

UPPER PILUWA KHOLA -3 HYDROELECTRIC PROJECT (4.95 MW)

Sankhuwasabha, Nepal

Progress Report

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Submitted by:



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SALIENT FEATURES

1. Project Details

Project Name	:	Upper Piluwa Khola 3 Hydroelectric Project
Location	:	Madi & Chainpur Municipalities, Sankhuwasabha
Geographical Coordinates	:	Latitude: 27° 17' 42"N and 27° 18' 04"N Longitude: 87° 24' 22"E and 87° 25' 30"E
Type of Scheme	:	Run off River
Installed Capacity	:	4.95 MW
Gross Head	:	128 m
Rated Design Head	:	116.7 m

2. Hydrology

Catchment Area	:	83.70 km ²
Mean Annual Precipitation	:	1500 mm
100 years Design Flood (HW)	:	259 m ³ /s
Design Discharge - Piluwa Khola	:	4.11 m ³ /s
- Sikhuwa Khola	:	0.91 m ³ /s
Mean Annual Discharge- Piluwa Khola	:	6.0 m ³ /s
- Sikhuwa Khola	:	1.34 m ³ /s
Riparian Release - Piluwa Khola	:	96 lps
- Sikhuwa Khola	:	21 lps

3. Headworks

Diversion Structure	:	Concrete overflow weir with undersluice
Length of Weir	:	25.0 m
Weir crest Elevation	:	EL 1162 masl
Height of Weir	:	7.0 m from bed level at weir
Undersluice	:	3 m x 1.75 m – 2 nos
Sill Level	:	1157 masl
Intake Type	:	Side Intake

Size of Opening (B x H)	:	3.0 m x 1.2 m - 2 nos
Sill Level	:	1160.40 masl
4. Gravel Trap		
Type	:	Rectangular RCC
Particle Size to be settled	:	5 mm
Size of Gravel Trap	:	8.0 m x 3.3 m (L x B)
5. Approach Canal		
Type	:	RCC Rectangular
Size	:	2.2 m x 2.2 m (B x H)
6. Desander		
Type	:	Dufour, double bay
Particle Size to be settled	:	0.20 mm
Size of Desander	:	Each bay of 45 m x 6.4 m (L x B)
7. Sikhuwa Diversion Scheme		
Type	:	Concrete overflow weir
Intake	:	Side intake of 1.5 m x 0.7 m, 2 nos
Gravel Trap	:	2 m deep, 5.0 m long and 1.5 m wide
Transfer Pipe	:	0.9 m diameter MS Pipe, 170 m long
8. Headrace Pipe		
Total Length	:	1398 m
Type	:	MS-Pipe Buried and exposed section
Diameter of Pipe	:	1.366-1.566 m dia with thickness 8 mm
9. Surge tank		
Type	:	Restricted orifice
Size	:	4 m diameter 25 m height
10. Penstock Pipe		
Total Length	:	395 m
Type	:	MS-Pipe Buried and exposed section

Diameter of Pipe : 1.120 to 1.378 m dia with varied thickness 8 mm to 14 mm

11. Powerhouse

Type : Surface
Dimension (l x b x h) : 23 m x 8.5 m X 11.40 m
PH Floor Level : EL. 1033.10 m
Turbine centerline Level : EL. 1033.50 m

12. Tailrace

Type : 2.0 m wide, 1.6 m high and 25.0 m long, RCC Box canal
Tailrace Water Level : EL 1034.0 m
Minimum Tail water level : EL 1033.57 m

13. Turbine

Type : 2 Nos. Horizontal Francis
Rated Discharge for each Turbine : 2.51 m³/s
Rated Output for each Unit : 2.578 MW
Rated Efficiency : 90%

14. Generators

Type : 2 Nos. Synchronous brushless, 3Ø AC
Rated Voltage : 6.6 kV
Power Factor : 0.85
Layout : Horizontal
Synchronous speed : 1000 rpm
Rated Efficiency : 96.0 %
Rated Output : 2910 kVA
Rated Frequency : 50 Hz

15. Power Transformer

Type : 1 No. 3 phase, 50 Hz Step up Transformer
Rated Efficiency : 99%

Rate Capacity	:	6500 kVA
Voltage Ratio	:	33kV/6.6kV

16. Transmission & Interconnection

Transmission line	:	Powerhouse Baneshwor substation, 14.0 km
Type of Circuit	:	Single Circuit 33 kV
Line Conductor	:	ACSR “dog”
Pole Type	:	Steel Tubular (11 and 13 m height)

