

# Solar for Homeowners

*Discover solar technologies for your home*



Center for  
Sustainable Energy™

Our Mission:

Accelerate the transition  
to a sustainable world  
powered by clean energy

# What We Do

## Information Resource & Expert Implementation Partner



Energy  
Programs



Technical  
Assistance



Training &  
Education



# Areas of Expertise



Building  
Performance



Clean  
Transportation



Distributed  
Generation



Energy  
Efficiency



Energy  
Storage



Renewable  
Energy

# CSE Disclaimer

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- **The Center for Sustainable Energy does not endorse any particular product, manufacturer or service** mentioned and does not represent that any goods or services are fit for any purpose or use.
- Along the same lines, this is an informational workshop designed for homeowners. **If you are in the energy efficiency or solar market, please refrain from pitching your products or services in this workshop.**

# Agenda

1. Energy use in the home
2. Learn about Solar Water Heating
3. Get Solar Water Heating for your home
4. Learn about Solar PV
5. Estimate your Solar PV system size
6. Understand your Solar PV financing options
7. Find a contractor
8. Your Questions



# California Solar Initiative





# Solar Photovoltaics vs. Solar Water Heating

- Solar Photovoltaic (PV) Systems
  - use light from the sun to produce electricity for your home.



- Solar Water Heating Systems
  - use the sun's heat to provide hot water for your home.





# Energy use in the home

## Part 1



# What's a Watt?



1 Light Bulb

**= 100 Watts (W)**



10 Light Bulbs

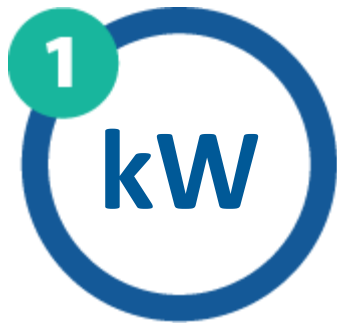
**=**

**1,000 Watts (W)**

or

**1Kilowatt (kW)**

If you keep 10 bulbs turned on for 1 hour...



1 Kilowatt

**X**



1 Hour

**=**

**1 Kilowatt-hour (kWh)**



# What is a Therm?

A therm is the unit of measurement for the natural gas you consume

SDG&E tracks and bills for natural gas usage in therms



Source: [www.capital-cooking.com](http://www.capital-cooking.com)



# What's your energy use?

California is changing the way utilities bill for electricity. To learn about these changes, and ways to save on your energy bill, visit [sdge.com/RateReform](http://sdge.com/RateReform).

## Account Summary

Previous Balance			\$16.02
Payment Received	06/15/15	THANK YOU	- 16.02
Current Charges			+ 42.21
<b>Total Amount Due</b>			<b>\$42.21</b>

## Summary of Current Charges

(See page 2 for details)

	Billing Period	Usage	Amount(\$)
Gas	May 22, 2015 - Jun 23, 2015	12 Therms	15.43
Electric	May 22, 2015 - Jun 23, 2015	145 kWh	26.78
<b>Total Charges this Month</b>			<b>\$42.21</b>

## Regulatory Notices

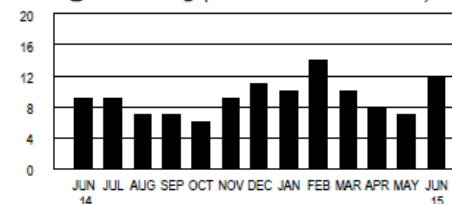
- All customers are required to pay a Competition Transition Charge as part of the charges above, including those who choose an electric service provider other than SDG&E.

Know your energy use before contacting contractors.

DATE DUE Jul 14, 2015

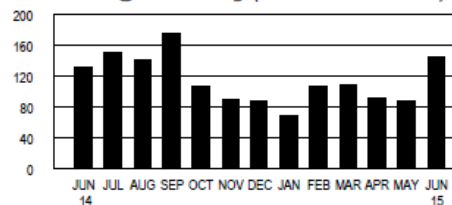
AMOUNT DUE \$42.21

## Gas Usage History (Total Therms used)



	Jun 14	May 15	Jun 15
Total Therms used	9	7	12
Daily average Therms	.3	.2	.4
Days in billing cycle	30	29	32
Change in daily average from last month			+ 100.0%
Change in daily average from last year			+ 33.3%

## Electric Usage History (Total kWh used)



	Jun 14	May 15	Jun 15
Total kWh used	132	87	145
Daily average kWh	4.4	3.0	4.5
Days in billing cycle	30	29	32
Change in daily average from last month			+ 50.0%
Change in daily average from last year			+ 2.3%

# What's your energy use?



[SDGE.com](#) | [Contact Us](#) | [Manage My Account](#)

Log Out ↕

- Home
- Bills and Payments
- Service Requests
- My Energy**
- Alerts and Subscriptions

## My Energy

Account:

Account Number:

View: My Bill Details ▾

- My Energy Overview
- My Bill Details**
- Analyze My Bill
- My Energy Survey
- My Energy Use

**Bill to Date**

You are 16 da

Estimated Cost to Date	\$19.34
Forecasted Bill this Month	\$30 - \$41

This estimate reflects your energy use in the current billing period.



**My Energy/  
Water Usage**

See your usage and tips to conserve


**My Bill Highlights**

↑ Your electric use increased for this bill.

Still have questions about your bill? Go to [Analyze My Bill](#).



# What's your energy use?



## My Account

Home » | [Log Out](#) | [sdjaffe@gmail.com](mailto:sdjaffe@gmail.com)

[My Account](#) | [My Bills & Payments](#) | [Request Services](#) | [My Energy](#) | [Alerts & Subscriptions](#) | [Manage My Accounts](#) | [My Profile](#)

[My Energy Overview](#) | [My Bill Details](#) | [Analyze My Bill](#) | [My Energy Survey](#) | [My Energy Use](#)

### My Energy

For Account 5971908143 (12249PEPPER TR)



























#### My Bill Details

Your bill detail for the selected account is shown below. More details can be found on each tab.

[Pay My Bill](#) | [View My Bill](#)

[Summary](#) | [Service Summary](#) | [Usage Detail](#) | [Cost Detail](#)

Choose meter: [Electric - 05416745](#) | [Previous](#) | [Next](#) | [View all](#)

Bill Period	Billing Days	Tier 1 <a href="#">GRAPH</a>	Tier 2 <a href="#">GRAPH</a>	Tier 3 <a href="#">GRAPH</a>	Tier 4 <a href="#">GRAPH</a>	Total Usage <a href="#">GRAPH</a>	Actions
1/13/2014	33	356	38	0	0	394	 
12/11/2013	30	324	46	0	0	370	 
11/11/2013	31	343	49	0	0	392	 
10/11/2013	29	325	98	11	0	434	 
9/12/2013	30	336	101	235	193	865	 
8/13/2013	29	325	56	0	0	381	 
7/15/2013	33	268	0	0	0	268	 
6/12/2013	30	329	0	0	0	329	 
5/13/2013	31	340	33	0	0	373	 
4/12/2013	30	324	42	0	0	366	 
3/13/2013	30	324	95	0	0	419	 
2/11/2013	31	335	101	32	0	468	 
1/11/2013	31	335	101	48	0	484	 

#### Related Links

- [Sign Up for Energy Use Alerts](#)
- [Set Up Reduce Your Use Day Alerts](#)
- [How-to Videos](#)
- [Save Money at Home](#)
- [Savings with Solar Energy](#)
- [Calculate My Carbon Footprint](#)
- [Green Button Connect My Data](#)

