Solar Energy for Local Governments

June 8, 2016

Trainer: Dan Lepinski, P.E.

Sponsored by:

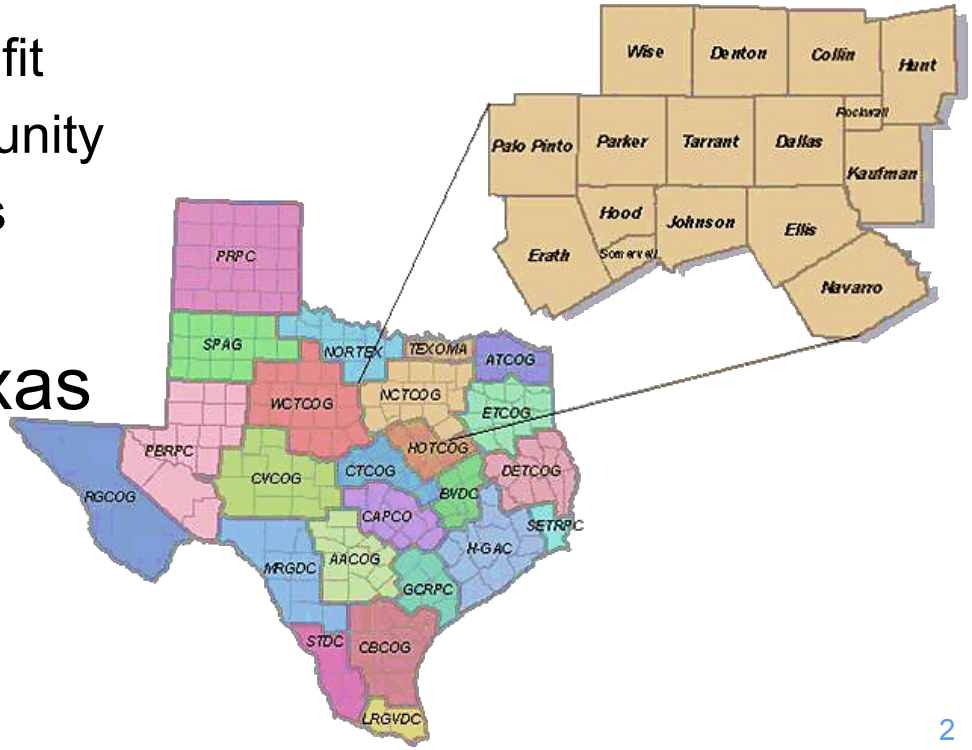
North Central Texas Council of Governments

SECO State Energy Conservation Office

www.GoSolarTexas.org

What is NCTCOG?

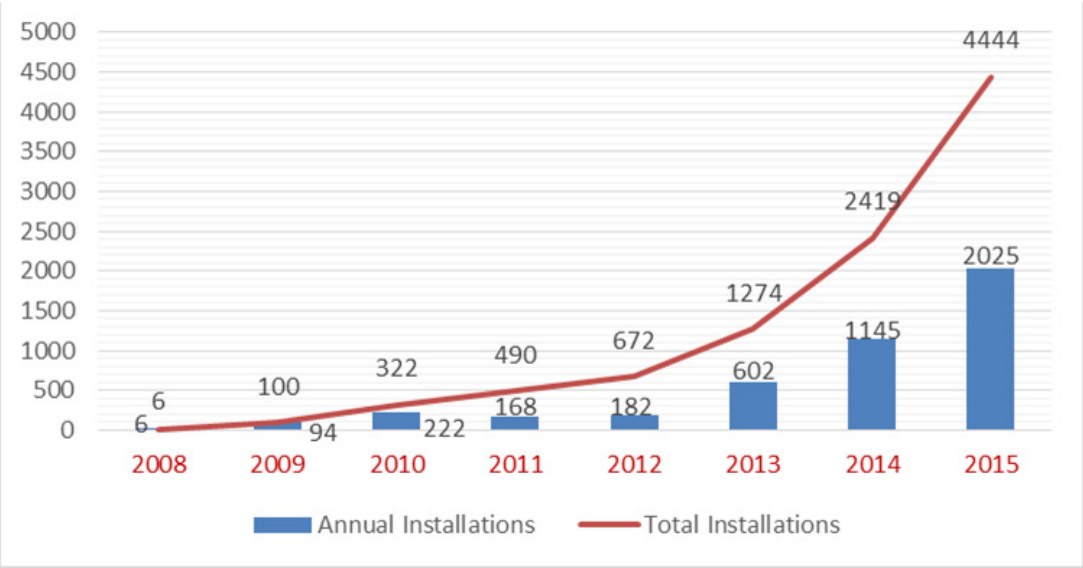
- Voluntary association of local governments
- Established in 1966
- Assists local governments in:
  - Planning for common needs
  - Cooperating for mutual benefit
  - Recognizing regional opportunity
  - Resolving regional programs
  - Making joint decisions
- One of 24 COGs in Texas
- www.nctcog.org



