



Verified Carbon Standard

KISHANGANGA HYDROELECTRIC PROJECT



Document Prepared by Core CarbonX Solutions Private Limited

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The purpose of the project activity is to generate electrical power using renewable hydel energy, through the operation of run of the river hydro turbines. The hydel energy generated from the hydel power plant is evacuated to the Indian Grid. NHPC Limited is the promoter of the proposed project activity.

Kishanganga Hydroelectric Project (3x110MW) is Greenfield Hydro Power Project is located in the Bandipora District of Jammu & Kashmir state of India, is a Run of the River with pondage scheme (ROR with pondage) envisaging diversion of water of Kishanganga (a tributary of river Jhelum) into an underground power house and discharging the tail race water into Wular Lake.

It is a run of the river scheme with Concrete Faced Rockfill Dam 37 m high (above deepest river bed level). The underground power house (113m x 21.3m x 46.5m) with installed capacity of 330 MW houses 3 nos. Pelton turbines and 3 generating units of 110 MW each designed to operate under the net rated head of 646 m and is proposed to be utilised to generate 1712.96 MU in a 90% dependable year with 95% machine availability.

Generating power through hydel plant is a clean technology as no Carbon intensive fossil fuel is burnt during the process. A hydel turbine produces power by harnessing the available potential energy. Thus, there are no GHG emissions associated with the functioning of the hydro turbines.

Project Name	Unit No.	Turbine Capacity	Location	Commissioning Date	Beneficiary States
Kishanganga Hydroelectric Project	I	110 MW	Bandipora; Jammu & Kashmir	13/03/2018	Jammu & Kashmir, Uttar Pradesh & Chhattisgarh
	II	110 MW		21/03/2018	
	III	110 MW		30/03/2018	

The current monitoring period is from 01/06/2019 to 31/03/2021. The total GHG emission reductions or removals generated in this monitoring period are 1,577, 127 tCO₂.

Audit Type	Period	Program	VVB Name	Number of years
Validation	13-Mar-2018 – 12-Mar-2028	<u>VCS</u>	<u>Earthood Services Private Limited</u>	10

Verification 1	13-Mar-2018 – 31-May-2019	<u>VCS</u>	<u>Earthood Services Private Limited</u>	1 Year 2 Months
Verification 2	01-Jun-2019 – 31-Mar-2021	<u>VCS</u>	<u>LGAI Technological Center, S.A. (Applus+ Certification)</u>	1 Year 10 Months
Total	<u>13-Mar-2018 – 31-Mar-2021</u>	<u>VCS</u>	=	3 Years 00 Months

1.2 Sectoral Scope and Project Type

The project activity falls under the following sectoral scope and Project Type:

Sectoral Scope: 01 - Energy industries (renewable / non-renewable sources)

Project Type: I - Renewable Energy Projects

The project is not a grouped project activity.

1.3 Project Proponent

Organization name	NHPC Ltd
Contact person	Dr. Avinash Kumar
Title	DGM (Environment), R & D Division.
Address	NHPC Limited, NHPC Office Complex, Sector 33, Faridabad 121003, Haryana, India
Telephone	0129-2278421
Email	cdm-env@nhpc.nic.in

1.4 Other Entities Involved in the Project

Organization name	Core CarbonX Solutions Private Limited
Role in the Project	VCS Monitoring Consultants
Contact person	Mr. Niroj Kumar Mohanty
Title	Managing Director

Address	Physical Address: 5R, Block-A, #6-3-668/9, Kanthi Shikara Complex, Punjagutta, Hyderabad-500082, Telangana, India
Telephone	040-23410367
Email	nmohanty@corecarbonx.com and info@corecarbonx.com

1.5 Project Start Date

Project start date: 13/03/2018

The project start date is the earliest commissioning date amongst all the Three Hydro Turbine Units which are part of this Large-Scale Hydro power project.

Project Name	Unit No.	Turbine Capacity	Location	Commissioning Date
Kishanganga Hydroelectric Project	I	110 MW	Bandipora; Jammu & Kashmir	13/03/2018
	II	110 MW		21/03/2018
	III	110 MW		30/03/2018

