



Verified Carbon Standard



HYDROELECTRIC PROJECT IN KINNAUR DISTRICT IN HIMACHAL PRADESH



Project title	Hydroelectric Project in Kinnaur District in Himachal Pradesh
Project ID	VCS 1742
Monitoring period	01-August-2022 to 31-December-2022 (inclusive of both dates)
Original date of issue	13-November-2024
Most recent date of issue	21-November-2024
Version	03
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PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The Government of India and the Government of Himachal Pradesh (GoHP) identified the Sutlej River as an important source of hydropower and have initiated hydroelectric projects along Sutlej and its Tributaries. Since commissioning, the project has been executed by Jaypee Karcham Hydro Corporation Limited (JKHCL), a special purpose vehicle formed by the promoter group Jaiprakash Associates Limited (JAL)¹.

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 from 01-September-2018 thus JSW Hydro Energy Limited is the new owner and has been acting as project proponent for the project activity.

Prior to the start of the project activity the existing demand in the Indian Grid was met through its existing fossil fuel based (coal, gas and diesel), nuclear, hydro and renewable energy-based power plants.

The measurement of electrical power supplied to the grid is continuously monitored by an energy meter installed by the state electricity board at the pothead yard for both import and export to Abdullahapur and Jhakri grids. Two lines in each grid facilitate the transfer of electricity. The actual energy generated is calculated as the difference between two consecutive day meter readings and then multiplied by a predetermined multiplying factor. This methodology is utilized to prepare the Daily Performance Report.

The plant team prepares the generation schedule on a daily basis. After deducting the transmission losses, auxiliary power consumption, and 12.12% free power to Government of Himachal Pradesh (home state), the remaining electricity is distributed based on the Power Purchase Agreements (PPAs) for four states - Punjab, Uttar Pradesh, Haryana, and Rajasthan. Furthermore, the distribution is also carried out on a short-term basis at power exchanges, after fulfilling contractual commitments.

The project activity has been devised to alleviate acute shortage of electricity generation capacity in the Northern Region of India especially at the time of system peak load by developing a 4 X

¹ The project was initially executed by Jaypee Karcham Hydro Corporation Limited (JKHCL), a special purpose vehicle (SPV) by the promoter group Jaiprakash Industries Limited (formally Jaiprakash Associated Limited). Thereafter, SPV Jaypee Karcham Hydro Corporation Limited was merged to newly formed Jaiprakash Power Ventures Ltd (JPVL), thus ownership document refers transfer of ownership from Jaiprakash Power Ventures Ltd (JPVL) to JSW Hydro Energy Limited (formerly Himachal Baspa Power Company Ltd (HBPCL)).

250 MW² renewable and versatile run of the river hydro power project at Karcham & Wangtoo on the river Satluj in Himachal Pradesh. The project proponent through implementation of this project activity eliminates the necessity of construction of a fossil-fuel fired thermal power plant of similar capacity to supply to electricity from the predominantly fossil fuel based regional grid, leading to reduction of GHGs emissions in the atmosphere.

Construction work at project site started from 18-November-2005 and the project activity started generation of electricity from 26-May-2011 (Unit-1).

Unit Name	Commissioning Date
Unit-1(250 MW)	26-May-2011
Unit 2(250 MW)	23-June-2011
Unit 3(250 MW)	08-September-2011
Unit 4(250 MW)	13-September-2011

As of 07-July-2021, the new operational capacity of the project has been augmented to 1045 MW, signifying that the current operational capacity of each of the four units has been raised to 261.25 MW from 250 MW each. During the current monitoring period the project activity supplied 1,695,340.87 MWh of electricity, and thus contributing to the GHG reductions of 1,361,528 tCO_{2e}.

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Validation	01-January-2013--31-December-2022	CDM	TÜV NORD CERT GmbH Ji	Ten year
First Verification	01-January-2013--31-December-2013	VCS	Earthood Services Private Limited	0 Years 11 Months 30 Days
Second Verification	01-January-2014--31-August-2015	VCS	TUV SUD SOUTH ASIA PVT LTD	01 Years 07 Months 28 Days

² As per the minutes of authority meeting held on 30/03/2021, CEA has agreed to upgrade the capacity of Karcham Wangtoo Hydro Electric Project from 1000 MW to 1091 MW in two stages i.e. 1045 MW (with 10% continuous overload) in first stage and then to 1091 MW (with 10% continuous overload) in the second stage, It was, however, decided by the Authority that after initial upgrading to 1045 MW (with 10% continuous overload, having capacity 261.25MW for each unit) in the first stage, the performance of the project and various operating parameters would be observed for at least two monsoon seasons w.e.f. 07/07/2021(The project is currently in its first stage). Therefore, the present operational capacity of the plant has been 1045 MW.

Third Verification	01-September-2015--31-December-2017	VCS	LGAI TECHNOLOGICAL CENTER, S.A. (APPLUS+ CERTIFICATION)	02 Years 04 Months 00 Days
Fourth Verification	01-January-2018--30-April-2020	VCS	LGAI TECHNOLOGICAL CENTER, S.A. (APPLUS+ CERTIFICATION)	02 Years 03 Months 29 Days
Fifth Verification	01-May-2020--31-July-2021	VCS	LGAI TECHNOLOGICAL CENTER, S.A. (APPLUS+ CERTIFICATION)	01 Years 03 Months 00 Days
Sixth Verification	01-August-2021--31-July-2022	VCS	VKU CERTIFICATION PVT. LTD	00 Years 11 Months 30 Days
Seventh Verification	01-August-2022--31-December-2022	VCS	LGAI TECHNOLOGICAL CENTER, S.A. (APPLUS+ CERTIFICATION)	00 Years 05 Months 00 Days

1.3 Sectoral Scope and Project Type

Sectoral scope³	01: Energy Industries (renewable / non-renewable sources).
Project activity type	Type I – Renewable Energy Projects

1.4 Project Proponent

Organization name	JSW Hydro Energy Limited (formerly Himachal Baspa Power Company Ltd)
Contact person	Mr. Vikas Sharma
Title	Plant Manager
Address	Karcham- Wangtoo H.E. Project, Sholtu Colony, P.O. Tapri, Sholtu, Himachal Pradesh 172104, India
Telephone	+ 91 9816183100
Email	vikas1.sharma@jsw.in

³ Projects, activities, or methodologies may be developed under any of the 16 VCS sectoral scopes: <https://verra.org/programs/verified-carbon-standard/vcs-program-details/#sectoral-scopes>

1.5 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the project	Project Consultant
Contact person	Mr. Vipul Sahu
Title	Deputy Manager
Address	Office No 201, Plot No 48, Scheme 78, Vijay Nagar Part- II, Indore 452010, India
Telephone	+91 91111112889
Email	vipul.sahu@enkingint.org

1.6 Project Start Date

Project start date	26-May-2011 (The project start date is earliest date of commissioning of the 1st 250 MW plant unit (unit-1) involved in the project activity.)
Justification	The project start date is earliest date of commissioning of the Unit-I.

1.7 Project Crediting Period

Crediting period	<input type="checkbox"/> Seven years, twice renewable <input checked="" type="checkbox"/> Ten years, fixed <input type="checkbox"/> Other (state the selected crediting period and justify how it conforms with the VCS Program requirements)
Start and end date of first or fixed crediting period	01-January-2013 to 31-December-2022 (inclusive of both dates).

