Center for Sustainable Energy® CALIFORNIA

Solar for Homeowners

Getting Started with Solar

January 9, 2014

California Center for Sustainable Energy

Mission:

Accelerating the transition to a sustainable world powered by clean energy

CCSE operates in three focus areas:

Energy Efficiency, Renewable Energy, and Transportation




www.energycenter.org

Upcoming Events

- **January 11, 2014 - 10am-1pm**
  - *Poway Energy Efficiency Home Tour*
- **January 18, 2014 - 10am-1pm**
  - *San Carlos Energy Efficiency Home Tour*
- **February 1, 2014 - 10am-1pm**
  - *Clairemont Energy Efficiency Home Tour*

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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. Introduction to Solar Electricity
2. Overview of the California Solar Initiative
3. Getting Started with PV
4. System Sizing
5. Finding & Researching Contractors
6. Online Resources and Next Steps

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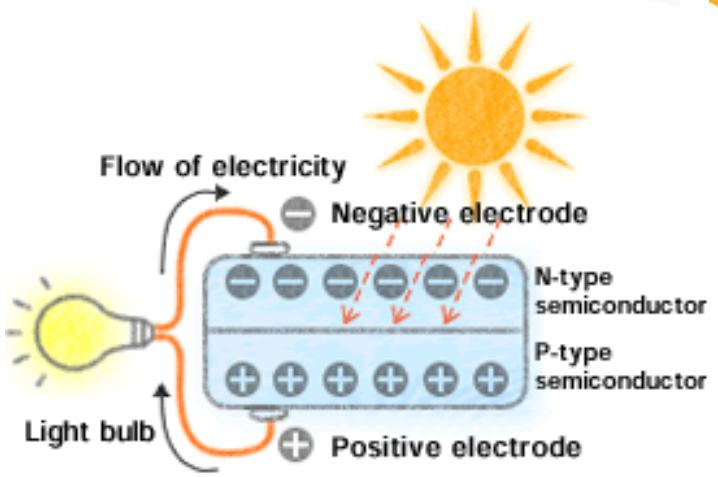
Introduction to Solar Electricity: Photovoltaics (PV)

What is Solar Electricity?

- **Photo-voltaic (PV)**

  photo = light

  voltaic = produces voltage



- Photovoltaic (PV) systems convert light directly into electricity using semi-conductor technology.
- Sunlight strikes the PV cell and causes the electrons to flow, creating an electric current (photovoltaic effect)

Terminology

- **DC**: Direct Current (produced by solar panels)
- **AC**: Alternating Current (used in the home)
- **Efficiency**: Measure of how much of the sunlight is converted to electricity (%)
- **Capacity**: Total amount of power that a system produces
- **Watt**: Basic unit of *power*
- **Kilowatt**: A unit of electrical power equal to 1,000 watts (most common measurement)
- **Kilowatt-Hour**: Basic unit of *energy*. The use of 1,000 watts of electricity for one full hour (basic unit of electrical usage billing)

What's a Watt?

1 light bulb = 100 Watts (W)

10 light bulbs = 1,000 Watts (W) or 1 Kilowatt (kW)

If you keep 10 light bulbs turned on for 1 hour:

1 kilowatt x 1 hour = 1 kilowatt-hour (kWh)

Kilowatt is a measure of instantaneous power

Kilowatt-hour is a measure of energy consumption (or production)

What's a Kilowatt-Hour?

100 DC Watt module

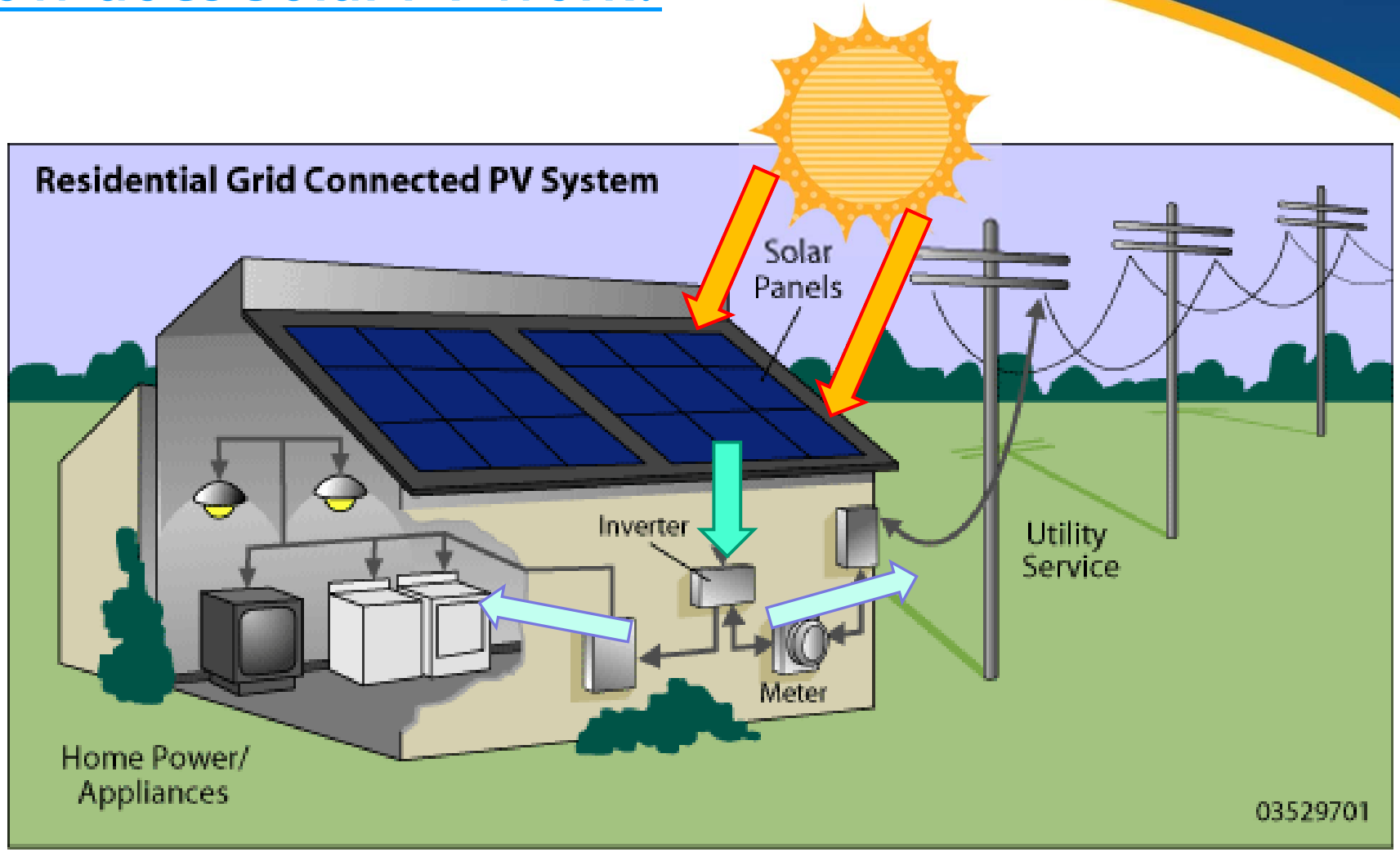
10 modules: 10 x 100 W = 1,000 W (1 kW)

If the sun shines for 5 hours/day on average…

1 kW x 5 hours = 5 kWh per day

5 kWh x 365 days = 1,825 kWh per year

How does Solar PV work?



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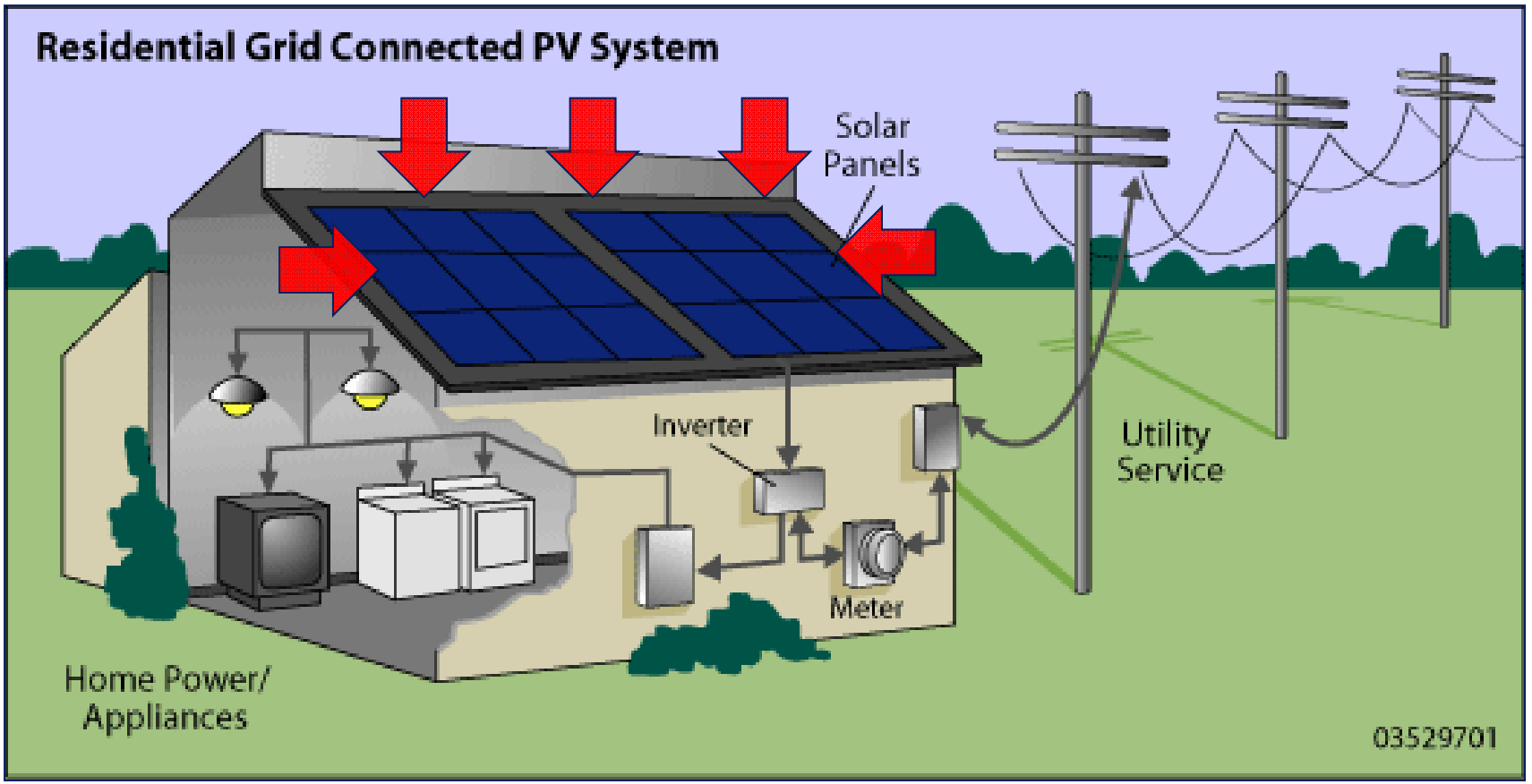
First, we will discuss PV Panels.



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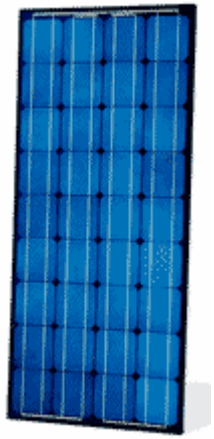
PV Terminology

Cell



Module / Panel

Array

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What are the different types of PV modules?

