



**Verified Carbon
Standard**

PARBATI HYDROELECTRIC PROJECT STAGE-III



DOCUMENT PREPARED BY CORE CARBONX SOLUTIONS PRIVATE LIMITED

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Project Title	Parbati Hydro Electric Project Stage-III
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The Parbati Hydroelectric Project, Stage III is Greenfield Hydro Power Project located on river Sainj and Jiwa nallah a tributary of Beas River near village Bihali, Kullu district of Himachal Pradesh state of India.

It is a run-of-the-river scheme whose design discharge includes the diversion of the tail race releases of Parbati Stage-II Power house as well as inflows from river Sainj and Jiwa nallah. This inflow of 177 cumec from Sainj river through 7.875 km long headrace tunnel utilized for generation of 520 MW (4x130 mw) in underground power house near village Bihali. Tailrace outlet near village Larji. The Underground powerhouse is designed for installation of four generating units each having a capacity of 130 MW and is utilised to generate 1,975.95 MU of electricity as per registered VCS PD.

The purpose of the project activity is to generate electrical power using 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 State Grid System which is part of Indian Grid.

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.

This in result replaces anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately 1,912,324 tCO₂e per year, thereon displacing 1,975,950 MWh/year amount of electricity from the grid as mentioned in registered VCS PD.

In the Pre- project scenario the entire 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.

The project is implemented and commissioning details are mentioned in section 1.5 of this MR.

The project was registered at VCS (Project I.D. 1425) and the details of the same can be viewed on

http://www.vcsprojectdatabase.org/#/project_details/1425

The monitoring period for this project activity is from 30-Mar-2015 to 28-Feb-2021. The total GHG emission reductions or removals generated in this monitoring period are 3,791,042 tCO₂e.

Audit Type	Period	Program	VVB Name	Number of years
Validation	17-March-2016	<u>VCS</u>	<u>Earthood Services Private Limited</u>	-
Verification 1	24-March-2014 - 29-March-2015	<u>VCS</u>	<u>Earthood Services Private Limited</u>	1 Year 6 Days
Verification 2	30-March-2015 - 28-February-2021	<u>VCS</u>	<u>LGA Technological Center, S.A.</u>	5 Years 11 Months
Total	<u>24-March-2014</u> <u>- 28-February-2021</u>	<u>VCS</u>	=	6 Years 11 Months 6 Days

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

PP hereby confirms that the project is an individual project and not a grouped project.

1.3 Project Proponent

Organization name	NHPC Limited
Contact person	Mr. Avinash Kumar
Title	General Manager (Environment)
Address	NHPC Limited, NHPC Office Complex, Sector 33, Faridabad 121003, Haryana, India
Telephone	0129-2278421
Email	<u>cdm-env@nhpc.nic.in</u>

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	Core CarbonX Solutions Private Limited
Telephone	+91-9908387772
Email	nmohanty@corecarbonx.com

1.5 Project Start Date

Project Start Date: Project Start Date: 24-Mar-2014 (Earliest Date of commissioning)

The project start date is the earliest commissioning date amongst all the Four Hydro Turbine

Project Name	Unit No.	Turbine Capacity	Location	Commissioning Date
Parbati Hydro Electric Project Stage-III	I	130 MW	Kullu, Himachal Pradesh	24-Mar-14
	II	130 MW	Kullu, Himachal Pradesh	24-Mar-14
	III	130 MW	Kullu, Himachal Pradesh	30-Mar-14
	IV	130 MW	Kullu, Himachal Pradesh	06-Jun-14

1.6 Project Crediting Period

Crediting Period Start date: 24-Mar-14

Crediting Period End date: 23-Mar-24

Estimated life time of the project is 35 years

The project activity adopts renewable crediting period with the first crediting period of 10 years and with an option to renew twice, considering the lifetime of the project activity to be more than 35 years.

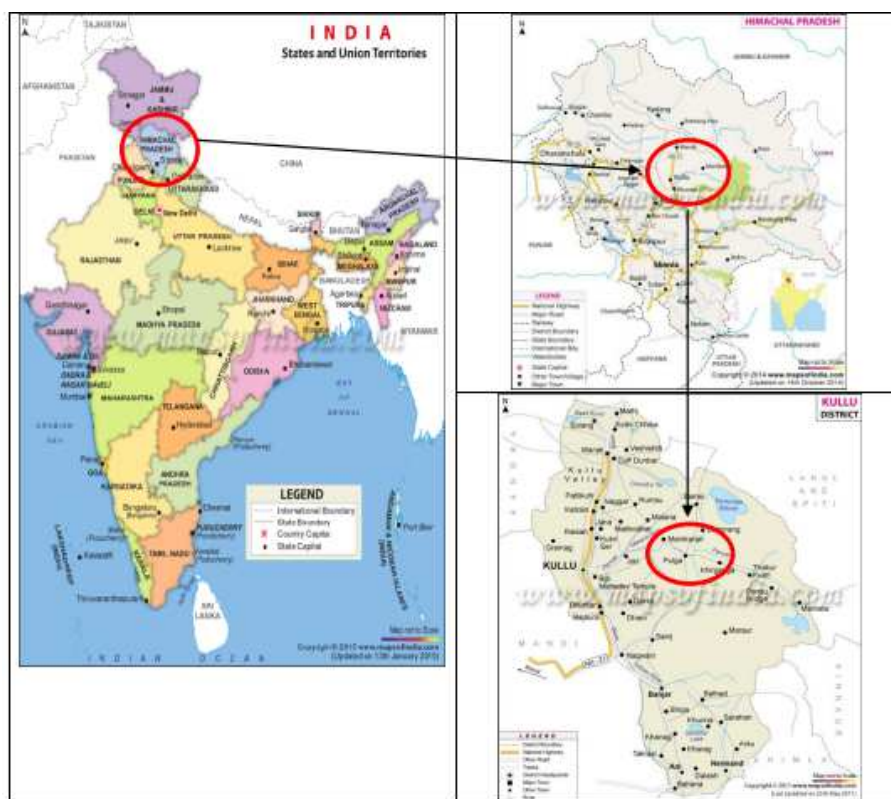
1.7 Project Location

The Parbati Stage-III hydroelectric project is installed across Sainj and Jiwa nallah near Bihali village in Kullu distt. in the state of Himachal Pradesh.

