



U.S. DEPARTMENT OF ENERGY
SOLAR DECATHLON

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HOW SOLAR WORKS: SHC FOR YOUR HOME





Introduction

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SHC Systems Overview

- Electric: PV (most well known in USA)
- Electric & Heat combi: CPV
- Pool Heating (non glazed collectors)
- DHW (most used solar technology in the world)
- Solar Home Heating (solar air & solar thermal)
- Solar Cooling: uses solar heat to create cooling



Solar PV





Solar CPV





Solar Pool Heating





Solar Domestic Hot Water





Solar Air Collectors for Home Heating





Solar Cooling



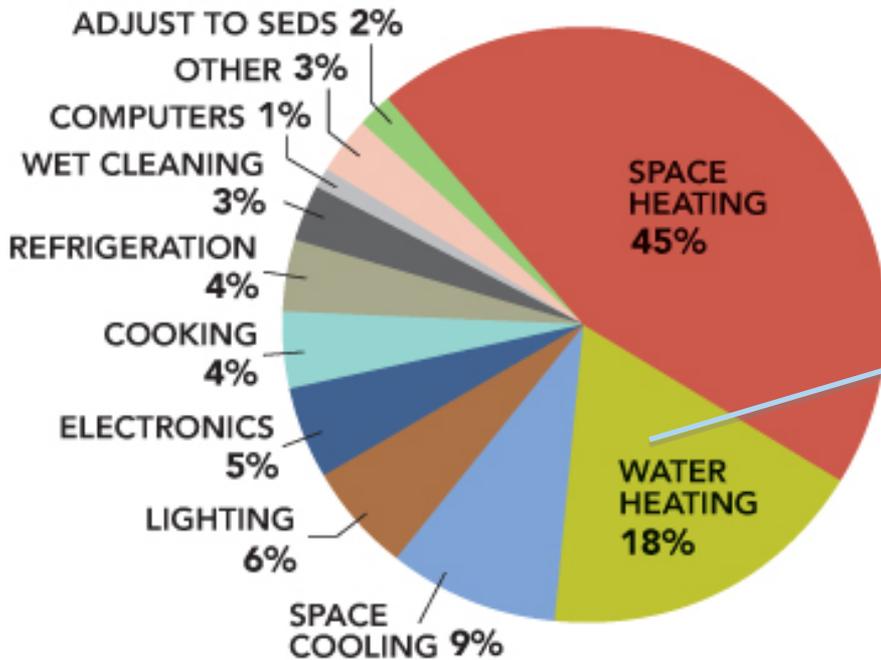
Most common solar systems in USA

- **Solar Pool:**
 - cost effective for pool heating, uses polymer unglazed collectors.
 - Installed cost by pro: \$3000-\$5000. (without incentives)
 - Payback period: ~3 years compared to electrical or gas pool heating
- **PV:**
 - Cool, “sexy”, but low efficiency (10-15%),
 - Install as much as you can afford. Cost: ~\$30000. (without incentives)
 - Payback period: ~ 15-25 years.
- **Solar DHW**
 - Very efficient (up to 70%)
 - eliminates up to 75% of energy needs for hot water
 - small footprint: just 2 collectors produce same energy as a small PV system.
 - Installed cost by pro: \$5000-\$9000. (without incentives)
 - Payback period: ~ 4 – 8 years.



