

Lower Erkuwa Hydropower Project (14.15 Mw)

1. INTRODUCTION

1.1 General

The Lower Erkuwa hydropower Project is located in Kulung and Chauki Danda VDCs of Bhojpur District, in East Nepal. It is located in the lower region of the Higher Himalayas, in the catchment of the Arun River, which is a major tributary of the Sapta Koshi River system. The Project is approximately 12 km upstream from Tumlingtar. The Project is a run-of-river hydropower having design discharge of 1.20 m³/s. The plant will utilize a net head of 146 m and is expected to generate approximately 79.8 GWh of energy annually. The Project is expected to be environmentally benign, and it is expected to enhance the local environment and livelihood of the local people.

1.2 Establishment of the Company

The Lower Erkuwa Hydroelectric Co. (P) Ltd. has been incorporated to develop this Project. Presently we are seeking partners to share in the equity for the Project. National Hydropower Co. Ltd (NHPC) having experience building and operating hydropower projects will lead the equity team holding majority shares, at least up to the construction period of the Project.

1.3 Special Features of the Project

The Project has the following features which makes it very attractive for investors:

Perennial water source from stream and lake

Medium Head Project

Run of River Scheme

Minimum size tunnel

Eastern Nepal where energy demand is high

Minimal environmental impact

Project does not lie in sensitive zone

Motorable access is available

Short transmission line

1.4 Project Features

The total length of the access road from Tumlingtar to the Project site is only about 12 km. The intake is located on the right bank and it is integrated as part of the dam structure. Settling basins are provided immediately after intake structure. Headrace tunnel of length 2491 m starts from the basins and ends at the beginning of the penstock shaft. Steel penstock is about 575 m long and the surface powerhouse is equipped with two units of Francis turbines and associated generating equipment. 132 kV Transmission

line of 14 km length, up to Tumlingtar is required to connect the Project to Integrated Nepal Power System (INPS).

1.5 Project Cost

The project cost is estimated at NRs. 2,480 million based on the price level of 2016. Of the total project cost, Rs. 1,736 million will be loan and Rs 744 million will be borne from equity, making it a 70 percent loan and 30 percent equity financing scheme.

2. PRESENT STATUS

2.1 Project partners

The existing shareholders have sought new partners to develop this Project further. NHPC, having experience in building and operating hydropower projects has taken this opportunity to enter into the Project as majority shareholder and develop it. Presently we are seeking additional partners to develop this Project.

2.2 Financial Arrangement

This Project will be financed through a combination of loans and equity. Of the total Project cost 30 % will be provided as equity by different stake holders and the remaining 70 % will be covered through loans from banks and financial institutions. 2.3 Construction Schedule: It is envisaged that the pre-construction activities will be completed by November 2017, and 36 months will be required to complete the construction of the Project thereafter.

3 Salient Features (Dec. 2016)

Name of the project	: Lower Erkuwa Khola Hydropower Project
Type	: Run-of-River
Location	: Bhojpur District
Longitude	: 87° 05' 57" E to 87° 07' 44" E
Latitude	: 27° 24' 28" N 27° 25' 24" N

Hydrology

Catchment area at headwork site	: 200.89 km ²
Mean Annual Precipitation	: 1994 mm
Mean Annual Flow	: 14.87 m ³ /s
Design Flood (1 in 100 years)	: 218.28 m ³ /s

Power Development

Type of Power Generation	:
Design Discharge (Q40%)	: 11.20 m ³ /s
Minimum Flow	: 3.46 m ³ /s
Full Supply Level	: 495.71 m
Tail Water Level	: 345.06 m
Gross Turbine Head	: 150.65 m
Net Turbine Head	: 145.78m
Installed Capacity	: 14.15 MW
Average Annual Energy	: 79.79 GWh
Annual Wet Energy	: 67.11GWh
Annual Dry Energy	: 12.68 GWh

Weir

Type	: Ogee Shaped, Overflow Type
Length	: 35m
Crest Level of Weir	: 495.90m

Under Sluice

Invert level near gate : 493 masl
No. : 2 Nos.
Width : 2.5 m

Intake

Intake Type : Orifice
No. : 3 Nos.
Size (W×D) : (2.3× 1.5) m

Approach Canal

Type : -
Size (W×D) : -
Length : -
Slope : -

Gravel Trap

Type : Surface
No. of Basin : 2
Size (L × B × H) : (11 × 5.5 × 2.53) m
Particle Size to be Settled : >2 mm

Settling Basin

Type : Surface/Hopper
Settling Criteria : 90% of ≥ 0.2 mm

No. of Chamber : 4 Nos.
Size (L × W) : (58 × 12) m
Total Depth : 4.4 m

Headrace Tunnel

Tunnel Type : Inverted D-Shaped
Tunnel Length : 2491 m
Tunnel Size (W×D) : 2.7 m ×(1.35+1.35) m (Finished Size)
Type of Lining : Shotcrete, Concrete

Surge Tank

Type : Non Spilling Type
Shape : Circular
Diameter of Orifice : -
Diameter of Surge Tank : 6 m
Height : 25 m
Upsurge Elevation : 503.69 m
Down Surge Elevation : 485.75 m

Penstock

Penstock Type : Surface and Underground (Steel Penstock)
Length : 575 m
Inner diameter : 2.2 m
Maximum Shell Thickness : 16 mm

Power House

Type of Powerhouse : Surface
Size (L x B x H) : 40 m × 25 m × 14.5 m

Tailrace Canal

Size (L x B x H) : (113 × 2.8 × 1.6)m
Tail Water Level : EL 345.06 m

Turbine

Turbine Type : Francis
Rated Discharge : 5.60 m³/s
Number of Turbine : 2 Nos.
Rated Output : 2 x 7.075 MW
Rated Net Head : 145.78 m
Efficiency of turbine : 92%

Generator

Number of units : 2 Nos.
Rated output : 2 × 8.84 MVA
Rated speed : 500 rpm
Rated frequency : 50 Hz
Type : Synchronous with brushless excitation system, water cooled
Efficiency : 97%

Transformer

Rating	:	2 × 8.84 MVA
Primary Voltage	:	11 kV
Secondary Voltage	:	132 kV
Frequency	:	50 Hz
Efficiency of transformer		99%

Efficiency

Overall Efficiency Adopted	:	88.30%
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Transmission Line

Transmission Line	:	About 14 km, 132 kV double circuit to Khadbari sub-station at Tumlingtar.
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Construction Period	:	3 Years
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Financial Parameter

Total Project Cost	:	NRs. 2.48 Billion
Net Present Value	:	NRs 458.035 Million
Avg. DSCR	:	1.76
Return on Investment	:	20.80%
Benefit Cost Ratio	:	1.2