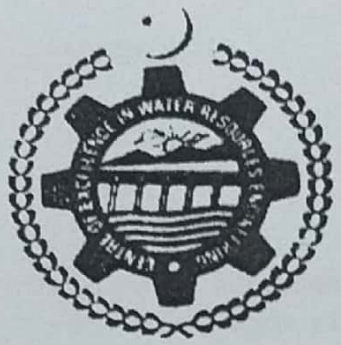
THESIS

SELECTION OF OPTIMAL HYDROPOWER PROJECT LAYOUT IN KAGHAN VALLEY



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(2003-PG-HPE-45)

For the Degree of

MASTER OF SCIENCE

IN

HYDROPOWER ENGINEERING

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

2005

ABSTRACT

Pakistan has significant potential for hydropower development. It is however necessary that this natural resource be utilized in a manner that the maximum economic benefits, when viewed from social perspective, are achieved. This study aims at optimization of power potential on Kunhar river near Kaghan valley, elaboration of optimization of high head hydropower plant. The optimization methodology employed was that the plant being sized was studied at various design discharge (installed capacity) conditions and the incremental cost of each step was compared to the incremental benefits of that increment. The optimum point was reached when incremental costs were equal to the incremental benefits. The benefits were quantified on the basis of equivalent thermal or avoided thermal cost, and on long run marginal cost (LRMC) basis. The above approach could be said to be refrains by the option or step that results at the maximum NPV at the selected parameters.

The project costs were determined by the use of HPC, a computer program that provides cost estimates of hydroelectric power plant.The project being sized were as:

- Alternative I: dam height 90 m, gross head 930 m and tunnel length 17 km.
- Alternative II: dam height 130 m, gross head 600 m and tunnel length 6.1 km.

The sizing was based on estimated cost of both the options at design discharge between 50 m^3/sec to 140 m^3/sec. Base cost estimation for each design discharge was computed by use of HPC model. For each design discharge, the firm capacity, peak energy and off-peak energy were computed and the total benefits of the each option was worked out and the results are summarized as:

Suki Kinari I: Optimum installed capacity and total energy at 110 m^3/sec design discharge are 852 MW and 3226 GWh respectively, resulting in net benefits of 148.48 million dollars.

Suki Kinari II: Optimum installed capacity and total energy at 120 m^3/sec design discharge are 600 MW and 2389 GWh respectively, resulting in net benefits of 88.04 million dollars.

The conclusion of the study was that Suki Kinari-I option was the preferred option with an installed capacity of 850 MW at design discharge of 110 m^3/sec and providing about 525 MW firm capacity and 3226 Gwh energy at 43% plant factor.