

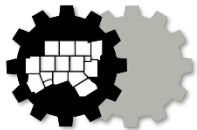


Financing Solar PV

Summer, 2016

Trainer: Dan Lepinski, P.E.

Sponsored by:



North Central Texas
Council of Governments

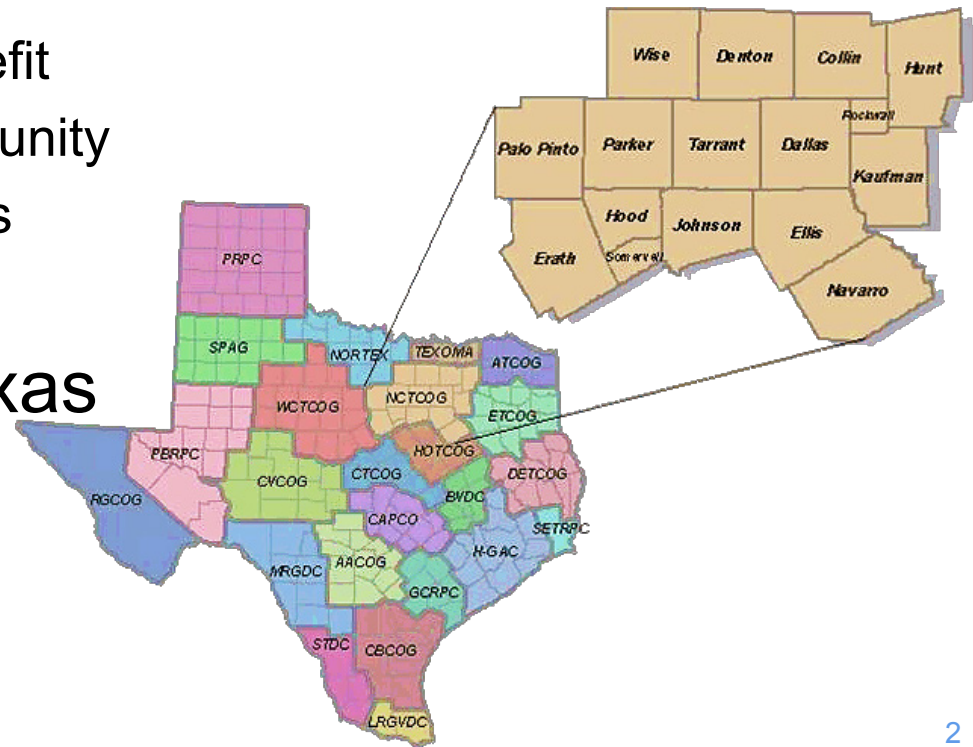


State Energy Conservation Office

www.GoSolarTexas.org

What is NCTCOG?

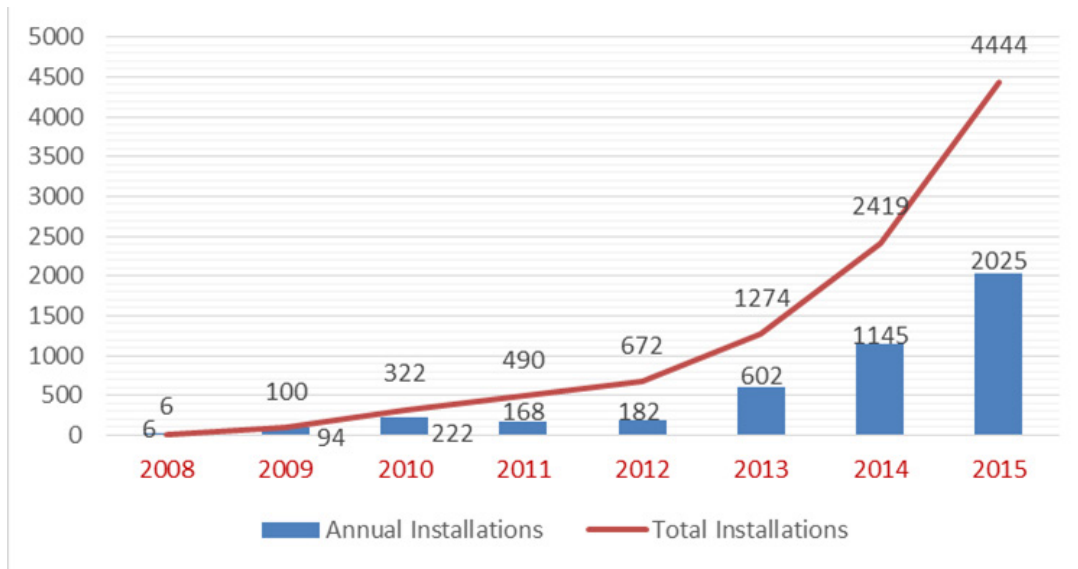
- Voluntary association of local governments
- Established in 1966
- Assists local governments in:
 - Planning for common needs
 - Cooperating for mutual benefit
 - Recognizing regional opportunity
 - Resolving regional programs
 - Making joint decisions
- One of 24 COGs in Texas
- www.nctcog.org



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 – Financing Solar



Solar PV – Financing Solar

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 – Financing Solar Energy Systems

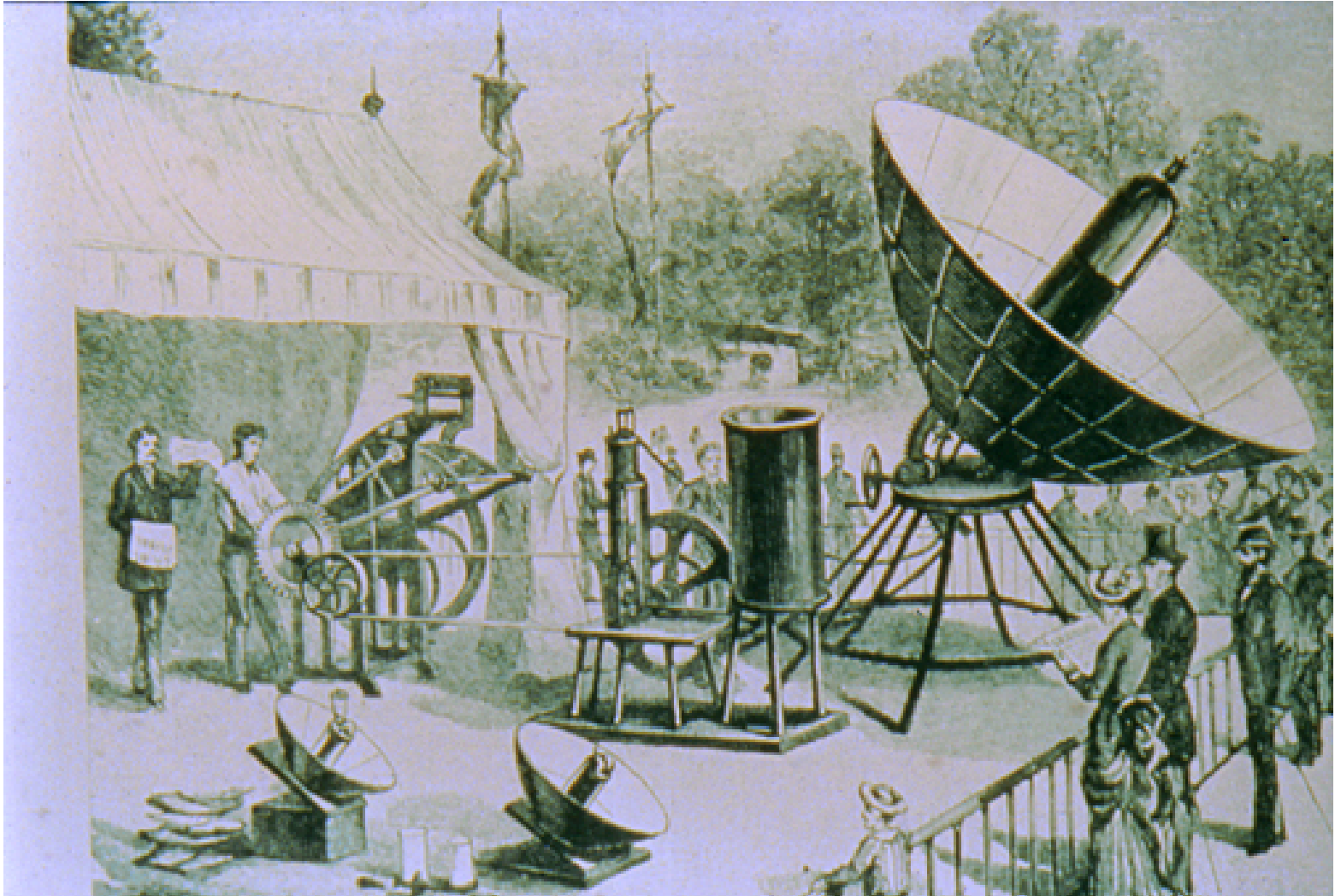
- ★ **Brief History & Overview of Solar Energy with Definitions**
- ★ **Fundamentals of Solar and How It Operates**
- ★ **The Economics of Solar Energy**
- ★ **Myths & Misconceptions about Solar Energy**
- ★ **Why Solar? Information for Building Owners, Contractors, and Lenders**
- ★ **Information for Buyers**
- ★ **Information for Lenders**
- ★ **Open Q & A**

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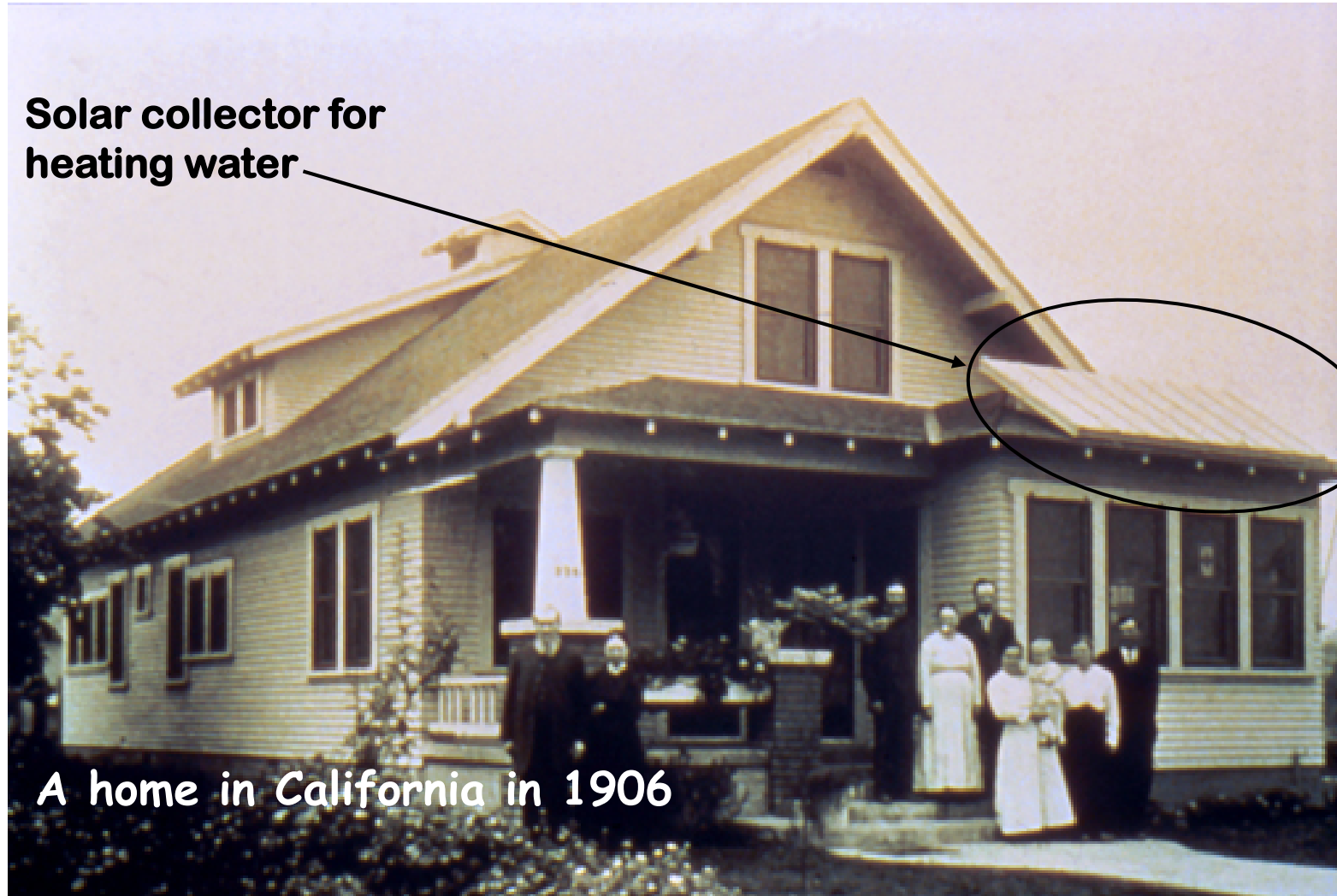
Solar Energy Isn't New...

