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Frequently Asked Questions on **Solar Powered Irrigation Pumps**



Published by:

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Photo Credits: Enrico Fabian, PricewaterhouseCoopers Pvt. Ltd, Nilanjan Ghose, Jitesh Kumar

Editing, Layout and Design: Rouge Communications

Partners: PricewaterhouseCoopers Pvt. Ltd. (PwC India)

Acknowledgement: GIZ is extremely grateful to PwC India for assisting us in designing and developing the frequently asked questions (FAQs) on solar powered irrigation pumps. GIZ would like to acknowledge the support and cooperation of different institutions and individuals who made significant contributions by way of valuable knowledge inputs at various stages of preparation of this document. We would like to acknowledge the kind contributions from the members of Vaishali Area Small Farmers Association (VASFA), Claro Energy Pvt. Ltd., Shakti Pumps (I) Ltd., Tata Power Solar Systems Ltd., Franklin Electric India Pvt. Ltd., Mass Solar Technologies Pvt. Ltd., Sun Urja, Surya Kiran Technologies Inc., Atom Solar Pvt. Ltd., Mr. Thomas Pullankev, Mr. Hari Natarajan, Dr. Indradip Mitra, Mr. Santosh Kumar Singh, Ms Annette von Lossau, Ms. Laura Jakobeit and Mr. Caspar Priesemann. We are also grateful to the Ministry of New and Renewable Energy (MNRE) and Bihar Renewable Energy Development Agency (BREDA) for their support and cooperation.



Frequently Asked Questions on Solar Powered Irrigation Pumps





A photograph of a solar-powered irrigation pump structure. The structure is made of metal and is mounted on a concrete base. It is situated in a rural area with a field of yellow flowers in the background. The sky is clear and blue. The pump structure is the central focus of the image, with its metal frame and concrete base clearly visible. The background shows a lush green field with yellow flowers, likely a mustard field, under a clear blue sky. The overall scene is bright and sunny, suggesting a rural agricultural setting.

Background

The market for solar energy powered pumps for irrigation in India is at present primarily dependent on government subsidies. With the removal of government subsidies from diesel and petrol, reduction in the global price for solar panels and the promotion of access to end user financing through banks, there is a high potential for a market-based approach for promotion of solar powered irrigation systems. "Indo-German Energy Programme- Access to Energy in Rural Areas" of GIZ India aims to create an enabling market environment for increased adoption of solar powered irrigation systems by addressing some of the key challenges affecting market growth.

Why have we prepared the frequently asked questions (FAQs) ?

The market for solar powered pumps in India is at present primarily driven by government subsidies. Therefore, there is a strong incentive for business to government (B2G) sales. However, there is a huge untapped market beyond B2G sales. There are no specific communication strategies available with most private manufactures/integrators for targeting farmers (B2F) to promote solar powered pumps. Unavailability of suitable communication materials is one of the factors resulting to low level of awareness and therefore leading to low demand for the technology.

The project observed that there are many common questions and misconceptions among farmers regarding the application, potential, costing, operation and suitability of solar powered irrigation pumps. To mitigate common doubts regarding solar powered irrigation pumps the project felt that the compendium of “Frequently Asked Questions (FAQs), would be an effective and valuable tool. The present FAQs are an effort to improve the basic level of awareness about the technology among the farmers and is the result of extensive stakeholder consultations.

Who are the potential users for the frequently asked questions (FAQs)?

The compendium targets farmers who are currently using diesel pumps for irrigation in the off-grid rural areas of eastern India. The purpose of the FAQs is to provide them with an overview and to raise their awareness on solar powered irrigation pumps. It is also expected that the FAQ would also come in handy for the sales team of any private sector company involved in promotion of solar powered irrigation pumps. In short, the FAQs provide a basic overview of the technology, instructions for setting up the technology, questions on improved operation and maintenance, access to information on government schemes and bank finance, and on safety and security of the technology.





How are the FAQs structured?

The FAQs are divided into five broad sections. The first section is the overview of the technology, the second provides information on the ways and means of setting up the technology, the third highlights issues on operation and maintenance, the fourth looks at government schemes and also bank finance, and the last section looks at safety and security of solar powered irrigation pumps.



In which of the languages are the FAQs available?

At present the frequently asked questions are available in English and Hindi languages.



