300MW HYDROPOWER PROJECT BY JHPL

Document Prepared by EKI Energy Services Limited

Contact Information: Office no. 201, Plot 48, Scheme 78 part 2 Vijay Nagar, Near Brilliant Convention Centre Indore - 452010 (M.P, India)

Project Title	300MW Hydropower project by JHPL[1]
Version	02
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[1]Due to change in ownership (from JHPL to HBPCL) of project activity, the deviation has been requested to change the project title from "300MW Hydropower project by JHPL" to "300MW Hydropower project by HBPCL". The ownership transfer documents are submitted to VVB for validation purpose. The project title will be revised after Deviation approval by VEERA.

Project ID	92
Monitoring Period	01-November-2020 to 31-July-2021 (inclusive of both start and end dates)
Prepared By	EKI Energy Services Limited
Contact	Mr. Souvik Mitra Project Manager Email ID : souvik@enkingint.org Address: Office no. 201, Plot 48, Scheme 78 part 2 Vijay Nagar, Near Brilliant Convention Centre Indore - 452010 (M.P, India) Website www.enkingint.org

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The Baspa project is a run-of-the-river hydro-electric power plant with an installed capacity of 300 MW. The diversion barrage of the project is located across river Baspa, one of the maor tributaries of the river Sutlej, at Kuppa in Himachal Pradesh. The power house is located at Karcham village in Kinnaur District. The project activity was an initiative of Jaiprakash Hydro Power Limited (JHPL) a part of the Jaypee Group.

The project activity is a run-of-the-river hydro project which supplies power through Indian Grid. The power generated by the project activity displaces the power that would have otherwise been generated using fossil-fuel as in the current supply pattern of the grid. INDIAN grid is operating with a mix of hydro, nuclear and fossil fuel power plants.Prior to the start of the project activity the existing demand in the Northern Region Grid was met through its existing fossil fuel based (coal, gas and diesel), nuclear, hydro and renewable energy based power plants.

From 01-September-2015 onwards, the Himachal Baspa Power Company Ltd. (HBPCL) has owned this hydro power plant and its name changed to JSW Hydro Energy Limited[2] from 01-September-2018 thus JSW Hydro Energy Limited is the new owner is acting as project proponent for the project activity.

The 300 MW hydro power project was implemented in three phases for three units –

Unit No.	Date of Commissioning
Unit I	24-May-2003
Unit II	29-May-2003
Unit III	08-June-2003

The run-of-river hydro-Power project consists of three units with installed capacity 100 MW each making total installed capacity of 300 MW.

During the current monitoring period 01-November-2020 to 31-July-2021, the project activity achieved 669,802 tCO_2e as a result of supplying 722,315.23 MWh clean electricity to grid.

In current monitoring period, it has been operational with normal schedule with scheduled maintenance; no event has been identified which may impact GHG emissions reductions.

1.2 Sectoral Scope and Project Type

Sectoral scope 1: Energy Industries (renewable / non-renewable sources).

[2] The relevant document for company name change has been provided

Project type: Renewable energy project

The project activity is not a grouped project

1.3 Project Proponent

Organization name	JSW Hydro Energy Limited (formerly Himachal Baspa Power Company Ltd)
Contact person	Mr. Anil Kumar Thakur
Title	Plant Engineer
Address	Karcham- Wangtoo H.E. Project, Sholtu Colony, P.O. Tapri, Sholtu, Himachal Pradesh 172104, India
Telephone	+ 91 7018858819
Email	Anilkumar.thakur@jsw.in

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the Project	Project Consultant
Contact person	Mr. Souvik Mitra
Title	Project Manager
Address	Office No 201, Plot No 48, Scheme 78, Vijay Nagar Part- II, Indore 452010, India
Telephone	+91-7489924005
Email	souvik@enkingint.org

1.5 Project Start Date

The project start date is earliest date of commissioning of the Unit-I i.e. 24-May-2003.

1.6 Project Crediting Period

First Crediting Period: 01-April-2006 to 31-March-2016

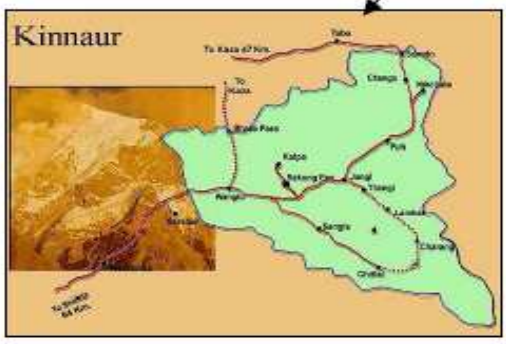
Second Crediting Period: 01-April-2016 to 31-March-2026

1.7 Project Location

The project site is located about 210 Km from Shimla. Shimla is connected to the project site by National Highway-22 (Hindustan Tibet Road). Nearest broad gauge railway station from the project site is Kalka which is about at a distance of 300Km from the project site. The geographical location of the power house is between Longitude 78°17' East and Latitude 31° 50' North. Location is depicted in following maps-

Location of Himachal Pradesh in India

Location of Kinnaur district



1.8 Title and Reference of Methodology

Methodology: ACM0002 ver. 17.0 (EB 89, Annex 1)[3]

Methodology Title: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

[3] https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG

It has been referred from the list of approved methodologies for CDM project activities in the UNFCCC CDM[4].

