



Introduction

Hydroelectric power is generated by capturing the kinetic energy of water as it moves from one elevation through a turbine to a lower elevation. The amount of energy captured by the turbine is dependent on the head (distance the water is falling) and flow rate of the water. Often, the water is raised to a higher potential energy level by blocking its natural flow with a dam. Another method of capturing the kinetic energy is to divert the water of a natural waterway, through a penstock and back to the water. KIUC is most interested in developing such “run-of-river” applications. Other forms of hydro generation include wave, tidal, and pumped storage technologies.

Potential for Kauai and KIUC

Hydro generation is a mature renewable energy technology which can provide competitively priced electricity. Hydro resources on Kauai are very good with consistently heavy rainfall and sharp elevation drops. On the other hand, Kauai stream flows vary considerably throughout the year, making hydro an intermittent, “as available” resource unless dams are utilized.

Kauai currently has seven hydro units (8.9 MW) that were originally installed by the sugar industry. A recent “Renewable Energy Technology Assessment” report for KIUC identified an additional 60 MW or 320 GWh of hydro potential. However, social opposition, environmental concerns, and access issues make some of this potential undevelopable.

Cost

The capital costs for a typical hydro plant is between \$1,700 - \$5,700/kW. The capital costs vary widely due to site-specific requirements for penstocks and civil works. The levelized cost of electricity is between 3.6 – 10.9¢/kW.

Advantages and Disadvantages

Advantages

- mature, proven technology
- less expensive than conventional generation
- no emissions
- good potential on Kauai

Disadvantages

- environmental impact due to dams and diversions
- “run-of-river” facilities are intermittent and require storage or backup generation
- significant public opposition due to environmental, cultural, and tourism concerns