Solar Water Pumps

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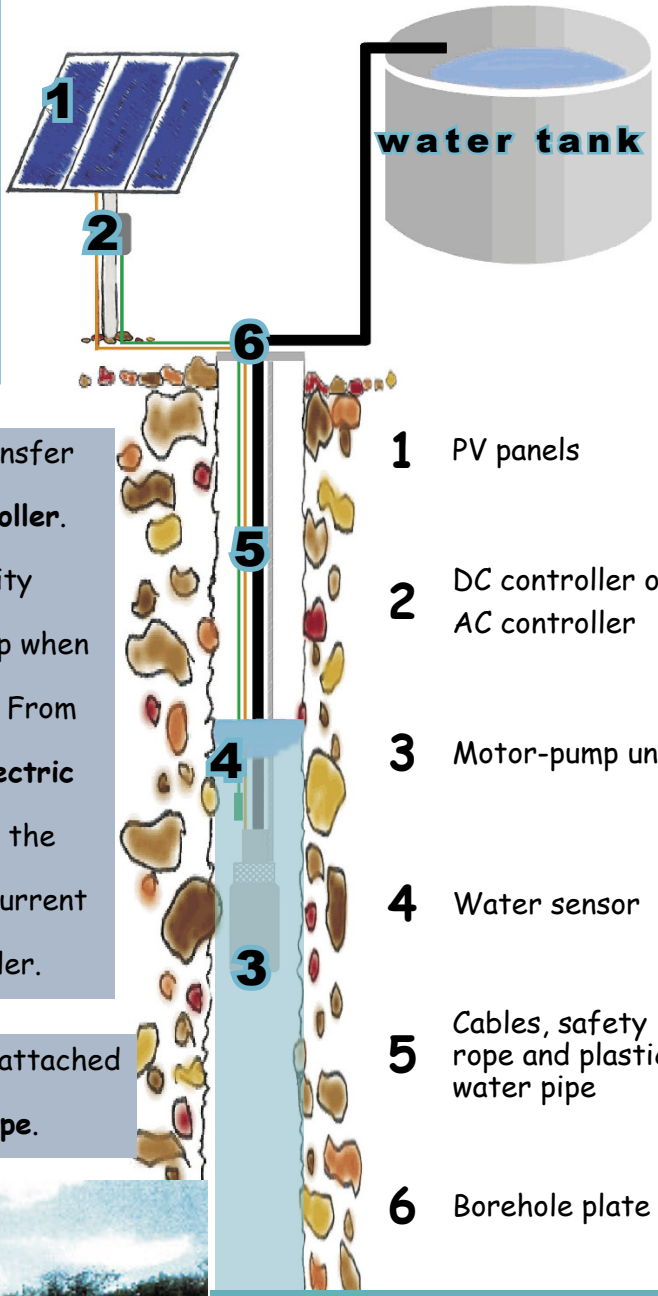
Also called a photo-voltaic pump (PVP), solar water pumps are a viable alternative to diesel water pumps.
A solar water pump's daily water delivery depends on the amount of PV panels installed and the depth of the water level and the height of the water storage tank (the depth and height added together are referred to as "total pumping head").

A **solar panel** also called photo-voltaic (PV) panel, turns sunlight into direct current (DC) electricity. Electricity produced by a PV panel is measured in Watt (W). PV panels come in different sizes. The more PV panels are connected together, the more electricity is produced, e.g. two 50W PV panels give you 100W of electricity. Good quality PV panels have a 25-year warranty.



