ALLAIN DUHANGAN HYDROELECTRIC PROJECT (ADHP)

Document Prepared By EKI Energy Services Limited

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Project Title	Allain Duhangan Hydroelectric Project (ADHP)
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1 PROJECT DETAILS

1.1 Summary Description of the Project

Project Profile:

Allain Duhangan Hydroelectric Project (ADHP) proposed by AD Hydro Power Ltd. (ADPL) is a run-of the-river 192 MW hydro power project at the confluence of Allain & Duhangan rivulets at Pirni village in Manali town of Kullu district in Himachal Pradesh state of India. This is a new hydroelectric project, currently with a reservoir having a power density of 6508.4746 W/ m2. The proposed project consists of high head underground power plant that would utilise flows from a combination of glacial snow melt and monsoon rains in these two rivulets for the purpose of harnessing hydro power.

ADPL intends to function as a merchant power plant with short term Power Purchase Agreements (PPA) of 1-3 years duration. The power generated at the project would be fed into Northern Regional Grid (NR Grid) of India. A 220 kV power transmission line (of approximately 185km length) is proposed to be constructed to evacuate power from the project, to an existing substation at Nalagarh, from where it will be fed to the NR Grid.

Construction work at project site has been started and the project activity is expected to start generation of power from June 2008. The project energy benefits have been assessed at (Central Electricity Authority CEA approved) 678.18 GWh year in 90% dependable years. The project activity has a power density factor of 6508 W/M2.

Project Purpose:

The purpose of the project activity is to generate electricity using renewable hydro energy and supply it to various consumers through NR grid. In the NR grid more than 70% of the power supplied is generated using fossil fuels (coal, Diesel, Gas etc). And as the project activity is a renewable energy based power project, it will reduce anthropogenic Green House Gases (GHG) emissions that would have been generated to supply power to NR grid using fossil fuel. The project activity shall also contribute to sustainable development1 in following manner:

- Sustainable development through utilization of renewable hydro resources available in the project region.
- Catering to power demand in Northern India by augmenting power supply in the NR Grid.
- Conservation of natural resources (like coal, gas, petroleum fuels etc.) through use of renewable source of energy.
- Adhering & contributing to India's national policy of promoting clean power.
- Providing Employment opportunities2 to local community during plant construction and operations
- Development of infrastructure in the region
- Implementation of the project activity would catalyse implementation of other similar hydro power projects in India by private players.

1.2 Sectoral Scope and Project Type

Project type	**:** Renewable energy projects
Sectoral Scope	**:** 1**-** Energy Industries (renewable/non-renewable sources).
Project Category	**:** Grid-connected electricity generation from renewable sources ACM0002- Version 06

This is not a grouped project activity.

1.3 Project Proponent

Organization name	AD Hydro Power Limited
Contact person	Mr. O.P. Ajmera
Title	Vice President- Finance
Address	Street/P.O.Box: Sector-1, Building: Bhilwara Towers, A-12, Noida, Uttar Pradesh, India ZIP: 201301
Telephone	+91-120-2541810
Email	opajmera@lnjbhilwara.com

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the project	Project Consultant
Contact person	Bhaskar Dutta
Title	Sr. Manager Operations
Address	Office No 201, Plot No 48, Scheme 78, Vijay Nagar Part- II, Indore 452010, India
Telephone	+91-8750286710
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1.5 Project Start Date

The commercial production of the project activity started on 17/07/2010 with the commissioning of Unit II of 96MW. Another unit, Unit I was commissioned on 16/09/2010. Hence the start date of the project activity is 17/07/2010, which is the earliest date of commissioning of Unit I of the run-of-river hydro power project activity.

1.6 Project Crediting Period

The crediting period of the project activity is for 10 years (fixed).

The length of crediting period is from 17/07/2010 to 31/05/2020[1].

1.7 Project Scale and Estimated GHG Emission Reductions or Removals

The project falls under large scale project category since the emission reductions are more than 300,000 tCO_2 e per annum

Project Scale	
Project	

[1] The start date of Crediting period will be according to VCS i.e. earliest COD of the project however the end date will be same as of the of registered CDM project 0862 and will abide to it.