The geographical co-ordinates of the project activity are:

Location	Latitude	Longitude
Parbati Stage III	32.5833N	77.5833E

The map below shows the exact location of the project activity:



1.8 Title and Reference of Methodology

Project Type: I- Renewable Energy Projects

Methodology:

ACM0002: Grid-connected electricity generation from renewable sources----- Version 16.0

<https://cdm.unfccc.int/methodologies/DB/EY2CL7RTEHRC9V6YQHLAR6MJ6VEU83>

Tool to calculate the emission factor for an electricity system--- Version 04.0, EB 75, Annex 15

<https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-07-v4.0.pdf>

1.9 Participation under other GHG Programs

The Project has not participated in any other GHG programs.

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

The Project has no intend to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program.

The project reduces GHG emissions from activities that are not included in an emissions trading program or any other mechanism that includes GHG allowance trading. Hence net GHG emission reductions or removals generated during this monitoring period have not been used for compliance under such programs or mechanisms.

1.11 Sustainable Development Contributions

The Parbati Hydroelectric Project Stage III is a Greenfield Hydro Power Project located on the river Sainj and Jiwa nallah a tributary of Beas River near village Bihali Kullu district of Himachal Pradesh state of India. It is a run of the river scheme whose design discharge includes the diversion of the tail race releases of Parbati Stage III Power house as well as inflows from river Sainj and Jiwa nallah. This inflow of 177 cumec from Sainj river through 7.875 km long headrace tunnel utilized for generation of 520 MW (4x130 mw) in underground power house near village Bihali. The Underground powerhouse is envisaged for installation of four generating units each having a capacity of 130 MW and is proposed to be utilised to generate 1977.23 MU of electricity every year. This project provides several co-benefits that are aligned to the United Nations' Sustainable Development Goals (SDGs). These include developing health facilities, establishing schools, improving water supplies, 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) Provides access to healthcare facilities and services to community
 - Trained Medical Doctor and Staff
 - Provide accessible, affordable and available healthcare to everyone
- b) Provide access to education
 - Provision of Digital Equipment
 - Distribution of Scholarships

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 Information and communications technology (ICT) skills	Implemented activities to increase	The project proponent has invested in the scholarships to students at Govt. Primary School Saari Block Banjar. The project proponent also constructed toilets in the schools under project boundary. A total of 210 (35*6=210) students have been benefitted with the scholarships over the current monitoring period.	The project includes development of student education by providing scholarships to students. The number of students who would be benefitted from the initiative is 35 children per annum. In the first monitoring period, a total of 35 students were benefitted and in the second monitoring period a total of 210 students were benefitted. The total number of students benefitted from the project is 245. More details about the project activity can be seen in the appendix

2)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to decrease the emissions of greenhouse gases in to the atmosphere.	The Parbati III project replaces anthropogenic emissions of greenhouse gases GHGs into the atmosphere. Total of 3,791,042 tCO ₂ e during the current monitoring period, thereby generating 3,917,175.2073 MWh using renewable energy. Hence displacing 3,917,175.2073 MWh electricity from the grid	The Parbati III project replaces anthropogenic emissions of greenhouse gases GHGs into the atmosphere. The total anthropogenic emissions of green house gases replaced over the period of first verification period are 630,977 tCO ₂ e and second verification period are 3,791,042 tCO ₂ e. The total emission reductions till date are 4,422,019 tCO ₂ e
3)	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 has distributed 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, 150 individuals were benefitted during the COVID crisis.	The project proponent has distributed 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 150.

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 ViSta Program, the conformance with the requirements set out in the Section 3.18 of VCS Standard version 4.4 is not applicable.

2.2 Local Stakeholder Consultation

As per the requirements mentioned in the MR template, version 4.2, the process for, and the outcomes from, ongoing communication with local stakeholders conducted prior to verification are given below. Prior to verification, the details of the local stakeholder consultation that were approved at the time of validation are taken into consideration and the same are given below.

A detailed stakeholder consultation process has been conducted by NHPC. This task was accomplished by the H.P. State Pollution Control Board. The Member Secretary has issued notice for environmental public hearing on 22nd July, 1998. An Environmental public hearing was conducted successfully on 27th August, 1998 at Village Larji in Distt. Kullu (H.P.).

The stakeholders identified for the project activity are as follows:

1. Government Officials
2. Local Citizens
3. Representatives of affected people including women residing in the project area.
4. Representatives of Panchayats of villages
5. NGO representatives

The discussions mainly aimed at–

- The basic protection of the biodiversity and environment affected due to the project
- Social issues like rehabilitation, compensation and employment
- Issues of water availability and natural calamities were also discussed
- Significant impacts in the region due to the project
- Possible impacts in the long run
- To understand various stakeholder perceptions

- Stakeholder awareness of project related issues

The comments of various stakeholders are reviewed below:

- The entire project region is a relatively fragile ecosystem, which is likely to be affected by any construction activity. But this project has taken up proper mitigation measures through a well implemented Environmental Management Plan (EMP).
- 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 has caused displacement of local families, but proper compensation is provided to them and any grievances have been solved.
- 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.

