

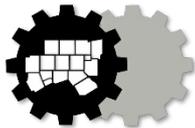


Solar PV for Real Estate Professionals

Summer, 2016

Trainer: Dan Lepinski, P.E.

Sponsored by:



North Central Texas
Council of Governments

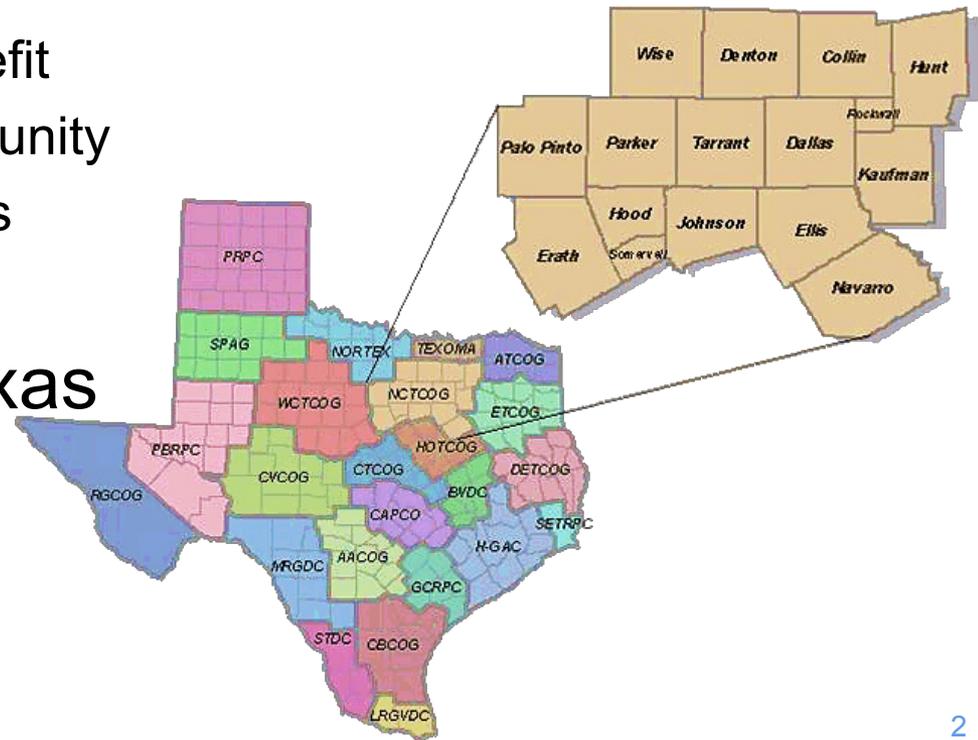


State Energy Conservation Office

www.GoSolarTexas.org

What is NCTCOG?

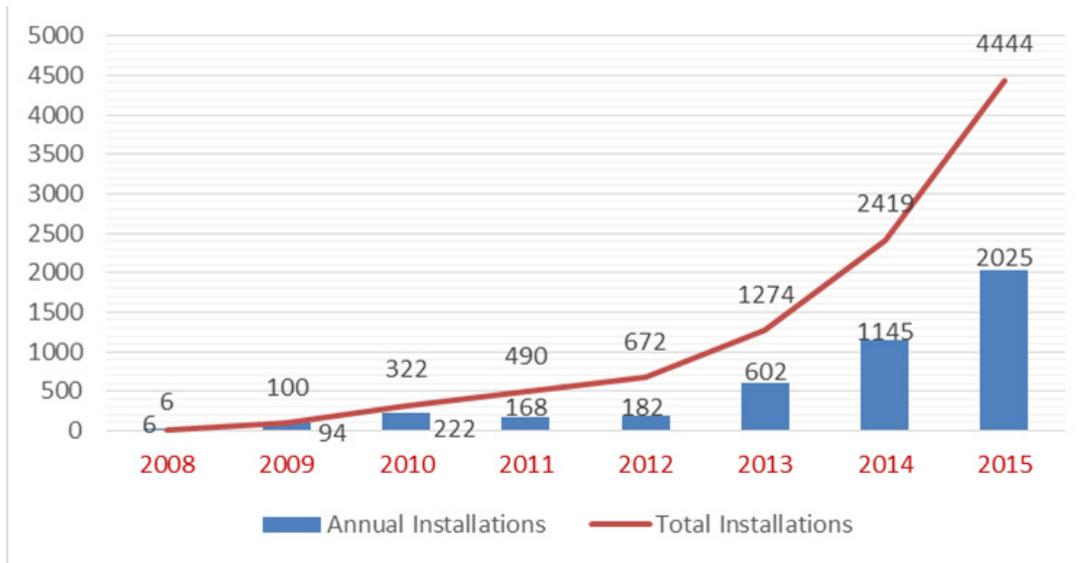
- Voluntary association of local governments
- Established in 1966
- Assists local governments in:
 - Planning for common needs
 - Cooperating for mutual benefit
 - Recognizing regional opportunity
 - Resolving regional programs
 - Making joint decisions
- One of 24 COGs in Texas
- www.nctcog.org



NCTCOG's SOLAR PROGRAM GOALS

- 1) Provide resources for cities
- 2) Improve air quality by reducing demand for electricity during peak loads
- 3) Increase local energy and grid reliability
- 4) Reduce costs

Dallas-Fort Worth Region Annual Installations and Total Installations (2008 to 2015)



REGIONAL STATISTICS:

- 744% growth in # installations since 2008
- 4,469 total installations in 123 cities
- 43,626 kW = Approximate regional installed solar capacity (Source: NTREG, 2016)
- 2.1 tons NO_x avoided annually

Solar PV for Real Estate Professionals



Solar PV for Real Estate Professionals

Presented in Collaboration with...

Texas State Energy Conservation Office

&

North Central Texas Council of Governments

**Celebrating 50 Years Serving Citizens in North Texas
and Throughout the State of Texas.**

Disclaimer

This Workshop is prepared in cooperation with the North Central Texas Council of Governments (NCTCOG), the State of Texas Energy Conservation Office (SECO), and the U.S. Department of Energy (DOE).

The contents of this presentation reflect the view of the author, who is responsible for the opinions, findings, and conclusions presented herein.

The contents do not necessarily reflect the views or policies of the North Central Texas Council of Governments, the Comptroller of Public Account's State Energy Conservation Office, and the U.S. Department of Energy (DOE).

Solar PV for Real Estate Professionals

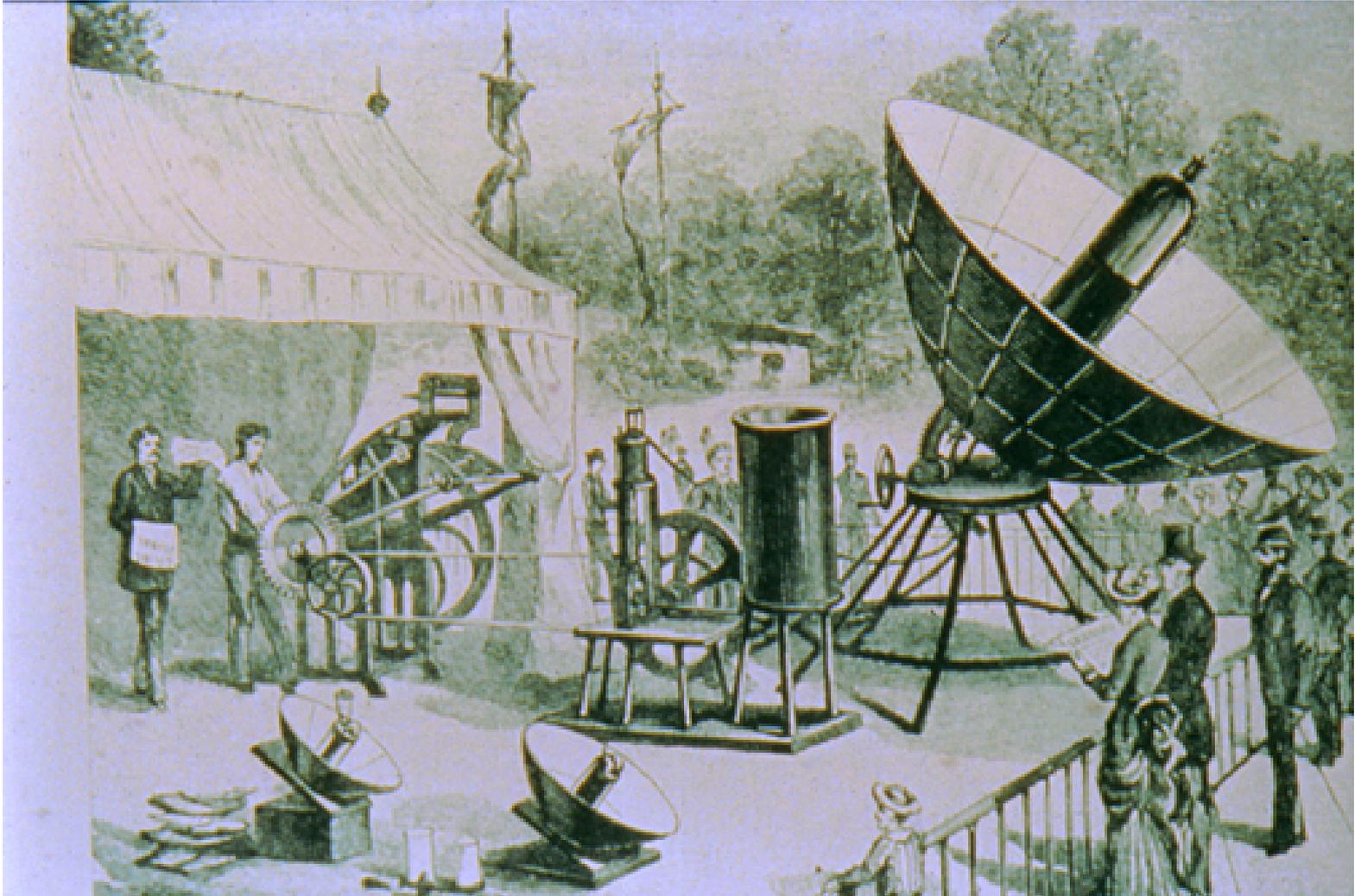
- ★ **Brief History & Overview of Solar Energy with Definitions**
- ★ **Fundamentals of Solar and How It Operates**
- ★ **The Economics of Solar Energy**
- ★ **Myths & Misconceptions about Solar Energy**
- ★ **Answers to Questions from Buyers, Sellers, and RE Professionals**
- ★ **Methods for Selling Solar Homes & the Benefit of Solar on Home Value**
- ★ **Analytics for Valuation - How a Solar-Equipped Property is Assessed**
- ★ **Open Q & A**

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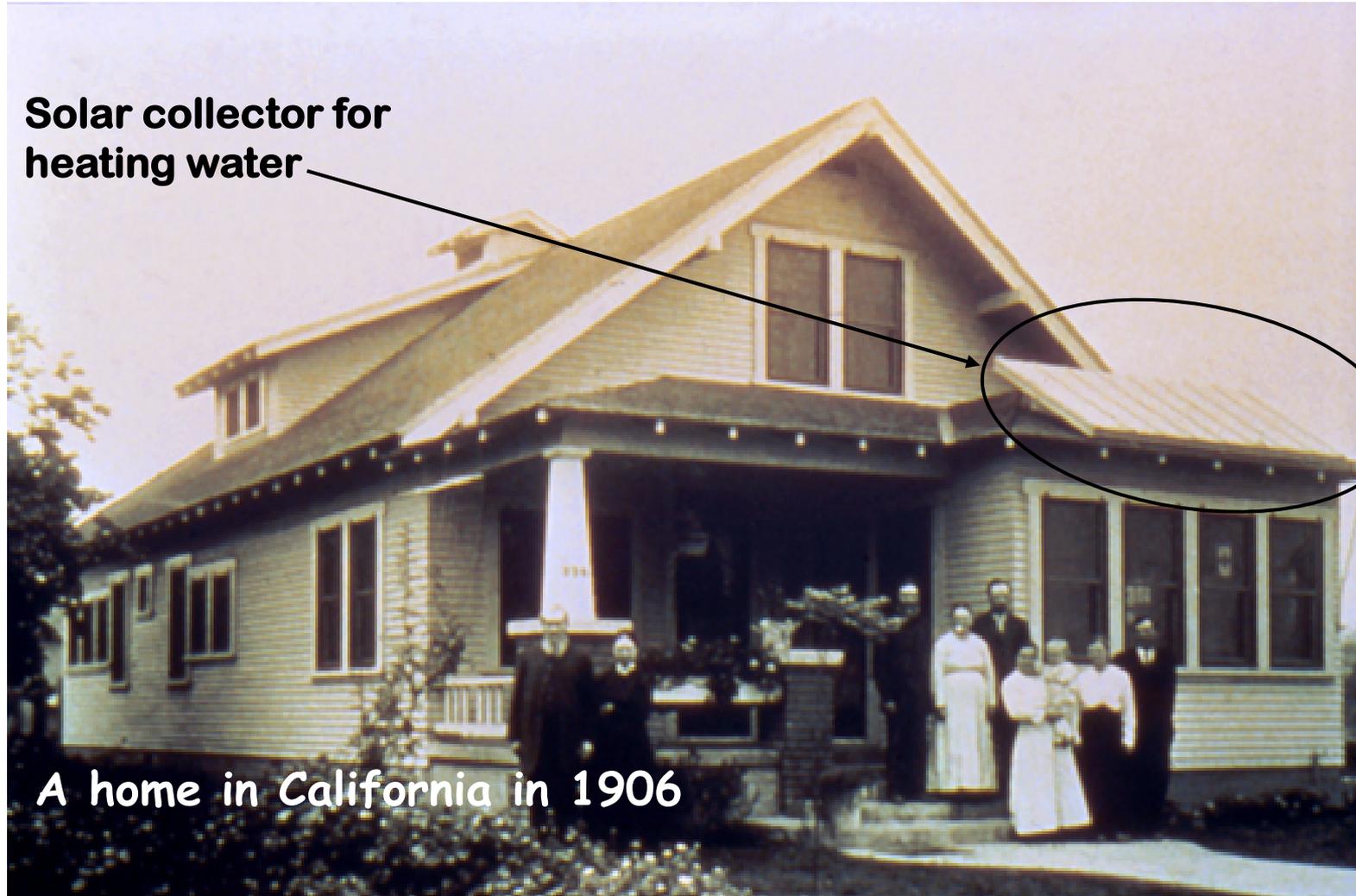
Solar Energy Isn't New...

This illustration is from the 1890's World Fair.



Solar Energy Isn't New...

This example is from California in 1906.