Large project	✓

Year	Estimated GHG emission reductions or removals (tCO_2e)
Year 1	494668
Year 2	494668
Year 3	494668
Year 4	494668
Year 5	494668
Year 6	494668
Year 7	494668
Year 8	494668
Year 9	494668
Year 10	494668
Total estimated ERs	4946680
Total number of crediting years	10
Average annual ERs	494668

1.8 Description of the Project Activity

Allain Duhangan HEP is a run of the river project envisaging generation of 192 MW power by utilising the flows in Allain and Duhangan streams. It has been noted that the river flow in these streams varies significantly between 3.5 cumecs and 30 cumecs during high flow and lean flow seasons. Due to snowmelt, the river flow in these streams varies hourly with a generally higher discharge during evening/night time. Water stored during the lean season at night can thus be utilised for peak power generation in the early morning when the discharge is at its lowest. The ADHP is designed to provide a peak power generation of 4 hours each day during lean season. During high flow season, the power plant will generate on continuous basis and no storage is required.

For a 4 hour peaking generation, ADHP requires 302,400 cum storage based on an installed flow capacity of 25.3 cumecs and minimum average combined river flow of 4.3 cumecs. The total storage capacity available at ADHP is 302,400 cum comprising of:

- Storage at barrage with 41 800 cum between El 2752m and 2745m;
- Storage at desander with 23 000 cum between El 2752m and 2744m;
- Underground storage in Allain and Duhangan headrace tunnels of 25 000 cum and 7 000 cum respectively between El 2752m and 2734m;
- Storage at intermediate reservoir with 205 600 cum between El 2748m and 2734m.

The barrage is designed to pass a flood discharge of 760 cumecs corresponding to 100 years return period. The spillway crest is at El 2745m which allows the passage of full flood discharge at water El 2752m. During monsoon period the spillway gates will be fully opened to avoid sedimentation occurring in the barrage reservoir.

The water level in the desander is controlled by the downstream sill with crest El 2744m. To ensure good operation of desander during monsoon, the maximum water level is fixed at El 2744.3 m.

During monsoon period, the intermediate reservoir will operate at maximum water level of 2742m.

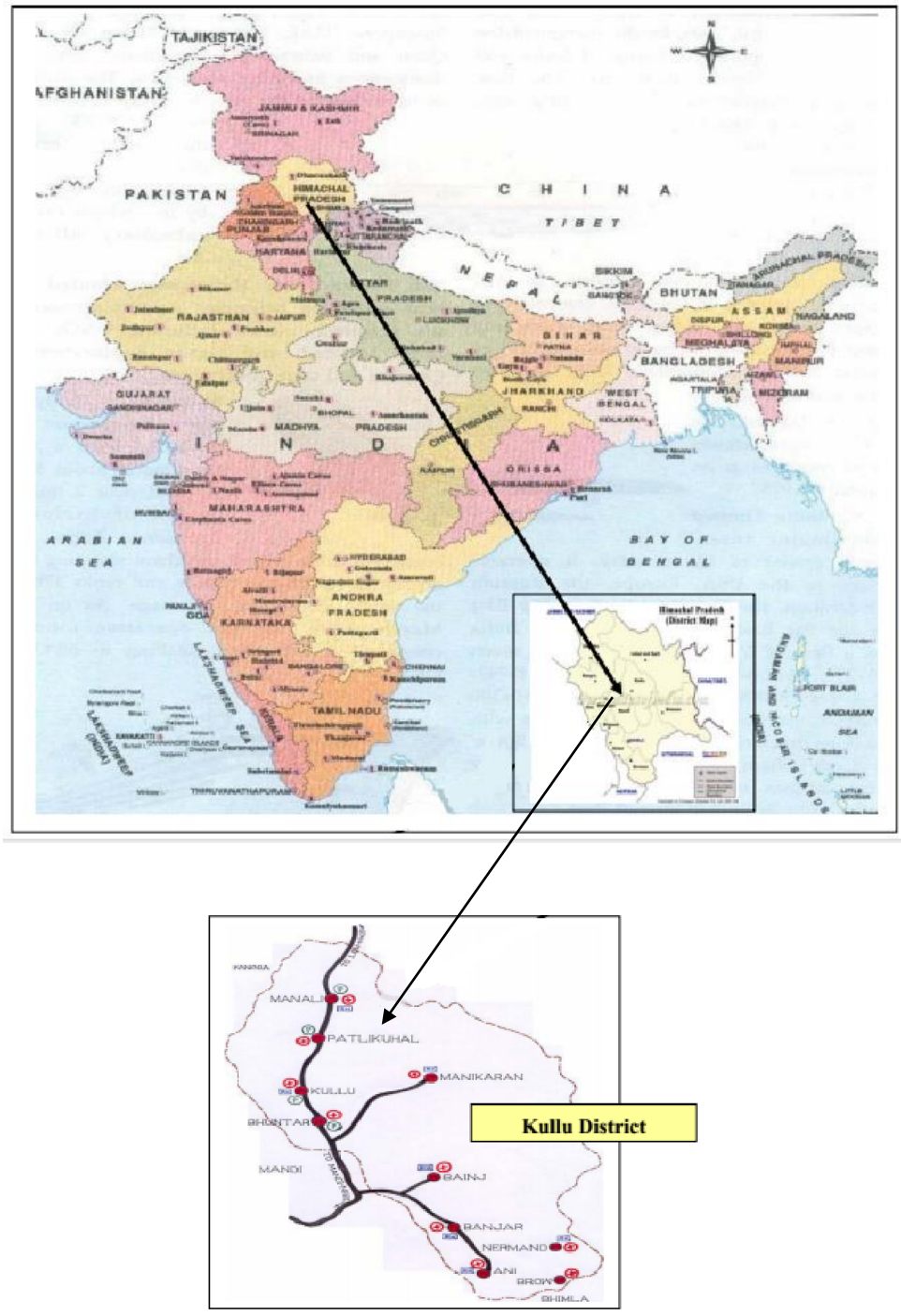
During non-monsoon period, the operating water level will vary between 2752 and 2738 m. The barrage and sluice gates will be closed and head regulator gates will be fully opened and any excess flow will be released through the overflow structures located in the intermediate reservoir. Due to this storage, the full reservoir level is kept identical to the high flood level corresponding to 100 year return period flood. Thus no additional submergence is envisaged due to non-monsoon peaking storage.