No major issue which would affect the life of the local community or raise any environment related problems in the region by the implementation of the project activity were identified during the discussion with stakeholders. All the minor issues were addressed and also the concerned departments are keeping a tight vigil for assessing any changes likely that may take place.

During the current monitoring period, it was observed that there were no issues that were raised by the local stakeholders pertaining to the project. The Project Proponent has conducted local stakeholder consultation regularly during the current monitoring period. The evidence for this is the regular CSR works that are taken up by the Project Proponent. These works are taken up specific to the project and the local stakeholder requirements.

As a part of the on-going communication, the PP has to regularly interact with the local stakeholders and accordingly plan the CSR activities. Hence, the interaction is done on an annual basis and the same can be verified from the annual CSR reports¹ published by the PP. The annual CSR reports clearly state the activities that are taken up by the PP to ensure that all the stakeholders' queries and requests are met.

¹ <https://www.nhpcindia.com/welcome/page/155.html>

2.3 AFOLU-Specific Safeguards

This section is not applicable as this project activity is the non-AFOLU project.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

Starting date of the operation of the project activity 24/03/2014, which is the earliest date of commissioning of the unit I of the project activity and 06/06/2014 which is date of the commissioning of the last unit IV of the project activity bundle. The project activity consists of four units each having 130 MW capacity totaling 520 MW capacities and supplying the entire electricity to the state grid.

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

There was a complete shut down of the plant for approximately three and half months due to maintenance activities in 2018-19. 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:

LOCATION	
STATE	HIMACHAL PRADESH
District	Kullu
River	Sainj (a tributary of Beas River), which also receives Parbati water from tailrace of Parbati Stage II powerhouse in Sainj valley.
Location of Dam & Power House	Diversion dam on river Sainj in Suind village & Power House near Bihali village.
Nearest Rail Head	Kiratpur
Nearest Airport	Bhuntar
HYDROLOGY (SAINJ RIVER)	
Catchment area at diversion site	650 square km
Snow catchment	152 square km
DIVERSION CUM SPILLWAY TUNNELS	
Number, size, shape & length	2 Nos, 6.75 m, Horse shoe shape 401 m & 480 & 460
Diversion discharge	800 m ³ /sec
Invert level at entry	EL. 1300.00 m
Invert level at exit	EL. 1286.00 m
DIVERSION CUM SPILLWAY TUNNEL GATES EMERGENCY GATE	
Number, size & sill elevation	2 nos., 5.6 m (B) x 6.75 m (H), EL. 1300.00 m
Type	Vertical lift gate (Fixed wheel type)

Lifting mechanism	Rope drum hoist
SERVICE GATE	
Number, size & sill elevation	2 nos., 5.6 m (B) x 6.75 m (H), EL. 1300.00 m
Type	Vertical lift gate (Fixed wheel type)
Lifting mechanism	Rope drum hoist
Operating platform	EL. 1333.00 m
DIVERSION DAM	
Type	Rockfill dam at Suind
Dam top	EL. 1333 m
Maximum dam height	43 m
Length at top including spillway	218 m
Length & thickness of cut-off wall	117 m, 0.8 m
Maximum depth of cut-off wall	46 m
SPILLWAY	
Location	Left bank
Type	Orifice type
Width of spillway	26.40 m
No. of bays	2
Crest level of spillway	EL. 1298 m
Width of each bay	7.2 m
Thickness of piers	6 m
Regulation gates	Hydraulically operated radial gates 2 nos., (7.2 m x 14 m)
R.C.C Breast wall	21 m high
Energy dissipation system	Ski-jump bucket with an apron
Design flood	3300 m ³ /sec (PMF)
Submergence ratio	0.10
RESERVOIR	
Full reservoir level (FRL)	EL. 1330 m
Minimum draw down level (MDDL)	EL. 1314 m
PRE-SEDIMENTATION	
Gross storage at FRL	1.6679 M.cum
Gross storage at MDDL	0.3854 M.cum
Live storage	1.2825 M.cum
Reservoir area at FRL	12.51 ha
Length of reservoir (fetch)	1.05 km
POST-SEDIMENTATION	
Gross storage at FRL	0.9892 M.cum
Gross storage at MDDL	0.1244 M.cum
Live storage	0.8648 M.cum
Reservoir area at FRL	8.78 ha
Length of reservoir (fetch)	0.68 km
INTAKE	
Number & size of openings	2 nos., 8.7 m (B) x 7.2 m (H)
Invert level	EL. 1302.50 m
Bulk head gate (opening)	4.5 m (B) x 5.0 m (H)
Type	Vertical lift gate (Slide type)
Lifting Mechanism	Rope drum hoist
Service gate (opening)	4.5 m (B) x 5.0 m (H)
Type	Vertical lift gate (Fixed wheel type)
Lifting Mechanism	Rope drum hoist
Trash rack	Inclined