Crystalline vs. Thin Film

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Crystalline Silicon PV Products

- Rigid crystals
- Longest track record, over 50 years
- Most common, over 93% of the market
- Highest efficiencies: avg. 15%, up to 22%
- ≤100 sq. ft. = 1 kW of solar
- Extreme heat reduces performance
- Shade highly reduces performance

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Traditional Crystalline PV Panels (checker pattern)

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Home with PV (front view)

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Same Home with PV (side view)

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Crystalline PV Panels on flat roof with tilt kit

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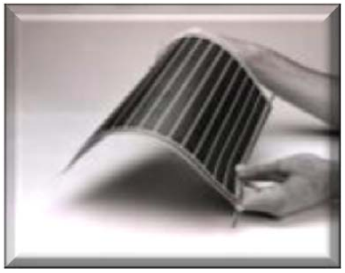
Crystalline PV on a Ground Mount tilted for performance

Thin Film PV Products



- Can be applied on many different materials
- Lower efficiencies: avg. 7%, up to 15%
- 150-200 sq. ft. = 1 kW of solar
- High heat somewhat reduces performance
- Shading moderately reduces performance

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Thin Film (Flush mounted)

Integrated Roofing Tiles

Pros

- Visually appealing
- Replaces roofing material
- Lightweight
- Avoids having to drill through roof

Cons

- Expensive (60% higher cost)
- Less efficient

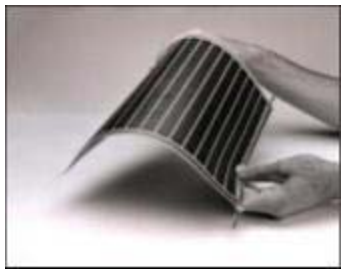
Comparison

Crystalline

- Residential Market Share: 93%
- Efficiency 15-22%
- Proven technology
- Most efficient sunlight conversion technology commercially available
- Most sensitive to heat

Thin Film

- Residential Market Share: 7%
- Efficiency 7-15%
- Less expensive per sq. ft. however you need more
- Less sensitive to heat and shading



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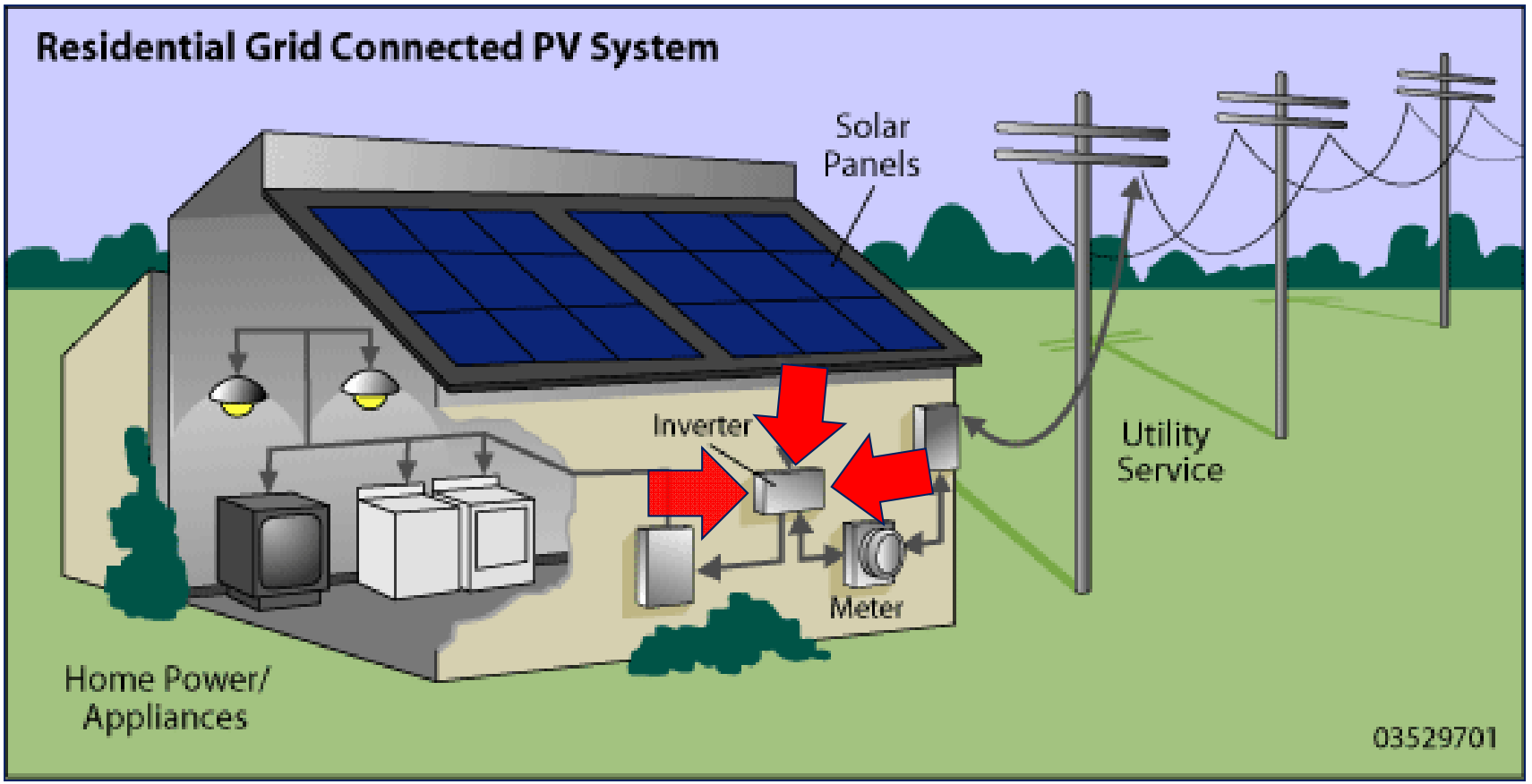
Next, we will discuss Inverters.



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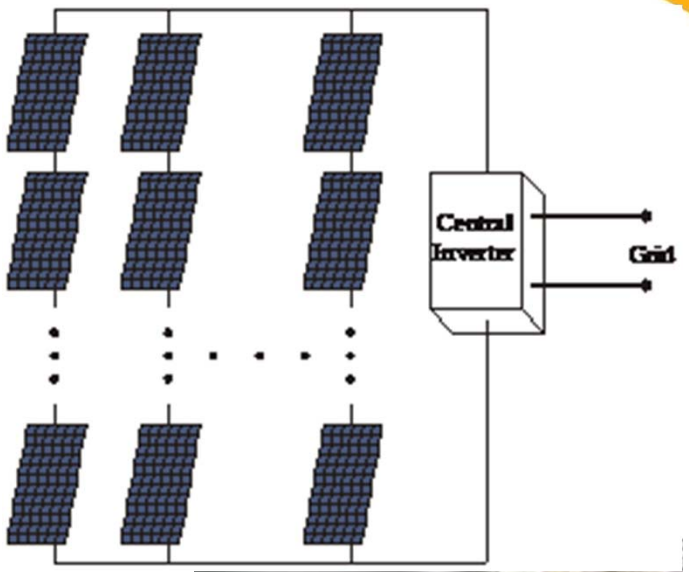
Inverter

Changes Direct Current (DC) to Alternating Current (AC)

Now you must decide to go with a Central Inverter or Micro Inverters…

Central Inverters

- One individual inverter *per array*.
- Benefits:
  - Older technology
  - Less expensive than micro inverters
  - Central point of failure
- Disadvantage:
  - Shading effects power output dramatically
  - Cannot see the output at the panel level
  - Does not allow for easy system size increases



Micro Inverters

- One individual inverter *per panel*.
- Benefits:
  - More tolerant to shade
  - Allows flexibility in design and for future additions
  - Easier trouble-shooting
- Disadvantage:
  - Newer technology
  - Typically more expensive but becoming more competitive

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PV System Maintenance?

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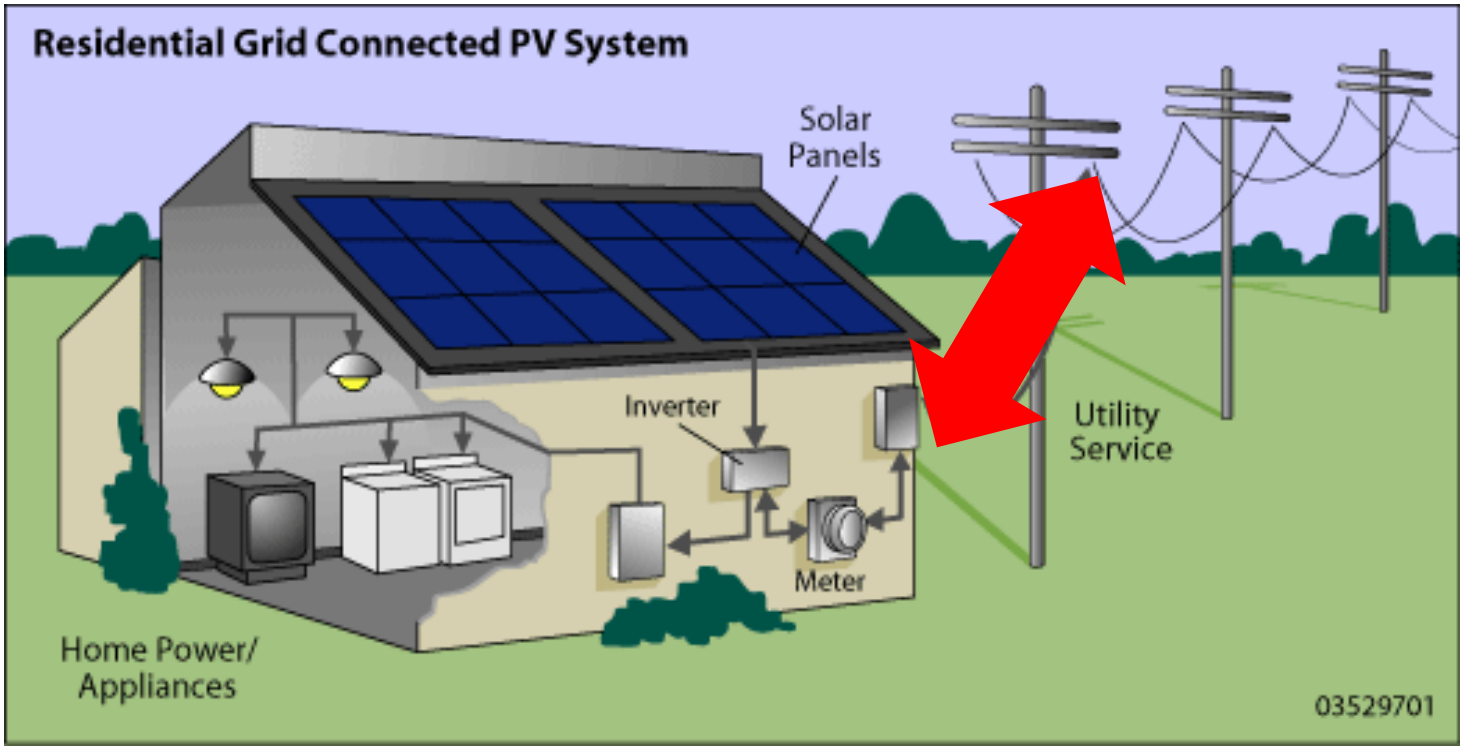
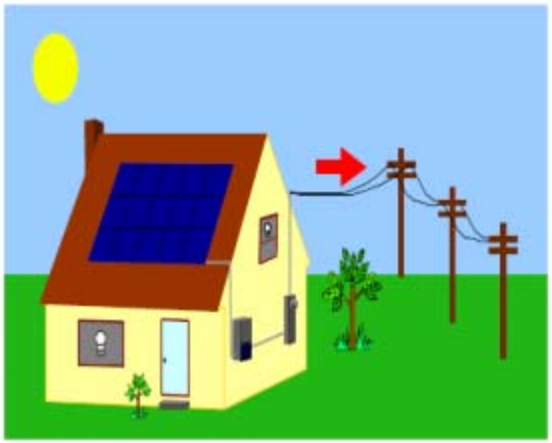
What is Net Metering?



Net metering is a method of "banking" excess electricity credits.

How does Net Metering work?

Sell Power to the Utility by Day



Buy Power at Night and Winter

The utility grid is a two-way street:

During the day, when electricity usage is typically low, electricity can be "sent back" to the grid by the customer (accruing credits)

At night, when electricity usage is high and solar system does not produce, the credit that was accumulated throughout the day is used.