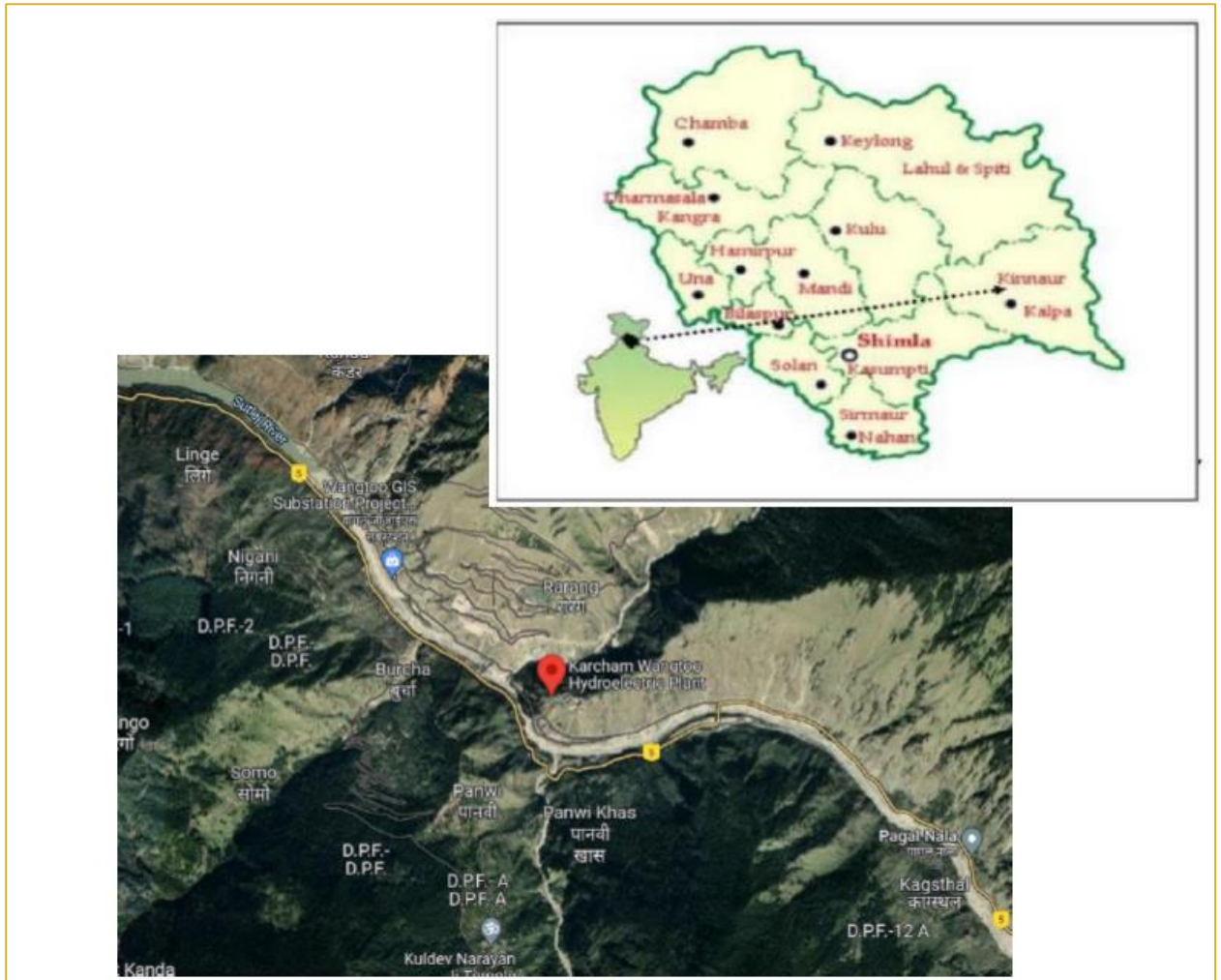
1.8 Project Location

The project activity is located on the stretch of Satluj River between Karcham and Wangtoo in the District of Kinnaur of Himachal Pradesh. The geographic coordinates of the project area are the following:

Latitude : 31°32'27.6"N

Longitude : 78°00'53.3"E

Nearest broad gauge railway station is Kalka under Northern Railway, which is 290 kms from the project site. The nearest airport to the project site is Shimla, which is 210 km from Karcham Wangtoo site. The airport is connected to the project site by a paved road. The location is further depicted in the following map:



1.9 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
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Methodology	ACM0002 ⁴	Consolidated baseline methodology for grid-connected electricity generation from renewable sources	12.1.0
Methodological Tool	TOOL01	Tool for the demonstration and assessment of additionality	05.2 ⁵
Methodological Tool	TOOL07	Tool to calculate the emission factor for an electricity system.	02 ⁶
Methodological Tool	TOOL02	Combined tool to identify the baseline scenario and demonstrate additionality	2.2 ⁷
Annex	Annex 58	Guidance on Assessment of Investment Analysis	03 ⁸

1.10 Double Counting and Participation under Other GHG Programs

1.10.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

Yes No

1.10.2 Registration in Other GHG Programs

Was the project registered or seeking registration under any other GHG programs?

Yes No

1.11 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

1.11.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit? See the *VCS Program Definitions* for definitions of emissions trading program and binding emission limit.

⁴ <https://cdm.unfccc.int/methodologies/DB/XB1TX7TAZ6SLWM9B7BC67THHVD16JV>

⁵ https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v5.2.pdf/history_view

⁶ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.pdf>

⁷ https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v2.2.pdf/history_view

⁸ https://cdm.unfccc.int/EB/051/eb51_repan58.pdf

Yes No

1.11.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system? See the *VCS Program Definitions* for definition of GHG-related environmental credit system.

Yes No

1.11.3 Supply Chain (Scope 3) Emissions

Do the project activities affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

Yes No

1.12 Sustainable Development Contributions

Contribution to sustainable development:

The project activity has beneficial effect on the local environment and employment in the nearby region. Clean Electricity generation through Hydro Project result in avoidance of consumption of fossil fuels which results in contribution to SDG 7. The emission avoidance through these activities results in contribution to SDG 13. All the workers at site are trained which results in increase of skills, which contributes to SDG 4. Also, 12.1295% of free electricity is provided to Himachal Pradesh Government from net electricity supplied to grid. Detailed indicators are mentioned in table 1. This is a voluntary project activity doesn't contribute to achieving any nationally stated sustainable development priorities. Project officials has taken decision to keep all the employees on permanent basis working at the project activity. There is no compliance for monitoring and reporting the emission reduction and SDG contribution from the project activity.

The following documents provided to VVB as evidence regarding the SD contributions:

SD Contributions	Documents submitted to VVB
SDG 4	Training Records
SDG 7	Monthly JMR and Invoices
SDG 13	Emission reduction calculation sheet

The project activity contributed in the sustainable development. The details of the SDG contribution can be found in the table 1 below-

Table 1: Sustainable Development Contributions

Row number	SDG target	SDG indicator	Net impact on SDG indicator	Current project contributions	Contributions over project lifetime																		
1)	7.2	7.2.1: Renewable energy share in the total final energy consumption	Implemented activities to generate renewable energy	About 1,695,340.87 MWh renewable electricity has supplied to Indian grid during the reported period that helps to increase the renewable energy share in the energy mix during the current monitoring period.	<p>Overall, 42,880,242.55 MWh renewable electricity has supplied to Indian grid throughout the project lifetime that helps to increase the renewable energy share in the energy mix.</p> <table border="1"> <thead> <tr> <th>Verification Period</th> <th>Electricity has supplied to Indian grid (MWh)</th> </tr> </thead> <tbody> <tr> <td>First Verification</td> <td>4,469,315.31</td> </tr> <tr> <td>Second Verification</td> <td>7,887,873.10</td> </tr> <tr> <td>Third Verification</td> <td>9,943,136.45</td> </tr> <tr> <td>Fourth Verification</td> <td>9,032,892.69</td> </tr> <tr> <td>Fifth Verification</td> <td>6,075,166.81</td> </tr> <tr> <td>Sixth Verification</td> <td>3,776,517.32</td> </tr> <tr> <td>Seventh Verification</td> <td>1,695,340.87</td> </tr> <tr> <td>Total</td> <td>42,880,242.55</td> </tr> </tbody> </table>	Verification Period	Electricity has supplied to Indian grid (MWh)	First Verification	4,469,315.31	Second Verification	7,887,873.10	Third Verification	9,943,136.45	Fourth Verification	9,032,892.69	Fifth Verification	6,075,166.81	Sixth Verification	3,776,517.32	Seventh Verification	1,695,340.87	Total	42,880,242.55
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2)	4.4	4.4.1: Proportion of youth and adults with information and communications technology (ICT) skills, by type of skill	Implemented activities to increase skills of youth and adults	Together with the technology supplier, the Project organize 63 training during current monitoring period (Training related to soft and technical skills)	Overall, 108 (45+63) trainings are provided.																		
3)	13.0	Total greenhouse gas emissions avoided or removed	Implemented activities to avoid emission of greenhouse gases	The project avoided release of 1,361,528 tCO ₂ e in to the atmosphere during current Monitoring period.	<p>Overall prevented the release of 34,437,102 tCO₂e into the atmosphere since project commissioning as no SDG reporting has been done previously.</p> <table border="1" data-bbox="1369 574 1948 1128"> <thead> <tr> <th>Verification Period</th> <th>Emission Reduction (tCO₂e)</th> </tr> </thead> <tbody> <tr> <td>First Verification</td> <td>3,589,307</td> </tr> <tr> <td>Second Verification</td> <td>6,334,750</td> </tr> <tr> <td>Third Verification</td> <td>7,985,332</td> </tr> <tr> <td>Fourth Verification</td> <td>7,254,300</td> </tr> <tr> <td>Fifth Verification</td> <td>4,878,965</td> </tr> <tr> <td>Sixth Verification</td> <td>3,032,920</td> </tr> <tr> <td>Seventh Verification</td> <td>1,361,528</td> </tr> <tr> <td>Total</td> <td>34,437,102</td> </tr> </tbody> </table>	Verification Period	Emission Reduction (tCO ₂ e)	First Verification	3,589,307	Second Verification	6,334,750	Third Verification	7,985,332	Fourth Verification	7,254,300	Fifth Verification	4,878,965	Sixth Verification	3,032,920	Seventh Verification	1,361,528	Total	34,437,102
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1.13 Commercially Sensitive Information

Not applicable, no commercially sensitive information has been excluded from the public version of the project description. There is no commercially sensitive information.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

The project by the project proponent involves constructing a 1040 MW run-of-river hydroelectric plant on the Satluj River, designed with minimal storage to avoid large reservoirs and reduce displacement of local populations. As a socially and environmentally responsible organization, the project proponent conducted an extensive stakeholder consultation process focusing on socio-environmental impacts. This voluntary initiative, led by Sharnam Sewa Samiti (SSS), an independent NGO, included direct community interactions and detailed assessments using baseline data from secondary sources like Census and district records, as well as primary data from community consultations and interviews. The study was thorough, considering environmental and safety aspects like earthquakes and dam breaches.