INTAKE TUNNELS	
Number, size and shape	2 Nos., 5.0 m, D-shaped
Design discharge from intake (incl. flushing discharge)	110.63 m ³ /sec in each tunnel
Length of intake tunnels	546 m & 493 m
Size, shape and length of construction adit to intake tunnel	6.0 (B) x 6.5 m (H), D-shaped, 443 m (L)
DESILTING ARRANGEMENT	
Type	Dufour type
Number & size of desilting chamber	2 nos., 250.00 m (L) x 12.20 m (B) x 22.50 m (H)
Particle size to be removed	90% of 0.30 mm and above
Gate operation chamber floor elevation	EL. 1333 m
Dimensions GOC of DC	70.0 m (L) x 5.4 m (B) x 7.8 m (H)
Nos. & size of gates	1 nos., 4.4 m (B) x 5.0 m (H)
Type	Vertical lift gate
Lifting Mechanism	E.O.T Crane
Sill elevation of gates	EL. 1300.00 m
Size, shape and length of access adit to GOC of DC	6 m (B)x6.0 m (H), D-shaped, 129.00 m (L)
Size, shape & length of branch construction adit to DC	6 m (B)x6.5 m (H), D-shaped, 127.00 m (L)
SILT FLUSHING TUNNEL	
Nos., & lengths of branch SFTs	2 nos., 184 m & 160 m
Size & shape of branch SFTs	2 m (B) x 2.2 m (H), D-shaped
Main SFT size, shape & length	3 m (B) x 3 m (H), D-shaped, 186 m (L), 136m underground + 50 m in cut & cover
Gate operation chamber floor elevation	EL. 1282.5 m
Size and length of GOC	6 m (B) x 8 m (H), D-shaped, 30 m
No. & Size of gates (Service and Emergency)	(2+2) nos., 1.8 m (B) x 2.2 m (H)
Sill elevation	EL. 1275.90 m
Size, shape & length of branch access adit to GOC to SFT	6.0 m (B) x 6.0 m (H), D-shaped, 210 m (L)
Outlet level of SFT	EL. 1273.46 m
River level	EL. 1269.00 m
HEAD RACE TUNNEL	
Size, shape & length	7.25 m, Horse-shoe, 7875 m
Design discharge	177 m ³ /sec
Velocity	4.06 m/sec
Slope	1 in 179
Size & shape of adits	6.0 m (B) x 6.5 m (H), D-shaped
Adit No. Length	HRT RD
Adit-1 - 145 m (Ungated plug)	17 m
Adit-2 - 715 m (Gated plug)	3975 m
Adit-3 - 256 m (Ungated plug)	7780 m
SURGE SHAFT	
Type	Restricted Orifice type
Orifice area	19.28 sqm
Diameter & height	13 m Dia., 148.75 m Height

Top elevation	EL. 1410 m
Bottom elevation	EL. 1261.25 m
Nos. & size of gate	2 nos., 3.5 m (B) x 5.5 m (H)
Sill elevation	EL. 1254 m
Top of Orifice slab	EL. 1263.25 m
ADIT TO SURGE SHAFT BOTTOM CUM SURGE GALLERY	
Size, shape and length	6.4 m (B) x 6.4 m (H), D-shaped, 222 m (L)
PRESSURE SHAFT	
Main (2 Nos., starting from Surge shaft)	
Type	2 Nos., Circular, steel lined
Dia & length	4.50 m, 496 m & 446 m long each bifurcating into two nos., 3.0 m dia penstocks near power house
POWERHOUSE COMPLEX	
Type	Underground
Installed capacity	520 MW
Size of powerhouse cavern	122 m (L) x 22 m (B) x 45.8 m (H)
Size of transformer cavern	90.2 m (L) x 15.5 m (B) x 25.2 m (H)
No. & type of D/S surge chambers	4 nos., Restricted orifice Type
Size of D/S surge chamber	15.45 m (L) x 12.7 m (B) x 39.5 m (H)
Sill elevation of bulk head gate in D/S surge chamber	952.00 m
Nos. & size of draft tube gate	4 nos., 3.75 m (B) x 4.5 m (H) each
Type of turbine	Francis, vertical axis
Generating units	4 nos. of 130 MW each
Rated head	326 m
Type of switchgear	GIS type
Size of pothead yard	107 m (L) x 27 m (B)
Elevation of pothead yard	Two tier – EL. 1082 m & EL. 1087 m
MAIN ACCESS TUNNEL TO POWER HOUSE	
Size of adit	8 m (B) x 7 m (H), D-shaped
Invert level at powerhouse service bay	EL. 974.00 m
Invert level at portal	EL. 1070.00 m
Length	1010 m
Slope	1:10.52
CABLE CUM VENTILATION TUNNEL	
Size, shape & length of tunnel	6 m (B), 6 m (H), D-shaped, 348 m (L), 191 m underground & 157 m in cut & cover
Invert level at transformer cavern	EL. 984.00 m
Invert level at Pothead Yard	EL. 1087.00 m
TAIL RACE TUNNEL	
Size, shape & length	8.1 m dia, Horse-shoe, 2713 m (L)
Outlet gate size	6.7 m (B) x 8.4 m (H)
Type of gate	Vertical lift gate
Hoisting mechanism	Rope Drum hoist
Mode of operation	Unbanced
Sill level at outlet	EL. 972.00 m
Gate operation platform level	EL. 988.00 m
Minimum tail water level	EL. 973.00 m

Total Capacity	520 MW (4* 130 MW)
Estimated Annual Generation:	1975.95 Million Units (90 % dependable year)
Estimated life time of the project	35 years

3.2 Deviations

3.2.1 Methodology Deviations

There are no methodology deviations.

3.2.2 Project Description Deviations

Deviation – 1:

In registered VCS PD, the export parameter mentioned source as Joint Meter Reading (JMR) / Monthly Special Energy Meter statement (SEM) from the energy meters, however project activity does not have JMR or monthly energy meter statement, hence deviation is requested to use source as “Deviation Settlement Account document” for export parameter. Also, there are no invoices raised for actual export value, thus actual export cannot be cross checked with invoices but can compare with Monthly Generation Report.