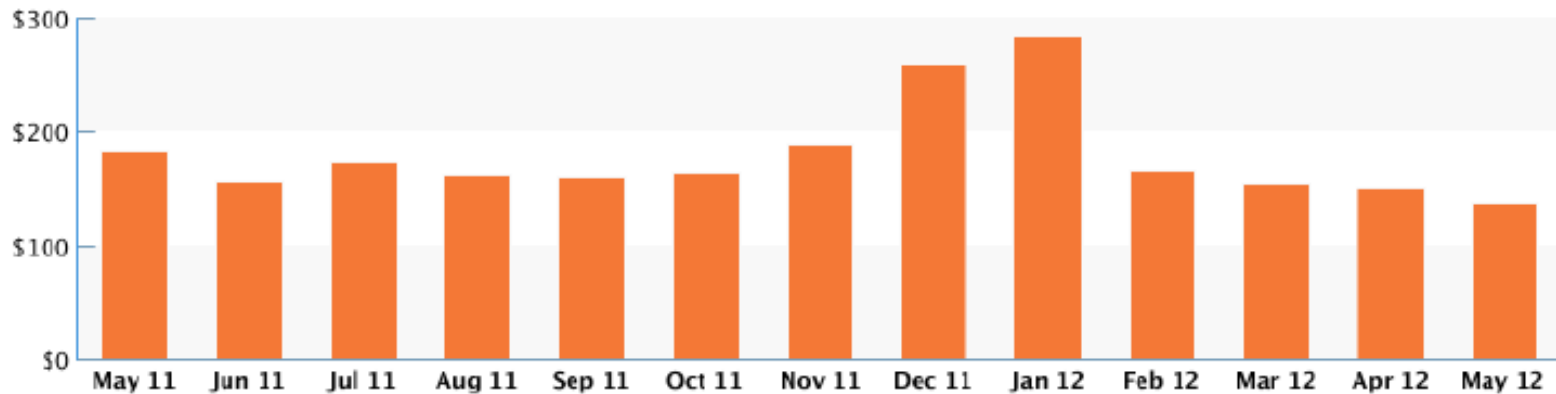
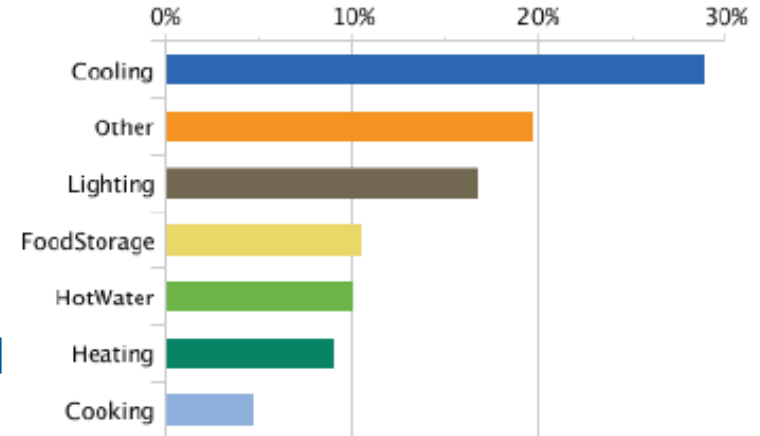
# Energy = Money

- Reduce your use before you produce



# SDGE Home Energy Audit

- Accessed through My Account on the SDG&E website using your log-in ID and password
- Uses data from your account
- Analyzes the energy use at the home based on survey responses and makes customized recommendations to save energy and water





# Energy Efficiency Rebates



## Home Upgrade

Energy Upgrade California®

- SDG&E's Home Upgrade offers incentives between \$1,000 and \$6,500
  - Insulation, air sealing and duct sealing/replacement
  - High efficiency heating, cooling and/or water heating systems
  - Cool roofs, high efficiency windows, etc.
- It also offers third-party quality assurance
- You must work with a participating contractor
- Contact SDG&E to participate

[www.sdgehomeupgrade.com](http://www.sdgehomeupgrade.com)



