ABSTRACT

TITLE:	Micro-Hydroelectric System Design
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ABSTRACT: A design review was conducted for the possible implementation of a hydroelectric power generating facility on private property north of Cortez, CO. The landowner stated a power need of 3 kilowatts (kW) and a maximum project cost of $25,000. The results of the study show that hydropower is a viable option for the site under a limited range of conditions. An analysis of different turbines resulted in the selection of a cross flow turbine. A computer model was designed to compute the geometry of the cross flow turbine for a range of flow rates and turbine rotational speeds. A prototype of the turbine was designed using the model and was constructed for testing. Testing was conducted under varying head and flow conditions. A turbine operating efficiency of 60% was achieved, which was less than a target efficiency of 75%. Factors that may be responsible for this are discussed. Based on an assumed turbine operating efficiency of 60%, 4.65 meters of head on the property and an design flow rate of 0.1 m3/s, a system design was prepared for the client which is estimated to produce 1.76 kW (includes all component efficiencies) at a projected cost of $18,000. A payback analysis was conducted on this proposed system, and it would pay for itself in approximately 12.2 years, based on residential electricity rates. The design includes an inlet structure, piping system, and turbine. The project will require permits and licensing from the Federal Energy Regulatory Commission, the Army Corps of Engineers, and the Dolores Division of Water Resources.