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 NOx avoided annually**

Solar Energy for Local Governments

Dan Lepinski, P.E.

Solar Energy for Local Governments

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.

SECO State Energy Conservation Office

50 YEARS 1966-2016

GO SOLAR

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 Energy for Local Governments
Part 1 of 2

- Brief History & Overview of Solar Energy with Definitions
- The Economics of Solar Energy
- Common Concerns & Misconceptions About Solar Energy
- Strategic Planning for 10, 20, and 30 Years

Solar Energy for Local Governments
Part 2 of 2

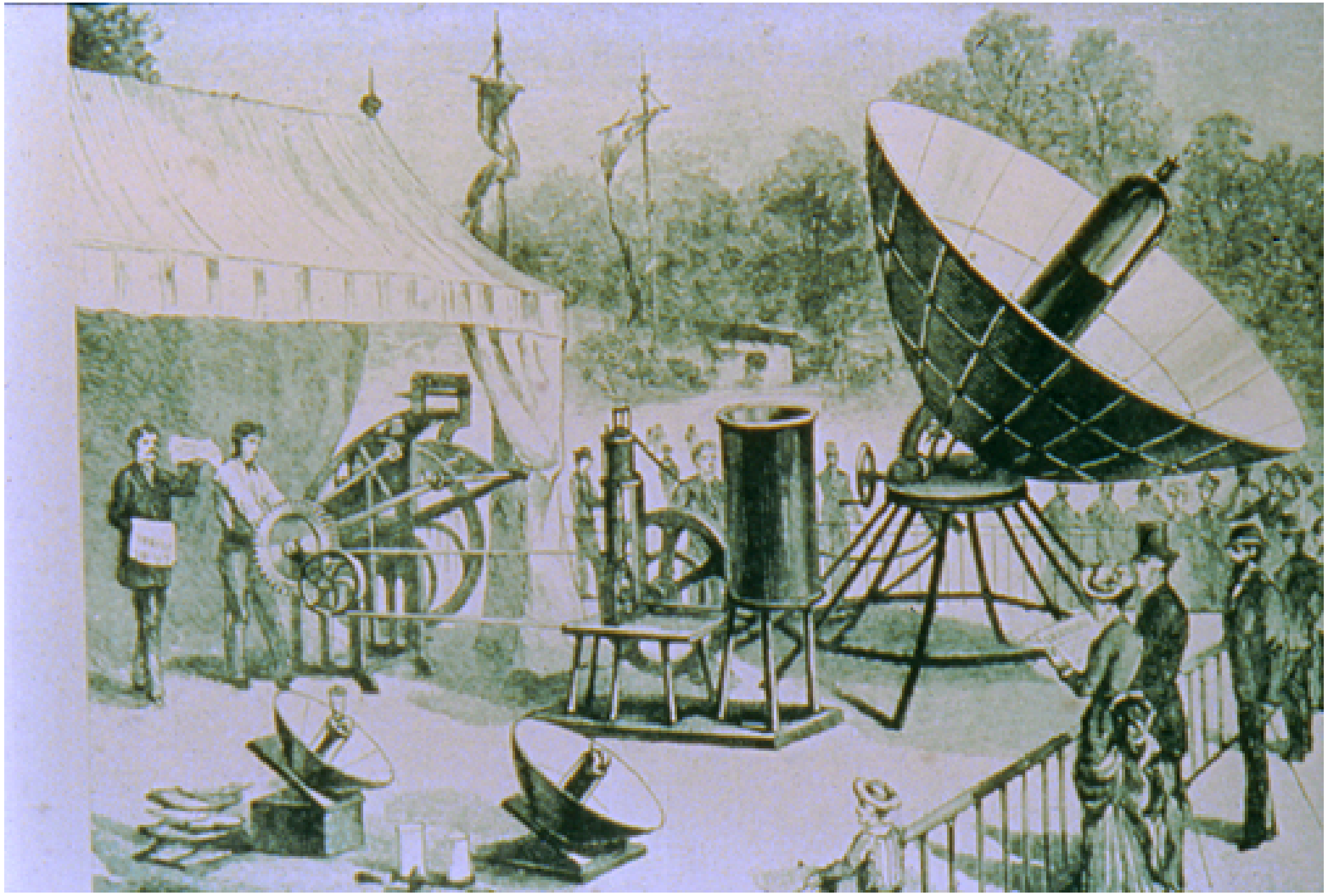
- Permitting & Ordinance Considerations
- Expedited Permitting
- Solar Technologies - Present and Future
- Open Q & A and Displays