17. Power and Energy

Installed Capacity	:	4.95 MW
Contract Energy after Outage & Loss	:	28.41 GWh
Wet Saleable Energy	:	23.51 GWh
Dry Saleable Energy	:	4.90 GWh

18. Construction Period : **2.0 Years**

19. Financial Indicators

Total Project Cost	:	893.37 MNRs. (With IDC)
B/C	:	1.27
IRR	:	15.23 %
RoE	:	18.16 %

1 GENERAL

The progress report has been prepared for updating about the construction and administrative progress of the Upper Piluwa Khola 3 Hydroelectric Project (UPK3HEP).

This report includes the tasks completed until the month of Poush, 2079. This report mainly focuses on the head office status, site office, site visit, design & construction of Project components.

2 PROJECT OVERVIEW

Upper Piluwa Khola-3 Hydroelectric Project is located along the Piluwa Khola between confluence area with Sikhuwa Khola and confluence area with Lakhuwa Khola. The project area lies in Madi and Chainpur Municipalities of Sankhuwasabha District, Province 1 in eastern Nepal, while waterway and powerhouse lies only on Madi Municipality. Chainpur is nearest market place from the project area. Project area is accessible by about 13 km road from Chainpur with a fair weather road. Present updated geographical boundary of project lies between latitude of 27° 17' 42"N and 27° 18' 04"N and longitude of 87° 24' 22"E and 87° 25' 30"E. The elevation at the proposed intake site is 1162 masl. The Project, optimized at an installed capacity of 4.95 MW, is a run-of-the-river type project with gross head of 128 m and design discharge of 5.02 m³/s. Net annual marketable energy to be generated from the Project is 28.41 GWh, out of which 4.90 GWh is dry season energy (Poush to Baisakh).

The Piluwa Khola is a tributary of Arun River. The basin lies in the eastern part of the Sankhuwasabha district. Elevation of the catchment ranges from 1160 m to 3525 m. The main stream flows from East to West direction. Catchment area at the intake site covers 83.70 km² out of which 15.18 km² is covered by Sikhuwa catchment and catchment at powerhouse is 98.50 km². Design flood at the proposed headworks is taken 259 m³/s (Q100-year). The riparian release for environmental requirement is considered as 0.096 m³/s for Piluwa Khola and 0.021 m³/s for Sikhuwa Khola, which corresponds to 10% of the driest month's flow of the river.

Geologically, the project area lies in Himal Group of Higher Himalayan Crystalline. Present study only covers the rock type and structures found within project area. Bedrocks are partially

exposed at steep slopes and cut bank and road cut sections. Most of the surface within project area is covered with soils.

A diversion weir on Sikhuwa diverts discharge of 0.91 m³/s from Sikhuwa Khola to approach canal from Piluwa Khola diversion works. A spilling weir at Piluwa Khola with two under sluices and two side intake openings will divert the design discharge of 5.02 m³/s to intake structure located at left bank of the river. The diversion structure is design for flood discharge of 259 m³/s. Headworks structure including side intake, gravel trap, approach canal and desander with fore bay are located on left bank of Piluwa Khola. The Headrace pipe from forebay to surge tank is aligned along left bank of Piluwa Khola. After 1360 m length of headrace pipe surge tank is located at left bank hillslope. After surge tank penstock pipe is proposed to be aligned on left bank of Piluwa Khola and the penstock line is designed to cross Lakhuwa Khola to reach Powerhouse. Powerhouse is located at left bank of Piluwa Khola near the confluence Piluwa Khola with Lakhuwa Khola. Powerhouse is dimensioned to accommodate two Francis turbine of horizontal configuration. The switchyard is located just upstream of powerhouse on left bank of Piluwa Khola. About 14 km long 33 kV transmission line connected to Baneshwar substation evacuated the Power generated from UP3HP.

The construction period of the Project has been taken to be 24 months. The total financial cost of the Project on the basis of rates as of January 2020 is estimated to be 893.37 MNRs. with IDC. The Project shall be financed from debt and equity ratio of 70:30 from financing institutions. Financial analysis has been undertaken with 11.75% interest rate on the long-term loan yielding 15.23% IRR, 18.16% RoE, and B/C ratio of 1.27.