This illustration is from the 1890's World Fair.



Solar Energy Isn't New...

This example is from California in 1906.

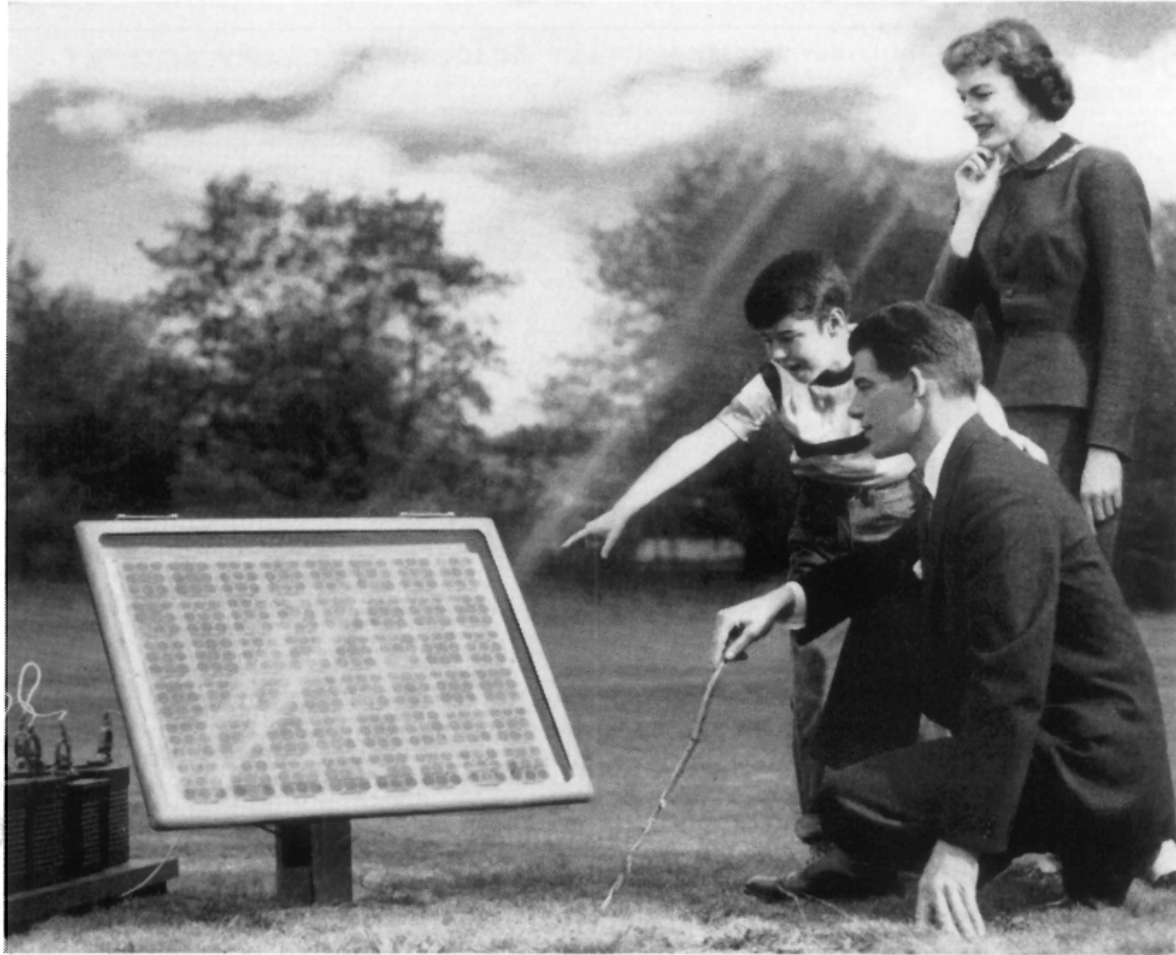


Solar collector for heating water

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

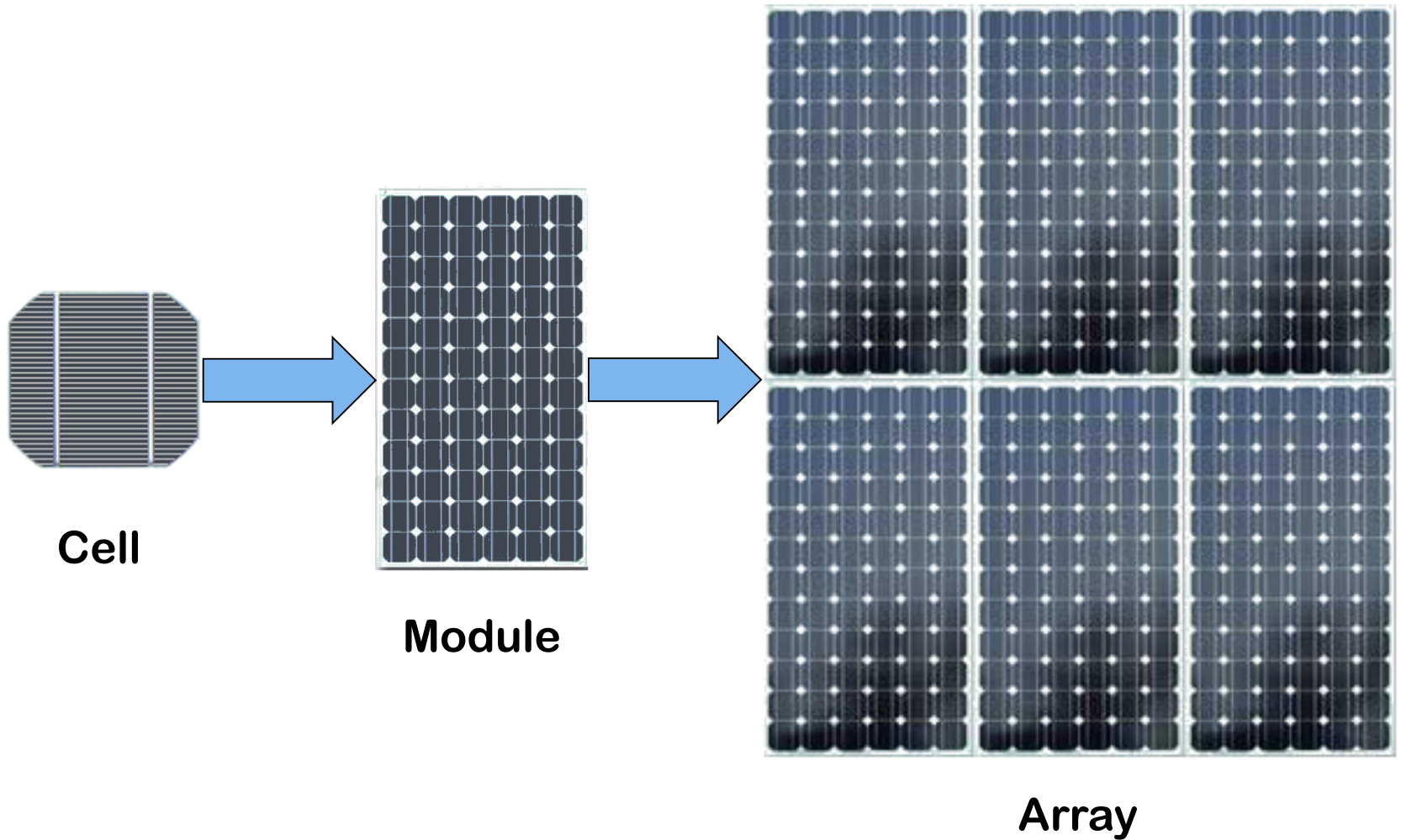
Cash Flow and Value

- Grid-Connected:** Connected to the utility lines.
- Leased System:** On the business, 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.

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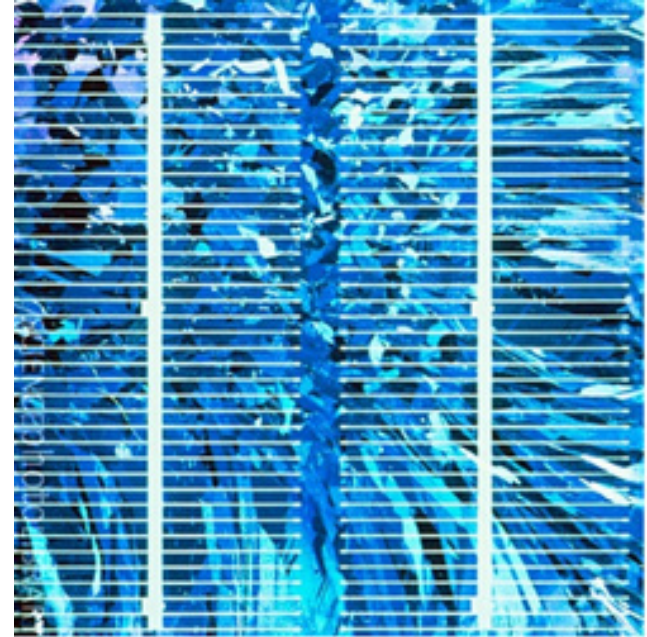
Definitions: "Solar Cell", "PV Module", "PV Array"



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



Monocrystalline Cell



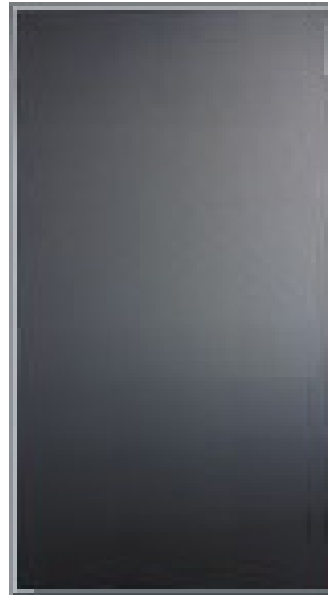
Polycrystalline Cell

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 is commonly installed as "solar shingles".

Basic Overview - Solar Electricity Works Like This...

Photovoltaic modules convert sunlight into electricity.



"Inverter" - converts solar DC into household AC.

Utility meter: Measures power consumed and all excess power 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.