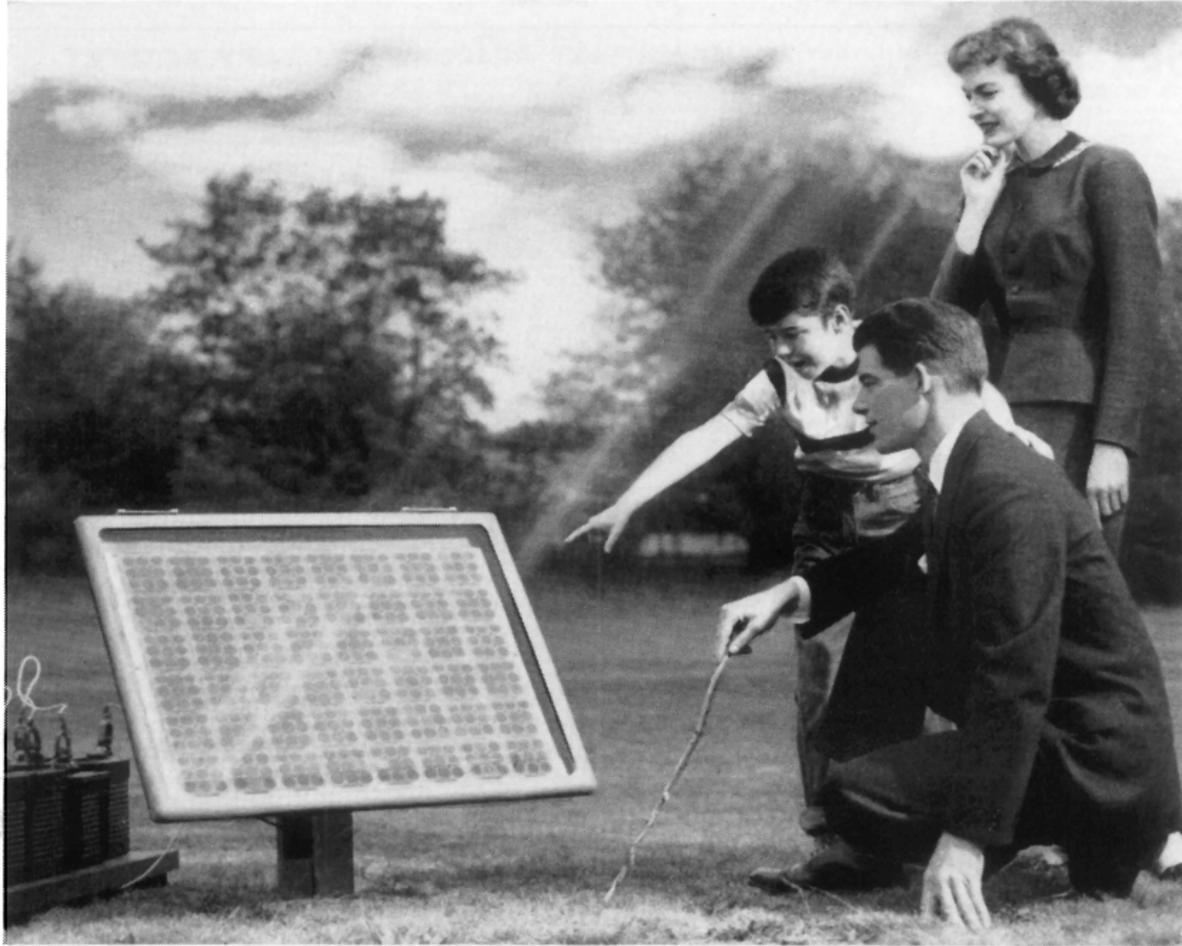


Solar collector for heating water

A home in California in 1906

Solar Energy Isn't New...

1955 Bell Telephone Ad Promoting Solar Electricity.
Bell Labs is credited with inventing solar cells.



Something New Under the Sun. It's the Bell Solar Battery, made of thin discs of specially treated silicon, an ingredient of common sand. It converts the sun's rays directly into usable amounts of electricity. Simple and trouble-free. (The storage batteries beside the solar battery store up its electricity for night use.)

Introduction to "Technical" Terminology

Electricity, Power, and Energy

Photovoltaic ("PV"): Electricity from light.

Solar Cell: Converts sunlight into electricity.

Photovoltaic Module: Multiple solar cells connected in one unit.

Photovoltaic Array: Multiple photovoltaic modules.

Direct Current ("DC"): Electricity that flows in one direction.

Alternating Current ("AC"): Electricity that changes direction.

Watts: Electrical power at any given moment.

Watt-hours: Quantity of electrical power over time.

Kilo: 1,000 of something.

1,000 watts = 1 kilowatt

1,000 watt-hours = 1 kilowatt-hour

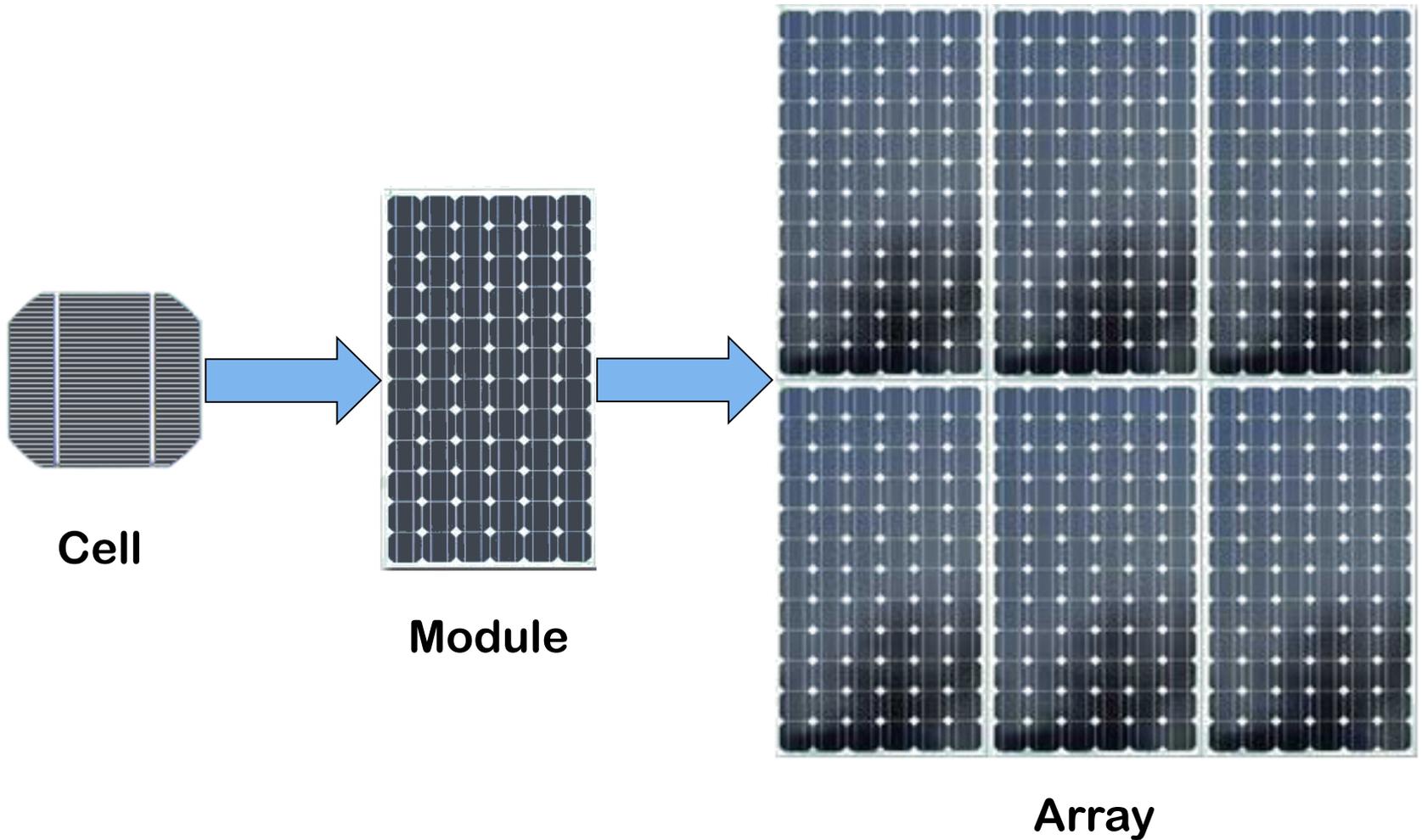
Inverter: Device that changes DC to AC.

Introduction to "Financial" Terminology

Cash Flow and Value

- Grid-Connected:** Connected to the utility lines.
- Leased System:** On the home, but owned by a third-party.
- Net Metering:** Credit for energy sent back to the utility.
- Net Zero:** Energy credit balances energy consumed.
- "PACE":** Property Assessed Clean Energy (Finance).
- Parity:** Energy value balances loan payment.
- "PPA":** Power Purchase Agreement.
- "REP":** Retail Electric Provider.
- Zero Energy Home:** Energy value produced = value consumed.

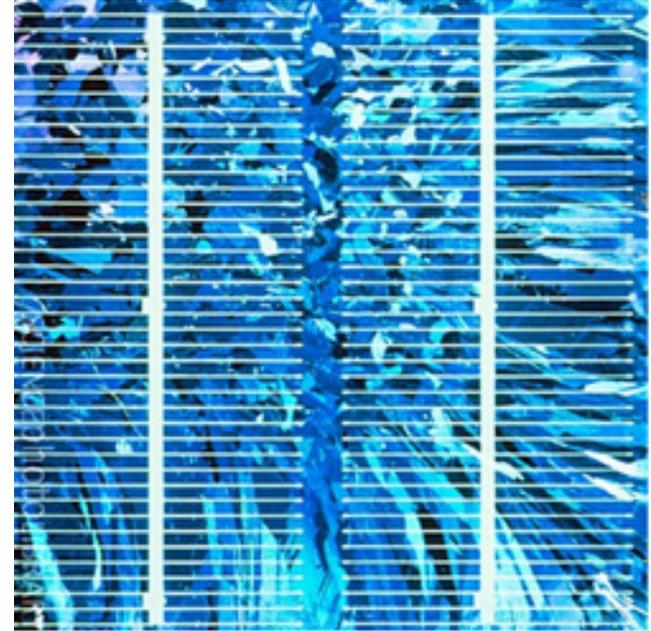
Definitions: "Solar Cell", "PV Module", "PV Array"



Most solar cells are black to various shades of blue...



Monocrystalline Cell



Polycrystalline Cell

Both are crystalline silicon. Manufacturing methods differ.

Some "thin film" types are reddish-brown or gray.



Amorphous Silicon



Cadmium Telluride



**Copper Indium
Gallium Selenide**

This technology on homes is commonly installed as "solar shingles".

Solar PV for Real Estate Professionals

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Basic Overview - Solar Electricity Works Like This...

Photovoltaic modules convert sunlight into electricity.



"Inverter" - changes solar "DC" into household "AC".

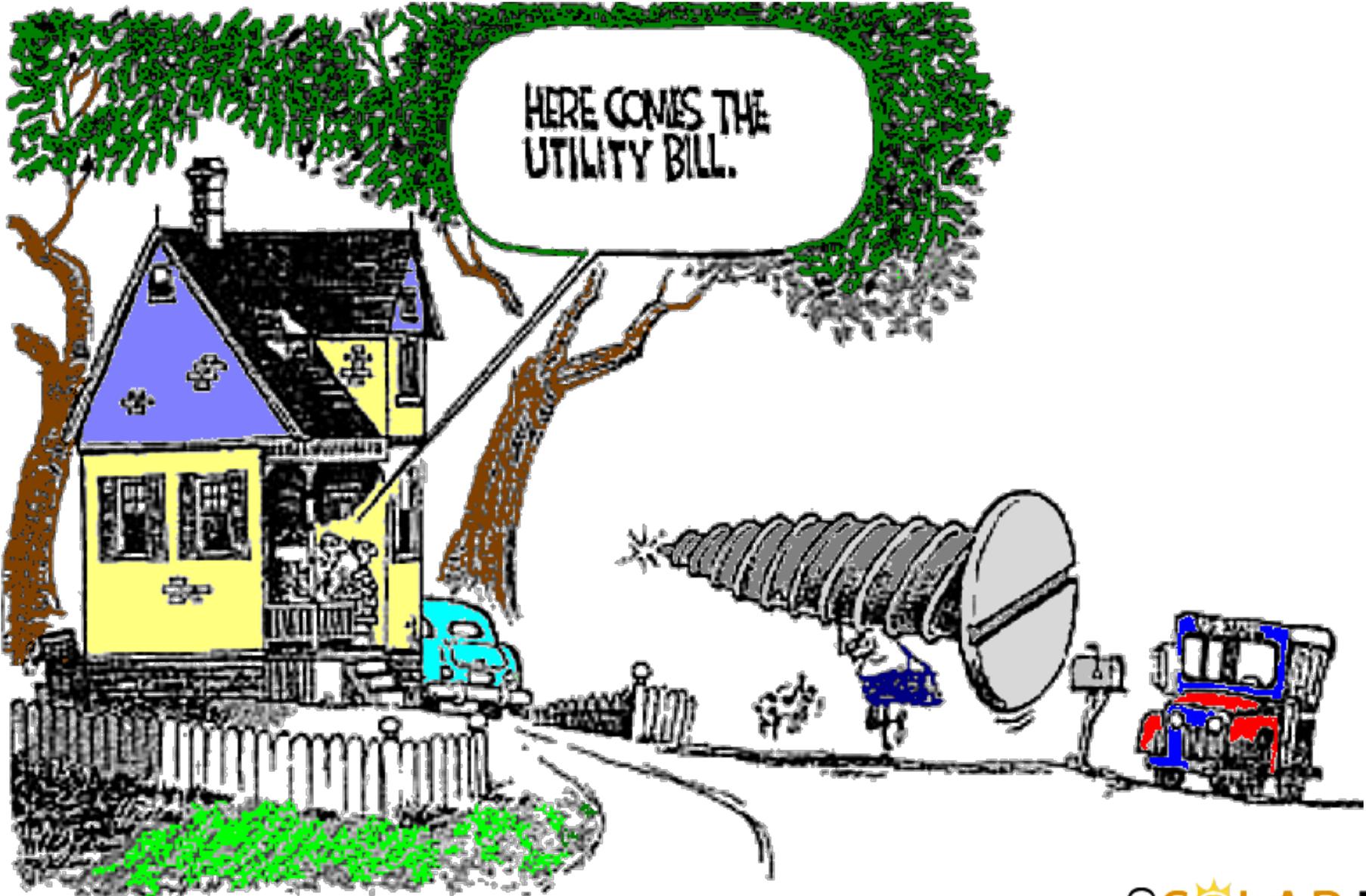
Utility meter: Measures energy consumed, and all excess energy fed back to the utility grid.

The solar electricity serves the building loads **first**. Any excess is fed out to the utility grid to the neighbors, and may accrue credit to the owner.