The operation rules for the peaking storage reservoir operation depend on both the seasons during the year and on daily flow variations. The following operation rules are adopted for run of the river type ADHP project:

- Priority for Peaking Energy - The reservoir water level is kept at the maximum level possible in order to generate the maximum energy during the peaking hours: for ADHP during the non-monsoon seasons, the maximum water level – El 2752m; during monsoon season, the maximum water level for barrage is fixed at El 2745 m and the intermediate reservoir operation was fixed as El. 2742.0 m;
- During the flood season, the target water level in the intermediate reservoir is fixed at El. 2 742.0 m. This permits storing a small quantity of the excess flow in the river during lean season;
- The ecological discharge is deducted from the river flow.
- The spillway will be fully opened when the combined river flow (Allain and Duhangan river flows) is greater than 13.5 m3/s, normally between May and September and the water level will be restricted to El 2745m.
- The spillway gates will be full closed when the combined river flow is less than 3.5 m3/s (Normally between October and April);
- When the combined river flow is less than 7.2 m3/s, the storage of the barrage reservoir of 41 800 m3 will be needed for peaking generation. In this case the head regulator gates will be closed.
- About one half hour after starting the peaking generation, one gate of the head regulator will be opened to discharge about 5.8 m3/s in two hours. After 2.5 hours, the barrage storage will be empty.
- It is assumed that two gates of the head regulator will be heated: one for normal operation; and one as stand-by. The gates will be operated from the powerhouse

1.9 Project Location

The project is located in Pirni village near Manali Town in the District of Kullu of Himachal Pradesh. The project site is located about 60 Kms from Bhuntar airport and 50 Kms. from the town of Kullu. Both these towns are located along the National Highway-21. Bhuntar is 500 Kms from national capital Delhi by road. The physical location of the project activity is shown in the following figure.



State, District, Tehsil	Pirni, Manali, Kullu, Himachal Pradesh, India
Longitude	32° 13´36´´ N
Latitude	77° 12´35´´ E
Nearest rail head	Joginder Nagar
Nearest Airport	Kullu Manali Airport
Nearest National Highway	NH - 21

1.10 Conditions Prior to Project Initiation

This is a Greenfield project. Electricity delivered to the grid by the project would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources. Thereby the project activity reduces the dependence on fossil fuel based generation units and as there are no associated emissions with this project it contributes to the reduction of greenhouse gases (GHG) emissions.

Please refer section B.4 of the registered PDD. The web link for the same is mentioned below: https://cdm.unfccc.int/Projects/DB/DNV-CUK1169040011.34/view

1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project activity is not mandatory by any local or national laws. However the project complies with technical, engineering and commissioning regulations. Please refer section B.4 of the PDD of UNFCCC registered CDM project with Ref No: 0862.[2]

1.12 Ownership and Other Programs

1.12.1 Project Ownership

For the ownership details of the project any of the following may be referred to:

1. Power Purchase Agreement between the project promoters and State Utility
2. Commissioning certificates

1.12.2 Emissions Trading Programs and Other Binding Limits

India is Non-annex1 country and there is no compliance with an emission trading program or to meet binding limits on GHG emissions for this project activity. The project is registered under CDM and UNFCCC (Registration ID 0862[3]). The project is also approved by the DNA and a copy of the approval is also submitted to the DOE. Project Proponent has submitted undertaking that they will not claim same GHG emission reductions of the project from CDM and VCS. PP would not use net GHG emission reductions by the projects for compliance with emission trading program to meet binding limits on GHG emissions.

