UPPER PILUWA KHOLA -3 HYDROELECTRIC PROJECT (4.95 MW)

Sankhuwasabha, Nepal

Progress Report

Date: 3rd Poush, 2079

Submitted by:

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Lalitpur-10, Nepal

Table of Contents

List of Figures

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 m^3/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 Ashwin, 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 Baiskah).

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 GENERAL WORKS

i. Site visit of consortium bank representatives accomplished
ii. Mobilization of hydro- mechanical team is done.
iii. Site verification by technical consultant for Interim payment certificate (IPC) 03 is done.
iv. Client's representatives along with NEA personals performed inspection of Generator, turbine and accessories.

4 CONSTRUCTION WORKS

4.1 Civil Works

4.1.1 Head works

i. First lift of intake panel is completed.

ii. Construction of upstream protection wall (masonry wall) is on progress.

iii. Installation of formworks on undersluice gate block is on progress.

4.1.2 Gravel trap, Desander and fore bay

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

4.1.3 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. Forest approval for tree cutting work from surge tank to powerhouse is in final stage.

4.1.4 Power House (Forebay, PH and Tail race)

i. Excavation of power house is completed up to 1042m masl.

4.2 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 on progress.

4.3 Electromechanical Works

i. Inspection of generator is done with NEA personals.
ii. Generator is going to dispatch in December end.

4.4 Transmission Line

i. Bay allocation for rare substation at baneshwor substation is in final stage.
ii. Detailed design report (DPR) of transmission line completed.
iii. ToR of IEE is approved by DoED.
iv. Single line diagram (SLD) for receiving substation is finalized.
v. Layout drawing of receiving substation is finalized.
vi. Contract for supply and installation of transmission line is under negotiation.

5 PHOTOGRAPHS

Figure 5.1: Intake, undersluice shear.

Figure 5.2: Headworks area overall progress.

Figure 5.3: Undersluice construction.

Figure 5.4: Site preparation for downstream protection wall.

Figure 5.5: Upstream Guide wall (masonry wall).

Figure 5.6: Installation of first stage embedded parts at undersluice gate and stoplog groove.

Figure 5.7: Desander from upstream.

Figure 5.8: Desander after concreting of settling panel base slab.

Figure 5.9: Desander from downstream side and base preparation for headpond and gate panel.

Figure 5.10: Track Widening for pipeline alignment.

Figure 5.11: Track widening for waterway alignment.

Figure 5.12: Track Widening for Headrace Pipeline Alignment

Figure 5.13: Powerhouse excavation.

Figure 5.14: Excavation for powerhouse and switchyard.

Figure 5.15: Hydro-mechanical contractor's camp.

Figure 5.16: Gate frame delivered at site.

Figure 5.17: Penstock pipe loading at Biratnagar yard.

Figure 5.18: Penstock pipe delivered at site.

Figure 5.19: Mabilung team, NEA personnel's and supplier team for Generator Inspection.

Figure 5.20: Inspection of Generator.

Figure 5.21: Fabrication of turbine runner at BFL factory India.

Figure 5.22: Fabrication of spiral casing at BFL factory India.

Figure 5.23: Mabilung developers, Site team along with lead and consortium bank representatives.

Figure 5.24: Site visit of bank representatives.

Figure 5.25: Site visit of with technical consultants (Jade team) along with site technical team.

UPPER PILUWA KHOLA 3 HYDROELECTRIC PROJECT (4.95MW)

SANKHUWASABHA, NEPAL

PROJECT SCHEDULE

ID	Task Name	Duration	% Complete	Start	Predecessors	Finish
0	**UPK3HEP Project**	664 days	41%	Wed 6/23/21		Wed 8/30/23
1	Infrastructures	423 days	88%	Wed 6/23/21		Sun 1/1/23
6	**Civil Works**	418 days	37%	Sun 1/23/22		Thu 6/1/23
7	**Headworks Construction**	**408 days**	**46%**	**Fri 1/28/22**		**Sat 5/27/23**
146	**Settling Basin (Desander)**	292 days	45%	Fri 2/18/22		Tue 2/21/23
191	**Headrace alignment**	357.5 days	53%	Sun 1/23/22		Sun 4/2/23
197	**Penstock Alignment**	90 days	0%	Sat 12/17/22		Thu 3/16/23
202	**Powerhouse**	211 days	7%	Thu 11/3/22		Thu 6/1/23
244	**Surge Tank**	**32 days**	**0%**	**Sat 12/17/22**		**Tue 1/17/23**
248	**Hydromechanical Works**	244 days	22%	Fri 6/24/22	247	Wed 5/10/23
249	**Fabrication, testing and supply of HM equipments**	**182 days**	**73%**	**Fri 6/24/22**		**Thu 3/9/23**
254	Headworks	112 days	0%	Wed 1/18/23		Tue 5/9/23
261	Settling Basin	52 days	0%	Fri 2/17/23		Sun 4/9/23
266	Headrace Pipe Installation	113 days	0%	Wed 1/18/23		Wed 5/10/23
272	Penstock Pipe Installation	69 days	0%	Wed 1/18/23		Mon 3/27/23
278	Surge Tank	40 days	0%	Wed 1/18/23	247	Sun 2/26/23
279	**Transmission line design and construction**	391 days	50%	Sun 1/23/22		Fri 5/5/23
283	**Electro-Mechanical Works**	524 days	50%	Tue 1/4/22		Tue 8/29/23
284	Fabrication, testing and Inspection of EM Equipments	270 days	70%	Tue 1/4/22		Mon 4/3/23
285	**Installation work**	**137 days**	**0%**	**Sat 4/15/23**		**Tue 8/29/23**
286	EOT Crane	15 days	0%	Sat 4/15/23	224FF+5 day	Sat 4/29/23
287	EM Mechanical	30 days	0%	Thu 6/1/23	230	Fri 6/30/23
288	EM Electrical	30 days	0%	Sat 7/1/23	287,243	Sun 7/30/23
289	Testing	15 days	0%	Mon 7/31/23	288	Mon 8/14/23
290	Trial Generation	15 days	0%	Tue 8/15/23	289	Tue 8/29/23
291	**COD**	1 day	0%	Wed 8/30/23	290	Wed 8/30/23