UPPER PILUWA KHOLA -3 HYDROELECTRIC PROJECT (4.95 MW)

Sankhuwasabha, Nepal

Monthly Progress Report –Asadh 2079

Date: 3rd Shrawan, 2079

MABILUNG ENERGY LTD.

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	:	1.60 m dia with varied thickness 6 mm

9. Surge tank

Type	:	Restricted orifice
Size	:	4 m diameter 23 m height

10. Penstock Pipe

Total Length	:	395 m
Type	:	MS-Pipe Buried and exposed section

Diameter of Pipe	:	1.40 m dia with varied thickness 8 mm to 10 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	:	2.592 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	:	2930 kVA
Rated Frequency	:	50 Hz

15. Power Transformer

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

Rate Capacity	:	6000 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 till the month of Asad, 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 has been 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. Bed rocks 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

- LC is opened to purchase pipe and accessories.
- Backfilling and River training work is carried out to minimize losses due to monsoon.

4 CONSTRUCTION WORKS

4.1 Civil Works

4.1.1 Head works

i. Concreting of all base slabs of undersluice completed.
ii. Vertical rebar erection for underslice, intake shear walls completed.
iii. Concreting work divide wall final level is achieved.
iv. Intake walls are concreted up to 90 cm height (1159.4m masl).
v. Concreting on guide wall panel -01 is completed (1166.0m masl)
vi. Backfilling up to base slab top level is accomplished.
vii. Concreting on undersluice shear wall (1.5m to 3m) height completed.

4.1.2 Gravel trap, Desander and fore bay

i. Site clearance completed.
ii. Earthwork in filling and compaction using roller in desander area is completed.
iii. Excavation for gravel trap and approach canal is completed.

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. Layout for powerhouse are has finalized.
ii. Site clearance completed.
iii. Excavation work for powerhouse foundation is in progress.
iv. Power house design work is in progress.

4.2 Hydro mechanical works

i. Design review is completed.
ii. Contract agreement to HM supplier to supply, fabricate and install pipe, gate, and accessories is accomplished.
iii. First stage embedded parts (ep's) for gate frame are delivered to site.
iv. First stage ep's installed at cobble flushing and undersluice gate grooves.
v. LC is opened for supply of steel pipes.

4.3 Electromechanical Works

i. Contract agreement to design, fabrication, supply, installation and commissioning of electromechanical components is accomplished.
ii. Layout of powerhouse and switchyard is finalized.
iii. All powerhouse drawings are issued by electromechanical supplier and approved by employer.
iv. Layout switchyard and receiving substation is finalized.

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 FURTHER WORK PLAN

The future work plan are as follows:

- IEE and Construction license of transmission line.
- Track opening from surge tank to powerhouse.
- Design and issuing construction drawing of powerhouse, switchyard and substation.

6 PHOTOGRAPHS

Figure 6.1: Undersluice slab concreting.

Figure 6.2: Formworks at Undersluice wall from downstream

Figure 6.3: Undersluice upstream bay and divide wall.

Figure 6.4: Guide wall and undersluice upstream slab from river side.

Figure 6.5: Guide wall panel -2 after final concreting.

Figure 6.6: Intake, intake sluice and gravel trap area

Figure 6.7:Installation of first stage embedded parts at undersluice gate and stoplog groove.

Figure 6.8:Gate grooves after concreting.

Figure 6.9: River training works upstream of headworks.

Figure 6.10: Gravel trap and desander inlet base preparation

Figure 6.11:Track Widening for pipeline alignment after rocky cliff.

Figure 6.12:Track widening for pipeline alignment

Figure 6.13:Track Widening for pipeline alignment.

Figure 6.14:Track Widening for pipeline alignment.

Figure 6.15: Track widening for waterway alignment.

Figure 6.16: Track Widening for Headrace Pipeline Alignment

Figure 6.17: Excess road from powerhouse to surge tank.

Figure 6.18: Powerhouse excavation work.

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

ID	Task Mode	Task Name	Duration	% Complete	Start	Finish
0		**UPK3HEP Project**	347.5 days	34%	Sun 1/23/22	Thu 3/23/23
1		Infrastructures	175 days	88%	Sun 1/23/22	Sat 10/1/22
6		**Civil Works**	293.5 days	33%	Sun 1/23/22	Sat 1/28/23
7		**Headworks Construction**	**288.5 days**	**48%**	**Fri 1/28/22**	**Sat 1/28/23**
8	✓	Site clearance	10 days	100%	Thu 5/26/22	Sat 6/4/22
10	✓	First stage river diversion	21 days	100%	Fri 1/28/22	Thu 2/17/22
15		**Undersluice construction**	**162.5 days**	**61%**	**Sat 3/5/22**	**Sun 10/30/22**
49	✓	**Upstream Flood wall**	**113 days**	**100%**	**Thu 3/10/22**	**Tue 8/16/22**
68		**Intake Structure**	**163 days**	**51%**	**Sun 3/13/22**	**Mon 11/7/22**
97		**Approach Canal**	**37 days**	**12%**	**Wed 5/25/22**	**Thu 6/30/22**
109		**Gravel Trap and spillway**	**134.5 days**	**2%**	**Tue 8/16/22**	**Sat 1/28/23**
126		**Settling Basin (Desander)**	276 days	18%	Sun 1/23/22	Tue 1/10/23
159		**Headrace alignment**	265.5 days	53%	Sun 1/23/22	Sat 12/31/22
165		**Penstock Alignment**	90 days	0%	Fri 9/16/22	Wed 12/14/22
170		**Powerhouse**	241.5 days	6%	Mon 3/7/22	Thu 1/19/23
212		**Hydromechanical Works**	113 days	0%	Tue 11/1/22	Tue 2/21/23
213		Headworks	112 days	0%	Tue 11/1/22	Mon 2/20/23
220		Settling Basin	52 days	0%	Thu 12/1/22	Sat 1/21/23
225		Headrace Pipe Installation	113 days	0%	Tue 11/1/22	Tue 2/21/23
231		Penstock Pipe Installation	69 days	0%	Tue 11/1/22	Sun 1/8/23
237		**Transmission line design and construction**	314 days	50%	Sun 1/23/22	Fri 2/17/23
241		**Electro-Mechanical Works**	99 days	0%	Tue 12/13/22	Wed 3/22/23
242		EOT Crane	10 days	0%	Tue 12/13/22	Fri 12/23/22
243		EM Mechanical	20 days	0%	Wed 1/11/23	Tue 1/31/23
244		EM Electrical	20 days	0%	Tue 1/31/23	Mon 2/20/23
245		Testing	15 days	0%	Mon 2/20/23	Tue 3/7/23
246		Trial Generation	15 days	0%	Tue 3/7/23	Wed 3/22/23
247		**COD**	1 day	0%	Wed 3/22/23	Thu 3/23/23