The methodology also refers to the latest approved versions of:

- Tool to calculate the emission factor for an electricity system, Version 06.0 (EB 97, Annex 7)[5]
- Tool for the demonstration and assessment of additionality, Version 05.2(EB 39, Annex 10)[6]

1.9 Participation under other GHG Programs

The project activity is neither registered nor seeking registration in any other GHG program. The project proponent has also provided undertaking that it will not claim any GHG credits in any GHG program other than that under VERRA during the current monitoring period.

1.10 Other Forms of Credit

India is Non-annex1 country and there is no compliance with an emission trading program or to meet binding limits on GHG emissions for this project activity. The project is neither registered nor seeking registration in any other GHG program. The project proponent (PP) has submitted undertaking that they will not claim any GHG credit in any GHG program other than that under VERRA for the same monitoring period. PP would not use net GHG emission reductions by the projects for compliance with emission trading program to meet binding limits on GHG emissions. PP has also submitted undertaking for not availing other forms of environmental credit for the same crediting period under consideration.

1.11 Sustainable Development

The National CDM Authority (NCDMA), which is the Designated National Authority (DNA) for the Government of India (GOI) under the Ministry of Environment, Forest and Climate Change (MoEFCC) has mentioned four indicators for the sustainable development. The project participant's view on the contribution of this project activity towards sustainable development is explained below:

Social well-being:

1. Project activity has generated direct and indirect employment for skilled and unskilled manpower during construction phase as well as during operational stage and thus helped in controlling migration from the region and alleviation of poverty.

[4] https://cdm.unfccc.int/methodologies/DB/EY2CL7RTEHRC9V6YQHLAR6MJ6VEU83

[5] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v6.pdf

[6] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf

2. The project activity's contribution of power supply towards the INDIAN grid is helping in the upliftment of the social life of the people by ensuring a sustainable and reliable source of power for the region.

Economic well-being:

The project activity has improved the infrastructural facilities like water availability, road, and medical facilities etc. The Project activity brings considerable investment in the region and helps in overall development of the region via following ways:

- Roads have been built in the vicinity of the project.
- Eight bridges, spanning up to maximum of 121 metres, were constructed at various locations between Wangtoo, upstream of Nathpa on NH-22 and Kuppa barrage site).
- Funds and expertise for upgrading of existing schools in the region and for developing new ones have been provided.
- Health care facilities in the form of a hospital, new dispensary, doctors and medicalstaff as well as free medicines have been arranged by the company in the vicinity ofthe project for the benefit of the people of adjoining villages

Environment well-being:

The project activity generates clean and green power thus causing negligible emissions of greenhouse gases. If a coal or oil-fired thermal plant of the same capacity were to be built the emission of greenhouse gases would add about 12,000 tons of Sulphur oxides (SOx), 6000 tons of Nitrogen oxides (NOx), and about 2 million tons of carbon dioxide into the atmosphere each year. By building and operating the Baspa project, much pollution is avoided. The project activity has reduced the dependence on fossil fuels for power generation thus conserving the natural reserves. The project has led to greenhouse gas emission reduction and hence helped in mitigating climate change.

Technological well-being:

The project activity envisages installation of high efficiency turbines and generators and the power is transmitted at high voltage to ensure low losses. Moreover, the technology being used is well established, most updated and environmentally safe.

There is no requirement of monitoring of sustainability development parameters neither according to the monitoring plan of the registered PD or host country regulation and through the above, the PP has considered that the project activity profoundly contributes to the sustainable development.

Additionally, report on sustainable developments related to this project activity is being submitted to VERRA registry board regularly according to the requirement.

2 SAFEGUARDS

2.1 No Net Harm

The Environment Impact Assessment study was conducted for the project activity and judicious efforts to cause minimal impacts on the surrounding environment and to maintain the natural balance.

Environmental Impact

The host party for the project activity is India. At the time when Baspa project was implemented, there was no specific requirement of prior consideration of an EIA study for large hydro power projects as per MoEFCC[7] guidelines. However, in order to receive financing for the project, it was a requirement of the lenders to have an EIA study conducted for this project. Hence it was necessary for JHPL to carry out an EIA study which was done by a well- known organization, NEERI (National Environmental Engineering and Research Institute) in 2002. In addition, another study for the purpose of a social audit was done by Sharnam Seva Samiti in the year 2007. The environmental studies were undertaken to study the impacts of project activity on environment.

