EXECUTIVE SUMMARY

LOCATION AND ACCESS TO PROJECT SITE

Rahi Chu Hydo Electric Project with an installed capacity of 3 x 8.33MW is located in North Sikkim District of Sikkim and is proposed on river Rahi Chu, a tributary of Tolung Chu. The project site is located at about 197 km from Siliguri by road via Singtam & Mangan. Singtam is 100 km from Siliguri (on Siliguri-Gangtok NH-31A) & Singtam to Mangan is about 55 Km. The Diversion site is located at about 42 km from Mangan via Tung Bridge (on River Teesta) & Saffu village. The Diversion site is about 7 km from Saffu village on the Saffu-Sangkalan road presently under construction by BRO. Access road of about 8 Km will be required to be constructed from the Saffu-Sangkalan road to reach the Diversion site.

HYDROLOGY

The Rahi Chu, is a tributary of Tolung Chu, which in turn is a major tributary of the Teesta. The Rahi The catchment area up to the dam site is about 50 Km^2 and lies between Longitude $88^o32'25"E$ to $88^o30'55"E$ and Latitude $27^o32'58"N$ to $27^o31'55"N$.

No site specific G&D data of Rahi Chu is available. Stream flow records (10-daily) of the Tolung Chu at the Sankalang gauge site (Catchment Area = 777 Km^2) are available for the period May 1990 – Apr 2004). The flow series for the Panan Hydro-Electric Project was generated by applying a reduction factor of 0.89 on the observed stream flow series at Sankalang (1991-91 to 2003-04) with an annual runoff of 4140 mm, thus arriving at 3684 mm.

Assuming that the stream flow is proportional to the catchment area, stream flow (10-daily) for the Rahi diversion site (50 Km^2) have been developed. It is considered prudent to adopt the 10-daily stream flow data for the power planning studies of the Rahi Chu Hydro-Electric Project on the basis of annual flows. The Years 2002-2003 and 1992-93 have been identified as the 50% and 90% dependable years, respectively.

The various parameters of the 50% and 90% dependable year are placed below:

Annual Flow (10^6 cum)	215.58 MCM	163.42 MCM
Maximum Flow (m^3/s)	16.01	12.43
Minimum Flow (m^3/s)	1.06	1.6
Average lean flow (m^3/s)	1.85	2.07

For the Pre-feasibility purpose, the design flood has been estimated as 400 cumec at the diversion site using empirical formulae.

POWER POTENTIAL STUDY

The following data and assumptions are used in the calculations:

- **Full Reservoir Level:** Full reservoir level for the project has been fixed at 1259 m.
- **Minimum Drawdown Level:** Minimum drawdown level for the barrage has been fixed at 1255.0 m. **Tail water Level:** Normal tail water level (all units running) = 820 m
- **Head Losses: A** head loss of 10m is considered for power potential assessment.
- **Design Head:** Rated head of 428.7 m is considered for the study
- **Overall plant efficiency:** Overall plant efficiency of 89.20 % for pelton turbine is considered
- **Riparian Flow:** In the present study, a minimum flow of 15 % of minimum lean discharge is considered as riparian flow throughout the year.

For fixing the installed capacity of the project, incremental energy study was done and following was inferred from the studies carried out above that:

i. On the basis of incremental energy benefits i.e. the energy that could be generated in the 90% dependable year with full installed capacity at 95 % machine availability of the generating station, the installed capacity of the Rahi Chu Hydro Electric project could be 25 MW ;
ii. On the basis of operating the plant as a peaking station , capable of providing minimum 4 hours peaking in a 24 hour period (Two hour peaking in two blocks of 12 hours each) for the full installed capacity with 95% machine availability also , the installed capacity works out to about 25 MW.

The installed capacity at Rahi Chu HE Project was proposed to be 25 MW considering this to be a peaking station and the corresponding design discharge is 6.88 cumecs. This will ensure a generation of 121.07 MU at 95% plant availability with an annual PLF of 55.28% and lean period PLF of 35.53 %.

PROJECT PLANNING

The layout of the project is done giving due considerations to the topographical & geological features, optimization of valley for power benefits, and the presence of Khangchendzonga National Park etc. All structures of the project are planned in manner so as to avoid encroachment of the Khangchendzonga National Park. The major structures planned for this project are described below:

i. A diversion weir across Rahi Chu to provide peaking storage
ii. Intake structure on the right bank of Rahi Chu.
iii. A connecting tunnel from intake to an underground desanding basin to remove suspended particles of size below 0.2mm.
iv. A surge Shaft
v. Pressure Shaft/Penstock conveying water to 3 numbers of pelton wheel turbines installed in a surface type power house on the right bank of Rahi Chu.

CONSTRUCTION PROGRAMME

The project involves construction of simple structures and the construction period is considered as 3.5 years excluding one and half years of pre-construction period during which, the DPR and infrastructure required will be completed.

POWER EVACUATION

Power will be transmitted through 132 kV S/C Transmission line from Rahi Chu HEP to the nearest Pooling Station proposed at Mangan (Teesta III HEP) which is approximately 2 Km from Rahi Chu HEP.

COST AND FINANCIAL PARAMETERS

The completed cost of construction assessed based on the construction schedule of 3 years is estimated at Rs.192.1 Crs. The tariff of the project with 70:30 as Debt : Equity ratio and considering interest rate @ 12% p.a. and 12 years repayment period, the 1st year tariff and the levellised tariff work out to R.4.60/Unit and Rs.3.91/Unit respectively.