The Case for Domestic Solar Hot Water

**RESIDENTIAL SITE ENERGY
CONSUMPTION BY END USE**



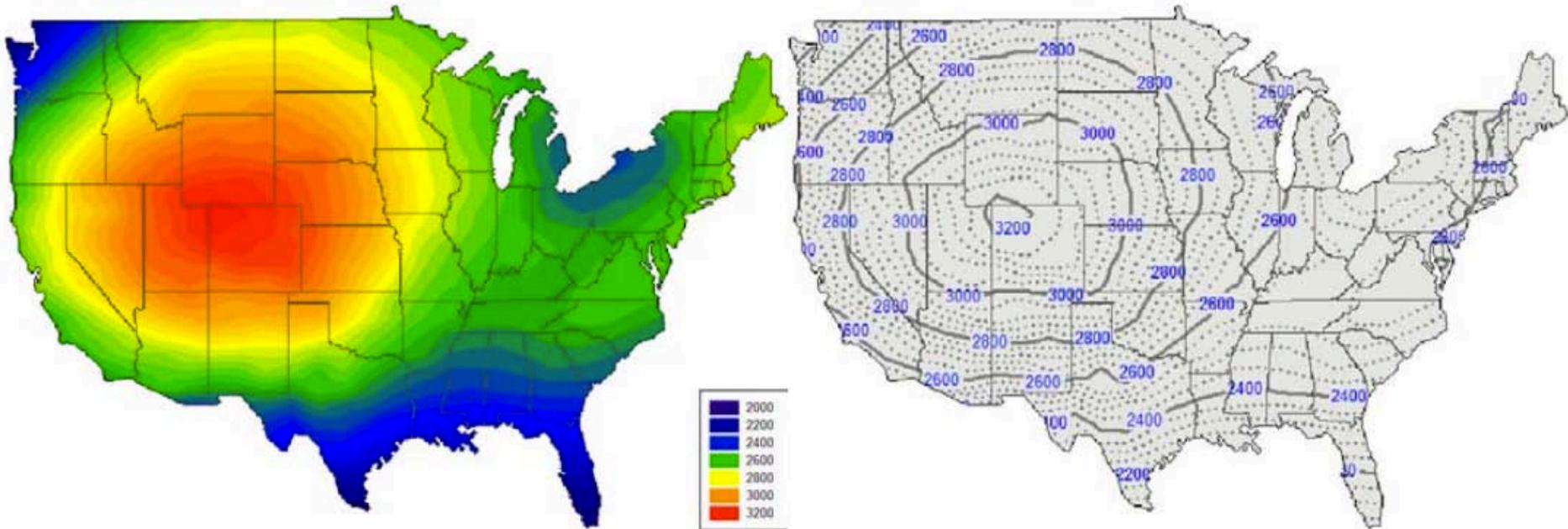
- \$37.3 billion expenditure (2008)
- 172.6 million tons CO₂ emission (2008)

