



# COMMON SENSE SOLAR

INTRODUCING THE SOLAR BASICS TO  
REAL ESTATE APPRAISERS IN CALIFORNIA

By

JORDAN COHEN  
VP, Head of Sales  
A1 Solar Power, Inc.

May 12, 2015





## INTRODUCTION

# WHO IS A1 SOLAR POWER?

- Company created in 1986.
- Solar Specialist since 2001.
- New management in 2009.
- 2010: 1 office in Los Angeles.
- 2011: ~20 employees and less than ~\$1 million revenue.







## INTRODUCTION

# A1 SOLAR POWER IN 2014

- Sold over \$88 millions in solar deals and ~350 employees.
- 9 Offices throughout California.
- A1 Solar becomes international with Operations in USA, Philippines and India.
- Top 10 residential solar contractor in California.\*
- Ranked 23rd out of 100 top residential solar contractor in the USA.



\*<http://www.solarpowerworldonline.com/2014-top-400-solar-contractors/2014-top-100-residential-solar-contractors/>





# INTRODUCTION

## JORDAN COHEN

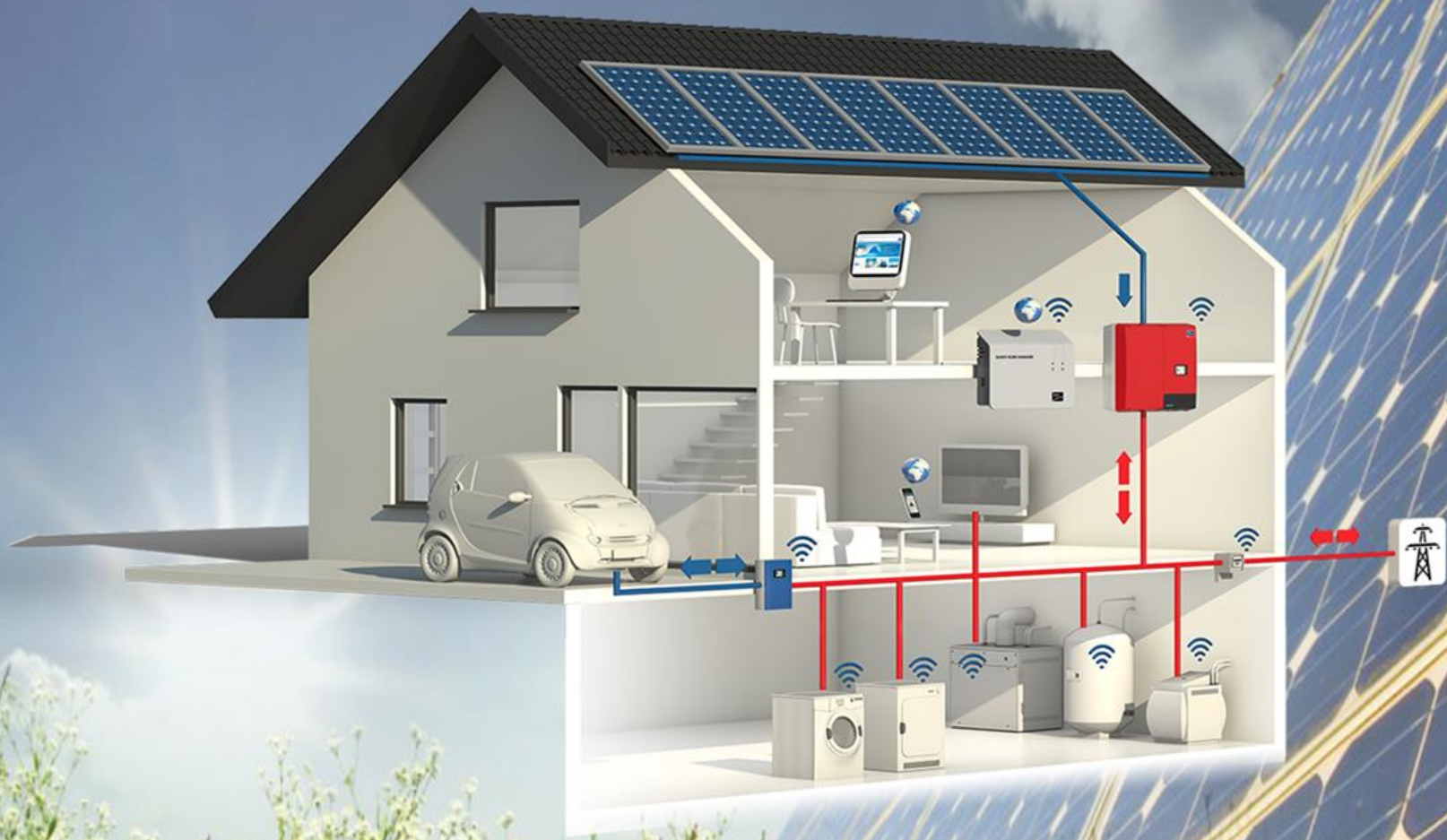
- 2011: Joined A1 Solar Power during the Summer as a solar representative.
- 2013: Manager of the LA Branch.
- 2014: Regional Manager of all Southern California Branches.
- 2015: Partner, VP and Head of Sales.