1.6 Project Crediting Period

Crediting Period Start date: 13/03/2018

Crediting Period End date: 12/03/2028

Total number of years: 10

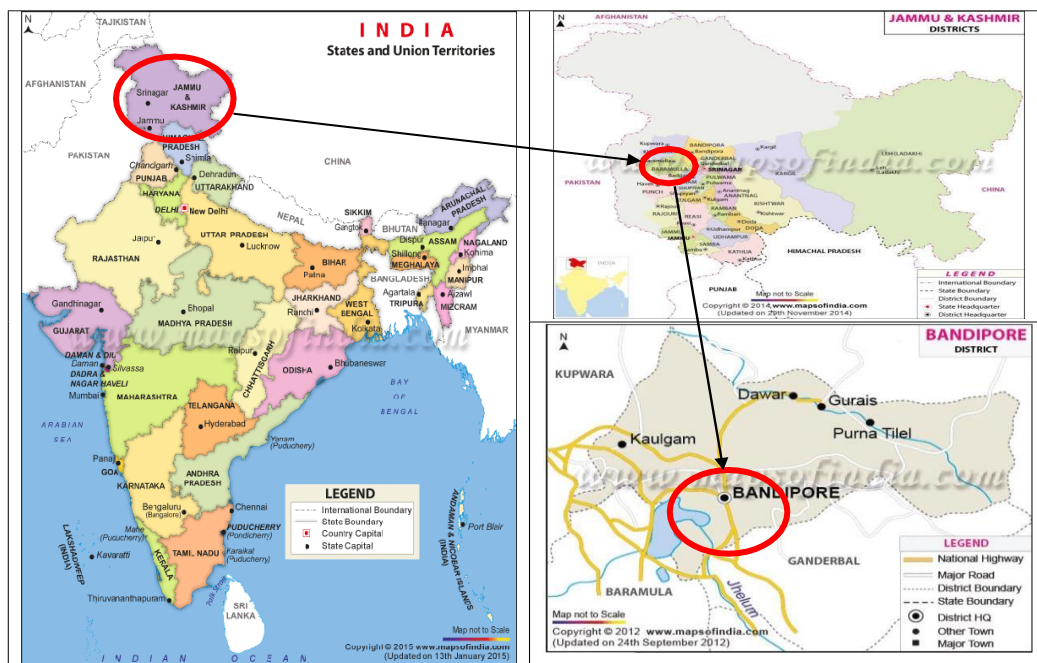
Crediting Period Type: Renewable

The project activity adopts a renewable crediting period with the first crediting period of 10 years and with an option to renew twice.

1.7 Project Location

The Kishanganga Power station (3x110MW) is located on the Kishanganga River, a tributary of river Jhelum in Bandipora District of Jammu & Kashmir state of India. The geographical coordinates of the project activity are as follows.

Location	Latitude	Longitude
Dam Site	34° 39' 00" N	74° 45' 08" E
Power House Site	34° 28' 17" N	74° 38' 28" E



1.8 Title and Reference of Methodology

Methodology: ACM0002: Grid-connected electricity generation from renewable sources --- Version 19.0,

Sectoral Scope: 01, EB 100,

Annex 6 <https://cdm.unfccc.int/methodologies/DB/VJI9AX539D9MLOPXN2AY9UR1N4IYGD>

The project activity also takes reference from following Tools from the tools prescribed by applied methodology:

1. Tool for the demonstration and assessment of additionality --- Version 07.0.0, EB 70, Annex 8 <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf>

2. Tool to calculate the emission factor for an electricity system ---Version 07.0, EB 100, Annex 4 <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf>

1.9 Participation under other GHG Programs

The project activity has not participated in any other GHG programs.

1.10 Other Forms of Credit and Supply Chain (Scope 3) Emissions

The project has neither generated nor has any intent to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program. The project has not been received any other forms of environmental credit, including renewable energy certificates during this monitoring period.

1.11 Sustainable Development Contributions

Kishanganga Hydroelectric project (3*110MW) is a Greenfield Hydroelectric Project located in the Bandipora district of the Jammu and Kashmir state of India, situated in the north of India. The Hydroelectric plant implements the run-of-river with a pond-age scheme and consists of three turbines with 110MW capacity and the total installed capacity is 330MW.

Hydroelectric power is the oldest means of using energy. The principle is simple: All it needs is water and a head (i.e difference in vertical height). The plant does not lead to flooding or resettlement of people. Run-of-river hydro power plants illustrate a great balance between utilizing a natural potential and low environmental and social impact.

The project provides several co-benefits that are aligned to the UN Sustainable Development Goals (SDGs). These include developing health facilities, establishing schools, improving water supplies, providing e-classrooms, employing locals, access to sustainable energy sources and mitigating global warming. The various activities undertaken by the project proponent on various areas and positively impacting the outcomes against several SDGs are summarized below.

- a) Provide access to healthcare facilities and services to community
 - i. Vaccination facility
 - ii. Medical Camps
 - iii. Provide accessible health care
- b) Provide access to education
 - i. Providing e-classrooms and infrastructure support
 - ii. Teaching assistance in the form of digital classrooms
 - iii. Access to sanitation facilities
- c) Reduction in the emission of greenhouse gases into the atmosphere.

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
Sequential row number	SDG Target number	Number and text of SDG indicator or, if no official SDG indicator is applicable, user-defined indicator	Indicate the project's contribution to the SDG Indicator (implemented activities to increase or decrease)	Brief description of the quantifiable impact of the project's activities related to the SDG indicator, during the monitoring period.	Brief description of the cumulative quantifiable impact of the project's activities related to the SDG indicator, over the project lifetime.
1)	4.4	4.4.1 Proportion of youth and adults with information and communication technology (ICT) skills, by type of skill	Implemented activities to increase the skills of students through ICT	The project proponent has invested in the establishment of Digital Classrooms with computer lab facilities at High School in Jurniyal, Gurez through the approved DPR and an MOU was signed with district administration for CSR sustainability and avoiding overlapping of Govt. Funding. Through this initiative the following benefits can be observed: 1. There is an availability of digital accessories for all students.	The project includes development of school infrastructure by providing children with Digital Classrooms and computer lab facilities. One particular High School Jurniyal, Gurez through the approved DPR and MOU (signed on 8th March 2019) benefitted from this initiative. The project is expected to last for 5 years. This initiative completed during 2020-21 1. The number of students who would be benefitted from the initiative is 72 children per annum 2. The lifetime of the project activity is 5 years hence: $5 \times 72 = 360$ students would be benefitted from the project activity over the lifetime of the project.