Source: DOE 2010 Buildings Energy Data Book



SHW Energy Savings Potential USA

Figure 7. Annual absolute energy savings in kWh for E64FPCL



Source: Florida Solar Energy Center

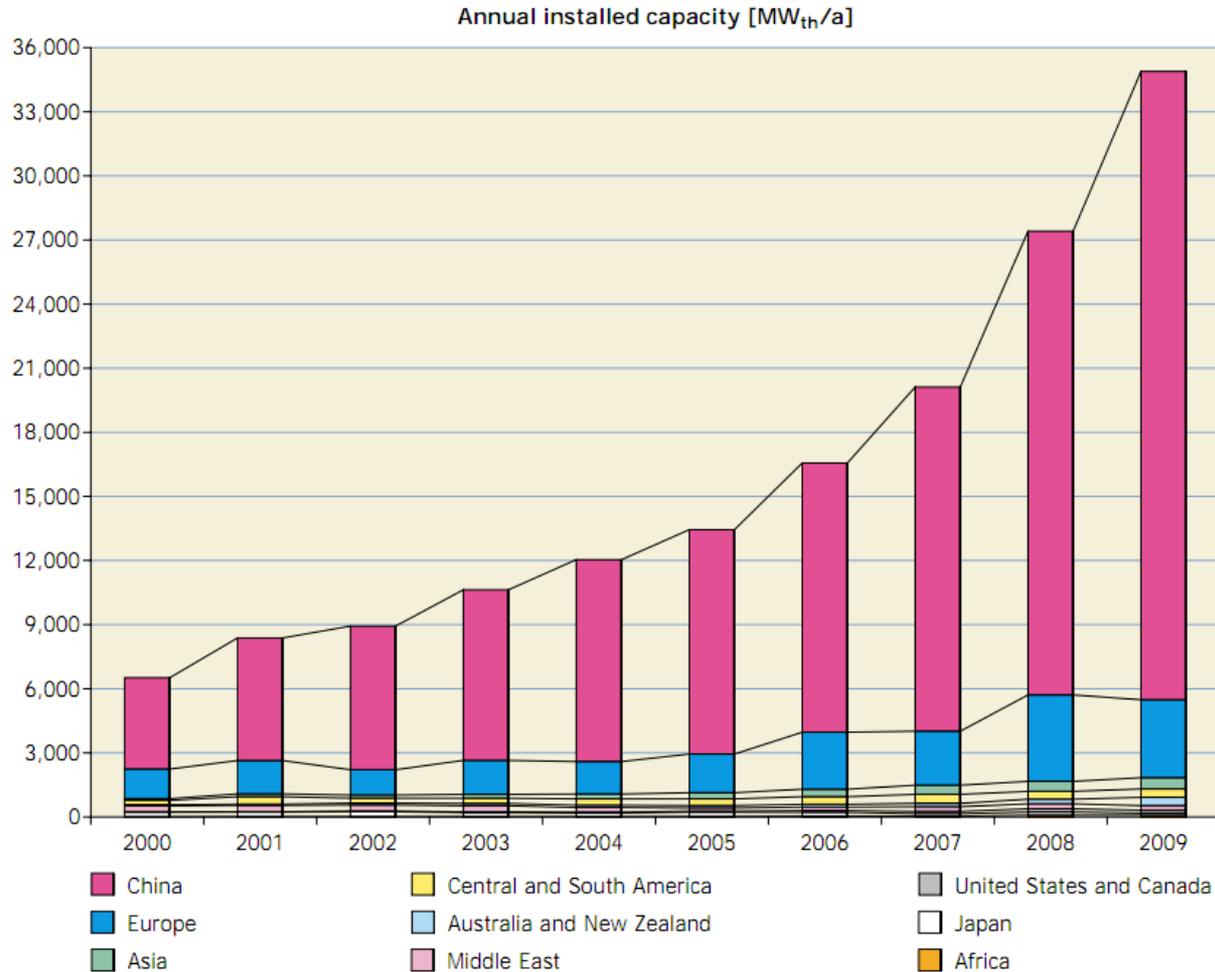
The Case for Domestic Solar Hot Water

- Entire USA has great solar resource
- Hot water is 2nd largest energy user in the house
- Systems affordable for “middle class”
- Good incentive programs:
 - 30% federal, 30% in many states
 - eligible for SRECs in DC and MD.

**Most affordable renewable energy option
a home owner can choose!**



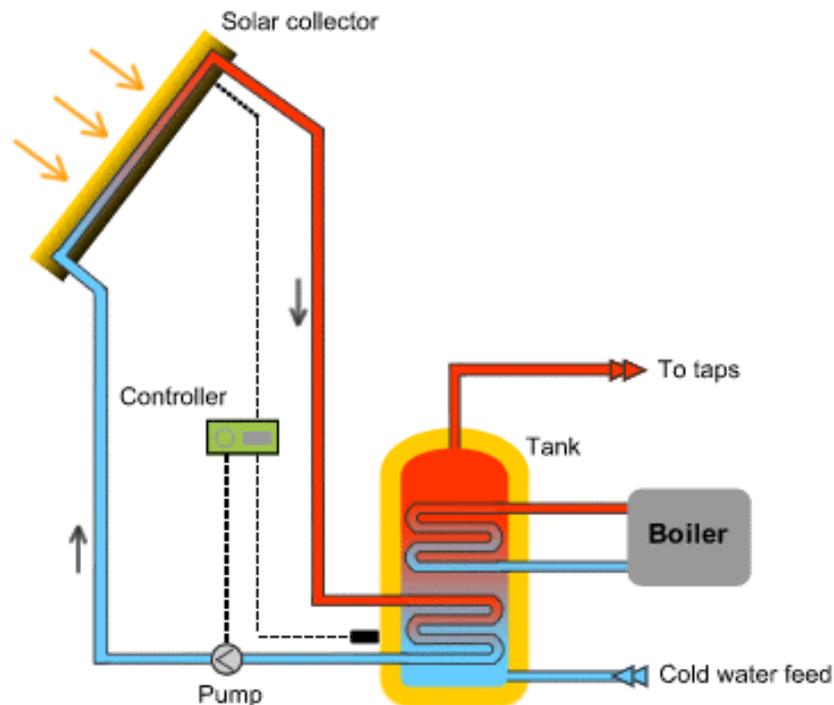
SHW in rest of the World





SHW Components

- Glazed **Collectors**: capture solar energy and heat up fluid to desired temperatures (>125 °F)
- **Tank**: for storage of solar heated water for later use.
- **Circulation system** to transfer heat from collectors to tank.



