

Ruthie Brown installed a small hydro system near the base of Humphrey's Ranch Dam near Creede, Colo. Such projects are attracting the attention of policymakers.

Big Potential for Small Hydro

With its large untapped capacity, small hydro is attracting policymakers' attention as a job-growth opportunity.

By **KURT JOHNSON**

In 1923, Colorado industrialist A.E. Humphreys built a 90-foot-tall (27-meter-tall) concrete arch dam on his ranch outside of Creede. Almost 90 years later, his great-granddaughter, Ruthie Brown, realized that the dam created a perfect opportunity for small hydro. With support from a U.S. Department of Agriculture grant, construction on a 310-kilowatt (kW) hydro plant was completed last July.

There is no standard definition of what constitutes "small hydro," although the word "small" is sometimes used as a proxy for "environmentally preferable." Small-hydro installations are typically either run-of-river (diverting a small percentage of a stream for hydro generation) or take advantage of existing infrastructure, including dams, pipelines and irrigation canals.

The Low Impact Hydro Institute has certified a wide range of project sizes, reflecting the fact that project capacity size is not a reliable indicator of environmental impact.

Small hydropower is not a new idea. In 1891, the Ames Hydroelectric Generating Plant near Telluride, Colo., went online with engineering by Nikola Tesla. The 3.5-megawatt (MW) Ames plant was the world's first power plant to generate, transmit and sell alternating-current electricity for commercial purposes. In 2010, the Federal Energy Regulatory Commission (FERC) re-licensed the Ames plant, granting the 119-year-old plant another 40 years of operation.

Mountain communities where hydro once was the only local source of electricity are taking another look at the resource. The city of Aspen,



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Small hydro projects typically take advantage of existing infrastructure to minimize environmental impact. Last March, the Bureau of Reclamation released an assessment of hydro potential at dams built by Reclamation. It is completing a similar assessment of Reclamation-owned canals.

Colo., is working to return to service its 1-MW Castle Creek Hydro Plant, which was decommissioned in 1962.

Bob Risch, mayor of the mountain community of Ouray, Colo., realized that an abandoned water supply pipeline created an opportunity to save money for the city and offset the electricity load for the city-owned Hot Springs Pools. With a grant from the Colorado Governor's Energy Office, in 2010 Ouray completed installation of a 20-kW hydro system.

For many mountain towns, the municipal water system consists of a pipeline high up a mountainside that carries water down to a water treatment plant. The water system typically must install pressure-reducing valves that can sometimes be profitably retrofitted with small hydro.

In addition to existing dams and pipelines, irrigation ditches and canals can be retrofitted with hydro, although there has not yet been a comprehensive national study of untapped hydro potential of canals. The Bureau of Reclamation is completing an assessment of hydro potential in Reclamation-owned canals.

Assessing the Untapped Resource

For many years, conventional wisdom held that hydropower was tapped out in terms of opportunities for new development. Under the Bush administration, hydropower was zeroed out from the U.S. Department of Energy's (DOE's) budget.

The Obama administration has taken a fresh look at developing hydro resources — seeking

to expand what is already the nation's largest renewable resource. Hydropower provides about 7 percent of the nation's electricity, accounting for roughly 65 percent of the nation's renewable energy generation. Current U.S. hydro generating capacity is approximately 100,000 MW.

Updated hydro resource assessments from the DOE and the Bureau of Reclamation have identified thousands of megawatts of additional, economically feasible, untapped hydro resources. A Navigant Consulting study commissioned by the National Hydropower Association found that, with the right policies, the U.S. hydropower industry could add about 60,000 MW of new hydro capacity by installing more efficient turbines at existing hydro sites, increasing the use of pumped storage projects, encouraging run-of-river projects, employing new marine and hydrokinetic technologies and developing new hydro at existing dams. Nationwide, there are approximately 80,000 dams, only about 3 percent of which currently include hydro. Pumped storage is getting increasing attention as an opportunity to "firm up" generation from intermittent renewable sources.

Hydro has managed to avoid the excessive partisanship in Washington, D.C. Sen. Lisa Murkowski (R-Alaska) introduced S. 629, the comprehensive Hydropower Improvement Act, with bipartisan co-sponsorship last spring.