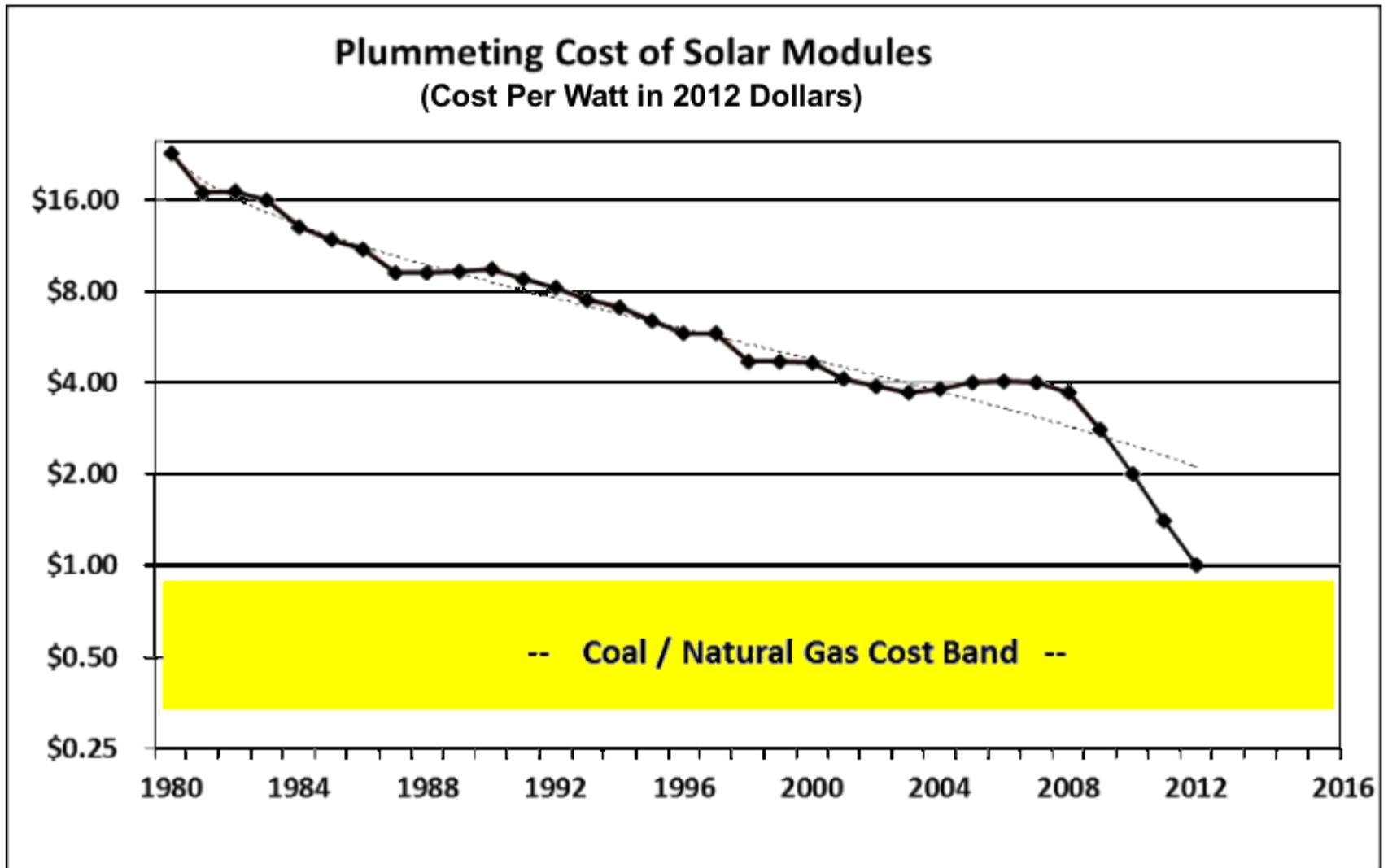
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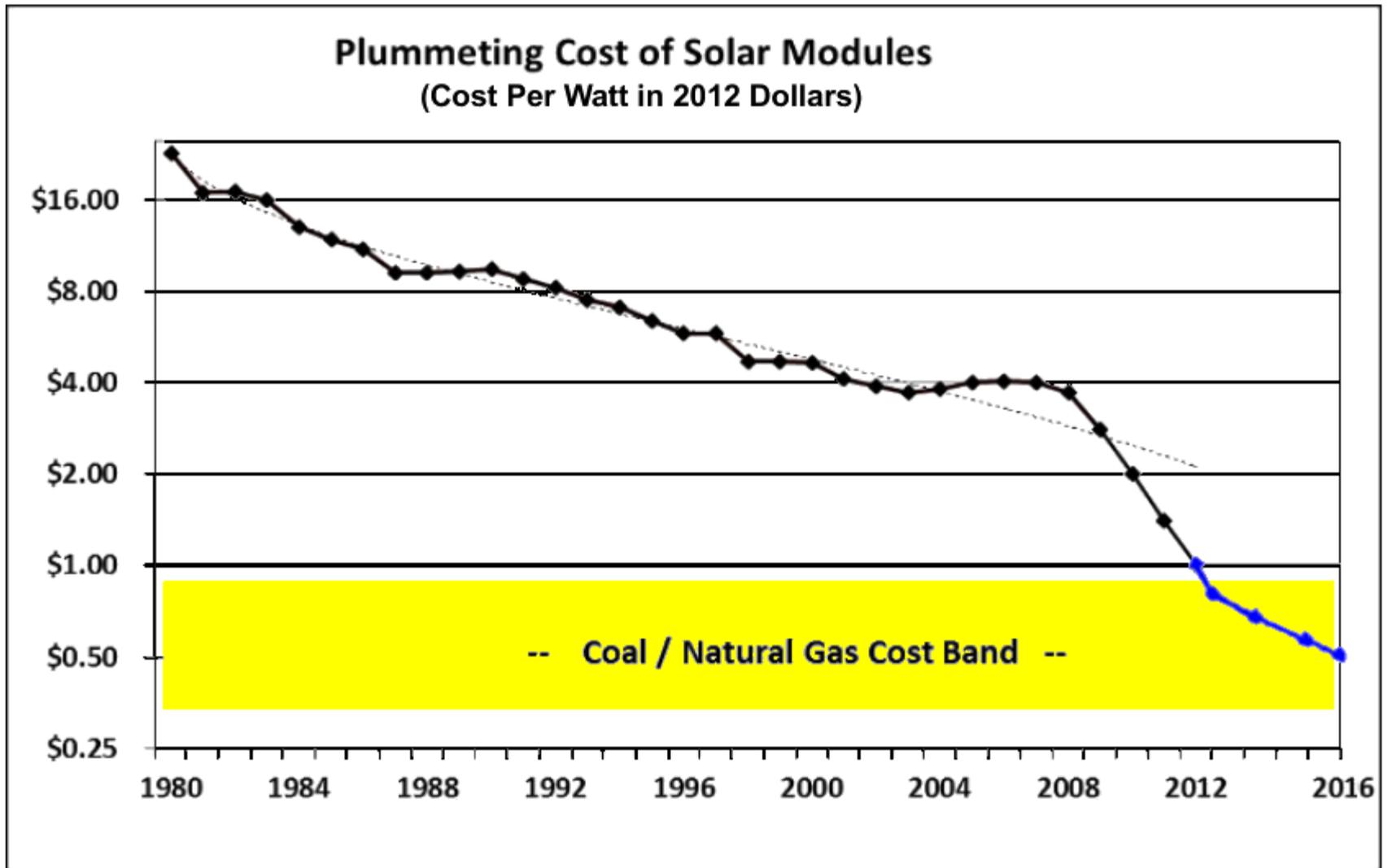
The Economics of Solar Energy...



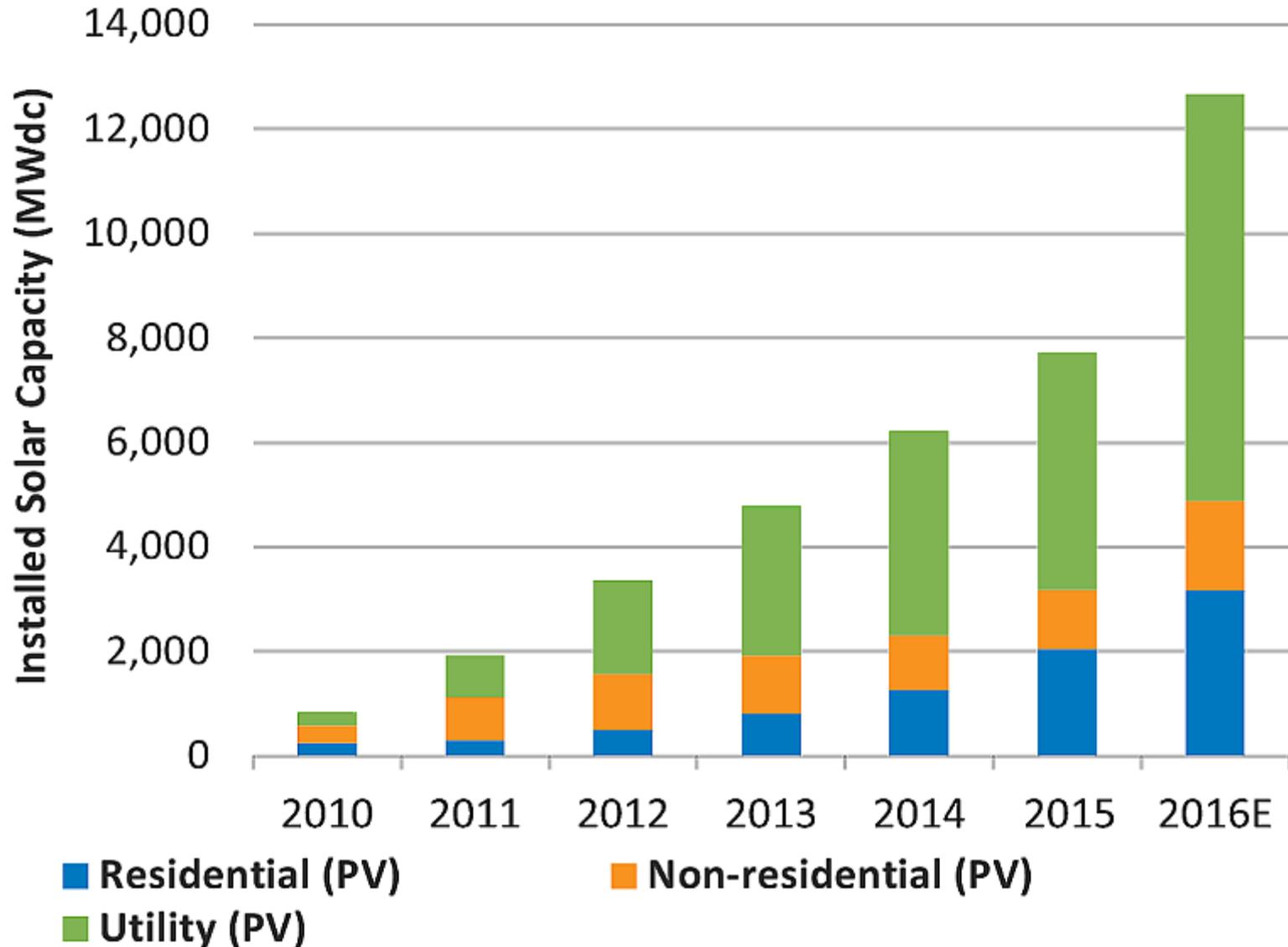
The Economics of Solar Energy ... The Sudden Popularity



The Economics of Solar Energy ... The Sudden Popularity



The Economics of Solar Energy ... Yearly US Installations



The Economics of Solar Energy ... Yearly US Installations

- ★ Solar electricity provided 40% of all new electricity supply that went on line in the first six months of 2015.
- ★ As of Q3, 2015, over 22,700 megawatts of solar capacity is operating in the USA. This is enough to power more than 4.6 million homes.
- ★ Approximately 20,000 megawatts of solar electricity is forecast to be installed in 2015-2016, doubling America's existing solar capacity in just two years.

The Economics of Solar Energy ... The Sudden Popularity

MReport [THE PULSE OF THE MORTGAGE BANKING INDUSTRY]

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Home >> Daily Dose >> Survey: More Homebuyers Want Energy-Efficient Homes

Print This Post

Survey: More Homebuyers Want Energy-Efficient Homes

Author: Samantha Guzman in Daily Dose, Data, Headlines April 1, 2015 0

Energy-efficient homes are increasingly becoming the most sought after feature for homebuyers, according to the [National Association of Home Builders](#) (NAHB). A survey of home buyers showed that efficiency is one of the most-wanted features and now builders are responding to the demand, with more new homes in April being built as energy-efficient.

"Our builder members are telling us that more and more buyers are looking at new homes for their efficiency in design and functionality," said NAHB chairman Tom Woods, a home builder from Blue Springs, Mo. "Whether it's improved insulation or sustainable building materials, today's new homes can reach higher energy performance and greater durability than was possible even 20 years



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MT BANK CORP Another Bank Settles False Claims Act Allegations

May 13, 2016
Author: Xhevrije West

TRID Title Companies Navigate Murky TRID Waters

May 13, 2016
Author: Xhevrije West

FANNIE MAE Center-Right Coalition Urges GSE Reform

May 13, 2016
Author: Brian Honea

At what point do you think the U.S. homeownership rate will 'bottom out' in the current cycle?

- 64.4%: It's as low now as it's going to get
- 64%: There's still a short way to go, but not much lower
- 62-63.9%: There's some space between here and the bottom
- Lower than 62%: It's only just begun to fall



The Economics of Solar Energy ... The Sudden Popularity

Solar Energy > Solar News > Uncategorized > The Market for Green Homes Continues to Improve

Posted on Tuesday February 11, 2014 by Scott Thill

1 (866) 485-2757

THE MARKET FOR GREEN HOMES CONTINUES TO IMPROVE



Green homes are a no-brainer, whether you're talking the cooling construction industry or our warming planet. A recent study from McGraw-Hill, co-produced and released by the National Association of Home Builders, reported green homes could grow from an unimpressive 23 percent to a competent third of the overall residential construction market by

2016. That's a value jump from \$36 billion to over \$100 billion, and it couldn't have happened without the Great Recession.

The Economics of Solar Energy ... The Sudden Popularity



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NEWS CENTER

Price of Solar Energy in the United States Has Fallen to 5¢/kWh on Average

Berkeley Lab study reveals 70% decline in PPA prices since 2009

News Release [Jon Weiner](#) 510-486-4014 • **SEPTEMBER 30, 2015**

Solar energy pricing is at an all-time low, according to a new report released by Lawrence Berkeley National Laboratory (Berkeley Lab). Driven by lower installed costs, improved project performance, and a race to build projects ahead of a reduction in a key federal incentive, utility-scale solar project developers have been negotiating power sales agreements with utilities at prices averaging just 5¢/kWh. These prices reflect receipt of the 30% federal investment tax credit, which is scheduled to decline to 10% after 2016, and would be higher if not for that incentive. By comparison, average wholesale electricity prices across the United States ranged from 3 to 6 cents/kWh in 2014, depending on the region.

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The Economics of Solar Energy ... Buyers Want It.



Results:

- 22,822 sales researched in eight states from 2002-2013.
- 3,951 homes were "solar".
- Solar homes commanded a premium of \$2-\$4 per watt.
- Solar homes sold up to 50% faster than non-solar homes.
- Neighboring property values were not affected.

Researchers included:

Sandra Adomatis, SRA
Adomatis Appraisal Services
Punta Gorda, Florida

Thomas Jackson, Ph.D., AICP, MAI, CRE, FRICS
Real Property Analytics, Inc.
Texas A&M University, College Station, Texas

The Economics of Solar Energy ... Buyers Want It.



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NEWS CENTER

Team of Appraisers Across Six States Find Home Buyers Will Pay Premium for Solar Homes

Results Confirm Earlier Berkeley Lab Large-Scale Study

News Release [Jon Weiner](#) 510-486-4014 • **NOVEMBER 12, 2015**

Photovoltaics added value to homes in six markets, according to a new report titled “Appraising into the Sun: Six-State Solar Home Paired-Sales Analysis,” led by a researcher from the U.S. Department of Energy’s Lawrence Berkeley National Laboratory (Berkeley Lab) and a home appraisal expert. Researchers engaged a team of seven appraisers from across the six states to determine the value that solar photovoltaic (PV) systems added to single-family homes using the industry-standard paired-sales valuation technique, which compares recent sales of comparable homes to estimate the premium buyers would pay for PV.

The Economics of Solar Energy ... Buyers Want It.

National Association of Homebuilders



Solar Does Add to Home Values

Buyers are increasingly willing to pay a premium for homes with solar energy systems...

February 5, 2015

The Economics of Solar Energy ... Buyers Want It.



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REAL ESTATE

THE TICKER

Realtors: Solar panels boost home values best in energy-rich Texas

Forget fixing up the bathroom

April 1, 2016 Kelsey Ramirez

KEYWORDS ENERGY EFFICIENT REMODELING SOLAR PANEL TEXAS ASSOCIATION OF REALTORS



A study done by The Appraisal Journal shows that homes with solar panels are sold at a premium. The average premium for their study area of six states was \$14,329. (\$4 per installed watt of solar panels.)

The Economics of Solar Energy ... Communities Want It.

An Option: "Community Solar"

Question: What is "Community Solar"?

Community Solar is a solar facility built as a stand-alone system, where people or business can invest in, or purchase "shares", and be credited on their own utility bills for the solar energy generated. Also called "shared solar".

- ☀ Many homes and buildings are not suited for solar PV due to shade, structure (strength), and building ownership issues.
- ☀ According to the US Department of Energy, National Renewable Energy Laboratory, only 22-27% of residential roofs are a good fit for solar PV.^[1]
- ☀ With Community Solar, everyone has the opportunity to "go solar".
- ☀ Shared solar can be both community- or third-party-owned. The finances can be structured in several ways. In most cases, owners subscribe to shared solar and receive energy bill credits accordingly, in proportion to their percentage of ownership.
- ☀ Community solar in Texas is growing rapidly, spurred by utility companies....