Stakeholder Identification	
	1. Local People / Local population
	2. Gram Panchayat members of seven villages directly coming under the purview of the project
	3. District and state level government officials
	4. NGO representatives
	5. Representatives of PP
	6. Government officials
	7. Ministry of Environment & Forests, Government of India
	8. Central Electricity Authority, Government of India
	9. Civil and construction work contractors
	10. H.P State Environment Protection & Pollution Control Board, Government of Himachal Pradesh

<p>Legal or customary tenure/access rights</p>	<p>The project proponent (JSW) holds legal ownership of the land through a 35-year permit granted by the government. There are no conflicts with local communities or Indigenous Peoples (IPs), as the land does not infringe upon any recognized rights.</p>
<p>Stakeholder diversity and changes over time</p>	<p>Diverse groups including local people, Panchayat members, NGOs, government officials, equipment supplier were identified as stakeholders in the project. They represent varied socio-economic backgrounds and cultural identities. Local people speak in Hindi language, while others have proficiency in English. Additionally, stakeholders have diverse employment status. Government officials, NGOs, local people interact with each other for the upliftment of the area. Various community service activities are undertaken around the project area by PP. There is no change in the make-up of stakeholders over the time.</p>
<p>Expected changes in well-being</p>	<p>The project helped in generating employment opportunities during the construction and operation phases.</p>
<p>Location of stakeholders</p>	<p>Local stakeholders comprise of the local people in and around the project area.</p>
<p>Location of resources</p>	<p>The local community, including herders and citizens, holds customary access rights to natural resources such as the grazing land surrounding the project area. However, the fenced portions of the project, including the substation and operation and maintenance buildings, are privately owned by the project shareholders and board of directors.</p>

2.1.2 Stakeholder Consultation and Ongoing Communication

<p>Ongoing consultation</p>	<p>As a part of continual improvement process, feedback from the associated stakeholders is vital, therefore a dedicated Visitor register cum grievance register has been placed at the project site which is accessible to stakeholders to provide their feedback on the project.</p>
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Date(s) of stakeholder consultation	Year 2007
Communication of monitored results	The monitoring results are communicated from the concerned individuals (stakeholders) to PP, through the grievance register. The site officials acknowledge and address the comments, suggestions, or grievances submitted by stakeholders, resolving issues as needed
Consultation records	Registers is used to records the grievances and feedback. Grievance register is placed at the main gate of site office and is accessible to everyone.
Stakeholder input	No any grievances received during the current monitoring period.

2.1.3 Free, Prior, and Informed Consent

Consent	The project secured consent through inclusive community consultations, involving Indigenous Peoples (IPs), Local Communities (LCs), and customary right holders. Extensive engagement, transparent information sharing, and acknowledgment of customary rights were key. Consent was documented in clear agreements accessible to all stakeholders. Conflict resolution mechanisms and ongoing engagement ensure a responsive approach. Continuous monitoring and evaluation demonstrate the commitment to transparency and positive community outcomes. The absence of ongoing conflicts reflects the project's success in aligning with stakeholder interests and maintaining a harmonious relationship with the community.
Outcome of FPIC	No complaints were received from Local Stakeholders. PP assures that the project has not encroached on land, relocated people without consent, and forced physical or economic displacement.

2.1.4 Grievance Redress Procedure

The stakeholders are also requested to share their experiences and grievances on continuous basis. Registers is used to records the grievances and feedback. Grievance register is placed at

the main gate of site office and is accessible to everyone. During the current monitoring period, no any grievances received during the current monitoring period.

Grievances received	Resolution and outcome
No grievances received	No action required as no grievance received for the current monitoring period

2.1.5 Public Comments

No negative comments have been received on project activity from any of the local stakeholders consulted. As all comments were very positive about the project, no further action is required. There were no further comments raised by the stakeholders and they were totally in support for setting up of these kinds of projects in the region. The local stakeholders expressed their support to the project

Summary of comments received	Actions taken
No comments received	No action required as no comments were received.

2.2 Risks to Stakeholders and the Environment

2.2.1 Management Experience

The management team consists of experienced professionals capable of effectively implementing the project and engaging with the community. No other entities are currently involved in this initiative. If any requirements arise in the future, the project owner will recruit specialized talent to fill any identified gaps, ensuring the project's success. Information of entities involved in previous verifications and registration process are mentioned in section 1.2.

2.2.2 Risk assessment

	Risk identified	Mitigation or preventative measure(s) taken
Natural and human-induced risks to stakeholders' wellbeing	No risk identified	No natural or human-induced events have been observed during the monitoring period that could impact stakeholders' wellbeing. All emergency preparedness and response measures are in place.
Risks to stakeholder participation	No risk identified	Stakeholder participation has been ensured through continuous

		engagement and transparent communication, in alignment with the Environment, Quality, Occupational Health, Safety, and Social (EQHS&S) Policy. No barriers to participation were noted.
Working conditions	Risk identified	All workers operate under safe and fair working conditions. Compliance with national labor laws and company policies has been maintained.
Safety of women and girls	No risk identified	The project adheres to strict policies ensuring the safety and wellbeing of women and girls in the community, with no incidents reported.
Safety of minority and marginalized groups, including children	No risk identified	No risks have been identified that affect minority and marginalized groups, during this period. Safety measures are actively upheld.
Pollutants (air, noise, discharges to water, generation of waste, and release of hazardous materials and chemical pesticides and fertilizers)	Risk identified	Since this is a hydro project, there are no concerns related to air pollution. Furthermore, power generation from the project will contribute to improved air quality and reduced emissions by offsetting the fossil fuel combustion typically associated with baseline power generation plants. Additionally, pollutant levels, including air quality, noise, and waste generation, remain within permissible limits. There have been no releases of hazardous materials, and all environmental safety measures are being strictly followed.

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

	Risks identified ⁹	Mitigation or preventative measure(s) taken
Discrimination	No risk identified	Company Policy clearly states company's commitment to providing equal opportunity to all with no discrimination. No incidents of discrimination were reported during the current monitoring period.
Sexual harassment	No risk identified	The "Company Policy" clearly emphasizes the organization's commitment to providing equal opportunities for all, free from any form of discrimination or harassment. No incidents of sexual harassment or discrimination were reported during the current monitoring period.
Gender equity in labor and work	No risk identified	As per "Company Policy", the company provides opportunity to all without any discrimination on the basis of gender. No incident regarding gender inequity was reported during the current monitoring period.
Forced labor	No risk identified	The project strictly prohibits the use of forced labor. No incidents of forced labor were reported during the current monitoring period.
Child labor	No risk identified	The project ensures that no child labor is employed at any stage. No incidents of child labor were reported during the current monitoring period.

⁹ The identified risks and commensurate mitigation or preventative measure(s) for forced labor, child labor, and human trafficking, must be inclusive of staff and contracted workers employed by third parties.

Human trafficking	No risk identified	The project does not involve or support human trafficking in any form. No incidents of human trafficking were reported during the current monitoring period.
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2.3.2 Human Rights

The following demonstrations show how the project is committed to safeguard the rights of IPs, LCs, and customary right holders, while following the international human rights law¹⁰, the UNDRIP¹¹ and ILO Convention 169-

Risks identified	Mitigation or preventative measure(s) taken
<u>Free, Prior, and Informed Consent (FPIC)</u>	The project activity has obtained the FPIC from the local stakeholders including the IPs, LCs and customary right holders, ensuring their unforced consent before the project operation, respecting their right to make decisions.
<u>Non-discriminatory Participation in the Project Activity</u>	The project distributed devices without cultural or social biases, safeguarding the rights of IPs, LCs, and customary rights holders to be free from discrimination.
<u>Employment due to the Project Activity</u>	The project activity also leads to the employment from the IPs, LCs and customary right holders, enabling them to exercise their right to fair treatment in employment and salary.

2.3.3 Indigenous Peoples and Cultural Heritage

Risks identified	Mitigation(s) or preventative measure taken
No risk identified	As per the “Environment, Quality, Occupational Health, Safety & Social Policy” PP is committed to protect the cultural heritage by preventing pollution at the workplace, surrounding areas

¹⁰ <https://www.ohchr.org/sites/default/files/Documents/Publications/fs9Rev.2.pdf>

¹¹ https://www.un.org/development/desa/indigenouspeoples/wp-content/uploads/sites/19/2018/11/UNDRIP_E_web.pdf

	and conserving natural resources and reduce the health, safety and environment (HSE) related risk for all personal including customers and community at large.
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2.3.4 Property Rights

Risks identified	Mitigation or preventative measure(s) taken
Displacement of Indigenous Peoples (IPs) or Local Communities (LCs); Conflicting property rights claims; Loss of customary land tenure/access rights; Access restrictions to natural resources.	Ensure free, prior, and informed consent (FPIC), conduct community consultations, provide fair compensation, recognize and respect customary rights, conduct due diligence on land tenure, utilize legal frameworks for dispute resolution, engage stakeholders for balanced resource access, and implement sustainable management practices.

2.3.5 Benefit Sharing

Summary of the benefit sharing plan	Under its CSR initiatives, JSW Foundation’s Benefit Sharing Plan ¹² promotes equitable distribution of benefits from social programs in education, health, skills, livelihoods, and sustainability. Through efforts like JSW Shakti, it empowers communities, especially women, fostering inclusive growth, cultural preservation, and long-term positive change in rural India.
Benefit sharing during the monitoring period	Activities undertaken for the welfare of local people for the current monitoring period are provided in the CSR Report separately.

2.4 Ecosystem Health

	Risk identified	Mitigation or preventative measure(s) taken during the monitoring period
Impacts on biodiversity and ecosystems	No risk identified	This project activity doesn't result in adverse effects; instead, it positively impacts on the

¹² <https://www.jsw.in/foundation>

		biodiversity and ecosystem by decreasing air pollution and mitigating climate change.
Soil degradation and soil erosion	No risk identified	This project activity keeps check of the soil degradation and soil erosion by periodic monitoring.
Water consumption and stress	No risk identified	This project activity is a run-of-river project and does not have any negative impacts on water consumption or does not lead to water stress in any way.

