

Solar Water Pump Installation



Solar water pumping is the process of pumping water with the use of power generated by sunlight. Solar pumping systems are reliable stand-alone systems that require no fuel and very little attention. Solar panels generate maximum power in full sun conditions when larger quantities of water are typically needed.

Panels

This demonstration unit has two 85 watt panels to convert the solar energy into electrical energy. In this system it is the only energy. No batteries are attached. They normally carry a 25-year warranty.

Sun Tracker

Some systems use a tracker to follow the sun to increase the solar panel efficiency. Some systems have passive tracking, meaning they take no power from the system, operating from the heat of the sun striking the frame members. The frame member is warmed causing the freon inside to move from one cylinder to the other as it follows the sun's heat. The tracker allows the system to pump an estimated 30-40% more water during the summer. It likely increases the pumping in the early parts of the morning and the late afternoon. Cost for trackers is estimated at \$500-600.

The trackers come with a 10-year warranty.

The system demonstrated here uses panels with more wattage and does not use the tracker.

Controller

This electronic "magic" box converts the variable energy from the solar panel to the constant voltage for the pump. The controller includes a pump speed control circuit, a remote switch circuit, a sensorless low-water cut-off circuit, an electronic circuit breaker, and indicator lights.

Pump

This is the part that does the actual pumping of the water. It is a diaphragm pump, meaning that the pump works on a positive displacement process. The pump has the capacity to pump water to greater height (greater head) without much decrease in volume. Pumping to greater height does require more energy from the solar panel. This pump has the capacity to pump to 100 ft of head (43 psi).

Do I need a water storage tank?

Storing water in a cistern or tank has many advantages. It's less expensive, more trouble-free, and more efficient than storing power in batteries. Since water is always a critical issue, it is

recommended that the tank should be able to store a minimum of 3-6 days worth of water or whatever is necessary during cloudy weather or in case of a system failure.

Generally speaking, animals, plants, and humans use less water on cloudy days. Conversely, the sunniest days are when water consumption is highest and when the solar panels are providing the pump with the most power.

Should I use batteries in my solar pumping system?

While batteries may seem like a good idea, they have a number of disadvantages in pumping systems. First, they reduce the efficiency of the overall system. Second, they are another source of problems and maintenance. Third, they add cost to the system.

Solar pump system suppliers indicate livestock producers should "store water and not power when possible and you will have much better performance and reliability with your solar pumping system."

Solar pump system costs (for demonstration unit)

Item	Description	Cost
Photovoltaic panels	2 85-watt panels	\$470
Fixed rack	DP-TPM2 Solarland 85	\$205
Controller	Solarjack PCA 30-M1D	\$275
Pump wire	10-2 w/grn	\$155
MC4 interconnect		\$38
Pump	SunPumps SDS-Q-130	\$976
Freight		\$155
Total		\$2274
<i>Prices from April 2012</i>		

Sunpumps: diaphragm pump, brass and stainless steel, with brushes, design for shallow well; air filled motor cavity; DC power only.

Grundfos: Sqflex pumps, CU200 controller, pole mount, solar panels, \$3152. Helical rotor pump, stainless steel, brushless, design for deep wells; oil filled motor cavity for lubrication and heat dissipation; AC or DC powered.



Solar Pumping System options

When wishing to have a **pressurized water system**, the following items are effective:

- 2 gallon pressure tank (\$40)
- pressure switch, preset at 15-30 psi or less (\$15)
- pressure gauge (\$7)
- check valve (\$7)

With all other connections and adapters, the system will cost about \$100 total.

Any **float valve** can work. The Hudson float valve (\$30) has been effective. When wanting to store energy to be used at night or during cloudy weather, batteries are required. This system requires 24-volt DC. Use two 12-volt marine-type deep cycle batteries (\$65 each). Include a charge regulator when using storage batteries. A Morningstar SS-10L-24V (\$65) has been effective.

Eastern Kansas dealers

Sun Pumps	Safford, AZ	800-370-8115 www.sunpumps.com
Panhandle Sales & Service	Beaver, OK	580-525-1919 580-646-9011 www.solarwellpumps.com
Solar Water Technologies, Inc	Kerrville, TX	800-952-7221 www.solarwater.com
Robinson Solar System	Canton, OK	866-519-7892 www.solarpumps.com
Oak Grove Fabrications	Alta Vista, KS	785-499-5311
Lyman, Inc.	Medicine Lodge, KS	620-886-5731
Preferred Pump	Wichita, KS	888-669-9897 620-960-7344

Figure 1. Solar pump demonstration unit.

Bison: BSP pump, SPC Controller, pole mount, solar panels, \$2425. Helical rotor pump, stainless steel, brushless, design for deep wells; oil filled motor cavity for lubrication and heat dissipation; AC or DC powered.

How much water can a solar pump supply?

These Sunpumps can pump at the rate 4–5 gallon per minute in full sun for about 2000 gallon per day. The maximum head of water is 100 ft, or 43 psi; a slower rate pump can pump up to 200 ft head, or 86 psi.

The Grunfos and Bison pumps can pump similar gallons with the same wattage of panels, these pumps have the capability to pump 300+ ft head.

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An electronic version of this pump system publication is available at https://www.kcare.k-state.edu/documents/2015_solar_pump_information.pdf

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