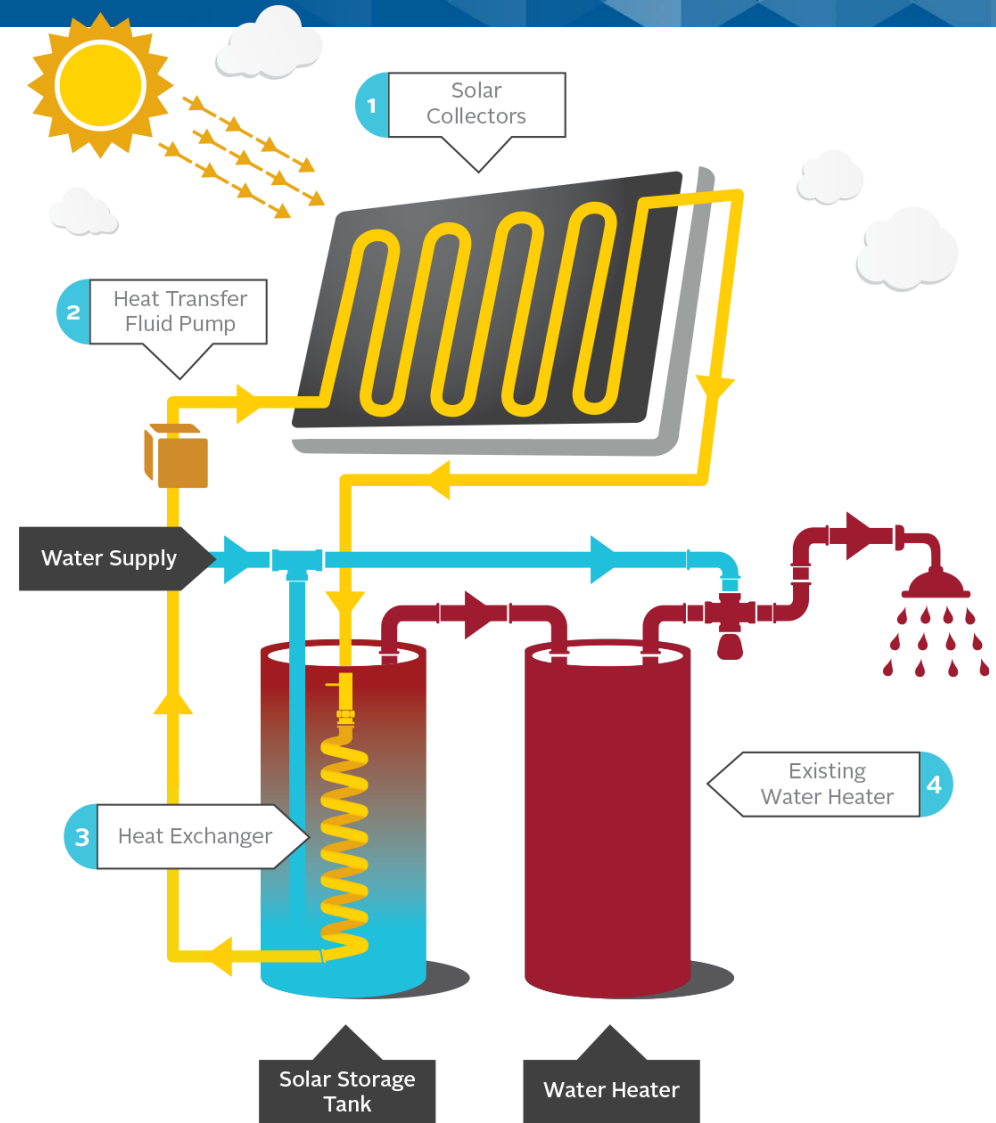
# Learn about Solar Water Heating

Part 2



# How Does Solar Water Heating Work

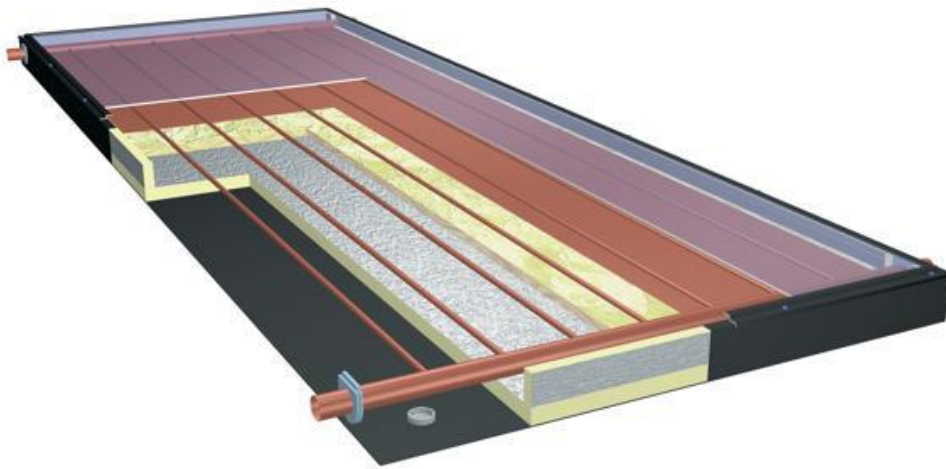
- Technology that captures the sun's **heat** to create hot water
- Pre-heat system for your existing water heater





# Flat Plate Collectors

- Most common solar water heating collector
- Heat is then transferred to water or to a heat exchange fluid flowing through the collector
- Long track record of reliability



Courtesy of Sunearth inc.





# Other Collector Types



Evacuated Tube Collectors



Unglazed Collectors  
(Generally for Pool Heating)

# Solar Storage Tanks

- All solar water heating systems have a storage component
- Solar storage is separate from your existing tank or tankless water heater



Roof mounted storage



Solar storage tank next to existing water heater



# Solar Water Heating – General Considerations



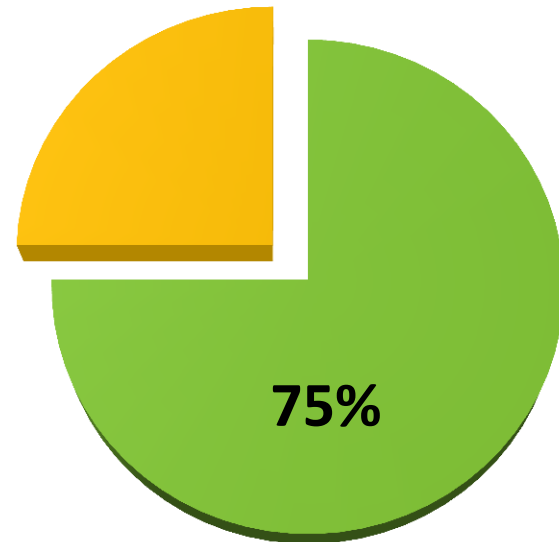
- Works with any backup (natural gas, electric, propane)
- Not required to replace existing water heater
- Can be compatible with tankless
- 1-3 collectors on your roof (32-120 sq. ft.)

# Average Savings

Solar water heating  
reduces the  
energy needed  
to heat  
your water.

You save \$\$\$ on your  
utility bill

Save up to 75%  
of hot water heating  
costs!







# Solar Water Heating Systems

Part 3

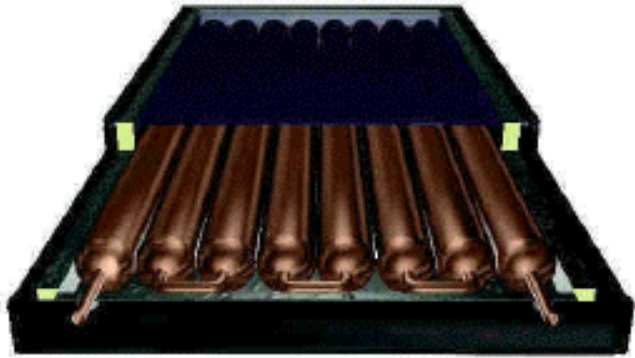


# Passive vs. Active Systems

- Passive Systems
  - Require no pumps
  - Simple design
  - Solar storage is on the roof
- Active Systems
  - Use a pump and a heat exchange fluid
  - The heat exchange fluid is heated in the collectors and then pumped into the storage tank to heat water
  - Fluid may be either glycol or water

# Passive Systems

# Integral Collector Storage System - Passive

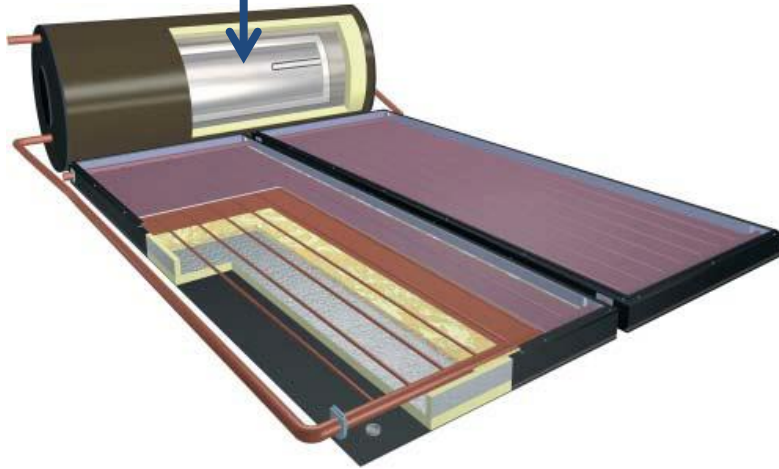


Water stored in the collectors



# Thermosyphon System - Passive

Water Stored in Tank



Source: SunEarth



CleanTech

# Example Passive System

# Active Systems

# Indirect Forced Circulation - Active

## Two Types

- Glycol
- Drainback





# Example Glycol System

# Example Drainback System

# General Considerations

- Freeze Protection
  - Systems are designed to function in cold conditions
  - All eligible types discussed here have freeze protection
- Overheat Protection
  - Glycol systems only
  - Your contractor should ensure protection from overheating

# Direct Forced Circulation

## Ineligible in the CSI-Thermal Program

- Open loop (no heat exchanger)
- Pumped system
- Risk of freezing in colder climates
- Not appropriate with hard water



# Alternative Systems

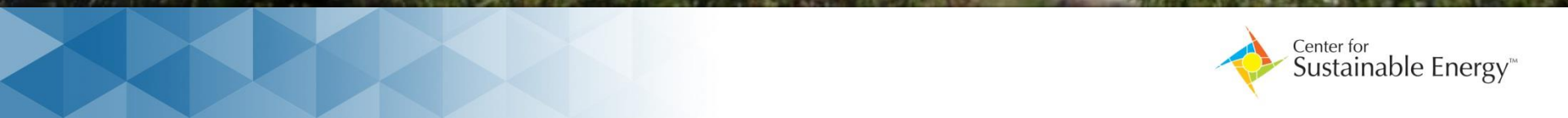
# Alternative Systems

- Systems that use PV instead of traditional thermal collectors
  - Not integrated into your PV system to offset house electricity