TECHNOLOGY OVERVIEW



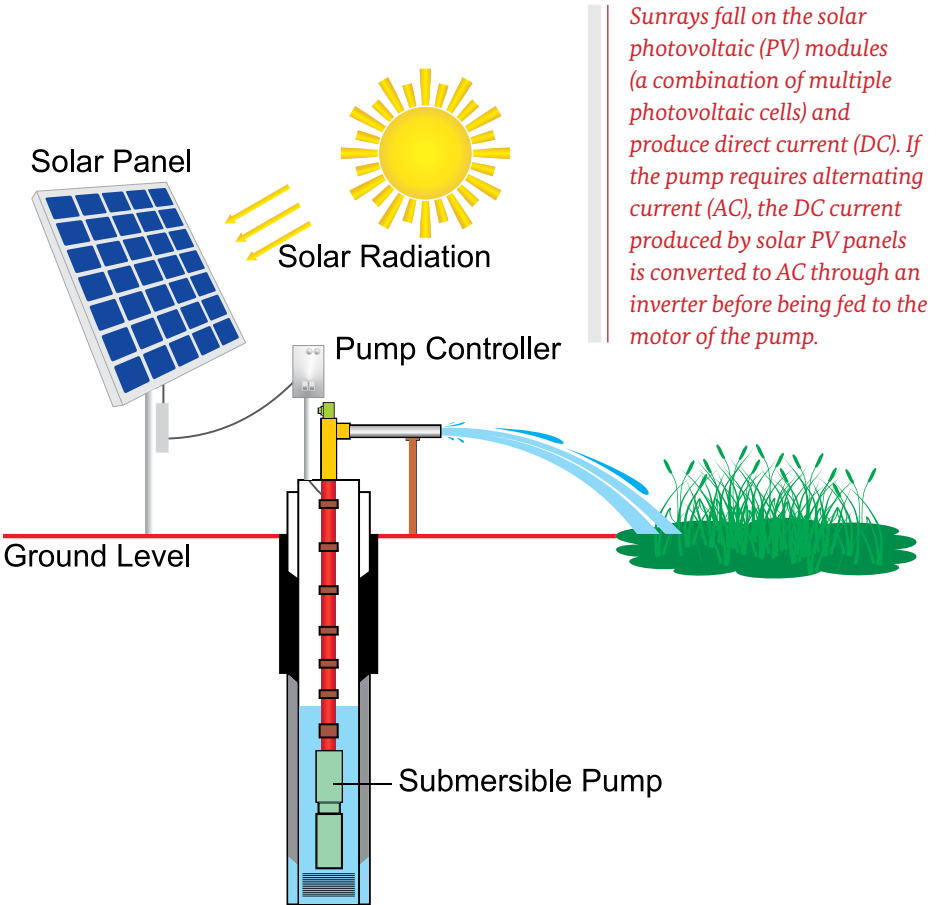
What is a solar powered pump?

A solar powered pump is a pump powered by solar energy. A solar powered irrigation pump consists of one or more solar panels (also known as solar modules or solar plates), a pump (mostly a centrifugal pump), electronic controls or a controller device to operate the pump, the required hardware and in some cases other items like inverters, batteries, etc. On a simpler note, solar powered pumps are like traditional electric pump with the only exception that it uses solar energy instead of fossil fuel or electricity.

A solar powered pump can be cost-effective, environment-friendly and low-maintenance solution for meeting water requirements for irrigation, community water supply, livestock and other purposes.

How does a solar powered pump work?

A solar powered pump works like any other available and commonly used water pumps. The main difference is that solar powered pumps run on solar energy and do not require any fuel (diesel, kerosene, gas, etc.) or external source of electricity (from an electricity company) to deliver water.



How is a solar powered pump different from a conventional pumps that runs on diesel or electricity?

1

A solar powered pump is different from a conventional pumps because it does not require any fuel (diesel, kerosene, etc.) or electric supply to operate.

2

A solar powered pump, once installed, does not have the recurring costs of electricity or fuel; and is not affected by power cuts, low voltage, single phase problems or the motor burning due to power coming on the neutral line. Generally, solar powered pumps are installed without a battery since the time for water requirement and the availability of sunshine generally coincides with each other.

3

A solar powered pumps can be installed even in remote areas where electricity is not available and diesel is difficult and/or very expensive to procure.

4

A solar powered pump does not require any external electricity supply and rather generates electricity for its own consumption. Thus, it is not dependent on any power company related factors like electricity bill, time of power supply, power cuts, etc.

5

A solar powered pump has fewer moving parts as compared to a diesel powered pump; hence, there is less wear and tear leading to low maintenance costs.

6

A solar powered pump does not require any special skill to operate. Solar powered irrigation pump is relatively easier to operate than a diesel pump.

7

Operating a solar powered pump does not require handling liquid fuel like diesel, kerosene, etc. and/or lubricants. Hence, chances of soil/water contamination by these oils are also eliminated with use of solar powered pump.

When does it make sense for me to choose a solar powered pump?

It makes sense for a farmer to generally choose a solar powered pump under the following circumstances:

1

Installation of new pump in a farm

2

Replacement of existing diesel/pump in a farm



If I buy a solar powered pump from the market, which parts does the set consist of?

A solar powered pumping system or the set consists of the following parts:

1. **Solar array:** The solar array is a set of solar modules which are to be connected in series and possibly strings of modules connected in parallel to get the required power to operate the pump.

