

**THESIS**

**OPTIMIZATION OF HYDROPOWER POTENTIAL AT  
RENALA HYDROPOWER PROJECT**



By

**AMIR SHAFIQ UR-REHMAN**  
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## ABSTRACT

Lower Bari Doab Canal (LBDC) is a perennial irrigation canal which off takes from Balloki Head Work at River Ravi and delivers the irrigation water for 11 months. The Renala Hydropower Project is located at RD 160+686 of LBDC. Sir Ganga Ram constructed this plant in 1925 to supply power to low head pumps installed for lift irrigation.

This power house is 85 years old and most of the plant components have outlived and deteriorated due to excessive wear & tear causing reduction in turbine efficiencies and capacity of plant.

Keeping in view the above problems a study was planned to optimize this power station for hydro power potential. For this purpose following 3 Alternatives were proposed to carry out detailed study.

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| Alternative-1: | Optimization of Hydro Power Potential at Renala Hydro Power Project by replacing the existing turbines (5 x 0.220 MW) with new ones (5 x 0.33 MW) with higher efficiency to a total capacity of 1.65 MW in the existing powerhouse.  |
| Alternative-2: | Optimization of Hydro Power Potential at Renala Hydro Power Project by replacing the existing turbines (5 x 0.220 MW) with new ones (5 x 0.33 MW) with higher efficiency in the existing powerhouse and extension of powerhouse by adding two units (2 x 1.20 MW) with a total capacity of 4 MW. |
| Alternative-3: | Optimization of Hydro Power Potential at Renala Hydro Power Project by demolishing the existing powerhouse and installing new units (3 x 1.365 MW) with a total capacity of 4 MW in new powerhouse.  |

In order to carry out the proposed study, visit to the site was conducted and the requisite data relating to climate, hydrology, geology, sediment and structures etc. collected.

From the collected discharge data for the year 1991 to 2005, the flow duration curve was prepared to ascertain the availability of flows. Power house was designed for 70 m<sup>3</sup>/s in 1925 but after remodeling LBDC in 1965 & 1986 the availability of flows at desired location is 170 m<sup>3</sup>/s for power production. Therefore design discharges of Alternative-I to Alternative-III are 70 m<sup>3</sup>/s, 170 m<sup>3</sup>/s & 170 m<sup>3</sup>/s respectively.

Power potential and Energy output was evaluated for Alternative-I to Alternative-III for comparison and finalization of best suitable Alternative. The maximum power output for Alternative-I to Alternative-III was 1.65 MW, 4 MW and 4 MW respectively. The mean annual energy output for Alternative-I to Alternative-III was 12.934, 25.574 & 25.579 respectively.

The cost estimates were carried out for Alternative-I to Alternative-III and total Project Costs are Rs 206.00, 532.357, 517.388 Million for Alt –I to Alt –III respectively while Economical & Financial Analysis was carried out for all the three alternatives and EIRR and FIRR values are 28.45%, 22.09%, 23.14% & 15.63%, 12.49%, 12.89% for Alt –I to Alt –III respectively.

The Alternative-III for optimization of Renala hydropower project having more energy, feasible, renders the required economic and financial returns and finalized for optimization of Renala HPP.