1.12.3 Other Forms of Environmental Credit

Project has been registered with UNFCCC under Clean Development Mechanism program. Registration reference number is 0862[4]. Project Proponent has submitted undertaking for not availing other forms of environmental credit for the same crediting period under consideration.

1.12.4 Participation under Other GHG Programs

Project has been registration with UNFCCC under Clean Development Mechanism program, Registration reference number is 0862[5]. PP also submitted undertaking for Project neither has

[2] https://cdm.unfccc.int/Projects/DB/DNV-CUK1169040011.34/view
[3] https://cdm.unfccc.int/Projects/DB/DNV-CUK1169040011.34/view
[4] https://cdm.unfccc.int/Projects/DB/DNV-CUK1169040011.34/view
[5] https://cdm.unfccc.int/Projects/DB/DNV-CUK1169040011.34

not intends to generate any form of GHG related environmental credit for GHG emission reductions or removals claimed under the VCS program.

1.12.5 Projects Rejected by Other GHG Programs

The Project is not rejected by other GHG programs.

1.13 Additional Information Relevant to the Project

Eligibility Criteria

The project does not fall under AFOLU category, hence not applicable.

Leakage Management

Project does not involve any leakage emissions as this is solar power project, Hence Leakage Management Plan and risk mitigation measures are not required.

Commercially Sensitive Information

There is no commercially sensitive information accounted for the determination of baseline, net GHG removals and for demonstration of additionality for the present project activity.

Sustainable Development

The four indicators1 stipulated by the NCDMA (National CDM Authority) which is the DNA (Designated National Authority) of India, for defining sustainable development are:

- Social well being
- Economic well being
- Environmental well being
- Technological well being

The Project participant contribution from the project activity towards sustainable development in accordance to NCDMA is explained below:

Social well-being:

- The project is implemented in a rural area that does not have proper roads and other infrastructure facilities. The project activity would augment infrastructural development like roads etc. in the area, thus benefitting local communities.
- The project activity would lead to enhanced direct and indirect employment opportunities at all levels from unskilled to skilled workers.

Economic well-being:

- The project activity involves capital investments, thus leading to the overall development of the region.

- The project activities would also lead to enhanced business opportunities for local stakeholders like consultants, suppliers, manufacturers, contractors etc. All this would lead to improved financial security and overall development of the region.

Environmental well-being:

- The project activity being run-of-the-river power project will have minimum environmental impact as compared to a reservoir based hydro power plant.
- Contribute in bridging the demand-supply gap of electricity by producing green energy
- The electricity generated by the project activity will be supplied to the Southern grid, which otherwise would have been generated by fossil fuel fired power plants in the grid.
- The project activity also helps in conservation of depleting fossil fuels which at present are predominantly used for power generation.

Technical well-being:

The project activity is a clean and eco-friendly type of power generation in comparison to fossil fuel based projects. This not only helps reduce environmental pollution but also helps in conserving fossil fuels.

Further Information

There are no information or incidents that will have bearing on the eligibility of the project, the net GHG emission reductions or removals, or the quantification of the project's net GHG emission reductions or removals.

2 APPLICATION OF METHODOLOGY

2.1 Title and Reference of Methodology

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

Reference: ACM0002, Version 06, Sectoral Scope: 1

The methodology has been referred from the list of approved methodologies for CDM project activities in the UNFCCC website
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

Methodological Tool: This methodology also draws upon of the

- Tool for demonstration and assessment of additionality Version 01

2.2 Applicability of Methodology

S. No.	Applicability Conditions in the ACM0002/ Version06	Position of the project activity vis-à-vis applicability conditions

1.	Applies to electricity capacity additions from: Run of-river hydro power plants; hydro power projects with existing reservoirs where the volume of the reservoir is not increased.	The project activity is a grid connected run-of-the river hydro power project
2.	New hydroelectric power projects with reservoirs having power densities (installed power generation capacity divided by the surface area at full reservoir level) greater than 4 W/m2	This is a new hydroelectric project with a reservoir having a power density of 6508.4746 W/ m2.
3.	This methodology is not applicable to project activities that involve switching from fossil fuels to renewable energy at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site.	It is a renewable energy project with no fuel-switch involved.
4.	The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available.	The project activity supplies power to NR Grid which in turn caters to electricity demand in various states in North India. The NR Grid encompasses all power plants supplying power through the grid to the states of Delhi, Haryana, HP, Jammu & Kashmir, Punjab, Rajasthan, Uttar Pradesh, Uttaranchal, and Union Territory of Chandigarh. Adequate data is available to estimate grid emission factor.