2. **Controller:** The controller is an electronic device that matches the power output from the solar array to the pump motor and regulates the operation of the pump according to the input from the solar array.

3. **Pump:** The pump comprises of the motor which drives the movement (prime mover) and the pump impeller which moves the water under pressure.

Additionally, the solar powered pump set might include accessories like cabling and fittings, a battery, and an inverter.



Does increasing/integrating more panels with a lower HP pump achieve a higher water output?

Any given pump has a rated capacity and maximum flow rate. As a result, increasing/integrating more solar panels as compared to the rated requirement for a particular capacity HP pump does not result in a higher water output.

However, since solar powered pumps work on the output from the solar array, increasing the number of panels in some case may increase the number of hours that the pump can operate or increase the output of water during lower levels of sunshine e.g. on a cloudy day. It is strongly recommended to consult the manufacturer/supplier to estimate the economic feasibility before making any changes.

Is it possible to couple batteries with a solar powered pump system?

Though it is possible to couple batteries with a solar powered pump system, it might not be an economically viable option for irrigation. However, it is strongly recommended to consult the manufacturer/supplier beforehand to estimate the feasibility and technical requirements of the system.



What is submersible and surface classification in solar powered pumps?

There are several different types of solar powered pumps depending on how you classify them as shown below.

Submersible Pump



A solar submersible pump is located deep below the ground level; whenever the suction head is beyond a depth of 10 metres, or in a region where the water table keeps on dipping radically, installation of the submersible pump within the water table in a bore-well is more practical. The pump remains submerged under the water.

The installation of a submersible pump often requires that a bore-well is dug which can be a costly undertaking. Sometimes, submersible pumps can also be located inside water bodies like lakes, canals, etc.

Submersible pumps are available in both DC and AC variants.



Surface Pump



A surface pump is located in the open by the side of a water source, for example an open well, lake or canal. The pump remains out of the water, and generally the motor and the pump can be seen separately. Surface pumps are usually easy to install and maintain.

Surface pumps can also be feasible options in cases where the water table is within a depth of up to 10 metres and an open well is available. This has been successfully shown by installation of surface pumps in Nalanda, Bihar, where surface pumps are installed on open-wells with water table below 7 metres.

How do I select between a submersible and a surface pump? Is there a thumb rule to help with the selection?

	ADVANTAGES	Submersible Pumps	Surface Pumps
	DISADVANTAGES	Submersible Pumps	Surface Pumps

Submersible Pumps

- » No need of priming since the pump itself is located deep inside water.

Surface Pumps

- » Easy to set-up, installation and maintenance.
- » Low upfront cost compared to a submersible pump.

Submersible Pumps

- » Needs to dig a bore-well which increases the installation as well as repair and maintenance costs.
- » Gets damaged by presence of mud which often happens with lowering of the water table and is not visible from surface.

Surface Pumps

- » Dry running can severely damage the pump. Priming is required everytime, particularly in case of a high difference in water level and pump location.
- » Not appropriate for deep water table.

The most important criteria for choosing between a surface and a submersible pump are the groundwater level and the type of water source. If the well is a bore well and total head (suction + delivery) is greater than 10-15 metres, a submersible pump should be used. If the water source is an open well, pond, canal, etc. then a surface pump is more feasible. As a thumb rule, a surface pump can be used if the water level is less than 10 metres; for levels more than 10 metres, the installation of a submersible pump is required.

What are direct current (DC) and alternate current (AC) pumps?

DC Pump



A DC pump has a motor which operates on direct current (DC). Solar panels generate DC current, which is then passed on to the DC pump motor through a controller. Since the current from solar panels or batteries is directly used, and no conversion to AC is required, there is no/little loss of power between generation and consumption. However, it should be noted that the current should not have to travel a long distance before being fed to the pump in order to minimize the losses.

DC versions are available both as submersible and as surface pumps.

AC Pump



An AC pump has a motor which operates on alternating current (AC). DC, generated by solar panels or batteries, is converted to AC by an inverter-cum-controller, and is then passed on to the AC pump motor. The conversion from DC to AC leads to small losses in power between the points of generation and consumption.

AC versions are available both as submersible and as surface pumps.



ADVANTAGES

DC Pumps

- » Approximately 10% higher water discharge as compared to an AC pump.
- » No need of inverter between the solar PV panels and the pump.

AC Pumps

- » Low upfront cost compared to a DC pump.
- » Easy to set-up, installation and availability of maintenance and repair services.



DISADVANTAGES

DC Pumps

- » High upfront cost.
- » Lack of repair and maintenance services in rural and remote locations.

AC Pump

- » Low efficiency and water output compared with a DC pump.
- » Additional inverter is required.

What is tracking done for? How does the additional effort of tracking (when done manually) benefit me?

