

Small Hydropower Case Study

Town of Basalt Small Hydro Project

Summary

The Town of Basalt built a 40 kW hydro system utilizing water delivered to the Town's water treatment plant which will generate an estimated 300,000 kWh annually. The project was funded through a grant from the Colorado Energy Office as well as an innovative energy pre-purchase agreement with the local electric utility, Holy Cross Energy. Holy Cross Energy provided \$300,000 to the Town to pay for project construction in return for a future repayment of 6,000,000 kWh from the project.

Background

The Town of Basalt is a small mountain community located between Carbondale and Aspen. Basalt began looking into its hydro potential due to its environmentally conscious citizenry with a long standing desire to develop the area's rich hydro potential. Basalt's Green Team, a committee of residents and elected officials, started exploring the idea of small hydro -- eventually leading to the decision to install a small hydropower project utilizing flow from two nearby springs being piped down to the town's water treatment plant.



Project Design and Technical Details

The project has a generating capacity of 40kW, generating an estimated 300,000 kWh annually at full capacity. The project utilizes water from two springs -- Basalt Springs and Luchsinger Springs -- and does not affect any stream flow. Through pipeline improvements -- including slip-lining, valving and installations of ductile iron piping -- the springs provide the needed flow for a small hydro project totaling approximately 2.0 cfs. The piping provides approximately 345 feet of head, yielding net pressure at the turbine of 140 to 160 psi. Based on the head and flow, a constant flow variable speed turbine was selected. The project construction timeline was approximately one year.

Two different factors drove decisions regarding the siting of the project: a desire to minimize the visual impact of the structure, and powerhouse placement to ensure maximum generating capacity.

The expected lifetime of the powerhouse building is 100 years and 20 years for the mechanical equipment and controls equipment.

The Town enlisted the assistance of an outside consulting firm with experience in the design and development of similar projects. The turbine, generator and controls for the project were provided by Canyon Hydro. The equipment has been working without difficulty since project commissioning.

The town installed equipment at the powerhouse to provide warning notification of problems, providing added safety to both equipment and people. Project monitoring is tied into some of the same monitoring equipment as is used for the water filtration plant in order to lower monitoring costs.

Challenges

The biggest challenge to the project has been related to water rights, which has inhibited the project from operating at full capacity, yielding reduced annual estimated generation of 175,000 kWh. The Town is pursuing additional water rights.

Project Economics

The hydro project cost was approximately \$207,000 which included ancillary work; however this cost does not include pipeline work to accommodate the pressures necessary to support the hydro, although the pipeline work would probably need to have been done anyway related to the town's water supply needs. The total costs for the project, including both the pipeline work (much of which was necessary regardless of hydro generation) as well as the hydro equipment, was approximately \$394,000.



Financing for the project was provided by Holy Cross Energy and the Colorado Energy Office.

The Colorado Energy Office supplied the project with \$119,000 in ARRA (federal stimulus) grant funds. Holy Cross agreed to finance up to \$300,000 which was scheduled to be repaid through the electrical generation of the plant, estimated at 6,000,000 kWh (for a Holy Cross Energy loan of \$300,000). Electricity generated by the project is being used to pay down what is effectively a no interest loan provided by Holy Cross Energy. By having Holy Cross supply the needed money for the project's upfront construction costs, the Town avoided taking out a loan, avoiding years of loan interest payments, ultimately saving approximately \$60,000 in interest payments (assuming a 20

year loan at 2%). The project's generated electricity will be provided to Holy Cross until the initial \$300,000 is paid off, after which point the Town will retain the revenue from electricity generated by the project.

The expected payback period involved several varying factors, including annual operations and maintenance costs of approximately \$1500 annually. At maximum production, the plant is expected to generate 300,000 kilowatt hours annually. At a power purchase rate of \$.08 per kilowatt hour, revenue is approximately \$24,000 per year, yielding a payback of about 11.4 years -- a best case scenario based upon maximum annual generation. The Town anticipates that the actual payback period may be closer 20 years based upon annual generation of 175,000 kWh.

Lessons Learned

Perhaps the most important part of the success of the project was the town's partnership with Holy Cross Energy -- without whose assistance the town probably could not have completed the project -- underscoring the importance of effective partnerships to project success. In addition to Holy Cross Energy and Colorado Energy Office, additional project partners included Boundaries Unlimited, Western Pipeway, Teagle Excavating and Martinez Western Construction.

One of the principal project barriers was federal permitting. Basalt's project moved through the FERC permitting process with extensive assistance from the Colorado Energy Office FERC streamlining program. However, based upon the town's experience with the costs and time required to comply with FERC requirements, the town has decided that it would best to wait until pending federal small hydro permitting reform legislation becomes law before seeking to proceed with any additional small hydro projects.