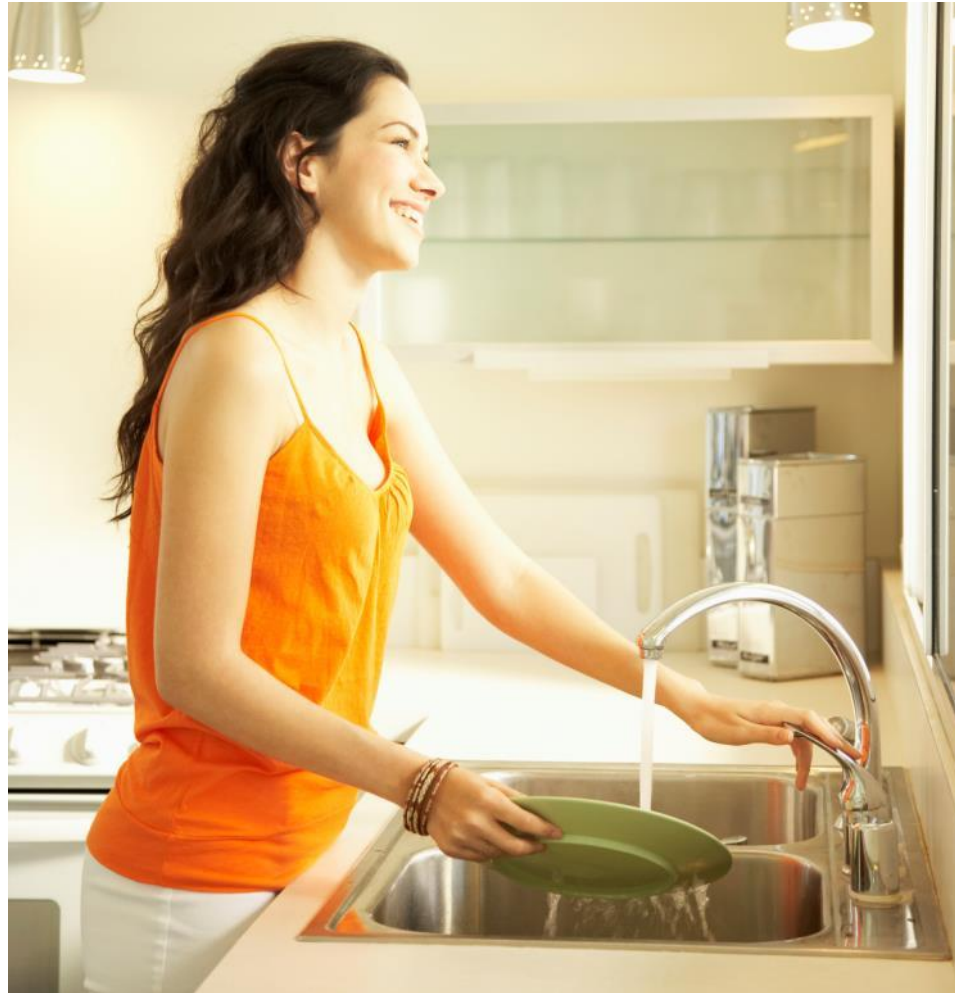


# Get Solar Water Heating for Your Home

Part 4



# California Solar Initiative-Thermal Program





# California Solar Initiative-Thermal Program

## ELIGIBLE

Gas water heating customers of  
SDG&E, PG&E, or SoCalGas

Retrofit  
New Construction

## NOT ELIGIBLE

Pool & Spa Systems, Space heating/cooling,  
Radiant Floor Heating

# CSI-Thermal Program Background

- Launched in 2010
- Natural Gas program through 2017
- Ratepayer funded program for customers of the large investor owned utilities

# How the rebate works

- One time payment
- Your contractor applies for you (self-installers apply for themselves)
- Apply for the rebate once the project is completely installed & has been inspected by the city or county

# Rebate Based on Expected Performance

- Expected annual energy savings (OG-300 rating)
- Current incentive level for natural gas
- Surface orientation
- Shading analysis






# System Rating

- Residential systems are certified and rated
  - Solar Rating Certification Corporation (SRCC)
  - International Association of Plumbing and Mechanical Officials (IAPMO)

Solar Specifications <http://nrelroweb.nrel.gov/solar/detail.aspx?productID=3174881e...>



**IAPMO RESEARCH AND TESTING, INC.**  
Solar Collector Rating Sheet

Manufacturer: SRCC  
SRCC, 8100 Linden Lakes Drive  
LA Quetta, CA 92023

File No: S-3051      Effective Date: June 2014  
Void After: June 2015

Collector Name: Sun-1 Unglazed SL412 (2")  
Brand Name: Sun-1  
Collector Type: Unglazed Flat-Plate  
Cyclic Type:  
Model Number: SL412

**COLLECTOR SPECIFICATIONS (for the tested collector)**

Gross Area	4.37 m <sup>2</sup>	46.63 ft <sup>2</sup>	Gross Length	3.65 m	11.98 ft
Aperture Area	4.33 m <sup>2</sup>	46.43 ft <sup>2</sup>	Gross Width	1.27 m	4.18 ft
Absorber Area	3.73 m <sup>2</sup>	40.02 ft <sup>2</sup>	Gross Depth	0.25 m	0.82 ft
Fluid Capacity	3.3 L/m <sup>2</sup>	3.54 gallons	Test Pressure	241.40 kPa	35.00 psi
Dr. Weight	50.1 kg	110.60 lb			

**COLLECTOR MATERIALS AND FINISHES**

Frame:		Back Insulation:	
Absorber Material:		Back Insulation:	
Absorber Coating:		Outer Cover:	
Glassing Material:	Outer Cover		
Surface Characteristics:			
Impact Safety Rating:			
Block-ups:			
Transmittance:			
Clearance:			
Panel Seal Length (unterminated):			
Tube Spacing to Header Enclosure Seal:		Drainage Material:	
Minimum Slope:			

**TECHNICAL INFORMATION**


ISO Efficiency Equation  
[NOTE: Based on gross area and (F<sub>r</sub>)<sub>0</sub>-T<sub>amb</sub>]  
ISO (η<sub>0</sub>): 0.7460 + 0.03339(A<sub>0</sub>) - (13.007 + 8.2199(A<sub>0</sub>))<sup>0.5</sup>      Performance: 0.9383      Slope: 19.538      (W/m<sup>2</sup>·°C)

Incident Angle Modifier (IAM):  $I_{AM} = 1 - 1.660 \cos^2 \theta - 0.1460 \cos^4 \theta$       θ = 0 to 60 degree

θ	30	35	40	50	60	70
I <sub>AM</sub>	0.998	0.992	0.983	0.959	0.912	0.753

Test Fluid: Water      Test Mass Flow Rate: 0.0742 (kg/m<sup>2</sup>·s)      16.294 (lb/m<sup>2</sup>·hr)

1 of 1 4/16/2015 2:18 PM



**CERTIFIED SOLAR SYSTEM**

SUPPLIER: HelioFro, Inc.  
4910 Sempert Avenue  
Kilbuck, CA 94026 USA  
www.heliofro.com  
In Accordance with:  
SRCC Standard 300-2014-07

BRAND: HelioFro  
MODEL: HFRAC-D16-206-G-132-ACC  
SYSTEM TYPE: Pumped, Indirect  
CERTIFICATION #: 30004239  
Original Certification: July 31, 2014  
Expiration Date: July 31, 2019

The solar system listed below has been evaluated by the Solar Rating & Certification Corporation™ (SRCC™), an ISO/IEC 17066 accredited and EPA recognized Certification Body, in accordance with SRCC OG-300, Operating Guidelines for Certifying Solar Water Heating Systems, and has been certified by the SRCC. This award of certification is subject to all terms and conditions of the Program Agreement and the documents incorporated therein by reference. This document must be reproduced in its entirety.