Solar Energy for Local Governments
Part 1 of 2

- **Brief History & Overview of Solar Energy with Definitions**
- The Economics of Solar Energy
- Common Concerns & Misconceptions About Solar Energy
- Strategic Planning for 10, 20, and 30 Years

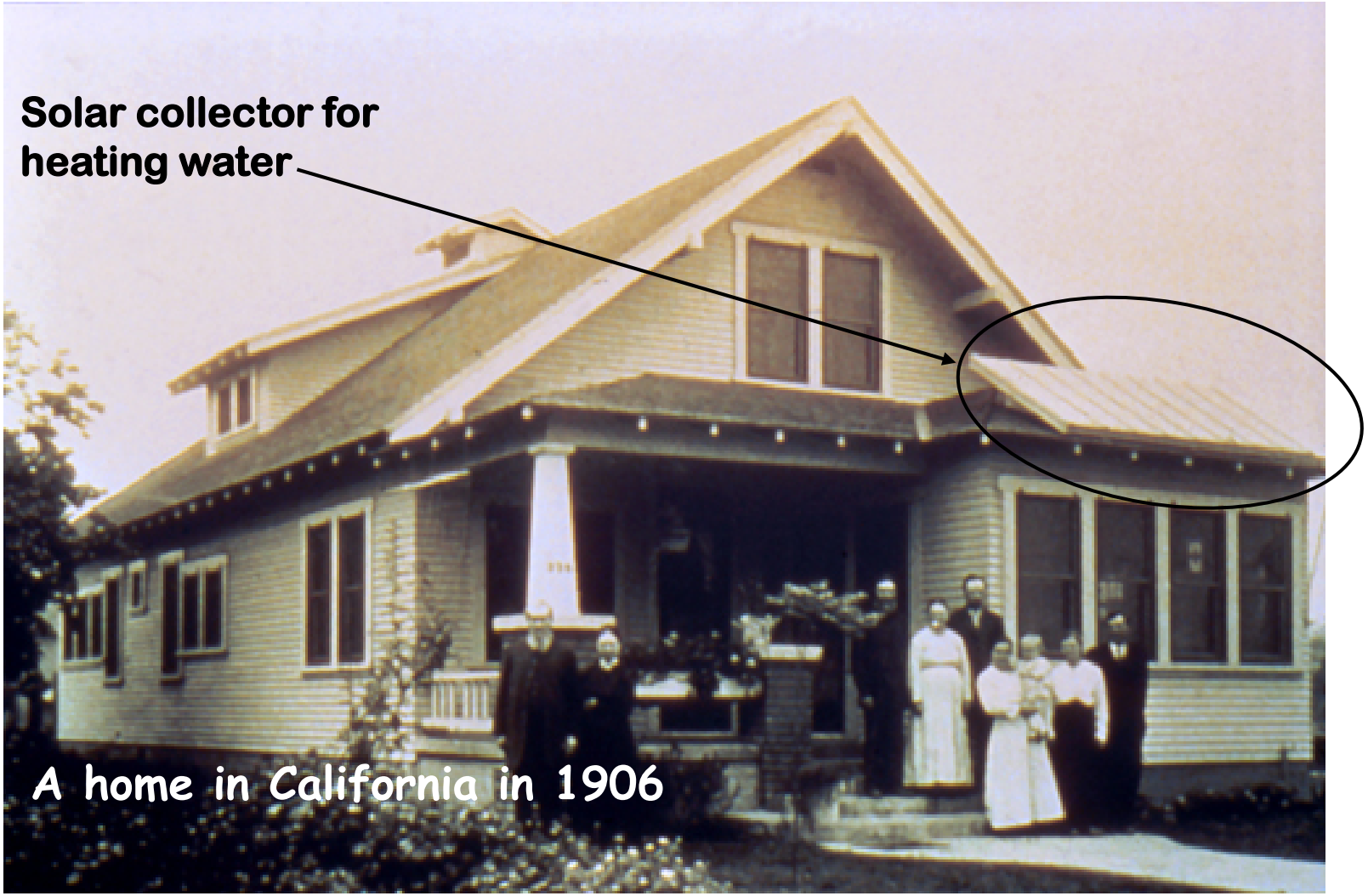
Solar Energy Isn't New…

This illustration is from the 1890's World Fair.