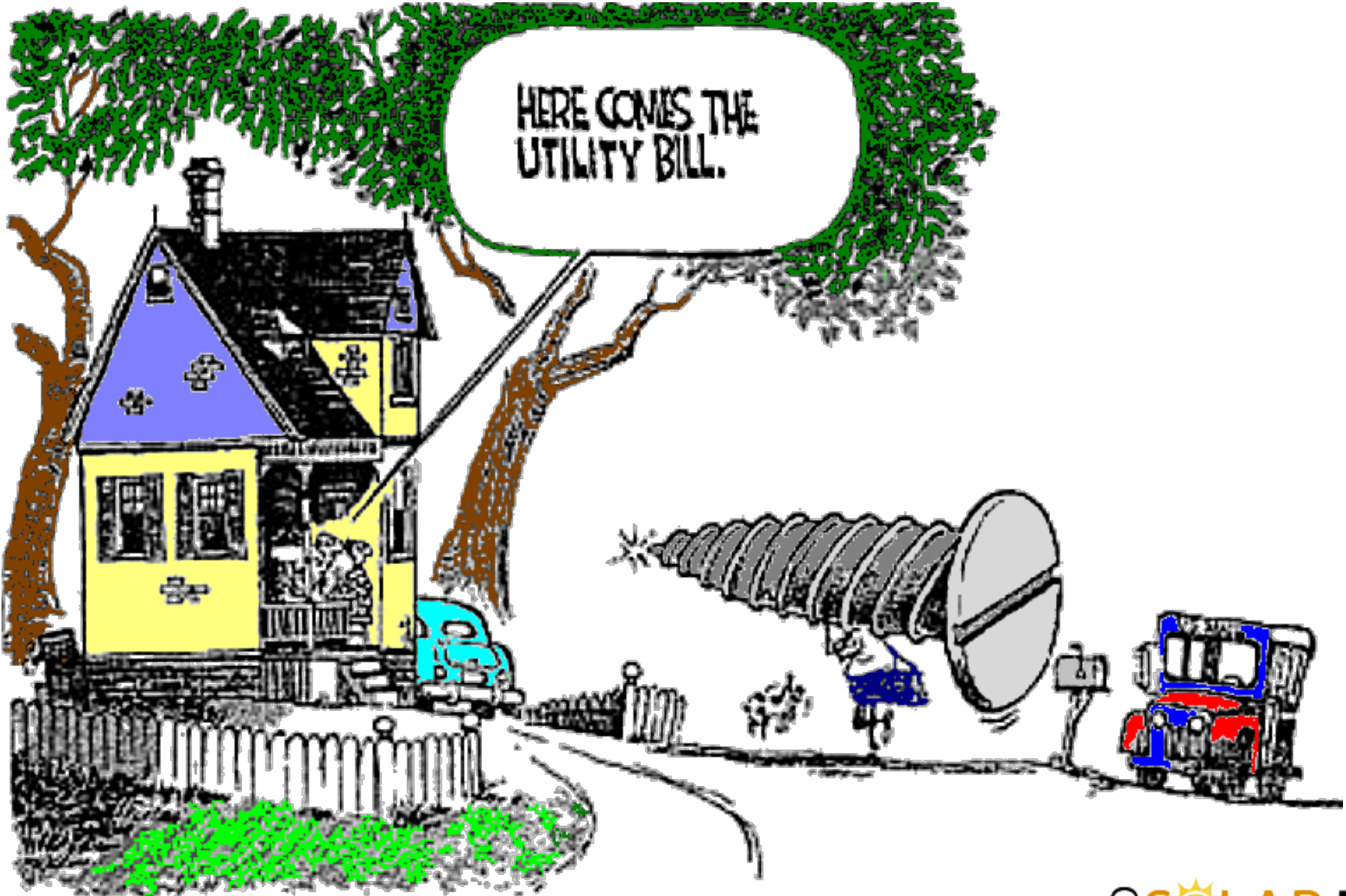


QUESTIONS?

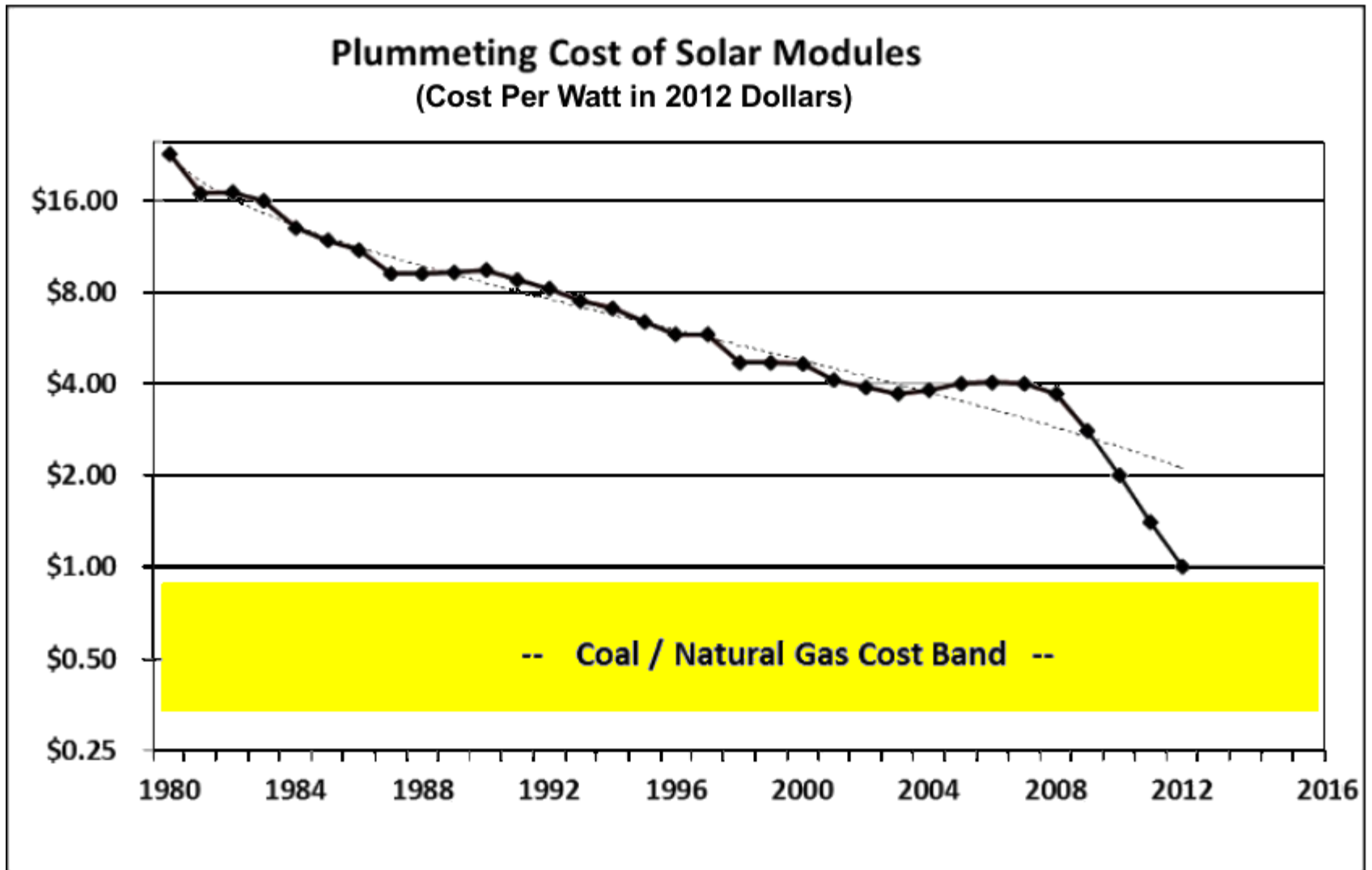
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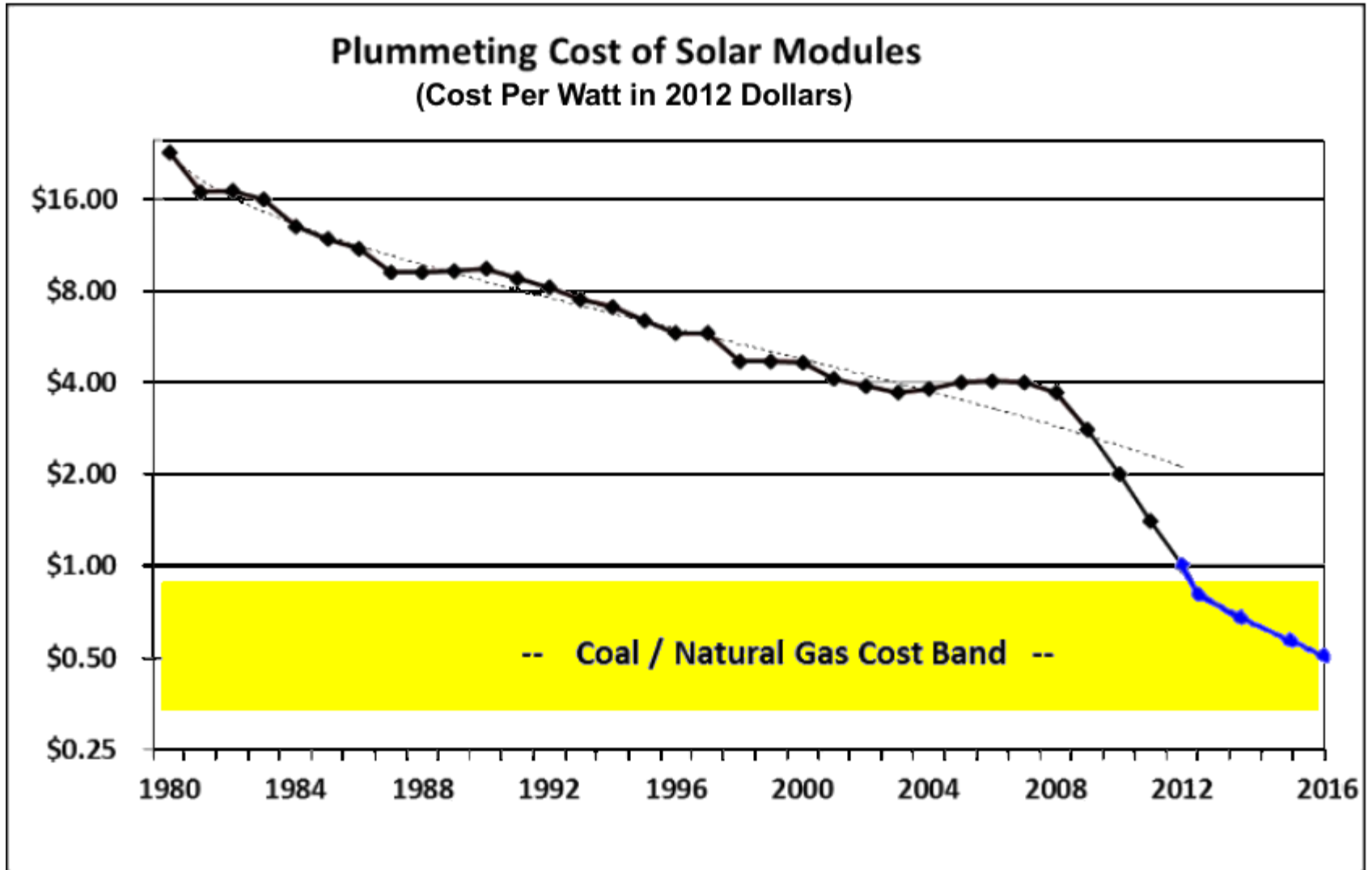
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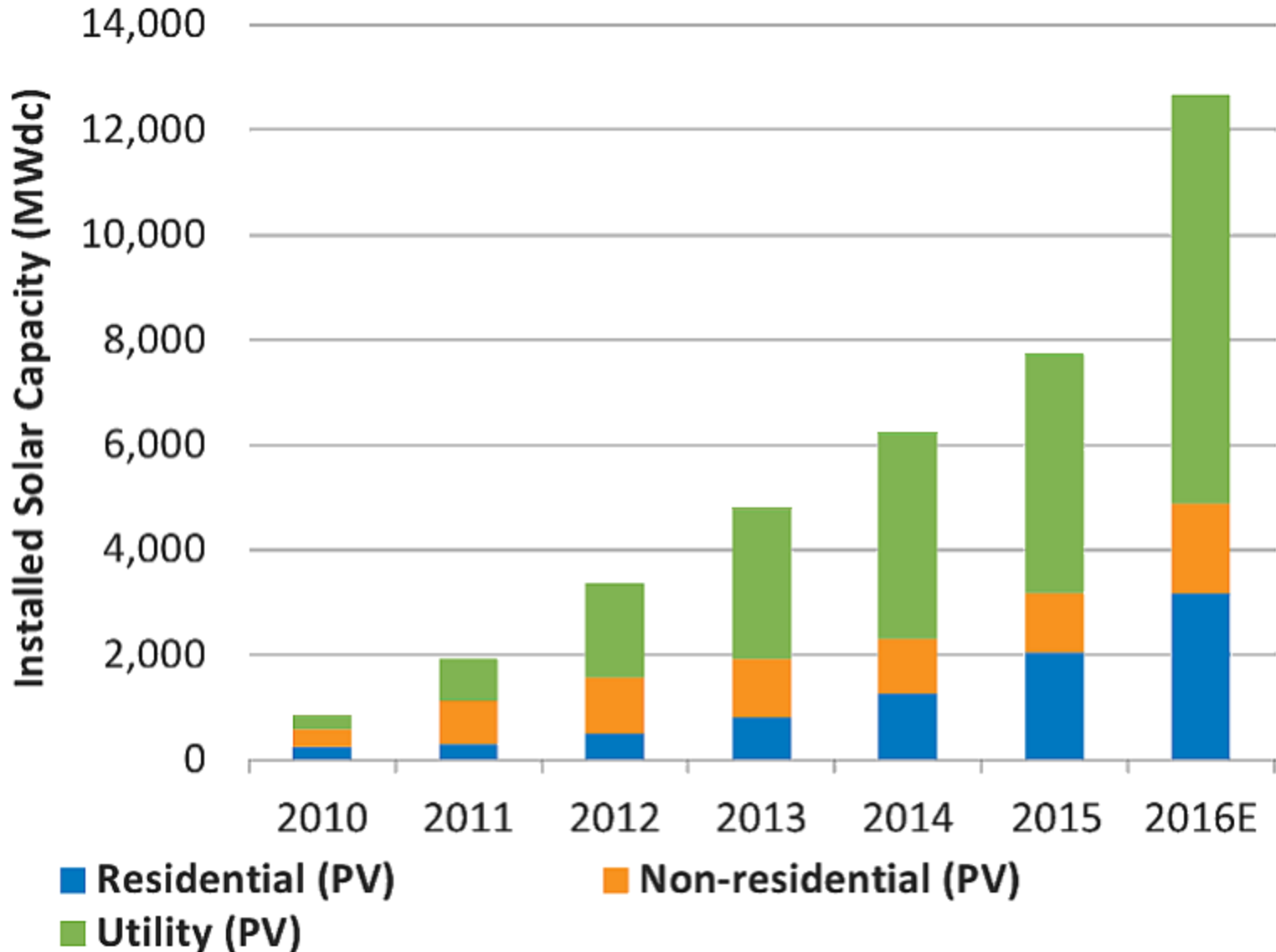
The Economics of Solar Energy ... The Sudden Popularity