2.4.1 Rare, Threatened, and Endangered species

Species or habitat	Not Applicable
Areas needed for habitat connectivity	Not Applicable

	Risks identified	Mitigation or preventative measure(s) taken
Habitats for rare, threatened, and endangered species	No risk identified	All necessary protective measures are in place, and regular monitoring ensures the integrity of these habitats.
Areas for habitat connectivity	No risk identified	Existing habitat corridors are well-maintained, and no significant threats to connectivity have been identified.

2.4.2 Introduction of species

At the time of registration, no species were identified as requiring mitigation for this project. The project involves the generation of hydroelectricity and its export to the Indian grid, which does not include the planting or introduction of any species. Hence, this section is not applicable.

Species introduced	Classification	Justification for use	Adverse effects and mitigation
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Not Applicable	Not Applicable	Not Applicable	Not Applicable
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Existing invasive species	Mitigation measures to prevent the spread or continued existence of invasive species
Not Applicable	Not Applicable

	Risks identified	Mitigation or preventative measure(s) taken
Invasive species	No risk identified	There is no invasive species identified hence no mitigation measure is required.

2.4.3 Ecosystem conversion

Since, the project activity is neither ARR, ALM, WRC nor ACoGS, hence this information is not applicable.

	Risks identified	Mitigation or preventative measure(s) taken
Ecosystem conversion	Not Applicable	Not Applicable

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The 1045 MW renewable type project, Karcham-Wangtoo hydroelectric Project (run-of-the-river development) envisages construction of a dam on Satluj river at Karcham, a diversion tunnel, intake tunnel, underground sedimentation chambers, head race tunnel, underground power house at Wangtoo and tail race tunnel. The Project site is located at a distance of 200km from Shimla.

The project operates in unified Indian grid & meets the energy requirements of northern states. Karcham-Wangtoo Hydroelectric Project utilizes a gross head of 295 m for power generation and comprises 98 m high (above deepest foundation level) concrete gravity diversion dam, four intakes and four underground sedimentation chambers having size 505 m (L) x 16 m (W) x 28 m (D) each, 17.2 km long and 10.48 m dia finished circular concrete lined Head Race Tunnel (HRT) for design discharge of 417 cumecs, 16/27 m dia and 184 m high surge shaft, four steel 1-10 lined pressure shafts of 4.75 m dia and each 290.5 m in length, a 143 m(L) X 21m(W) X 49 m(H) underground power station, and a 909 m long Tail Race Tunnel and outfall works. The power station has installed capacity of 1045 MW (4 units of 261.25 MW each) with four vertical axis Francis Turbines for 275.93 m design head.

The 1st unit got commissioned on 26-May-2011, the second unit on 23-June-2011, third unit on 08-September-2011 and the project got fully commissioned, i.e. the fourth unit got commissioned on 13-September-2011.

The power generating equipment installed in the project activity is:

- Francis turbines, 255 MW/347000MHP
- Make: Andritz VA Tech Hydro
- Generators: 4 semi-umbrella vertical synchronous generators, 277.70 MVA
- Speed: 214.30 rpm

The Project activity is a run-of-river hydropower project that utilizes the natural flow of Satluj to generate electricity and the major components involved are as following:

1. River diversion works
2. Diversion dam
3. Intake and sedimentation chambers
4. Head race tunnel
5. Surge shaft
6. Pressure shafts and penstocks
7. Power house complex for housing 4 x 264.25 MW generating units
8. Tail race Tunnel

The design features of the project components are presented in the following table:

HYDROLOGY

1. Catchment area at Dam site	48,755 Sq.Km
2. Snow catchment	38,760 Sq. Km
3. Max. observed av. 10 days discharge	1,870.48 cumec
4. Design Flood: PMF	6,744 cumec
5. Average run off in 90% availability year	9,413m cum
6. Average run off in 50% mean year	12,148m cum
7. Discharge for 90% availability	80.8 cumec
8. Discharge for 50% availability	176.0 cumec
9. Percent availability corresponding to design discharge of 421 cumec	32.38%

RIVER DIVERSION WORK

1) Diversion tunnel	
a. Size	10.15m (lined) and 10.75m (unlined) with invert lining modified horse shoe section
b. Length	541m (i/c 93m inlet & outlet structure)
2) Cofferdams	Rock fill with concrete wall
a. Upstream	16.50m high
b. Downstream	5.50m high

DIVERSION DAM

1) Type	Concrete gravity
2) Top of dam	EL. 1,813.00m
3) Height	88.00m

4) Total length at Top	182.00m
5) No. of blocks	10
6) Minimum river bed level at dam axis	EL.1,777.00m
7) Deepest foundation level	EL.1,725.00m
8) Maximum pond level (FRL)	EL.1,810.00m
9) Minimum pond level (MDDL)	EL.1,799.00m
10) Maximum water level (MWL)	1,812.40m
11) Live storage capacity	544.97 Ha-m

STILLING BASIN (ENERGY DESPINES)

1) 1.Length	95.00m
2) 2. Floor level	1,765.00m
3) 3. Sill elevation	1,776.50m

MAIN SPILLWAY (SLUICES)

1) Location	Block no. 4 to 7 of Dam
2) No. of bays	4
3) Crest elevation	1,778.00m
4) Thickness of intermediate piers	8m
5) Size of each gate	10m (W) x 10.50M (H)
6) Type of gates	Radial Gates (Top sealing type)
7) Discharge capacity of Sluices	8,123 cumec at FRL with all gates Fully raised

AUXILIARY SPILLWAY

1) Location	Block nos. 5 & 6
2) No. of bay	1
3) Width of bay	6.00m
4) Crest elevation	1,807.00m
5) Size of gate	6m (W) x 3.30m (H)
6) Type of gate	Fixed wheel gate
7) Maximum discharge capacity	150 cumec at EL. 1,813.00m 53 cumec at EL. 1,810.00m
8) Ski-jump bucket lip elevation	1,788.843m

INTAKE

1) No. of intake bays	4
2) Size of each bay at trash racks	16m (W) x 18.50m (H)
3) Orientation with respect to Dam axis	110°
4) Crest elevation	1,793.00m
5) Invert Level of Intake	1,789.00m

6) Discharge through each intake bay	126.25 cumec
7) No. of gates	4
8) Size of each gate	7.5m (W) x 4.0m (H)
9) Size of intake tunnels	6.0m dia circular concrete lined
10) Length of intake tunnels	317m, 365m, 414m & 462m

SEDIMENTATION CHAMBERS

1) Particle size to be excluded	+0.2mm and above
2) No. of chambers	4
3) Width of each chamber	18.00m
4) Depth of each chamber	30.25m
5) Length of each chamber	424m + 70m transitions
6) Flushing discharge for 1000 MW <small>错误,未定义书签。</small>	84.2 cumec
7) Fall velocity of 0.2mm particles	2.3 cm/sec.
8) Size of flushing duct at start	1.0m (W) x 0.80m (H) steel lined
9) Size of flushing duct at end	2.0m (W) x 2.3m (H) steel lined
10) Design discharge & average Velocity through each chamber for 1,000 MW <small>错误,未定义书签。</small> output	Q (cumec): 126.25, V(m/sec): 0.235

POWER GENERATION

1. Installed capacity	1,000 MW <small>错误,未定义书签。</small>
2. Annual generation (90% dependable year)	4,131.06 GWh
3. Plant load factor (90% dependable year)	47.16%

During the current monitoring period, the hydro power project was operating with normal operational schedule including scheduled shut down and maintenance details of plant shutdown have been mentioned in Appendix 3: BREAKDOWN DETAILS . No any event occurred during the current monitoring period that may impact GHG emissions reductions or removals and monitoring crucially.

3.2 Deviations

3.2.1 Methodology Deviations

No methodology deviation is applied during current monitoring period.

3.2.2 Project Description Deviations

Deviation requested in Third verification (Monitoring period: 01-September-2015 to 31-December-2017 (Inclusive of both date)):

Deviation 1: 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 11-September-2018. The relevant document for change in company name and corresponding change in communication agreement has been provided to VCS. The following deviation had taken place in the 3rd periodic verification. The above deviation has been already approved.

Deviation requested in Sixth verification (01-August-2021 to 31-July-2022 (Inclusive of both date)):

Deviation 2: With the approval of the Central Electricity Authority (CEA), Ministry of Power, the Retrofit activities is approved for the project activity in two phases i.e., 1,045 MW and after reviewing the performance of the initial upgrade for at least two monsoon seasons, the second phase will lead to further upgradation to 1091 MW. The CEA letter is being submitted VVB. The first phase trail run started in July 2021 and the generation started accounting from August 2021 onward. From the current monitoring period onwards, electricity reports are produced on 1045 MW capacity i.e. 261.25 MW per Unit. Surplus power generated in plant due to uprating project capacity exported on a short-term basis to power exchanges. Since there is no addition of new unit, the retrofit activities are categorized as project design deviation. In order to assess additionality, sensitivity parameter as per registered PDD is considered.