				2. The children would learn to operate the computer with the help of a technical assistant The average expenditure per student is Rs. 908.3. So, the contribution made by the project proponent has enabled access to digital education. By using this facility students were able to undergo digital training and access to computers which further enabled their cognitive skills to improve. Through this amenity, more than 50 children were able to access this facility. Children of classes' 4th -8th standard were able to use computers.	3. There is one school which was benefitted from the project activity. More details about the project activity can be seen in the Appendix III. There were no beneficiaries during the first monitoring period. In the second monitoring period, the number of beneficiaries is 72. Hence, the cumulative number of beneficiaries is 72.
2)	3.8	Indicator: Access to quality affordable and essential healthcare	Implemented activities to increase the access of local stakeholders to affordable medical care during the COVID 19 pandemic.	The project proponent intends to distribute medical kits as a part of the CSR activity in the year 2020-21. The activity involved distributing medical kits and emergency items to COVID affected individuals. The kits included oxygen cylinders, medicines and other items. Through this activity, 930 individuals were benefitted during the COVID crisis.	The project proponent intends to distribute medical kits as a part of their CSR activity. The activity involved distributing medical kits and emergency items to COVID affected individuals. There were no beneficiaries during the first monitoring period. In the second monitoring period, as this is a single time project activity taken up during COVID, the number of people benefitted are 930.
3)	3.8	Indicator: Access to quality affordable and	Implemented activities to increase the access of the local stakeholders to medical care.	The project activity intends to provide medical equipment to District Hospital Bandipora and Sub District Hospital, Gurez By the signing of a Memorandum of Understanding with the District Authority	The MoU was signed on 23-10-2019, the project activity is expected to last for 5 years. The number of people benefitted from the activity is 1400 every year.

		essential healthcare		for maintenance and Sustainability. Around 1400 people were benefitted in the year 2019-20 The assistance of NHPC has benefitted the hospitals by providing the hospitals with Horizontal Electric Autoclave Rectangular, Electric Cauty (400 volts), Multichannel Cardiac Monitor with ETCO2 monitoring, Dresseing DRUM MEDIUM Size, Cataract Set complete, Fluid Warmer, Proceal LMA size 3,5, Ventilating boogies and Masks were supplied to the hospitals along with the help of District administration	It would benefit $1400 \times 5 = 7000$ persons in the next five years. There were no beneficiaries during the first monitoring period. In the second monitoring period., the number of beneficiaries are 2800. Hence, the total beneficiaries are 2800.
4)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to decrease the emissions of greenhouse gases into the atmosphere.	The Kishanganga project replaces anthropogenic emissions of greenhouse gases into the atmosphere. Total of 1,577.127 tCO₂e during the current monitoring period 2019-21, thereby generating 1,728,176.9194MWh using renewable energy. Hence displacing 1,728,176.9194MWh of electricity from the grid.	The Kishanganga project replaces anthropogenic emissions of greenhouse gases GHGs into the atmosphere. The total anthropogenic emissions of greenhouse gases replaced over the period of first verification period are 685,478 tCO₂e and second verification period are 1,577,127 tCO₂e. The total emission reductions till date are 2,262,605 tCO₂e

2 SAFEGUARDS

2.1 No Net Harm

There were no harms identified from the implementation of the project. Hence, no mitigations measures are required.

As the project has previously not certified to the CCB or SD VSta Program, the conformance with the requirements set out in the Section 3.19.2 of VCS Standard versión 4.5 is not applicable.

2.2 Local Stakeholder Consultation

A detailed stakeholder consultation process has been conducted by NHPC. This task was accomplished by the J&K State Pollution Control Board. The Member Secretary has issued public notice for environmental public hearing on 05-Jul-2003 & 17-Jul-2003 and Environmental public hearing was conducted successfully on 04-Sep-2003 near power house site at village Bandipora & on 06-Sep-2003 in Gurez valley at Dam site PWD Guest House.

The stakeholders participated in the Public Hearing are as follows:

1. Government Officials
2. Local Citizens
3. Representatives of affected people residing in the project area.
4. Representatives of villages

The discussions mainly aimed at–

- Displacement due to submergence.
- Social issues like rehabilitation, compensation
- The basic protection of the biodiversity and environment affected due to the project
- Impacts in the region due to the project
- To understand various stakeholder perceptions
- Stakeholder awareness of project related issues

The comments of various stakeholders are reviewed below:

- One major issue raised during public consultation was related to impact of project on ethnic community in Gurez and submergence of Villages. People requested NHPC to consider lowering of Dam height to reduce submergence.
- To generate employment and prevent the influx of population in form of unskilled labourers, NHPC will only employ local labourers, and only in case of non-availability will it hire from outside.

- The project development has led to the anticipation of further developmental opportunities that will come up.
- For the project area proper earthquake parameters have been considered for the designing structures to prevent any calamity.
- That there are no apparent trends to indicate that the project has resulted in adversely affecting the livelihood, health, availability of water and other necessities of life in the region.

Keeping in view the request of locals for reducing Dam height, the dam height was reduced and now only one village is getting submerged. The change in Dam height was communicated to MoEFCC and revised Environmental Clearance was accorded by MoEFCC to the project vide letter dated 09-Mar-2006. As per condition stipulated in the revised Environmental Clearance for the project, a fresh socio-economic survey for the project affected families was conducted through University of Kashmir, Srinagar and a revised Rehabilitation and resettlement plan was prepared. MoEFCC had accepted the socio-economic survey report and R&R plan for project affected families vide its letter dated 23-Oct-2007.

No other major issues were identified for the project. The concerned departments are keeping a tight vigil for assessing any changes likely that may take place.

After completion of the public hearing, the final EIA & EMP reports and proceedings of Public Hearing were submitted to MoEFCC for appraisal by the Expert Appraisal Committee (EAC) of MoEFCC. After recommendation of EAC, Environmental clearance was issued to the project on Date 19-Apr-2004 which was revised on 09-Mar-2006.