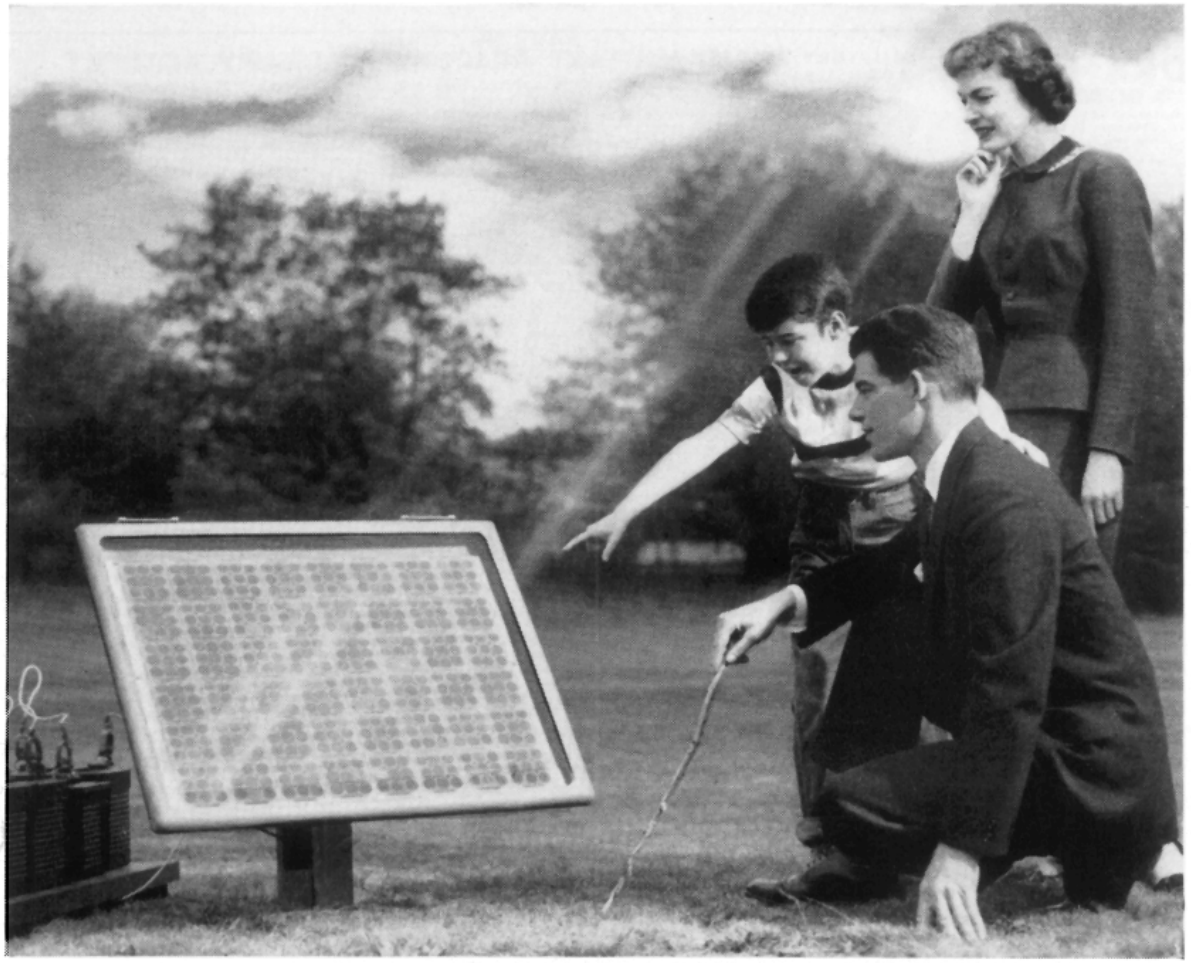
Solar Energy Isn't New…

This example is from California in 1906.