# HOW SOLAR WORKS







# THE COMPONENTS



THE PANELS



INVERTER



BATTERY  
BACK-UP



UTILITY GRID  
CONNECTION





# THE COMPONENTS

## THE PANELS

FRAME



GLASS



ENCAPSULANT



SOLAR CELLS



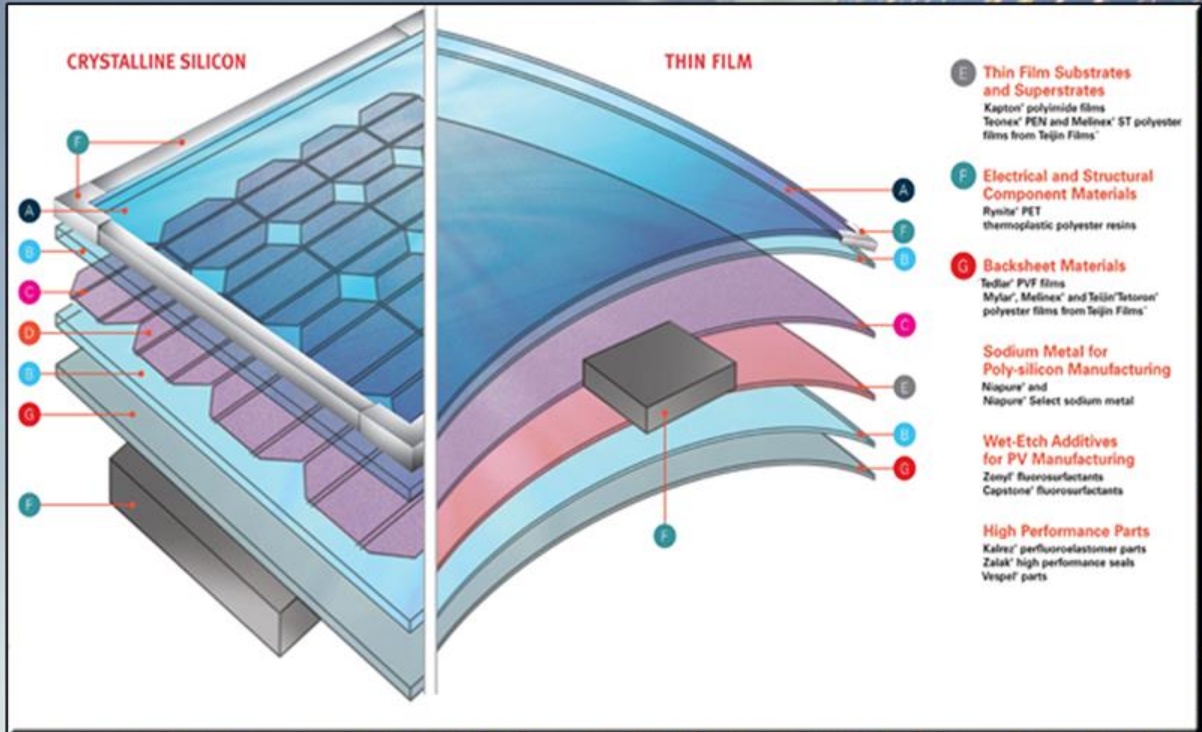
ENCAPSULANT



BACKSHEET



JUNCTION BOX







## THE COMPONENTS

### INVERTER

A solar inverter, or PV inverter converts the variable direct current (DC) output of a photovoltaic (PV) solar panel into alternating current (AC). It is a critical component in a solar system.

There are 3 broad types of inverters:

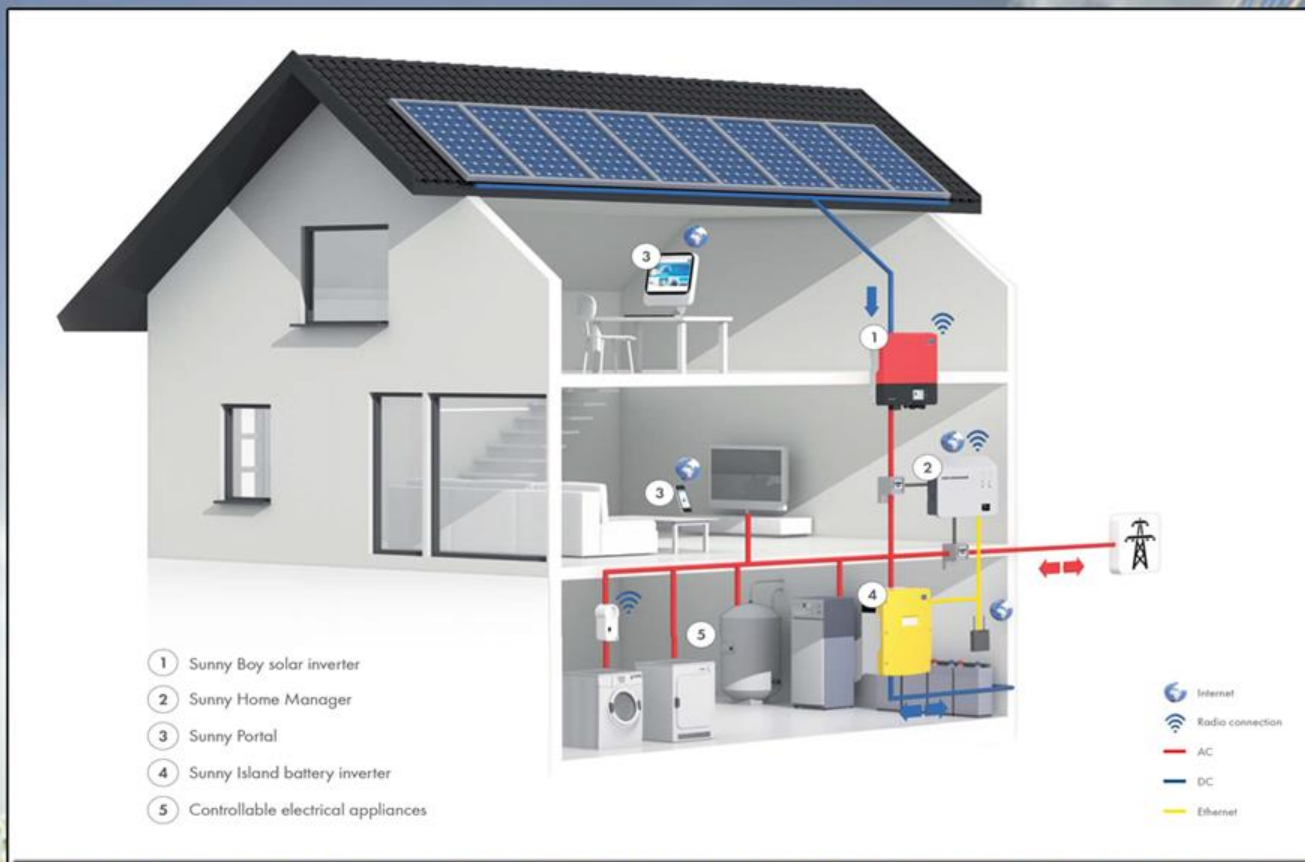
- Stand-alone inverters, used in isolated systems where the inverter draws its DC energy from batteries charged by photovoltaic arrays.
- Grid-tie inverters, are designed to shut down automatically upon loss of utility supply, for safety reasons. They do not provide backup power during utility outages.
- Battery backup inverters, are special inverters which are designed to draw energy from a battery, manage the battery charge via an onboard charger, and export excess energy to the utility grid.