The environmental impacts associated with the project activity are as follows:

Air and Noise environment: The air quality and noise levels were assessed at different stationsAll stations recorded SPM concentration below the central pollution boardstandard. The levels of gaseous air pollutants, viz. SO2 and NO2 were below the detectable limit of 6 µg/m3. The noise levels for the residential area were in the range of 40 to 50 dBA and in sensitive areas i.e. schools and hospitals were in the range of 40 to 45 dBA and are well within the Central Pollution Control Board standards for residential and sensitive areas.

Water environment: The water quality of Baspa River for physical, chemical and heavy metal concentration is within permissible limits as per CPCB standard. There is no organic pollution as no major sources of domestic or industrial discharge in the river. Bacteriological quality of ground water sources does not show faecal contamination.

Land environment: The total land required for various activities of the project is 65.1584 ha and include forest land (44.1795 ha), Govt. land (7.0675 ha) and private land (13.9111 ha). The forest land to be utilised does not cover extensive forest or trees or endangered species.

Biological environment: The project activity does not cause any significant disturbance to the ecosystem. The plant species of the project area are neither endemic nor rare and endangered. There are no any significant adverse impacts of the project activity on wildlife, mammals, reptiles and migratory birds in the project area. Further, Rukcham-Chitkul wildlife sanctuary is located at 5 km off the Baspa site and does not have any adverse impact on the sanctuary due to the projectactivity. The baseline status of the aquatic environment with reference to flora and fauna in the Sutlej has been studied. The Shannon diversity Index and Palmer's pollution Index values show that the river water is not polluted with sub-optimal levels of nutrients.

Socio-economic environment: The impact of construction on local labour force availability is highly significant. Increased income resulted in increased imports of labourers to the area and

[7] Since June 2014, the name of CDM DNA of India changed to Ministry of Environment, Forest and Climate Change (MoEFCC)

further income was generated by servicing the workforce. The construction of the power project triggers an all-round increase in development activities such as housing, transport and education and those have significant positive impact on the life style of the population. In sum the overall impact of the project on the socio-economic environment is expected to highly beneficial and positive.

Summary:

The work on the Environmental Management Plan (EMP) as per the NEERI report for the project is ongoing. The project proponent has sanctioned INR 20 crores (INR 200 Million) toGoHP as per the CAT Plan and along with the GoHP officials has undertaken efforts to re-vegetate the area. Almost 50% of the compensatory afforestation work is completed with a survival rate of 75- 80% of the plants. The project proponent has constructed cement walls along the side of the river banks and roads to stabilize the area and prevent erosion. The PP has also installed an effluent treatment plant at the Sholtu site to treat the domestic wastewater from colonies before discharging it into the river. The PP also maintains a flow of 5 cusecs while releasing the water to maintain the downstream flow as per the Power Purchase Agreement. Thus it may be concluded that the project promoters have made judicious efforts tocause minimal impacts on the surrounding environment and to maintain the natural balance.
No potential negative environmental and socio-economic impacts in the project activity.

2.2 Local Stakeholder Consultation

The Stakeholder Consultation Report primarily deals with socio-economic impact of the project activity and provided an opportunity for the local population to express their viewpoints and comments with respect to the project.

Before implementation of the project activity, the project proponent did thorough consultation with stakeholders – identifying the stakeholders, consultation with the stakeholders in number of phases and through number of media – focus group discussion, detailed social mapping and fieldwork, inclusion of local stakeholders from all sections of community , explanation of project activity – purpose and details to them and resolving the comments/ grievances along with seeking suggestions from them. The PP has engaged a number of local NGOs for local stakeholder consultations by applying various strategies to engage them in project and for taking care of their complaints/grievances/suggestions. The process is ongoing and continuous; this process is undertaken throughout the year.

During the current monitoring period, the project proponent has engaged with the local stakeholders in different ways including various Corporate Social Responsibility (CSR) activities undertaken by the company. Besides, PP has kept grievance register in plant site office seeking complaints/grievances from local community. There has also been the provision of receiving letters from local community for any suggestion/comment/complaint.