The Economics of Solar Energy ... The Sudden Popularity



The Economics of Solar Energy ... Yearly US Installations



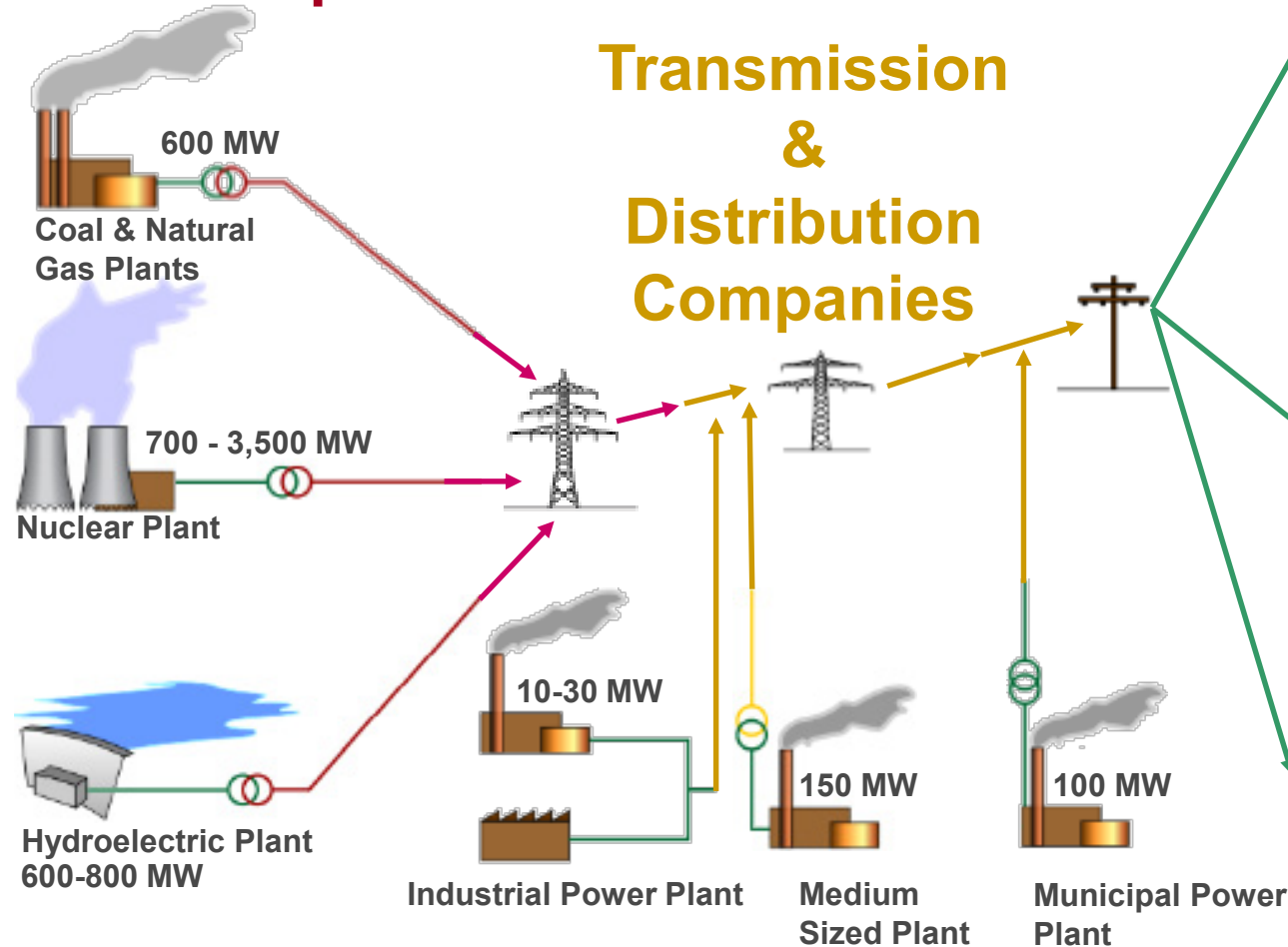
The Economics of Solar Energy ... Yearly US Installations

- ☀ Solar electricity provided 40% of all new electricity supply that went on line in the first six months of 2015.
- ☀ As of Q3, 2016, 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...

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 utility 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...

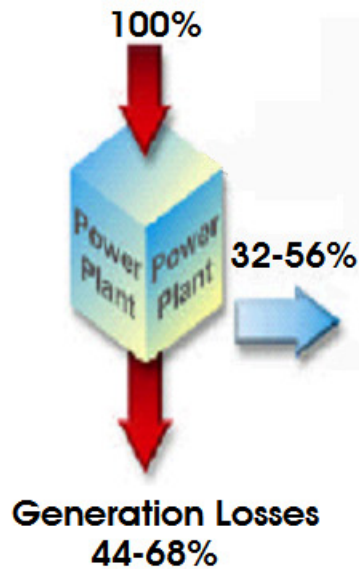
Why Is Distance Significant?



...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...

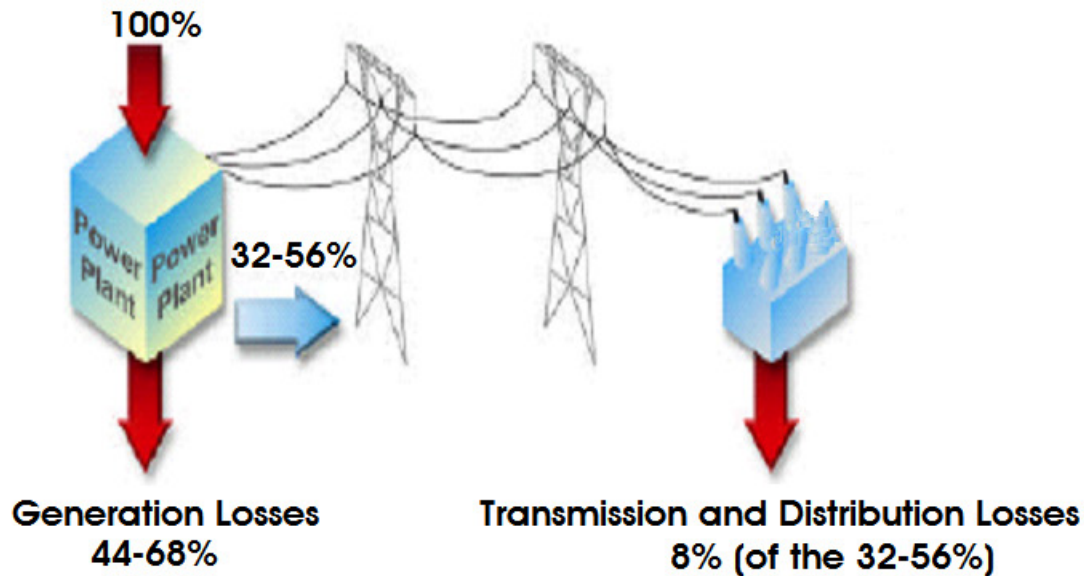
Why Is Distance Significant?



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

The Economics of Solar Energy...