A backup heater is **ALWAYS** part of every SHW system – so you will **ALWAYS** have hot water!

SHW System Choices (and Why?)

- Systems without freeze protection (Hawaii, PR).
 - Batch heater (passive)
 - Thermosyphon system (passive, tank above collector)
- Systems with freeze protection (active systems= with pump)
 - Closed loop glycol system (antifreeze to avoid pipes busting during freezes).
 - Drainback system. Drains fluid from collectors to prevent freezing. *
 - Passive geyser pumped system (Sunnovations) *

Closed loop systems require a heat exchanger to circulate glycol fluid to transfer heat to solar storage tank.

* Offers Overheat protection – important in USA!

Process to Get a DSHW System

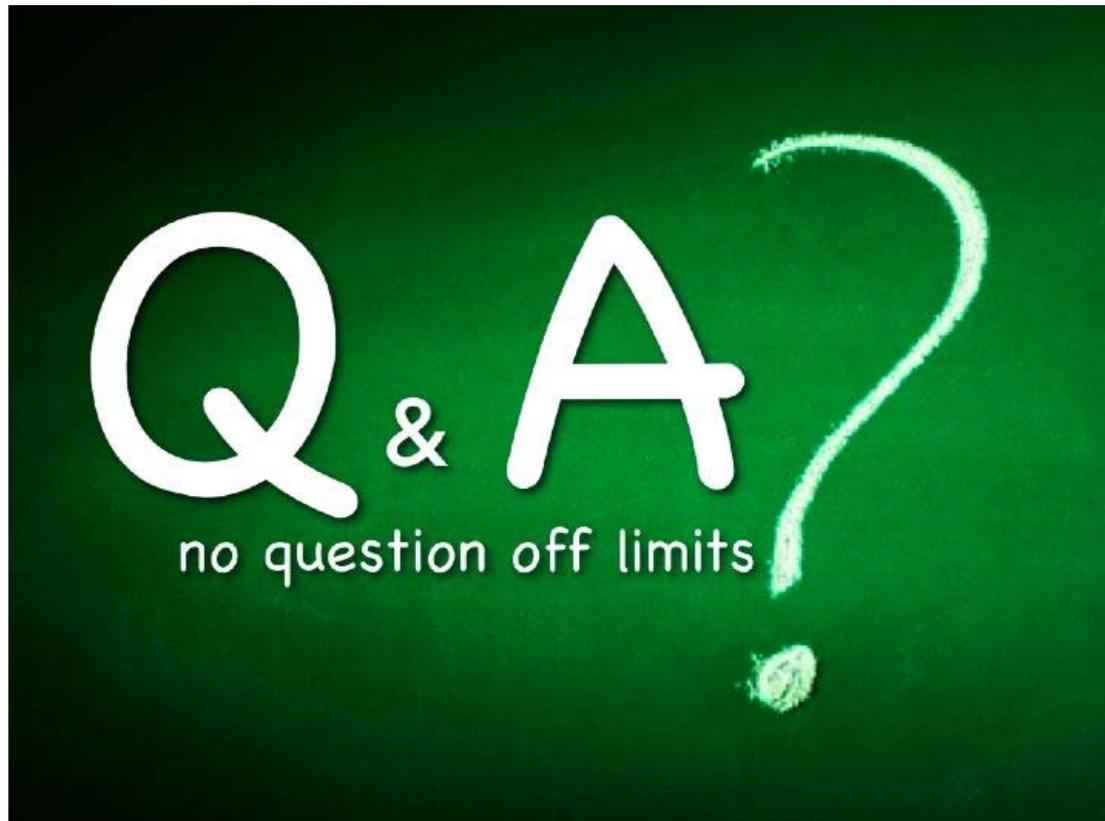
- Contact one or more local SHW installer.
- A site visit checks suitability for SHW (roof, shading, current HW system, etc).
- Installer provides a quote.
- Installation for SHW takes 1 day, sometimes 2 days.
- 30% Federal tax credit filed with annual tax form (on system, permitting & installation cost)
- State incentive program differs per state, but installer will normally do all the paperwork

Why?

- Saves you \$\$\$
- Large impact on Carbon Production
- SHW alone can satisfy energy reduction mandates in Europe.



Questions & Answers



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Backup: Sunnovations System