Justification - Since hydro projects involves scheduling of energy and invoice is based on scheduled energy, however the difference between scheduled energy and actual energy is reflected in Deviation Settlement Account document. There is no any JMR prepared for the project activity and no invoices are raised based on actual export values. Thus, for proposed project activity, the deviation settlement account data has been considered for actual electricity supplied to grid parameter and also same data can be cross checked with Monthly Generation Report. The deviation Settlement account document considers actual export through online measurement of line1 and line 2 meters. The Monthly generation report gives the gross generation by the project activity and this monthly generation report value should be higher than export value mentioned in deviation Settlement account document. The change is sources for the export parameter and its cross check mechanism is mentioned as deviation in VCS MR.

Deviation 2 –

- In registered VCS PD, the source of data for import parameter is mentioned as Monthly electricity sales bills raised by State Electricity Board, however PP do not have these bills, thus PP has submitted import data certified by state electricity board. Thus deviation is requested for the source of import data.
- The project activity involves Import parameter as a monitoring parameter and PP has monitored this parameter. However the latest calibration reports of import meters are available with PP, thus project description deviation is requested for the delay in calibration and application of error factor conservatively as per CDM guidelines

Justification –

- a) The state electricity board takes monthly reading of import meters and determines the import by the project activity. Due to non-availability of all sales bills, PP has taken certification from state electricity board for the import data and same can be considered as authentic data for the import parameter.
- b) The non- availability of earlier calibration of import meters are justified as below and conservative approach has been followed for import values for the current monitoring period
 1. The import meters are not under control of PP.
 2. As per VCS Registered PD “The Import meters will be calibrated and maintained by state electricity Board”, thus PP do not have import meters calibration certificates.
 3. Since there is monetary transaction involved and PP need to pay to state electricity Board for import of electricity, thus state electricity board ensures that meters are running accurately. PP do not have any role for calibration of meters.
 4. It is the state electricity board who decides about when to do calibration of import meters. The state electricity board is not sharing calibration certificates to PP for import meters and this is common practice followed by them.
 5. Since earlier calibration certificates are not available with PP, however the latest calibration certificates are available with PP and calibration certificate shows the error is within permissible limit of accuracy class. Hence as a conservative approach, the error factor is applied for import as per CDM guidelines.

The two deviations mentioned above are already approved in the previous monitoring report.

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 10, December 2014 ²

² http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver10.pdf

Value applied	0.9862 (NEWNE Grid)
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 04.0.0” as 3-year generation weighted average using data for the years 2011-2012, 2012-2013 & 2013-2014. The data are obtained from “CO2 Baseline Database for Indian Power Sector” version 10.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of Data	For the calculation of the Baseline Emission
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 10, December 2014 ³
Value applied	0.9495 (NEWNE Grid)
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 04.0.0” for the years 2013-2014. The data are obtained from “CO2 Baseline Database for Indian Power Sector” version 10.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of Data	For the calculation of the Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	EF _{grid,CM,y}
Data unit	tCO ₂ /MWh
Description	Operating Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 10, December 2014 ⁴
Value applied	0.9678 (NEWNE Grid)
Justification of choice of data or description of	The combined margin emissions factor is calculated as follows:

³ http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver10.pdf

⁴ http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver10.pdf

measurement methods and procedures applied	$EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$ Where: $EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (tCO₂e/MWh) $EF_{grid,OM,y}$ = Operating margin CO₂ emission factor in year y (tCO₂e/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 Emission
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 net electricity generation supplied by the project, plant/unit to the grid in year y
Source of data	Energy Meters ⁵
Description of measurement methods and procedures to be applied	Net electricity supplied to grid will be calculated as Net electricity generated and supplied by the project plant/unit to the grid = Electricity exported by the project to the grid at project site switch yard – Electricity imported by the project from the grid at interconnection point of the Regional Supply $EG_{PJ,y} = EG_{Export,y} - EG_{Import,y}$
Frequency of monitoring/recording	Continuous measurement and at least monthly recording
Value monitored	3917175.2073 MWh

⁵ For hydro projects, the PP need to provide schedule for electricity to be injected and based on electricity meters measured data, the actual injected electricity is monitored. There is a difference in scheduled electricity and injected electricity and the same is called as deviation. The state load dispatch centre (WB) West Bengal State Electricity Transmission Company Limited (A Govt. of W.B Enterprise) issues statement on deviation also called as Deviation Settlement Account document.

The actual electricity injected (i.e actual electricity supplied to grid) is measured through electricity meters and that measured data is mentioned in the "Deviation Settlement Account document". The export energy meter details are mentioned in MR and these export energy meters are used to measure the Quantity of Electricity exported by the project to the grid.

Thus energy meters data is used for calculation of net electricity supplied to grid and same is in line with version 16 of methodology ACM0002. The deviation is requested for the source of data, and export parameter is measured through energy meters.