Solar 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

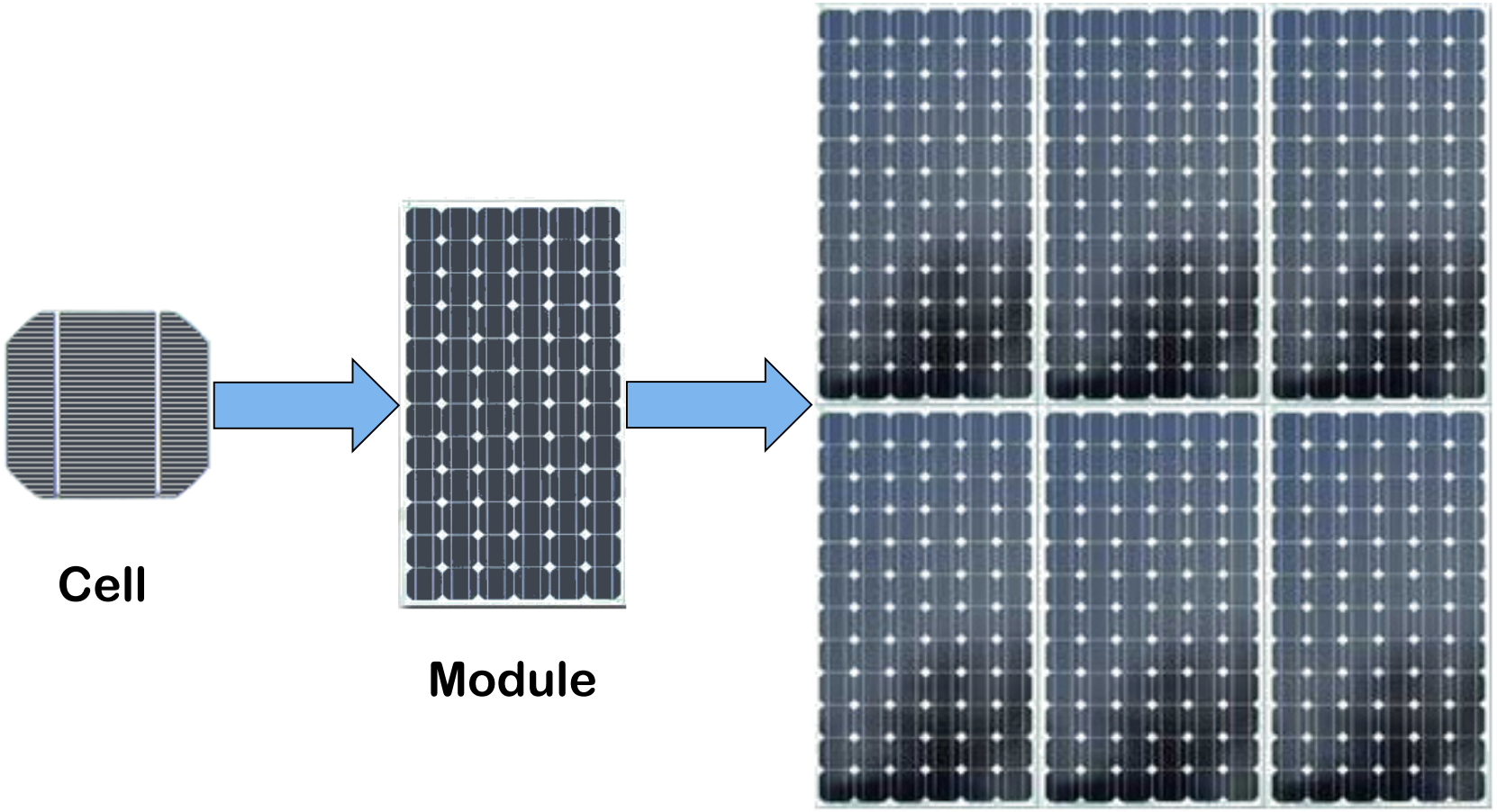
Inverter: Device that changes DC to AC.