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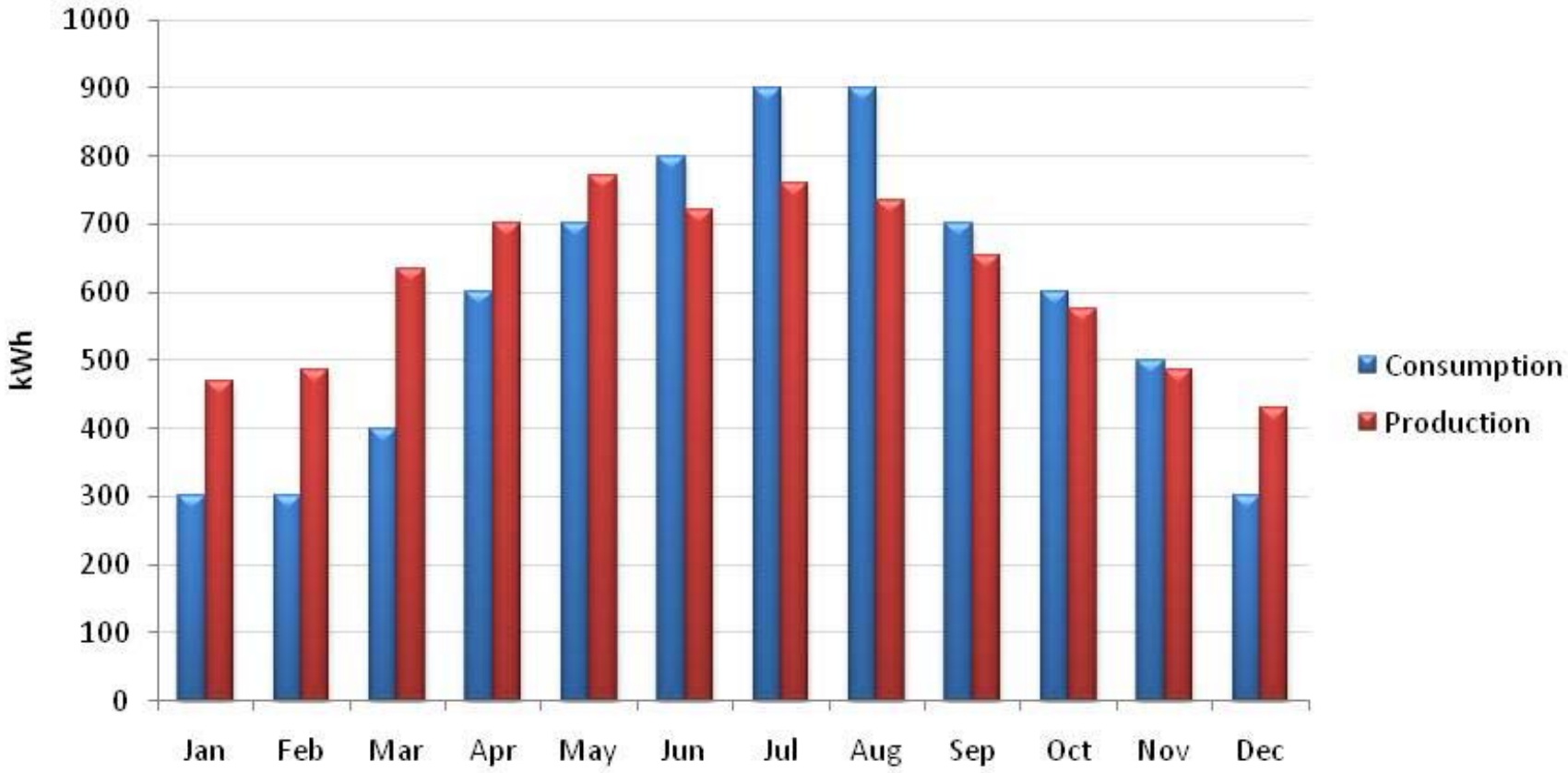
Consumption and Production



The California Solar Surplus Act

- AB 920 requires the utility to purchase over generation by net metered utility customers.
- Purchase price is ≈$0.04/ kWh

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Overview of the *California Solar Initiative*

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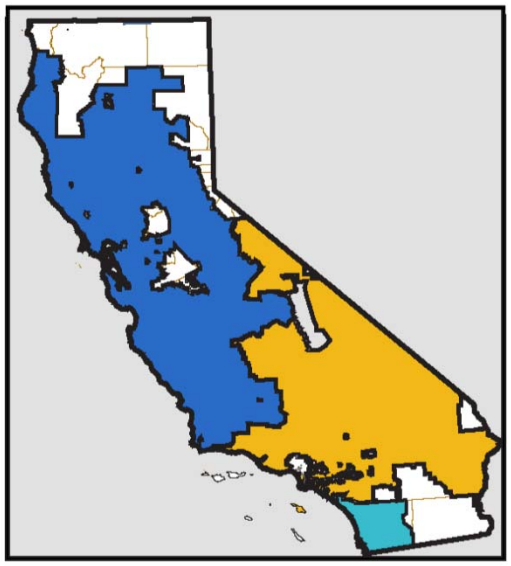
www.energycenter.org

What is the California Solar Initiative?

The California Solar Initiative (CSI) is the solar rebate program in California for customers of the investor-owned utilities - Pacific Gas and Electric, Southern California Edison, and San Diego Gas & Electric (administered by CCSE).

- $2.1 billion program for 10 years (2007-2016)
- Financed through utility rate-payers
- Designed for residential (retrofits only),commercial, government and non-profit sectors
- Program set in place by Senate Bill 1 (2006)
- Overseen by the California Public Utilities Commission



CSI Goals for the San Diego Region

Residential General Market

- **Goal**:
  - Install 59.5 MW of solar photovoltaic on single-family homes from 2007-2016
  - Total of 15,000 x 4kW (average size) systems
- **Achieved**:
  - 71.1 MW and 14,327 residential solar systems currently installed

CSI Residential Incentives

2 types of incentives:

Expected Performance-Based Buy down (EPBB): One-time, up-front payment based on the expected performance of the solar system.

EPBB is required for all projects less than 10 kW.

Performance-Based Incentives (PBI): 5-year monthly payment based on the actual performance of the solar system.

PBI is required for all projects larger than 30 kW.

CSI Residential Incentives

- Rebates are offered on a declining step scale: Step 1-10
  - The more solar installed, the lower the rebate
- The current rebate is $0.20/watt (EPBB) for residential systems.
- The current rebate is $0.025/kWh (PBI) for residential systems.

CSI Eligibility

- SDG&E, PG&E, or SCE customer
- Domestic Rate (DR)
- New system components
- Installed on an existing permanent building
  - (New Construction can apply for the New Solar Homes Partnership)
- At least 1 kW of solar
- The system is sized so that it offsets part or all of the on-site load

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5 Minute Break

Getting Started with PV

How it all Relates to You

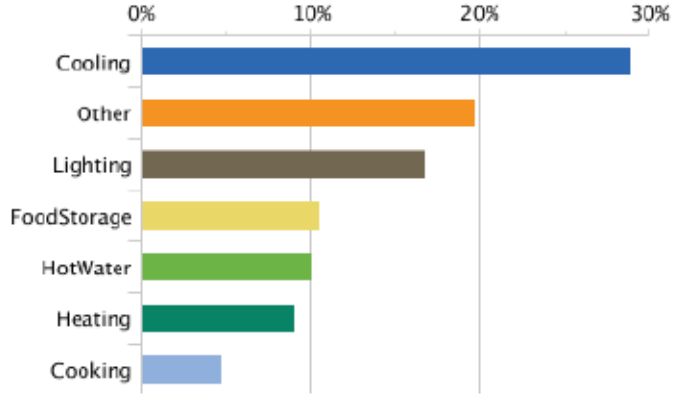
www.energycenter.org

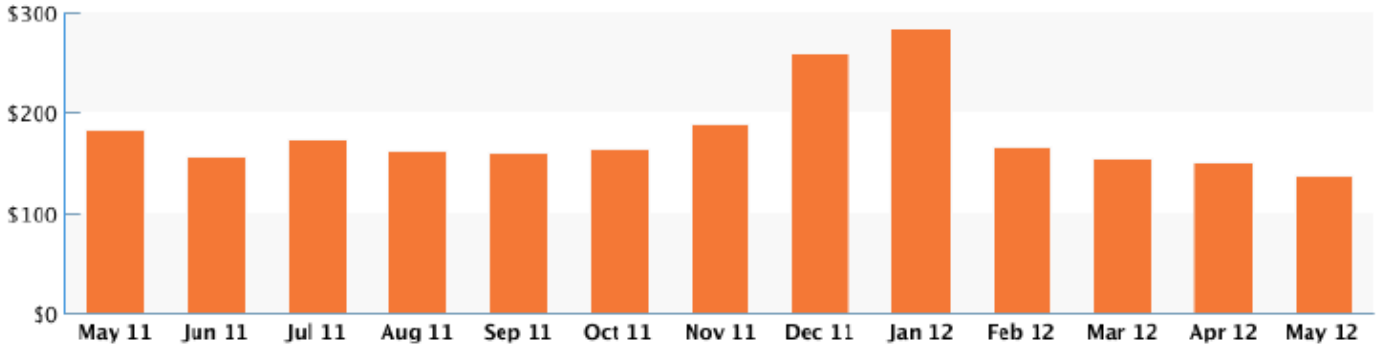
Reduce, then Produce!

- Energy efficiency improvements *reduce* the amount of energy your home wastes.
- Make your home energy efficient before you go solar… you may be able to get a smaller solar system!
- Energy efficiency improvements also bring quality-of-life benefits:
    - **Comfort**: Adding insulation and sealing air leakage helps keep your home cool in summer and warm in winter.
    - **Health**: Sealing leaky ducts helps keep dust and irritants out of your home.
    - **Safety**: Ensuring your natural gas appliances are operating properly reduces risk of gas leaks or carbon monoxide.

SDG&E's Energy Audit

- Accessed through your account on the SDG&E website
- Pulls data directly from your account
- Analyzes the energy use at the home and makes recommendations to save energy
- http://sdge.com/save-money/solutions-your-home/your-home-can-save-you-money





Energy Upgrade California

- Connects homeowners with contractors trained in energy efficiency
- Provides rebates of between $1,000 and $4,500
  - Insulation, air sealing and duct sealing
  - High efficiency heating, cooling and/or water heating systems
  - Cool roofs, high efficiency windows, etc.
- 3 steps to participate:

www.energycenter.org/homeupgrade

Historical Energy Use

- System sizing is specific to each individual site
- Know your home and know your energy usage prior to contacting contractors.

- Having an understanding of your usage and the amount of offset you would like to achieve will prepare you for entering into negotiations with contractors.

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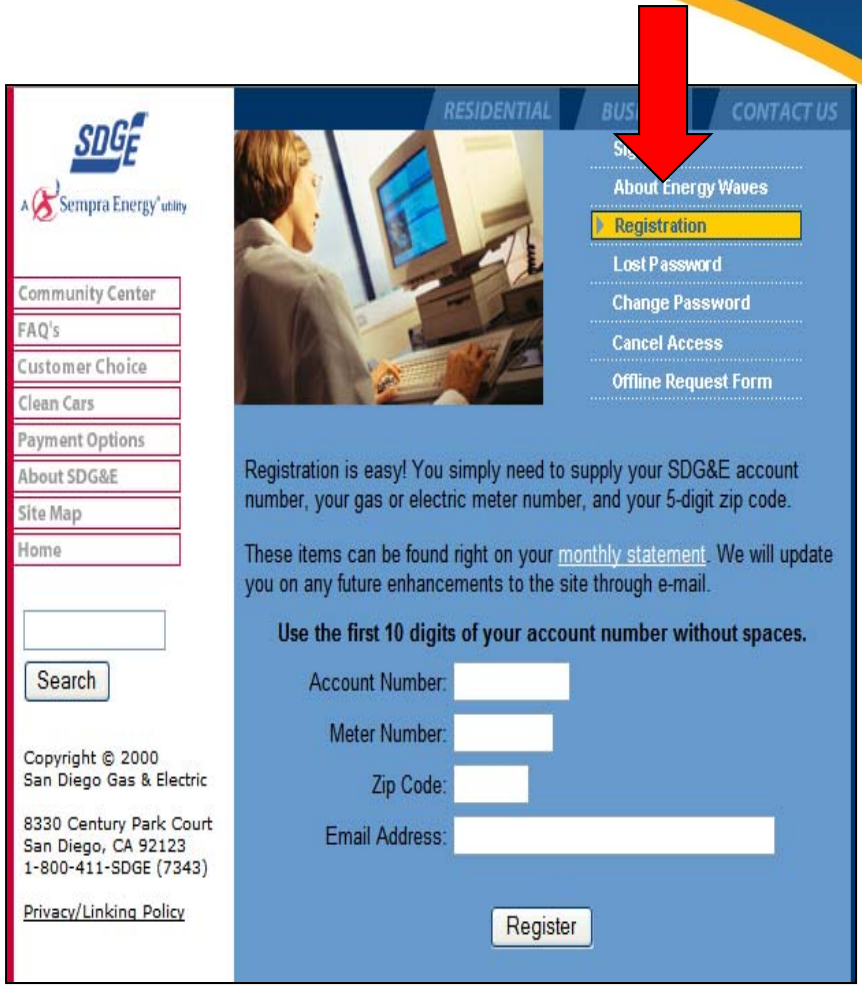
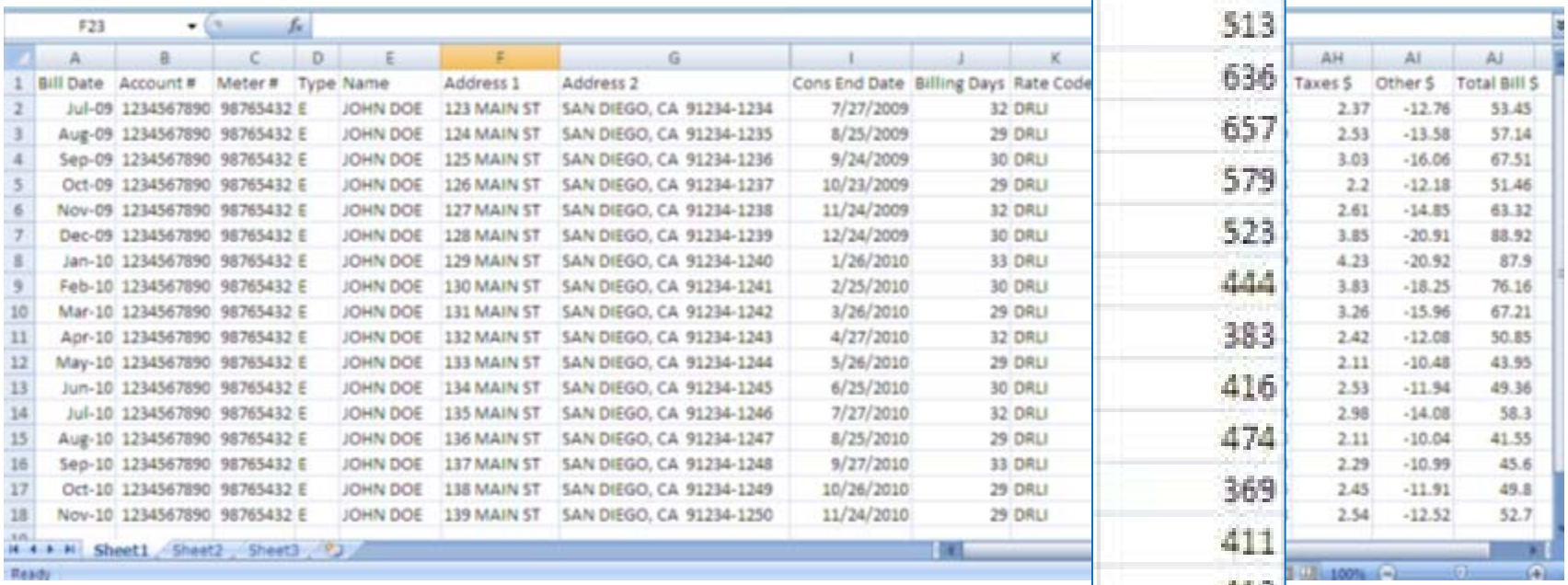
Energy Waves
https://energywave.sdge.com