	Registered	Actual New Capacity	Percentage Change
Capacity (MW)	1000	1045	4.50%
Generation as per PDD	4463880	4328244.9	-3.04%
As per registered PDD Version 04 dated 28-03-2012 page number 28.			
IRR Variation	-10%	0%	10%
Generation	10.81%	9.80%	8.80%

When compared to registered PDD, it is observed that with an increase of 4.50% capacity, the actual annual increased generation is still -3.04% lower than the estimated generation in registered PD. As per registered sensitivity analysis, an increase in generation is not likely to exceed 5% in the project context, which would result in an IRR of 10.29%, which remains lesser than the benchmark. With increased capacity, the actual generation is below the estimated values, therefore the registered additionality is not breached.

The project description deviation doesn't impact the applicability of the methodology, additionality and baseline scenario, emission reduction calculation of project. The nature of deviation is permanent.

Deviation 3: The Longitude (E) and Latitude (N) of the location of the Karcham & Wangtoo HEP has been updated in the monitoring report to ensure more accurate detection. The deviation doesn't impact the applicability of the methodology, additionality or the appropriateness of the baseline scenario. The coordinates for the power house of the Karcham & Wangtoo HEP have been revised and are now recorded as.

Longitude (E): 78°00'53.3"

Latitude (N): 31°32'27.6"

The nature of deviation is permanent.

Deviation requested in Current verification (01-August-2022 to 31-December-2022 (inclusive of both dates):

Deviation – 4: Approved PROJECT DESCRIPTION V02 dated 17-April-2018 specifies a calibration frequency of once in every two years which is in line with PPA. However, the same is not followed at site because the meter is under control of Grid company and calibration is managed by the grid company. Thus, Calibration is not in the control of project proponent.

Although, as per Central Electricity Authority (Installation and Operation of Meters) Regulations-2006 Dated 17th March, 2006 with Amendments Dated: 4th June, 2010 and. Dated: 26th November, 2014 section 18 Calibration and Periodical Testing of Meters, Energy accounting and audit meters shall be tested at site at least once in five years or whenever the accuracy is suspected or whenever the readings are inconsistent with the readings of other meters.

As the meter is working fine and EB bill is generated based on this meter reading hence, the PP follows the five-year calibration frequency recommended by the Central Electricity Authority. Hence PP is requesting for Deviation 04 to allow for five-year calibration frequency.

The nature of deviation is permanent.

3.3 Grouped Projects

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

3.4 Baseline Reassessment

Did the project undergo baseline reassessment during the monitoring period?

Yes No

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	EF _{OM,y}
Data unit	tCO ₂ /MWh (A unit conversion has been performed to convert GWh to MWh)
Description	Operating Margin emission factor for erstwhile NEWNE regional grid
Source of data	Referred from CO ₂ Baseline Database for the Indian Power Sector prepared by Central Electricity Authority Version 4.0
Value applied	1.0086
Justification of choice of data or description of measurement methods and procedures applied	It is calculated in accordance with the Tool to calculate the emission factor for an electricity system with 3 years vintage data (2005-06, 2006-07, 2007-2008) on Net Generation provided by CEA with an option of ex ante calculation based on Simple Operating Margin Method. There is a unit conversion from GWh to MWh.
Purpose of Data	Calculation of baseline emissions
Comments	The value is fixed and it is same for the entire crediting period

Data / Parameter	EF _{BM,y}
Data unit	tCO ₂ /MWh (A unit conversion has been performed to convert GWh to MWh)
Description	Build Margin emission factor for the erstwhile NEWNE regional grid
Source of data	Referred from CO ₂ Baseline Database for the Indian Power Sector prepared by Central Electricity Authority Version 4.0
Value applied	0.5977
Justification of choice of data or description of measurement methods and procedures applied	Calculated from CEA database in accordance with ACM0002 for the year 2007-08. The build margin is calculated in this database as the average emissions intensity of the 20% most recent capacity additions in the grid based on net generation and option of ex ante calculation
Purpose of Data	Calculation of baseline emissions
Comments	The value is fixed and it is same for the entire crediting period

Data / Parameter	EF _{grid,CM,y}
Data unit	tCO ₂ /MWh (A unit conversion has been performed to convert GWh to MWh)

Description	Combined Margin CO ₂ emission factor for erstwhile NEWNE regional grid
Source of data	Estimated figure based on 50% of OM and 50% of BM values
Value applied	0.8031
Justification of choice of data or description of measurement methods and procedures applied	It is calculated it as per “Tool to calculate the emission factor for an electricity system” (Version 02) with 3years vintage data and option of ex ante calculation based on 50% of OM and 50% of BM values approach.
Purpose of Data	Calculation of baseline emissions
Comments	The value is fixed and it is same for the entire crediting period

Data / Parameter	A _{BL}
Data unit	m ²
Description	Area of the reservoir (m ²) measured in the surface of the water, before the implementation of the project activity, when the reservoir is full. For new reservoirs, this value is zero
Source of data	Project site
Value applied	0
Justification of choice of data or description of measurement methods and procedures applied	Measured from topographical surveys, maps, satellite pictures, etc.
Purpose of Data	-
Comments	-

Data / Parameter	Cap _{BL}
Data unit	W
Description	Installed capacity of the hydro power plant before the implementation of the project activity.
Source of data	Project site
Value applied	0
Justification of choice of data or description of measurement methods and procedures applied	The installed capacity is determined based on recognized standards
Purpose of Data	-
Comments	-

4.2 Data and Parameters Monitored

Data / Parameter	EG _{facility, 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	Meters are installed at the Pothead yard for export/import to Abdullahapur grid and Jhakri grid. There are two lines for each grid through which the electricity is exported / imported, which upon energy measurement are included in daily performance report.							
Description of measurement methods and procedures to be applied	Meters installed at the switchyard would accurately monitor electricity supplied to the grid. Hourly measurement and monthly recording is being done.							
Frequency of monitoring/recording	Continuous monitoring and monthly recording							
Value monitored	<table border="1"> <thead> <tr> <th>Year</th> <th>Net Electricity Supplied to grid (MWh)</th> </tr> </thead> <tbody> <tr> <td>2022</td> <td>1,695,340.87</td> </tr> <tr> <td>Total</td> <td>1,695,340.87</td> </tr> </tbody> </table>		Year	Net Electricity Supplied to grid (MWh)	2022	1,695,340.87	Total	1,695,340.87
Year	Net Electricity Supplied to grid (MWh)							
2022	1,695,340.87							
Total	1,695,340.87							
Monitoring equipment	The metering system includes a main meter and a back-up check meter of accuracy class 0.2s. All meter data is automatically recorded and is submitted to Northern Region Load Dispatch Centre (NRLDC) on weekly basis.							
QA/QC procedures to be applied	The meters are calibrated once in every 5 years ¹³ . The value shall be cross checked with value obtained by subtracting Auxiliary consumption from gross generation. The net electricity export value is also cross checked with electricity sales invoices. Details of calibration of energy meters have been provided in APPENDIX 2.							
Purpose of the data	Calculation of baseline emissions							
Calculation method	Net electricity is directly monitored on hourly basis from the meters							

¹³ As per the clause 8.2.2.2 of PPA the meters shall be tested and calibrated in accordance with the provisions set out in the connection agreement and IEGC atleast once in 2 years. (Page no. 46 of PPA). PP has taken the deviation for change the calibration frequency of the meters. (refer deviation 4 in this report)

Comments	The Monitored Data to be kept for a minimum of two years after the end of the crediting period or the last issuance whichever is later.
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Data / Parameter	TEG _y						
Data unit	MWh						
Description	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y.						
Source of data	Measured at the Project activity site. (Pothead Yard)						
Description of measurement methods and procedures to be applied	Hourly measurement and monthly recording by energy meter.						
Frequency of monitoring/recording	Continuous monitoring and monthly recording						
Value monitored	<table border="1"> <thead> <tr> <th>Year</th> <th>Total Electricity Generation (MWh)</th> </tr> </thead> <tbody> <tr> <td>2022</td> <td>1,954,622.68</td> </tr> <tr> <td>Total</td> <td>1,954,622.68</td> </tr> </tbody> </table>	Year	Total Electricity Generation (MWh)	2022	1,954,622.68	Total	1,954,622.68
Year	Total Electricity Generation (MWh)						
2022	1,954,622.68						
Total	1,954,622.68						
Monitoring equipment	Energy meters: Details of energy meters along with calibration dates are provided in APPENDIX 2: METER CALIBRATION DETAILS.						
QA/QC procedures to be applied	The meters are calibrated once in every 5 years ¹⁴ (Refer deviation 4)						
Purpose of the data	For cross check of net generation						
Calculation method	Not applicable						
Comments	The Monitored Data to be kept for a minimum of two years after the end of the crediting period or the last issuance whichever is later.						

Data / Parameter	Cap _{PJ}
Data unit	W

¹⁴ As per the clause 8.2.2.2 of PPA the meters shall be tested and calibrated in accordance with the provisions set out in the connection agreement and IEGC at least once in 2 years. (Page no. 46 of PPA). PP has taken the deviation for change the calibration frequency of the meters. (refer deviation 4 in this report)

Description	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data	Commissioning Certificate.
Description of measurement methods and procedures to be applied	The Cap _{PJ} would be verified through the technical specification sheet of the turbines installed in project activity.
Frequency of monitoring/recording	-
Value monitored	261.25*4*10 ⁶ 15
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of the data	-
Calculation method	-
Comments	-.

