

## Technology Data Sheet

# Solar Water Pumping

Solar water pumping systems are a practical and affordable solution used to solve water shortage problems. Due to rolling blackout and the constantly rising cost of fuel, pumping of water from surface water and groundwater wells has become extremely difficult for farmers and other water users. Solar powered systems are proven as an affordable alternative pumping system for individual farmers and enterprises.

Solar water pumping systems use photovoltaic (PV) cells to power DC pumps. DC pumps require considerably lower power than conventional AC pumps and provide greater efficiency. Solar systems only operate during daylight hours and the water pumped out must be stored in a storage tank for use 24 hours per day, to ensure constant availability of water. The tank capacity should be designed to allow for rainy or cloudy days (no sun days) when pumping will be limited. The size and dimensions of the storage tank is determined based on the required number of days storage. If large storage tanks are impractical, back up batteries or a petrol generator can also be incorporated in the design to allow for prolonged periods of no sun days that will eventually empty the water storage tank.

### Basic features and benefits of the solar water pumping system:

- Solar pumps operate anywhere the sun shines
- System productivity increases in summer when water requirement is usually greater
- Requires minimal service and maintenance
- Powered by clean, renewable energy
- Is virtually free to operate, compared to the cost of diesel and grid electricity which is constantly increasing
- Solar systems can be easily moved to meet seasonal or variable location needs

### Types of pumps

- **Submersible** – for deep wells
- **Surface** – for shallow wells and surface water like streams, ponds and creeks

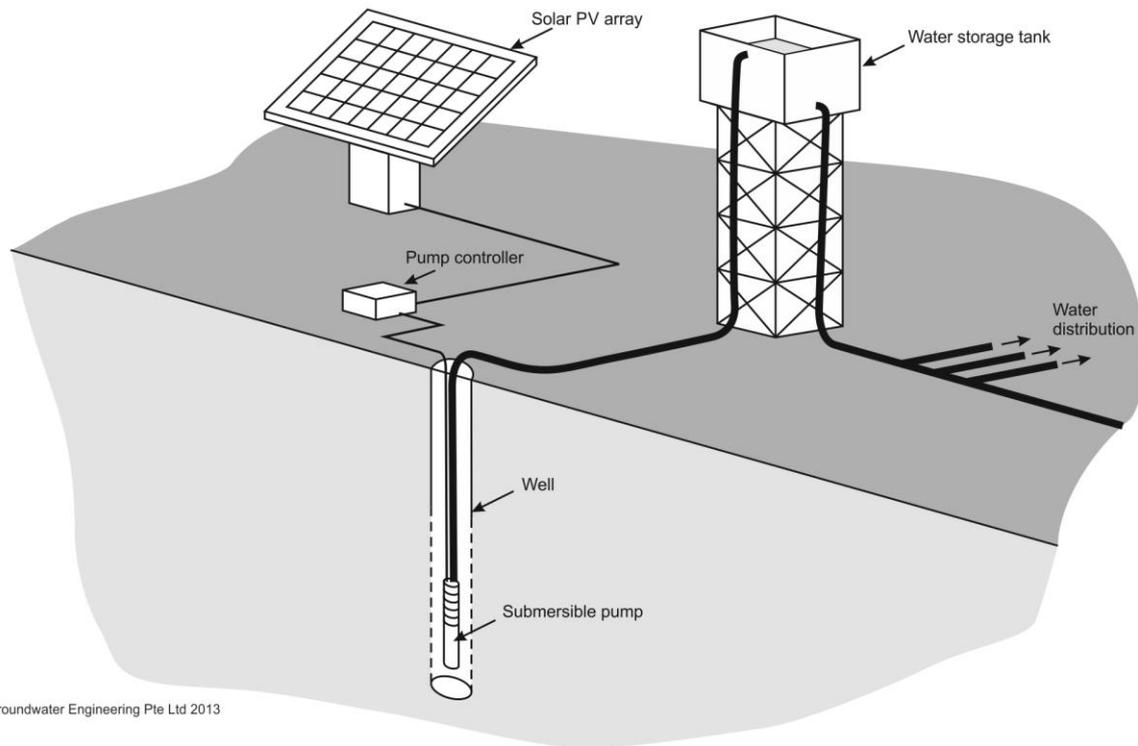
### Applications

- **Livestock** – cattle watering and fish farming
- **Agriculture** – irrigation or crop watering
- **Recreational** – swimming pool circulation pumps; spa
- **Residential** – water supply for drinking or pressure boosting
- **Industrial** – water supply for businesses