Tracking is done to keep the orientation of the solar panels in the direction of maximum solar irradiation (or maximum intensity of sunlight). Accordingly, solar panels are tilted in such a way that, at any given point of time, the incident of solar rays on the solar PV Panels is at an angle of 90 degrees. Tracking enables the solar panels to provide higher power output (closer to rated output) by higher incidence of solar energy. Tracking, if done properly and continuously, provides the benefit of capturing maximum solar energy.





What is a dual axis tracker?

The amount of sunshine hitting a specific surface on earth is dependent on its position with respect to the sun and the position of the sun vis-à-vis the location of the pump (seasonal variation). A dual axis tracker helps to orient solar panels in the direction of maximum irradiation for the two types of changes in the position of the sun in the sky:

1 Change in position of the sun during the day (east to west), and

2 Change in position of the sun during the seasons/year (north to south)

A dual axis tracker therefore has two axes of rotation which help keep the orientation of the solar panels towards the position of the sun in the sky all year round, irrespective of seasons and time of the day.

What is an automatic tracker? How does it differ from a manual tracker?

An automatic tracker usually consists of motors and gears which automatically and continuously orient the solar panel in the direction of maximum solar irradiation. The motors and gear trains are programmed for the movement of solar panels based on time of day and/or seasonal position of the sun. Use of motors and gears for automatic and continuous tracking eliminates the need of manual adjustment of solar panels; thus no manpower is required as is the case for manual trackers. Whilst automatic trackers do improve the efficiency of a system, they are also prone to failure and increase the maintenance cost of the system. Also, costs for the initial investments will increase by almost 10 per cent.



Advantages: Better power output from solar panels, and therefore higher water output.



Disadvantages: More investment on maintenance required; higher initial costs of the solar powered pumping system.

How do I select the solar powered pump most suitable for me? Is there any thumb rule to help with this selection?

Solar powered pumps should be selected on the basis of suitability depending on various factors, such as:

Farm size to be irrigated (or command area)

Water discharge requirement

Availability of shade free area for solar panels

Availability of maintenance and repair services

Concerning a thumb rule, there is no certain method to decide on pump size; however, daily water requirements and the ground water level can give indications.

Although it is often mentioned that a 2 HP pump can cater to about two acres of land, and a 7.5 HP is said to cater to 10 acres of land, this data is not universally applicable since the output of pumps changes depending on the groundwater level, and the type of irrigation required for a particular crop, e.g., flood irrigation for paddy cultivation.

INSTALLATIONS

Where should I install my solar powered pump?

The different sets of criteria for selection of the location for installing solar panels and the pump are listed below:

Preferred location for solar panels

The location for installing solar panels should fulfill the criteria given below:

- » Even surface for mounting the solar panel structure;
- » Shade-free area (no shade from nearby houses, structures, overhead tanks, electricity poles, etc.);
- » Low dust and dirt, low incidence of bird droppings;
- » Easily accessible for cleaning of panels;
- » As close as possible to the pump and water source; and
- » Provision of space for unrestricted tracking movement.

Preferred location for pump

The location of the pump should fulfill the criteria given below:

- » Minimal suction head should be preferred: if the water level is within 10 metres, a surface pump can be installed; water levels below 10 metres depth require installation of submersible pumps;
- » Low suction lift (vertical distance between the water surface and the surface pump);
- » As close as possible to solar panels;
- » Suitable (higher/central) location within the area to be irrigated; and
- » In case where multiple water sources are available, the place with the highest water table should be chosen.

How long does it take to install a solar powered pump (with/without boring)?

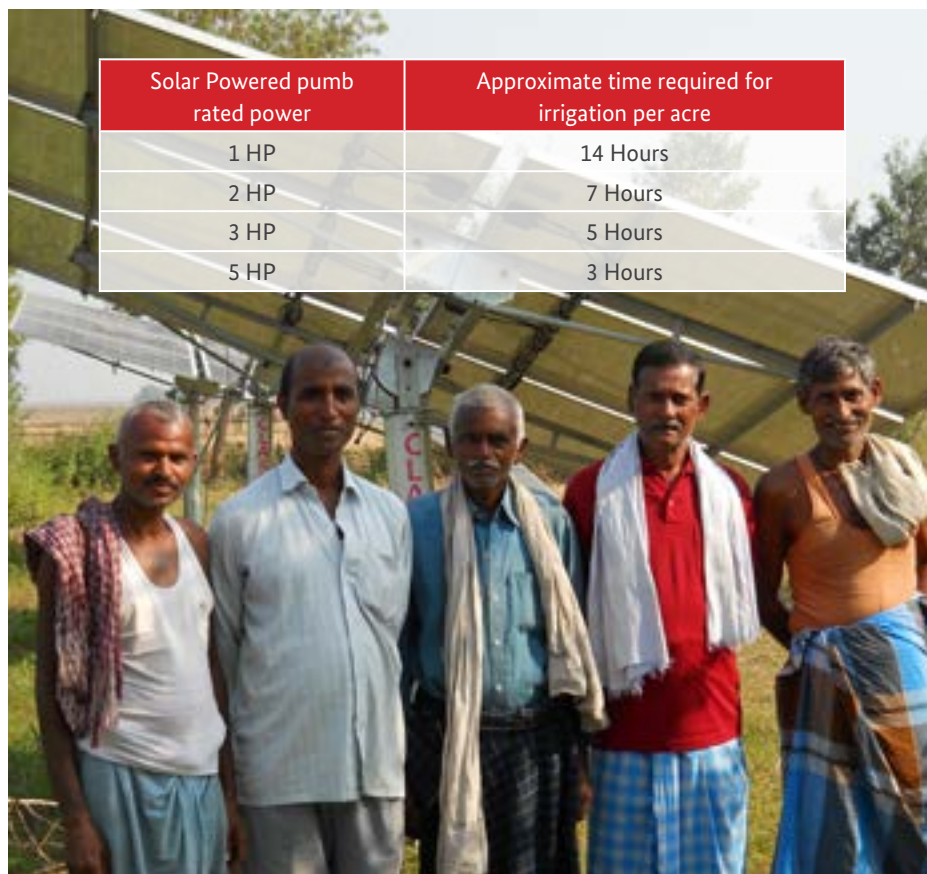
A solar powered pump is rather quick to install and to commission. If an existing diesel pump on an existing bore-well is to be replaced with a solar powered pump, field work of 3-4 days will be required.