The PP also ensures that the interaction with the local stakeholders happens regularly. The meeting with the local village panchayat is arranged at least once a month to get to know the issues in the village due to the project implementation and the PP helps out in whatever form deems fit.

2.3 AFOLU-Specific Safeguards

The project does not fall under the category of AFOLU projects. Hence, this section is not applicable

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

Kishanganga Power station (3x110MW) is located on Kishanganga River, a tributary of river Jhelum in Bandipora District of Jammu & Kashmir.

All the three units, i.e Unit-I, Unit-II & Unit-III of the Power Station were commissioned in the month of March 2018.

The other entity involved has been changed to Core CarbonX Solutions Private Limited which is a consulting company for the verification of the project.

The information of the breakdown details are given in the Appendix 1. There were no significant renovations or exchange of equipment in the project activity during the current monitoring period. There were no circumstances that occurred during the current monitoring period that may impact the applicability of the applied methodology. Salient features of the project:

1	LOCATION	
	State	Jammu & Kashmir
	District	Bandipora
	River	Kishanganga
	Dam site	Gurez valley
	Latitude	34° 39' 00" N
	Longitude	74° 45' 08" E
	Power House site	Near village Kralpora, Bandipora
	Latitude	34° 28' 17" N
	Longitude	74° 38' 28" E
2	HYDROLOGY	
	Catchment area	1815 km ²
	Max. Observed flood	990 cumec
	Probable Max. flood	2000 cumec
	Avg. Annual run-off	3103 Mcum
	Annual rainfall	676 mm
	Annual snowfall	1206 mm
3	RESERVOIR	
	Full Reservoir level	2390.0 m
	Max. Reservoir level	2390.0 m
	MDDL	2384.5 m
	Gross storage upto FRL	18.35 Mcum
	Dead storage capacity	10.80 Mcum
	Live storage capacity	7.55 Mcum
4	DAM	
	Type	CFRD
	Max. height above deepest river bed	37 m
	EL. Of Top of dam	2395.0 m
5	SPILLWAY	
	Design flood	2000 cumec
	Type	Chute Spillway
	Crest elevation of gated spillway	2370.00 m
	No. of gates	3
	Energy dissipation	Flip bucket
6	DIVERSION TUNNEL	
	Number	1
	Size	9.5 m dia

	Shape	Horse shoe
	Length	569 m
	Diversion capacity	1000 cumecs
7	INTAKE	
	Invert level	E1 2378.80
8	HEAD RACE TUNNEL	
	Number	1
	Size and shape	6.24 m Horse Shoe Shape (DBM) / 5.2 m dia., Circular (TBM)
	Length	23.2 km (14.75 km TBM & 8.45 km DBM) Approx.
	Design discharge	58.40 cumec
9	HRT ADITS	
	No. & Length	Three – 224 m, 659 m & 262 m
10	SURGE SHAFT	
	Diameter	17.75 m
	Height	109.66 m
	Type	Restricted orifice
11	PRESSURE SHAFT	
	No. & type	One circular, Inclined, steel lined
	Diameter	4.0 m, trifurcating into three 2.30m dia., horizontal branches at bottom
	Length	1020 m
12	POWER HOUSE COMPLEX	
	Type	Underground, two caverns
	Installed capacity	330 MW
	No. of units	3
	Power house cavity	113m x 21.3m x 46.5m
	Transformer hall cavity	75m x 15m x 15.2m
	Type of turbine	Pelton wheel
	Design Max. Gross head	670.82 m
	Rated net head	646 m
	Tail water level	
	For 1-unit operation	1711.18 m
	For 2-unit operation	-
	For 3-unit operation	1715.15 m
13	TAIL RACE SYSTEM	
	Tunnel Portion	
	Tunnel Portion type	Horse shoe
	Length	903 m Approx.
	Diameter	5.0 m
	Open channel	Length 36 m Approx.
14	SWITCHYARD	
	Size & Location	191 m x 115 m Near Kralpora village
15	POWER GENERATION	
	Installed capacity	330 MW
	Annual design energy generation	1712.96 GWh

3.2 Deviations

3.2.1 Methodology Deviations

There were no methodological deviations applied to the project activity during this monitoring period.

3.2.2 Project Description Deviations

The previous monitoring period did not have deviations, and the current monitoring period has the deviation mentioned below.

Deviation:

In section 4.3 of the registered PD, all meter details are provided. These meters are installed at the time of commissioning. In due course, three of these meters have been changed due to the meters being faulty. Thus, a deviation is requested to change the meter numbers of the locations KG-04, KG-07, and KG-11 from NR-3236-A, NR-3245-A, and NR-3291-A to WR-2169-A, WR-2167-A, and NR-3493-A respectively. The change of these meters does not affect the reading of energy generation. The meter at the location KG-07 is a main meter, and the readings were taken from the check meter when the faulty meter was being replaced. The other two meters at locations KG-04 and KG-11 are the Check meter and Standby Meter, respectively. The readings from the main meters were taken while the faulty meters were being replaced. Hence, the meter reading will not be affected by the change in meters.

Justification:

The meter number NR-3291-A in the location number KG-11 was replaced with the meter NR-3493-A on 15/02/2020. The meter number NR-3236-A, located in location number KG-04, was replaced with the meter WR-2169-A on 13/06/2022. The meter number NR-3245-A, located in location number KG-07, was replaced with the meter WR-2167-A on 05/03/2022. Only one meter (located in KG-11) was changed in the current monitoring period. The remaining two meters were changed in 2022, which does not cover the current monitoring period.