# THE COMPONENTS

## GRID-TIE SYSTEM WITH BATTERY BACK - UP

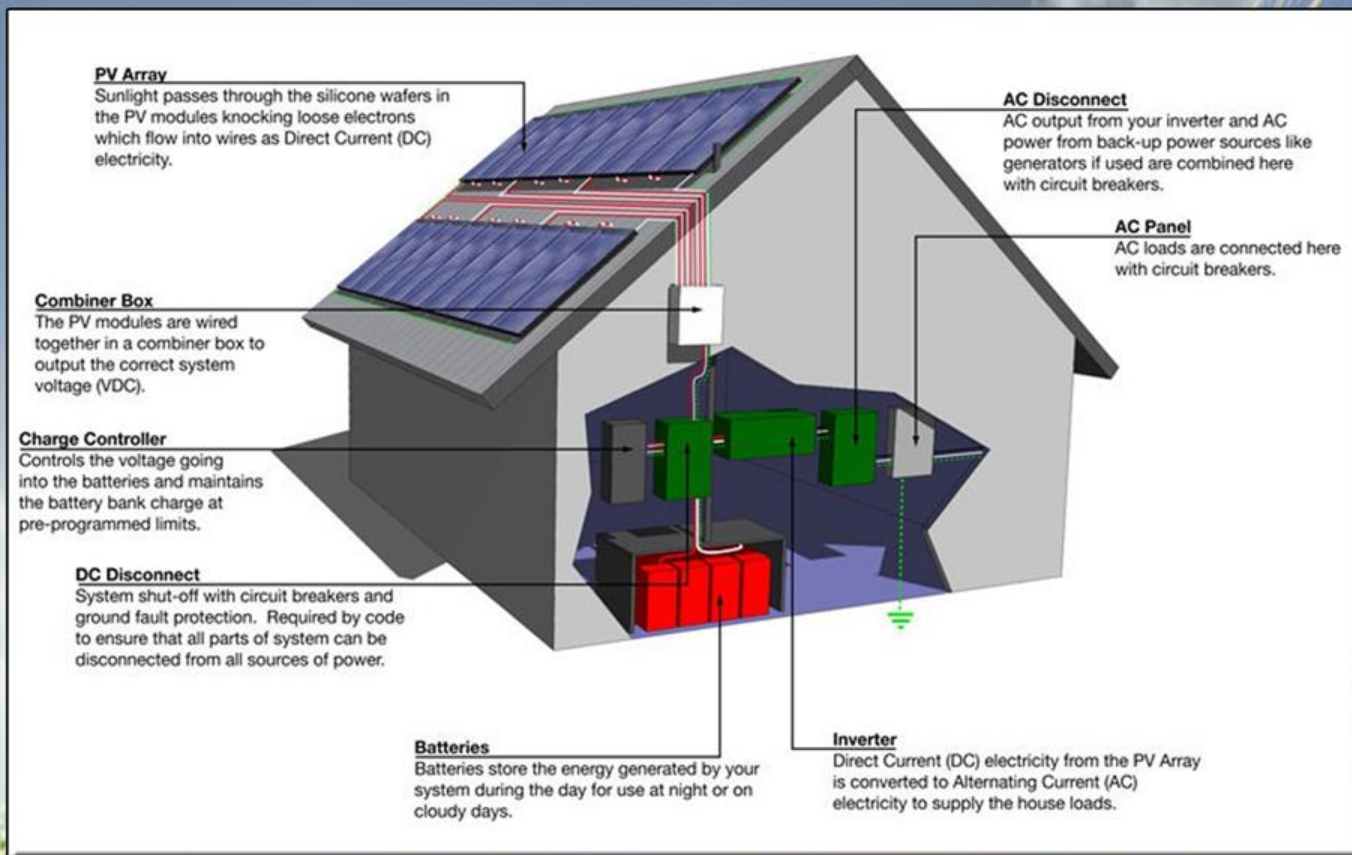






# THE COMPONENTS

## OFF-GRID SYSTEM

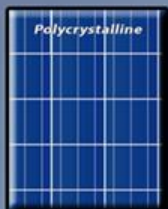






# THE COMPONENTS

## TYPES OF SOLAR PANELS AVAILABLE



### POLYCRYSTALLINE

- The process used to make polycrystalline silicon is simpler and cost less.
- Polycrystalline solar panels tend to have slightly lower heat tolerance.
- The efficiency based solar panels is typically 13-16%.

### MONOCRYSTALLINE

- Have the highest efficiency rates since they are made out of the highest-grade silicon.
- Tend to be more efficient in warm weather. Performance suffers as temperature goes up.
- Are space-efficient and live the longest.
- Are more expensive.
- Efficiency rates of monocrystalline solar panels are typically 16-20% up to 25%.



### THIN FILM



- Easy installation, no to little alteration of roof.
- Mass-production is simple.
- Their homogenous appearance makes them look more appealing.
- Can be made flexible, High temperatures and shading have less impact on solar panel performance.
- Low efficiency typically 10 to 15%.





# SOURCE OF COMPONENTS



VS







# SOURCE OF COMPONENTS

## DOMESTIC PRODUCTION

### Domestic Production

In the United States, manufacturers produced PV modules with a capacity of 715,000 peak kilowatts<sup>41</sup> (kW) in 2012. By value, combined U.S. PV cell and module shipments totaled about \$7 billion in 2012.<sup>42</sup> As shown in **Table 1**, SolarWorld and First Solar accounted about half of total domestic module production.

**Table 1. Cell and Module Production in the United States**  
(in MW, 2012)

Company	Location of Headquarters	Technology	Cells	Modules	% of U.S. Module Production
SolarWorld	Germany	Mono/Multi c-Si	412	243	25.6%
First Solar	United States	CdTe		229	24.1%
Sharp	Japan	Mono/Multi c-Si		116	12.2%
Suniva	United States	Mono/Multi c-Si	102	63	6.6%
SunPower	United States	Mono/Multi c-Si		61	6.4%
All Others			8	237	25.0%
<b>Total</b>			<b>522</b>	<b>949</b>	<b>100.0%</b>

**Source:** International Energy Agency, U.S. PV Applications National Survey Report (IEA-PVPS), 2012, November 2013, pp. 14-16. The 2013 U.S. national report does not give company-specific information for cell and module production.

**Notes:** C-Si stands for crystalline silicon. Monocrystalline PV cells are usually cut from a single grown silicon ingot, while multicrystalline PV cells are manufactured such that wafers are made from multiple crystals. Monocrystalline PV cells have an efficiency of 16% to almost 20%, while the cheaper to produce multicrystalline PV cells achieve an efficiency of 14% to 15%. Thin-film PV is based on other materials such as amorphous silicon (a-Si), cadmium telluride (cdTe), or copper iridium diselenide (CIGS).