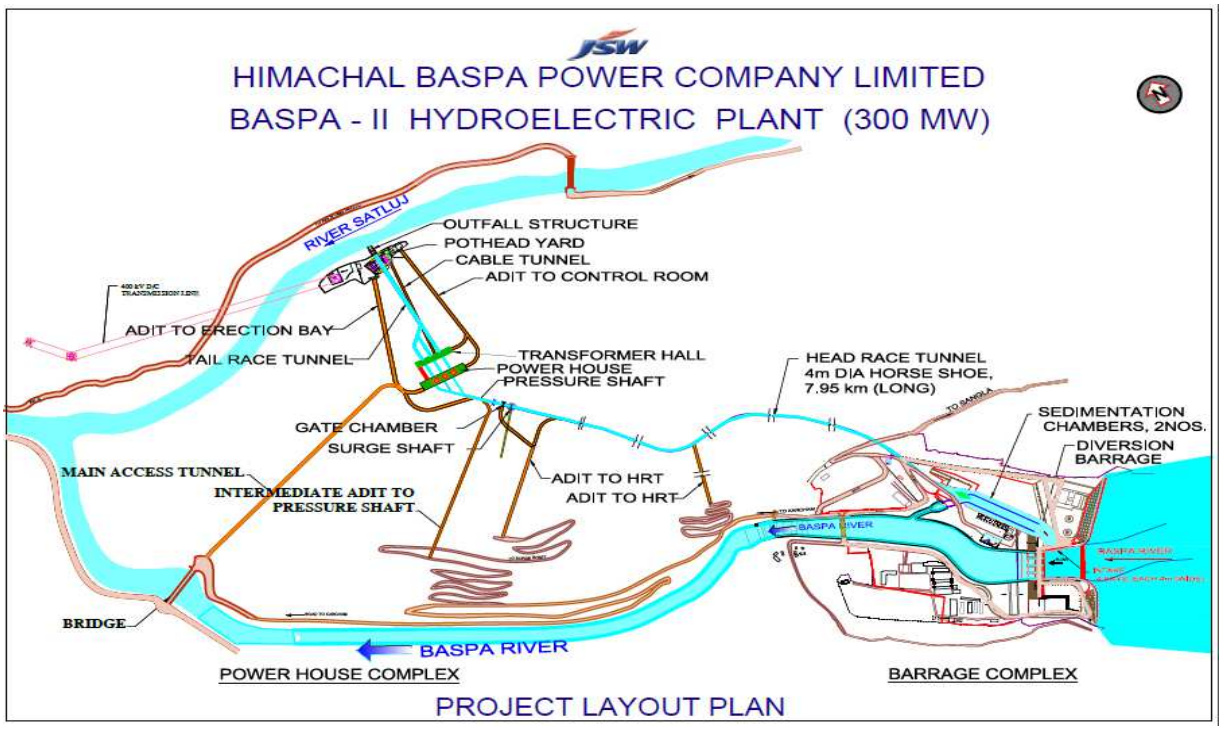
2.3 AFOLU-Specific Safeguards

Not applicable to this as this is not an AFOLU project activity

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The 1st unit of the 300 MW run-of-river hydro power project of installed capacity 100 MW got commissioned on 24-May-2003, the second unit on 29-May-2003 and third unit on 08-June-2003 that corresponds to the date when the project got fully commissioned. The project, being a run-of-river type Hydro-Power project, would generate power by utilizing the water diverted from the flow of river Baspa. The flow in the river Baspa is contributed by several nullahs and khuds and numerous glaciers. The diversion barrage of the project is located across river Baspa, one of the major tributaries of river Satluj, at Kuppa in Himachal Pradesh. Water is diverted from the barrage to the power house through a diversion barrage. Two open sedimentation chambers are used after the diversion barrage to exclude the silt from water used for power generation. The water is passed through a head race tunnel of about 7.95 km long and steel lined pressure shaft (about 885 meters long to create a design head of 702 meters) which is branching into three penstocks for running 3 pelton turbines of 100 MW each. A surge shaft has been constructed between the head race tunnel and the pressure shaft which would be used to regulate the flow.



The power generated is stepped up to 400 KV and is evacuated by two circuits of 400 KV lines for the power station to Jhakri substation, which is about 55 Km from the site. The transmission line from the power station to Jhakri consisting of 121 towers has been installed as a part of the project. From Jhakri, 400 KV transmission system is utilized to evacuate the full output of (300 MW) hydroelectric project.

Technical information of the Project activity

Parameters	Specifications
HYDROLOGY	
Catchment area at barrage axis	967.72 sq.km
Snow catchment	514.15 sq.km
Design flood (1 in 100 Years)	1150 Cumec
Minimum discharge for 90%	9.4 Cumec
DIVERSION BARRAGE	
Type	Gated, 61 m long
Length of Barrage	70 m (4 bays of 13m each, 3 Piers of 3m each
Height of Barrage from deepest foundation	21.15 m (EL. 2533.50 to EL. 2512.35m at 40m D/S of
Maximum Pond Level	EL. 2531.50m
Minimum Pond Level	EL. 2527.50m
Live Storage at FRL	75.00 Ha-m
Average River bed level at barrage site	EL. 2519.00m
INTAKE	
Crest Level	EL. 2525.00m
No. of intake bays	4 bays each 4 m wide (Plus 2 bays for Baspa Stage-I)
Discharge through intake	65 cumec
SEDIMENTATION CHAMBER AND FLUSHING DUCTS	
Particle Size to be Excluded	(+) 0.2 mm
Flow through velocity	0.3 m/s
Desilting tanks	2 Nos.
Size of tank	138.5m (L) x17m (W) x16m (H)
Flushing discharge	13 cumec
Size of Flushing tunnel	0.84mx1.8m (H) (2 Nos.)
Head Race Tunnel (HRT)	
Length	7950 m (excluding 103m of cut and cover portion)
Type of Section	4m dia, Modified Horse Shoe
Design Discharge	52 cumec
Slope in tunnel	1 in 114
Lining	Concrete lining
SURGE SHAFT	
Type	Underground