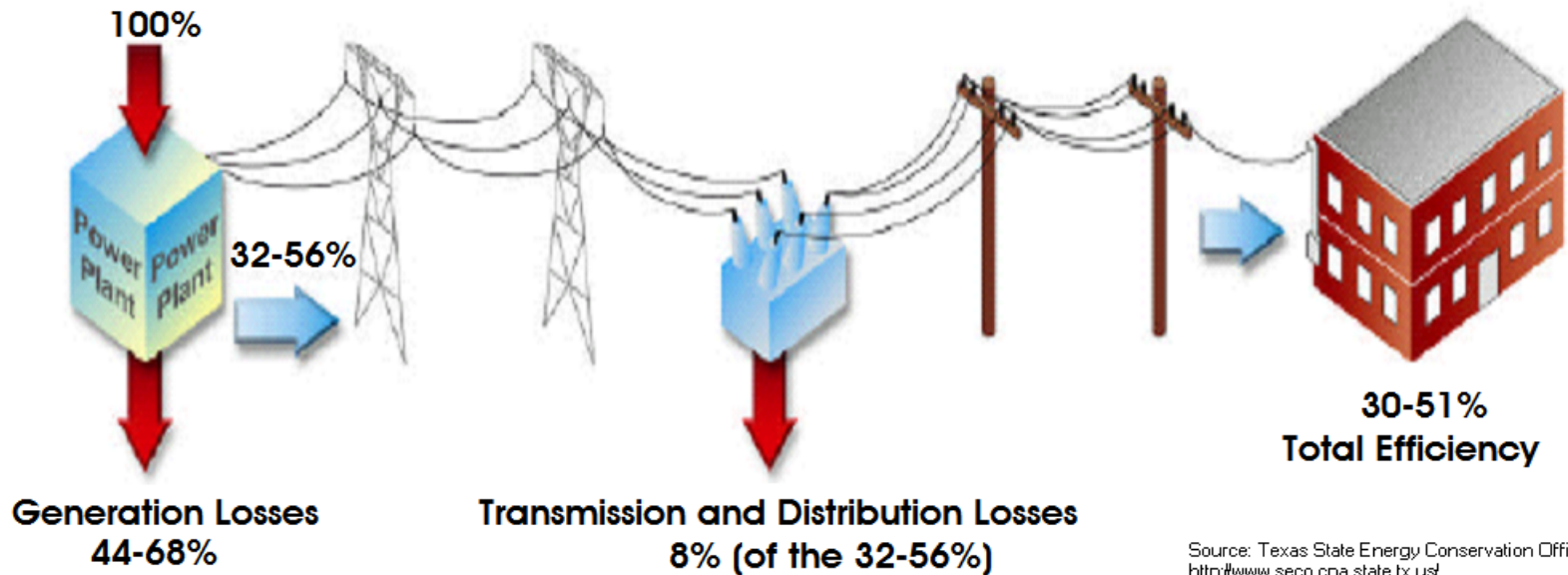
Why Is Distance Significant?



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

The Economics of Solar Energy...

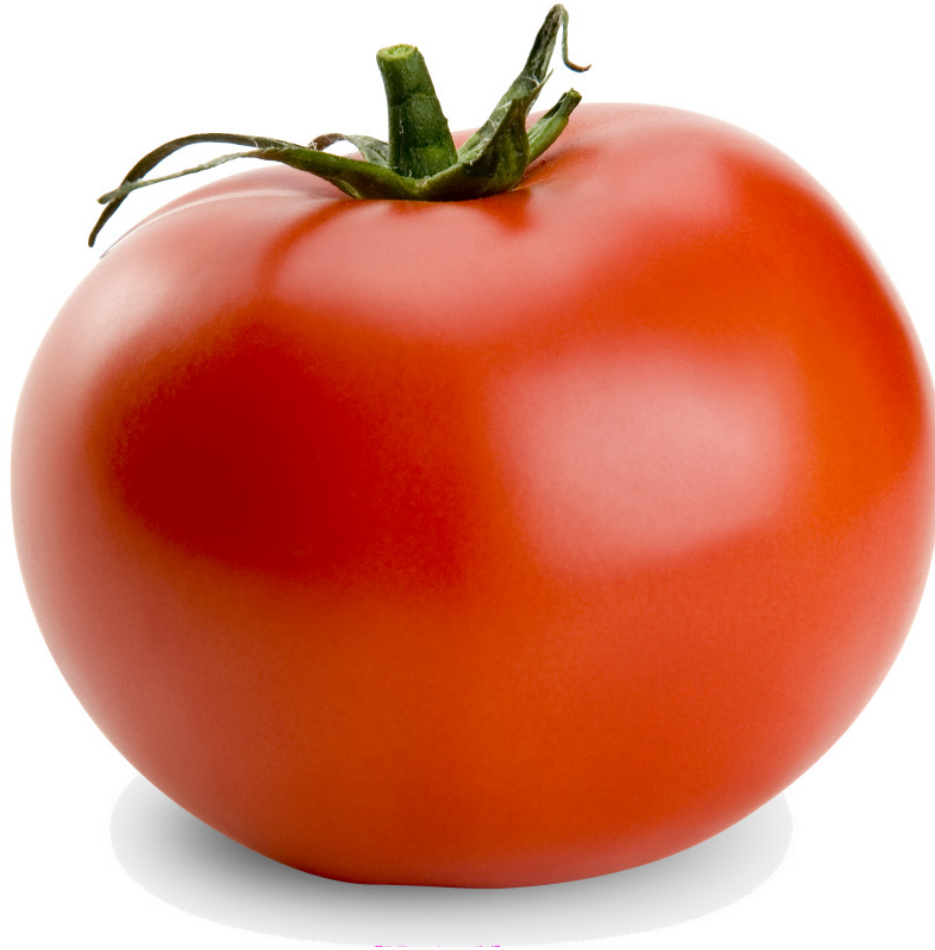
Why Is Distance Significant?



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...

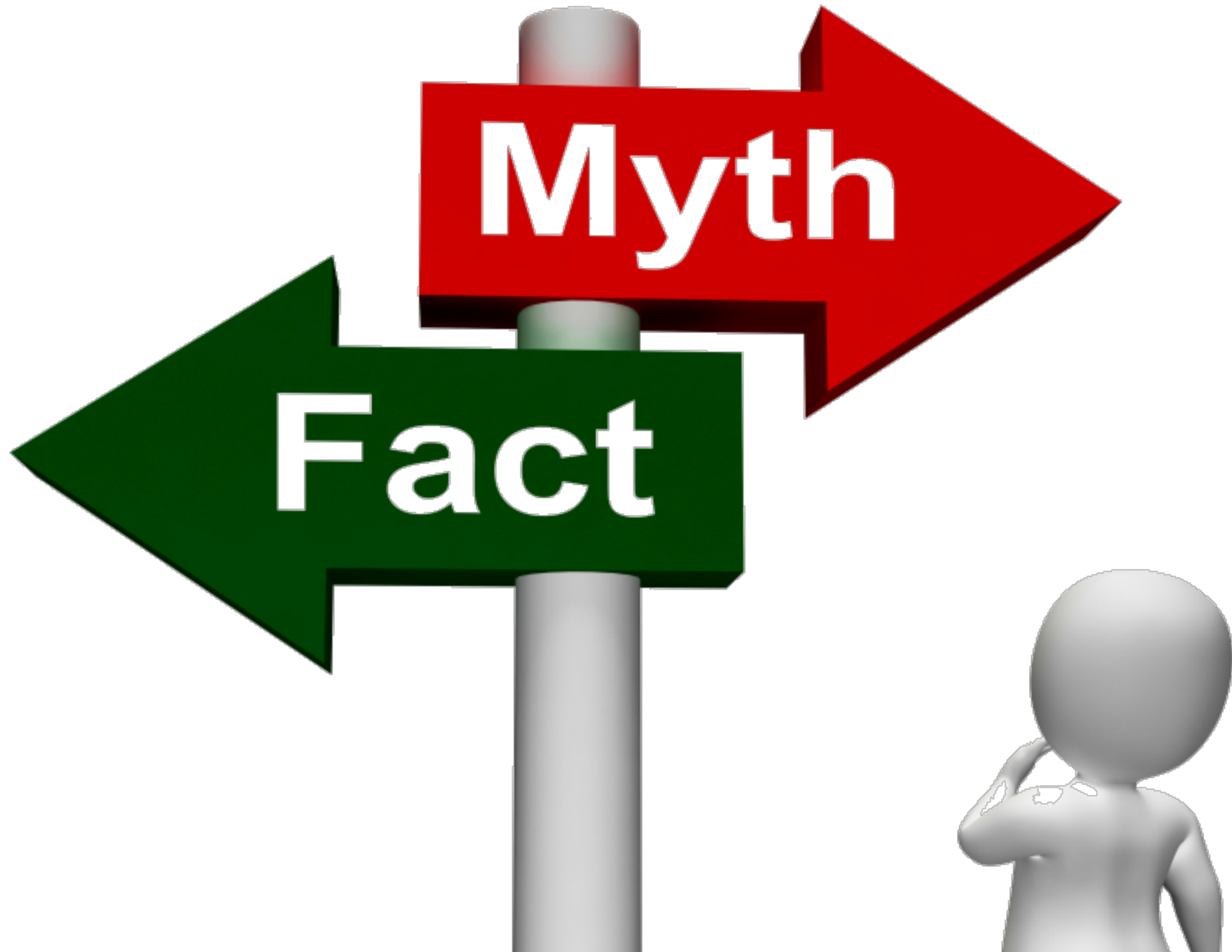
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Common Myths and Misconceptions



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...

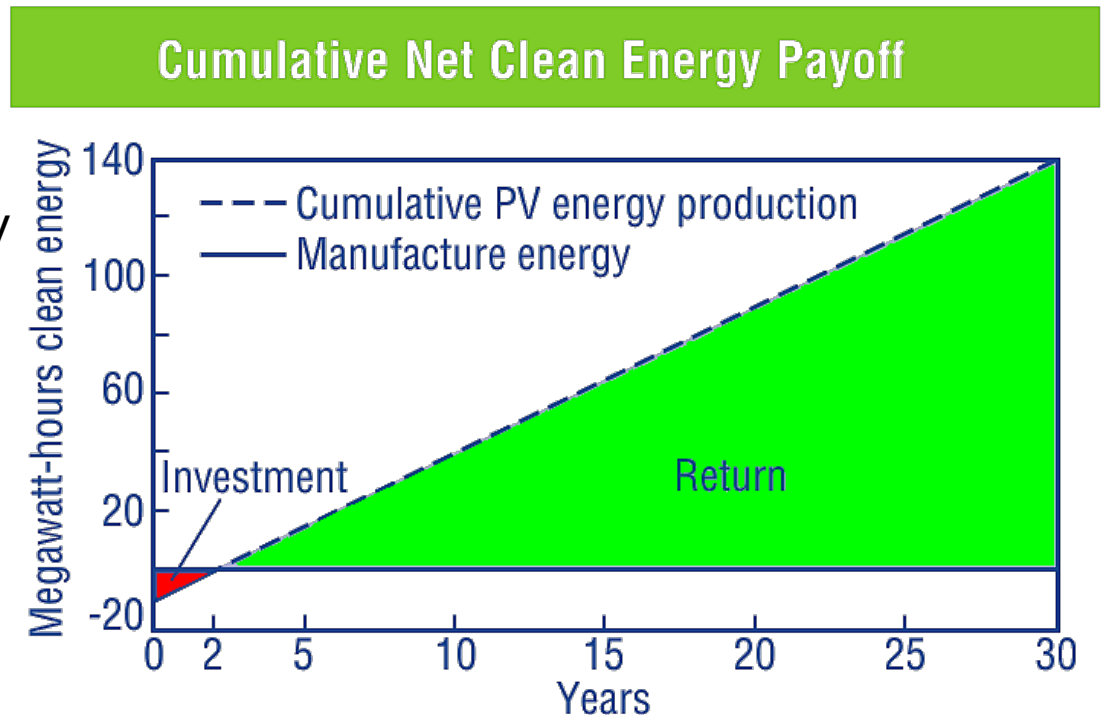


The Top Four Solar Myths:

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 frame.

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 heavily 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 total energy subsidies over that period.

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 heavily subsidized.
9. If we have solar panels installed, we'll have electricity if the lights go out.
10. Everything will wear out in 10 years (or less) and will require replacement.

NONE of these myths are true!