# SOURCE OF COMPONENTS

## FOREIGN PRODUCTION

**Table 3. Top PV Solar Module Manufacturers by Production**  
(2013)

Rank	Manufacturer	Location of Headquarters	% of Module Production	Founded	Plant Locations (current and planned)
1	Yingli <sup>a</sup>	China	8.3%	1998	China
2	Trina Solar	China	6.7%	1997	China
3	Sharp <sup>b</sup>	Japan	5.4%	1959	Japan
4	Canadian Solar <sup>c</sup>	China	4.9%	2001	China
5	Jinko Solar	China	4.6%	2006	China
6	Renesola	China	4.5%	2005	China
7	First Solar <sup>d</sup>	United States	4.2%	1990	United States, Malaysia
8	Hanwha SolarOne <sup>e</sup>	South Korea	3.3%	2004	China, Malaysia, Germany
9	JA Solar	China	3.2%	2005	China
10	Kyocera	Japan	3.1%	1996	Japan, China, Czech Republic, Mexico

Source: Bloomberg New Energy Finance, "PV Production 2013: An all-Asian Affair," Solar Insight—Research Note, pp. 5-7, April 16, 2014.

- a. Yingli Green Energy went public on June 8, 2007.
- b. Sharp closed its factories in the United States and Europe.
- c. Canadian Solar, incorporated in Canada, manufactures most of its solar modules in China.
- d. First Solar closed its manufacturing operations in Germany in December 2012. It has also idled some of its production lines in Malaysia, cutting its global workforce by about 2,000 positions. See First Solar April 17, 2012, press release, "First Solar Restructures Operations to Align with Sustainable Market Opportunities."





# SYSTEM CHARACTERISTICS

## PANEL QUALITY

Several factors will help you identify the quality of a solar panel:

- Warranty.
- Quality of Silicon.
- Resistance.
- Performance Tolerance (-10% / +10%).
- CEC Approved.







# SYSTEM CHARACTERISTICS

## PANEL EFFICIENCY

The efficiency between panels can change considerably depending on these factors:

- Cell Efficiency.
- STC (Standart test Condition) vs PTC (PVUSA Test Condition).
- Azimuth.
- Tilt.
- Location & Weather Condition.
- Dust, dirt and debris.
- Shade.



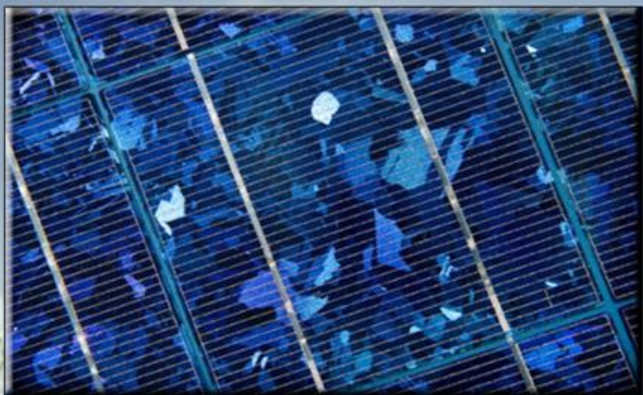




## SYSTEM CHARACTERISTICS

# PANEL DEGRADATION

The degradation of a panel will be determined by the following factors:



- PTC (PVUSA tested condition).
- Oxidation and corrosion.
- Physical damage to panels.





# SYSTEM CHARACTERISTICS

## INVERTER QUALITY

Having a quality inverter with an extended warranty will increase the value of a solar system. The following factors will help you determine the quality of the inverter:



- Resistance and Performance.
- Warranty and Expected Lifetime.
- Shut-off capacity.
- Fail-detection.
- Monitoring Capacity.





## SYSTEM CHARACTERISTICS

# INVERTER EFFICIENCY

A very efficient inverter will increase the amount of output electricity received, therefore increasing the savings and the value of the home. These factors will help determine the inverter efficiency:



- Max Input/output.
- Voltage Range.
- Efficiency when exposed to high temperatures.
- Micro-inverters and power-optimizers.

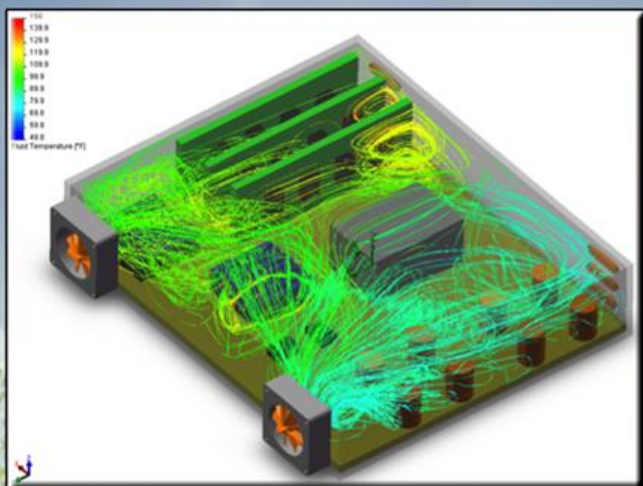




## SYSTEM CHARACTERISTICS

# INVERTER DEGRADATION

Most inverters have a 10 years life expectancy. Some companies offer up to 25 years warranty on micro-inverters or power optimizers. Inverter degradation will be impacted by:



- Electrical degradation.
- Resistance to weather conditions.
- Corrosion and oxidation.
- Fire hazard and overheating.