Diameter	6m/8m
Height	121m
PRESSURE SHAFT	
No. & Type	One number, steel lined 3.1 m dia 885m long with two bifurcations U/S of Power House
Unit Penstock	3 Nos, 1800 mm dia
Power House	
Capacity	3 x 100 MW
Type	Underground
Size of P.H. Cavern	92 m (L) x 18m (W) x 39 m (H)
Size of T.H. Cavern	75 m (L) x 13m (W) x 20 m (H)
GENERATION	
In 90% dependable year	1213 MU per annum
In 50% dependable year	1391.61 MU per annum
Tail Race Tunnel (TRT)	
Length and Shape	250m long, 5.6m d-shaped
Hydraulic Turbines (HYDRO-VEVEY, SWITZERLAND)	
Type	Pelton
Design Head	702 m
Rated Output	103 MW
Normal Speed	375 rpm
No. of Jets	4
Generators (SIEMENS A.G., GERMANY)	
Rated Output	111MVA with 10% overload margin with higher temperature rise
Rated Voltage	13.8 kV +/- 5%
Frequency	50 Hz +/- 3%
Synchronous speed	375 rpm
MAIN UNIT TRANSFORMERS (BHEL)	
No. & Capacity	3x41 MVA, Single Phase
BUS DUCTS (SIEMENS A.G., GERMANY)	
Type	Isolated phase, Continuous type
Rated Voltage	15 kV
Rated Current	6000 A (Main) / 4000A (Delta)
Cooling	Natural
E.O.T. CRANES (WMI CRANES LTD.)	
No. & Capacity	1x 210/25/10 tonne
Span	18.8 m
55 Km long, 400kV D/C Transmission Line between Baspa-II to Jhakri - Total scope including Benching work, Foundation work, Tower Erection Work, Stringing Work and Revetment Work at 121 Locations involving crossing of the valley 13 times	

During the current monitoring period, the hydro power project was operating with normal operational schedule including scheduled shut down for maintenance. Details of plant shut downs have been provided in APPENDIX 2.

3.2 Deviations

3.2.1 Methodology Deviations

No methodology deviation is applied during the monitoring period.

3.2.2 Project Description Deviations

Since 01-September-2015, project activity ownership rests on the Himachal Baspa Power Company Ltd. The company name changed to JSW Hydro Energy Limited from 01-September-2018. The relevant document for change in company name and corresponding change in communication agreement to VCS has been provided.

3.3 Grouped Project

The project is not a grouped project thus this is not applicable.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{Grid, CM,y}$
Data unit	tCO_2/MWh
Description	Combined Margin Grid emission factor for the project activity
Source of data	Calculated from CEA database, Version 12, May 2017[8]
Value applied	0.9273
Justification of choice of data or description of measurement methods and procedures applied	The data are obtained from "CO_2 Baseline Database for Indian Power Sector" version 12.0, published by the Central Electricity Authority, Ministry of Power, Government of India. 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 CO_2 emission factor in year y (tCO_j/MWh) $EF_{grid,OM,y}$= Operating margin CO_2 emission factor in year y (tCO_2/MWh) W_{OM} = Weighting of operating margin emissions factor (%) = 25%

[8] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver12.pdf

	W_{BM} = Weighting of build margin emissions factor (%) = 75% The above weighing is as per "Tool to calculate the emission factor for an electricity system", version 06.0.0 for other projects (hydro in this case) and for second crediting period
Purpose of Data	Calculation of baseline emissions
Comments	The value is fixed and it is same for the entire crediting period