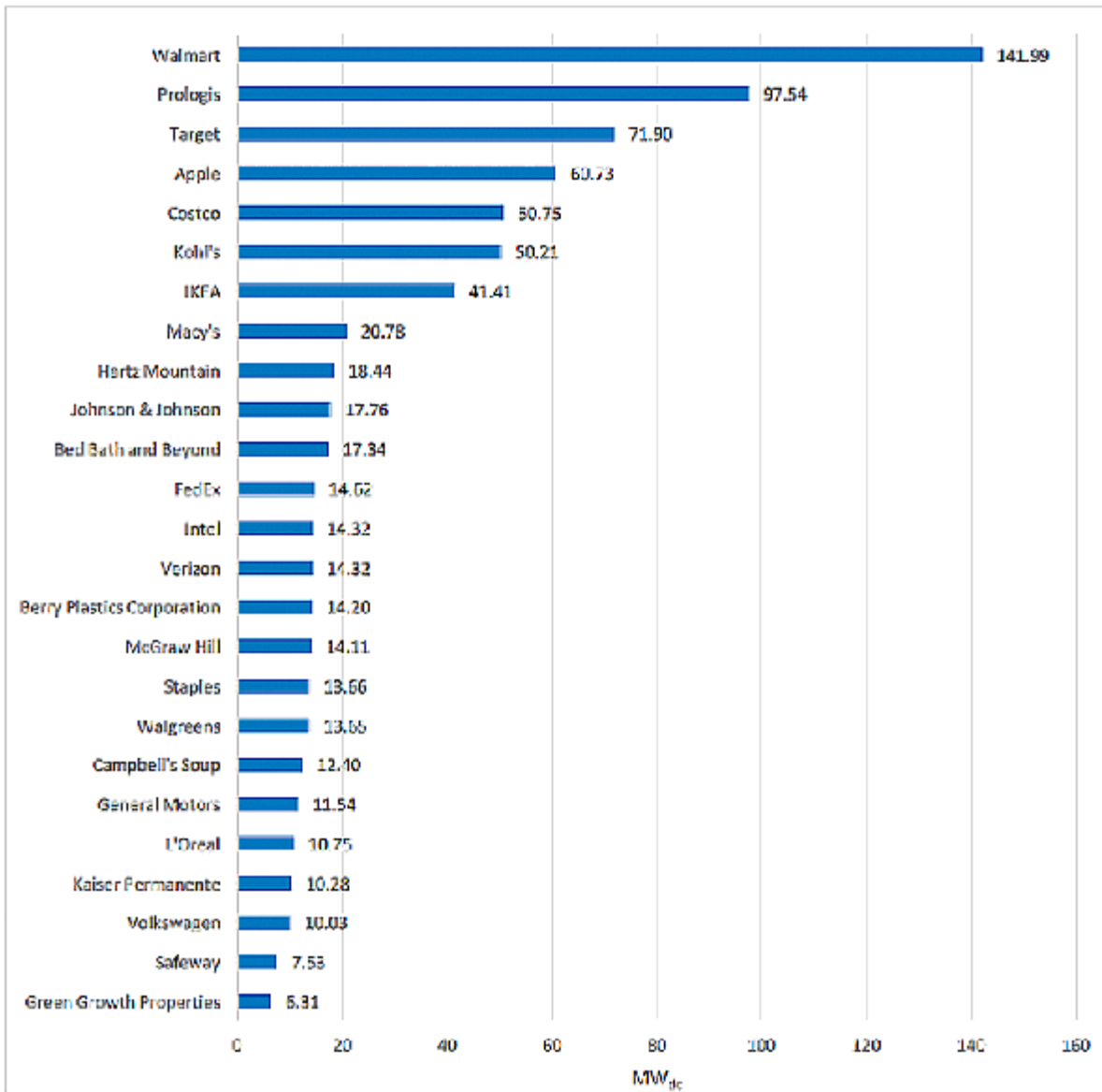
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Solar PV – Financing Solar Energy Systems

Why Solar?



Forward-thinking companies.

The list of the top 25 companies in terms of on-site solar are among the most iconic household brands in America.

They must know something about solar WE don't know - yet.

Solar PV – Financing Solar Energy Systems

Why Solar?

Long-term business advantages to “solar energy”:

- ☀ Fixed price of the energy for the next 25+ years.
- ☀ Increased property value.
- ☀ 30% Federal Tax Credit if you purchase.
- ☀ Accelerated Depreciation available (MACRS).
- ☀ Provides opportunity to sell excess energy.
- ☀ Decreases your “carbon footprint”.
- ☀ Socially and environmentally responsible.
- ☀ Improves public perception of your business.

Solar PV – Financing Solar Energy Systems

Why Solar?

Questions:

- ☀ How long will a system last?
- ☀ What parts will “wear out” first?
- ☀ With technology changing, will it be better to wait?
- ☀ What's the difference between a lease, third-party ownership, and purchase?
- ☀ If purchasing .. is it better to borrow, or pay outright?
- ☀ What financial incentives exist for building owners who purchase?

Solar PV – Financing Solar Energy Systems

Economics – Third-Party Ownership Vs. Lease Vs. Purchase...

Question: What's the difference between "third-party-ownership", a lease, and an outright purchase?

In "third-party-ownership" and a "lease", the solar PV system is owned by someone other than you (or your company). Though similar, differences in contractual and payment terms delineate the two:

Third-Party Ownership*

- ☀ Billing via "PPA".
- ☀ Billing varies monthly.
- ☀ Removed at end of contract.

Leased System*

- ☀ Billing via contracted amount.
- ☀ Billing fixed.
- ☀ Has "fair market" buyout option.

* Terms and conditions are subject to change. Some aspects may be negotiated.

Solar PV – Financing Solar Energy Systems

Economics – Third-Party Ownership Vs. Lease Vs. Purchase...

Question: What is a “Power Purchase Agreement” (PPA)?

- ☀ A power purchase agreement ("PPA") is a contract to buy electricity generated by a power plant, or sell excess electricity (usually solar) to a power provider.
- ☀ The power provider will most often negotiate to purchase excess solar energy from a qualified facility with a capacity sufficiently large to make the agreement worthwhile to the utility company.
- ☀ Price paid by the utility company is usually the "avoided" or wholesale cost of the energy.
- ☀ PPAs typically run in length up to 20 years.

Solar PV – Financing Solar Energy Systems

Economics – Third-Party Ownership Vs. Lease Vs. Purchase...

Question: What is a “Power Purchase Agreement” (PPA)?

A solar PPA is defined by whether you're buying, or selling solar electricity:

- ☀️ A PPA is a contract to purchase electricity generated by a solar power system, or to sell excess electricity from the solar power system to a utility company.
- ☀️ If a third-party owns the system: You are the "buyer", and agree to purchase solar electricity from the owner of the system at an initial price, which usually includes an escalation rate of 2.5 - 3.0% each year for the term of the contract.
- ☀️ If you own the system: As a "seller", you may be eligible to negotiate a PPA with a local utility company if the system is sufficiently large to be of interest to the utility company, and the quantity of excess energy is attractive to them.
- ☀️ PPAs typically run for 20 years, but terms may be negotiated.

Solar PV – Financing Solar Energy Systems

Economics – Third-Party Ownership Vs. Lease Vs. Purchase...

Question: Pros / Cons of a PPA (Power Purchase Agreement)?

- + Usually has little or no up-front cost.
- + No maintenance costs. The system is owned by a third-party.
- + Often has little or no “performance” risk to you.
- + Long-term, known energy price per kilowatt-hour.
- + Lessor is responsible for maintenance (if any).

- Typically has an “escalation clause”, with regular increases in energy costs.*
- Equipment owner (not you) inherits benefits from Federal Tax Credit, depreciation ("MACRS"), local cash incentives, and others.
- Buyout value is unpredictable.
- Adds no value to your property.
- Requires a long-term commitment – 10 to 20 years.
- May end up paying more for power than to the utility company.

* The escalation clause typically raises the price paid for the solar energy 2.5-3.0% each year over the life of the contract.

Solar PV – Financing Solar Energy Systems

Economics – Third-Party Ownership Vs. Lease Vs. Purchase...

Question: Pros / Cons of a Lease

- + Higher long-term savings potential compared to PPA.
- + Low up-front costs. Usually considered “off the balance sheet”.
- + Locks in a consistent monthly payment to help stabilize energy expenses.
- + May provide a path to system ownership after a specific number of years.
- + May have benefit if you have a small “tax appetite”.

- Represents a long-term debt obligation.
- May make it more difficult to sell your property.
- Building owner doesn’t own the solar equipment during the lease period.
- May have a “buyout” clause of unknown amount at the end.
- Is not part of the property at time of sale. If building is selling, options are:
 - ★ Lease must be paid off by seller before building can be sold, or;
 - ★ Seller pays to have system removed and moved to new location, or;
 - ★ Buyer must qualify for the lease separately, and assume it.

Solar PV – Financing Solar Energy Systems

Economics – Third-Party Ownership Vs. Lease Vs. Purchase...

	Third-Party Ownership	Purchase
Cash Outlay	Minimal to zero	Cost of System (after incentives)
Federal Tax Credit	To Lessor	To Business Owner
Local Incentives	To Lessor	To Business Owner
Maintenance	Lessor	Homeowner
Monthly Payment	Yes. May vary w/energy.	No. (Unless financed.)
Escalation Clause	Yes. Pmt increases w/time.*	No.
On Sale of Building	Buyer assumes contract.*	Wrapped into mortgage.
	* Lease terms may vary.	

Purchase by cash payment or low-interest loan (LoanSTAR, PACE, etc.) is a clear winner in terms of ROI in virtually all cases.

Solar PV – Financing Solar Energy Systems

Economics – Direct Purchase

Question: Pro / Con – Direct Purchase (cash, financed, etc.)

- + Highest long-term savings potential of all the plans.
 - + Buyer receives immediate tax benefits through the Federal Tax Credit, plus state and local incentives.
 - + Buyer can take advantage of rapid asset depreciation through “MACRS”.
 - + Lowest energy rate of all the options.
 - + Locked-in rate for energy produced by the solar equipment.
 - + Increases the value of your building.
-
- May require large capital outlay or loan depending on your balance sheet.
 - Responsibility for maintenance is on the buyer.

Solar PV – Financing Solar Energy Systems

Economics – "PACE" - A Direct-Purchase Funding Program

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.

Solar PV – Financing Solar Energy Systems

Economics – "PACE" - A Direct-Purchase Funding Program

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.

Solar PV – Financing Solar Energy Systems

Economics – "PACE" - A Direct-Purchase Funding Program

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.

Solar PV – Financing Solar Energy Systems

Economics – "PACE" - A Direct-Purchase Funding Program

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.

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Economics – "PACE" - A Direct-Purchase Funding Program

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...

Solar PV – Financing Solar Energy Systems

Economics – "PACE" - A Direct-Purchase Funding Program

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 the utility rates go up.

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

Solar PV – Financing Solar Energy Systems

Economics – "PACE" - A Direct-Purchase Funding Program

Example comparing PACE to 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

All three are viable. Best ROI is through PACE.

Solar PV – Financing Solar Energy Systems

Economics – Fannie Mae "HomeStyle Energy Program"

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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

Solar PV – Financing Solar Energy Systems

Economics – Fannie Mae "HomeStyle Energy Program"

- ☀ 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.

Solar PV – Financing Solar Energy Systems

Economics – Fannie Mae "HomeStyle Energy Program"

- ☀ 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.

Solar PV – Financing Solar Energy Systems

Economics – 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....