Generally, the installation of a solar powered pump will take about 3-4 days depending on the size of the installation. Examples from the field shows successful installation of a 7.5 HP solar powered pump pumping system within two days.

If a bore-well is to be dug, another 5-7 days – depending on the site conditions – needs to be envisaged while planning the installation.

Is there any rule of thumb for selecting solar powered pumps regarding land size?

The following table can be used as an indicative guide for the selection of adequate ratings for solar powered pumps for different farm sizes:



Solar Powered pump rated power	Approximate time required for irrigation per acre
1 HP	14 Hours
2 HP	7 Hours
3 HP	5 Hours
5 HP	3 Hours

The above guide is in accordance with two inches of irrigation level and 10 metres of suction head. Generally, farmers have installed 2-3 HP capacity solar powered pumps for irrigating 2-3 acres of land area.

However, other factors like the type of crop to be cultivated, soil type, climatic conditions, water table, etc., also play an important role in determining the adequate capacity of a solar powered pump for any given land size. It is, therefore, highly advisable that you take the help of an expert from a solar water pumping company to recommend the most suitable pump for you.

Is there a thumb rule to determine the capacity of my solar powered pump when replacing a diesel pump?

The criteria of determining the capacity of a solar powered pump to replace the diesel pump is the quantity of water output required per day. The daily water requirement needs to be estimated and the level of the water table to be determined. Based on these two criteria, the pump installation team can design an appropriate system for you.

With what capacity of solar powered pump can I replace my 7.5 HP diesel pump?

Generally a 5 HP capacity solar powered pump works well in place of 7.5 HP diesel pump. However, this is only an indicative guideline and should not be solely relied upon for making any pump capacity size choices. You are strongly encouraged to consult a subject matter expert/solar powered pump manufacturer for your specific requirements.



How many panels are required for a 2 HP Solar powered pump?

A 2 HP pump is ideally powered with 1,800 Wp (peak watt) capacity solar array. The solar array could comprise of eight solar modules with 225 Wp each or 24 solar modules of 75 Wp each or any combination adding up to 1,800 Wp.

How much land is required for installing a 2 HP solar powered pump?

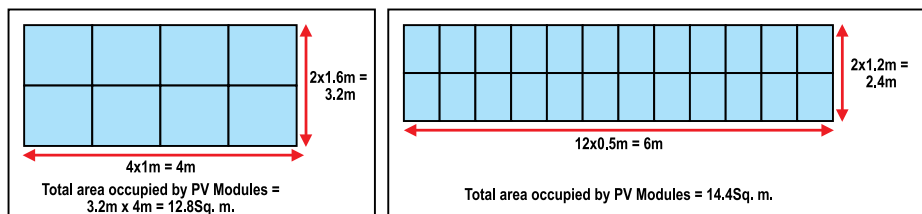
As a general thumb rule, approximately 10 sqm of land are required for every 1,000 Wp of solar panels installed.

As an example, consider a 2 HP solar powered pump having an 1,800 Wp solar panel installation. The required solar power can be generated using either eight modules of 225 Wp (high wattage rating) or 24 modules of 75 Wp (low wattage rating).

1 Dimensions of one 225 Wp Module (LxW) = 1.6 m x 1 m

2 Dimensions of one 75 Wp Module (LxW) = 1.2 m x 0.5 m

Using modules with greater wattage saves space compared to modules of lesser wattage. The graphic below demonstrates this.



Since the panels occupy space, I lose some land when I install them. Can I install a smaller array of panels to run the pump?

