

WHY USE SOLAR POWER ON BOAT DOCKS?

Electricity does not grow on trees.

It does, however, fall from the sky!

Q.) Why should I use a solar electrical system versus a utility grid-tied system for my boat dock power?

A.) Safety, Cost, Convenience, Independence, Environment

- **Safety**
 - Grounding system that is not referenced to earth so is therefore safer than traditional utility-tied system
- **Cost**
 - No cost for running power line
 - No easement fee for U.S. Army Corps of Engineers lakes
- **Convenience**
 - less maintenance (no moving parts, no wire connection to shore)
 - flexible system design (can build to fit your specific energy and space requirements)
 - easily upgradeable system (modular unit so you can replace or add parts)
 - portable system (although the unit is fixed to the dock, it can be easily relocated with the proper tools)
- **Independence**
 - reliable power (won't go down when the utility grid fails)
 - can supply power to remote location where grid power is unavailable or too expensive/complicated to install
 - pride and security of generating your own power and not paying rent for a commodity you will never own
 - no personal dependence on fossil fuels which helps lessen the dependence of the U.S. on other countries
- **Environment**
 - improved water quality by eliminating runoff caused by clear cutting trees and foliage for a power line run
 - aesthetics: beauty of the natural environment is improved by eliminating the need to clear cut trees and foliage for power line run
 - quiet and clean operation: no noise or air pollution

SAFETY

- *Electricity and Water - A Dangerous Combination*

While electricity and water are never a good combination, some ways are more dangerous than others when it comes time to power up a floating facility, specifically a boat dock. This will explain the difference between using solar power and traditional utility power to provide for your electrical needs from a safety point of view. In order to understand the difference only one electrical fact needs to be understood - *electricity always returns to its source and will use all available means to do so.* With only this in mind, let's look at utility power run out to your dock.

The circuit is only complete when the electricity finds a return path back to its source, which is the earth. As long as everything works perfectly on the dock the electrical circuit is routed back to the utility pole on the return wire or "neutral." The danger here is if there is any malfunction of an electrical device on the dock that is if a "ground fault" exists. Proper functioning of the grounding system has now become critical since electricity will use all means to return to its source. The proper functioning of the ground wire has critical importance around water because if any malfunction exists, the water becomes the conductor back to the shore for the ground fault.

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Herein lies the danger. The ground fault might be minuscule, perhaps not even enough to trip a 5 milliamp ground fault circuit interrupter (GFCI), much less a 15 or 20 amp breaker in the main electrical panel, but 3 milliamps is the maximum that an adult male can tolerate. Females and children have an even lower threshold. Since this fault is below the level needed to activate the protective circuits on the dock, it can exist indefinitely, lying in wait for the right set of circumstances to make itself known. The most dangerous aspect of utility power around water is that it is "referenced" to the earth. This means that any path it can find to "ground" is what it will use. A simple demonstration will illustrate this "ground referenced" electrical circuit. Suppose you plugged an extension cord into a receptacle on

your home and ran it out into the yard. If a screwdriver were to be stuck into the ground, a voltmeter would indicate 120 volts between the "hot" or supply wire of the extension cord and the screwdriver. The electricity is using the dirt as a return path to complete the circuit. You are essentially a "bird on a wire" at this point. The electricity is flowing through the earth under your feet but you are not part of the circuit. However, if you touched the "hot" wire in the extension cord and the screwdriver, you would now be a part of the circuit and receive a shock. In fact, just touching the "hot" wire and being in contact with the ground will result in your becoming part of the electrical circuit. Most of us have been shocked at one time or another in our lives and it is usually because we became part of an electrical circuit seeking a path to ground. When this situation occurs around water the results are often tragic. This is because the water takes the place of the earth in our example. This means you are no longer a "bird on a wire" standing on top of the electrical circuit. As a swimmer in the water, you become a part of this electrical circuit if it occurs in fresh water. This occurs because the human body is a better conductor than fresh water. The swimmer becomes a conductor because that is the path of least resistance. At the least a scary experience awaits the unwary swimmer and all too often the electricity snares the unwary swimmer in its invisible grasp with fatal results. On the other hand, solar-generated electricity behaves in an entirely different fashion than "ground referenced" electricity. Solar powered electricity is created using electrons from light rather than electrons from the earth. This means the electrical circuit can begin and end in midair. No connection to "ground" is necessary. It is this fact that makes all the difference. Since the electricity did not originate from earth, it isn't seeking a path to earth by "all available means." Let's use the previous example of the extension cord and the screwdriver in the yard again to illustrate this principle. Instead of the extension cord being plugged into the house, this time it will be plugged into a solar-powered electrical circuit with no connection to the utility power in the home. Although there is still 120 volt AC electricity in the cord, just as before, this 120 volt circuit is suspended in midair and will remain there. This can be demonstrated by using the voltmeter between the "hot" wire in the extension cord and the screwdriver, as before. This time the volt reading will be zero. Since the electricity is seeking a return path to its "source" and that "source" is suspended in midair, the earth will not complete the electrical circuit. Neither will the water the dock is floating on serve to complete this circuit. The electricity in the "hot" wire in the extension cord is still seeking "all paths back to source" but because there is no "reference to ground", and the source is suspended in midair, the majority of these paths are eliminated. Only the return or "neutral" wire serves as a suitable path for the electricity to complete the circuit. Simply by removing the electrical source from its relationship with the earth yields a far safer way to manage the electrical circuit over water and solar power is the logical way to accomplish this.