- On-line tool that records your monthly consumption in kWh.
- Click "**Registration**" -- you will need your SDGE account #, meter #, zip code, and email address
- You will receive an email with your password. Click "**Sign On**" on the webpage and enter your account number and password from the email



Energy Waves

http://energywave.sdge.com



Bill Date	Account #	Meter #	Type	Name	Address 1	Address 2	Cons End Date	Billing Days	Rate Code	Taxes $	Other $	Total Bill $	Total Cons
Jul-09	1234567890	98765432	E	JOHN DOE	123 MAIN ST	SAN DIEGO, CA 91234-1234	7/27/2009	32	DRLI	2.37	-12.76	53.45	453
Aug-09	1234567890	98765432	E	JOHN DOE	124 MAIN ST	SAN DIEGO, CA 91234-1235	8/25/2009	29	DRLI	2.53	-13.58	57.14	452
Sep-09	1234567890	98765432	E	JOHN DOE	125 MAIN ST	SAN DIEGO, CA 91234-1236	9/24/2009	30	DRLI	3.03	-16.06	67.51	509
Oct-09	1234567890	98765432	E	JOHN DOE	126 MAIN ST	SAN DIEGO, CA 91234-1237	10/23/2009	29	DRLI	2.2	-12.18	51.46	426
Nov-09	1234567890	98765432	E	JOHN DOE	127 MAIN ST	SAN DIEGO, CA 91234-1238	11/24/2009	32	DRLI	2.61	-14.85	63.32	513
Dec-09	1234567890	98765432	E	JOHN DOE	128 MAIN ST	SAN DIEGO, CA 91234-1239	12/24/2009	30	DRLI	3.85	-20.91	88.92	636
Jan-10	1234567890	98765432	E	JOHN DOE	129 MAIN ST	SAN DIEGO, CA 91234-1240	1/26/2010	33	DRLI	4.23	-20.92	87.9	657
Feb-10	1234567890	98765432	E	JOHN DOE	130 MAIN ST	SAN DIEGO, CA 91234-1241	2/25/2010	30	DRLI	3.83	-18.25	76.16	579
Mar-10	1234567890	98765432	E	JOHN DOE	131 MAIN ST	SAN DIEGO, CA 91234-1242	3/26/2010	29	DRLI	3.26	-15.96	67.21	523
Apr-10	1234567890	98765432	E	JOHN DOE	132 MAIN ST	SAN DIEGO, CA 91234-1243	4/27/2010	32	DRLI	2.42	-12.08	50.85	444
May-10	1234567890	98765432	E	JOHN DOE	133 MAIN ST	SAN DIEGO, CA 91234-1244	5/26/2010	29	DRLI	2.11	-10.48	43.95	383
Jun-10	1234567890	98765432	E	JOHN DOE	134 MAIN ST	SAN DIEGO, CA 91234-1245	6/25/2010	30	DRLI	2.53	-11.94	49.36	416
Jul-10	1234567890	98765432	E	JOHN DOE	135 MAIN ST	SAN DIEGO, CA 91234-1246	7/27/2010	32	DRLI	2.98	-14.08	58.3	474
Aug-10	1234567890	98765432	E	JOHN DOE	136 MAIN ST	SAN DIEGO, CA 91234-1247	8/25/2010	29	DRLI	2.11	-10.04	41.55	369
Sep-10	1234567890	98765432	E	JOHN DOE	137 MAIN ST	SAN DIEGO, CA 91234-1248	9/27/2010	33	DRLI	2.29	-10.99	45.6	411
Oct-10	1234567890	98765432	E	JOHN DOE	138 MAIN ST	SAN DIEGO, CA 91234-1249	10/26/2010	29	DRLI	2.45	-11.91	49.8	413
Nov-10	1234567890	98765432	E	JOHN DOE	139 MAIN ST	SAN DIEGO, CA 91234-1250	11/24/2010	29	DRLI	2.54	-12.52	52.7	438

System Sizing

How big should your system be?

How much of your energy load do you want to offset?

How much do you want to save? How much do you want to spend?

1. Rule of Thumb
   - The basic approach to sizing your system

2. CCSE On-line Electric Rate Analyzer
   - The in depth approach to sizing your system

www.energycenter.org

Rule of Thumb

a. Total your 12 month electricity consumption (kWh)

b. Divide the annual kWh by 1700kWh (average annual production of 1kW in San Diego).

- This will give you the number of kW that would offset your energy use

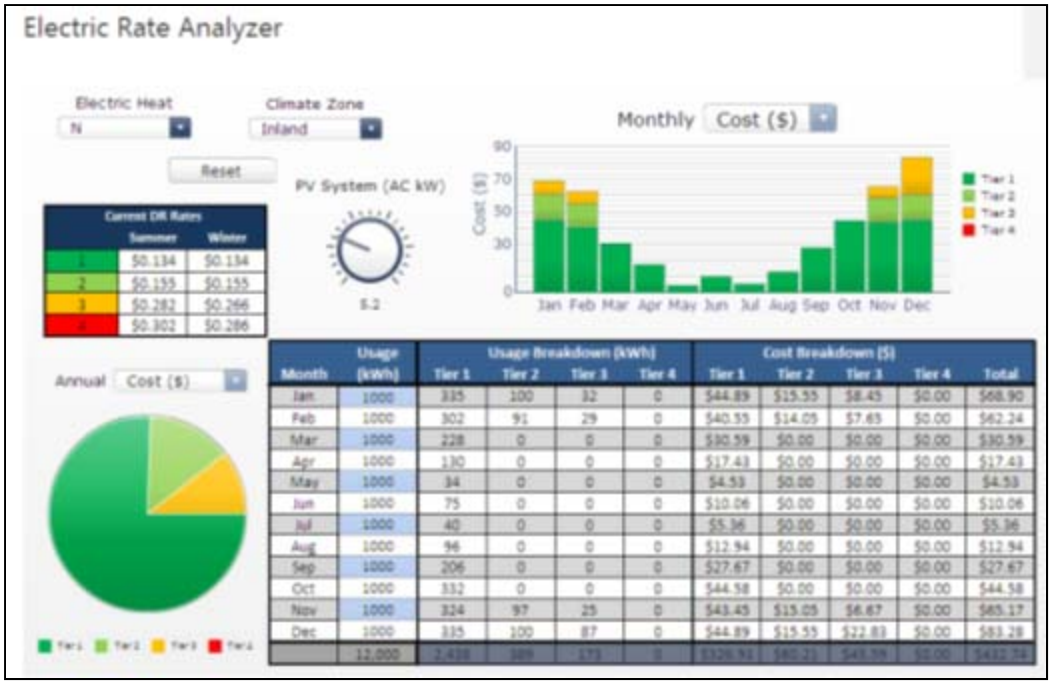
Example: 7,000kWh / 1,700kWh = 4.1 kW PV System

Remember: this will offset 100% of your annual energy use

CCSE's Electric Rate Analyzer

www.energycenter.org/analyzer

- Allows you to understand your current electric usage and rates and project how energy savings and solar power can lower your energy costs.



Finding a Contractor

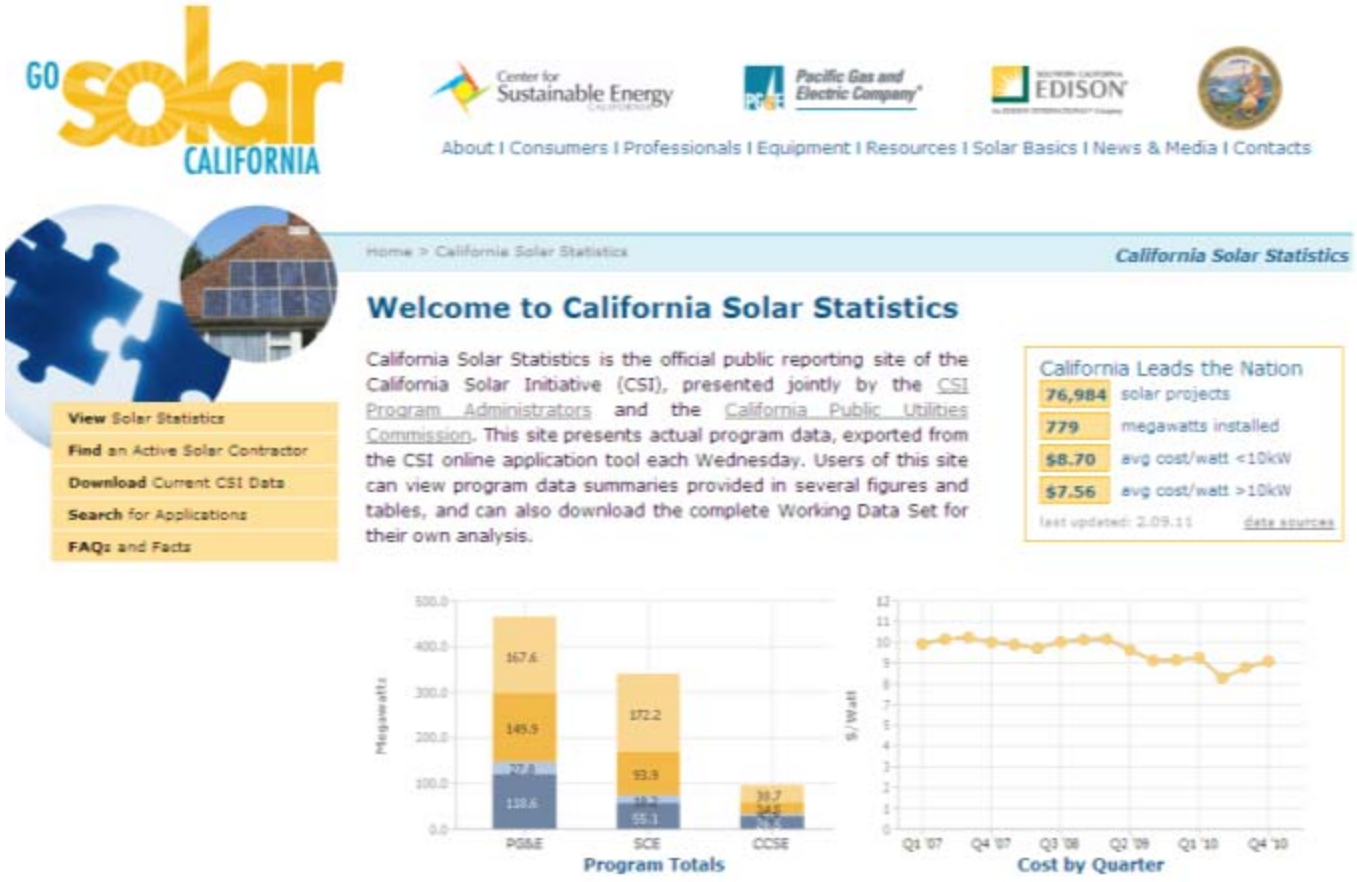
1. Find solar contractors at:
   - http://californiasolarstatistics.com/
   - www.gosolarcalifornia.ca.gov
   - Friends, Family, Neighbors, Co-Workers