Three energy meters were replaced due to faulty readings. Since the meters are under the control of PGCIL, they have replaced the faulty meter with the new one. The readings were taken from the check meter when the faulty meters were being replaced. The new meter data has been found to be correct and in line with the previous readings.

The deviation does not impact the baseline emissions, the applicability of the methodology, or the additionality of the Project.

3.3 Grouped Projects

This project is not a grouped project. Hence, this section is not applicable.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	EF _{grid,OM,y}
Data unit	tCO ₂ /MWH
Description	Operating Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 14, December 2018
Value applied	0.9610
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per “Tool to calculate the emission factor for an electricity system, version 07.0.0” as 3-year generation weighted average using data for the years 2015-16, 2016-17 & 2017-18. The data are obtained from “CO ₂ Baseline Database for Indian Power Sector” version 14.0, published by the Central Electricity Authority, Ministry of Power, Government of India
Purpose of Data	For the calculation of the Baseline Emissions
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	EF _{grid,BM,y}
Data unit	tCO ₂ /MWH
Description	Build Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 14, December 2018
Value applied	0.8644
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per “Tool to calculate the emission factor for an electricity system, version 07.0.0” for the year 2017-18. The data are obtained from “CO ₂ Baseline Database for Indian Power Sector” version 14.0, published by the Central Electricity Authority, Ministry of Power, Government of India
Purpose of Data	For the calculation of the Baseline Emissions
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	EF _{grid,CM,y}
Data unit	tCO ₂ /MWH
Description	Combined Margin CO ₂ emission factor in year y

Source of data	Calculated from CEA database, Version 14, December 2018
Value applied	0.9126
Justification of choice of data or description of measurement methods and procedures applied	The combined margin emissions factor is calculated as follows: $EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$ Where: $EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (tCO₂/MWh) $EF_{grid,OM,y}$ = Operating margin CO₂ emission factor in year y (tCO₂/MWh) W_{OM} = Weighting of operating margin emissions factor (%) = 50% W_{BM} = Weighting of build margin emissions factor (%) = 50%
Purpose of Data	For the calculation of the Baseline Emissions
Comments	This parameter is fixed ex-ante for the entire crediting period.

4.2 Data and Parameters Monitored

Data / Parameter	EG _{PJ,y}
Data unit	MWh
Description	Quantity of electricity generation supplied by the project plant/unit to the grid in year y
Source of data	Deviation Settlement Account statement issued by NRPC
Description of measurement methods and procedures to be applied	Data Type: Measured Monitoring equipment: Energy Meters are used for monitoring Recording Frequency: Continuous monitoring and Monthly recording from Energy Meters, Summarized Annually Archiving Policy: Paper & Electronic Calibration frequency: 5 years Electricity exported by the project to the grid at project site switch yard is the actual generation recorded and monitored by the metering system installed at the project site switch yard. The metering system comprises of three individual special energy meters (SEMs) (acts as standby meters) installed at the power station, for each generating units. These are connected via four transmission lines of 220 kV, each having its own SEM meter (main meter and check meter). In case, anyone transmission line is not in service than complete load is shifted to other transmission line which is in operation. The energy meters are special energy meters which are installed and sealed by the Power Grid Corporation of India Limited in the presence of the representatives of the power producer.

	The check meter is used during the period the main metering system is not in service. Further in case of failure of main meter and check meter, sum of the net electricity generation recorded by three individual special energy meters (SEMs) and individual auxiliary meters is used for accounting and billing purpose.
Frequency of monitoring/recording	Continuous measurement and at least monthly recording
Value monitored	1,728,176.9194 MWh
Monitoring equipment	Special Energy Meters (SEMs) of 0.2s accuracy class ¹ .
QA/QC procedures to be applied	Energy meters will be calibrated once in a five year and faulty meters will be duly replaced immediately. This data may be cross checked with the Monthly Generation Reports.
Purpose of the data	Calculation of baseline emissions
Calculation method	Not applicable
Comments	The data would be archived electronically and maintained for the entire crediting period plus two years.

4.3 Monitoring Plan

The project proponents at the power station have a procedure to ensure proper monitoring of the VCS project activity. The project activity has installed monitoring and control equipment that measure, record, report, monitor and control various key parameters.

The methodology requires monitoring of the net electricity supplied from the project activity.