Description: Glass Flat Plate, Differential, Differential, Differential, External Plate Heat Exchanger, 80°C, 88°F, Non-DRAS, None, Fluid, Pressure Integration

Single-Day Rating		SINGLE DAY RATING CONDITIONS		SI Units	Imperial Units
Solar Energy Factor (SEF)	Solar Fraction (SF)	System Set Temperature	19.2°C	66.6°F	130°F
2.0	0.64	Environment Temperature	13.9°C	57.0°F	65°F
		Ambient Temperature Profile Average	14.4°C	58°F	66°F
		Water Means Temperature	14.4°C	58°F	66°F

Single-Day Rating Conditions:  
SEF = Solar Energy Factor (info link)  
SF = Solar Fraction (info link)

Collected Load	43.5 kWh/def	41,546 Btu/def
Solar Incidence	4,733 Wh/m <sup>2</sup> ·def	1,000 Btu/m <sup>2</sup> ·def

**Storage Tank(s)**

Solar Tank Vol (l)	Solar Tank Vol (gal)	Aux Tank Vol (l)	Aux Tank Vol (gal)
484	127	189	50

Note: The auxiliary tank can have a volume between 132 and 246 liters (35 and 66 gallons).


Approximate Collector Area: 6.0 m<sup>2</sup>, 63.9 ft<sup>2</sup>

The solar water system listed here has been certified by the SRCC as meeting the minimum standards for testing, installation, operation, maintenance, performance, reliability and safety as specified in SRCC Document OG-300. Thermal performance ratings are based on the successful durability and performance testing of a sample collector where said tests have been conducted by an independent laboratory approved and listed by the SRCC. The system has been modeled using the computer simulation program TRNSYS to calculate the ratings.

Before the Supplier can make any change in design, materials, specifications, parts, or construction, the change(s) must be reported to the SRCC for evaluation of continued certification.

*John Higgins*  
Technical Director

Print Date: September, 2014 Page 1 of 2  
© Solar Rating & Certification Corporation™  
www.solar-rating.org • 400 High Point Drive, Suite 200 • Cocoa, Florida 32926 • (321) 213-6037 • Fax (321) 821-2910



- Testing is performed to determine how much energy a system can be expected to offset in therms per year
- This rating is used to calculate your rebate

# Incentives: Natural Gas

Steps	\$ per Therm Saved	Single Family Cap
Step 1	\$29.85	\$4,366
Step 2	\$25.37	\$3,710
Step 3	\$14.30	\$2,091
Step 4	\$3.23	\$472

# Example: Incentive Formula (Natural Gas)

Average Energy Savings	115 Therms
x \$/Therm	x \$29.85
x Surface orientation factor	x 1.0
x Shade factor	x 1.0
= \$ Rebate	= \$3,433

# Rebate Summary



	Average System Cost	Average Rebate	Out-of-Pocket Cost
Gas	\$ 7,300	\$ 3,300	\$ 4,000

# Federal Solar Investment Tax Credit

- 30% of the net system cost thru 2019
- 26% in 2020
- 22% in 2021
- IRS Form 5695  
(Renewable Energy Credit)



Talk to your tax professional!

[http://www.energystar.gov/about/federal\\_tax\\_credits](http://www.energystar.gov/about/federal_tax_credits)



# Average Costs



	Initial Investment	Cost After Rebate	Fed Tax Credit (30%)	Net Cost
Gas	\$7,300	\$4,000	\$1,200	\$2,800
Electric	\$7,300	N/A	\$2,190	\$5,110

# Contract Structure Options - \$7,300



\$ 4000



\$ 7300

- \$ 3300

rebate

\$ 4000



\$ 3300

rebate

Rebate \$ goes to contractor



\$ 0

Rebate \$ goes to you

# Solar Water Heating Contractors must be eligible

- Contractors participating in the CSI Thermal Rebate Program must:
  - have an active license
    - Class A
    - Class B
    - Class C-4
    - Class C-36
    - Class C-46
  - have attended a CSI Thermal eligibility workshop

To find an active Solar Water Heating contractor near you visit  
**[energycenter.org/swhcontractors](http://energycenter.org/swhcontractors)**

# Basic Questions to Ask Solar Water Heating Contractors

1. Are you an “eligible” contractor through the CSI-Thermal Program?
2. Is the SWH system OG-300 certified?
3. What type of freeze protection does this SWH system have?
4. What type of heat protection does this SWH system have?
5. What type of insulation will be used on the pipes?





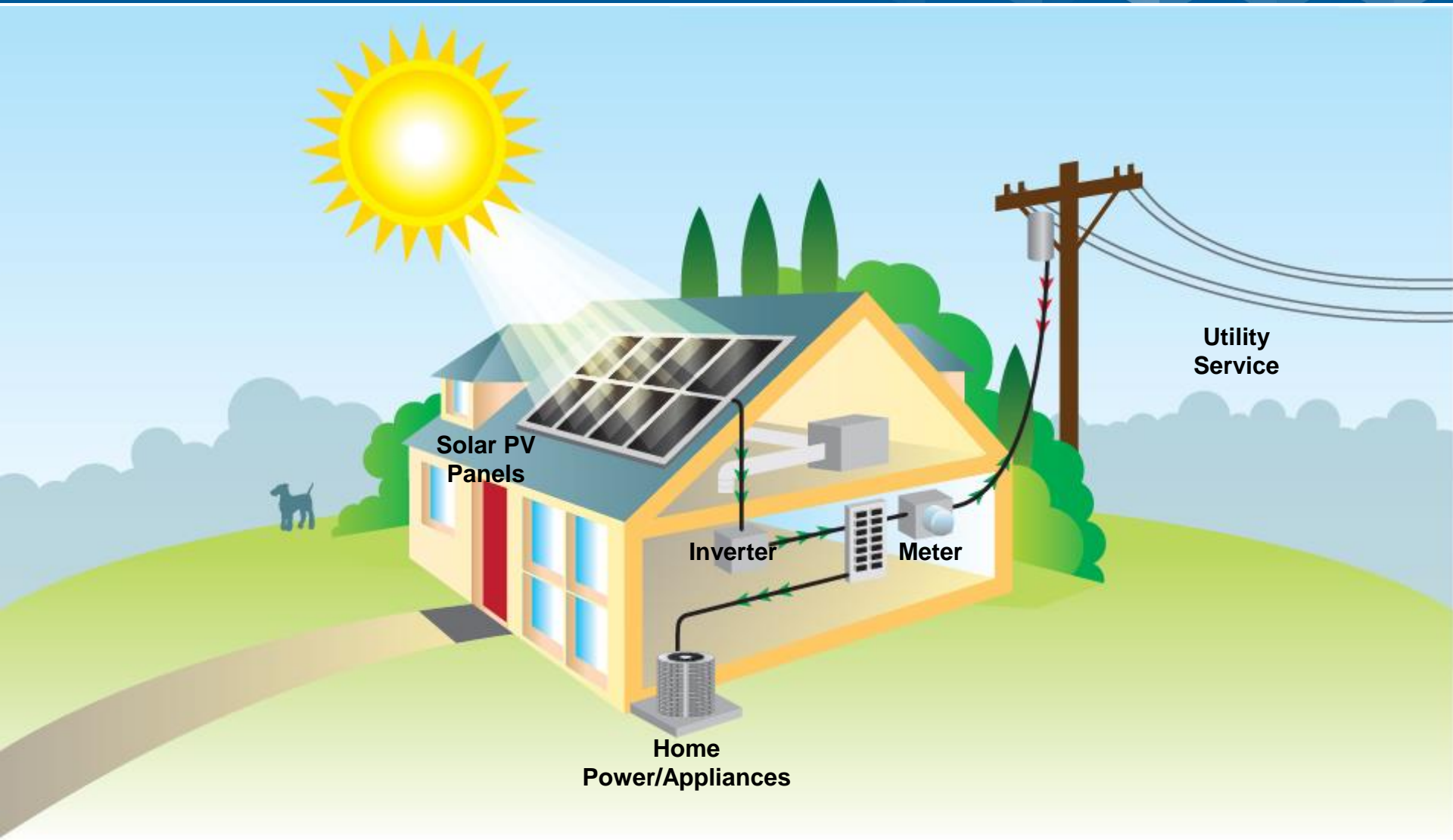
# Learn About Solar PV

## Part 5





# How does solar PV work?



# PV Terminology



Cell



Module / Panel



Array

# Crystalline Silicon PV Panels



**Roof Mounted**

- Rigid crystals
- Longest track record, over 50 years
- Most common, over 93% of the market
- Extreme heat reduces performance
- Shade highly reduces performance



