

Case Study: Energy-Saving Technology

Solving Problems with Photovoltaic Water Pumping

Some Oregon ranchers have found that solar-powered water pumping is a cost-effective way to give their cattle a drink.

Skinner Ranches Inc. in Jordan Valley, for example, needed power at a remote well to water cattle. A feasibility study showed a solar photovoltaic (PV) system to be cheaper over its lifetime than running a power line to the well or installing a generator. The system was even cheaper with a 35 percent Business Energy Tax Credit offered by the Oregon Office of Energy.

Other ranchers are discovering that PV systems, which use silicon panels to convert sunlight to electricity, have benefits beyond being cost-effective and reducing fossil fuel use. They can serve as creative solutions to challenges a ranch may have because of its location or land base.

TROMP VAN HOLST: KEEPING STREAMS CLEAN WITH PV

THE PROBLEM

Martin and Melanie Tromp van Holst are Cove-area cattle ranchers in eastern Oregon concerned about water quality. They knew that using a PV water-pumping system to keep cattle out of streams would protect riparian zones, helping to keep soil, vegetation and fish habitat healthy. But they wondered whether solar power would also be a cost-effective solution for keeping polluted groundwater out of streams. Groundwater contaminated with fertilizer nitrates flows from nearby property onto the Tromp van Holst ranch and into the Grande Ronde River. The family wanted to use PV pumping to grow a forest that would serve two purposes: be a marketable crop and soak up the nitrates and other nutrients before they reached the river.

THE SOLUTION

The Tromp van Holsts planted several acres of fast-growing hybrid poplar saplings that could serve as a buffer between the



Photovoltaic-powered drip irrigation system

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polluted groundwater and the river. The Tromp van Holsts needed to irrigate the poplars with river water. They chose a 240-watt PV system to power a pump capable of distributing about 270 gallons of water per hour through a drip irrigation system. The PV system was estimated to be cheaper than either a power line extension or a generator.*

THE RESULT

The Tromp van Holsts' 14-year-old son manages the tree plantation and the PV system. The family is finding the PV system to be reliable, cost-effective and low-maintenance. Once the trees are established, the portable PV system can be moved to help start another plantation. When the trees are mature, researchers will determine how the poplars soaked up nitrates and other nutrients from the groundwater. The Tromp van Holsts plan to sell the mature trees for firewood to help pay for their son's college education.

HOTCHKISS RANCHES: A FRAGILE ECOSYSTEM

THE PROBLEM

Before Mark and Susan Doverspike installed a PV system, thousands of remote arid acres went under-used at Hotchkiss Ranches, their fourth-generation ranch in Burns. The problem was too little accessible water for 500 head of cattle, despite a wetland spring in the area. The spring had been fenced off because cattle overused the wetland when they came to drink. The Doverspikes wanted to pump water from the spring to cattle troughs in a less sensitive area three-quarters of a mile away (and 40 feet higher in elevation).

STATE TAX CREDIT FOR PHOTOVOLTAIC WATER PUMPING SYSTEMS

The state of Oregon provides a tax credit for businesses that invest in energy conservation, recycling, renewable energy resources and less-polluting transportation fuels. PV water pumping systems and irrigation efficiency improvements qualify.

The tax credit is 35 percent of eligible project costs — the incremental cost of the system or equipment that's beyond standard practice. You take the tax credit over five years: 10 percent in the first and second years and 5 percent each year thereafter.

THE SOLUTION

Extending a power line six miles to the spring would cost about \$60,000 up-front and \$500 in annual maintenance. The 160-watt PV system they installed instead cost only \$2,800. Maintenance costs are less with the PV system, too, and there are no electricity bills. Gas and diesel generators also would have been more expensive over the equipment's lifetime than a PV system (see table on next page).

THE RESULT

The PV system at the Doverspikes' ranch is designed for a maximum pumping rate of 3.5 gallons per minute. Floats on the troughs monitor water level, keeping them from overflowing. The Doverspikes worried that



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Ranch owner Mark Doverspike (right) and Justin Klure, Oregon Office of Energy, by the pump and wetland spring that provide water for 500 head of cattle at Hotchkiss Ranches, near Burns.

*Because this was a demonstration project, most of the materials and labor were donated by the Oregon Office of Energy, Oregon Department of Environmental Quality, Oregon Department of Forestry and Oregon State University Extension Service.

vandals might use their solar panels for target practice, but no problems have occurred. Even if someone had shot the panels, the Doverspikes chose a model designed to withstand such vandalism.

The system provided an added bonus beyond cost savings and habitat protection: The PV pumping system provides a water source for elk and other wildlife that also drink from the troughs.



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A photovoltaic system at Hotchkiss Ranches

COST COMPARISONS — 160-WATT SYSTEM FOR HOTCHKISS RANCHES

	Line Extension	Gas Generator	PV System
Installed costs	\$60,000 (6 miles)	\$1,300	\$2,800
Equipment life	30 years	15 years	20 years
Annual costs			
Maintenance	\$500	\$100	\$25
Energy cost	\$32 (\$.045/kWh)	<u>220</u> (180 gal. x \$1.20)	<u>0</u>
Total operating cost	\$532	\$320	\$25

PV System Savings and Payback (compared with gas)

Additional cost of PV system	\$1,500
Oregon Office of Energy rebate	\$100*
35% state Business Energy Tax Credit	\$490**
Additional cost after rebate and tax credit	\$910
Yearly cost savings on maintenance and fuel	\$295
Simple payback (\$910/\$295)	3 years

*While funds last, a \$100 state rebate is available if the PV system costs less than a power line extension.

**Typical tax credit for a project with an incremental cost of \$1,500. Hotchkiss Ranches did not receive a tax credit or state rebate because the Oregon Office of Energy paid for the PV system as a demonstration project.



Photovoltaic Water Pumping Systems

OREGON OFFICE OF ENERGY

The Oregon Office of Energy offers a 35 percent Business Energy Tax Credit for PV water pumping systems and irrigation efficiency improvements, among other energy-saving projects. While funds last, a \$100 state rebate is available if the PV system costs less than a power line extension.

Phone: 1-800-221-8035 (toll-free in Oregon) or 503-378-4040

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SANDIA NATIONAL LABORATORIES

Sandia's Photovoltaic Systems Assistance Center distributes publications on PV systems and their applications.

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IDAHO POWER

Idaho Power offers financial and technical advice for any type of renewable energy system, including photovoltaic systems.

Phone: 208-388-2200

OREGON STATE UNIVERSITY EXTENSION ENERGY PROGRAM

Energy agents provide information about PV water pumping systems.

Eastern Oregon: 541-963-1010

Southern Oregon: 541-776-7371

Central Oregon: 541-548-6088

TO LOCATE PV EQUIPMENT SUPPLIERS:

Solar Energy Industries Association

122 C St. NW, Fourth Floor

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202-383-2600