A Feasibility Study Of Micro Hydroelectric Power Plant At Marguzar Waterfall, Swat, Pakistan

Abstract:

We know that water is the best and free source of energy. This paper discusses the scope of developing a mini hydropower station at Marguzar waterfall in Mingora at district of SWAT, Pakistan. Provision of energy is an important need of the human life. The environmental degradation caused by fossil- fuel based energy generation has led the governments and policy makers to switch to renewable and clean energy technologies. The present study aims to estimate the cost and benefit of Micro hydropower (MHP) projects in rural areas and also to show that Micro hydro power is environmentally sustainable and cost-effective technology for energy generation. Primary data, as well as secondary data, is used. Two sets of data are used, one taken from WAPDA connected households and the other from MHP connected households in District SWAT Khyber Pakhtunkhwa. The methodology used in the study is Descriptive Statistics, Financial and Economic analysis to estimate the results. Environmental analysis is used to estimate the emission reductions caused by Micro hydropower technology. Informal survey techniques are also used to highlight the main issues associated with community-based MHP technology. The result of the study shows that the expenditure made by MHP connected households on alternative energy sources is less as compared to the expenditure made by WAPDA connected households. Financial and Economic analysis show that MHP is a feasible and viable technology that gives higher rate of return to the investors.

Summary:

A number of technical parameters are considered before deciding on the proposed site. The head, the flow of water and hydraulic pressure is estimated. The water that flows freely without a platform has low density. The speed of water increases with the increase in length of penstock, keeping the slope and friction constant. The total installed capacity of the site and household spread is also taken into account. If the household spread is more, then a step-up transformer is installed to increase the voltage in transmission lines.

The results indicate that the main source of lighting for MHP households is the electricity generated from the MHP plant. While for WAPDA users the main source of lighting is kerosene oil, generators and mostly DC chargeable lamps. Moreover, the MHP connected households are better up in terms of the monthly electricity bill and the expenditure made on other sources of energy. Thus the MHP households get a saving due to low expenditure on the use of energy items. This consumer surplus may be used for the consumption of other household items resulting into their welfare improvement. The unit capital cost of MHP is Rs. 13333/kW. While per unit energy price is Rs.1.33. On the other hand per unit cost of WAPDA electricity is Rs. 12 while for consumers it is Rs. 9 (for consumers using 100- 200 kWh). Based on this analysis, MHP electricity is far cheaper than WAPDA electricity.

References:

1. Fahmida Sharmin Jui; Sabrina Alam; Md. Didarul Alam; Sabuj Chowdhury Dec. 2015 A feasibility study of the mini hydroelectric power plant at Sahasradhara waterfall, Sitakunda, Bangladesh
2. M. Mohibullah; A.M. Radzi; M.I.A. Hakim: Nov. 2004 Basic design aspects of micro hydropower plant and its potential development in Malaysia
3. Saran Zeb ; ND Mazhar Ali; Asad Mujeeb; Hameed Ullah Jan. 2019 Cost efficient Mini hydro plant with low water head whirlpool design methodology for rural areas : (Micro Hydro Whirlpool power plant)
4. S. P. Adhau; R. M. Moharil; P. G. Adhau Dec. 2012 Design of mini-hydropower plant on small weir: Need-based technology for rural electrification
5. A.B. Turner; R.J. Simpson; C. Guillaud Mar 1988 Developing a mini-hydro plant in the remote Canadian North
6. A.R. Wallace 1994 Mini-hydro generation: applications, regulations, and economics
7. MUHAMMAD UMAR ANWAR HUSSAIN AUG 2015 Micro Hydro Power: A source of Sustainable Energy in Rural Communities: Economic and Environmental Perspectives.