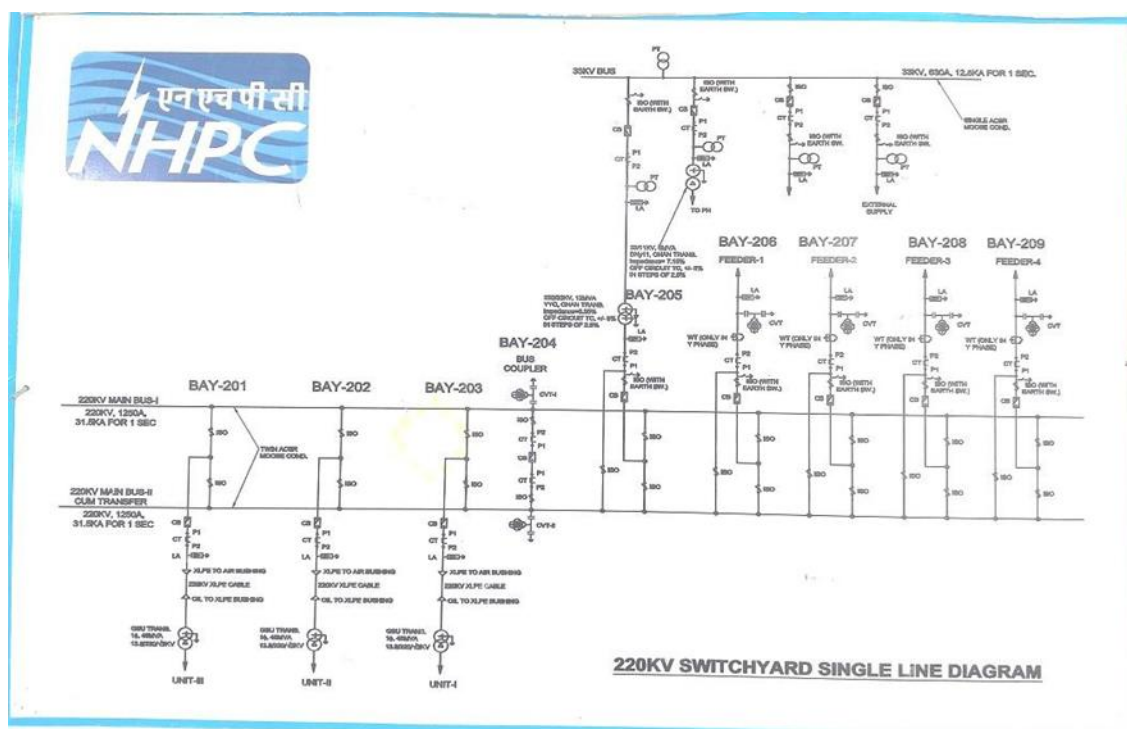
The proponent shall maintain complete and accurate records and all other data required for the purpose of proper administration and operation of the hydro power plant. The data will be kept for at least 2 years after the end of the crediting period.

1. Purpose - The purpose of monitoring the project is to assess the annual emission reductions in tonnes of CO₂ that the project activity has achieved.
2. Data to be reported - EG_{PJ,y} in MWh and periodical calibrations of monitoring equipment's.
3. Meter Details and Line Diagram:

The metering system comprises of 12 new-calibrated meters which were installed at the power station switch yard. All the meters are of accuracy class 0.2s and sealed by the Power Grid Corporation of India Limited and will be calibrated once in 5 years.

¹ The energy meters make, class and calibration details are mentioned in the Appendix 2

From the 12 meters, three individual special energy meters (SEMs) (acts as standby meters) are installed at the power station switch yard for each generating unit for monitoring and recording of electricity generation through individual unit after transformation losses. These 3 units are further connected to 4 feeders or transmission lines of 220 kV (Amargarh-1, Amargarh-2, Wagoora-1, Wagoora-2). Each feeder line has 2 separate energy meters (main meter and check meter) installed at the power station switch yard for measurement and recording the electricity supplied to the grid by the project activity. In order to monitor auxiliary power consumption, one separate meter of same technical specification is installed at power station switch yard.



Meter location ID no.	Make	Meter Number	Accuracy Class	Category	Installed On	Place of installation of SEM
KG-01	Elster	NR-3292-A	0.2s	M	Feb-2018	220 kV Amargarh-1
KG-02	Elster	NR-3314-A	0.2s	C	Feb-2018	220 kV Amargarh-1
KG-03	Elster	NR-3504-A	0.2s	M	Feb-2018	220 kV Amargarh-2
KG-04	Schneider	WR-2169-A ²	0.2s	C	Jun-2022	220 kV Amargarh-2
KG-05	Elster	NR-3241-A	0.2s	M	Feb-2018	220 kV Wagoora-1

² The meter number NR-3236-A was replaced with the meter WR-2169-A on 13/06/2022 since that meter was faulty.

KG-06	Elster	NR-3243-A	0.2s	C	Feb-2018	220 kV Wagoora-1
KG-07	Schneider	WR-2167-A ³	0.2s	M	Mar-2022	220 kV Wagoora-2
KG-08	Elster	NR-3247-A	0.2s	C	Feb-2018	220 kV Wagoora-2
KG-09	Elster	NR-3258-A	0.2s	S	Feb-2018	GT-1 (220kV)
KG-10	Elster	NR-3288-A	0.2s	S	Feb-2018	GT-2 (220kV)
KG-11	Elster	NR-3493-A ⁴	0.2s	S	Feb-2020	GT-3 (220kV)
KG-12	Elster	NR-3325-A	0.2s	S	Oct-2018	220 kV Aux Transformer (220kV/33kV)

Where, M – Main Meter, S – Standby Meter, C – Check Meter

4. Monitoring times and periods - The data is monitored on a continuous basis but is recorded on a monthly basis with the energy meters installed at the site.
5. Data Accuracy - As per clause 4.0, Metering Arrangement of the Power Purchase Agreement (PPA) the metering arrangement including its installation, testing, maintenance and collection transportation and processing of data required for energy exchange shall be governed as per the notification/ directives issued/or to be issued by Central Electricity Regulatory Commission and as per relevant provisions contained in IEGC as amended from time to time. The Central Electricity Authority (CEA) notification regarding Installation and Operation of meters regulations, 2006, says that meters are required to be tested once in 5 years (refer clause 18 of the guideline) 10. Thus, the meters recording the electricity exported will be calibrated at least once 5 years.
6. Emission Reduction Calculation Approach - The emission reductions are calculated as a product of the net electricity generated from the project activity and the combined margin emission factor. The calculation approach is explained in detail under section 3 of the registered VCS PD document.
7. Monitoring roles and responsibilities: A project team would be constituted for the monitoring of the project. This team is responsible for data collection and archiving. The team is met periodically to review the data collected as per monitoring plan. In case of any irregularity observed by any of the team members, it will be informed to the concerned person for necessary actions to be taken. The following be is the team structure for project monitoring:

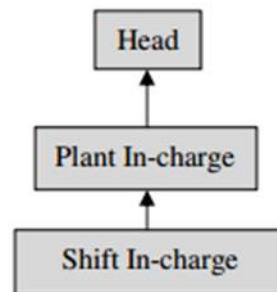
³ The meter number NR-3245-A was replaced with the meter WR-2167-A on 05/03/2022 since that meter was faulty.