Introduction to "Financial" Terminology

Cash Flow and Value

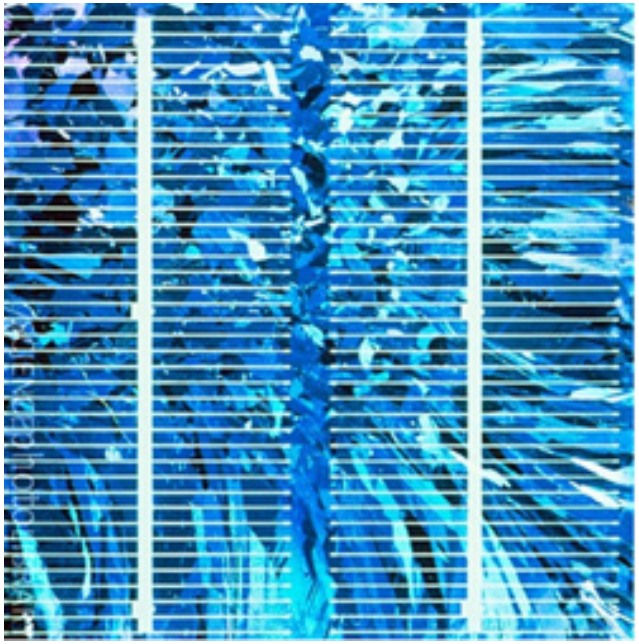
Grid-Connected:	Connected to the utility lines.
Leased System:	On the home, but owned by a third-party.
Net Metering:	Credit for energy sent back to the utility.
Net Zero:	Energy credit balances energy consumed.
"PACE":	Property Assessed Clean Energy (Finance).
Parity:	Energy value balances loan payment.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

Definitions: Solar Cell, “PV” Module, Array



Most solar cells are dark blue to black…

Monocrystalline Cell



Polycrystalline Cell

Both are silicon. Manufacturing methods differ.

Some solar materials are reddish-brown or gray…

Amorphous Silicon

Cadmium Telluride

Copper Indium
Gallium Selenide

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.