The Economics of Solar Energy ... Communities Want It.

An Option: "Community Solar"

Question: What is "Community Solar"?

Growth: 59% compound annual growth in Texas between 2014 and 2020, per GreenTech Marketing data.

Texas "Community Solar" Facilities:

- ★ CoServ Solar Station, Krugerville, Texas
(NE of Denton, Texas)
- ★ Nueces Electric Cooperative, Corpus Christie
- ★ CPS Energy customers (residential & commercial), San Antonio.
- ★ Austin Energy, Austin
Austin Energy has a goal of drawing 55% of its energy from renewable sources by 2025.
The company is at 28.5% as of August, 2015.
- ★ Pedernales Electric Community Solar Project. Fifteen 1 megawatt sites.
PEC is one of the largest electric cooperatives in the USA with around 200,000 members, serving the Hill Country area in Texas west of Austin and San Antonio.
- ★ ... with more on the way...



CoServ Community Solar, Krugerville, Texas (NE of Denton)

Image Credit: CoServe



Join Us!

Summer Solar Webinar Series

Community Solar in Texas, 11:30 a.m., Friday, July 8

This webinar will focus on providing information to electric utility cooperatives and municipal-owned utilities who may be interested in exploring opportunities for community solar programs. Presentations will discuss ownership structures, financing options, and marketing & outreach needs.

Putting Underutilized Land to Work, 11:30 a.m., Wednesday, July 27

This webinar will focus on providing information to local governments including school districts, special districts, and business/industry sectors interested in going solar. Presentations will include topics such as solar applications on landfills, brownfields, wastewater treatment plants, and other facilities where Solar PV can be put to work for energy savings.

Visit [GoSolarTexas.org](https://www.GoSolarTexas.org) for webinar details

The Economics of Solar Energy ... "PACE"

Question: What is “PACE”, and how does it work?

PACE = “Property Assessed Clean Energy”

- ☀️ A program for financing energy efficiency and renewable energy improvements on private property. PACE programs allow local governments, state governments, or other jurisdictional authorities to fund up-front costs of energy improvements on commercial properties, which are paid back over time by the property owners through the property tax.
- ☀️ Lenders often grant more favorable interest rates because a PACE loan is seen as low-risk.
- ☀️ Buyers of the building inherit the benefits of the solar energy system, and continue to pay on the balance. When the loan is paid, taxes decrease to pre-loan levels.
- ☀️ A limited number of Texas tax districts participate in PACE as of June, 2016, but the number is growing.

The Economics of Solar Energy ... "PACE"

Question: What is "PACE", and how does it work?

- ☀ PACE pays up to 100% of a project's costs and is repaid for up to 20 years with an assessment added to the property's tax bill.
- ☀ PACE financing stays with the building upon sale and is easy to share with tenants.
- ☀ Commercial PACE programs aren't under scrutiny from mortgage lenders and regulators; the only consents needed for commercial PACE projects to move forward are the consent of an existing mortgage lender and PACE administrator.

The Economics of Solar Energy ... "PACE"

Question: What benefits are derived through PACE?

Businesses often face capital budgets constraints that force business owners to choose between capital improvements. Using PACE financing enables business to take advantage of fixed rates and longer terms that allow capital costs to be annually and significantly reduced by savings associated with energy efficiency, renewables and other energy improvements. In addition, PACE financing is an off-balance-sheet transaction that maintains your company's cash position while allowing capital projects to be advanced immediately. Assessments may be paid off early without penalty.

The Economics of Solar Energy ... "PACE"

Question: Where in Texas is PACE financing available, and who is eligible?

- ☀ In Texas, PACE financing is available for owners of commercial, industrial, and multi-family dwellings, agricultural operations, and nonprofit organizations.
- ☀ PACE is presently active in Travis County, Willacy County, Cameron County, Williamson County, and most recently .. the City of Dallas.

The Economics of Solar Energy ... "PACE"

Example: Comparing PACE to a cash payment and a conventional loan:

Financing Scenario Comparison Summary			
	Self-Funded	Conventional Loan	PACE
Out-of-Pocket Investment	(\$2,500,000)	(\$500,000)	\$0
Savings (First Year)	\$473,000	\$473,000	\$473,000
Annual Payment	\$0	(\$561,568)	(\$217,961)
Cash Flow Impact Year 1	(\$2,027,000)	(\$588,568)	\$255,039
Net Project Cash Flow Year 2	(\$1,554,000)	(\$677,136)	\$510,077
Years to Positive Project Cashflow	5.3	7.0	IMMEDIATE
Debt Service Over Finance Term	0	(2,807,839)	(4,359,228)
10-Year Project NPV	\$673,869	\$431,691	\$1,711,330
20-Year NPV	\$2,143,984	\$1,901,806	\$2,504,007

Let's do the math to see how this works...

The Economics of Solar Energy ... "PACE"

Example comparing PACE to a cash payment, and conventional loan:

- ★ \$2.5 million would purchase a PV system rated approximately 910 kilowatts. (Using \$2.80 per watt as the "installed" cost per watt. This is very typical today.)
- ★ Such a system would generate an average of 4,800 kilowatt-hours per day in Texas, with a value of \$580 per day (based on \$0.12 per kW-h "real" cost).
- ★ This amount of energy is valued at \$17,400 per month.
- ★ The Federal Tax Credit of 30% on this system would be \$775,000.
- ★ Net out-of-pocket cost on this system: $\$2,500,000 - \$775,000 = \$1,775,000$
- ★ Financed for 10 years at 3.5% per year, the monthly payment would be \$17,300.
- ★ Average annual utility rate increase is 2.38% based on the past 30 year history.
- ★ From day one .. this system is break-even to cash-flow-positive, and it only gets better with time as utility rates increase.

.. so let's look at the chart again ...

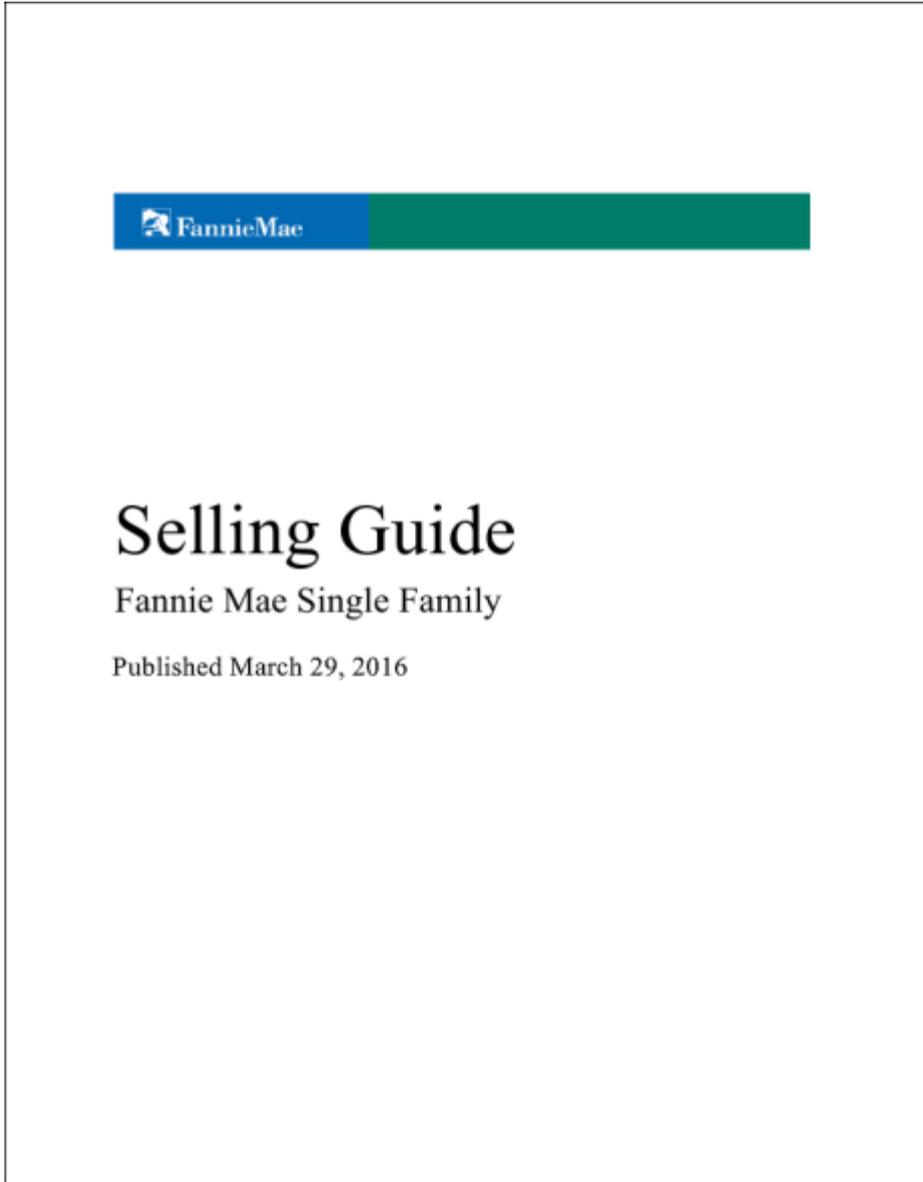
The Economics of Solar Energy ... "PACE"

Example comparing PACE to cash payment, and a conventional loan:

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All three are viable. Best ROI is through PACE.

The Economics of Solar Energy - Fannie Mae Will Finance It.



Fannie Mae will purchase or securitize a mortgage loan on a property with solar panels.

If the property owner is the owner of the solar panels ... standard eligibility requirements apply (for example, appraisal, insurance, and title).

If the solar panels are leased ... the solar panels may not be included in the appraised value of the property.

The Economics of Solar Energy - Fannie Mae Will Finance It.

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Fannie Mae Offers Cheaper Option to Fund Solar, Efficiency



Solar and energy efficiency may have just gotten even cheaper.

by Katherine Tweed

June 03, 2016

Tying home energy-efficiency upgrades to property tax bills has become incredibly popular in just the past few years, at least in California.

Property-assessed clean energy (PACE) programs for houses have morphed into a \$2 billion industry nearly overnight. Now, Fannie Mae is offering a new program that could bring another flavor of property-tied energy improvements to the wider U.S. market.



Google's Project Sunroof Expands to 42 States and Millions More Rooftops

The Economics of Solar Energy - Fannie Mae Will Finance It.

- ☀️ Fannie Mae's "HomeStyle Energy Program" is a mortgage option that allows borrowers to finance clean energy upgrades equal to up to 15 percent of the as-completed appraised value of the home.
- ☀️ Solar PV is also an option along with energy and water-efficiency retrofits.
- ☀️ It is available for single-family homes and multifamily homes of up to four units.
- ☀️ HomeStyle Energy is different than PACE. PACE is an assessment tied to the property's tax bill.
- ☀️ HomeStyle can be added at the time of getting a mortgage or refinancing. HomeStyle Energy can be used for new projects or to take higher-interest unsecured loans or PACE loans and refinance them or roll them into a potentially lower-cost mortgage.

The Economics of Solar Energy - Fannie Mae Will Finance It.

- ☀ Upgrades must be completed within 180 days after the mortgage note is issued.
- ☀ Improvements also have to come with an energy report, whether a Home Energy Score Report or a Home Energy Rating Systems report, and must specify the monthly savings to the borrower.
- ☀ HomeStyle Energy is different than PACE. PACE is an assessment tied to the property's tax bill.
- ☀ HomeStyle Energy changes the nature of the PACE financing for those who use it to refinance PACE loans.
- ☀ It would turn a property-tax-based obligation into a loan that would have to be paid off if the property is sold.

The Economics of Solar Energy - FHA Will Finance It.



FHA HANDBOOK 4000.1 SINGLE FAMILY HOUSING POLICY HANDBOOK

Issued: March 14, 2016

Effective: Multiple

For specific questions, contact the FHA Resource Center:
1-800-CALL-FHA or (1-800-225-5342)

An online publication of the
U.S. Department of HUD
www.hud.gov/groups/appraisers.cfm

451 7th St., S.W. • Washington, DC 20410
Ph: (202) 708-1112 • TTY: (202) 708-1455

A mortgagee may add the cost of a solar energy system to the mortgage up to 20% above the maximum insurable mortgage limit.

Costs for new solar systems may be added to an FHA-insured base mortgage for the following Sections of the Act and transaction types:

- Section 203(b)
- Purchase Transaction
- Rate and Term Refinances and Simple Refinance

A Property that contains or operates with a leased energy system or Power Purchase Agreement may be eligible for FHA-insured financing only when such agreements are free of restrictions that prevent the Borrower from freely transferring the Property.

The Economics of Solar Energy... Increased Valuation

Colorado Energy Office Study - Sales of Solar Homes

As of January 2013, a value indication using the Paired Sales Analysis is:

\$1,070 to \$1,780 (rounded) per kW

for a 2.8 kW, 5-year old system with 20 years remaining of useful life.

As of January 2013 the value indication using the Cost Approach is:

\$1,780 per kW

for a 2.8 kW, 5-year old system with 20 years remaining of useful life.

As of January, 2013, the value indicated using the income approach is:

\$2,280 to \$2,300 (rounded) per kW

for a 2.8 kW, 5-year old system with 20 years remaining of useful life.

As of January 2013, the final value conclusion is:

\$1,800 per kW

for a 2.8 kW, 5-year old system with 20 years remaining of useful life and with a location in Broomfield, Co, Subdivision "A."

The marketing time was 27 days: 9 days faster than the subdivision average of 36 days.