Cutting Regulatory Red Tape

One of the biggest barriers to small hydro development has been federal permitting requirements. Under the Federal Power Act, grid-connected small hydropower projects are subject to permitting requirements that can be particularly onerous for small projects.

In December 2009, FERC held a public conference to solicit input from small-hydro developers about how to make the permitting process easier. FERC subsequently published updated small-hydro permitting information on its website, including templates to simplify the process.

In August 2010, the state of Colorado announced a memorandum of understanding with FERC. The Colorado Governor's Energy Office is simplifying permitting for "incidental hydro," which takes advantage of existing infrastructure such as pipelines. Eligible projects for the program must qualify for a Conduit Exemption or a 5-MW Exemption under FERC's guidelines.

The first hydro project approved by FERC under the new program was announced in Sep-



Mountain communities where hydro once was the only local source of electricity are taking another look at it. To offset its electric load, the city of Ouray, Colo., installed a 20-kilowatt Pelton turbine that uses water from an abandoned water supply pipeline.

tember, prompting praise from both FERC and the hydropower industry.

The Colorado program is expected to end in 2012 after 20 projects have completed the FERC process.

Some legislators are working to remove small hydro projects from FERC jurisdiction. Last February, U.S. Rep. Adrian Smith (R-Neb.) introduced HR 795, legislation to exempt projects smaller than 1.5 MW from FERC jurisdiction. In September, U.S. Rep. Scott Tipton (R-Colo.) introduced HR 2842, legislation to authorize all Bureau of Reclamation conduit facilities for hydropower development under Bureau of Reclamation, not FERC, permitting guidelines. In December, Reps. Cathy McMorris Rodgers (R-Wash.) and Diana DeGette (D-Colo.) introduced H.R. 3680, the Hydropower Regulatory Efficiency Act of 2011, legislation which would remove FERC jurisdiction from hydro projects under 5 megawatts that utilize existing conduits.

Making the Economics Work

Another barrier to small hydro development has been securing an attractive power purchase agreement with the local utility.



States offer various financing incentives for small hydro. In Colorado, Tri-County Water Conservancy District has been approved to receive 2 percent loan financing from state agencies to support construction of a 7-megawatt hydro project at Ridgway Dam.

In many states, utilities are required by law to offer net metering, allowing project owners to receive the full retail value of the energy they generate in order to offset their on-site electricity consumption. Many hydro sites, however, are located in remote areas without an adjacent electricity load to offset.

Even in states that have a renewable portfolio standard (RPS), if utilities can meet their RPS requirements entirely with utility-scale renewable generation, there may be little incentive for utilities to simplify interconnection for small hydro projects.

This barrier is readily overcome where there is a feed-in tariff. In California, for example, small (less than 1.5 MW) renewable generators, including hydro in Pacific Gas & Electric service territory, are eligible for feed-in tariff payments. The amount of the payment depends on the "market price referent" as determined by the California Public Utilities Commission. For example, the 2012 baseload rate for a 10-year contract is 9.2 cents per kilowatt-hour. The base payment amount is also adjusted by a time-of-day factor to reflect the fact that electricity produced during peak times is more valuable. The feed-in tariff is offered on a first come, first served basis that expires when the allocated

amount of available generation capacity has been reached.

Project financing is another obstacle to development. Hydro, like other renewable energy sources, benefits from federal tax incentives, though these are subject to congressional reauthorization or expiration. States also offer various financing incentives. Colorado, for example, has low-interest (2 percent) loan funding available to support hydro project construction.

Creating Jobs

Small hydro has the potential to create jobs. In a study done for the National Hydropower Association, Navigant Consulting estimated that for every megawatt of new small hydro installed at existing dams without hydro, 5.3 jobs are created (including direct, indirect and induced jobs).

Jobs in hydro development typically include not only product manufacturing but also jobs for project managers, engineers, lawyers and environmental analysts, as well as construction jobs for welders, plumbers, electricians and carpenters and operations and maintenance jobs.

With continuing support from federal and state policymakers, small hydro is poised for growth, creating jobs and accelerating rural economic development. **ST**