3 CONSTRUCTION WORKS

3.1 Civil Works

3.1.1 Head works

- i. Construction of undersluice shear wall is completed.
- ii. Construction of upstream protection wall (masonry wall) is completed.
- iii. Construction of intake shear wall is completed.
- iv. Construction of shear walls of intake gate and approach canal is on progress.

3.1.2 Gravel trap, Desander and fore bay

- i. Concreting on all three main panel base slab, inlet transition gate slab of desander is completed.
- ii. Base preparation of downstream forebay accomplished.
- iii. Formworks for shear wall is on progress.

3.1.3 Waterway Alignment

- i. Project road from headworks to surge tank completed.
- ii. Track widening for waterway from 0+000 to 1+500m chainage is completed.
- iii. Track opening from powerhouse to base of gadidanda (0+1700 to 2+000m chainage) is completed.

3.1.4 Power House (PH, Switchyard and Tail race)

- i. Excavation of power is completed.
- ii. Site preparation work for foundation is on progress.

3.2 Hydro mechanical works

- i. Design review is completed.
- ii. Hydro-mechanical contractor is mobilized at site.
- iii. All gate frame of headworks and desander are delivered to site.
- iv. Delivery of penstock pipe to site is completed.
- v. Installation of pipes and bends at headrace alignment is on progress.

3.3 Electromechanical Works

- i. Generator is arrived at Nepal boarder and stored at warehouse in Biratnagar.
- ii. Earthing materials and drainage pipes for powerhouse are dispatched.

3.4 Transmission Line

- i. Layout drawing of receiving substation is finalized.
- ii. First lot of transmission poles are delivered to site.

4 PHOTOGRAPHS



Figure 4.1: Intake shear wall final lift concrete.



Figure 4.2: Undersluice shear wall .



Figure 4.3: Construction of upstream protection wall and excavation for boulder rip-rap.



Figure 4.4: Settling basin bird-eye view.



Figure 4.5 : Settling basin from upstream side.



Figure 4.6: Desander from downstream side and base preparation for headpond and gate panel.



Figure 4.7: Excavation of pit for pipe installation.



Figure 4.8: Headrace pipe installation.



Figure 4.9: Hydro-mechanical camp establishment



Figure 4.10: Powerhouse and switchyard excavation.



Figure 4.11: Excavation for powerhouse and switchyard.



Figure 4.12: Gate frame delivered at site.



Figure 4.13: Pipe delivered and de-coiled at site.



Figure 4.14: Generator set stored at Biratnagar yard.

UPPER PILUWA KHOLA 3 HYDROELECTRIC PROJECT (4.95MW)
SANKHUWASABHA, NEPAL
PROJECT SCHEDULE

ID	Task Name	% Complete	Start	Finish	2022	Qtr 2, 2022				Qtr 3, 2022				Qtr 4, 2022				Qtr 1, 2023				Qtr 2, 2023				Qtr 3, 2023				Qtr 4, 2023						
					Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov											
0	UPK3HEP Project	47%	Wed 6/23/21	Tue 9/26/23																																
1	Infrastructures	93%	Wed 6/23/21	Wed 2/1/23																																
6	Civil Works	45%	Sun 1/23/22	Wed 7/5/23																																
7	Headworks Construction	55%	Fri 1/28/22	Wed 7/5/23																																
146	Settling Basin (Desander)	64%	Fri 2/18/22	Tue 2/28/23																																
191	Headrace alignment	53%	Sun 1/23/22	Wed 5/10/23																																
197	Penstock Alignment	0%	Wed 1/25/23	Mon 4/24/23																																
202	Powerhouse	12%	Thu 11/3/22	Wed 6/28/23																																
244	Surge Tank	0%	Wed 1/25/23	Sat 2/25/23																																
248	Hydromechanical Works	21%	Fri 6/24/22	Sat 6/17/23																																
279	Transmission line design and construction	61%	Sun 1/23/22	Wed 5/24/23																																
285	Electro-Mechanical Works	58%	Tue 1/4/22	Mon 9/25/23																																
293	COD	0%	Tue 9/26/23	Tue 9/26/23																															9/26	9/26