A smaller array of solar panels will adversely affect the water output from the pump. It is strongly recommended to install a solar array of adequate capacity with the solar powered pump.

Further, farmers can also grow several varieties of crops, mostly vegetables like lettuce, broccoli, cauliflower, etc., which can be grown in the shade below solar panels. Cultivating such crops will help compensate the reduction in crop due to installation of solar panels

How far can the water from a 2 HP Solar powered pump be transported through plastic pipes?

A 2 HP solar powered pump can usually carry water over a horizontal distance of 700 metres, though pressure is somewhat reduced at the end of the plastic pipe. However, the flow of the water from the pump would also be influenced by the local regional topography. Hence, the above measures are tentative figures.

Is it possible to relocate solar powered pumps once they have been installed?

Solar panels and pumps are usually permanently installed at a particular location. It is not advisable to frequently change their location by shifting from one place to other. While it is possible to move the solar array and the pump (ideally a surface pump) from place to place using a mobile mounting platform, the cost of the mobile structure and the chances of damage are high. Some suppliers are currently working on the development of portable solar PV pumping systems which can be pulled to different places using a tractor.

Can panels, once installed, be removed and placed at a different location?

Though it is possible to remove and re-locate solar panels, it is not advisable to change their location.

What can I do to avoid theft of solar panels?

Solar panels that are installed for a solar powered pump normally have tamper-proof hardware to make it difficult for miscreants to take the panels away. Panels are mounted on the structure using anti-theft nuts and bolts, which make it difficult to open and to dismantle the modules from the structure. The only way a panel can be stolen is if those bolts are cut – an undertaking requiring a lot of time and resources. There have been very rare instances where solar panels, located in the open, have been stolen or vandalized.

However, in case of perceived threats, solar panels can be installed within the house provided the in-house location provides the advantages of a preferred location. In such a case, the distance between the solar panels and the pump should be within 35 metres.





What is the respective water outflow of a typical 5 HP AC submersible solar powered pump?

As per the latest guidelines issued for solar powered pumps by the central government, a 5 HP AC submersible must provide at least 91,000 litres of water output per day from a total head of about 50 metres.

Is the 'force' of water lower for solar powered pumps? Why does the outflow of the pump keep changing?

The rate of water discharge is dependent on the given solar radiation on a particular period of the day. The outflow of the pump is directly dependent on the amount of sunshine falling on the solar array and hence, the outflow from the pump will keep changing due to decrease in solar irradiation by the presence of fog, cloud cover, etc., and will increase when sky is clear.

Is the water discharge rate from solar powered pumps dependent on high temperatures? Will solar powered pumps work during winters when it is very cold?

The discharge rate from solar powered pump depends on the radiation and not on the temperatures. In fact, the power generated from solar panels decreases (slightly) with increase in ambient temperature and thus, water outflow from a solar powered pump at higher ambient temperature will be slightly lesser than at a lower ambient temperature for the same level of incoming solar radiation on the solar panels.

It should be noted that in winters, the cold temperature is often associated with reduced availability of sunshine and hence, the output of the solar powered pump is likely to be reduced in winter when compared to summer. This is not due to the reduced temperature but due to fact that the solar radiation falling on the solar array is reduced.

Does a solar powered pump work during cloudy and foggy days? How does one manage with a solar powered pump during such days? Can a hybrid option be provided? Can we run it using batteries?

The water discharge rate of a solar powered pump is affected by the availability of solar irradiation. However, the limitation can be overcome by use of a hybrid power supply to the pump. The pump can be connected to a suitable connection of the state electricity grid or a diesel generator set while making proper adjustments in the controller. However, this should always be done in consultation with the manufacturer of the solar powered pump. While the pump can also be run using batteries of adequate capacity, it is normally not advised due to techno-commercial reasons. Suitable features are available in controllers for the selection of power supply from solar panels, state grid or batteries, depending on the requirement. Users should always consult with the pump manufacturer/supplier before attempting any change in power supply to the pump.

Are solar powered pumps suitable only for specific crops, e.g., vegetables, which require to be watered either early in the morning or late in the evening, or can it be used to irrigate all kinds of crops?

Solar powered pumps can be used to irrigate all types of crops. For best results, solar powered pumps should be coupled with the most ideal irrigation system for any particular type of crop, for example, drip irrigation system, sprinkler irrigation system, etc.



Since solar powered pumps work for only a limited number of hours per day, are they able to replace pumps currently used for irrigation and which run for nearly 16 hours per day in the cropping season?

Yes. Solar powered pumps can be installed as a replacement for the existing pumps by prior planning of adequate size/capacity and regularization of the irrigation schedule during the peak irrigation season. Choosing a solar powered pump of adequate size for given conditions of water table, irrigated area, cropping pattern, etc., is a very important activity to be done carefully while making a decision for purchase of a solar powered pump to replace an existing diesel pump.