# SYSTEM CHARACTERISTICS

## SYSTEM LIFE AS WARRANTED

Most panels today will be under a 25 years limited warranty. But the warranty is only as strong as the company who is giving it to you. These are the factors to take in consideration:



- How many years the panels are under warranty for.
- American warranty vs foreign warranty.
- Warranty from the installer and the manufacturer.
- Guaranteed production.
- Limitations.





# SYSTEM CHARACTERISTICS

## SYSTEM LIFE AS EXPECTED

Solar panels, if maintained properly and can work for over 40 years:

- SolarWorld has panels working today that were installed over 30 years ago.
- Low panel degradation means longer life for the solar system.
- A good degradation is around 0.7% a year. Meaning after 25 years, the system is still 83% efficient.







## TOOLS TO WORK WITH:

# THE APPRAISAL JOURNAL

The first time that the idea that energy efficient home improvement could increase the value of a home came from the Appraisal Journal from 1999. According to them, a home value would increase by \$20 for every \$1 reduction in annual utility bills.

A reprint from

### The Appraisal Journal

#### *More Evidence of Rational Market Values for Home Energy Efficiency*

Electronically reprinted with permission from The Appraisal Journal (October 1999),  
© by the Appraisal Institute, Chicago, Illinois.

### CONSTRUCTION AND THE APPRAISER

#### More Evidence of Rational Market Values for Home Energy Efficiency

*Rick Nevin, Christopher Bender, and Heather Gazan*

The article, "Evidence of Rational Market Values for Home Energy Efficiency," which appeared in the October 1998 issue of *The Appraisal Journal*, presented the results of research indicating that market values for energy-efficient homes reflect a rational trade-off between homebuyers' fuel savings and their after-tax mortgage interest costs. This research estimated implicit values for the number of rooms in a house, the square footage of living space, lot size, location, and other home characteristics, including the annual utility bill. We performed separate regression analyses for attached and detached homes based on the 1991, 1993, and 1995 American Housing Survey (AHS) national data and AHS metropolitan statistical area (MSA) data for 1992 through 1996. **Table 1**

shows that the results of these separate regression analyses were remarkably consistent, indicating that home value increases by about \$20 for every \$1 reduction in annual utility bills, reflecting after-tax mortgage interest rates of about 5% from 1991 through 1996.

To demonstrate the "real world" validity of this research, the regression results have been compared with the collective judgment of real estate agents participating in "cost versus value" surveys conducted by *Remodelling Magazine* (RM). Each year, the RM survey asks agents throughout the United States to estimate the amount that popular remodeling projects would add to the value of a home in their area if the home were sold within a year of project completion. This sur-

\*Evidence of Rational Market Values for Home Energy Efficiency, The Appraisal Journal, October 1998 and 1999, Page 2





# TOOLS TO WORK WITH:

## S.A.V.E. CALCULATOR (Solar Advantage Value Estimator)

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Home > tools > save.php

### SAVE Online Training Schedule

Download SAVE Training Schedule (PDF)

### Solar Advantage Value Estimator

1920 S Sunrise Dr Monterey Park CA 91754

Real Estate Parcel Type: Residential  
System Type: Solar PV  
System Leased: No  
System Capacity: 4400.00 Watts \*  
Annual Energy Output: 7,188.46 kWh  
Interconnection Date: 11/5/2013\*  
Utility: Southern California Edison  
Climate Zone: 9

ESTIMATED ENERGY USAGE RATE	Low	Avg.	High	Custom *
<b>PRESENT VALUE</b>	\$19,898.35	<b>\$32,908.80</b>	\$47,449.90	N/A
Utility Rate (per kWh)	\$0.13000	\$0.21500	\$0.31000	N/A
2014 Energy Cost Savings	\$934.50	\$1,545.52	\$2,228.42	N/A

Solar Capacity Factor: 18.55 %  
Age: 1 Years \*  
System Remaining Lifetime: 24 Years \*  
System Expected Lifetime: 25 Years \*  
Annual Discount Rate: 3.00 %  
Annual Energy Escalation Rate: 2.00 %  
Annual Solar System Degradation Rate: 1.00 %

Asterisks (\*) denote operator specified values and cannot be verified for accuracy by the California Energy Commission

<http://www.gosolarcalifornia.org/tools/save.php>





# TOOLS TO WORK WITH:

## EPBB - EXPECTED PERFORMANCE BASED BUYDOWN

**Site Specifications**

Project Name:

ZIP Code:

Utility:

Customer Type:

Incentive Type:

**PV System Specifications**

PV Module:   
215W Polycrystalline Module (189.4W PTC)

Number of Modules:

Mounting Method:

Inverter:   
250W Utility Interactive Inverter (96% efficiency)

Number of Inverters:

Shading:  Minimal Shading

Shading Derate Factors (%)	
January	100
February	100
March	100
April	100
May	100
June	100
July	100
August	100
September	100
October	100
November	100
December	100

Array Tilt (degrees):

Array Azimuth (degrees):

True North 0°  
270° 90°  
180°

<http://csi-epbb.com/default.aspx>





# TOOLS TO WORK WITH:

## CSLB - CONTRACTORS STATE LICENSE BOARD

The screenshot shows the CSLB website interface. At the top, there is a search bar and navigation tabs for Consumers, Contractors, Online Services, Media Room, and About Us. The main content area displays the 'Contractor's License Detail for License # 493623'. A disclaimer is provided, followed by a list of notes. Below this, the 'Business Information' section lists the details for A1 Solar Power Inc. The 'License Status' section indicates that the license is current and active. The 'Classifications' section lists C10 - ELECTRICAL and C46 - SOLAR. On the right side, there are 'Online Services Quick Hits' and 'Online Services' sections with various links and a photo of two workers in hard hats.

**Contractor's License Detail for License # 493623**

**Business Information**

A1 SOLAR POWER INC  
15025 ONNARD ST 200  
VAN NUYS, CA 91411  
Business Phone Number: (855) 410-4700 FREE

**Entity** Corporation  
**Issue Date** 06/18/1986  
**Reissue Date** 09/24/2004  
**Expire Date** 09/30/2016

**License Status**

This license is current and active.  
All information below should be reviewed.

**Classifications**

- C10 - ELECTRICAL
- C46 - SOLAR

<http://cslb.ca.gov/>

It is always important to look up the installer on the CSLB and verify that he is carrying the right licenses.

4 licences can be used on a solar project (in order of preference):

C46 : Solar Specialist

C10 : Electrical

A : General Engineer

B : General Contractor





# INCENTIVES

## PROPERTY TAX EXCLUSION

STATE OF CALIFORNIA

STATE BOARD OF EQUALIZATION  
PROPERTY AND SPECIAL TAXES DEPARTMENT  
450 N STREET, SACRAMENTO, CALIFORNIA  
PO BOX 942879, SACRAMENTO, CALIFORNIA 94279-0064  
916 445-4982 • FAX 916 323-8765  
www.boe.ca.gov

MAY 21 2008

BETTY T. YEE  
First District, San Francisco

BILL LEONARD  
Second District, Ontario/Sacramento

MICHELLE STEEL  
Third District, Rolling Hills Estates

JUDY CHU, Ph.D.  
Fourth District, Los Angeles

JOHN CHIANG  
State Controller

RAMON J. HIRSIG  
Executive Director

No. 2008/037

TO COUNTY ASSESSORS:

SOLAR ENERGY PROPERTY TAX INCENTIVE

We are receiving an increasing number of calls asking about the property tax "exemption" for solar energy. This letter is to clarify California's property tax incentive for solar energy systems.

The property tax incentive for the installation of an active solar energy system is in the form of a new construction exclusion. It is not an exemption. Therefore, the installation of a qualifying solar energy system will not result in either an increase or a decrease in the assessment of the existing property.

Generally, when something of value is physically added to real property, what is added is





# INCENTIVES

## PROPERTY TAX EXCLUSION

Home Glossary Links FAQs Contact About

**DSIRE SOLAR**  
solar policy information

CALIFORNIA  
Incentives/Policies for Renewables & Efficiency

Printable Version

**Property Tax Exclusion for Solar Energy Systems** Like 23

Last DSIRE Review: 12/20/2012

Program Overview:

State:	California
Incentive Type:	Property Tax Incentive
Eligible Renewable/Other Technologies:	Solar Water Heat, Solar Space Heat, Solar Thermal Electric, Solar Thermal Process Heat, Photovoltaics, Solar Mechanical Energy
Applicable Sectors:	Commercial, Industrial, Residential
Amount:	100% of system value; 75% of system value exemption for dual-use equipment
Maximum Incentive:	Not specified.
Expiration Date:	12/31/16
Web Site:	<a href="http://www.boe.ca.gov/proptaxes/gase.htm">http://www.boe.ca.gov/proptaxes/gase.htm</a>
Authority 1:	Cal Rev & Tax Code § 73
Expiration Date:	12/31/16
Authority 2:	Guidelines for Active Solar Energy Systems New Construction Exclusion
Date Enacted:	11/15/2012

[http://www.dsireusa.org/incentives/incentive.cfm?incentive\\_code](http://www.dsireusa.org/incentives/incentive.cfm?incentive_code)





# INCENTIVES

## PROPERTY VALUE INCREASE

### Solar Homes Sold 20% Faster, and for 17% More, NREL Study Finds

by Susan Kraemer

277 Share 204 Tweet 16 Share 542 542 Share

repost



In by far the most exhaustive and detailed study to date, the National Renewable Energy Laboratory (NREL) found that solar homes sold 20% faster, for 17% more than the equivalent non-solar homes, across several subdivisions built by different California builders.