4.2 Data and Parameters Monitored

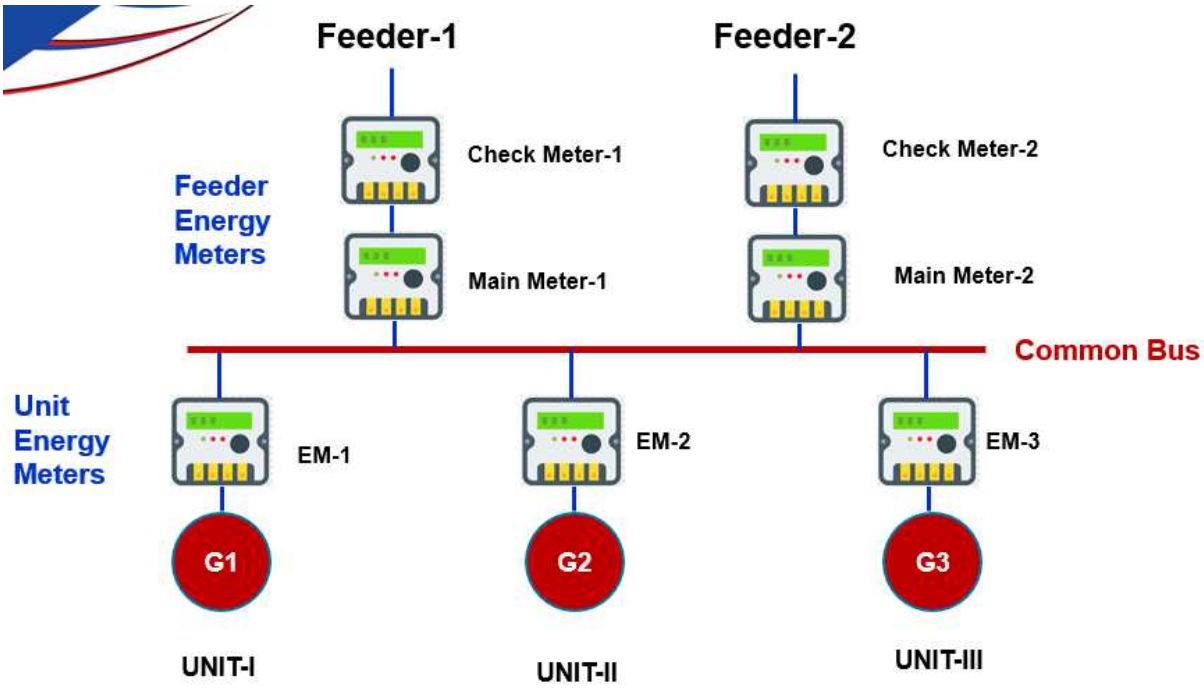
Data / Parameter	$EG_{PJ,y}$ / $EG_{facility,y}$
Data unit	MWh
Description	Net Electricity supplied to the grid by the project activity during the year y
Source of data	Joint Meter Reading (JMR) by SEB
Description of measurement methods and procedures to be applied	For the measurement of net energy delivered to the grid, two transmission lines are provided. Each transmission line has a set of main meter and check meter have been installed at the power house of project activity. The meters are capable of metering export and import data separately. The net electricity delivered to the grid would be the difference of export and import energy. The JMR Readings form the basis for calculation of the emission reductions. The JMR Readings are taken at the power house of the project activity in the presence of SEB officials and the PP representative.
Frequency of monitoring/recording	Continuous monitoring and monthly recording
Value monitored	<table><tr><th>Year</th><th>Net Electricity Supplied to grid(MWh)</th></tr><tr><td>2020</td><td>79,963.83</td></tr><tr><td>2021</td><td>642,351.40</td></tr><tr><td>Total</td><td>722,315.23</td></tr></table>
Monitoring equipment	Two sets of meters (main & check meters) are used for measuring the electricity export to the grid and electricity import from the grid.The details of meters and calibration details are

	provided in APPENDIX 1.
QA/QC procedures to be applied	The meters are calibrated once inevery 5 years; and faulty meters will be duly replaced immediately. The meter accuracy class and calibration interval is under purview of state electricity board and PP do not have any control on it. It is also noted thatmonitoring procedure is under control of state electricity board. The net electricity export value is also cross checked with electricity sales invoices.
Purpose of the data	Calculation of baseline emissions
Calculation method	Net Energy Generation = Total electricity generation – 0.65% of Total electricity generation
Comments	-