Monitoring equipment	Tri-Vector Energy Meters of 0.2s accuracy class ⁶
QA/QC procedures to be applied	Net electricity supplied to grid is a calculated value. Therefore, No QC/QA is required.
Purpose of the data	Calculation of Baseline emissions
Calculation method	$EG_{PJ,y} = EG_{Export,y} - EG_{Import,y}$
Comments	-

Data / Parameter	EG_{Export}
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 as mentioned in deviation in section 2.3.2 of this MR
Description of measurement methods and procedures to be applied	Electricity exported by the project to the grid at project site switch yard is the Net Transmitted Units recorded and monitored by the metering system installed at the project site switch yard. The metering system comprises of four individual special energy meters (SEMs) (acts as standby meters) for each generating units. These will be connected via two transmission lines of 400 kV, each having its own SEM meter (main meter and check meter). In case, anyone transmission line is not in service than complete load will be shifted to other transmission line which is in operation. The energy meters are tri-vector meter which are installed and sealed by the Power Grid Corporation Limited in the presence of the representatives of the power producer. The energy meters have capacity of recording both import & export; however net transmitted units are recorded & monitored. Northern Regional Power Committee monitors the export of project activity through online on daily basis and publishes weekly Deviation Settlement Account where actual export value is mentioned. The check meter shall be used during the period the main metering system is not in service. Further in case of failure of both main meter and check meter, sum of the net electricity generation recorded by four individual special energy meters (SEMs) and

⁶ The energy meters make, class and calibration details are mentioned in the appendix 1.

	individual auxiliary meters shall be used for accounting and billing purpose. As per the deviation mentioned in section 2.3.2 of the report, the Deviation Settlement Account Statement is used for the calculation of electricity exported by the project to the grid at project site switch yard. Electricity exported by the project to the grid at project site switch yard. The deviation Settlement account statement mentioned collectively total export of all units and of both transmission lines.			
Frequency of monitoring/recording	Continuous measurement and at least monthly recording			
Value monitored	3930958.2183 MWh			
Monitoring equipment	MAIN METER FOR LINE -1 and LINE -2		CHECK METER FOR LINE -1 and LINE -2	
	Meter Serial No. (Line 1)	NP-8576-A	Meter Serial No. (Line 1)	NP-8577-A
	Meter Serial No. (Line 2)	NP-8592-A	Meter Serial No.(Line 2)	NP-8540-A
	Model	ER300P	Model	ER300P
	Make	L&T	Make	L&T
	Accuracy Class	0.2S	Accuracy Class	0.2S
	QA/QC procedures to be applied	Energy meters are calibrated once in a five years and no faulty meters were observed. EG_{Export,y} can be cross checked from Monthly Generation Report. The Monthly generation report gives the gross generation by the project activity and this monthly generation report value is higher than export value mentioned in deviation Settlement account document.		
Purpose of the data	Calculation of Baseline emissions			
Calculation method	The Deviation Settlement Account statement mentioned collectively total export of all units and all transmission lines.			

Comments	The data would be archived electronically and maintained for the entire crediting period plus two years.
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Data / Parameter	EG _{import}		
Data unit	MWh		
Description	Quantity of electricity generation supplied by the project, plant/unit to the grid in year y		
Source of data	Data certified by State Electricity Board		
Description of measurement methods and procedures to be applied	The Project activity has two 11kV Electricity Supply line from State Electricity Boards system which is used to import electricity during start-up, shutdown and the lean period. The Electricity imported during start-up, shutdown and the lean period would also be recorded and monitored. Especially, in winter season when the project is partially or totally unable to operate, the project may draw energy required for start up and maintenance of the project from the State Electricity Boards system, which shall be metered at the interconnection point of the regional supply. As mentioned in deviation, due to non-availability of all sales bills, PP has taken certification from state electricity board for the import data and same can be considered as authentic data for the import parameter. As a conservative approach, PP has considered these import values and also error factor is applied due to non-availability of import meters’ calibration reports.		
Frequency of monitoring/recording	Continuous measurement and at least monthly recording		
Value monitored	13783.0110 MWh		
Monitoring equipment	Location of import meter	BHB 1 (old office)	BHB 8 (Administrative building)
	Meter serial number	HPS30825	HPS47566
	Make	Secure	Secure

	Accuracy class	0.5S	0.5S	
	Calibration date	19/04/2017	19/04/2017	
	Location of import meter	SPB 1 (Sapangini Township)	BHB 12 (Power House)	SJP16 (Dam site)
	Meter serial number	6645897	07044580	6769799
	Make	L&T	L&T	L&T
	Accuracy class	0.5S	0.5S	0.5S
	Calibration date	20/04/2017	19/04/2017	20/04/2017
	Location of import meter	BHB 13 (Surge Shaft)	LDT 1 (TRT)	
	Meter serial number	229228	226972	
	Make	HPL Electric & power Pvt Ltd	HPL Electric & power Pvt Ltd	
QA/QC procedures to be applied	Accuracy class	0.5S	0.5S	
	Calibration date	19/04/2017	20/04/2017	
The deviation has been requested for non-availability of calibration certificates for import meters due to no control of PP and conservative approach followed with application of maximum permissible error factor as mentioned in deviation request.				
EG _{Import,y} is sourced from the document certified by State Electricity Board				
Purpose of the data	Calculation of Baseline emissions			

Calculation method	EG _{Import,y} is sourced from the document certified by state electricity board.
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.