⁴ The meter number NR-3291-A was replaced with the meter NR-3493-A on 15/02/2020 since that meter was faulty.

- a. Unit Head: Overall responsibility of compliance with the monitoring plan.
- b. Power Plant In-charge: Responsibility for completeness of data, reliability of data (calibration of meters), and monthly report generation.
- c. Shift In-charge: Responsibility of daily report generation from the SCADA system/ log-books.

The Organisational structure for GHG data collection and management system is as below:

Organisational Structure for Monitoring



8. Managing Data Quality: The Power plant In-charge prepares the report pertaining to the recorded values of the monitored parameters as by the shift-in- charge. The day-to-day records are verified by Unit Head, compiled and documented. The company ensures a safe storage of data. NHPC is an ISO – 9000, and ISO – 14000 certified company having an integrated management system. It also ensures all the requirements are met for the project.
9. As a part of regular monitoring activities, the Unit Head performs the data quality checks as per the standard procedures on a monthly basis.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The baseline emissions are calculated using the following formula:

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

$EF_{grid,CM,y}$: Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (tCO₂/MWh) (i.e., 0.9126 tCO₂/MWh).

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

BE_y : Baseline emissions in year y (tCO_{2e}/year)

Here,

$$EF_{grid, CM, y} = 0.9126$$

$$EG_{PJ, y} = 1,728,176.9194$$

$$BE_y = 1,728,176.9194 * 0.9126 = 1,577,127 \text{ tCO}_2e$$

Period	Net Electricity generation (MWh)	Baseline emission factor (tCO _{2e} /MWh)	Baseline Emissions (tCO _{2e})
01/06/2019 - 31/12/2019	565299.0000	0.9126	515891
01/01/2020 - 31/12/2020	974362.5298	0.9126	889198
01/01/2021 - 31/03/2021	188515.3896	0.9126	172038
Total	1,728,176.9194		1,577,127⁵

5.2 Project Emissions

The project activity involves in harnessing hydro power. So, the emissions from the project are zero

5.3 Leakage

No leakage emissions have been considered and hence the leakage emission is zero.

5.4 Net GHG Emission Reductions and Removals

As per the applied methodology, emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

Where,

⁵ Baseline emissions value is rounded down.

ER_y = Emission Reduction in tCO₂/year

BE_y = Baseline emission in tCO₂/year

PE_y = Project emissions in tCO₂/year

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2019 (<u>01-Jun-2019 – 31-Dec-2019</u>)	515,891	0	0	515,891
2020 (<u>01-Jan-2020– 31-Dec-2020</u>)	889,198	0	0	889,198
2021 (<u>01-Jan-2021– 31-Mar-2021</u>)	172,038	0	0	172,038
Total	1,577,127	0	0	1,577,127

<u>Ex-ante emissions reductions/removals</u>	<u>Achieved emissions reductions/removals</u>	<u>Percent difference</u>	<u>Justification for the difference</u>
2,869,522	1,577,127	-45.04%	As the source of energy generation is water, the availability is not in the control of PP. The non-availability of water is a major reason for the difference in ex-ante emission reductions and the achieved emission reductions. Unit1, Unit2, and Unit3 had major breakdown during the monitoring period. The details of the same have been given in the appendix I under the title “Breakdown Details of the Project”.

APPENDIX I: BREAKDOWN DETAILS OF THE PROJECT

The breakdown details all three units of the project activity are given below:

Year	Period		Details
	From	To	
2019-20			
	13-May-19	13-Jun-19	FREQUENT OUTAGE OF U#2 DUE TO HIGH UGB PAD TEMPERATURE.
	3-Jun-19	16-Jun-19	OUTAGE OF U#3 FOR IN-HOUSE REPAIR OF TGB SHELL DUE TO HIGH TEMPERATURE.
	4-Jul-19	8-Jul-19	OUTAGE OF U#2 DUE TO ROTOR EARTH FAULT.
	1-Oct-19	26-Nov-19	
	12-Mar-20	1-May-20	
	4-Aug-19	8-Aug-19	OUTAGE OF U#2 DUE TO GENERATOR POLE DISCREPANCY FAULT.
	1-Dec-19	27-Sep-20	OUTAGE OF U#1 DUE TO DAMAGE OF ONE RUNNER BUCKET, DEFELCTOR AND ONE NOZZLE COVER OF NOZZLE NO.5 W.EF 01-DEC-2019.UNIT WAS RUNNING AT PARTIAL LOAD.
	8-Feb-20	27-Apr-20	OUTAGE OF U#3 FOR INSPECTION/REPAIR OF RUNNER.
2021	25-Mar-21	7-Jun-21	OUTAGE OF U#1 FOR ANNUAL MAINTENANCE & RECTIFICATION OF HIGH LGB VIBRATION.
	30-May-21	8-Jul-21	OUTAGE OF U#2 FOR REPAIR WORK OF STATOR WINDING ⁶ .

⁶ The project activity has three units in total. For the period of 30-May-21 to 08-Jul-21 only, unit 2 has been completely shut down for the winding repair works. The units 1 and 3 were operational and the electricity was being generated by the units.