Getting the most benefit from solar water pumping systems requires research and design before the first PV module and pump is purchased and installed. Each component must be carefully matched, and proper planning is essential – so the final system will be efficient and reliable system and can function for many years to come.

**Want to find out more? For Further details contact:**

[enquiries@groundwaterinternational.com](mailto:enquiries@groundwaterinternational.com)



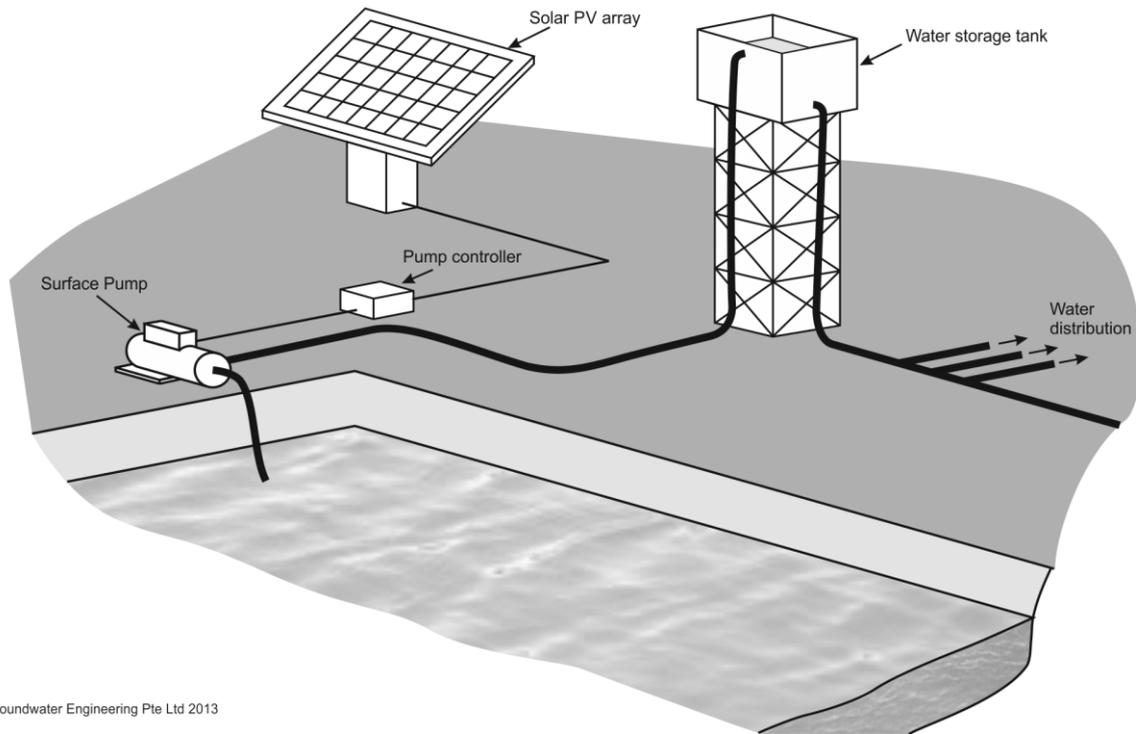
*Example of deep well solar water pumping system*

**Submersible pumps** are used for deeper wells, where surface pumps cannot be used because the water level is too deep below ground level (below approximately 6 meters depth). These pumps are specially designed to have a small outside diameter so they can be suspended below the water level in the well and connected to an output pipe that extends up to the surface. The right pump for each application will depend on the required pumping rates and pumping height and distance.