The Economics of Solar Energy... Increased Valuation

Colorado Energy Office Study - Sales of Solar Homes

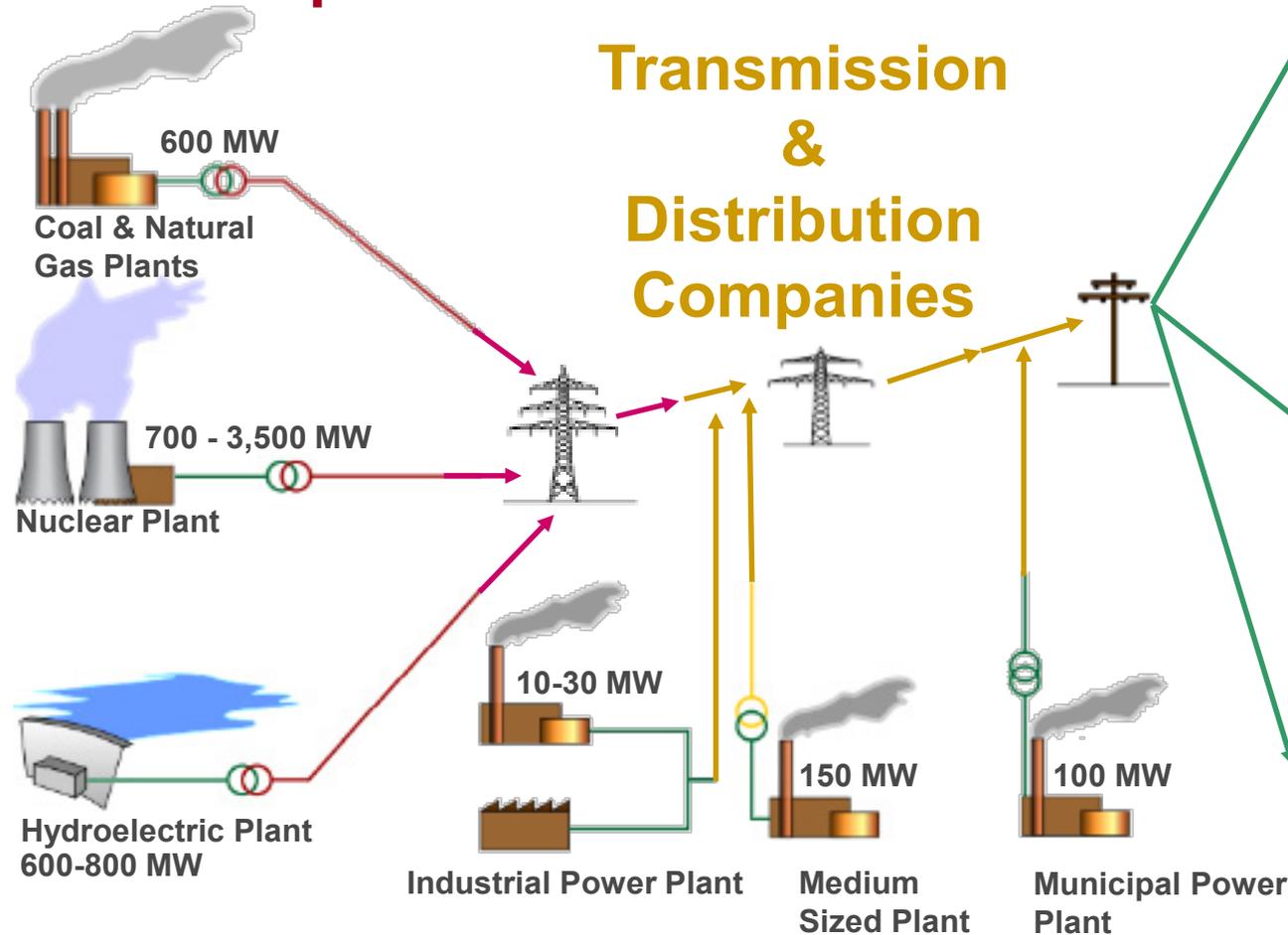
CITY	YEAR of SALE	LEASED or OWNED	REAL ESTATE AGENT COMMENTS
Englewood	2009	Owned	Good marketing (showing utility bills and giving a depreciation table) was key. Value contribution was around \$7,000. Buyer specifically wanted a "Green" house. PV was key to sale, as the market was dead at the time.
Longmont	2010	Unknown	No feedback on PV system. Sold very quickly. PV had little or no impact on value.
Denver	2011	Owned	2.8kW. Took longer to sell because potential buyers had to be educated on the system. Buyers liked the system after they learned about it. At the time, there were not enough sales of PV systems and buyers did not understand them.
Arvada	2012	Owned	Had to be proactive as a Realtor for value to be realized. Buyers loved saving energy. All potential buyers liked it. Added \$20,000 to \$25,000. Buyers see a lot of value when systems are owned, not leased.
Arvada	2012	Leased	Lease did cause a negative issue in negotiation of the sale. The system was brand new.
Nederland	2012	Owned	PV helped the seller sell the home. Buyer had a large focus on solar. Had one of the better rebate contracts with Xcel Energy.
Arvada	2013	Leased	The lease was a bad issue. Seller had to pre-pay (or buy out the lease). Lending company required lots of extra documentation. Was a negative.
Black Hawk	2013	Owned	Seller believes he got \$18,000 back. Realtor actively marketed and educated buyers on system. Every potential buyer was "impressed" with the system. Sold much quicker than other homes.
Erie	2013	Owned	Biggest interest for the buyers was the PV system and the neighborhood. Utility bills were \$5 per month. Added \$15,000 to \$20,000 to value.
Lafayette	2013	Owned	4.8kW. PV was a plus. Had multiple offers and bidding war. Sold very fast. If systems are leased, they are not viewed favorably. Buyers loved that the system came with the house.
Platteville	2013	Unknown	A system where the lease is paid off makes a huge difference. Added value to the property. PV was a huge plus for this buyer.

Total 39 Agent Comments. 22 Positive. 7 Neutral. 10 Negative (all 10 were leases).

The Economics of Solar Energy...

Where does electricity come from?

Electricity Generation Companies



Retail Electric Providers



The Economics of Solar Energy...

Why Is Distance Significant?

For every watt we consume, the power company must generate two to three watts!



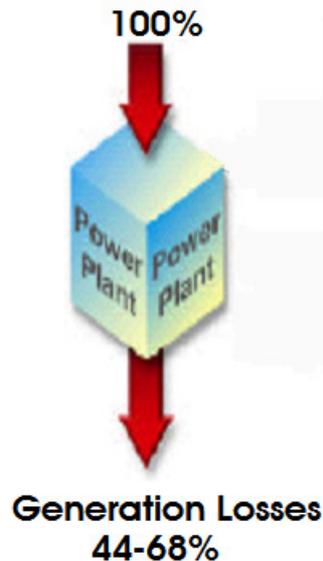
Here's why.

Let's say this represents a power generating plant.

Of the energy used to generate the electricity - most of which is either coal or natural gas ...

The Economics of Solar Energy...

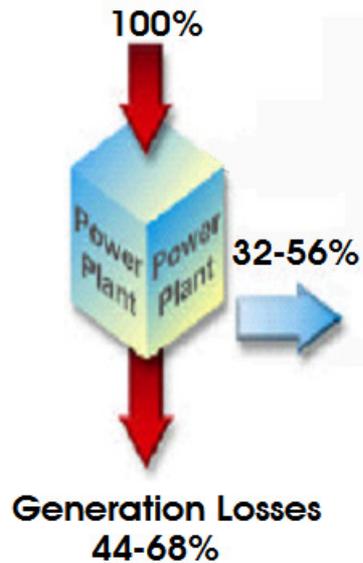
Why Is Distance Significant?



...between half and two-thirds of this energy is lost as heat and other waste products in the power plant itself.

The Economics of Solar Energy...

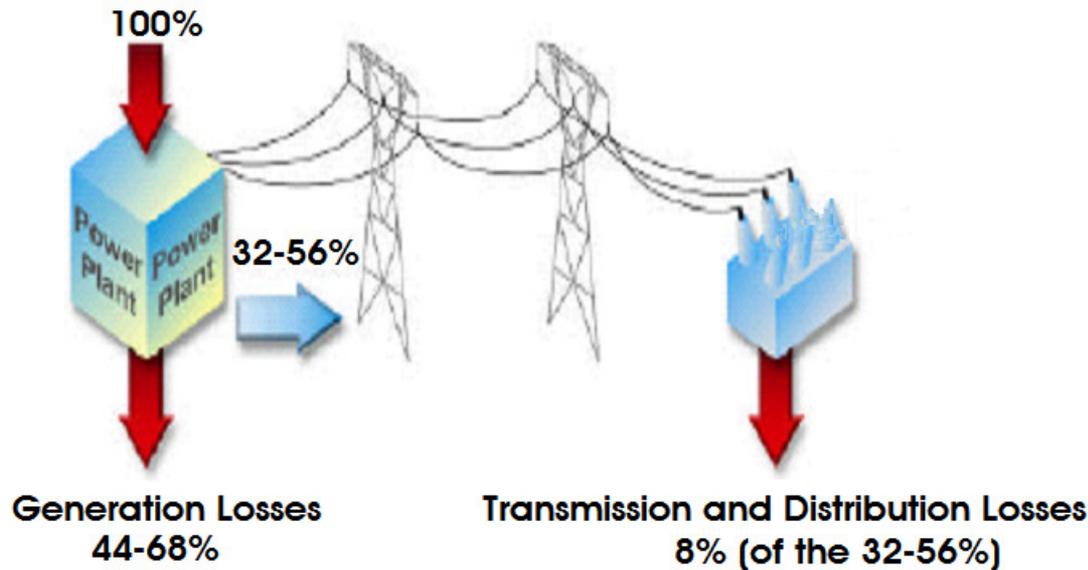
Why Is Distance Significant?



...leaving 1/3 to 1/2 of the initial energy.

The Economics of Solar Energy...

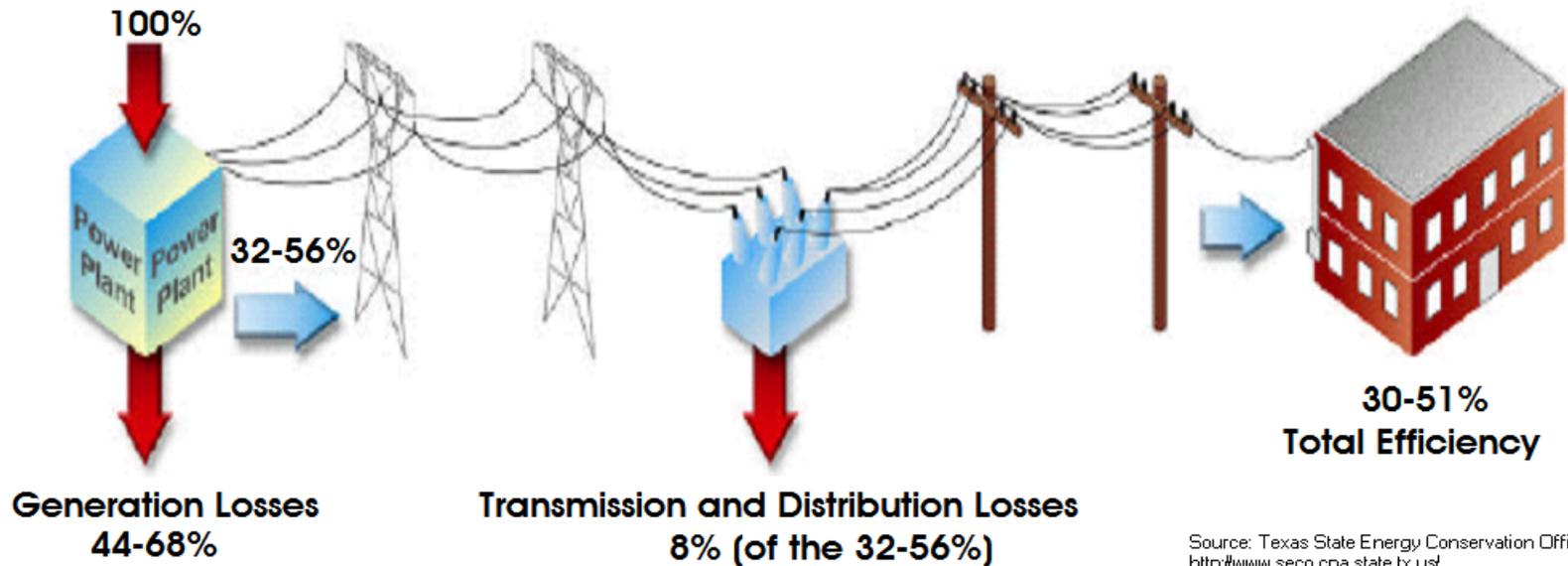
Why Is Distance Significant?



High-voltage power lines and big transformers lose another 8%.

The Economics of Solar Energy...

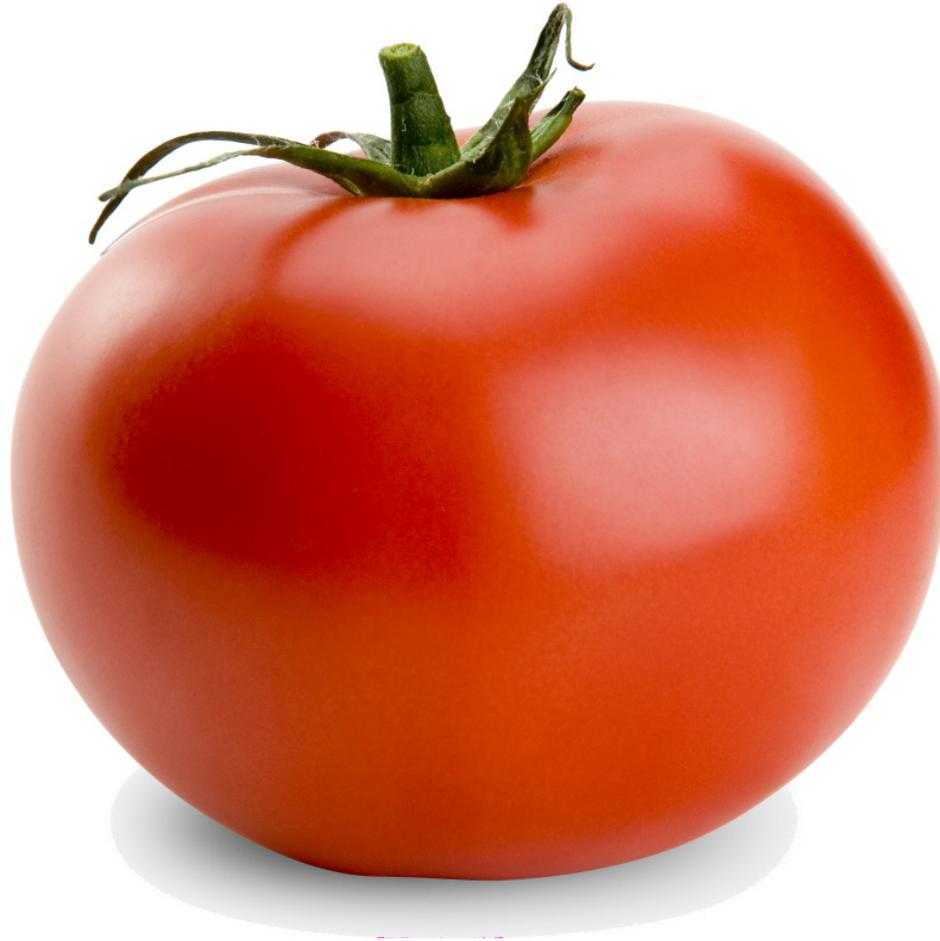
Why Is Distance Significant?



**By the time the electricity gets to the consumer ...
50-70% of the original energy to generate it is wasted.**

The Economics of Solar Energy...

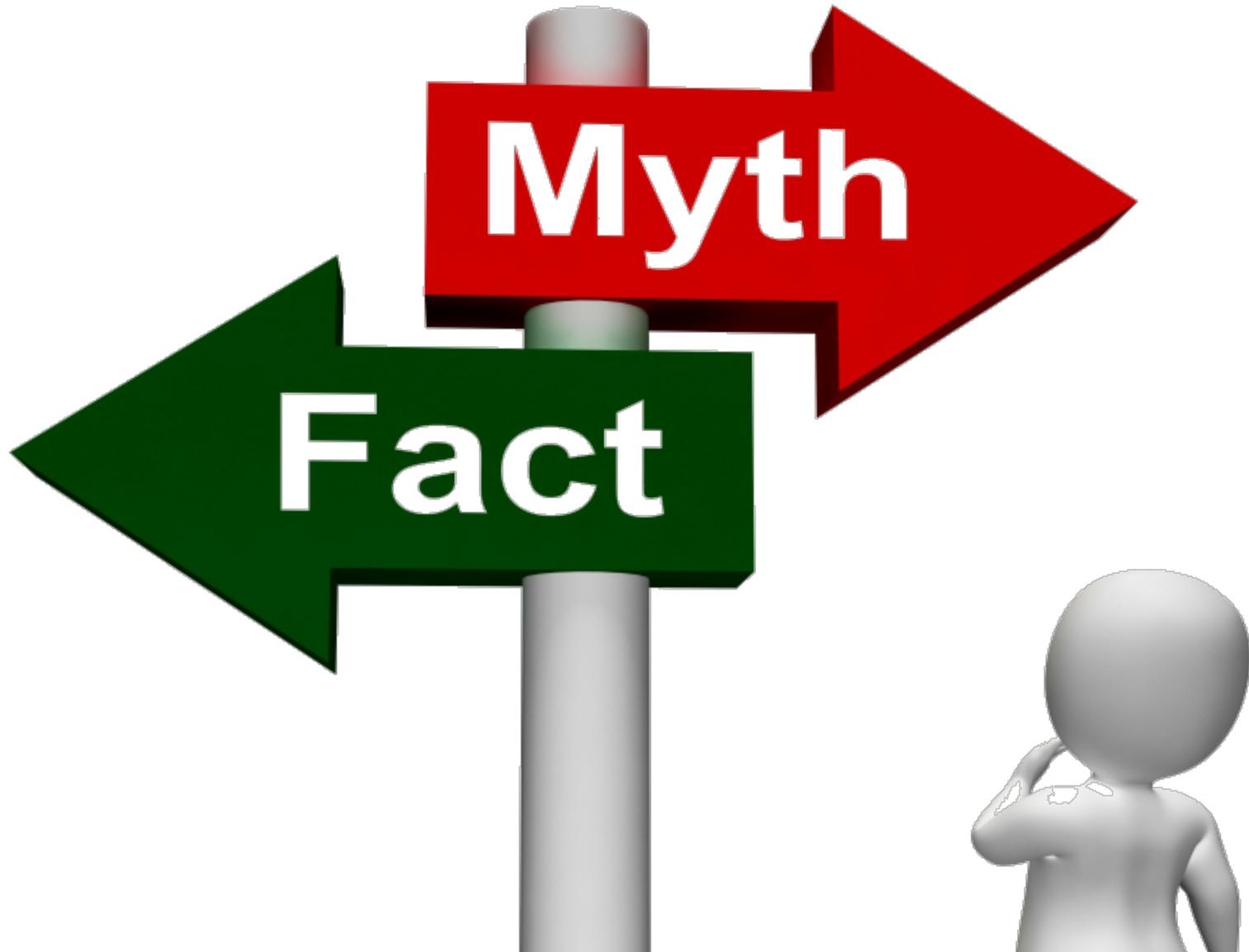
Why Is Distance Significant?



