

THESIS

**STUDY OF CAPACITY ENHANCEMENT OF RENALA HYDEL
POWER STATIONS**



By

ABDUL WAHAB
(2010-PG-HPE-96)

For the Degree of

MASTER OF SCIENCE

IN

HYDROPOWER ENGINEERING

CENTRE OF EXCELLENCE IN WATER RESOURCES ENGINEERING
University of Engineering and Technology, Lahore, Pakistan.

2014

ABSTRACT

Hydroelectric power stations play a key role to meet the electricity requirement of the country as well as to keep overall generation cost to a low level. In addition country is saving a lot of foreign exchange by reducing import of costly fuel by utilizing environmental friendly hydel energy. To achieve target of meeting power demand at an affordable cost of generation, the installation of new hydel power plants is important, also optimum utilization of existing hydel power plants is equally important. Keeping in view the aforementioned standpoint, the Renala hydel power project located at RD 160+686 of Lower Bari Doab Canal (LBDC) constructed by Sir Ganga Ram in 1925 to operate the low head pumps with installed capacity of 1.10 MW (5 x 0.22 MW) was selected as case study to validate the "standpoint".

The data related to hydrology, geology, hydraulics & environment was collected from different sources. Power and energy potential at the proposed site have been estimated on ten daily basis using post Water Apportionment Accord (1991) flow time series.

Four options were considered for capacity enhancement of 89 years old Renala hydel Power Plant. Available flows estimated for option-1 as 71 m³/s and for option-2 to option-4 as 171m³/s while different layout alternative options and Environmental complications were studied.

Option-1 considered replacing the existing old 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, Option-2 considered replacing the existing turbines (5 x 0.220 MW) with new ones (5 x 0.33 MW) with higher efficiency in the existing power house and extension of

the existing powerhouse by adding two units (2 x 1.65MW); so aggregated to a total capacity of 4.95 MW, Option-3 considered demolishing the existing powerhouse and installation of new units (3 x 1.37 MW) with a total capacity of 4.11 MW in new power house, while Option-4 considered keeping the existing powerhouse but construction of new powerhouse on the right side of existing building & installation of new units (2 x 2 MW) with a total capacity of 4.0 MW; old power house remaining in operation to give extra power during construction period.

In all respects Option-4 with a new 4.0 MW power house scheme on right side of old power house and using same power channel with remodeling turned out as the best option to enhance the generation capacity at Renala hydel power station. Besides it does not create any significant environmental or social problem. In addition it makes use of maximum flow of LBDC for cheap hydropower production, has no effect on hydraulic regime of the main canal, causes almost no disturbance to the existing civil structures, and the existing road access/space availability make the construction work an easy undertaking.

©