2. Contact a minimum of 3 contractors and ask for quotes

3. One of the following active licenses is required:
   - **A** – General Engineering Contractor
   - **B** – General Building Contractor
   - **C10** – Electrical Contractor
   - **C46** – Solar Contractor

Find a Solar Contractor

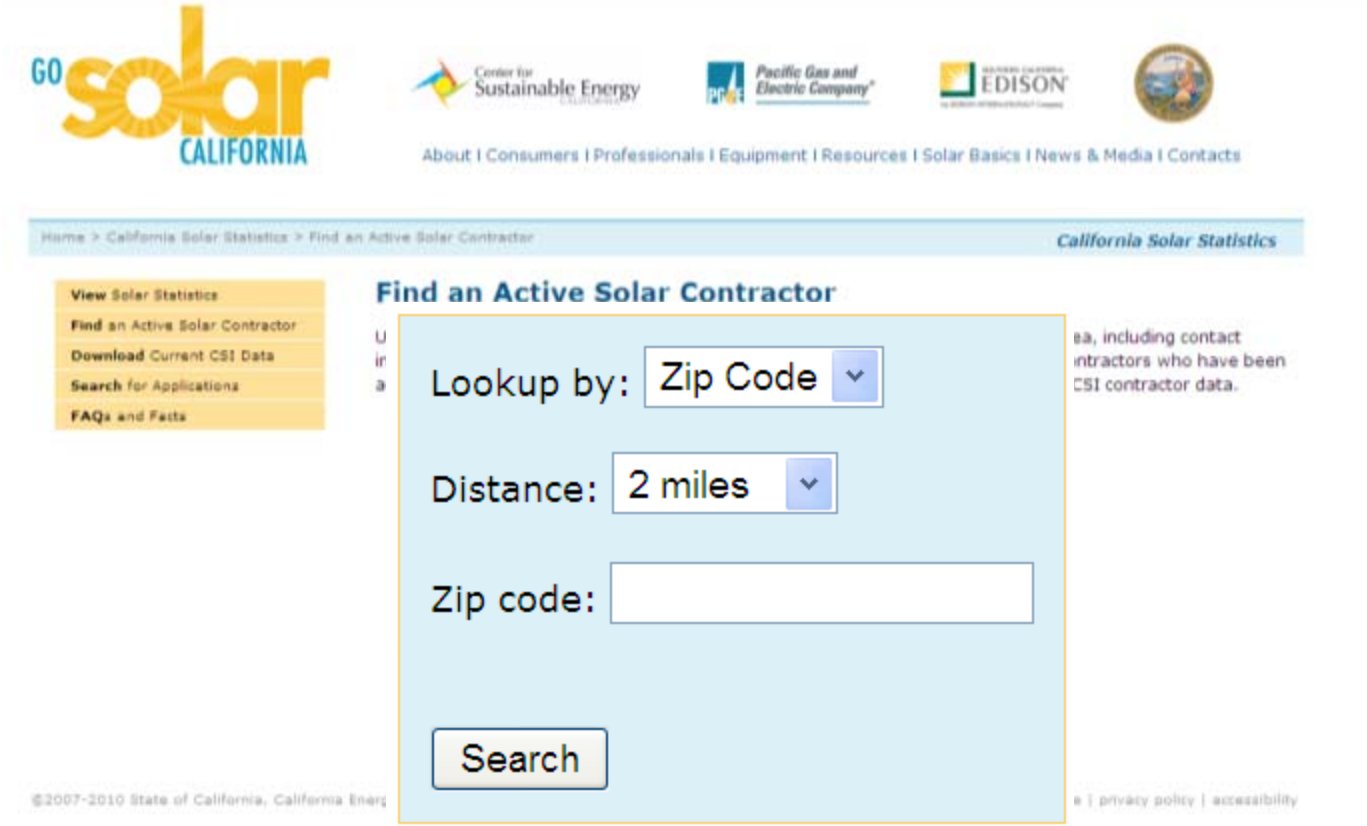
www.californiasolarstatistics.com



www.energycenter.org

Find a Solar Contractor

www.californiasolarstatistics.com



Find a Solar Contractor

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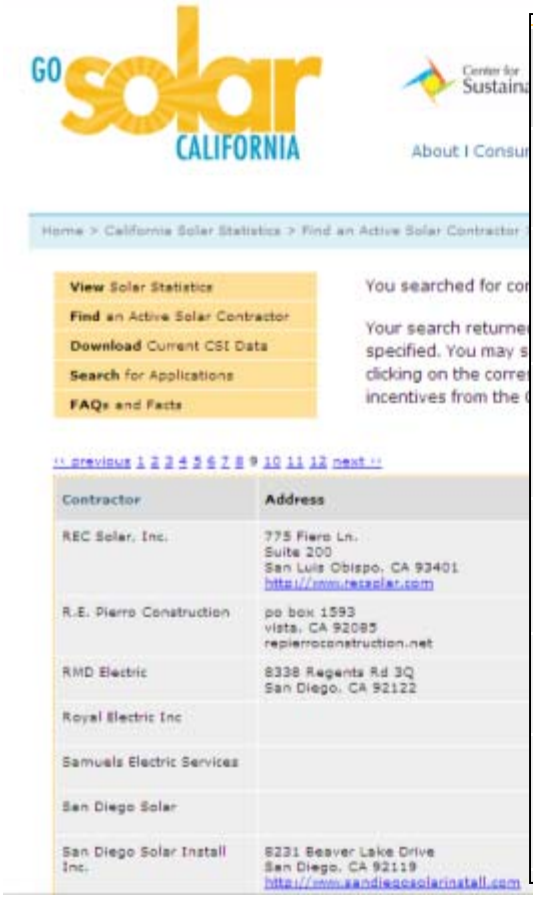


Average System Size	Projects in Area	Average Cost per Watt
4.408 kW	1	$5.98
4.493 kW	2	$7.98
7.744 kW	4	$9.26
14.475 kW	2	$8.84
3.224 kW	1	$6.16
5.082 kW	2	$8.58

Where can you assess potential solar contractors?

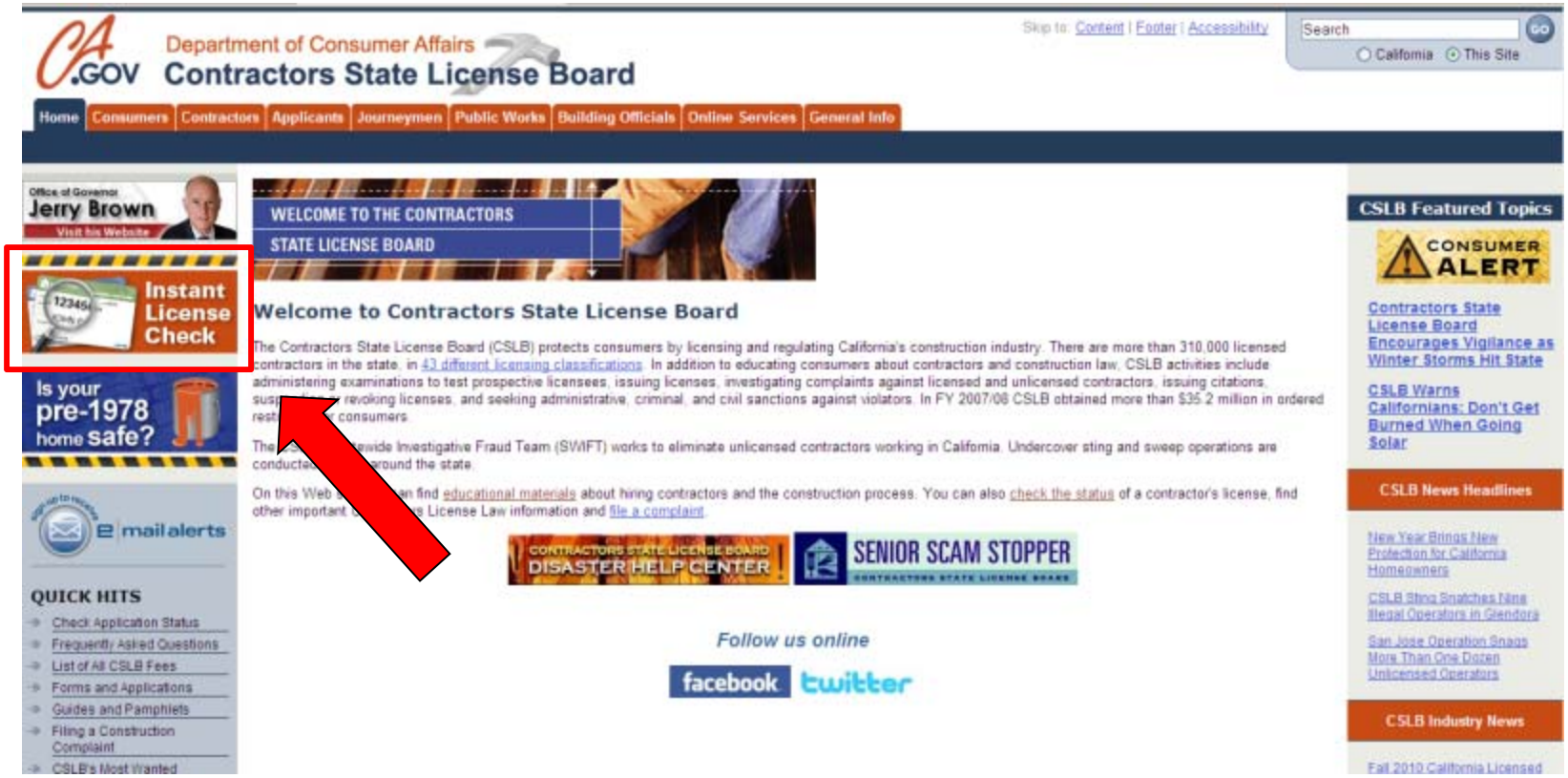
Researching solar contractors at:

- www.cslb.ca.gov
- www.bbb.com
- www.google.com

Remember to ask for references!