Solar PV for Real Estate Professionals

- ★ Brief History & Overview of Solar Energy with Definitions
- ★ Fundamentals of Solar and How It Operates
- ★ The Economics of Solar Energy
- ★ **Myths & Misconceptions about Solar Energy**
- ★ Answers to Questions from Buyers, Sellers, and RE Professionals
- ★ Methods for Selling Solar Homes & the Benefit of Solar on Home Value
- ★ Analytics for Valuation - How a Solar-Equipped Property is Assessed
- ★ Open Q & A

Common Myths and Misconceptions



The Top Four Solar Myths:

1. Solar panels require more energy to manufacture than they'll produce in their lifetime.

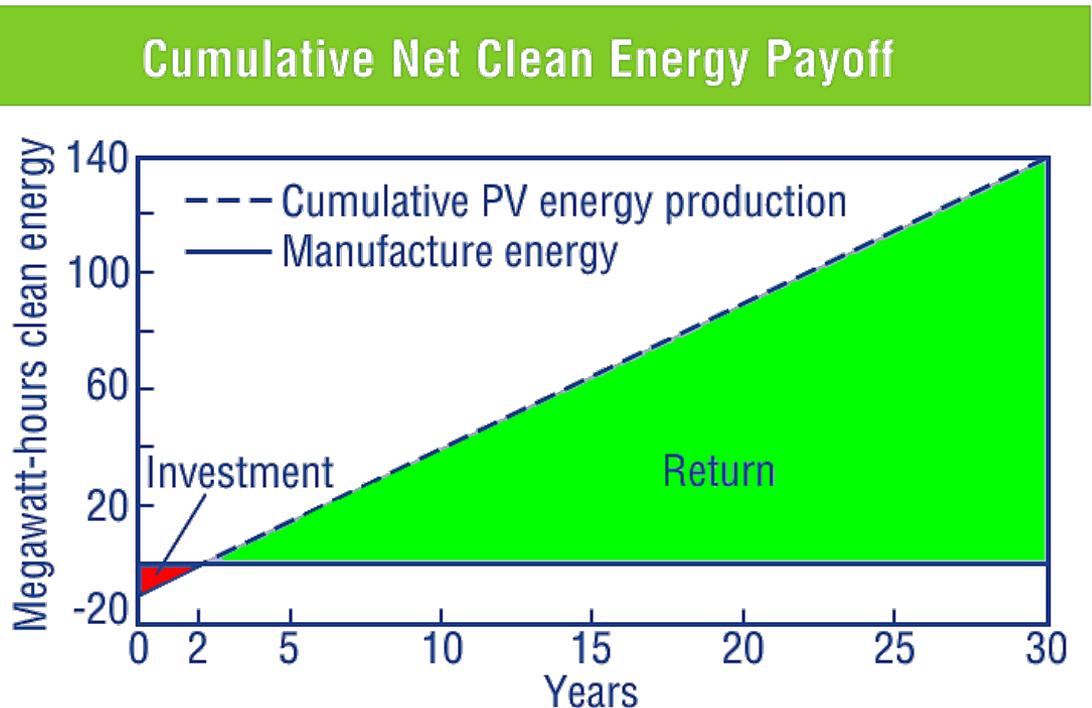


The Top Four Solar Myths:

1. Solar panels require more energy to manufacture than they'll produce in their lifetime.

False.

Analysis conducted by the United States Department of Energy National Renewable Energy Laboratory shows PV systems can "repay" their energy investment in about 2 years.



In other words .. a solar panel will generate as much energy in two years as it took to manufacture it. This includes the aluminum frame.

The Top Four Solar Myths:

1. Solar panels require more energy to manufacture than they'll produce in their lifetime.
2. Solar manufacturing results in more pollution than is saved by solar usage.
3. Solar energy is too expensive.
4. Solar equipment is ugly.

Take a close look – is this the profile of a young lady, or the face of an older woman?

They're both here, but some of you see one woman, some see the other.

Solar energy is the same...



Six More Common Myths and Misconceptions

5. Solar panels are heavy.
6. Solar panels work better in hot weather.
7. Solar panels require maintenance.
8. Solar energy is highly subsidized.

The Economics of Solar Energy ... Subsidies 1950-2010

Summary of Federal Energy Incentives, 1950–2010

(Billions of 2010 Dollars¹)

TYPE OF INCENTIVE	ENERGY SOURCE							SUMMARY	
	Oil	Natural Gas	Coal	Hydro	Nuclear	Renewables	Geothermal	Total	Share
Tax Policy	194	106	35	13	-	44	2	394	47%
Regulation	125	4	8	5	16	-	-	158	19%
R&D	8	7	36	2	74	24	4	153	18%
Market Activity	6	2	3	66	-	2	2	80	10%
Gov't Services	34	2	16	2	2	2	-	57	7%
Disbursements	1	-	7	2	-18	2	-	-6	-1%
Total	369	121	104	90	73	74	7	837	
Share	44%	14%	12%	11%	9%	9%	1%		100%

Conventional energy sources received \$757 billion (2010 dollars) collectively, or 90% of ALL energy subsidies from 1950 to 2010.

Source: Management Information Services, Inc., Energy Subsidies Report: "60 Years of Energy Incentives - An Analysis of Federal Expenditures for Energy Development" Prepared for The Nuclear Energy Institute, Washington, D.C., October 2011
 MISI is an internationally recognized, Washington, D.C. - based economic research firm.

Six More Common Myths and Misconceptions

5. Solar panels are heavy.
6. Solar panels work better in hot weather.
7. Solar panels require maintenance.
8. Solar energy is highly subsidized.
9. If we have solar panels on our house, we'll have electricity when the lights go out.
10. Everything will wear out in 10 years (or less) and will require replacement.

NONE of these myths are true!

More Myths - Homebuilders Don't Like "Solar"...

Homebuilders Offering Solar as a Standard Feature:

At least 6 of 10 largest U.S. homebuilders - led by KB Homes - include photovoltaic systems as a standard feature in new construction in 2016. Installing systems during construction is about 20% lower cost than installing them after a house is built.

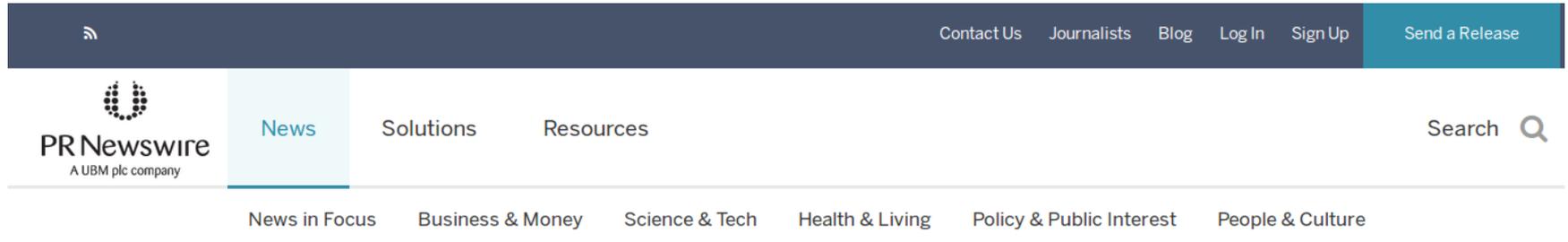
KB Homes is currently developing 22 communities that include solar panels as a standard feature. KB sells solar as an option on homes in Nevada, Texas and Colorado, and Arizona.

A few other developers and homebuilders offering solar as a standard feature are:

- ✦ Braselton Homes
- ✦ Coventry Homes
- ✦ DR Horton, Inc.
- ✦ Lennar Homes
- ✦ Pulte Group, Inc.
- ✦ Standard Pacific Homes
- ✦ Richmond American Homes
- ✦ Meritage Homes (a top 10 national home builder currently in eight states)

More Myths - Homebuilders Don't Like "Solar"...

2014 McGraw Hill Financial Construction Study



Green Home Building Continues to Climb, Valued at \$36 Billion in 2013 and Expected to More than Double by 2016--Says New McGraw Hill Construction Study



QUESTIONS?

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Questions from Buyers, Sellers, and RE Professionals

SELLING / BUYING PROPERTY WITH SOLAR PANELS

Q: Do solar panels add value to a house?
If so, how much value?
How is the value estimated?

A: Just as there are many factors and variables that go into appraising the value of a property, several aspects of a solar energy system establish its nominal value. Some key points are:

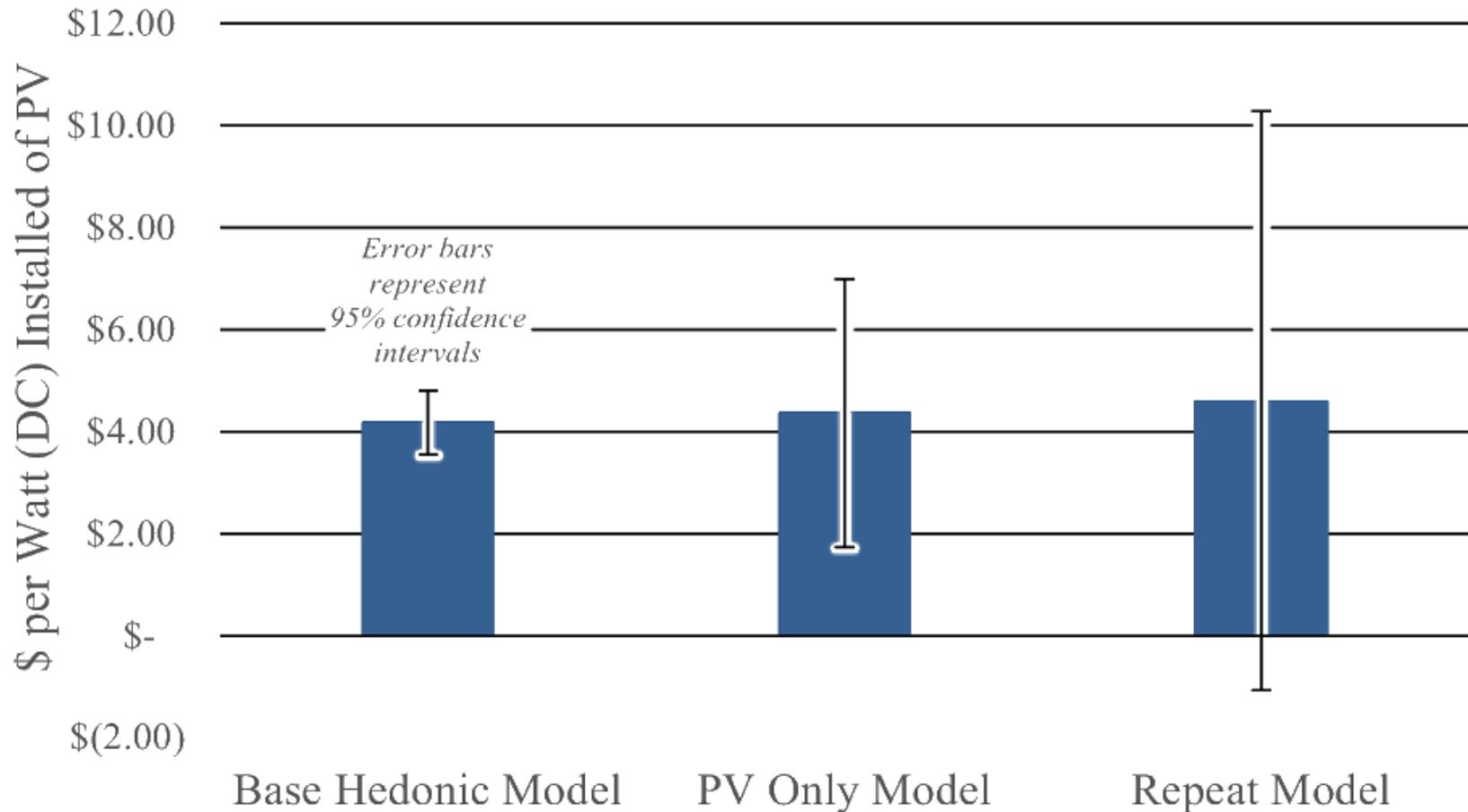
- ★ Cost of electricity in the area.
- ★ Size of the solar energy system (in watts).
- ★ Quantity of energy generated annually.

Surprisingly, age of the system has been shown by the studies not to have value impact one way or the other.