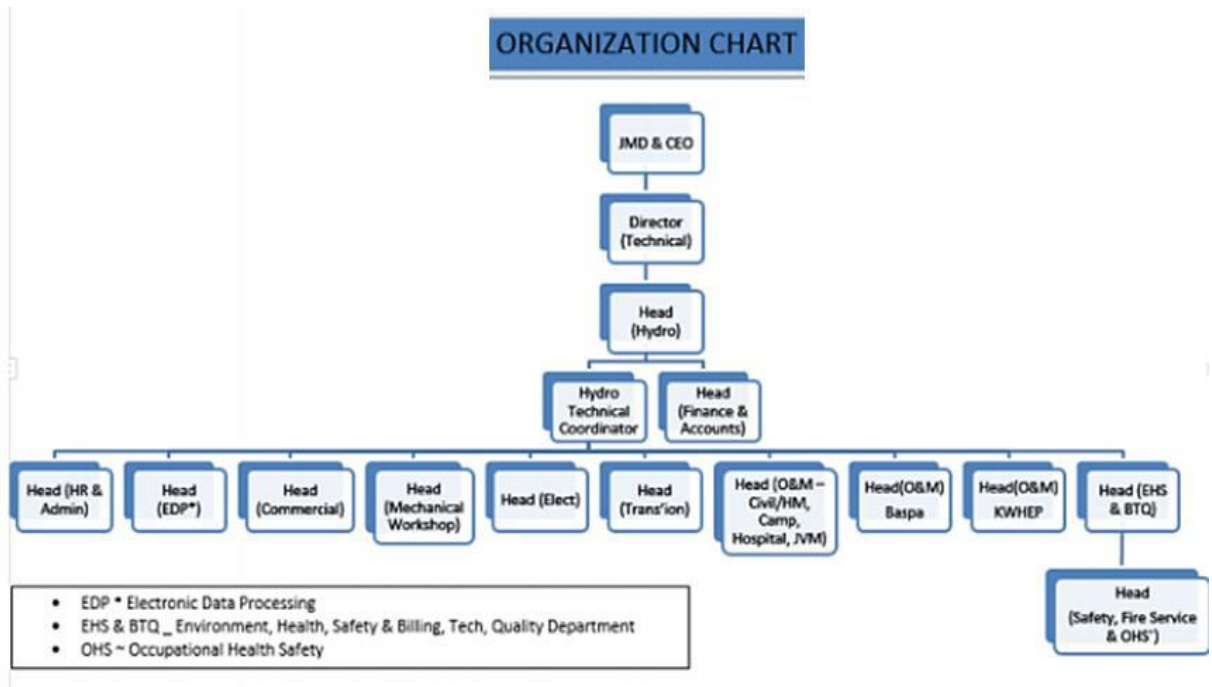
Data / Parameter	A _{PJ}
Data unit	m ²
Description	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
Source of data	Measured by actual surveys conducted at project site
Description of measurement methods and procedures to be applied	Calculated from measured values
Frequency of monitoring/recording	-
Value monitored	553,758, as in October 2022 (As per PDD: area 588400 m ² having a power density of 1699.52 W/m ² .)

¹⁵ Please refer deviation 1 of deviation requested in the previous verification (01-August-2021 to 31-July-2022 Inclusive both date) in section 3.2.2 of MR.

Monitoring equipment	Topographic survey
QA/QC procedures to be applied	As per IS 5477 (Part 1): 1999 (reaffirmed 2004) – Fixing the capacities of reservoirs – Methods – Part I – General Requirements (1st revision)
Purpose of the data	-
Calculation method	Calculated using stream profile and valley cross sections
Comments	-.

4.3 Monitoring Plan

An internal audit carried out every year to ensure that the monitoring parameters are being monitored on sampling basis in accordance with Section 4.2 of monitoring report. The Operation and Maintenance (O&M) for the VCS project activity is managed in-house. The O&M structure is outlined as follows:



The above organization chart is followed by new owner JSW Hydro Energy Limited. A project team is constituted with participation from relevant departments. Personnel are trained on concept and monitoring plan. Site In charge and site team is responsible for data collection and archiving. Site Incharge reports to Head (O&M) Karcham Wangtoo Hydroelectric Plant (KWHEP). Head (O&M) KWHEP review all the parameter. This team meets periodically to review project activity, check data collected, emissions reductions etc. On a weekly basis, the monitoring reports are reviewed and treated as quick audit and discussed by the senior team members/managers. In case of any

irregularity observed by any of the team member, it is informed to the concerned person for necessary action. On monthly basis, these reports are forwarded at the management level.

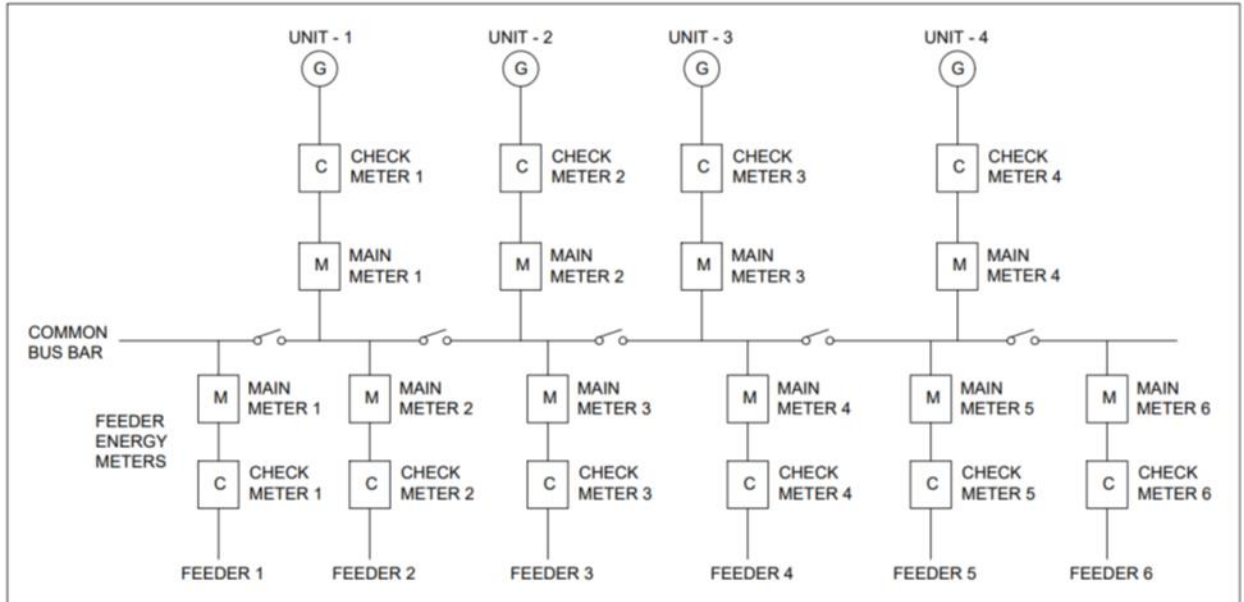
The metering and monitoring procedures are in accordance with the Power Purchase Agreement (Article 8), and an excerpt of the same is presented below:

Metering: Installation of Meters: All meters are installed by the Company at its own cost. Each meter shall be of static type, conforming to latest IEC-687/IEC-62053-22, and shall meet the requirements of Indian Electricity Grid Code Regulations (IEGC). Each Meter shall be capable of displaying the following parameters by turn on demand and storing all such parameters for a period of ten (10) days:

- Average frequency for each successive 15-minute block, as a two-digit code (00 to 99 for frequency from 49.0 to 51.0 Hz),
- Net Wh transmittal during each successive 15-minute block, up to second decimal, with plus/minus sign,
- Cumulative Wh transmittal at each midnight, in six digits including one decimal,
- Cumulative VARh transmittal at voltages above 103% of the nominal voltage at Interconnection point, at each midnight, in six digits including one decimal,
- Cumulative VARh transmittal at voltages below 97% of the nominal voltage at Interconnection point, at each midnight, in six digits including one decimal,
- Date and time blocks of failure of voltage transformer supply on any phase, as star (*) mark.

A set of Meters comprising (a) a set of Main Meters and (b) a set of Check Meters are installed by the Company on each circuit of the outgoing transmission lines so as to record frequency quantities of both Active energy and reactive energy for (a) energy exported by the Project to the Grid during each settlement period and (b) energy imported by the Project from the Grid during each settlement period.

Single Line Diagram:



One such set of meters shall be installed by the company at the Interconnection Point and one complete set of tested, calibrated and sealed Meters shall be kept as spare in safe custody of the Company. All such meters shall be sealed in the presence of Central Transmission Utility (Project State Utility) and the Company, which seal shall remain intact unless it is broken by the Testing Laboratory for testing and calibration.

Accuracy class, Testing and Calibration of Meters:

The accuracy class of measuring instruments shall be equal or better than:

- a) 0.2% (0.2s accuracy class) for Wh measurement of Meters,
- b) 2% for KVArh measurement of Meters; and
- c) 0.5% for current transformers and voltage transformers.