**Ground Mounted**



# Inverters

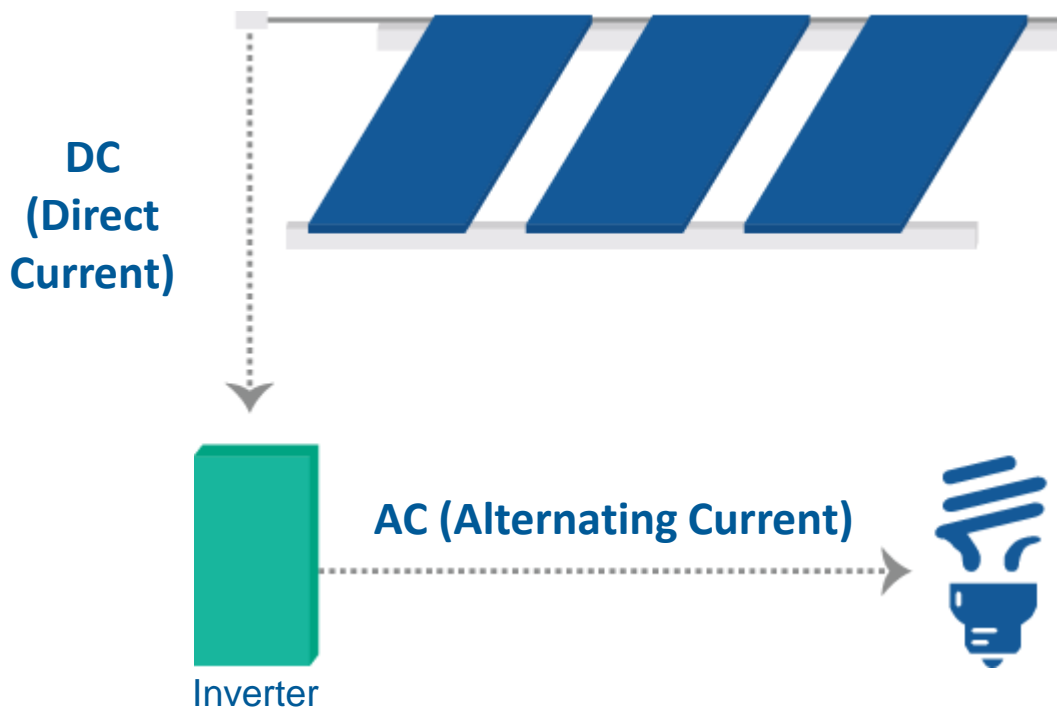


# Inverters

Inverters change DC electricity from panels to AC electricity for use in your home

## Two Types

- Central Inverters
- Micro Inverters





# Central Inverters

One individual inverter per array



# Central Inverters

One individual inverter per array.

## Benefits:

- Central point of failure
- Longer track record

## Disadvantage:

- Shading can affect power output dramatically
- Does not allow for easy system size increases

# Micro Inverters

One individual inverter per panel



# Micro Inverters

One individual inverter per panel.

## Benefits:

- More tolerant to shading
- Allows flexibility in design and for future additions

## Disadvantage:

- Shorter track record

# What is Net Metering?

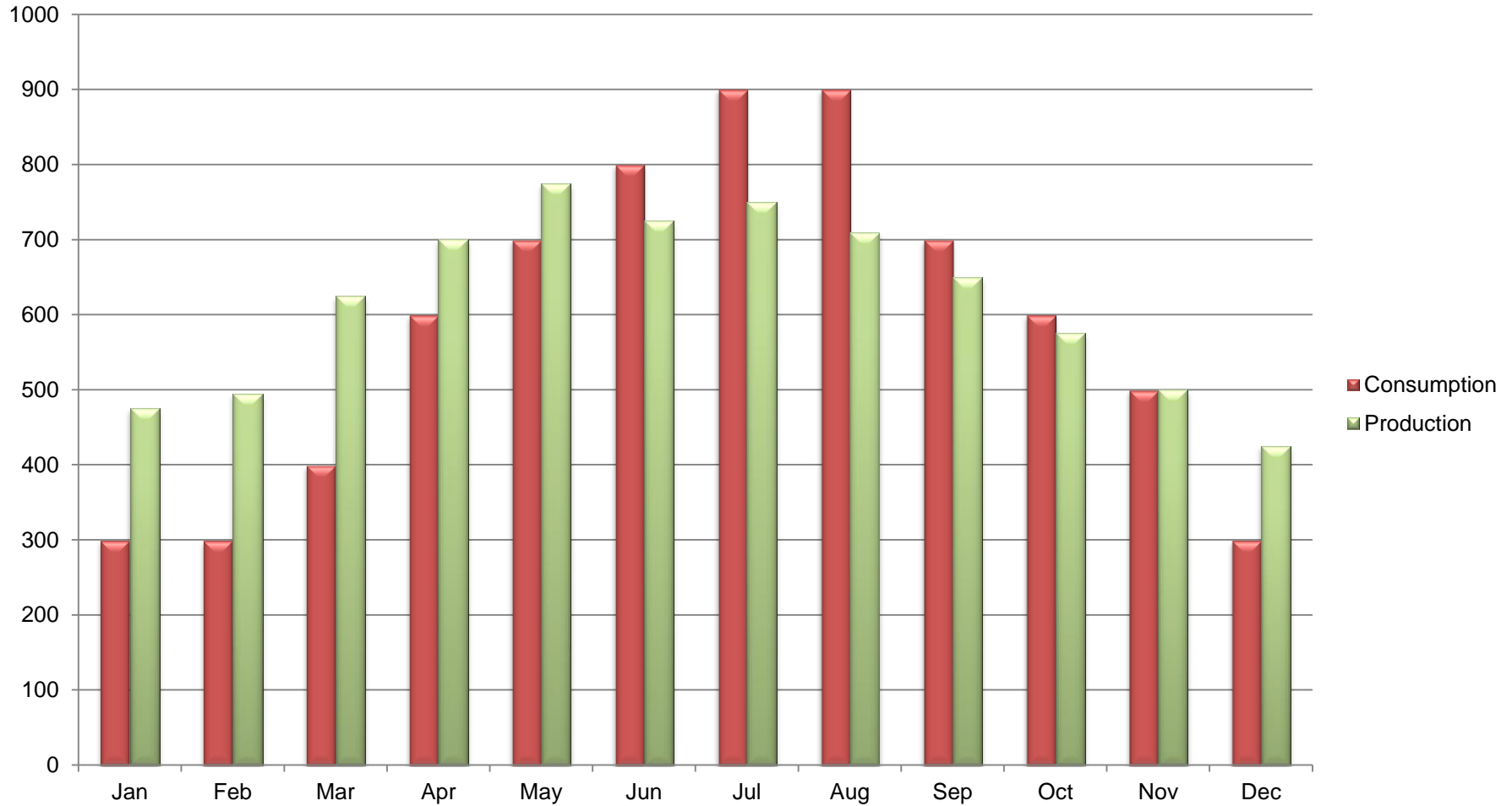




# Net Energy Metering

- Interconnection fee
  - \$132 for SDG&E customers
- Non-bypassable charges (~\$0.02/kWh)
  - Applied to all energy usage from the grid
- Mandatory time-of-use (TOU) rate
  - Enacted after General Rate Case decided