Questions from Buyers, Sellers, and RE Professionals

SELLING / BUYING PROPERTY WITH SOLAR PANELS

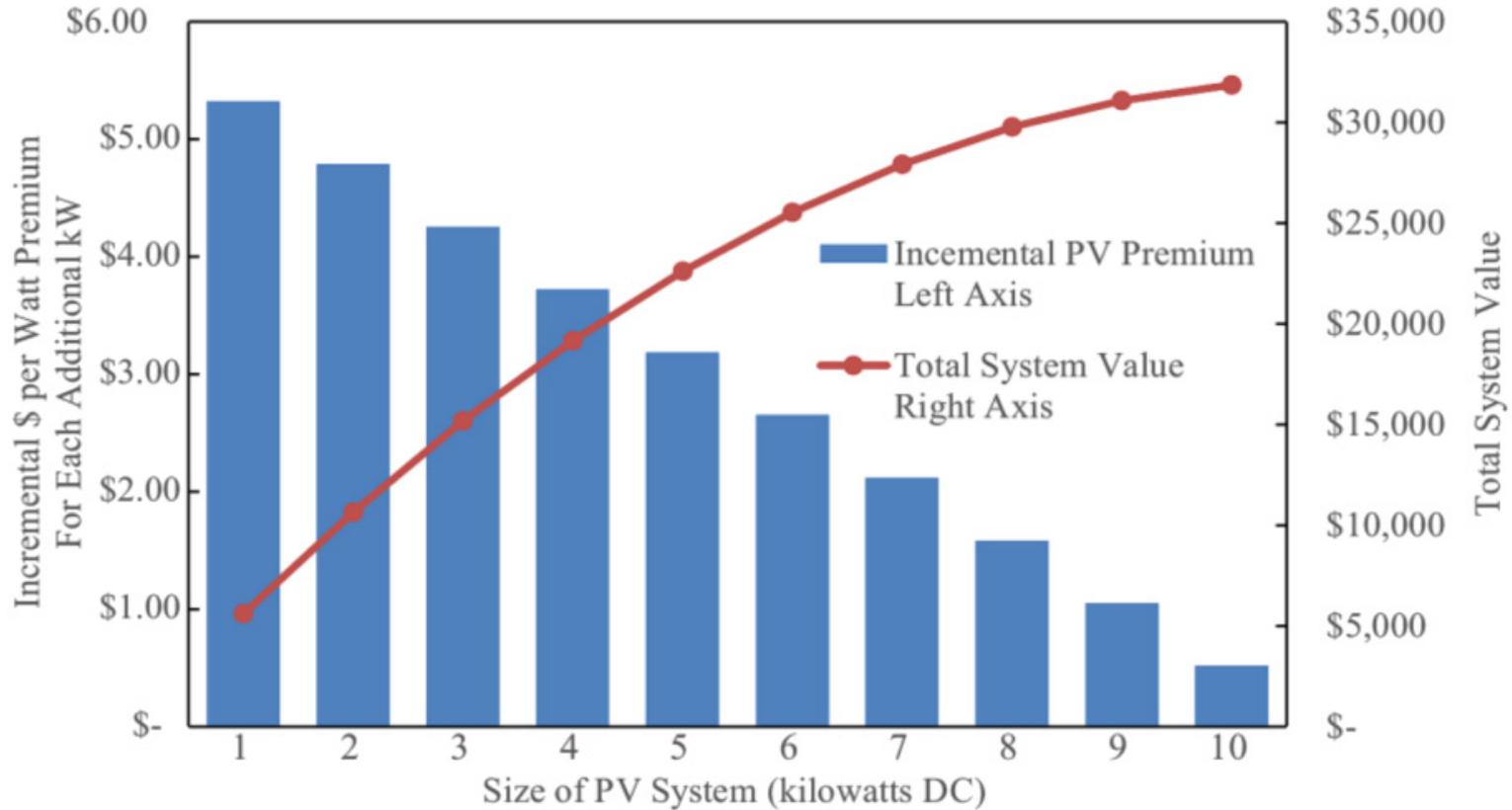
Option #1A: Flat Rate x Size of the system in "watts".



Questions from Buyers, Sellers, and RE Professionals

SELLING / BUYING PROPERTY WITH SOLAR PANELS

Option #1B: Size of the system in "watts" x Incremental \$/W.



Questions from Buyers, Sellers, and RE Professionals

SELLING / BUYING PROPERTY WITH SOLAR PANELS

Q: What materials should seller and seller's agent have in hand to provide to appraiser to properly take into account the value? To provide to buyer to keep for future maintenance, insurance, etc.?

A: Materials and information items are:

1. Ownership type (owned, or leased)?
2. System energy production for the last 12 months.
3. Size of the system in kilowatts (DC).
4. Age of the system.
5. Copy of the original receipts (if available).
6. Name of the installing company.
7. Brand and model of the solar panels and inverter(s).
8. Copy of the interconnection agreement.
9. Appraisal Form 820.04 completed.

Questions from Buyers, Sellers, and RE Professionals

SELLING / BUYING PROPERTY WITH SOLAR PANELS

Q: Are solar panels allowed by most HOAs?

If allowed, does an HOA have a say in how they look, which part of roof they're put on, etc.?

A: Yes .. with conditions.

State law HB362 (passed in 2011) prevents HOAs from restricting solar panels on homes. However, the home owner must follow the requirements of the law, and the HOA does have a voice in where they may be installed as determined by the amount of energy they'll generate in a given location.

The above aside, the HOA cannot simply deny the installation.

Questions from Buyers, Sellers, and RE Professionals

SELLING / BUYING PROPERTY WITH SOLAR PANELS

Q: If the seller is expecting extra money for the panels, “Will it appraise?” .. meaning, will the appraiser add value for panels compared to comps without panels.

A: It depends...

Understand your (and the party’s) right to a competent appraiser. In many markets, you are eligible to specify with the lender that you will only accept an appraiser from the Certified Green Residential Appraiser List. These appraisers have been trained to recognize the value of high-performance home improvements such as solar energy systems.

Ensure the Certified Green Residential Appraiser is knowledgeable about solar panels, and will appraise them properly.

Questions from Buyers, Sellers, and RE Professionals

SELLING / BUYING PROPERTY WITH SOLAR PANELS

Q: How do for-lease panels work? Does the buyer have to allow them to remain on the home?

- ☀ System belongs to a "third party".
- ☀ May be paid on a flat-rate, or by energy produced.
- ☀ Are a long-term debt obligation.
- ☀ Contract terms govern outcome at time of home sale.
- ☀ Studies have shown "leased" are not as advantageous as "owned" panels, and may be a negative in some cases.

Questions from Buyers, Sellers, and RE Professionals

SELLING / BUYING PROPERTY WITH SOLAR PANELS

Q: Does homeowner's insurance cover solar panels?
What happens if solar panels are damaged by hail?

- ☀ Many insurance companies offer coverage.
- ☀ (Check with your insurance company before you install!)
- ☀ Tempered glass will withstand at least 1" hail at 55 mph.
- ☀ If a panel **DOES** get broken, contact your insurance company.

Questions from Buyers, Sellers, and RE Professionals

SELLING / BUYING PROPERTY WITH SOLAR PANELS

Q: Does a regular TREC inspection cover anything about the panels, such as whether they are correctly installed structurally, electrically, and as to leak-proof for the roof?

- ☀️ TREC Standards of Practice do not include solar.
- ☀️ An Inspection report may address code-based issues, or may refer to a particular code, but an inspection is NOT a code-compliance inspection and does NOT verify compliance with manufacturer's installation instructions.
- ☀️ Some safety issues may be addressed in the report, but inspection is NOT a safety/code inspection, and the inspector is NOT required to identify all potential hazards.

Questions from Buyers, Sellers, and RE Professionals

FINANCIAL QUESTIONS

Q: In an existing home, are there other energy-upgrade measures that can/should be considered that are either cheaper than panels and/or save more energy per dollar spent?

A: Yes. Any of the energy-efficiency steps with which you're already familiar may be more appropriate first, such as:

- ☀ Adequate insulation.
- ☀ Seal leaks in HVAC system.
- ☀ Verify HVAC unit is operating properly.
- ☀ Water heater type, age, and temperature setting.
- ☀ Upgrade with Energy-Star appliances.
.. and others.

Questions from Buyers, Sellers, and RE Professionals

FINANCIAL QUESTIONS

Q: What percentage of my total electrical costs will the PV system cover?

Q: How much electricity does a PV system generate?

A: "It depends...". Several variables must be considered to estimate the annual energy produced by a PV system:

1. How much energy do you consume?
2. Where is the system located?
3. How large is the system?
4. What direction does it face?
5. At what angle is it tilted?
6. Are there any shade sources that reduce output?

These .. plus a free on-line program called "PV Watts" will allow you estimate the amount of energy and its approximate value.

Questions from Buyers, Sellers, and RE Professionals

FINANCIAL QUESTIONS

Use "PVWatts" to Estimate System Production and Value

PVWatts® Calculator NREL
NATIONAL RENEWABLE ENERGY LABORATORY

My Location *1900 Ballpark Way, Arlington, Texas* [Release Notice \(?\)](#) [HELP](#) [FEEDBACK](#) [ALL NREL SOLAR TOOLS](#)

RESOURCE DATA **SYSTEM INFO** RESULTS

SYSTEM INFO RESTORE DEFAULTS

Modify the inputs below to run the simulation.

DC System Size (kW):	<input type="text" value="1"/>	i
Module Type:	<input type="text" value="Standard"/>	i
Array Type:	<input type="text" value="Fixed (roof mount)"/>	i
System Losses (%):	<input type="text" value="20.28"/>	i Loss Calculator
Tilt (deg):	<input type="text" value="30"/>	i
Azimuth (deg):	<input type="text" value="180"/>	i

Draw Your System
Click below to customize your system on a map. (optional)

[Go to resource data](#) [Go to PVWatts® results](#)

Click here to enter shade percent.

Questions from Buyers, Sellers, and RE Professionals

GENERAL QUESTIONS

Q: How much is the solar panel installation industry growing in Texas?

Texas Electric News

All the Important Texas Electric Industry News in One Place, Fast

ERCOT Predicts up to 50-Fold Increase in Solar by 2030

Oct 19, 2015

A: ERCOT, the "Electric Reliability Council of Texas", is the agency with oversight and regulation of more than 75% of all electricity in Texas.^[1]

More Data:

There are currently more than 445 solar companies in Texas, employing more than 7,000 people - up from 170 companies in 2010.^[2]

In 2015, \$372 million was invested on solar installations in Texas. This represents a 48% increase over 2014. 2016 is expected show similar growth.

Per the NAHB, 52% of member homebuilders offer a solar option in 2016.

This figure jumps to 84% in 2018.^[1]

Source: [1] National Association of Home Builders

www.nahb.org/en/news-and-publications/press-releases/2014/june/green-homes-show-growth-in-a-recovering-market-according-to-new-report-from-mcgraw-hill-construction.aspx



Questions from Buyers, Sellers, and RE Professionals

GENERAL QUESTIONS

Q: Are most residential installs on new construction or as retrofits onto existing homes?

A: At present, most systems are retrofits on existing homes and buildings. However, this is rapidly changing.

According to the National Association of Home Builders, 84% of their members plan to offer "solar" as a standard available feature by 2018.^[1]

Source: [1] National Association of Home Builders

www.nahb.org/en/news-and-publications/press-releases/2014/june/green-homes-show-growth-in-a-recovering-market-according-to-new-report-from-mcgraw-hill-construction.aspx

Questions from Buyers, Sellers, and RE Professionals

GENERAL QUESTIONS

Q: Is glare an issue?

A: Essentially, no. It's impossible to predict every set of installation circumstances, so it can't be said "never".

Solar panels are designed to absorb light, not reflect it. Solar panel glass has an anti-reflective coating. The glare and reflectance levels from a PV system are substantially lower than glare and reflectance generated by standard glass and other common reflective surfaces in the environments surrounding the given PV system.

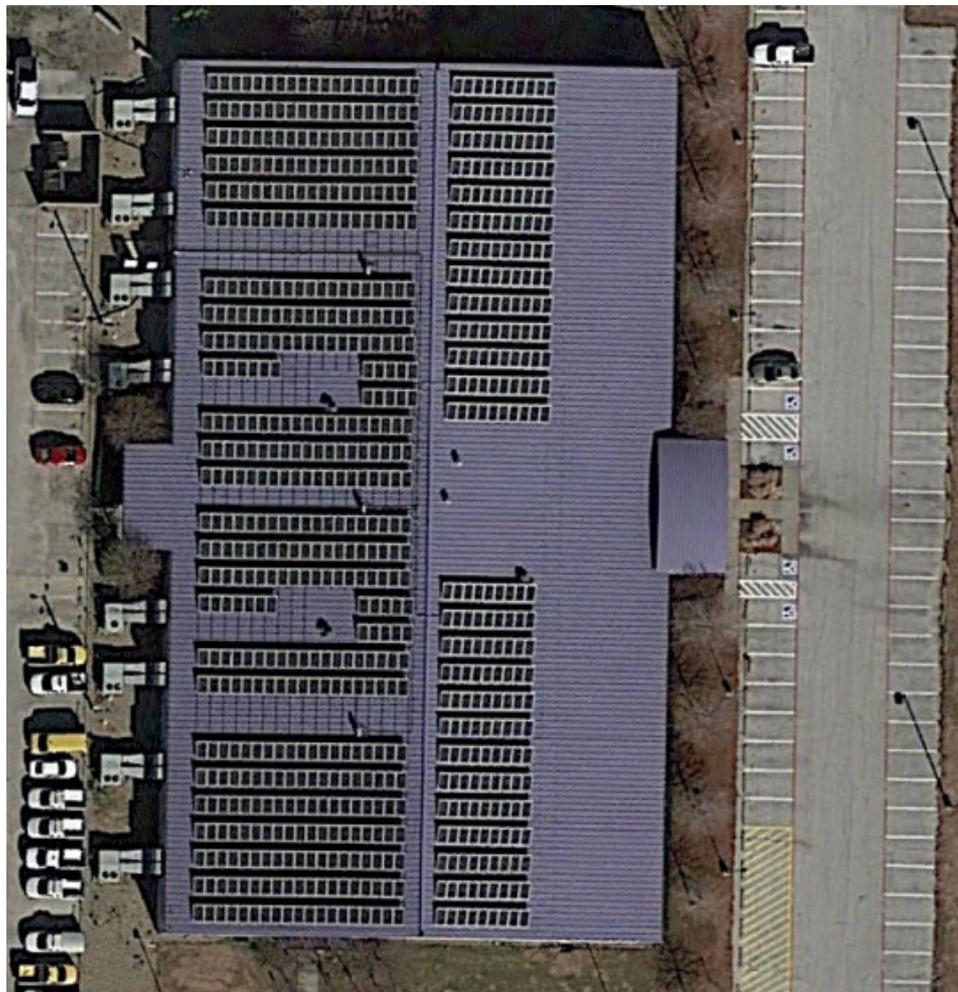
The solar industry has multiple large projects installed near airports or on Air Force bases. Each of these large projects has passed FAA or Air Force standards, and all projects have been determined as “No Hazard to Air Navigation”.

Questions from Buyers, Sellers, and RE Professionals

GENERAL QUESTIONS

Q: Is glare an issue?

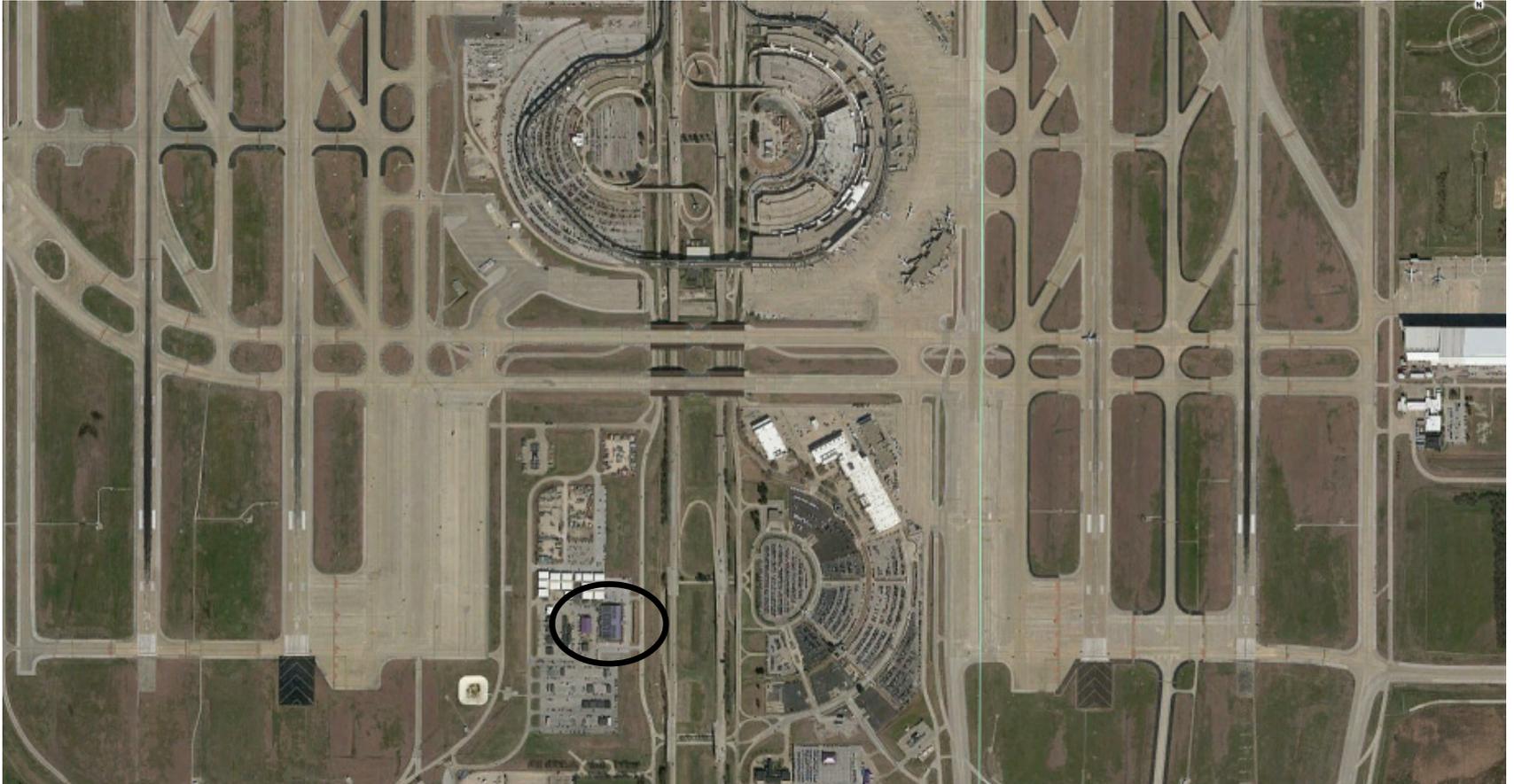
Anyone recognize this building?