APPENDIX II: METER CALIBRATION DETAILS

The energy meters are in the custody of Power Grid Corporation of India Limited (PGCIL) and hence the calibration of the export meters is under the control of PGCIL. The Calibration frequency of the Energy Meters is once in 5 years. The meters were tested on 05/10/2015, 17/11/2015, 17/12/2015 however the installation happened on 13/03/2018. The latest calibration for the meters was done on 13/09/2023, 15/09/2023 and 16/09/2023 for the meters.

As the testing/calibration of the energy meters was done on 05/10/2015, the calibration is valid for 5 years i.e., till 04/10/2020 according to the No. 502/70/CEA/DP&D In exercise of the powers conferred by sub-section (1) of section 55 and clause (e) of section 73 read with sub-section (2) of section 177 of Electricity Act, 2003 “Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006” and subsequent amendments clause 18 (1), (2) and (3), para number 18 of Calibration. The next calibration was not done as per schedule. As per the CDM validation and verification standard for project activities, Version 03.0, if the calibration is delayed, the following conservative approach need to be followed: “Applying the maximum permissible error of the energy meter to the measured values taken during the period between the scheduled date of calibration and the actual date of calibration, if the results of the delayed calibration do not show any errors in the measuring equipment, or if the error is smaller than the maximum permissible error.” Hence, the error factor is applied to the values of energy generation from 05/10/2020 to 31/03/2021 (the end of the crediting period)

The calibration of the energy meters is not under the control of PP. and hence there was a delay in calibration. The Power Grid Corporation of India Limited (PGCIL) has a full control of the energy meters. The calibration is done only when the PGCIL representatives find any discrepancy in the meter readings, not at regular intervals.

As the % error indicated in the calibration reports is within the limits of Maximum Permissible Error (MPE) +/- 0.2% thus MPE of -0.2% has been applied to measured ERs i.e. baseline emission of net energy export $((100\% - 0.2\%) * (EG_{\text{export},y} * BE_y))$ has resulted in 1,577,127 tCO_{2e} GHG emission reductions or net anthropogenic GHG removals. Thus, the last calibration report and its reference data support the requirement for the missing calibration report given in the VVS requirements.

The energy meter details along with calibration details are given below:

Meter locati	Ma ke	Meter Number	Accur acy Class	Install ed On	Date of testing/calibration ⁷	Date of calibratio n	Due date of	Result
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⁷ According to No. 502/70/CEA/DP&D In exercise of the powers conferred by sub-section (1) of section 55 and clause (e) of section 73 read with sub-section (2) of section 177 of Electricity Act, 2003 “Central Electricity Authority (Installation and

on ID no.							calibration	
KG-01	Elster	NR-3292-A	0.2s	Feb-2018	17/11/2015	16/09/2023	15/09/2025	Error is within the limits.
KG-02	Elster	NR-3314-A	0.2s	Feb-2018	17/11/2015	16/09/2023	15/09/2025	
KG-03	Elster	NR-3504-A	0.2s	Feb-2018	17/12/2015	13/09/2023	12/09/2025	
KG-04	Elster	NR-3236-A	0.2s	Feb-2018	05/10/2015	Not available		
	Schneider	WR-2169-A ⁸		Jun-2022	13/06/2022	13/09/2023	12/09/2025	
KG-05	Elster	NR-3241-A	0.2s	Feb-2018	05/10/2015	13/09/2023	12/09/2025	
KG-06	Elster	NR-3243-A	0.2s	Feb-2018	05/10/2015	13/09/2023	12/09/2025	
KG-07	Elster	NR-3245-A	0.2s	Feb-2018	05/10/2015	Not available		
	Schneider	WR-2167-A ⁹		Mar-2022	05/03/2022	13/09/2023	12/09/2025	
KG-08	Elster	NR-3247-A	0.2s	Feb-2018	05/10/2015	13/09/2023	12/09/2025	
KG-09	Elster	NR-3258-A	0.2s	Feb-2018	05/10/2015	15/09/2023	14/09/2025	

Operation of Meters) Regulations, 2006” and subsequent amendments clause 18 (1), (2) and (3), para number 18 of Calibration and periodical testing of meters need to be calibrated at least once in five years. Hence, the calibration is valid till 04/10/2020.

⁸ The meter number NR-3236-A was replaced with the meter WR-2169-A on 13/06/2022 since that meter was faulty.

⁹ The meter number NR-3245-A was replaced with the meter WR-2167-A on 05/03/2022 since that meter was faulty.

KG-10	Elster	NR-3288-A	0.2s	Feb-2018	17/11/2015	15/09/2023	14/09/2025	
KG-11	Elster	NR-3291-A	0.2s	Feb-2018	17/11/2015	NA	NA	
		NR-3493-A ¹⁰		Feb-2020	15/02/2020	15/09/2023	14/09/2025	
KG-12	Elster	NR-3325-A	0.2s	Oct-2018	17/11/2015	16/09/2023	15/09/2025	

A total of three energy meters were changed due to the meters being faulty. Since the meters are under the control of PGCIL, they have replaced the faulty meter with the new meter. The readings were taken from the check meter when the faulty meters were being replaced. As the new meter data has been found correct and in line with the previous readings, there is no impact on the baseline emissions of the Project.

APPENDIX III: CSR ACTIVITIES TAKEN UP BY THE PROJECT PROPONENT

The CSR activities taken up by NHPC Limited under Kishanganga Hydroelectric Project are accessible through the following link. The CSR reports for every year are given in the below link:

Web-Link: <https://www.nhpcindia.com/welcome/page/155>

¹⁰ The meter number NR-3291-A was replaced with the meter NR-3493-A on 15/02/2020 since that meter was faulty.