When Shea Homes put solar PV and solar thermal systems on half the homes in a development, all 257 of them sold within a year, two years faster than expected. And while these new houses were priced at \$380,000 to \$500,000, they sold for as much as \$600,000.

This was well before the housing crash, so it represents the buoyant market of that time, in 2003. Still, it found that compared with non-solar homes, the houses that had solar on them sold for more. While the average price increase related was 55% for the solar homes, the non solar homes appreciated only 33% (pg 49.) This represents a 20% higher sales price for solar homes.

The Clarum Homes' solar homes in the study also sold faster than their "control" homes. The solar homes sold in 23 months, the non-solar, in 28 months. This is a 17% faster home sale for a solar home.

**The solar homes appreciated 20% more, and sold 17% faster than the non-solar homes.**

In by far the most exhaustive and detailed study to date, the National Renewable Energy Laboratory (NREL) found that solar homes sold 20% faster, for 17% more than the equivalent non-solar homes, across several subdivisions built by different California builders.

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# INCENTIVES

## PROPERTY VALUE INCREASE

Forbes



Ashlea Ebeling, Forbes Staff

I write about how to build, manage and enjoy your family's wealth.

TAXES | 8/01/2011 @ 3:51PM | 11,482 views

### How Much Do Solar Panels Boost Home Sale Prices?

Add a new steel front door to your house and you'll likely recoup the investment if you have to sell. But what about a solar power system?



Image by joncallas via Flickr

A group of California economists looked at that question in a recent study and found that on average, homeowners in California who install photovoltaic solar panels to power their homes can recover nearly all the investment costs if they move—and that's on top of the annual energy savings.

And if they live in a liberal community (with more registered Green Party members and Toyota Priuses) there's an even greater payback.

The economists looked at utility data, sales records of single family homes and building permit data in San Diego County and Sacramento County from 2003 through year-end 2010. The study, published by the National Bureau of Economic Research, titled "Understanding the Solar Home Price Premium: Electricity Generation and 'Green' Social Status," is available here.

For the average installation, the authors found that solar panels added a \$20,194 premium to the sales price of the house based on repeat sales data (houses were in the mid-\$500,000 range). Solar is really expensive to install—the average total system cost is \$35,967, but the effective price to homeowners with subsidies including the federal tax credit is \$20,892. Thus, homeowners appear to recover approximately 97% of their investment costs—in addition to the savings associated with reduced energy bills.

By contrast, a luxury kitchen remodel brings a 60% payback, according to Hanley Wood's 2010-2011 Cost v. Value report. A new steel front door brings a 102% payback. For the Hanley Wood report, click here. Of course it depends on your personality as to whether you get more enjoyment out of ushering guests through a steel door, showing off new granite countertops, or leading a tour of the mechanical guts of a photovoltaic system.

The solar study has big implications for state and federal policy. "Are subsidies necessary if the value is already there?" asks Joshua Graff Zivin, one of the co-authors and an economist at the University of California, San Diego. "It doesn't mean there is no role, but we don't see the government in the business of subsidizing people to remodel their kitchens," he says.

A group of California economists looked at that question in a recent study and found that on average, homeowners in California who install photovoltaic solar panels to power their homes can recover nearly all the investment costs if they move—and that's on top of the annual energy savings.



Image by joncallas via Flickr

install—the average total system cost is \$35,967, but the effective price to homeowners with subsidies including the federal tax credit is \$20,892. Thus, homeowners appear to recover approximately 97% of their investment costs—in addition to the savings associated with reduced energy bills.





# LEASING

## MONTHLY LEASE

- Leasing a solar system is pretty much the same as leasing a car.
- You pay your solar provider a monthly fee (fixed, escalating or de-escalating) to lease their solar panels.
- Many companies will allow homeowners to prepay the entire lease, or part of it (down payment).





# LEASING

## PPA MONTHLY (Power Purchase Agreement)

Power purchase agreements are almost identical to solar leases – the only difference is that you pay for the amount of power the solar panels produce, as opposed to just leasing the equipment. If a solar panel doesn't produce, you don't pay.





# LEASING

## PPA PREPAID LEASE

You purchase 20 years of electricity upfront at a discounted and fixed price per kWh. Savings will be higher than a monthly lease. No monthly payment to the solar provider. Finance can be provided to purchase the PPA Prepaid lease.





# LEASING

## LEASES CAN GO WRONG

Leased Solar Panels Can Cast A Shadow Over A Home's Value

JULY 15, 2014 3:31 AM ET

<http://www.npr.org/>

Rooftop Solar Lease Revisited: 5 Disadvantages or the Facts Leasing Companies Don't Want you to Know

by Tadas on July 22, 2014

<http://sanjosegreenhome.com/>

**Rooftop Solar Leases Scaring Buyers When Homeowners Sell**

7:03 AM PDT  
June 24, 2014

<http://www.bloomberg.com/>





**THANK YOU FOR YOUR ATTENTION**



**JORDAN COHEN**  
**[jordan@a1solarpower.net](mailto:jordan@a1solarpower.net)**