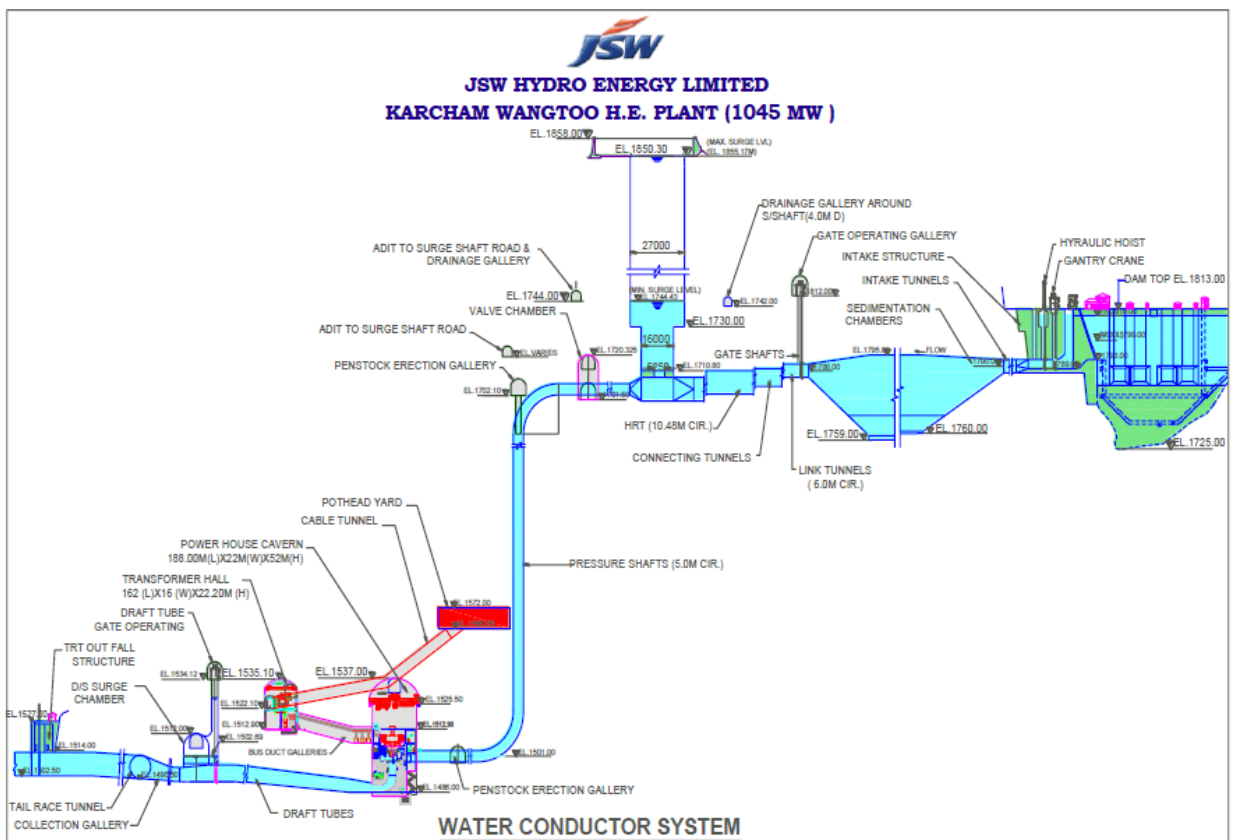
All the Main Meters and Check Meters are tested and calibrated by a reputed Testing laboratory. The Meters (and associated circuits, if necessary) shall be tested and calibrated in accordance with the provisions set out in the Connection Agreement and the IEGC, at least once in two (2) Tariff years, or at any time when the difference between the readings of the Main Meter and the corresponding Check Meter is found to exceed zero-point four percent (0.4%). The company shall bear the cost of testing and calibration of the Meters. A notice of seven (7) days shall be issued by the Party which arranges for such testing and calibration, to enable authorized representatives of the other parties to witness the testing and calibration.

One main meter has been replaced in this monitoring period of the project activity in feeder 3 Installed by power grid to monitor net energy generation.

Energy Measurement Procedure:

Manually energy meter reading is taken on a daily basis at 00:00 hrs. Actual energy is the difference between the two successive day meter reading multiplied by multiplying factor, this method is used for preparation of Daily Performance Report (DPR). Plant team prepares the generation schedule on a daily basis. Now after deducting the aux power consumption & 12.12% of free power to GoHP (home state), the distribution of balance quantum of electricity after fulfilling the contractual commitments, is being carried out according to the Power Purchase Agreements (PPAs) for four states, namely Punjab, Uttar Pradesh, Haryana, and Rajasthan. Additionally, the distribution is also being carried out on a short-term basis to power exchanges. The Plant Team sent a schedule to PTC India limited on a daily basis. Plant team prepared the monthly energy sheet on the basis of the Daily Generation Schedule and sent it to the billing department. Now the billing team prepare the invoice as per Regional Energy Account (REA) issued by the Northern Regional Power Committee (NRPC) site and sent it to PTC for billing. KWHEP has Four Units (261.25 MW each) capacity which generates electricity. It is transferred through four outgoing feeders, Karcham- Jhakri circuit-1 & 2 and Karcham- Wangtoo circuit-1 & Circuit-2. All feeders are connected to the grid.

Karcham Wangtoo HEP Flow diagram:



Inaccuracy of Meters:

If during any testing and calibration, a Main Meter is found to be within zero point two percent (0.2%) permissible limit of error and the corresponding Check Meter is found to be beyond such

limit of error, the Monthly bill shall be as per the reading of the Main Meter. The corresponding Check Meter shall be repaired and calibrated by Regional Test Laboratory Jalandhar & certified by Power Grid Corporation of India Limited (PGCIL) or replaced by a new and tested meter.

If during any testing and calibration, a Main Meter is found to be beyond zero-point two percent (0.2%) permissible limit of error but the corresponding Check Meter is found to be within limit of error, the monthly bill shall, for that Month and till the date and time of the repair and calibration or replacement of the defective Main Meter, be as per the reading of the Check Meter. The corresponding Main Meter shall be replaced forthwith with a spare tested and calibrated meter, and the defective Main Meter shall be repaired and calibrated by the Testing Laboratory or replaced by a new and tested Meter.

If during any testing and calibration, a Main Meter and corresponding Check meter are both found to be beyond zero-point two percent (0.2%) permissible limit of error, either both the Meters or at least the Main meter shall be replaced forthwith with a spare tested calibrated meter. The project activity does not involve any such inaccuracy of meters during current monitoring period.

QA/QC of monitored data:

A fully functional Supervisory Control and Data Acquisition (SCADA) system is present at site to ensure seamless monitoring of the whole working of plant. The electricity measurement for billing is under control of state electricity board. The meters are calibrated once in every 5 years and faulty meters duly replaced immediately. The meter accuracy class and calibration interval are under purview of state electricity board and PP do not have any control on it. The net electricity export value from daily performance report is also cross checked with electricity sales invoices. All data is kept for a minimum of 2 years following issuance of verified carbon units or the end of the crediting period, whichever is later, and the storage of this data is the responsibility of the project owner.

Emergency preparedness:

In case Main meter or check meter is found to be outside the acceptable limits of accuracy or faulty or not functioning properly, it is being repaired, recalibrated or replaced as soon as possible. In the event that the Main meter is not in service as a result of maintenance, repairs or calibration, the check meter is being used. In case both the main and check meter are found to be outside the acceptable limits of accuracy or faulty or not functioning properly, both the meters shall be calibrated immediately and the error percentage found in the main meter during its calibration shall be applied to its metered energy data for the entire period since its last calibration to obtain the corrected value of net electricity exported to the grid. However, no such case has been observed.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The emission factor value has been fixed Ex-ante and the same shall be used for the monitoring period. Net Electricity Generated is obtained by deducting total import (from grid) from total export (to grid).

The data used for the calculation of the baseline emission factor was obtained from the baseline calculations published by the CEA, Baseline Carbon Dioxide Emissions from Power Sector – Version 4.0 which uses the methodology ACM0002. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. Baseline emissions are calculated by multiplying the Net electricity exported to the grid with net baseline emission factor, as given in the registered VCS PD.

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

Where,

BE_y = Baseline Emissions (tCO₂/year)

$EG_{facility,y}$ = 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 CO₂ 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:

$$BE_y = 1,695,340.87 \times 0.8031 = 1,361,528$$

$$BE_y = 1,361,528 \text{ (Rounded Down value)}$$

5.2 Project Emissions

According to the chosen baseline methodology ACM0002, for hydro power project activities that result in new reservoirs and hydro power project activities that result in the increase of existing reservoirs, project proponents determine project emissions, as follows:

a) If the power density (PD) of power plant is greater than 4 W/m² and less than or equal to 10 W/m².

$$\text{Project Emissions (PE}_y\text{)} = (\text{EF}_{\text{RES}} * \text{EG}_y) / 1000$$

Where,

PE_y = Emission from reservoir expressed as tCO₂e/year

EF_{RES} = Default emission factor for emissions from reservoirs, and the default value as per EB23 is 90 Kg CO₂e /MWh.

EG_y = Electricity produced by the hydroelectric power project in year y, in MWh

b) If the power density of the project is greater than 10 W/m², $\text{PE}_y = 0$

The power density of the project activity is calculated as follows:

$$\text{PD} = (\text{Cap}_{\text{PJ}} - \text{Cap}_{\text{BL}}) / (\text{A}_{\text{PJ}} - \text{A}_{\text{BL}})$$

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).

For new hydro power plants, this value is zero. A_{PJ} = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m²). A_{BL} = Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m²). For new reservoirs, this value is zero.