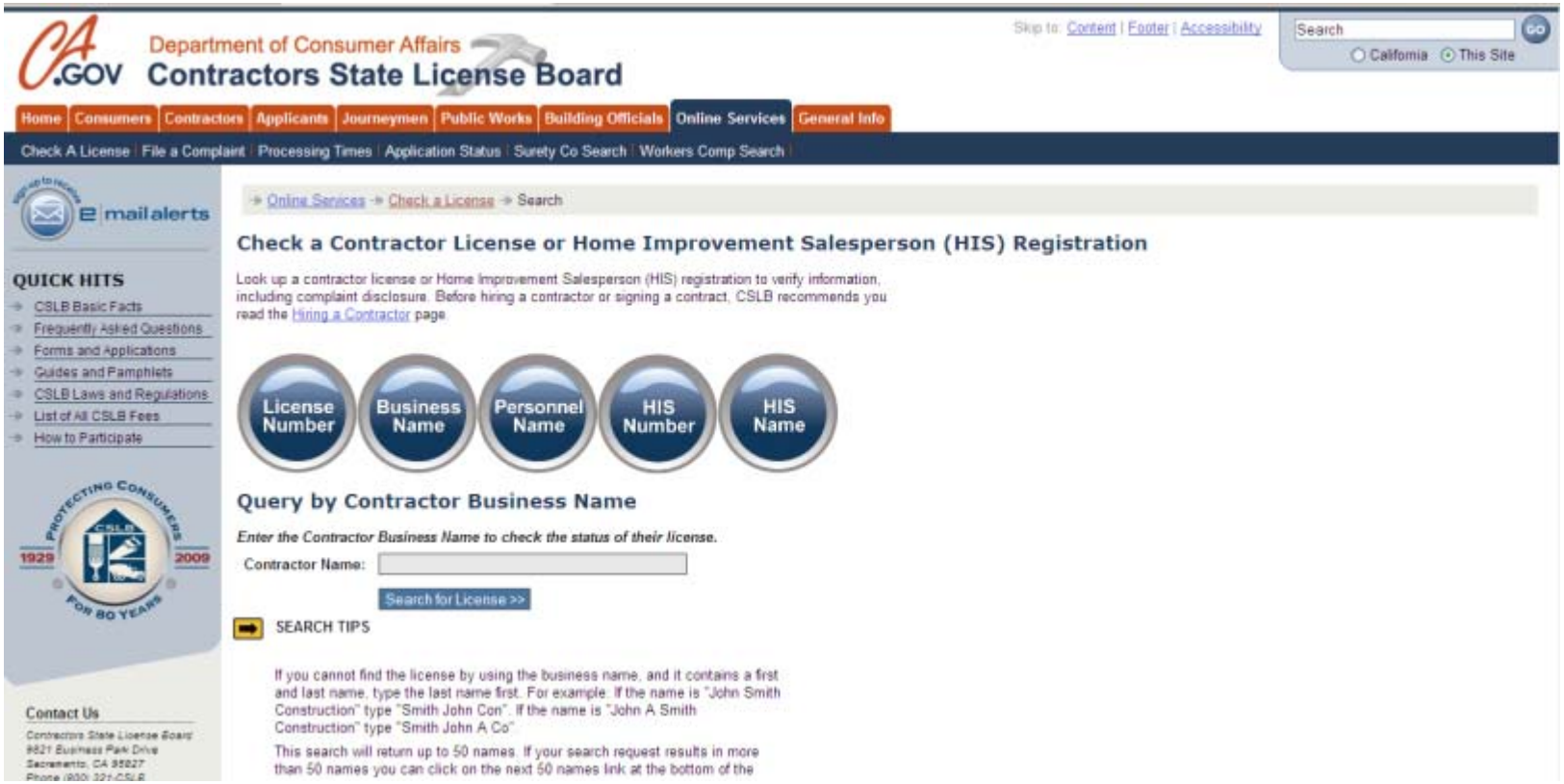
Contractors State License Board

www.cslb.ca.gov



Contractors State License Board

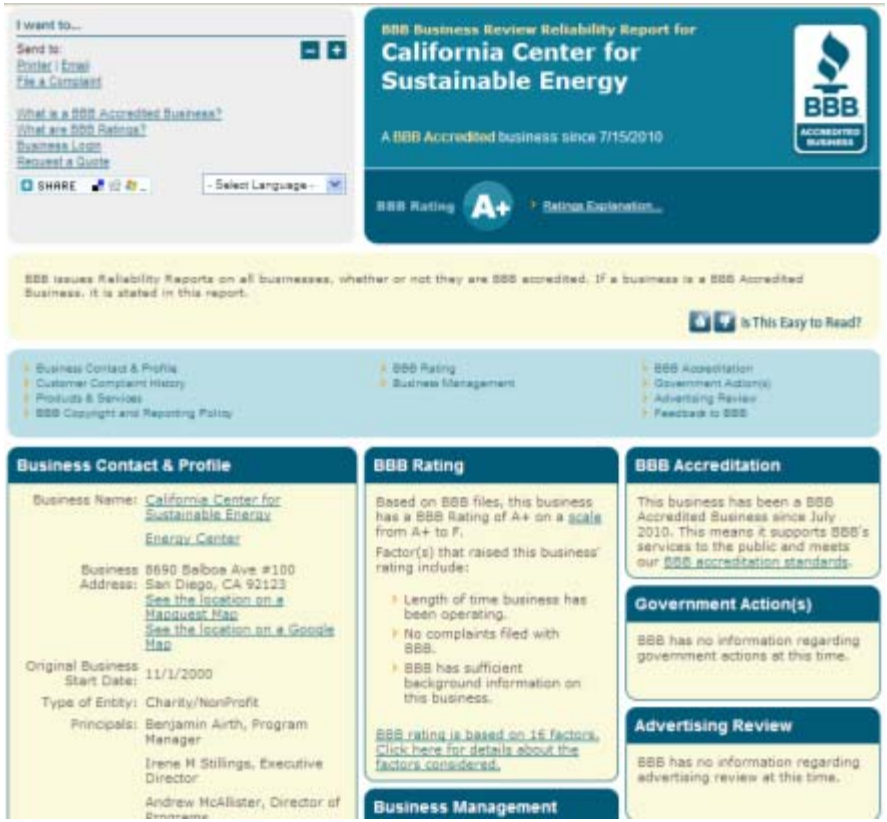
www.cslb.ca.gov



Better Business Bureau

www.bbb.org

- Does your contractor have any complaints against them?



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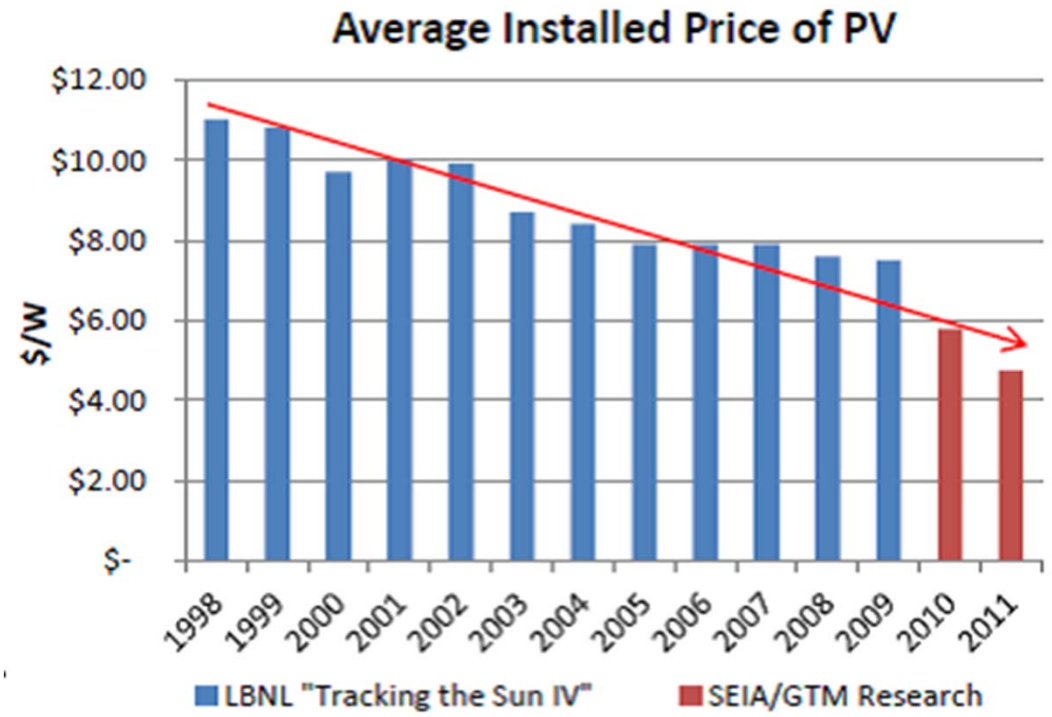
SYSTEM COST

How Much Does Solar PV Cost?

- Average installed cost of solar PV has decreased 46% from 1998 to 2011



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Average Cost of Residential PV System:

$4 - $7 / Watt (AC)

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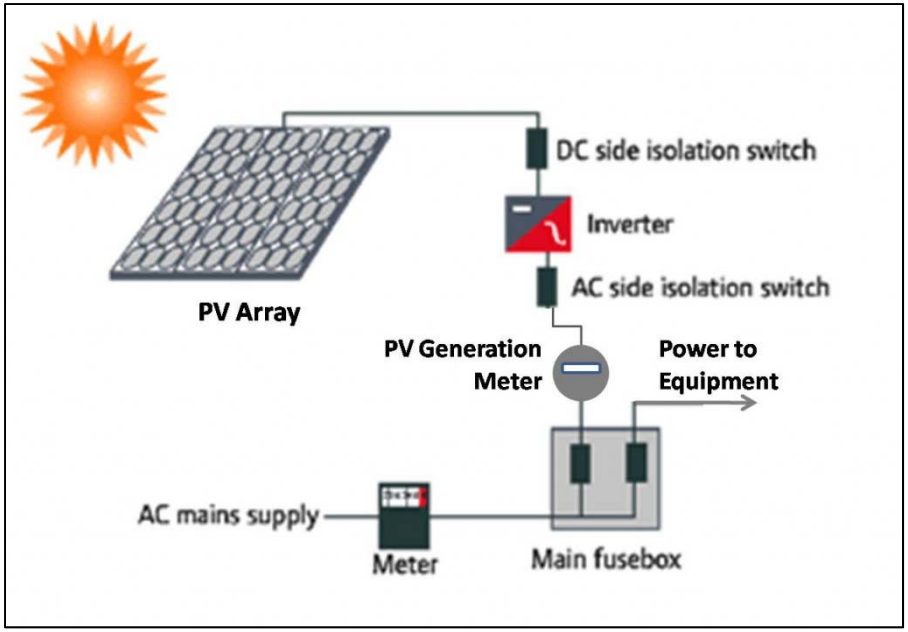
Which of the major components in a solar PV system represents the largest cost?



Cost Breakdown for Major Components

- Majority of the cost of an installed system are the PV modules (≈50%).

Components	CSI Residential Program	
PV Modules	$2.64/W	48%
Inverter(s)	$.66/W	12%
Balance of System	$2.20/W	40%
Total System Cost	$5.50/W	100%

Purchased System Example

5100 kWh/year	5100kWh/1700kWh	3kW System
System Cost	3,000W x $5.00/Watt	$15,000
Rebate Amount	3,000 x $0.20/Watt	$600
Federal Tax Credit	30% x ($15,000-$600)	$4,320
Total after Incentive and Tax Credit		$10,080

That's a savings of 33%!

Possibility of payback within 6-9 years

Center for Sustainable Energy® CALIFORNIA

Consumer Awareness

Avoid High Pressure Signing Tactics

- "Don't be pressured into signing a contract by intimidation tactics, such as losing out on government incentives for not acting quickly. This might be a hint that the contractor does not have your best interests in mind." –CSLB Website

Don't Sign Anything You Do Not Understand

(i) You grant to and its agents, employees and contractors the right to reasonably access all of the Property for the purposes of (a) installing, constructing, operating, owning, repairing, removing and replacing the System or making any additions to the System or installing complementary technologies on or about the location of the System; (b) enforcing rights as to this Lease and the System; (c) installing, using and maintaining electric lines and inverters and meters, necessary to interconnect the System to your electric system at the Property and/or to the utility's electric distribution system; or (d) taking any other action reasonably necessary in connection with the construction, installation, operation, maintenance, removal or repair of the System. This access right shall continue for up to ninety (90) days after this Lease expires to provide , with time to remove the System at the end of the Lease. shall provide you with reasonable notice of its need to access the Property whenever commercially reasonable.

(ii) During the time that has access rights you shall ensure that its access rights are preserved and shall not interfere with or permit any third party to interfere with such rights or access. You agree that the System is not a fixture, but has the right to file any UCC-1 financing statement or fixture filing that confirms its interest in the System.

(i) Indemnity

To the fullest extent permitted by law, you shall indemnify, defend, protect, save and hold harmless , its employees, officers, directors, agents, successors and assigns from any and all third party claims, actions, costs, expenses (including reasonable attorneys' fees and expenses), damages, liabilities, penalties, losses, obligations, injuries, demands and liens of any kind or nature arising out of, connected with, relating to or resulting from your negligence or willful misconduct; provided, that nothing herein shall require you to indemnify , or its own negligence or willful misconduct. The provisions of this paragraph shall survive termination or expiration Lease.

(j) Monthly Payments

The Monthly Payments section (Section 4(B)) describes your monthly payment obligations unde Lease. YOU AGREE THAT THIS IS A NET LEASE THE OBLIGATION TO PAY ALL MONTHLY PAYM AND ALL OTHER AMOUNTS DUE UNDER THIS LEASE SHALL BE ABSOLUTE AND UNCONDITI UNDER ALL CIRCUMSTANCES AND SHALL NO SUBJECT TO ANY ABATEMENT, DEFENSE, COUNTERCLAIM, SETOFF, RECOUPMENT OR REDUCTION FOR ANY REASON WHATSOEVER, BEING THE EXPRESS INTENT OF THE PARTIES THAT ALL AMOUNTS PAYABLE BY YOU HEREU SHALL BE AND CONTINUE TO BE PAYABLE IN EVENTS INCLUDING BY YOUR HEIRS AND ES AND, EXCEPT AS SET FORTH BELOW, YOU HE WAIVE ALL RIGHTS YOU MAY HAVE TO REJECT CANCEL THIS LEASE, TO REVOKE ACCEPTANC THE SYSTEM, OR TO GRANT A SECURITY INTE IN THE SYSTEM.