4.3 Monitoring Plan

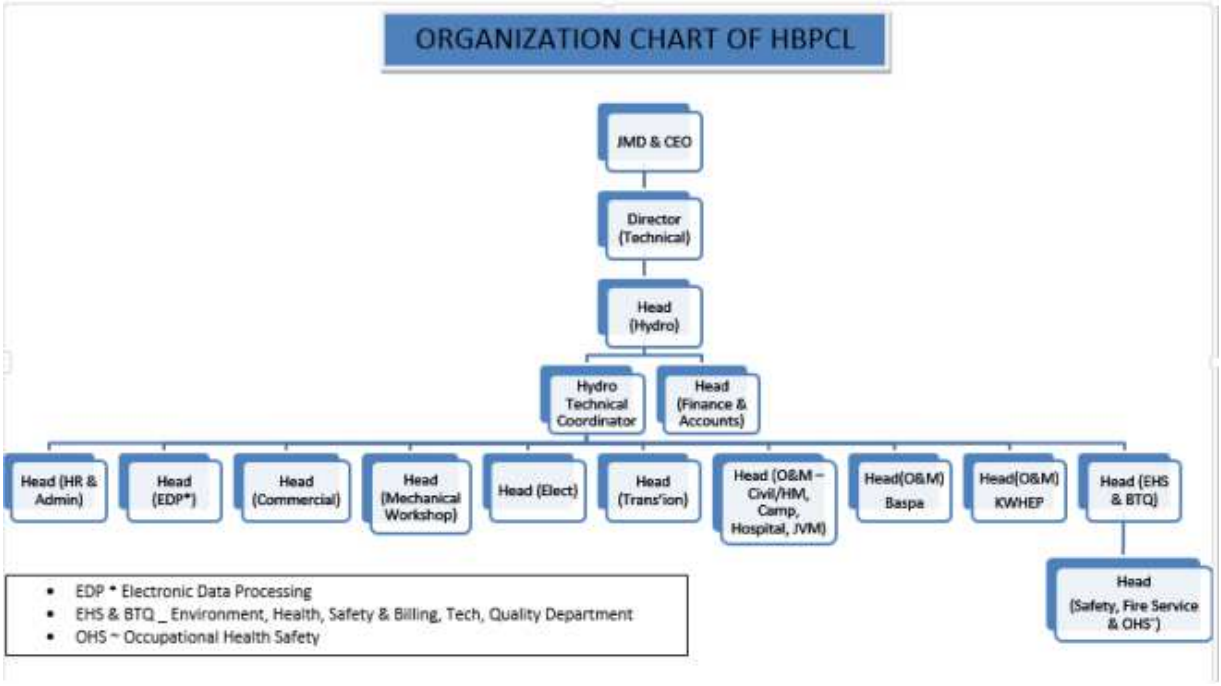
A project team is constituted with participation from relevant departments at the site. It is comprises of personnel at the Kuppa barrage, and the Sholtu office. This team is responsible for data collection and archiving. They meet periodically to review the project activity, and check the data collected, etc. The Kuppa office is responsible for barrage control and the operation and maintenance of hydro mechanical equipment. The Sholtu office looks into the general administration along with the liaisoning with various government departments viz civil administration, horticulture etc. and is overall in-charge of the Baspa plant along with the barrage, transmission lines and co-ordination with HPSEB. At the project site, the JMR of commercial metering at inter-connection point is jointly recorded by the representatives of PP and HPSEB every month. To account the transmission loss between project site and Jhakri sub-station, the net electricity supplied to grid measured at project site has been deducted at 0.65%. This is as per state electricity board regulations.

All the metering points of the project activity are shown in the schematic diagram below:



The JMR reports are checked and discussed by the senior team members/managers periodically. In case of any irregularity observed by any of the team member, it is informed to the concerned person for necessary actions. The project site also has a digital system SCADA for the overall monitoring of the project.

The management structure is as given in the diagram below:



Data Monitoring:

The methodology requires monitoring of the following:

• Net Electricity generation from the project activity;

All the main meters and check meters are tested by a reputed agency on a periodic basis. In caseof any faulty readings observed appropriate corrective action will be taken. If the error is found tobe beyond the permissible limits, the PP will inform the respective agency so as to immediatelyrectify the error in the instrument.

Metering System

The project activity comprises of two transmission lines for energy exported to the grid. Each transmission line has a main meter and a check meter, which are calibrated as per CEA notification. These are tri-vector meters of Secure make with digital display and are of 0.2 accuracy class. There is a separate import meter for the 22kV line which is used to supply power to the Sholtu site. This meter is under the purview of HPSEB and is maintained by them.

Completeness and Reliability:

The project activity has installed the latest state-of-art monitoring and control equipment that measure, record, report, monitor and control various key parameters. Real time data monitoring by SCADA takes place using these control system. All the monitoring equipments undergo the process of regular meter testing and calibration as under Section 4.2. The JMRs for the powerexported from the project activity and the HPSEB bills/ invoices of the 22 kV line are used to validate the data accuracy.

Frequency:

The frequency is as explained in data and parameters monitored.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

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Baseline emissions are calculated by multiplying the Net electricity exported to the grid with net baseline emission factor.

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

Where,

BE_y = Baseline Emissions (tCO_2/year)

$EG_{PJ,y}$ = 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)

$EF_{grid, CM, y}$ = Baseline Emission Factor (Combined margin CO_2 emission factor for grid)

The project activity being a greenfield project, $EG_{PJ, y} = EG_{facility,y}$= Net electricity exported to grid by the project activity (MWh/year)

The calculation of yearly baseline emissions is provided in the table below:

Year	Net Electricity Export (MWh)	Baseline Emission Factor (tCO2/MWh)	Baseline Emissions (tCO_2)
2020	79,963.83	0.9273	74,150
2021	642,351.40	0.9273	595,652
Total	722,315.23	-	669,802

Hence the baseline emission calculated for the reported monitoring period i.e.BE_y= 669,802tCO_2e

5.2 Project Emissions

PE_y= Project emission due the project activity in a year

For most renewable energy power generation project activities, PE_y = 0.