# Consumption/Production Patterns

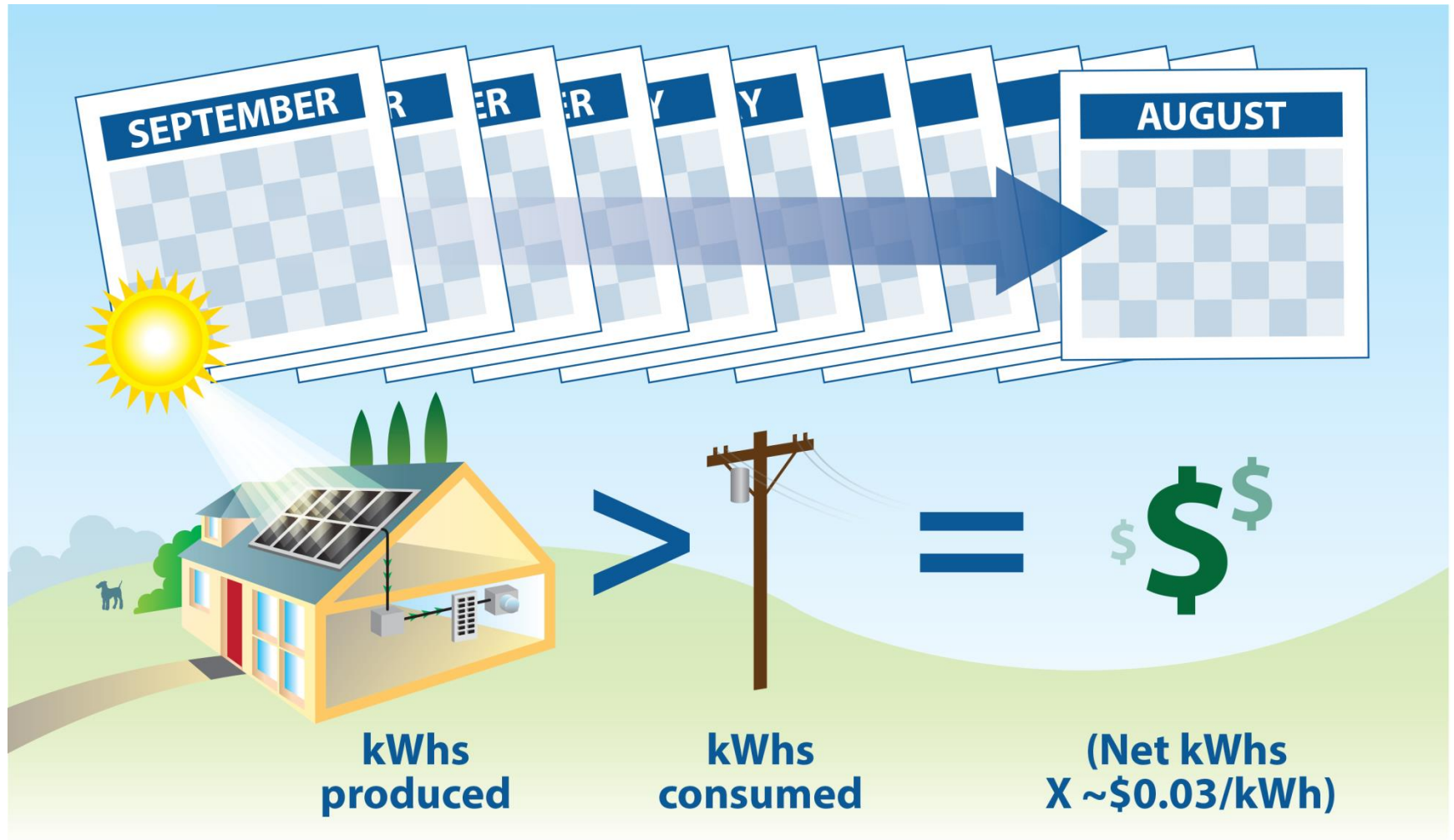


# The California Solar Surplus Act

- AB 920 requires the utility to purchase annual over generation by net metered utility customers.
- Purchase price is  $\approx$ \$0.03/ kWh

Note - If you offset more than 100% of your kWh usage, you will receive a minimum charge of \$10/month.

# Annual True-up



# Time of Use Rate

- SDGE residential NEM 2.0 participants are not required to select TOU until after SDGE TOU rates are determined for all residential customers
- Residential customers can participate in NEM 2.0 prior to TOU rates being determined (while on SDGE tiered rates)
- NEM 2.0 participants prior to TOU rate determination can remain on SDGE tiered rates for 5 years
- Once TOU rates are determined, all NEM 2.0 participants will be on TOU
- TOU implementation is expected once the General Rate results are enacted





# PV System Sizing- How much electricity do you need?

Part 6

# System Sizing

$$\begin{array}{ccc} \text{12 month} & & \text{1,700 kWh} \\ \text{electricity} & / & \text{(average annual} \\ \text{consumption} & & \text{production of 1} \\ \text{(kWh)} & & \text{kW in San Diego)} \\ & & = \\ & & \text{\# of kW} \\ & & \text{that would} \\ & & \text{offset your} \\ & & \text{electricity use} \end{array}$$

*\*\*Remember: this will offset 100% of your annual electricity use\*\**

# System Sizing Example

$$7,000 \text{ kWh} / 1,700 \text{ kWh} = 4.1 \text{ kW PV System}$$

12 month electricity  
consumption (kWh)

average annual production of  
1 kW in San Diego

kW that would offset  
your electricity use

*\*\*Remember: this will offset 100% of your annual electricity use\*\**

# SDG&E Solar PV Calculator

Home Bills and Payments Service Requests **My Energy** Alerts and Subscriptions

My Energy Overview | My Bill Details | Analyze My Bill | My Energy Survey | My Energy Use

**My Energy**

For Account 4182143179 (3315 KEARNY VIL) Select Account: 3315 KEARNY VIL

### Bill-to-Date Estimate

You are 23 days into your billing cycle.

Estimated Cost to Date	\$87.00
Forecasted Bill this Month	\$112 - \$151

This estimate reflects your energy use in the current billing period.

### When Does My Home Use Energy?

Daily Energy Use

Meter: Electric - 05941829

**Meter Highlights**

- You've used 395 kWh this period.

For more detailed analysis and graph options, go to [My Energy Use](#).

### My Neighborhood Comparison

Avg. Home \$450

**Get Your Results**

[Home Profile](#)  
Complete your home profile to get a personalized graph of your energy use.

### My Bill Highlights

Your electric use increased for this bill.

Still have questions about your bill? Go to [Analyze My Bill](#).

### How Does My Home Use Energy?

**Analyze My Energy Use**

Complete your [Home Profile](#) to get an analysis of your energy use.

### How Does My Use Compare?

**My Bill Details**  
View and graph up to 25 months of information from your bills.

### Related Links

- Sign Up for Energy Use Alerts
- Select a New Pricing Plan
- How-to Videos
- Save Money at Home**
- Savings with Solar Energy
- Calculate My Carbon Footprint

# SDG&E Solar PV Calculator

Home Bills and Payments Service Requests **My Energy** Alerts and Subscriptions

[My Energy Overview](#) | [My Bill Details](#) | [Analyze My Bill](#) | [My Energy Survey](#) | [My Energy Use](#)

## My Energy

For Account

Select Account:

 Save |  Print

Estimated Solar Size Options

Produce up to 51% of your power (0.7 kW)

Produce up to 73% of your power (1.0 kW)

Produce up to 102% of your power (1.4 kW)

### ESTIMATES






### Estimated Energy Produced

1,194 kWh  
Enough to supply 51% of your annual usage

1,705 kWh  
Enough to supply 73% of your annual usage

2,387 kWh  
Enough to supply 102% of your annual usage

 Less Estimated Federal Tax Credit	-\$1,230	-\$1,760	-\$2,460
<b>Total Estimated Incentives</b>	<b>-\$1,370</b>	<b>-\$1,960</b>	<b>-\$2,740</b>
 Estimated Out-of-Pocket Cost	<b>\$2,870</b>	<b>\$4,100</b>	<b>\$5,740</b>
 Estimated Carbon Footprint Reduction	859 lbs	1,228 lbs	1,719 lbs
 Estimated 12 Month Savings	\$210	\$290	\$350

Customize your solar installation by selecting a

Select 0.7 kW

Select 1.0 kW

Select 1.4 kW



A 3D puzzle with several pieces. One large piece is shaped like a solar panel with a grid of blue cells. Other pieces are shaped like US dollar bills, showing details like the portrait of Benjamin Franklin, the text 'HUNDREDDOLLARS', and 'FEDERAL RESERVE SYSTEM'. The puzzle is set against a white background with a blue geometric pattern at the bottom.