- Purpose** - The purpose of monitoring the project is to assess the annual emission reductions in tonnes of CO₂ that the project activity has achieved.
- Data to be reported** - EG_{export} & EG_{import} in MWh and periodical calibrations of monitoring equipments
- Origin of data and monitoring including estimation approach**- Net electricity generated and supplied to grid is a calculated value whereas EG_{export} will be sourced from Deviation Settlement Account statement and EG_{import} will be sourced from data certified by State Electricity Board.
- Meter Details:**

Details of MAIN & CHECK Meters for Line – 1

MAIN METER FOR LINE -1		CHECK METER FOR LINE -1	
Meter Serial No.	NP-8576-A	Meter Serial No.	NP-8577-A
Model	ER300P	Model	ER300P
Make	L&T	Make	L&T
Accuracy Class	0.2S	Accuracy Class	0.2S

Details of MAIN & CHECK Meters for Line-2

MAIN METER FOR LINE -2		CHECK METER FOR LINE -2	
Meter Serial No.	NP-8592-A	Meter Serial No.	NP-8540-A
Model	ER300P	Model	ER300P
Make	L&T	Make	L&T
Accuracy Class	0.2S	Accuracy Class	0.2S

All meters are calibrated on 29/06/2022,

Details of import meters:

Location of import meter	BHB 1 (old office)	BHB 8 (Administrative building)	SPB 1 (Sapangani Township)	BHB 12 (Power House)	SJP16 (Dam site)	BHB 13 (Surge Shaft)	LDT 1 (TRT)
Meter serial number	HPS30825	HPS47566	6645897	07044580	6769799	229228	226972
Make	Secure	Secure	L&T	L&T	L&T	HPL Electric & power Pvt Ltd	HPL Electric & power Pvt Ltd
Accuracy class	0.5S	0.5S	0.5S	0.5S	0.5S	0.5S	0.5S
Calibration date	19/04/2017	19/04/2017	20/04/2017	19/04/2017	20/04/2017	19/04/2017	20/04/2017
Calibration Due Date	18/04/2022	18/04/2022	19/04/2022	18/04/2022	19/04/2022	18/04/2022	19/04/2022

5. **Monitoring times and periods** - The data will be monitored on a continuous basis but will be recorded on a monthly basis with the energy meters installed at the site.
6. **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)⁷. Thus, the meters recording the electricity exported has to be calibrated at least once 5 years.
7. **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.
8. **Monitoring roles and responsibilities:** A project team would be constituted for the monitoring of the project. This team will be responsible for data collection and archiving. The team will meet periodically to review the data, it will be informed to the concerned person for necessary actions to be taken. The following be will the team structure for project monitoring:

⁷ CEA metering regulation clause 18 on page 12 of the regulation
http://www.powermin.nic.in/whats_new/pdf/Metering_Regulations.pdf

- 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
9. **Managing Data Quality:** The Power plant In-charge would prepare the report pertaining to the recorded values of the monitored parameters as by the shift-in- charge. The day-to-day records would be verified by Unit Head, compiled and documented. The company will introduce a safe storage of data. NHPC is an ISO – 9000, and ISO – 14000 certified company having an integrated management system. It will ensure also requirements are met for the project also.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

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

Where,

$EF_{grid,CM,y}$ = Combined Margin CO₂ emission factor in year y

$EG_{PJ,y}$ = Net electricity supplied to the NEWNE regional grid (MWh)

$$\begin{aligned} BE_y &= EG_{PJ,y} \times EF_{grid,CM,y} \\ &= 3,917,175.2073 \times 0.9678 \\ &= 3,791,042 \text{ tCO}_2\text{e} \end{aligned}$$

Period	Net Electricity generation (MWh)	Baseline emission factor (tCO ₂ e/MWh)	Baseline Emissions (tCO ₂ e)
30-03-2015 to 31-12-2015	621217.3288	0.9678	601214
01-01-2016 to 31-12-2016	660363.8568	0.9678	639100
01-01-2017 to 31-12-2017	711831.2082	0.9678	688910
01-01-2018 to 31-12-2018	636815.4944	0.9678	616310

01-01-2019 to 01-12-2019	641337.4445	0.9678	620686
01-01-2020 to 31-12-2020	626321.9312	0.9678	606154
01-01-2021 to 28-02-2021	19287.9434	0.9678	18667
Total	3917175.2073		3791042

5.2 Project Emissions

The project emission calculation as per para 35 of ACM0002 version 16,

$$P_{E_y} = P_{E_{FF,y}} + P_{E_{GP,y}} + P_{E_{HP,y}}$$

Where:

P_{E_y} = Project emissions in year y (t CO₂e/yr)

$P_{E_{FF,y}}$ = Project emissions from fossil fuel consumption in year y (t CO₂/yr)

$P_{E_{GP,y}}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (t CO₂e/yr)

$P_{E_{HP,y}}$ = Project emissions from water reservoirs of hydro power plants in year y (t CO₂e/yr)

$$P_{E_{FF,y}} = 0$$

As per para 37 of ACM0002 version 16, "For all renewable energy power generation project activities, emissions due to the use of fossil fuels for the backup generator can be neglected"

$$P_{E_{GP,y}} = 0$$

Not applicable for the hydro power projects

$$P_{E_{HP,y}} = 0$$

Since, the project is run of river, the project activity does not involve the installation of a new reservoir; it does not result in CH₄ emission from the reservoir.

Therefore, $P_{E_y} = 0$

5.3 Leakage

As per para 60 of ACM0002 version 16, No leakage emissions need to be considered for the project activity.