Questions from Buyers, Sellers, and RE Professionals

GENERAL QUESTIONS

Q: Is glare an issue? Not here.

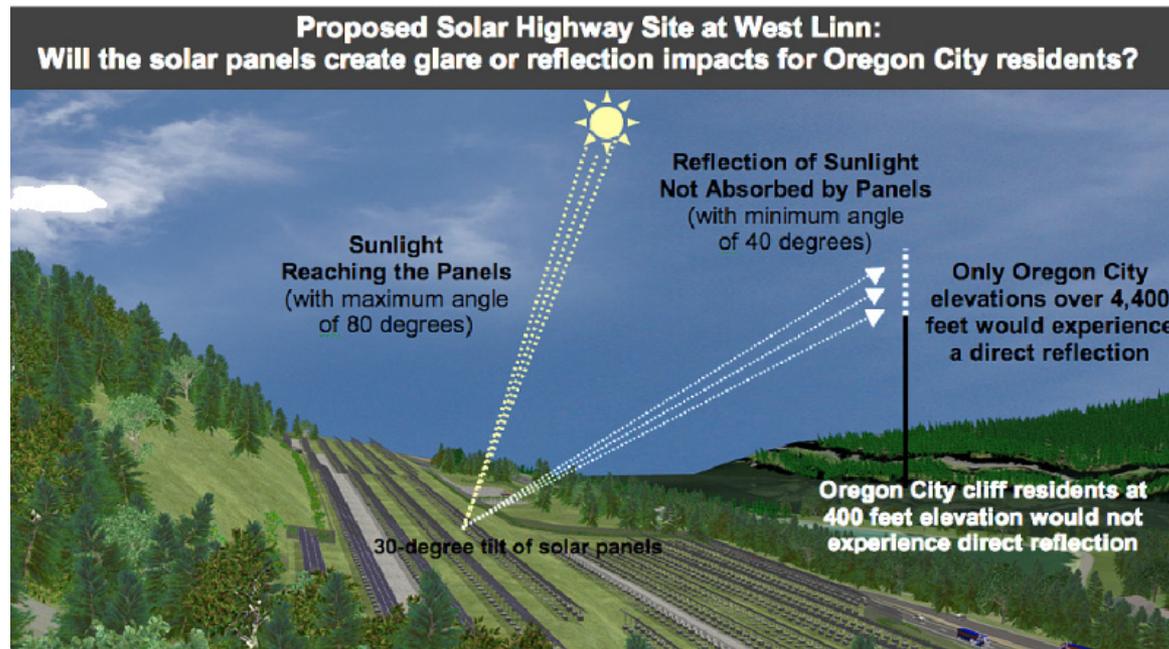


693 photovoltaic panels on the Airport Development and Engineering Building, between - and directly in line with - ALL of the main runways. Glare?

Questions from Buyers, Sellers, and RE Professionals

GENERAL QUESTIONS

- ☀ Solar panels have an anti-reflective coating. Reflected light = lost energy.
- ☀ The City of Benbrook, Texas (Fort Worth suburb) initially passed an ordinance listing "glare" among the concerns, restricting where solar panels could be placed, and the direction they could face. Benbrook rescinded the directional restrictions in 2015 after they discovered glare was not an issue.
- ☀ Solar panels are tilted to face the sun. Reflection that *may* occur goes skyward.



Questions from Buyers, Sellers, and RE Professionals

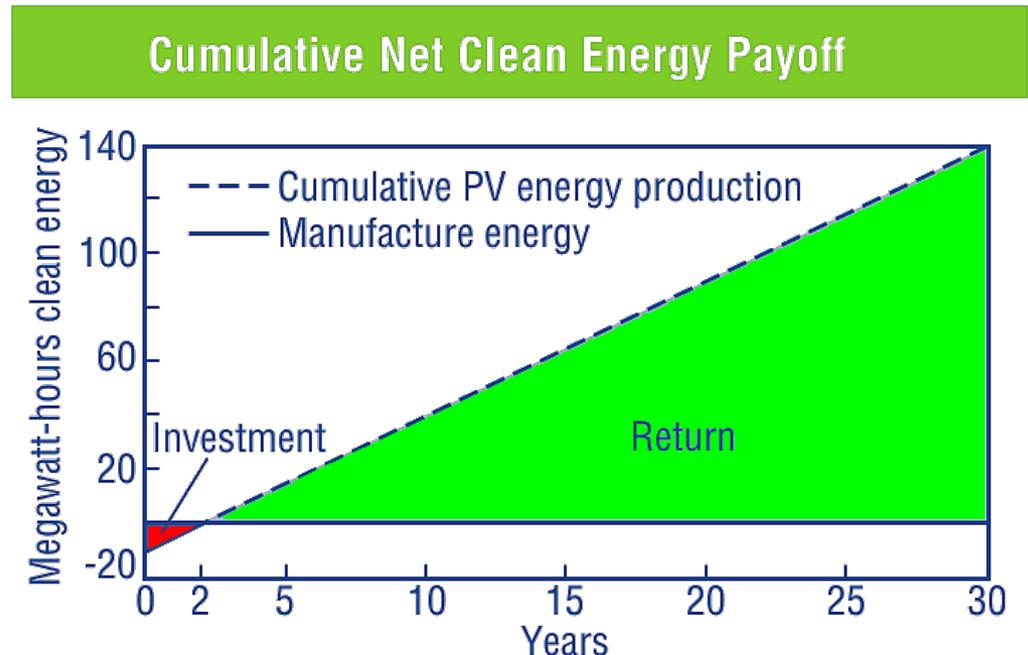
GENERAL QUESTIONS

Q: A prominent green architect used to say that because of their efficiency drop-off as they age, panels would never produce as much energy as it took to produce them. Was/is that true?

A: No.

Remember this graph?

The maximum time to recoup the manufacturing energy is two years. For some types of solar panels .. it's even less.



A solar panel will generate as much energy in two years (or less) as it took to manufacture it. This includes the frame. After that .. it's free.

Questions from Buyers, Sellers, and RE Professionals

GENERAL QUESTIONS

Q: Are the panels so heavy that if installed on existing roofs they cause rafters to bow?

A: Not on modern roofs. See the studies conducted by Sandia National Laboratory and the University of New Mexico titled "Structural Code Considerations for Solar Rooftop Installations", and "Empirically Derived Strength of Residential Roof Structures for Solar Installations".

Roofs with rafters smaller than 2" x 6" and/or spacings wider than 24" would need to be evaluated by a competent licensed Structural Professional Engineer.

Homes built since the mid 1970s, and constructed to the National Building Code, have 2x6 rafters on 24" centers.



**MORE
QUESTIONS?**

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- ★ Open Q & A

Methods for Selling Solar Homes & the Benefit of Solar on Home Value.

1. Before attempting to sell a "solar" home, learn about the basics of solar energy.
2. If you're representing a seller, #1 question to ask: *"Do you own, or lease the system"*.
3. If leased, the contract must be carefully reviewed for terms and possible issues. Also, neither Fannie Mae nor Freddie Mac will allow a leased system to be appraised as part of the property. It's a liability, not an asset, and must be handled as such.
4. Presuming an owned system, gather as much detail about the system as you can. Make a check list of information required, and give it to the sellers to complete.

Methods for Selling Solar Homes & the Benefit of Solar on Home Value.

5. Information will be of benefit to you representing the seller, as well as the appraiser.
6. Ensure you engage an Accredited Green Appraiser **who understands solar energy** to do the appraisal. "Green" encompasses many aspects besides "solar"
7. Be able to translate the workings of the system into terms any potential buyer understands.
8. If you're representing the seller, and have a prospective buyer, learn the buyer's motivation for interest in the solar property. Lower bills? Environmentally conscious? Work to emphasize whatever is of interest to the buyer.

Methods for Selling Solar Homes & the Benefit of Solar on Home Value.

Learn to use online valuation tools such as "PV Value" from the United States Department of Energy.

www.pvvalue.com

Here are examples of actual real-life information:

Details	System 1	System 2	System 3
Size (kW)	6.24	6.60	7.85
Annual kW Production Estimate	7,292	7,715	9,910
Solar Replacement % of Consumption	53%	56%	72%
Price	\$18,096	\$23,100	\$30,607
Price after federal & state credits	\$11,667	\$15,170	\$20,425
Estimated Annual System Savings	\$2,224	\$2,353	\$3,022
Return on Investment Time (yrs)	5.2	6.4	6.8

Methods for Selling Solar Homes & the Benefit of Solar on Home Value.

Q: As an Inspector, what should I consider when evaluating a "solar" home?

A: Consider the following:

1. If the Realtor hasn't done so already .. provide a copy of the Appraisal Institute Form 820.04 - The "Residential Green and Energy Efficient Addendum" to the seller. They may need help filling it out.
2. The seller will need to provide as much detail about the system as possible: System age, size (in "DC" watts), copies of at least the 12 past month's utility bills.

Methods for Selling Solar Homes & the Benefit of Solar on Home Value.

Q: As an Appraiser, what should I consider when evaluating a "solar" home?

A: Consider the following:

1. If the system is not owned by the seller, there's nothing more for you to do.
2. If the system is owned by the seller, provide them with Appraisal Institute Form 820.04 - The "Residential Green and Energy Efficient Addendum" to the seller, and ask them to complete it to the best of their ability.
3. If the seller is unsure about completing Form 820.04, suggest they contact the original installing company for assistance.

Methods for Selling Solar Homes & the Benefit of Solar on Home Value.

Q: As an Appraiser, what should I consider when evaluating a "solar" home?

A: Also Consider the following:

1. Learn to use "PV Watts" as an estimating tool for energy production. It's free, and requires little technical skill.
2. Utilize "PV Value", an on-line program for your major calculations. It's been in development and tested for several years, and has data inputs related to value, cash flow, and others that will help establish a value for the PV system.

www.pvvalue.com

Methods for Selling Solar Homes & the Benefit of Solar on Home Value.

Q: As an Appraiser, what should I consider when evaluating a "solar" home?

"PV Value[®]" - Online Program

- ★ Developed to conform to the Uniform Standards of Professional Appraisal Practice (USPAP) requirements.
- ★ Uses both Income and Cost approach to value solar PV with user-selectable inputs.
- ★ Output is provided on the PV Value[®] form in the industry standard legal sized PDF format.
- ★ HUD and Fannie Mae will allow for the income and cost approaches utilized within PV Value for developing the value of solar PV improvements on residential dwellings.

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Analytics for Valuation - How a Solar Property Is Assessed

Major Analytics - Location

- ★ System Location, City?
- ★ System Age?
- ★ Regional Climate (30 year history using "TMY3" - automatic in software)?
- ★ Shading source(s) (permanent, temporary)?

Analytics for Valuation - How a Solar Property Is Assessed

Major Analytics - System - PV

- ✦ System Size (kilowatts DC)?
- ✦ Brand and model of PV?
- ✦ PV type: Standard or premium?
- ✦ PV orientation (compass) and tilt angle? (Roof or ground? Tracked or fixed?)
- ✦ Approximate annual PV degradation rate?
- ✦ PV manufacturer still in business? (Requires on-line verification.)
- ✦ PV & Warranty Duration and Terms?

Analytics for Valuation - How a Solar Property Is Assessed

Major Analytics - System - Inverter

- ✦ System topology: Inverter type, brand, and model?
- ✦ Inverter manufacturer still in business?
- ✦ Amount of warranty remaining on inverter?
- ✦ Strength (bankability) of warranty support on all components?

Analytics for Valuation - How a Solar Property Is Assessed

Major Analytics - Financial

- ✦ Measured energy production (revenue grade metering)?
- ✦ Net Reduction in Utility Bills?
- ✦ Income from power production (if any)?
- ✦ Utility Rate?
- ✦ Annual Average Utility Escalation Rate (Inflation, etc.)?
- ✦ O & M Expense (if any)?
- ✦ Value of Energy Produced based on TOU or other metrics?
- ✦ May also consider age of roof, and its remaining life expectancy.
Remove/replace a PV system adds expense.

Solar PV for Real Estate Professionals

- ★ Brief History & Overview of Solar Energy with Definitions
- ★ Fundamentals of Solar and How It Operates
- ★ The Economics of Solar Energy
- ★ Myths & Misconceptions about Solar Energy
- ★ Answers to Questions from Buyers, Sellers, and RE Professionals
- ★ Methods for Selling Solar Homes & the Benefit of Solar on Home Value
- ★ Analytics for Valuation - How a Solar-Equipped Property is Assessed
- ★ **Open Q & A**

In closing .. I'd like to leave you with the words of one rather famous American, who said:

"I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait until oil and coal run out before we tackle that."

Any idea who may have made such an insightful statement?

~Thomas A. Edison ~
(1847-1931)

...in conversation with Henry Ford and Harvey Firestone...





QUESTIONS?



Join Us!

Summer Solar Webinar Series

Community Solar in Texas, 11:30 a.m., Friday, July 8

This webinar will focus on providing information to electric utility cooperatives and municipal-owned utilities who may be interested in exploring opportunities for community solar programs. Presentations will discuss ownership structures, financing options, and marketing & outreach needs.

Putting Underutilized Land to Work, 11:30 a.m., Wednesday, July 27

This webinar will focus on providing information to local governments including school districts, special districts, and business/industry sectors interested in going solar. Presentations will include topics such as solar applications on landfills, brownfields, wastewater treatment plants, and other facilities where Solar PV can be put to work for energy savings.

Visit GoSolarTexas.org for webinar details



Thank You!

**Presentations, upcoming webinars and
training opportunities posted at
GoSolarTexas.org**

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Thank You!

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Your Presenter...

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- ★ **Voting Member** - Underwriters Laboratories UL 1741 Standards Technical Panel.
Author the UL 1741 Safety Standard for the entire solar energy industry.
- ★ Member - Solar Industry Task Force to the National Fire Protection Association.
NFPA publishes the National Electric Code, NFPA 70.
- ★ Member - Solar America Board for Codes and Standards.
Interface with and advise the NEC Task Force and UL 1741 STP.
- ★ Member - Electric Power Research Institute "Smart Grid" Development Committee.
Engineers, scientists, experts from academia & the industry address challenges in electricity.
- ★ Professional Consultant with Intertek / ETL.
Intertek / ETL is one of several Nationally Recognized Testing Laboratories certified by OSHA to test products to the UL Safety Standards.
- ★ Master Instructor for "NABCEP" - the American Certifying Body for solar energy system designers and installers ensuring code and safety compliance.
- ★ 44 years in the solar energy industry .. and still active!