COST

- *Costs of Power Lines*

Avoid the cost of running power lines from the utility provider to the dock.

- *Easement Costs*

On many Army Corps of Engineer lakes in America, an ongoing easement fee has been enacted to connect the boat dock to the local utility power provider. When solar power is utilized this fee is waived. This provides a financial incentive to the dock owner, which when combined with the cost of running the power line to the dock and paying the minimum fee required by the utility provider makes solar power a very attractive, cost effective option.

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CONVENIENCE

- *Maintenance*

Solar power is an attractive option when compared to the constant maintenance of a utility feeder line connected to the continually moving structure of a boat dock. The solar panel itself has no moving parts and needs only to be kept clean. Normal rainfall is usually adequate to accomplish this. The only component needing service is the batteries. You will need to make sure the batteries have adequate water levels. Normally, this check can be performed at three to four month intervals and usually one gallon or less of distilled water will be needed.

- *System Designed for Your Application*

We will build the system to fit your specific energy and space requirements and tasks. Our enclosure is designed to take up as little space as possible on the dock yet still complies with all requirements of the National Electric Code (NEC) and meets or exceeds all design standards set forth by the Army Corps of Engineers for solar powered systems. The dock unit is attached to the frame of the boat dock and locked by padlock for security. The unit is weatherproof and needs no additional precautions regarding inclement weather. It is compact and its purpose driven design is a blend of function, simplicity and safety.

- *Upgradeable System*

A solar-powered electrical system can be installed as a modestly sized unit to serve as a weekend duty system and be upgraded at any time in the future to full-time duty simply by adding another solar panel or a larger solar panel than the one initially installed. Many boat dock owners utilize this approach as they retire and relocate to their weekend home as their full-time retirement home.

- *Portable System*

Although the unit is securely fixed to the dock, it can be easily relocated with the proper tools.

INDEPENDENCE

- *Reliable Power*

Solar power won't go down when the utility grid fails

- *Remote Locations*

Can supply power to remote location where grid power is unavailable or too expensive/complicated to install.

- *Dependence of Fossil Fuels*

No personal dependence on fossil fuels with this system which helps lessen the dependence of the U.S. on other countries strengthening our national economy and security.

- *Pride of Ownership*

Our nation was founded upon the principles of self sufficiency and this desire still courses through the veins of many Americans. There is a certain satisfaction and security that comes from turning on lights in a darkened area and knowing you own the system that made it happen, as opposed to writing a check at the end of the month paying yet another month's rent on a commodity you will never own.

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In many cases the solar powered boat dock is the first exposure our customers have to renewable energy. It has been our experience that once exposed to on-site power generation using solar, people begin to see other uses for this electricity in their lives. While solar power has remained out on the fringe in most of the U.S., it is rapidly becoming commonplace on boat docks. It is not at all uncommon to see clusters of solar powered electrical systems, each belonging to neighbors who learned about it from someone in the neighborhood who installed a system.

ENVIRONMENT

- *Water Quality and Natural Beauty*

All of us would like to see our lakes and rivers in pristine condition. After all, they are a major portion of our recreational lives. Solar provided electricity contributes to this in two major ways. Since the needed electricity is generated on site, there is no need to route a power line from a centralized utility provider. This means no clear cutting and defoliating the natural timber growth of the shoreline and surrounding topography. Not only is the natural beauty of the shoreline and countryside enhanced, but this contributes to the water quality as well. The trees and foliage along our shorelines serve as a buffer to prevent soil runoff into our watershed, which in many parts of the country is the most significant detriment to water quality.

- *Noise and Air Pollution*

This is a quiet system that doesn't produce odors and air pollution like a fossil fuel burning generator.

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