# Understanding the Cost of Solar PV and your Financing Options

## Part 7

# Financing Options

Two avenues for financing:

## Purchased

- Cash
- Loan

## Third Party Owned

- Lease
- Power Purchase Agreement (PPA)

# Financing Options

## What are you buying?

### **Purchased**

Buying an asset

### **Third Party Owned**

Buying a service,  
usually with a  
purchase option

# Financing Options

## What is included in the purchase?

### Purchased

Generally will not include:

- Inverter replacement
- Operations & Maintenance
- Insurance

May include:

- Monitoring

### Third Party Owned

Generally includes:

- Inverter replacement
- Operations & Maintenance
- Insurance
- Monitoring

# Financing Options

## What are the tax implications?

### Purchased

Need to have the tax liability to make use of the federal investment tax credit (ITC)

### Third Party Owned

Solar services provider has the tax liability for the federal investment tax credit (ITC) **and** the commercial tax depreciation



# Financing Options

## What are the risks?

### Purchased

Building owner responsible for operation and maintenance

### Third Party Owned

Longevity of the solar services provider

# Financing Options

## What happens if I move?

### Purchased

New homeowner buys the asset

### Third Party Owned

Can transfer payments to new homeowner **or** must buy out the remainder of the contract at 'fair market value'

# Financing Options

## What are the financial benefits?

### Purchased

Return on investment in the form of lower electricity bills

### Third Party Owned

Little or no upfront cost, usually cash positive or neutral in the first year

# California Residential Solar Costs: SDG&E territory

Average Residential PV Cost:

**\$3 to \$5 per Watt (AC)**



# How much does solar PV cost?

## Factors that could increase costs:

- Roof replacement
- Electrical panel upgrades
- Tree trimming
- Trenching (for ground-mounts)



# Federal Solar Investment Tax Credit

- 30% of the eligible system cost available through 2019
- 26% in 2020
- 22% in 2021
- One-time credit, but may be carried over
- IRS Form 5695 (Renewable Energy Credit)

Talk to your tax professional!

[www.dsireusa.org](http://www.dsireusa.org)

# Purchased PV System Example

<b>Home consumes 5100 kWh/year</b>	<b>5100 kWh / 1700 kWh</b>	<b>3kw system</b>
<b>System Cost</b>	<b>3,000W x \$4.00/Watt</b>	<b>\$12,000</b>
<b>Federal Tax Credit</b>	<b>30% x \$12,000</b>	<b>\$3,600</b>
<b>Total Cost After Tax Credit</b>	<b>\$12,000 - \$3,600</b>	<b>\$8,400</b>

# Purchase Options

- Cash Purchase
- Loans
  - Home Equity Loan: bank loan secured with equity from the house (if available)
  - Energy Efficient / Solar Loan
    - San Diego Metropolitan Credit Union
    - Point Loma Credit Union
- Property Assessed Clean Energy (PACE) Loan  
[www.energycenter.org/pace](http://www.energycenter.org/pace)
- Loan from solar contractor

# Third Party Options

- Lease
  - Fixed \$ per Month
  - May be pre-paid or monthly
- Power Purchase Agreement (PPA)
  - Fixed \$ per kWh produced by system
  - Customer buys *all* power produced by system



# Find your solar contractor

Part 8



# The Three Steps

1. Research contractors
2. Compare your options
3. Negotiate bidding/contracting

# Research Contractors

- Find solar contractors:
  - Referrals from friends, family, neighbors, co-workers
  - [www.californiasolarstatistics.com](http://www.californiasolarstatistics.com)
  - [www.gosolarcalifornia.ca.gov](http://www.gosolarcalifornia.ca.gov)
  - [www.sdgehomeupgrade.com](http://www.sdgehomeupgrade.com)
  - [www.energycenter.org/swhcontractors](http://www.energycenter.org/swhcontractors)
- Contact a minimum of 3 contractors and ask for quotes

**Make sure to use a licensed contractor.  
Go to [cslb.ca.gov](http://cslb.ca.gov) to check a license  
number.**

# Consumer Awareness

- Avoid high pressure signing tactics
- Don't sign anything you do not understand
- Keep records of all documents, revisions, quotes, etc.

# What to Look for in a Contract

1. Installer and Host Customer Information
2. System Size
3. Make/Model/Quantity of Panels and/or Inverters
4. Freeze protection method (SWH systems)
5. Warranty Language
6. Work Schedule/Description of Work
7. Price/Payment Schedule
8. Rebate amount and recipient (SWH systems)
9. Know all Parties Involved

# Bid Comparison





# Things to Consider

- Is your home as energy efficient as possible?
- What are your HOA restrictions? (Civil code 714)
- Do you have space for PV panels? Solar water heating collectors?
- Will you have shading on your roof?
- Future load growth?
- Talk to your homeowners insurance company before adding solar to your home.

# Which technology is right for you?



- Solar PV and Solar Water Heating systems:
  - are designed to last twenty years or more
  - provide protection from rising energy costs
- Solar Water Heating has a significantly lower upfront capital cost
  - Rebates are at their highest levels
- Solar PV will save you more money in the short term

# Electric Vehicle - Available Rebates

## Clean Vehicle Rebate Project

Vehicle Type	Rebate Amount
Fuel-Cell	\$5,000
All-Battery or Range Extended	\$2,500
Plug-in Hybrid	\$1,500
Neighborhood Electric Vehicle	\$900
Zero-Emission Motorcycle	\$900

## Federal Tax Credit

Vehicle Type	Rebate Amount
All Battery or Range Extended	\$7,500
Plug-in Hybrid	Up to \$7,500

Questions? Contact [cvrp@energycenter.org](mailto:cvrp@energycenter.org)





Center for  
Sustainable Energy®

858 – 244 – 1177

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[swh@energycenter.org](mailto:swh@energycenter.org)



Center for  
Sustainable Energy™

# Online Resources

- [www.energycenter.org](http://www.energycenter.org) – CSE Website
- [www.csi-trigger.com](http://www.csi-trigger.com) - CSI Statewide Trigger Point Tracker
- [www.gosolarcalifornia.ca.gov](http://www.gosolarcalifornia.ca.gov) – CPUC and CEC
- [www.cslb.ca.gov](http://www.cslb.ca.gov) – Contractor State License Board
- [www.bbb.org](http://www.bbb.org) – Better Business Bureau
- [www.yelp.com](http://www.yelp.com) - Customer Reviews
- [www.californiadgstats.ca.gov](http://www.californiadgstats.ca.gov) – Statewide DG Data
- [www.sdgehomeupgrade.com](http://www.sdgehomeupgrade.com) – SDG&E Home Upgrade
- [www.energycenter.org/solarwater](http://www.energycenter.org/solarwater) – Solar Water Heating Program