6. CONDITIONS PRIOR TO INSTALLATION OF THI SYSTEM

s obligation to install and lease the Sys are conditioned on the following items having be completed to its reasonable satisfaction:

(a) completion of the engineering site audit (a thorough physical inspection of the Property including, if applicable, geotechnical work), real estate due diligence to confirm the suit of the Property for the construction, installat and operation of the System;

(b) approval of this Lease by financi partner(s);

(c) confirmation of rebate, tax credit and renew energy credit payment availability in the am used to calculate the Monthly Payment amo set forth in this Lease;

(d) confirmation that , will obtain all applicable benefits referred to in Section 9;

(e) receipt of all necessary zoning, land use and building permits.

, may terminate this Lease without liability if, in its reasonable judgment, any of the above listed conditions (a) through (e) will not be satisfied for reasons beyond its reasonable control. Once starts installation, however, it may not terminate this Lease for your failure to satisfy conditions (a) through (e) above.

Both parties will also have the right to terminate this Lease, without penalty or fee, if determines after the engineering site audit of your Home that it has misestimated by more than ten percent (10%) any of (i) the System size, (ii) the System's total cost or (iii) the System's annual production. Such termination right will expire at the **earlier** of (i) one (1) week prior to your scheduled System installation date and (ii) one (1) month after we inform you in writing of the revised size, cost or production estimate. Any changes to the System will be documented in an amendment to this Lease. You authorize to make corrections to the rebate paperwork to conform to this Lease or any amendments to this Lease we both sign.

7. WARRANTY

YOU UNDERSTAND THAT THE SYSTEM IS WARRANTED SOLELY UNDER THE LIMITED WARRANTY, AND THAT THERE ARE NO OTHER REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, AS TO THE MERCHANTABILITY, FITNESS FOR ANY PURPOSE, CONDITION, DESIGN, CAPACITY, SUITABILITY OR PERFORMANCE OF THE SYSTEM OR ITS INSTALLATION.

8. TRANSFER

may assign, sell or transfer the System and this Lease, or any part of this Lease or the exhibits, without your consent. Assignment, sale or transfer generally means that would transfer certain of its rights and certain of its obligations under this Lease to another party.

9. OWNERSHIP OF THE SYSTEM; TAX CREDITS AND REBATES

You understand and agree that this is a lease and not a sale agreement. owns the System for all purposes, including any data generated from the System. You agree that the System is personal property under the Uniform Commercial Code. You shall at all times keep the System free and clear of all liens, claims, levies and legal processes not created by SolarCity, and shall at your expense protect and defend SolarCity against the same.

YOU UNDERSTAND AND AGREE THAT ANY AND ALL TAX CREDITS, INCENTIVES, RENEWABLE ENERGY CREDITS, GREEN TAGS, CARBON OFFSET CREDITS, UTILITY REBATES OR ANY OTHER NON-POWER ATTRIBUTES OF THE SYSTEM ARE THE PROPERTY OF AND FOR THE BENEFIT OF , USABLE AT ITS SOLE DISCRETION. ! SHALL HAVE THE EXCLUSIVE RIGHT TO ENJOY AND USE ALL SUCH BENEFITS, WHETHER SUCH BENEFITS EXIST NOW OR IN THE FUTURE. YOU AGREE TO REASONABLY COOPERATE WITH SO THAT IT MAY CLAIM ANY TAX CREDITS, REBATES OR BENEFITS FROM THE SYSTEM. THIS MAY INCLUDE TO THE EXTENT ALLOWABLE BY LAW FILING APPLICATIONS FOR REBATES FROM THE FEDERAL, STATE OR LOCAL GOVERNMENT OR A LOCAL UTILITY AND GIVING THESE TAX CREDITS, REBATES OR BENEFITS TO SOLARCITY.

10. OPTION TO PURCHASE THE SYSTEM PRIOR TO THE END OF THE LEASE TERM

You may not purchase the System prior to the end of the Lease Term.

11. OPTION TO RENEW YOUR LEASE

You have the option to renew your Lease Term for up to ten (10) years in two (2) five (5) year renewal periods. We will send you renewal forms three (3) months prior to the expiration of the Lease Term, which forms shall set forth the new Monthly Payments due under the renewal Lease, based on our assessme of the then current fair market value of the System. If you want to renew and you are in compliance with thi Lease, complete the renewal forms and return them t us at least one (1) month prior to the end of the Lease In the event that you do not agree to the new Monthly Payments or do not submit a renewal form, the Lease shall expire by its terms on the termination date.

12. SELLING YOUR HOME

(a) If you sell your home you can;

(i) **Transfer this Lease and the Monthly Payments.**

If the person buying your Home meets credit requirements, then the person buying your Home can sign a transfer agreement assuming all of your rights and obligations under this Lease.

(ii) **Move the System to your new Home.**

If you are moving to a new home in the same utility district, the System can be moved to your new home only pursuant to the Limited Warranty. You will need to pay all costs associated with relocating the System, execute and deliver to an easement for the replacement premises and provide any third party consents or releases required by in connection with the substitute premises.

(iii) **Prepay this Lease and Transfer only the Use of the System**

If the person buying your home does not meet credit requirements, but still wants the System, then you can (A) prepay the payments remaining on the Lease (See Section 16(f)(i) and (ii), (B) add the cost of the Lease to the price of your home; and (C) have the person buying your Home sign a transfer agreement to assume your rights and non-Monthly Payment obligations under this Lease. The System stays at your Home, the new owner of your Home does not make any Monthly Payments and has only to comply with the non-Monthly Payment portions of this Lease.

(b) You agree to give at least fifteen (15) days but not more than three (3) months' prior written notice if you want someone to assume your Lease obligations. In connection with this assumption, you, your approved buyer and shall execute a written transfer of this Lease. may charge you a transfer review fee of two hundred fifty dollars ($250). Unless we have released you from your obligations in writing, you are still responsible for performing under this Lease. If your buyer defaults on this Lease and we have not yet signed the transfer agreement, you will be responsible for its default. We will release you from your obligations under this Lease in writing once we have a signed transfer agreement with the person buying your Home (provided such person has been approved as a transferee by in writing).

(c) If you sell your home and can't comply with any of the options in subsection (a) above, you will be in default under this Lease. Section 12(a) includes a home sale by your estate or heirs.

(d) EXCEPT AS SET FORTH IN THIS SECTION, YOU WILL NOT SUBLEASE, ASSIGN, SELL, PLEDGE OR IN ANY OTHER WAY TRANSFER YOUR INTEREST IN THE SYSTEM OR THIS LEASE WITHOUT OUR PRIOR WRITTEN CONSENT, WHICH SHALL NOT BE UNREASONABLY WITHHELD.

13. LOSS OR DAMAGE

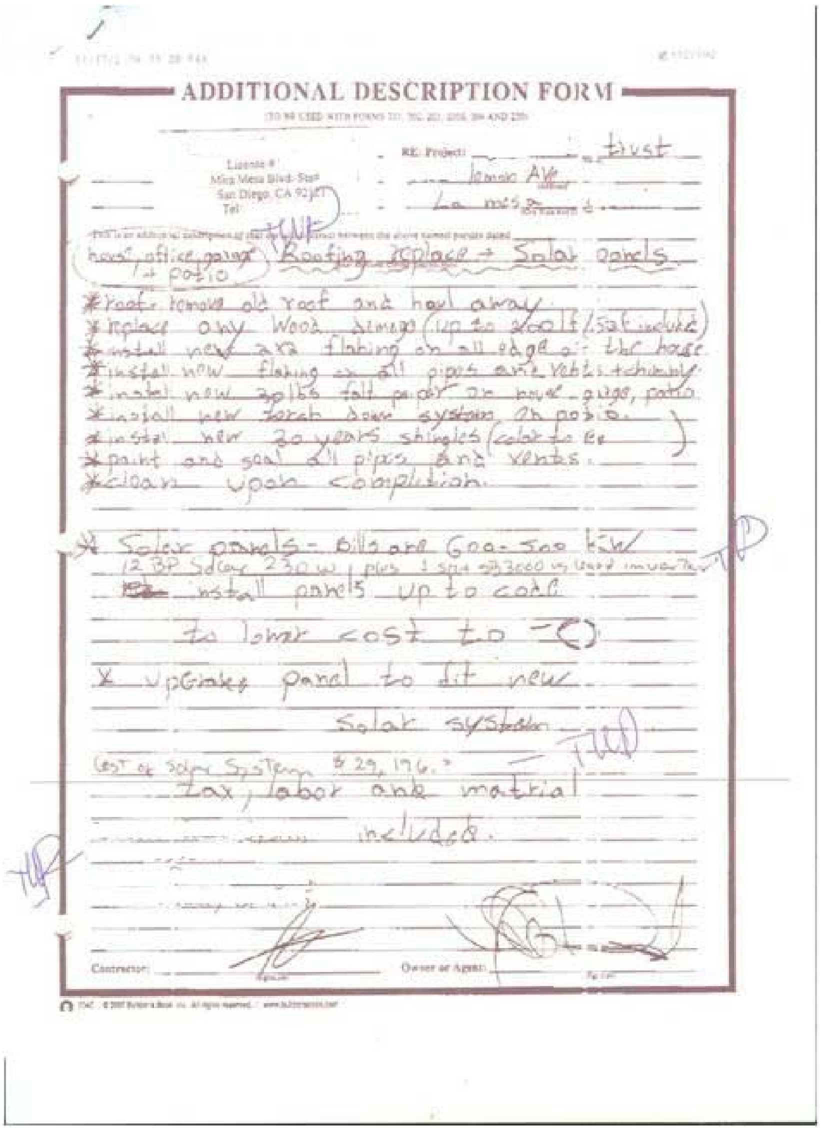
(a) Unless you are grossly negligent or you intentionally damage the System, will bear all of the risk of loss, damage, theft, destruction or similar occurrence to any or all of the System. Except as expressly provided in this Lease, no loss, damage, theft or destruction will excuse you from your obligations under this Lease, including Monthly Payments.

(b) If there is loss, damage, theft, destruction or a similar occurrence affecting the System, and you are not in default of this Lease, you shall continue to timely make all Monthly Payments and pay all other amounts due under the Lease and, cooperate with , at , sole cost and expense, to have the System repaired pursuant to the Limited Warranty.

14. LIMITATION OF LIABILITY

(a) No Consequential Damages

SOLARCITY'S LIABILITY TO YOU UNDER THIS LEASE SHALL BE LIMITED TO DIRECT, ACTUAL DAMAGES ONLY. YOU AGREE THAT IN NO EVENT SHALL EITHER PARTY BE LIABLE TO THE OTHER FOR CONSEQUENTIAL,



ADDITIONAL DESCRIPTION FORM

RE: Project: ______ trust

Lemon Ave

La Mesa

house, office, garage, Roofing replace + Solar panels
+ patio

* roof: remove old roof and haul away.
* replace any wood damage (up to 200 lf/5 lf include)
* install new 2x2 flashing on all edges of the house
* install new flashing on all pipes and vents + chimney
* install new 30 lbs felt paper on house, garage, patio
* install new torch down system on patio.
* install new 30 years shingles (color to be)
* paint and seal all pipes and vents.
* clean upon completion.

* Solar panels - bills are 600-800 kw
12 BP Solar 230 w, plus 1 SMA $3000 vs Used inverter
install panels up to code
to lower cost to (·)
* upgrade panel to fit new
Solar system

Cost of Solar System $29,176.
tax, labor and material
included.

Contractor:

Owner or Agent:

Do Not Sign Anything You Do Not Think Can Be Enforced in a Court of Law

Keeping Records

- Prepare to sign all documents at a location with either a scanner or copier.
- Make sure that you get a copy of the contract right after you and the seller/installer have signed the documents.
- If any changes are made to the system, the price, or the payment terms, make sure that you sign off on these changes with your initials and maintain copies of the updated contract or the addendum that clearly spell out these changes.