As per para 38 of ACM0002 Version 17.0, for all renewable energy power generation projectactivities, emissions due to the use of fossil fuels for the backup generator can be neglected.

The project emission includes the CH4 emission from the reservoir. Since the project activity is a run-of-the-river project with a reservoir facility for diurnal storage, the calculation for project emissions as per the methodology is as follows:

Parameters	Unit of Measurement	Value
Capacity	MW	300
Running Hours	Hours	24
Reservoir area	Ha	33

$PD = (Cap_{PJ} - Cap_{BL}) / (A_{PJ} - A_{BL})$

PD = Power density of the project activity, in W/m2

Cap_{PJ} = Installed capacity of the hydro power plant after the implementation of the project activity (W).

Cap_{BL} = Installed capacity of the hydro power plant before the implementation of the project activity (W).

Since the reservoir is a newly installed facility and does not result in the increase of existing reservoirs, and Cap_{BL} and A_{BL}can be assumed to be zero. The reservoir area is 33 ha (FSL).

Thus,

$PD = Cap_{PJ} / A_{PJ} = (300*1000*1000)/ (33*10000) = 909\ W/m^2$

As per the methodology if the power density (PD) of the power plant is greater than 10 W/m2, then the project emission are zero.

Hence the Project Emission are $PE_y = 0\ tCO_2e$

5.3 Leakage

According to ACM0002 version 17.0, leakage emissions are nil.

$LE_y = 0\ tCO_2e$

5.4 Net GHG Emission Reductions and Removals

The Formula used to calculate the net emission reduction for the project activity is

$ER_y = BE_y - PE_y - LE_y$

Where,

ER_y = Emission Reduction in tCO_2/year

BE_y = Baseline emission in tCO_2/year

PE_y = Project emissions in tCO_2/year

LE_y = Leakage Emissions in tCO_2/year

For the project activity during the current monitoring period, as per section 5.1, 5.2 and 5.3

BE_y = 669,802 tCO_2e

PE_y = 0 tCO_2e
LE_y = 0 tCO_2e

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
2020	74,150	0	0	74,150
2021	599,652	0	0	599,652
Total	669,802	0	0	669,802

The actual VER is about 26.1%lower than the estimated VER. This variation is majorly due to the variations in water flow which is mainly dependent rainfall and other parameters including grid availability – these factors are not in the control of project proponent.

APPENDIX 1: METER CALIBRATION DETAILS

There are eight (8) meters in the project activity in two sets – four main meters and remaining four are check meters and these two sets of meters are used alternatively. The details of meters along with operation schedule are given below:

		01-November-2020 to 10-Npvember-2020	11-November-2020 to 31-July-2021
Feeder 1	Main Meter (Main-1)	HPU06260	HPU 06213
	Check Meter (Check-1)	HPU06261	HPU 06214
Feeder 2	Main Meter (Main-2)	HPU06262	HPU 06215
	Check Meter (Check-2)	HPU06263	HPU06216

Details of meters (all)-

Make: SECURE

Accuracy class: 0.2s

Meter calibration details:

Serial No.	Date of calibration	Validity till
HPU06260	05-December-2017	04-December-2022
HPU06261	05-December-2017	04-December-2022
HPU06262	06-December-2017	05-December-2022
HPU06263	06-December-2017	05-December-2022
HPU 06213	20-December-2016	19-December-2021
HPU06214	20-December-2016	19-December-2021
HPU06215	20-December-2016	19-December-2021
HPU06216	20-December-2016	19-December-2021

Considering calibration frequency of once in five years, there have not been any delay in calibration of the meters.

APPENDIX 2: SHUTDOWN DETAILS

Month/Year	Description	Time(hours)
December 2020	Unit 3 forced outage due to Deflectors Hunting Issue on 12-December-2020	06:17
February 2021	Unit 1j under forced outage due to Cooling water tank level too low Switch Malfunctioning. This resulted shutdown on 27-February-2020	08:30
March 2020	a) Unit 2 under planned shutdown for Annual Maintenance Works from 00:00 hours of 01-March-2021 to 07:30 hours of 04-March-2021 b) Unit 3 under planned shutdown for Annual Maintenance Works from 14:00 hours of 14-March-2021 to 14:30 hours of 17-March-2021	152.00
June 2021	a)Unit 1 under forced outage due to failure of Cooling Water pumps for 01:10 hours on 10-June-2021 b) Unit 2 under forced outage due to failure of Cooling Water pumps for 02:16 hours on 14-June-2021	03:26