This project activity being a greenfield project, $\text{Cap}_{\text{BL}} = 0$ and $\text{A}_{\text{BL}} = 0$

$$\text{Hence, PD} = (1045 * 1000 * 1000) / 553,758 = 1887 \text{ W/m}^2$$

Since the power density of the project is greater than 10 W/m², Project Emissions (PE_y) = 0.

$$\text{PE}_y = 0 \text{ tCO}_2\text{e}$$

5.3 Leakage Emissions

According to applicable methodology ACM0002 page 11, leakage emissions are neglected. The emissions potentially arising due to activities such as power plant construction and upstream emissions from fossil fuel use are (e.g. extraction, processing, transport etc.) neglected.

$$\text{LE}_y = 0$$

5.4 GHG Emission Reductions and Carbon Dioxide Removals

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

$$\text{ER}_y = \text{BE}_y - \text{PE}_y - \text{LE}_y$$

Where,

ERy = Emission Reduction in tCO₂/year

BEy = Baseline emission in tCO₂/year

PEy = Project emissions in tCO₂/year

LEy = Leakage Emissions in tCO₂/year

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

BEy = ERy = 1,361,528 tCO₂e

Vintage period	Baseline emissions (tCO ₂ e)	Project emissions (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Reduction VCUs (tCO ₂ e)	Removal VCUs (tCO ₂ e)	Total VCUs (tCO ₂ e)
01-Aug-2022 to 31-Dec-2022	1,361,528	0	0	1,361,528	-	1,361,528
Total	1,361,528	0	0	1,361,528	-	1,361,528

Vintage period	Ex-ante estimated reductions/removals	Achieved reductions/removals	Percent difference	Explanation for the difference
01-Aug-2022 to 31-Dec-2022	1,484,693	1,361,528	-8.30 %	The actual VER is 8.30 % lower than the estimated VCUs. The amount of electricity generated is dependent on the volume of water flowing through the plant, with variations in water availability potentially affecting the plant's output. Factors such as drought or altered precipitation patterns may influence the water supply and subsequently impact the electricity production of the hydroelectric facility. 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.

Total	1,484,693	1,361,528	-8.30 %	<p>The actual VER is 8.30 % lower than the estimated VCUs. The amount of electricity generated is dependent on the volume of water flowing through the plant, with variations in water availability potentially affecting the plant's output. Factors such as drought or altered precipitation patterns may influence the water supply and subsequently impact the electricity production of the hydroelectric facility. 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.</p>
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APPENDIX 1: COMMERCIALY SENSITIVE INFORMATION

Section	Information	Justification
	N/A	N/A

APPENDIX 2: METER CALIBRATION DETAILS

The calibration details of meters installed by Power Grid for measurement of net electricity export are as below. There are six feeder lines involved for the electricity export. Considering the two years calibration frequency, there is no delay in calibration for current monitoring period.

Meter Installed by Power Grid (to monitor net energy generation)

Sr No	Location	Type	Serial Number	Make	Accuracy Class	Calibration date	Due date of calibration
1	Feeder-1	Main	NP8526A	L & T	0.2s	08-November-2020	07-November-2022
2	Feeder-2	Main	NP8530A	L & T	0.2s	08-November-2020	07-November-2022
3	Feeder-3	Main	NP8528A ¹⁶	L & T	0.2s	08-November-2020	07-November-2022
4	Feeder-3	Main	WR2178A ¹⁷	L & T	0.2s	15-February-2022	14-February-2024
5	Feeder-4	Main	NP8529A	L & T	0.2s	08-November-2020	07-November-2022
6	Feeder-5	Main	NP8527A	L & T	0.2s	08-November-2020	07-November-2022
7	Feeder-6	Main	NP8546A	L & T	0.2s	08-November-2020	07-November-2022
8	Feeder-1	Check	NP8400A	L & T	0.2s	09-November-2020	08-November-2022
9	Feeder-2	Check	NP8401A	L & T	0.2s	09-November-2020	08-November-2022
10	Feeder-3	Check	NP8402A	L & T	0.2s	09-November-2020	08-November-2022
11	Feeder-4	Check	NP8403A	L & T	0.2s	09-November-2020	08-November-2022
12	Feeder-5	Check	NP8548A	L & T	0.2s	09-November-2020	08-November-2022
13	Feeder-6	Check	NP8547A	L & T	0.2s	09-November-2020	08-November-2022

Meter installed for Units at 15.75kV side (to monitor Total Generation)

Serial No.	Unit No.	Type	Serial No.	Make	Accuracy class	Calibration date	Due date of calibration
1	Unit-1	Main	LT0175B	L & T	0.2s	10-November-2020	09-November-2022
2		Check	LT0176B	L & T	0.2s	10-November-2020	09-November-2022
3	Unit-2	Main	LT0177B	L & T	0.2s	10-November-2020	09-November-2022
4		Check	LT0178B	L & T	0.2s	10-November-2020	09-November-2022
5	Unit-3	Main	LT0179B	L & T	0.2s	10-November-2020	09-November-2022
6		Check	LT0180B	L & T	0.2s	10-November-2020	09-November-2022
7	Unit-4	Main	LT0181B	L & T	0.2s	10-November-2020	09-November-2022

¹⁶ This Meter has been changed on 15/02/2022 (provided in serial no. 4 of Meter Installed by Power Grid), meter is calibrated and valid till 14/02/2024. Hence Meter serial no. is changed from NP8528A to WR2178A with meter make L&T, Model ER300P.

¹⁷ The details provided for feeder 3 main meter is replaced on 15/02/2022 and new meter serial number is WR2178A.

8		Check	LT0182B	L & T	0.2s	10-November-2020	09-November-2022

Calibration record covering the current verification duration¹⁸:

Sl. No.	Location		Meter Sl. No.	Make	Accuracy Class	Calibration Date	Calibration Due Date ¹⁹
1	Feeder-1	Main	NP8526A	L & T	0.2s	12-November-2022	11-November-2027
2	Feeder-2	Main	NP8530A	L & T	0.2s	12-November-2022	11-November-2027
3	Feeder-3	Main	WR2178A	L & T	0.2s	11-November-2022	10-November-2027
4	Feeder-4	Main	NP8529A	L & T	0.2s	12-November-2022	11-November-2027
5	Feeder-5	Main	NP8527A	L & T	0.2s	11-November-2022	10-November-2027
6	Feeder-6	Main	NP8546A	L & T	0.2s	12-November-2022	11-November-2027
7	Feeder-1	Check	NP8400A	L & T	0.2s	14-November-2022	13-November-2027
8	Feeder-2	Check	NP8401A	L & T	0.2s	14-November-2022	13-November-2027
9	Feeder-3	Check	NP8402A	L & T	0.2s	14-November-2022	13-November-2027
10	Feeder-4	Check	NP8403A	L & T	0.2s	14-November-2022	13-November-2027
11	Feeder-5	Check	NP8548A	L & T	0.2s	11-November-2022	10-November-2027
12	Feeder-6	Check	NP8547A	L & T	0.2s	14-November-2022	13-November-2027
Meter installed for Units at 15.75kV side (Generation)							
1	Unit-1	Main	LT0175B	L & T	0.2s	15-November-2022	14-November-2027
2		Check	LT0176B	L & T	0.2s	15-November-2022	14-November-2027
3	Unit-2	Main	LT0177B	L & T	0.2s	15-November-2022	14-November-2027
4		Check	LT0178B	L & T	0.2s	15-November-2022	14-November-2027
5	Unit-3	Main	LT0179B	L & T	0.2s	15-November-2022	14-November-2027
6		Check	LT0180B	L & T	0.2s	15-November-2022	14-November-2027
7	Unit-4	Main	LT0181B	L & T	0.2s	15-November-2022	14-November-2027
8		Check	LT0182B	L & T	0.2s	15-November-2022	14-November-2027

¹⁸ Error factor equivalent to accuracy class of meter have been applied to the missing calibration duration.

¹⁹ As per Central Electricity Authority (Installation and Operation of Meters) Regulations- 2006 Dated 17th March, 2006 with Amendments Dated: 4th June, 2010 and. Dated: 26th November, 2014 section 18 Calibration and Periodical Testing of Meters, Energy accounting and audit meters shall be tested at site at least once in five years or whenever the accuracy is suspected or whenever the readings are inconsistent with the readings of other meters.

As per Approved PD (Version 02, Date of Issue 17-April-2018) specifies a calibration frequency of once every two years. However, meter calibration is managed by the state electricity board, not in the control of project proponent, and the board does not adhere to fixed calibration schedule. Consequently, the PP follows the five-year calibration frequency recommended by the Central Electricity Authority.

APPENDIX 3: BREAKDOWN DETAILS

Date	Hrs.	Unit Tripped	System	Flags/annunciation control/ Relay Panel	Observation	Action taken
23-August-2022	17:00	Unit-3	DTG	Differential pressure of MIV and Spiralcas not balanced	Guide Vane No-19 Stuck at intermediate position. And bypass valve of MIV remain in open position.	Guidevane-19 fixed at close position. Unit Synchronised on date 25.08.2022 at 20:33 hrs.
07-September-2022	18:28	Unit-4	Excitation System	U-4 Excitation backup trip active.	Excitation backup trip active. Relay contactor loose and excitation channel-1 fan 1& 2 was not working	Relay contactor tightened and both the faulty fans changed with new one
25-November-2022	06:15	Unit-4 not started	Generator break	-	while start the unit, break not released.	Limit switch was not functioning, replaced with new one.
05 December-2022	06:28	Unit-1	Monitoring system	bearing vibration trip	Bearing vibration sensor malfunctioning	Checked the connection at terminal box, pannel and Connection tightening.
15-December-2022	05:59	Unit-4	DTG system	Communication failure.	Communication failure between Ethernet switch & DTG CPU	Replaced the faulty ethernet switch with new one
The total breakdown duration is 54 hours and 17 minutes.						