Solar PV – Financing Solar Energy Systems

Economics – 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 for webinar details

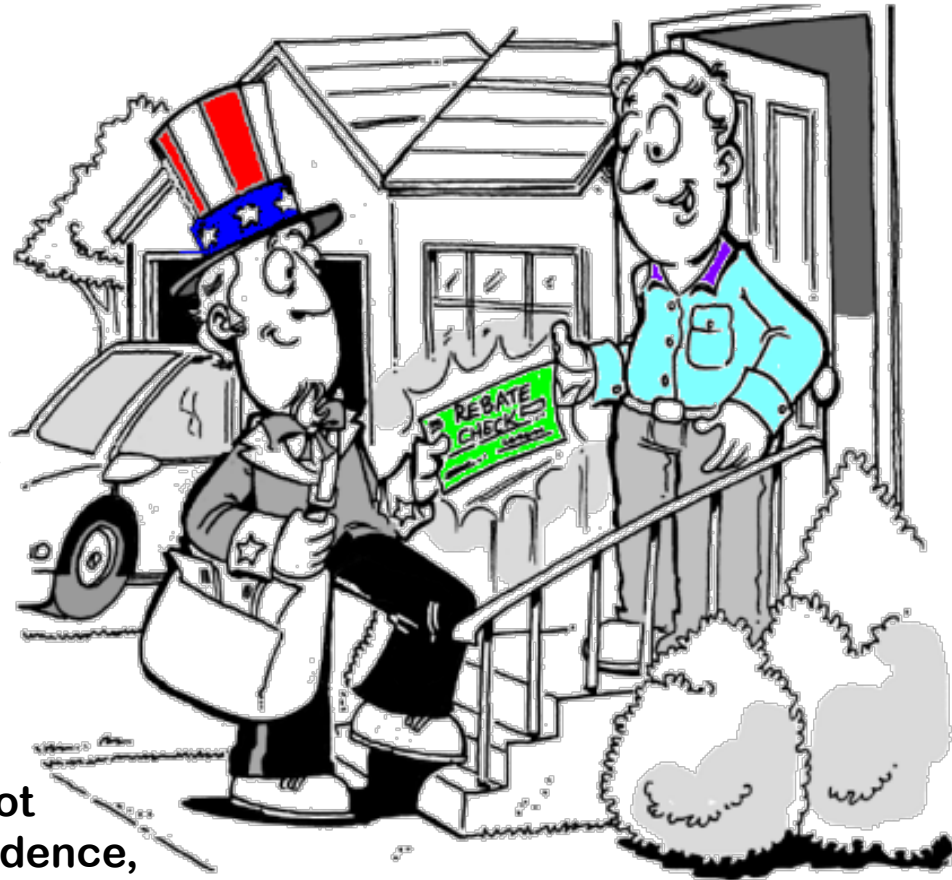
Solar PV – Financing Solar Energy Systems

Financial Incentives - Federal - 30% Tax Credit

Federal Energy Bill of 2005 - Extended to 2019

30% of Installed Cost Through December 31, 2019.

- ☀ There is **NO LIMIT** on the maximum tax credit.
- ☀ Ramps down to 26% in 2020, 22% in 2021, and after 2023, the commercial and utility credit will stay at 10%. Residential goes to zero in 2023.
- ☀ The credit applies to the total installed cost of commercial or residential solar energy systems, and is taken on the balance remaining after all other incentives are applied.
- ☀ The home served by the system does not have to be the taxpayer's principal residence, but cannot be rental or income property.



Solar PV – Financing Solar Energy Systems

Financial Incentives - State, Regional & Local Incentives

The Database of State Incentives for Renewables & Efficiency® ("DSIRE") lists all known state, regional, and local incentives.

Database of State Incentives for Renewables & Efficiency®

Find Policies & Incentives Near You | Zip Code

Find Policies & Incentives by State

1 180

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

NC CLEAN ENERGY TECHNOLOGY CENTER

NC STATE UNIVERSITY

There are 153 rebates, policies, tax exemptions, and other incentives to advance renewable energy in Texas. (As of June 6, 2016).

Solar PV – Financing Solar Energy Systems

Financial Incentives - Federal Tax Break - "MACRS"

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

MACRS = “Modified Accelerated Cost Recovery System” (rapid depreciation).

- ☀ Qualifying solar energy equipment is eligible for a cost recovery period of five years.
- ☀ For equipment on which an Investment Tax Credit (ITC) or a 1603 Treasury Program grant is claimed, the owner must reduce the project’s depreciable basis by one-half the value of the 30% ITC.
- ☀ This means the owner is able to deduct 85 percent of his or her tax basis.

If you have a third-party-owned or leased system, you are not eligible for MACRS.

Solar PV – Financing Solar Energy Systems

Financial Incentives - State Tax Breaks

- ☀ Businesses that either use or manufacture or install solar or wind energy can receive franchise tax deductions and/or exemptions.
- ☀ There also exists a State of Texas property tax exemption involving solar, wind, biomass, and anaerobic digestion for business installation or construction of such systems.
- ☀ Though the focus in this presentation is on business, commercial and public properties, it's appropriate to mention residential renewable energy systems are also eligible for tax exemptions on assessed valuation.
- ☀ Resource:

<http://seco.cpa.state.tx.us/re/incentives-taxcode-statutes.php>

Solar PV – Financing Solar Energy Systems

Financial Incentives - State, Regional & Local Incentives - Utility Company Rebates

If Oncor charges you for use of their power lines (check your bill), they offer incentives for commercial and residential customers:

Oncor provides rebates to customers for implementation of solar electric and solar hot water systems up to approximately 30% of the cost of the system – including installation.

www.takealoadoftexas.com

Click on “Business” .. Then “Solar Photovoltaic”.

Utility companies throughout Texas offer incentives. To find offers in your area, visit: www.dsireusa.org, select "Texas", and review the list. Several search options are provided.

Solar PV – Financing Solar Energy Systems

Financial Incentives - State, Regional & Local Incentives - Utility Company Pay/Credit

Utility companies that pay or give credit for excess solar energy may be found here: www.powertochoose.com

As of June 7, 2016, utility companies paying and/or offering credit for solar energy are:

TXU Energy

"Clean Energy Credit Program"

MP2 Energy Texas, LLC

"Solar Buyback Program"

"Net Energy Metering Program"

Reliant Energy

"Reliant Solar Sell Back Plan"

Green Mountain Energy

"Renewable Rewards®"

Amigo Energy

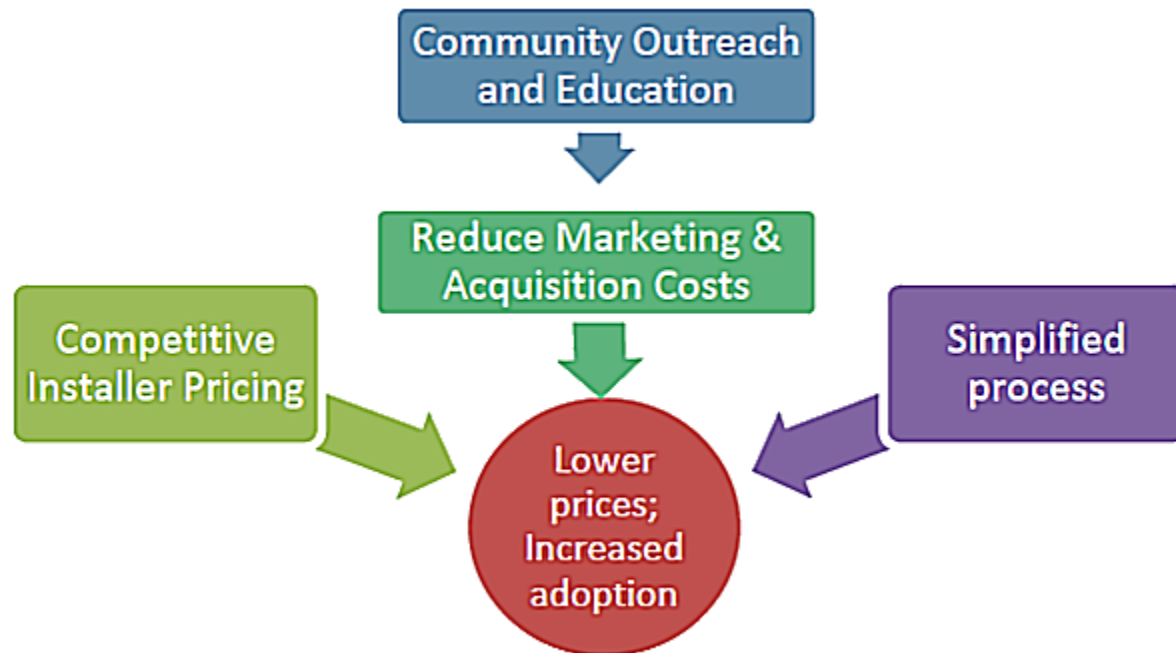
"Excess Generation Sell Back Program"

Solar PV – Financing Solar Energy Systems

Financial Incentives - State, Regional & Local Incentives - "Solarize" Groups

Though not an incentive, "Group Purchase" concepts such as "Solarize" programs reduce cost and promote local solar PV adoption.

Typically "grass-roots" efforts that leverage a common group purchase in exchange for discounts. Groups average 10% cost reduction compared to independent purchases.



Solar PV – Financing Solar Energy Systems

Financial Incentives - State, Regional & Local Incentives - "Solarize" Groups

Formal "solarize" groups exist in the following Texas communities:

- ☀ Houston www.solarize-houston.org
- ☀ Plano www.solarizeplano.org
- ☀ Fredericksburg www.fbgshines.org
- ☀ Wells Branch www.wellsbranchsolar.blogspot.com

Loosely organized groups exist in:

Fort Worth, Garland, McKinney, Gillespie County, Kyle, and San Marcos, with others in the formative stages around Texas.

For more information: www.solarizetexas.org

Solar PV – Financing Solar Energy Systems

Financial Incentives - Your ACTUAL Utility Rate:

Account Detail

Previous Balance		\$	141.17	
Credits/Payments				
Payment	02/12/2013	\$	141.17	CR
Subtotal		\$	141.17	CR
Balance Forward		\$	0.00	
Debits/Charges				
TXU Energy Aid Donation		\$	1.00	
Subtotal		\$	1.00	

Additional Information

This invoice indicates you're a residential customer on a residential electricity plan. Rates, taxes and other charges under residential electricity plans may be different than those under business plans. We know that you have a choice in your plan and electricity provider, and we're glad you've chosen TXU Energy. We're committed to providing you with outstanding customer service. Want to send a compliment, comment or complaint? Please email our executives at bxexec@txu.com or write us at TXU Energy Executive Feedback, PO Box 850784, Dallas, TX 75285-0784. See an unauthorized or unknown charge on your bill? Contact us toll-free at 1-877-460-4262 (24X7), and we'll work to investigate and resolve the situation. If you're not satisfied with the resolution on the charges, you may file a complaint with the Public Utility Commission of Texas PO Box 13326, Austin, TX 78711-3326; (512)936-7120 or toll-free in Texas (888)782-8477. Hearing and speech-impaired individuals with text telephones (TTY) may contact the Public Utility Commission of Texas at (512)936-7136.

ESI ID Detail

The average price you paid for electric service this month was 14.5 cents per kWh excluding taxes and non-recurring charges or credits.

Meter ID	Days In Reading	Read Type	Previous Read Date	Previous Meter Read	Current Read Date	Current Meter Read	Usage (kWh)	Multiplier	Billed Usage (kWh)
115488339LG	29	Actual	01/27/2013	9205	02/25/2013	10048	843	1	843

TXU Energy FlexProtectSM

Base Charge	\$	2.95
Energy Charge (600 kWh x \$0.10565300)	\$	63.39
Energy Charge (243 kWh x \$0.09422500)	\$	22.90
Subtotal	\$	89.24

Other Fees and TDU Surcharges

TDU Delivery Charges	\$	33.04
Gross Receipts Reimb	\$	2.40
Subtotal	\$	35.44
Sales Tax	\$	0.00

Total Current Charges	\$	125.68
Total Amount Due	\$	125.68

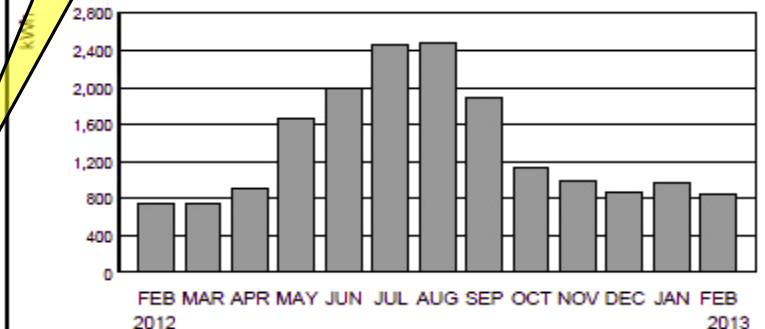
Energy Fee

Total Used

Energy Rate

Total Paid

Your Electricity Usage



Solar PV – Financing Solar Energy Systems

Financial Incentives - Your **ACTUAL** Utility Rate:

Do The Math

- Divide the **TOTAL** \$ paid by the **total** kW-h used
- **NOT THIS**: $\$ 89.24 \div 843 \text{ kW-h} = 10.6 \text{ ¢ per kW-h}$
- **THIS**: $\$125.68 \div 843 \text{ kW-h} = \underline{14.9} \text{ ¢ per kW-h}$

Solar PV – Financing Solar Energy Systems

Financial Incentives - Your **ACTUAL** Utility Rate:

Different layout - same information as TXU.