Can I use the solar powered pump (power from the solar panel) to cut fodder, grind flour or any such activity when the pump is not used for irrigation?

Theoretically, the single phase AC power of solar powered pump systems can be used to run compact fluorescent lamps (CFLs), fans, television, computers, etc., when the pump is NOT running. Modern day controllers can provide options for battery charging. However, currently these applications should be done only after consulting the pump manufacturing company representatives.

OPERATIONS & MAINTENANCE

What is the maintenance required for a solar powered pump? Can I take care of the maintenance of the pump even though I do not have any knowledge about solar powered pumps.

A very minimal effort is required for maintenance of the panels including their regular cleaning. Training is provided for maintenance and cleaning by the company installing the pump. Village personnel can easily be trained to take care of the pump and solar panels. A list of nearby located service centres can be sought from the manufacturer/supplier which can be contacted in case of a major breakdown.

Is it necessary to clean the solar panels?

Solar panels are required to be cleaned, particularly in dry areas or where panel tilt is minimal as, dust and other substances, such as bird droppings, can build up over time and impact the amount of electricity generated by a panel.

Air pollution, dust, fallen leaves and even bird droppings block sunlight falling on the solar panel surface. Grime and bird droppings do not need to cover an entire panel to have an effect. Experience suggests that dirty solar panels, which have not been cleaned for a week, lead to a drop in power generation by as much as 25 - 30 percent. Hence, it is absolutely necessary to clean the solar panels to ensure maximum power output and water discharge rate.

How should the solar panels be cleaned?

Before commencing cleaning, one must always follow the procedure described in the operation manual which is provided by the manufacturer/supplier.

For safety reasons, it is also advisable to clean solar panels from the ground itself, wherever possible. A good quality soft brush and a squeegee with a plastic blade on one side and a cloth covered sponge on the other side, with a long extension is an adequate tool to perform solar panel cleaning from the ground level itself. Solar panels can also be cleaned using a hose with a suitable nozzle to allow a stream of water to reach the panels.



Can hail storm and/or lighting lead to damage of the panels?

Modern day solar panels have adequate safety features in terms of impact resistance and are very unlikely to be damaged by a hail storm.

Solar panel installations also do not increase the probability of lightning strikes. Solar arrays themselves are at no more risk than the inverter or other loads connected to the grid. However, in the rare event of the solar array being hit by a direct lightning strike, the modules are likely to suffer considerable damage. This risk, again however, is mitigated by the integration of an external lightning protection system with the solar array. Good grounding is essential for the proper operation and safety of the solar powered pump system. Users must consult with solar powered pump manufacturers/suppliers on concerns regarding system grounding.

What is the life of solar powered pumping system? What happens to performance of solar powered pump over years of use?

Solar powered pumps have a significantly longer life expectancy compared to diesel pumps. Solar panels continue to produce electricity for the pump for even longer than 25 years. As per MNRE guidelines for the promotion of solar powered pumps, a solar powered pump system, regardless of whether submersible or surface, shall have a warranty for five years provided by the manufacturer. The solar modules must have a warranty for output wattage, which should not be less than 90 per cent after 10 years, and 80 per cent after 25 years.

Why is a DC pump more expensive than an AC pump?

DC solar powered pumps are more expensive than AC solar powered pumps because of the application of DC motors, which have a higher upfront cost than AC motors. However, DC pumps do not require any inverter which is costly and needs replacement after 6 - 8 years.

Why does a submersible pump cost more than a surface pump despite the fact that surface pumps provide a higher water outflow?

A very important thing to note is that submersible and surface pumps have different applications depending on the water source from where water is to be pumped (bore-well or open-well). Hence, a direct comparison of the cost of submersible and surface pump on the basis of water outflow should not be made.



In order to serve their peculiar application, submersible pumps have higher complexities in manufacturing and use superior grades of manufacturing materials to ensure seamless under-water operation. Also, submersible pumps have additional safety features like a sleeve (to protect pump from overheating and resultant damage). These factors eventually increase the cost of submersible pumps.

Why are solar powered pumps so expensive? What would be my break-even/ pay back if I am using (a) grid electricity for irrigation (b) diesel for irrigation?

The high cost of the solar panels is the key reason for the high price of the solar powered pumps. A large share of up to 60 per cent of the total cost goes towards solar panels. However it is worthwhile to mention that the prices of solar panels have been reduced drastically over the last couple of years. Various calculations to estimate the cost-effectiveness of a 1 HP solar powered pump suggest a 3-4 year payback period for replacing a diesel pump with a solar powered pump.

The cost-effectiveness of solar powered pumps vis-à-vis electrical pumps running on grid electricity is not so attractive, though it will depend greatly upon prevalent electricity tariffs in states.

It must be noted that the break-even for replacement of a diesel pump with a solar powered pump is dependent on a number of parameters like pump size, loan repayment period, rate of interest, etc. Solar powered pumps are the most cost effective when run for maximum hours every year, i.e., for irrigation of maximum land area, having cash crops or high value vegetables every year, etc.

