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**HARMONY FARM SOLAR**  
*presents*

**Reducing Upfront Solar Energy Costs**

How can you reduce your initial capital costs for a photovoltaic system, but still achieve a net-zero annual PG&E bill?

**Conservation!**

Solar power is quiet, reliable, and almost completely maintenance free, but it also has a relatively high up front cost. To get the most function for every dollar spent on a photovoltaic system, it is important to first be confident that you have minimized the power you use. Many standard household appliances have been redesigned in recent years to greatly reduce their energy use. Clothes washers, dishwashers, refrigerators, freezers, dehumidifiers, fans, air-conditioners, and many other common household appliances are now available in "Energy Star" certified versions. For every dollar you spend replacing older electrical appliances, you can save \$3 or \$4 in upfront solar energy costs. Here are a few examples:

**REFRIGERATORS** have improved dramatically in just the last 10 years. Using a typical 18.5-20 ft<sup>3</sup> top freezer model as an example, we find the following power consumption changes over time:

Year	kWhr/month	kWhr/year
<1990	100	1200
90-93	70	840
>1993	55	660
Energy Star	37	444



You are ready to go solar, but have an old refrigerator. What should you do first?

1989 refrigerator power consumption = 1200 kWhr/year => 3.29 kWhr/day  
 Solar power required: 3.29 kWhr/day ÷ 4.5 peak sun-hrs/day = .73kW = 730W (module STC)

Energy Star refrigerator power consumption = 444 kWhr/year => 1.22 kWhr/day  
 Solar power required: 1.22 kWhr/day ÷ 4.5 peak sun-hrs/day = .27kW = 270W (module STC)

730W - 270W = 460W less solar power required with new refrigerator

460W requires ~\$2,875 in installed solar power

**=> \$800 for a new refrigerator or an additional \$2,875 to solar power old one!**  
 (Replace older appliances with new, efficient models prior to going solar)

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**WATER HEATERS** frequently come up as a potential opportunity to power with solar. The thought goes, "Maybe we could get solar electricity and switch our water heater from gas to electric and save some money?"

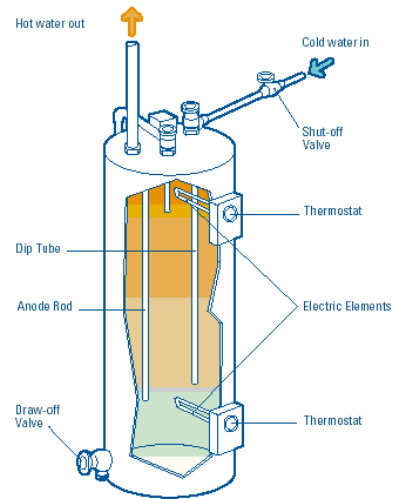
Power consumption for a typical family of 4 with a 4500W water heater is a conservative 500kWhr per month. What would it cost to power it with solar?

500 kWhr/month => 16.44 kWhr/day

Solar power required:

$$16.44 \text{ kWhr/day} \div 4.5 \text{ peak sun-hrs/day} = 3.65 \text{ kW (module STC)}$$
$$= 3650\text{W (module STC)}$$

**=> 3650W => ~\$22,815 in installed solar power!**  
(Solar hot water pre-heat is a more cost effective way to solar power your hot water needs)



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**WALL TRANSFORMERS** (also known as wall warts!) are ubiquitous and many of us have them scattered all over our homes. They are used to power and charge all kinds of devices from answering machines to cell phones to inkjet printers. Manufacturers love them because external AC-DC power conversion eliminates the burden of AC regulatory requirements.

What most people don't realize is that wall transformers consume power all the time they are plugged in (even when the device they power isn't attached!). One to five watts is typical standby loss on older models. Meanwhile, new "Energy Star" compliant power adapters are, on average, 30% more efficient and consume less than .5 watts in standby.



Let's say we have 10 of the older 5W versions plugged in at any one time. What is the solar power required to cover their standby loss?

$$10 \times 5\text{W} = 50\text{W} \times 24 \text{ hr.} = 1,200\text{W/day} \Rightarrow 1.2 \text{ kWhr/day}$$

$$\text{Solar power required: } 1.2 \text{ kWhr/day} \div 4.5 \text{ peak sun-hrs/day} = .27 \text{ kW (module STC)}$$

$$= 270\text{W (module STC)}$$

**=> 10 wall transformers on standby => 270W => ~\$1,680 of installed solar power!**  
(Unplug your unused transformers or put them on switched power strips)

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Solar energy can improve our environment and save you money. Awareness of opportunities to conserve power and improve energy efficiency can do the same. Together, they make a partnership that will move us into a

***Sustainable Energy Future!***