Service Address		Current Electricity Charges Detail	
For outages or emergencies 1-888-313-4747		30 Day Billing Period From 08/20/2013 To 09/19/2013	
ESI ID:		Reliant ClearSM Flex Plan	
Electric Usage Detail		Base Charge 0.00	
Meter Number: 113419649LG		Energy Charge 1,825 kWh @ \$0.115000/kWh	209.88
Current Meter Read	22578	Oncor Electric Delivery Charges	65.45
09/19/2013		Gross Receipts Tax Reimbursement	5.50
Previous Meter Read	20753	Sales Tax 1.00%	2.81
08/20/2013		Current Charges	\$283.64
kWh Multiplier	1	The average price you paid for electric service this month (per kWh) \$0.151	
kWh Usage	1,825		

Future Pricing Information: To obtain information about the price that will apply on your next bill, please contact one of our Customer Care representatives at 1-855-347-3232 or chat with us online at reliant.com.

Energy Fee

Energy Rate

Total Paid

Total Used

Solar PV – Financing Solar Energy Systems

Financial Incentives - Your **ACTUAL** Utility Rate:

Do The Math

- Divide the **TOTAL** \$ paid by the **total** kW-h used
- **NOT THIS**: $\$ 209.88 \div 1,825 \text{ kW-h} = 11.5 \text{ ¢ per kW-h}$
- **THIS**: $\$283.64 \div 1,825 \text{ kW-h} = \underline{15.5} \text{ ¢ per kW-h}$

You must take the total of all charges, fees, and taxes into account when calculating your net cost of energy per kilowatt-hour.

Why is this important?

Every kilowatt-hour contributed to your daytime usage by a PV system will have **THIS** higher net monetary value.

Solar PV – Financing Solar Energy Systems

Funding Sources - Federal Grants for Solar and Energy Efficiency

United States Department of Agriculture "REAP" Grant

"REAP" = "Rural Energy for America Program"

- ☀ Grants for up to 25% of the project cost.
- ☀ Grant range: \$2,500 to \$500,000.
- ☀ Applicants must provide at least 75% of the project cost if applying for a grant only.
- ☀ Loan guarantees on loans up to 75% of total eligible project costs.
- ☀ Businesses must be in an area other than a city or town with a population of greater than 50,000 inhabitants and the urbanized area of that city or town.
- ☀ More information: www.rd.usda.gov
... and type "REAP" into the search box at the top of the page.

Solar PV – Financing Solar Energy Systems

Funding Sources - State

LoanSTAR Pilot Program

offered by

Texas State Energy Conservation Office



www.seco.cpa.state.tx.us

Solar PV – Financing Solar Energy Systems

Funding Sources - State

LoanSTAR Pilot Program

- ☀️ LoanSTAR is a revolving loan program financing energy-related cost-reduction retrofits for state, public school district, public college, public university, and tax-district supported public hospital facilities
- ☀️ Each April and October, SECO publishes a Notice of Loan Fund Availability and request for applications of LoanSTAR loans. The notice is published in the Texas Register, on the Comptroller's website, and on the SECO Funding and Incentives web page.
- ☀️ To date, SECO has issued over \$395 million in loans for energy efficiency projects, saving Texas Taxpayers consumers \$419 million in energy costs. Actual energy savings exceeded by over 20% of the originally estimated savings, proving the program works.

Here are the numbers....

Solar PV – Financing Solar Energy Systems

Funding Sources - State

LoanSTAR Pilot Program

State Agencies and Public Higher Education

No of Loans	Project Cost	Payback, yrs.
72	\$173,938,134.60	7.1

Local and County Governments

No of Loans	Project Cost	Payback, yrs.
56	\$124,668,219.00	8.7

Public School Districts

No of Loans	Project Cost	Payback, yrs.
116	\$107,342,372.13	7.8

Solar PV – Financing Solar Energy Systems

Funding Sources - State

LoanSTAR Pilot Program

Junior and Community Colleges		
No of Loans	Project Cost	Payback, yrs.
12	\$30,705,967.00	8.6
Hospitals		
No of Loans	Project Cost	Payback, yrs.
12	\$7,323,299.00	7.9
Totals		
No of Loans	Project Cost	Payback, yrs.
269	\$443,977,991.73	8.6

Solar PV – Financing Solar Energy Systems

Funding Sources - State

LoanSTAR Pilot Program

Open enrollment period:

- ☀ Ends November 15, 2016 for this round.
- ☀ Reviewed on a first-come first-serve basis.
- ☀ Maximum number of loans: 2 per borrower.
- ☀ Loan interest rate: 2.0% per annum (1% for ARRA* funds).
- ☀ Maximum loan size per application: \$7.5 million.

Applications that do not have Memorandum of Understanding commitment by November 15, 2016 .. expire.

* ARRA = American Recovery and Reinvestment Act of 2009.

Solar PV – Financing Solar Energy Systems

Why Solar? Information for Building Owners, Contractors, and Lenders

- ☀ What steps are involved installing solar equipment on a building?
- ☀ Is there something that to do before installing solar that offers a better return?
- ☀ Finding a solar energy company.
- ☀ Comments about “leased” solar systems and a UCC filing...



Solar PV – Financing Solar Energy Systems

Information for Building Owners and Contractors

Question: How much solar equipment can be installed on our building?

This depends on the building, its location, its orientation, the amount of equipment on the top of your building .. and to a certain extent .. your Retail Electric Provider.

Typically, you can get a very rough approximation by estimating the available square footage of the roof area (minus obstructions, and allowing for clearance for pathways and other purposes), and multiplying it by 10. Thus, if you have a 30,000 square foot roof area, you could install approximately 300,000 watts of solar energy system.

Question: How are solar panels installed on a building?

Here are some examples...

Solar PV – Financing Solar Energy Systems

Information for Building Owners and Contractors

Racking & Attachment Methods - Commercial & Industrial

"Ballasted" (weighted) racks represent a large percentage of commercial roof solar PV installations. They're suitable only for flat roofs of appropriate strength.



This system uses plastic trays for the ballast blocks.



This systems uses aluminum plates for the ballast blocks.

Image courtesy of Iron Ridge www.ironridge.com

Solar PV – Financing Solar Energy Systems

Information for Building Owners and Contractors

Racking & Attachment Methods - Commercial & Industrial



Ballasted mounts allow flexibility in placement with minimal or no roof penetrations. The roof structure must be strong enough to support all of the additional weight. Roofing materials must also be suitable, and in very good condition.

Solar PV – Financing Solar Energy Systems

Information for Building Owners and Contractors



Large ballasted system covers this entire building.

379 kW laminated system.
Not as heavy as ballasted, but also not as efficient due to PV running hotter (no ventilation).



Coca Cola bottling plant, Los Angeles. (379 kW)

Solar PV – Financing Solar Energy Systems

Information for Building Owners and Contractors

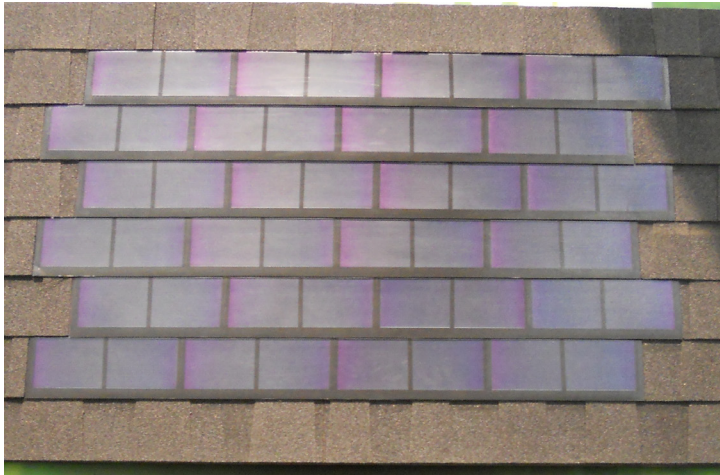


Coca Cola Distribution Center in Montebello, California (375 kW)

Solar PV – Financing Solar Energy Systems

Information for Building Owners and Contractors

Building-Integrated Photovoltaics ("BIPV")



Solar PV – Financing Solar Energy Systems

Information for Building Owners and Contractors

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

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.

Solar PV – Financing Solar Energy Systems

Information for Building Owners

- ★ What steps are involved installing solar equipment on a building?
- ★ Is there something that to do before installing solar that offers a better return?
- ★ Finding a solar energy company.
- ★ Finding a lender (if needed).
- ★ **Concerns:**
 1. Is fire fighting an issue when solar panels are present?
 2. Describe any maintenance and service required.
 3. Is obsolescence a concern?
 4. What if the roof needs replacement?
 5. What about hail?



FedEx Hub, Hutchins, Texas. Largest rooftop PV system in N. Texas (~1.4 MW)

Solar PV – Financing Solar Energy Systems

- ★ 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
- ★ Why Solar? Information for Building Owners, Contractors, and Lenders
- ★ **Information for Buyers**
- ★ Information for Lenders
- ★ Open Q & A

Solar PV – Financing Solar Energy Systems

Information for Buyers

- ★ Finding and vetting a solar energy company.
- ★ Finding a lender.
- ★ What surprises may await in the process?
- ★ The "no money out of pocket" is attractive, but a 20-year lease is onerous.
- ★ What should I / we expect when the system is installed?
- ★ After the system is installed?
- ★ Solar leasing companies say the "inverters" will wear out in 10 years, and will have to be replaced. Is this true?
- ★ Will the solar equipment continue to power the building if utility power goes off?

Solar PV – Financing Solar Energy Systems

- ✦ Brief History & Overview of Solar Energy with Definitions
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- ✦ **Information for Lenders**
- ✦ Open Q & A

Solar PV – Financing Solar Energy Systems

Information for Lenders

- ★ What is the risk profile when financing solar energy equipment?
- ★ How do we confirm a fair value of the installed system for underwriting?
- ★ Describe the life expectancy of the solar equipment.
- ★ We're interested in financing solar equipment, but would like to know more about it. Where can lenders go for assistance?

Lenders may contact:

State of Texas Energy Conservation Office
Texas Pace Authority
Solar Energy Finance Association (SEFA)

<http://seco.cpa.state.tx.us>
www.texaspaceauthority.org
www.sefa-finance.org



QUESTIONS?

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...





Thank You!

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

**Training Contact:
Dan Lepinski, P.E.
Dan@ntree.org
817.884.6081**



Thank You!

**Presentations, upcoming webinars and
training opportunities posted at
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Your Presenter...

Dan Lepinski, P.E. - Professional Consulting Engineer in Solar & Power Industries.
Dan@ntree.org

- ★ **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!