Financing Options

- Lease
  - Fixed $ per Month
- Power Purchase Agreement (PPA)
  - Fixed $ per kWh produced by system
- Home Equity Loan
  - Bank loan secured with equity in home (if available)
- San Diego Metropolitan Credit Union
  - Energy Efficient and Solar Loans

Owning	Leasing
What are you buying?	
Buying an asset	Buying a service, usually with a purchase option
What is included in the purchase?	
Generally will not include inverter replacement, O&M, insurance, may include monitoring	Generally includes O&M, inverter replacement, insurance, monitoring
What are the tax implications?	
Need to have the tax appetite to make use of the 30% ITC. If financed through home equity loan, then get tax deduction	Solar services provider has the tax appetite for the 30% ITC **AND** can make use of *commercial* depreciation tax benefits
What are the risks?	
Responsible for O&M	Longevity of the solar services provider
What happens if I move?	
New homeowner buys the asset	Can transfer payments to new homeowner or must buy out the remainder of the contract at 'fair market value'
What are the financial benefits?	
Return on investment in the form of lower electricity bills and increased home value	No or little upfront cost, benefits from commercial depreciation tax credit, usually cash positive or neutral in year 1

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Bid Comparison

Bid Comparison

- **DC Rating**

  Manufacturer's rating of the module's ideal output

- **CEC-AC Rating**

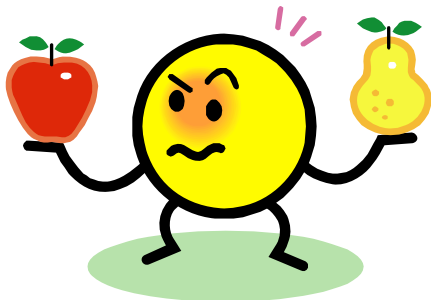
  CEC's rating which accounts for module and inverter efficiencies.

  PTC rating is the estimated module output under

  Performance Test Conditions

We recommend getting bids in CEC-AC

Reference EPBB Calculator for CEC-AC system size (csi-epbb.com)



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Bid Comparison - Efficiency

	Bid 1	Bid 2	Bid 3
Panel Quantity, Make, & Model (PTC rating)	12 Panel A (220 Watt) (PTC rating 196.6 Watts)	12 Panel B (220 Watt) (PTC rating 197 Watts)	12 Panel C (220 Watt) (PTC rating 194 Watts)
Inverter Quantity Make, & Model (efficiency)	1 Inverter X (95.5% efficiency)	1 Inverter Y (97% efficiency)	12 Micro Inverters Z (95% efficiency)
DC Rating	2640 Watts DC	2640 Watts DC	2640 Watts DC
CEC-AC Rating	2253 Watts CEC-AC	2293 Watts CEC-AC	2212 Watts CEC-AC
Total System Cost	$14,238	$34,853	$18,625
Cost per watt CEC-AC	$6.32/Watt	$15.20/Watt	$8.42/Watt

Bid Comparison - Cost

Annual Energy Usage 6,500 kWh

	Bid 1	Bid 2	Bid 3
System Size CEC-AC	2.99 kW	2.38 kW	1.47 kW
Estimated Annual System Production	5087 kWh	4048 kWh	2497 kWh
% of Usage Offset	78.27%	62.28%	38.41%
Annual Electric Bill Before	$1,100	$1,100	$1,100
Annual Electric Bill After	$175	$315	$560
Annual Savings	$925	$785	$540

Bid Comparison

- Warranties
  - Equipment & Workmanship
- Performance Guarantees
- Performance Monitoring & Reporting Service (is it included?) – *Required for systems 10kW or larger*
- Who will receive the rebate?

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Contract Information

What to Look for in a Contract

1. Installer and Host Customer Information
2. System Size
3. Make/Model/Quantity of Panels and Inverters
4. Warranty Language
5. Work Schedule/Description of Work
6. Price/Payment Schedule
7. Know all Parties Involved

Installer and Host Customer Information

The installation contract must include the following contractual information:

- **Name, address and contractor's license number** for the company installing the system
- **Full name of the Host Customer**
- **Complete site address** for where the system will be installed
- **Original Signatures** from both the Seller and the Host Customer

Make/Model/Quantity of Panels and Inverters

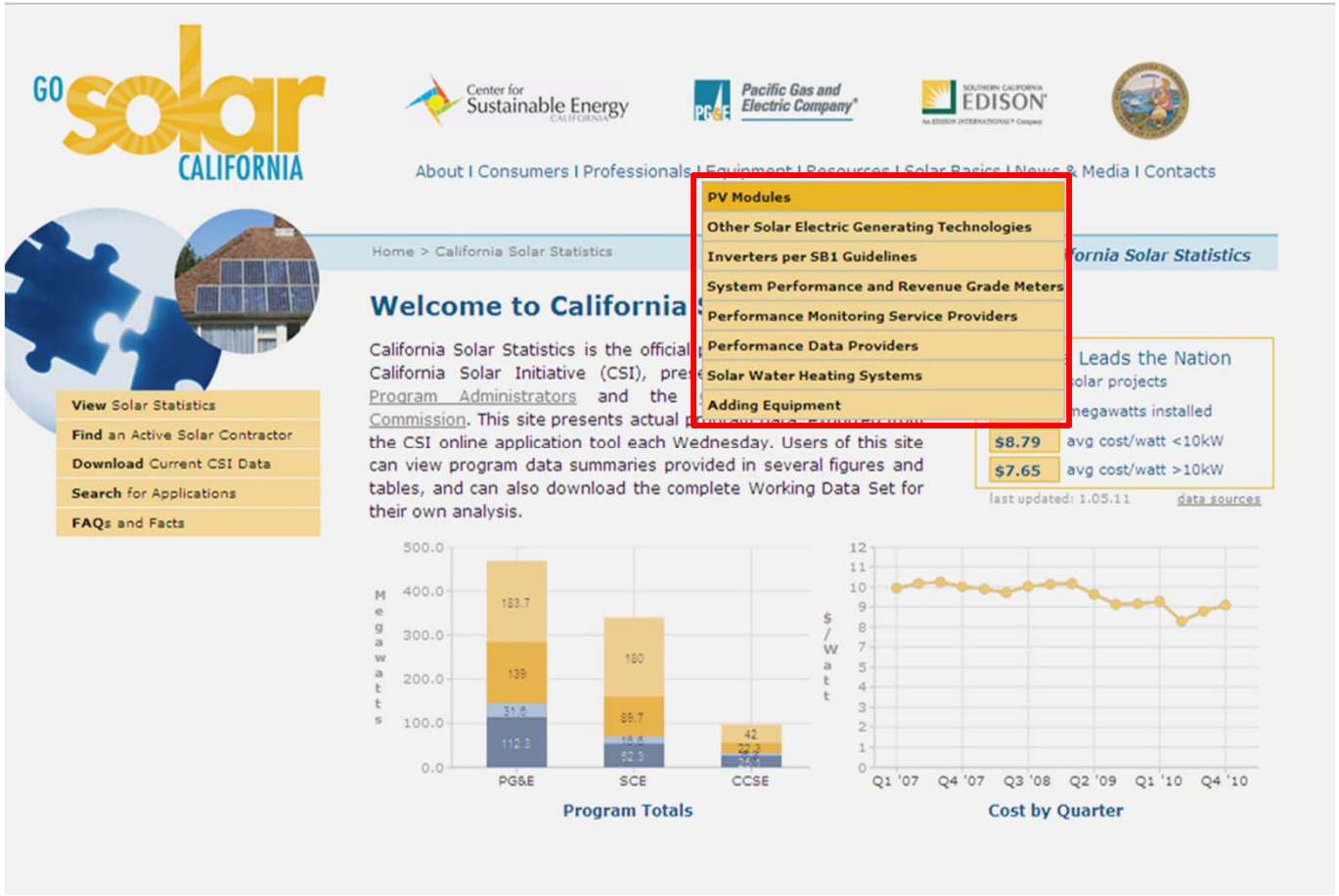
- A clear description of the system components is required.

Equipment & System Installation Description

ITEM
7.990 kW DC (STC) photovoltaic system
Meter Number for this site: 01788742
Modules: Yingli Green Energy:YL235P-29b (34)
Inverter(s): Fronius USA:IG Plus 3.0-240 (1)
Inverter(s): Fronius USA:IG Plus 5.0-240 (1)
Free SolarGuard Solar Energy Monitoring System (20 Years)
Mounting System
System Installation

System Components

www.gosolarcalifornia.ca.gov



Warranty Requirements for CSI

- All equipment (PV modules, inverters…) shall have a **minimum 10-year manufacturer performance warranty** to protect against degradation of more than 15% from their originally rated electrical output.

- **All contractors** shall provide a **minimum 10-year installation warranty** to provide for no-cost repair and replacement of the system for any expenses not otherwise covered by the manufacturer.

Work Schedule/Description of Work

- Description of the work to be performed
  - Clear concise description of the scope of work that you feel comfortable with and understand.
- Work Schedule
  - Average time between signing a contract and commissioning is 90 days
  - Average time of installation is 2-3 days

Price and Payment Schedule

- The **total purchase price** of the system installation before applying the incentive including payment terms (payment dates and dollar amounts) is required to be on all contracts
  - Down Payment - $1,000 or 10% of total project cost (which ever is less)
  - Late payment repercussions

- Designation of the **CSI rebate**
  - Who will receive the rebate?
  - How much is it buying down?

Solar Installation Flow Chart

1. Design System
2. Sign Contract
3. Submit CSI Reservation Application
4. Obtain Building Permit
5. Submit SDG&E Net Metering Application
6. Obtain HOA approval*
7. Install System
8. Obtain City/County Inspection Approval
9. Obtain SDG&E Interconnection Approval
10. Turn System On
11. Submit CSI Incentive Claim Application
12. CSI Field Inspection*

If Applicable*

Online Resources

- energycenter.org – *CCSE Website*
- ccse.powerclerk.com - *CSI Online Project Management Tool*
- csi-epbb.com - *CSI Program Incentive Calculator*
- csi-trigger.com - *CSI Statewide Trigger Point Tracker*
- www.gosolarcalifornia.ca.gov – *CPUC and CEC Website*
- www.cslb.ca.gov – *Contractor State License Board*
- www.bbb.org – *Better Business Bureau*
- www.yelp.com - *Customer Reviews*
- www.californiasolarstatistics.com – *CSI Program Data*

Now you know!

- General knowledge about solar technology & equipment
- About the CSI program
- How to size your PV system
- Where to find and research contractors
- Available financing options
- How to compare bids
- What details should be listed in your solar purchase agreement

Things to Think About Before Going Solar

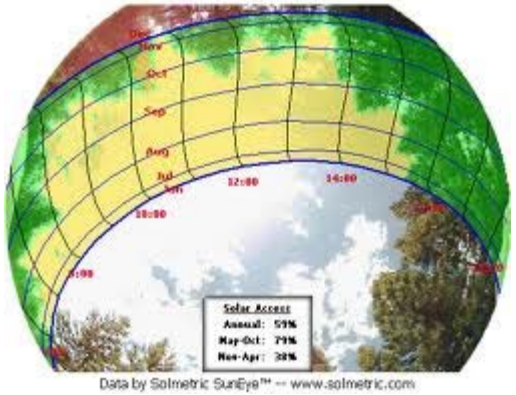
- Does your home have feasible space for solar?
- What direction could your system face?
- Will shading pose a problem for your system?
- What are your HOA restrictions? *(Civil code 714)*
- What are your expectations for financing?
- Talk to your homeowners insurance company before adding solar to your home.

Next Steps to Take

- Complete SDG&E Energy Efficiency Audit
- Run EnergyWave report
- Use the Electric Rate Analyzer
- Find & research local contractors
- Get quotes from a minimum of 3 contractors

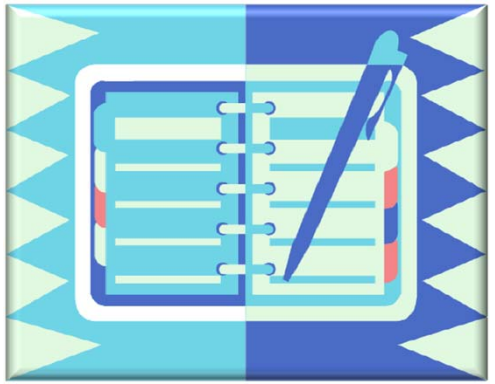
Shade Analysis by CCSE

- Ryan Robinson – Inspector/Shade Analyzer
  - Shade Analysis
  - Answer questions
  - It's free



Upcoming Events

- **January 11, 2014 - 10am-1pm**
  - *Poway Energy Efficiency Home Tour*
- **January 18, 2014 - 10am-1pm**
  - *San Carlos Energy Efficiency Home Tour*
- **February 1, 2014 - 10am-1pm**
  - *Clairemont Energy Efficiency Home Tour*



CCSE CSI Contact Information

California Center for Sustainable Energy (CCSE)

9325 Sky Park Court, Suite 100

San Diego, CA 92123

858-244-1177

http://energycenter.org

Laura Williams 858-737-1586

Ale Patey 858-244-1192