5.4 Net GHG Emission Reductions and Removals

As per Para 61 of ACM0002 version16; Emission Reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

Where:

ER_y = Emission reductions in year y (t CO₂e/yr)

BE_y = Baseline emissions in year y (t CO₂/yr)

PE_y = Project emissions in year y (t CO₂e/yr)

Therefore, Net GHG Emission Reductions and Removals are calculated as follows:

$$ER_y = BE_y - PE_y$$

$$ER_y = 3,791,042 - 0 = 3,791,042 \text{ tCO}_2$$

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)
2015 (30-Mar-2015 – 31-Dec-2015)	601214	0	0	601214
2016 (01-Jan-2016 – 31-Dec-2016)	639100	0	0	639100
2017 (01-Jan-2017 – 31-Dec-2017)	688910	0	0	688910
2018 (01-Jan-2018 – 31-Dec-2018)	616310	0	0	616310
2019 (01-Jan-2019 – 31-Dec-2019)	620686	0	0	620686
2020 (01-Jan-2020 –	606154	0	0	606154

31-Dec-2020)				
2021 (01-Jan-2021 – 28-Feb-2021)	18667	0	0	18667
Total	3,791,042	0	0	3,791,042

<u>Ex-ante emissions reductions/removals</u>	<u>Achieved emissions reductions/removals</u>	<u>Percent difference</u>	<u>Justification for the difference</u>
11,332,484	3,791,042	-66.55%	As the project is a hydropower project, the energy generation depends on water availability. The availability of water is not under the control of the Project Proponent. The difference in ex-ante emission reductions is due to the non-availability of water in the monitoring period. The information of the breakdown details are given in the Appendix 1

APPENDIX I: BREAKDOWN DETAILS OF THE PROJECT

The breakdown details of the project activity are given below:

Year	From Date	To Date	Reasons
2014-15	28-Mar-15	31-Mar-15	OUTAGE OF U#1 DUE TO MALFUNCTIONING OF FIRE AND WATER SPRINKLER SYSTEM IN GENERATOR BARREL AREA.
2015-16	31-Mar-15	26-Jul-16	OUTAGE OF U#1 DUE TO GEN. DIFFERENTIAL SPLIT PHASE, OVERALL DIFFERENTIAL & GENERATOR FIRE PROTECTION OPERATED DURING RESTORATION of U#1 ON 31-MAR-2015.
	15-Dec-15	20-Feb-16	COMPLETE SHUTDOWN OF POWER STATION FOR REPAIR OF PRESSURE SHAFT
2018-19	20-Dec-18	5-Apr-19	COMPLETE SHUTDOWN OF POWER STATION FOR REPAIR OF HRT

Actual Generation Data of the project:

S.No.	Year	Export (MWh)	Import (MWh)	Actual Net Generation (MWh)
1	2015	622846.18	1625.6	621220.58
2	2016	663056.331	2687.1	660369.231
3	2017	714142.221	2306.4	711835.821
4	2018	640342.727	2428.3	637914.427
5	2019	644771.267	2140	642631.267
6	2020	629657.892	2072.5	627585.392
7	2021	19824.183	495.6	19328.583

As per the VCS PD, the estimated generation of the project is 1,975,950 MWh/year. However, it is evident from the data given in the table above that the actual generation is much less than the estimated generation. This is due to the low availability of water.

APPENDIX II: CALIBRATION DETAILS OF THE METERS

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. As the calibration of the Meters were done on 11/06/2013, this calibration certificate is valid till 10/06/2018.

The next calibration was done not 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."

The calibration of import energy meters is not under the control of PP. Since the calibration certificates are not available with PP, as a conservative approach, the maximum permissible error factor is applied to the import data as per the CDM guidelines.

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 difference between baseline emission of energy export and baseline emission of energy import $((100\% - 0.2\%) * (EG_{export,y} * BE_y - (100\% + 0.2\%) * EG_{import,y} * BE_y))$ has resulted in 3,791,042 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.

Details of MAIN & CHECK Meters for Line - 1

MAIN METER FOR LINE -1		CHECK METER FOR LINE -1	
Meter Serial No.	NP-8576-A	Meter Serial No.	NP-8577-A
Model	ER300P	Model	ER300P
Make	L&T	Make	L&T
Accuracy Class	0.2S	Accuracy Class	0.2S
Calibration Date	11/06/2013	Calibration Date	11/06/2013
Latest Calibration Date	29/06/2022	Latest Calibration Date	29/06/2022

Details of MAIN & CHECK Meters for Line-2

MAIN METER FOR LINE -2	CHECK METER FOR LINE -2
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Meter Serial No.	NP-8592-A	Meter Serial No.	NP-8540-A
Model	ER300P	Model	ER300P
Make	L&T	Make	L&T
Accuracy Class	0.2S	Accuracy Class	0.2S
Calibration Date	11/06/2013	Calibration Date	11/06/2013
Calibration Due Date	10/06/2018	Calibration Due Date	10/06/2018
Latest Calibration Date	29/06/2022	Latest Calibration Date	29/06/2022
Calibration Due Date	28/06/2027	Calibration Due Date	28/06/2027

Details of calibration of Import meters:

Location of import meter	BHB 1 (old office)	BHB 8 (Administrative building)	SPB 1 (Sapangin i Township)	BHB 12 (Power House)	SJP16 (Dam site)	BHB 13 (Surge Shaft)	LDT 1 (TRT)
Meter serial number	HPS30825	HPS47566	6645897	07044580	6769799	229228	226972
Make	Secure	Secure	L&T	L&T	L&T	HPL Electric & power Pvt Ltd	HPL Electric & power Pvt Ltd
Accuracy class	0.5S	0.5S	0.5S	0.5S	0.5S	0.5S	0.5S
Calibration date	19/04/2017	19/04/2017	20/04/2017	19/04/2017	20/04/2017	19/04/2017	20/04/2017
Calibration due date	18/04/2022	18/04/2022	19/04/2022	18/04/2022	19/04/2022	18/04/2022	19/04/2022

APPENDIX III: CSR ACTIVITIES TAKEN UP BY PROJECT PROPONENT

The CSR activities taken up by NHPC Limited under Parbati III 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/sub_page/106