



Cattle Producer's Handbook

Range and Pasture Section

541

Solar Stockwater Systems

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Supplying adequate amounts of water for livestock at a reasonable price is a problem facing nearly all western ranchers. Inadequate water facilities is the number one cost associated with grazing on public lands. Inadequate and too few water developments is the main reason for poor distribution of cattle, uneven utilization of rangelands, and over utilization of riparian areas.

Most water developments on western rangelands are located away from reliable power sources. Ranchers have turned to windmills and labor intensive systems for pumping water, such as gas powered pumpjacks. Photovoltaic pumping systems are now an economical alternative for pumping stockwater on western ranges.

This fact sheet examines the use of photovoltaics technology, solar pumping system components, advantages of solar pumping, and how to choose and design a solar pumping system. Cost of pumping livestock water for shallow, moderate, and deep wells are variable (Balliette and Garrett 1990).

Photovoltaic Technology

(Photovoltaic) PV panels provide electricity directly from sunlight, with no moving parts. They provide modest amounts of cost-effective power, beyond the reach of utility lines. Hundreds of thousands of PV systems are used to provide electrical power in applications as varied as marine navigation buoys, mountaintop radio repeaters, pipeline and utility monitoring, electric fences, signs and yard lighting, boats, RV's, cabins, remote-site homes, and water wells.

Before 1980, high prices and lower efficiency of PV panels restricted their use primarily to the aerospace industry. Since then, technical advances and mass-production have brought PV prices down and improved efficiency.

At the heart of the technology is the solar cell made of silicon. Silicon is an inert dark-blue mineral, refined from sand. Sunlight causes electrons to jump from the negative to the positive side of the cell, generating electric power.

Solar cells are assembled into small panels called modules. A typical PV module consists of 36 cells, wired in rows behind a sheet of high-strength tempered glass. This laminated assembly is sealed weather-tight in an aluminum frame. For most stockwater pumping applications, a typical PV module is 5 square feet in size, weighs 14 pounds, and produces 50 watts of DC power at 15 volts.

The modules are assembled into a PV array by bolting them to a metal frame and wiring them together to obtain the desired voltage and current. An array of 10 50-watt PV modules can run a 1/2 horsepower DC or AC (with an inverter) electric motor.

Most PV modules use crystalline silicon solar cells, which have been in use since 1955. They have never been known to wear out. They resist hail storms and the most extreme climates on earth. Most have a 10-year warranty. Failures are exceedingly rare. Solar electricity, in terms of modules, is a one-time investment with a lifetime of return!

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