1 PV panels

2 DC controller or AC controller

3 Motor-pump unit

4 Water sensor

5 Cables, safety rope and plastic water pipe

6 Borehole plate

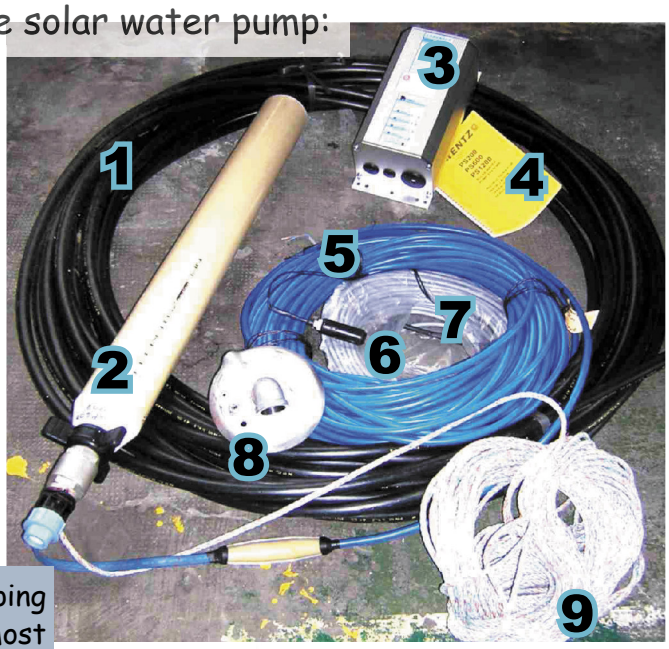
Electric cables inter-connect the PV panels and transfer electricity to the solar water pump through a **controller**. The controller regulates and stabilises the electricity from the PV panels and can also switch off the pump when there is no water (with the help of a water sensor). From the controller, the **electric cable** connects to an **electric submersible pump** installed below the water level in the borehole. Some solar water pumps use alternating current (AC), in which case an inverter replaces the controller.

The submersible pump hangs in the borehole and is attached to a **plastic pipe**, the electric cable and a **safety rope**.

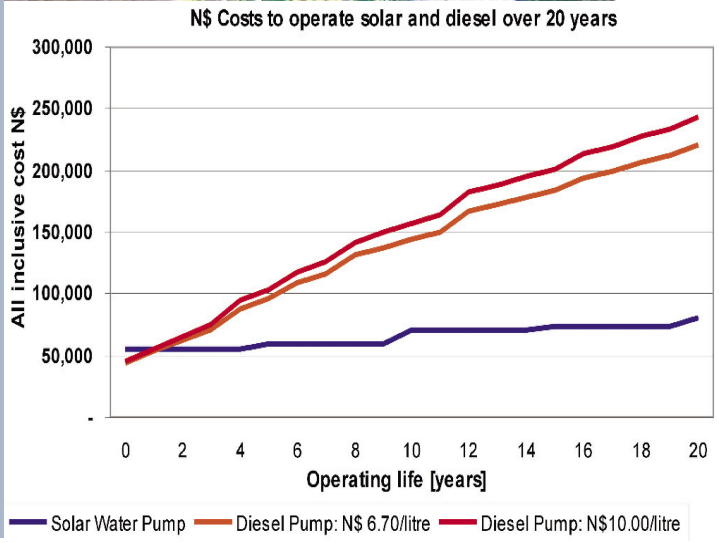
Submersible solar pumps are not the only type of solar water pumping technology. Other technologies are also common and some, like the JUWA Solar Water Pump was even manufactured in Namibia.

Typical components of a submersible solar water pump:

1. HDPE water pipe
2. Submersible pump in a stilling tube
3. Controller
4. User manual
5. Submersible cable
6. Water sensor
7. Water sensor cable
8. Borehole plate with elbow pipe fitting
9. Polypropylene safety rope



In order to decide which type of water pumping technology is most appropriate and most economically viable, it is advisable to use the **Life Cycle Costing** (LCC) concept.
LCC calculates the initial capital costs and the long-term operating costs. The right hand graph shows a Life Cycle Cost comparison between a diesel water pump (at different fuel prices) and a solar water pump. The comparison is calculated for a total head of 50 m and 10,000 litres per day.
The graph shows that over 20 years a diesel pump will have accumulated total costs of over N$ 200,000. Over the same period the total costs for the solar water pump is only about N$ 80,000.



The table shows under which depth and daily water delivery solar water pumps are most ideal compared to a diesel pump. The numbers in the table show the years after whoich the solar pump has recovered its intial capital costs. This pay-back period is called the **amortisation period**.

Depth	Daily volume flow [m³/day]						
[m]	3	6	8	12	20	40	60
40	0.0	0.0	0.3	0.4	1.2	4.4	4.7
80	0.0	1.1	1.9	2.2	5.0	6.6	6.6
120	0.0	2.0	3.5	6.1	6.8	Diesel	Diesel
160	0.0	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
200	0.0	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel

m^3

Cubic meters (m^3) indicate 1,000 litres of water. The table shows the daily drinking water requirements of different users. This can be used as the basis to calculate the total water requirements.

Cattle:	45 litres
Goats:	5 litres
Sheep:	5 litres
Pigs:	5 litres
Ostrich:	2 litres
Game:	15 litres
Humans:	20 litres
Elephant	300 litres

Additional Information

http://en.wikipedia.org/wiki/Solar_energy

http://www.pvsolarpumps.com/

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