2.3 Project Boundary

The project site:

The project activity boundary covers the point of water supply to the point of power generation and export to the grid, where ADHP has a full control. Thus, the project boundary includes the water level over the intake, penstock, flow control valves, turbine, generator, control systems, auxiliary consumption units, synchroniser and the power evacuation system (Switch yard, transmission line) at the project activity site.

Electricity Grid:

NR Grid (Now Indian Grid) has a pool of state & private owned power generating plants. The units are owned by central government, respective state governments, and private enterprises and in some cases jointly owned. Data about all these plants have been considered while estimating the grid emission factor. It also includes the electricity imports from other regional grids. The states in the NR grid are Delhi, Chandigarh, Haryana, Uttaranchal, Himachal Pradesh, Punjab, Rajasthan, J&K and Uttar Pradesh.

Therefore northern regional grid (Now Indian grid) of India would be part of the geographical and system boundary for the project.

Source	Gas	Included?	Justification/Explanation

Source		Gas	Included?	Justification/Explanation
Baseline	Grid Electricity Generation	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification- this is conservative
		N_2O	No	Excluded for simplification- this is conservative
Project Activity	Electricity Generation	CO_2	No	The project activity is a run-of-river hydro power and hence no emissions.
		CH_4	No	
		N_2O	No	

2.4 Baseline Scenario

Please refer to section B.4 of the PDD of UNFCCC registered CDM project with Ref No: 0862. The web link for the same is given below:

https://cdm.unfccc.int/Projects/DB/DNV-CUK1169040011.34/view

2.5 Additionality

Please refer to section B.3 of the PDD of UNFCCC registered CDM project with Ref No: 0862. The web link for the same is given below:

https://cdm.unfccc.int/Projects/DB/DNV-CUK1169040011.34/view

2.6 Methodology Deviations

Not Applicable, as there are no methodological deviations for this project activity.

3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

3.1 Baseline Emissions

Please refer to section B.4 of the PDD of UNFCCC registered CDM project with Ref No: 0862. The web link for the same is given below:

https://cdm.unfccc.int/Projects/DB/DNV-CUK1169040011.34/view

3.2 Project Emissions

Please refer to section B.4 of the PDD of UNFCCC registered CDM project with Ref No: 0862. The web link for the same is given below:

https://cdm.unfccc.int/Projects/DB/DNV-CUK1169040011.34/view

3.3 Leakage

Please refer to section B.4 of the PDD of UNFCCC registered CDM project with Ref No: 0862. The web link for the same is given below:

https://cdm.unfccc.int/Projects/DB/DNV-CUK1169040011.34/view

3.4 Net GHG Emission Reductions and Removals

Please refer to section B.6.4 of the PDD of UNFCCC registered CDM project with Ref No: 0862. The web link for the same is given below:

https://cdm.unfccc.int/Projects/DB/DNV-CUK1169040011.34/view

4 MONITORING

4.1 Data and Parameters Available at Validation

Please refer to section D.2 of the PDD of UNFCCC registered CDM project with Ref No: 0862. The web link for the same is given below:

https://cdm.unfccc.int/Projects/DB/DNV-CUK1169040011.34/view

4.2 Data and Parameters Monitored

Please refer to section D.2.of the PDD of UNFCCC registered CDM project with Ref No: 0862. The web link for the same is given below:

https://cdm.unfccc.int/Projects/DB/DNV-CUK1169040011.34/view

4.3 Monitoring Plan

Please refer to section D.4 of the PDD of UNFCCC registered CDM project with Ref No: 0862. The web link for the same is given below:

https://cdm.unfccc.int/Projects/DB/DNV-CUK1169040011.34/view

5 SAFEGUARDS

5.1 No Net Harm

Please refer to section F.1 and F.2 of the PDD of UNFCCC registered CDM project with Ref No: 4776. The web link for the same is given below:

https://cdm.unfccc.int/Projects/DB/DNV-CUK1169040011.34/view

5.2 Environmental Impact

Please refer to section F.1 and F.2 of the PDD of UNFCCC registered CDM project with Ref No: 0862. The web link for the same is given below:

https://cdm.unfccc.int/Projects/DB/DNV-CUK1169040011.34/view

5.3 Local Stakeholder Consultation

Please refer to section E.1 and E.2 of the PDD of UNFCCC registered CDM project with Ref No: 0862. The web link for the same is given below:

https://cdm.unfccc.int/Projects/DB/BVQI1304680909.79/view

5.4 Public Comments

The project has been listed for Global Stakeholder consultation.