GOVERNMENT SCHEMES/BANK FINANCE

Is bank finance available for purchasing solar powered pumps?

Various banks provide financing for purchasing solar powered pumps. These include The National Bank for Agriculture and Rural Development (NABARD), commercial banks, regional rural banks, state and district central cooperative banks and state cooperative agricultural rural development banks (SCARDBs) provide finance for purchase of solar powered pumps.

What are the documents necessary to avail a bank loan?

The National Bank for Agriculture and Rural Development has laid down the following procedure for availing finance for the installation of solar powered pumps:

- 1 Submit an application, to procure a loan for solar powered pumping systems, available from NABARD to your local bank.
- 2 After the loan application has been approved, the user has to deposit 10 per cent of the solar pump cost as margin money, depending on the size of the solar water pumping system. The deposit amount may vary from bank to bank in different states.
- 3 The local bank forwards the application to an approved vendor/channel partner.
- 4 The channel partner completes the installation process at the desired site.
- 5 A bank manager/field officer inspects the installation to ensure that only Ministry of New and Renewable Energy approved components are installed.
- 6 To avail subsidy from the government, the application is sent to NABARD to release the subsidy amount (if provision of subsidy exists in the particular state).
- 7 After the subsidy amount has been released by NABARD, the local bank keeps the subsidy amount as a collateral towards the loan.
- 8 If there is default on the loan, the user will not be eligible for the subsidy amount, and will be responsible for repaying the entire loan amount for the solar powered pumping system.

How much subsidy is available from the central government?

The central government provides a credit linked scheme in which capital subsidy is back ended. According to this scheme, capital subsidy amount currently ranges from Rs. 43,200 - 57,600 per HP upto 5 HP capacity. For capacities >5 HP it is fixed at Rs. 1,94,400.00 flat.

In a separate scheme, MNRE provided 30% subsidy to those states that provided a minimum of 15% additional subsidy. (In Bihar, for example, 2 HP DC surface pumps were installed with a subsidy of 75 per cent as on May 2016).

Persons interested in purchasing solar powered pumps can take advantage of any one of the above mentioned schemes.

What is the subsidy provided by Bihar Renewable Energy Development Agency?

Bihar Renewable Energy Development Agency has been providing a total of 75 per cent capital subsidy (consisting of 30 per cent from the central government and 45 per cent from the state government) for solar powered pumps of 2 HP and 3 HP ratings (as on May 2016).

Would the documents for the bank vary depending on the pump size?

The documents for the bank should not vary depending on the pump size.

Is there any insurance scheme available which covers the security concern of solar powered pumps?

Several insurance schemes are available which covers the security concern for solar powered pumps; however, there are several pre-requisites that need to be fulfilled in order to acquire the same, such as fencing around the installation. The installation set up in Nalanda, Bihar (34 numbers of 7.5 HP solar powered pumps supplied by a private company) is, for example, covered by an insurance scheme.

SAFETY AND SECURITY

What are the precautionary methods to protect the panels against strong winds?

Solar panels are firmly mounted on structures which are designed according to guidelines issued by MNRE, and can therefore withstand strong winds and storms with a velocity up to 150 km/hr. The direction of the wind needs to be observed and the direction of the panels rotated accordingly so that the minimum area of panels comes under wind pressure.

Will storms and cyclones damage the panels? What precautions should be taken during such times?

The panels will only get damaged if the structure on which they are mounted collapses during the storm or cyclone. However, as a precaution, it is suggested that the array is kept horizontally at 180 degrees during storms or cyclones so that minimum resistance is offered to the wind. In areas in which cyclones or strong storms occur, precautions should be taken by building strong foundations in the case of fixed PV systems. Mobile PV systems should be moved to a safe location. Infrastructure works are also necessary if other equipment is prone to be damaged. The solar powered pumps for providing water for domestic use in cyclone-prone areas of Bangladesh, for instance were built with steel-enforced concrete towers.

Are there any potential health impacts due to the solar radiation from the solar panels attached to the pumps?

As per our current knowledge, globally, there has been no evidence/occurrence of events causing any negative health impact due to solar radiations from the solar panels. On the contrary, solar powered pumps effectively reduce air pollution and GHG emissions by eliminating fossil fuel for irrigation purposes, which eventually has a positive impact on health and longevity in the long term.



Disclaimer: The FAQs on the solar powered irrigation pump has been developed based on questions raised by farmers during technology demonstration camps in Bihar. The present document is an attempt to put together relevant information to raise the basic level of awareness on solar powered irrigation pumps. It is strongly recommended to consult manufacturers/suppliers/local solar powered pump dealers before investing in a solar powered irrigation pump. Please note that this document is neither exhaustive nor comprehensive. GIZ will not be responsible for any financial decision based on the information provided in the document.

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