A submersible pump is usually positioned in a well, although there are instances where a stream or pond is used as the source. Submersible pumps operate differently to surface pumps (which are installed above water level and draw water up from shallow sources) by pushing water up to a holding tank or pressure tank. A correctly sized submersible can pump water out of deep wells, from depths of up to 450 meters. Most models of pump are durable and can tolerate water with relatively high levels of salinity.

There are three main categories of submersible pump — centrifugal, helical rotor, and diaphragm pumps:

- **Centrifugal pumps** have an impeller that spins at high speeds. Because the rate of rotation is high, the flow rate from the pump is generally high. However, the delivery pressure, and therefore the lift (amount of pumping height) that can be attained, is usually lower than in other types of pumps.
- **Helical rotor pumps** are a type of “positive displacement” pump which can achieve higher lifts and also provide a flow rate great enough to meet most demands. Since the water needs to be carried through the pump body, the result is a lower flow compared to centrifugal pumps. However, with its higher pressure, a helical rotor pump can deliver water against higher heads.
- Submersible **diaphragm pumps**, another type of positive displacement pump, can pump up to about 20 liters per minute from shallow wells (less than 30 meters depth), or lower volumes from well depths down to approximately 70 meters. Although these pumps are less expensive than centrifugal or helical rotor pumps, they require significantly more maintenance.



*Example of surface solar water pumping system*

**Surface pumps** are used to move water from sources such as shallow wells, ponds, streams, and tanks, where the pump itself can be located no more than 6 meters above the water level. There are many types of pump available; the choice will depend on how much water per day needs to be moved and the height and distance to the delivery point (such as the storage tank). Pump efficiency and reliability can be improved if suction lift can be minimized to just a few meters.

There are three main categories of surface pumps – delivery, pressure and booster pumps:

- **Delivery pumps** are used to move water from one place to another. Some are capable of high pressure while others are intended mainly for moving large volumes at low pressure.
- **Pressure pumps** are often used for pressurizing small water systems in buildings – homes, schools, businesses or hospitals.
- **Booster pumps** are used to maintain pressure or flow – typically useful in towns or communities with unreliable water pressure particularly at times of high demand.

### Permanent dewatering using solar power

Permanent dewatering pumping is sometimes necessary for structures and buildings. The dewatering pumping system may be part of the structure, such as an under-drain for a deep building basement slab, or in a roadway tunnel may be used to maintain the groundwater below a certain level, for foundation stability.

The sun only shines during the day, and depending on the location, usable sun-hours will vary. Permanent dewatering using solar pumps can offer large savings in electrical cost. Excess power produced during the day can be stored to a battery bank, for use at night or during no sun periods. If net-metering is available at the project location, it may be possible to link an inverter to the system sell excess electricity back to the AC utility grid.



## COMPANY PROFILE

Groundwater Engineering is an international company specializing in dewatering, groundwater control and water well engineering for clients in the construction, mining and oil & gas industries. Backed by decades of industry experience and technical expertise we are committed to providing our clients with high quality and cost-effective solutions to their groundwater problems.

We pride ourselves on providing safe, technically sound and environmentally sensitive designs, and delivering them in the field, on time and on budget. Our teams combine geotechnical, hydrogeological, engineering and construction management skills, a strong supply chain, quality equipment and materials and skilled operatives to meet our client's needs.

### Contracting

Groundwater Engineering provides a specialist contracting and construction service to design, install, commission, operate and maintain specialist groundwater, geotechnical and water supply systems, including:

- Construction dewatering and groundwater control
- Mine dewatering
- Water wells and water supply
- Geothermal systems

### Consultancy

Groundwater Engineering offers a comprehensive design and consultancy service in the dewatering, groundwater control, water well, geothermal and groundwater remediation markets. We are able to provide robust, cost effective designs, and to innovate where it will benefit our clients.

### Equipment sales and rental

Groundwater Engineering sells and rents a wide range of materials and equipment in the dewatering and water well fields:

- Dewatering pumps and equipment
- Pipework and pump controls
- Water well materials and pumps
- Well rehabilitation supplies

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