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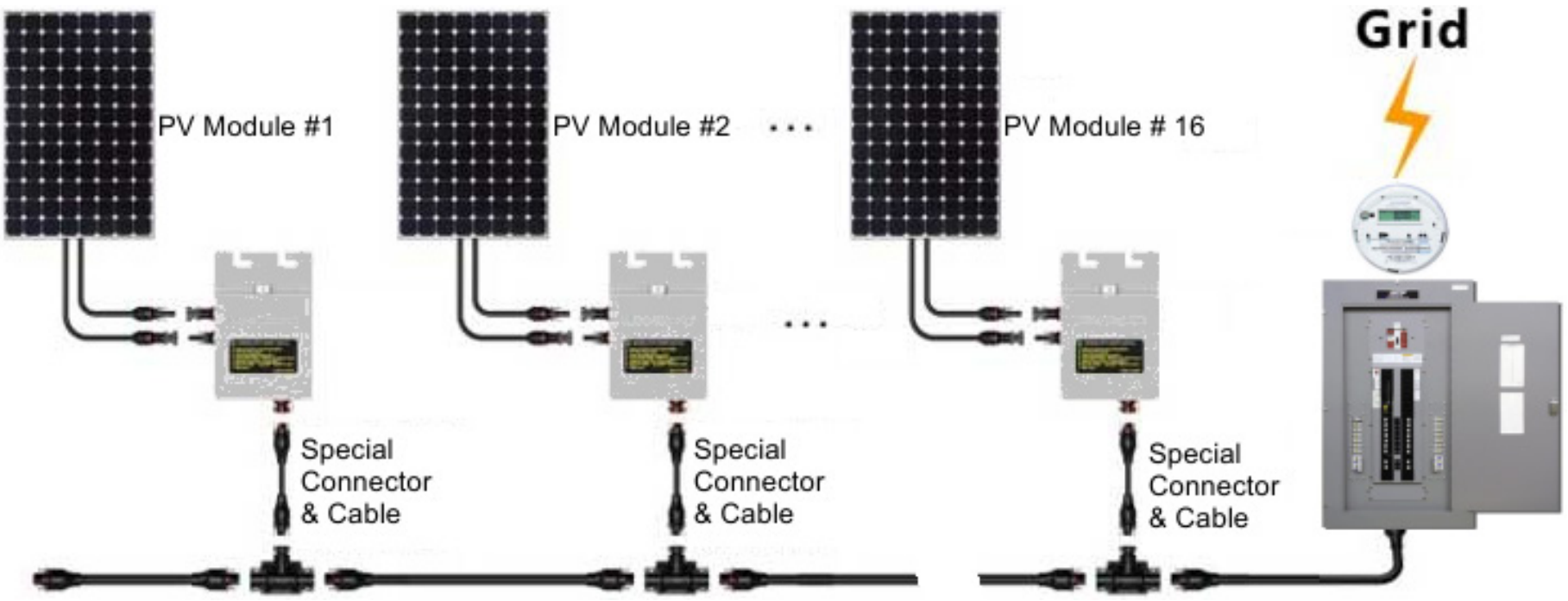
Basic Overview - "Microinverter" Inverter System



Microinverters

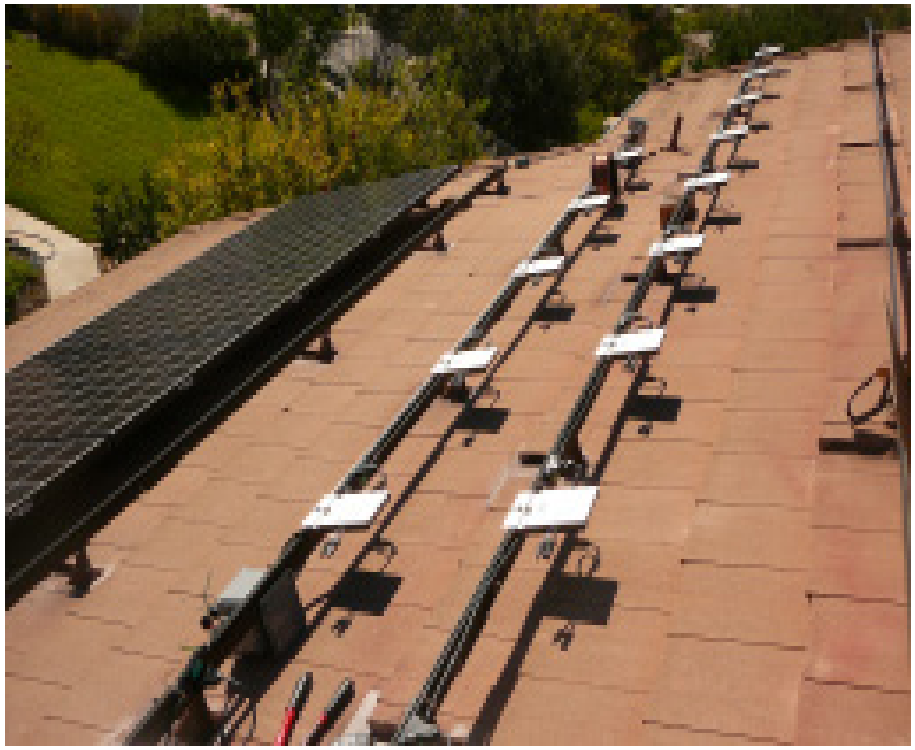
Some Considerations for Selection and Use:

1. Sites where shade may be an issue.
2. Odd-facing roof surfaces.
3. Insufficient continuous roof surface.
4. Allows for incremental system growth.

Basic Overview - "Microinverter" Inverter System

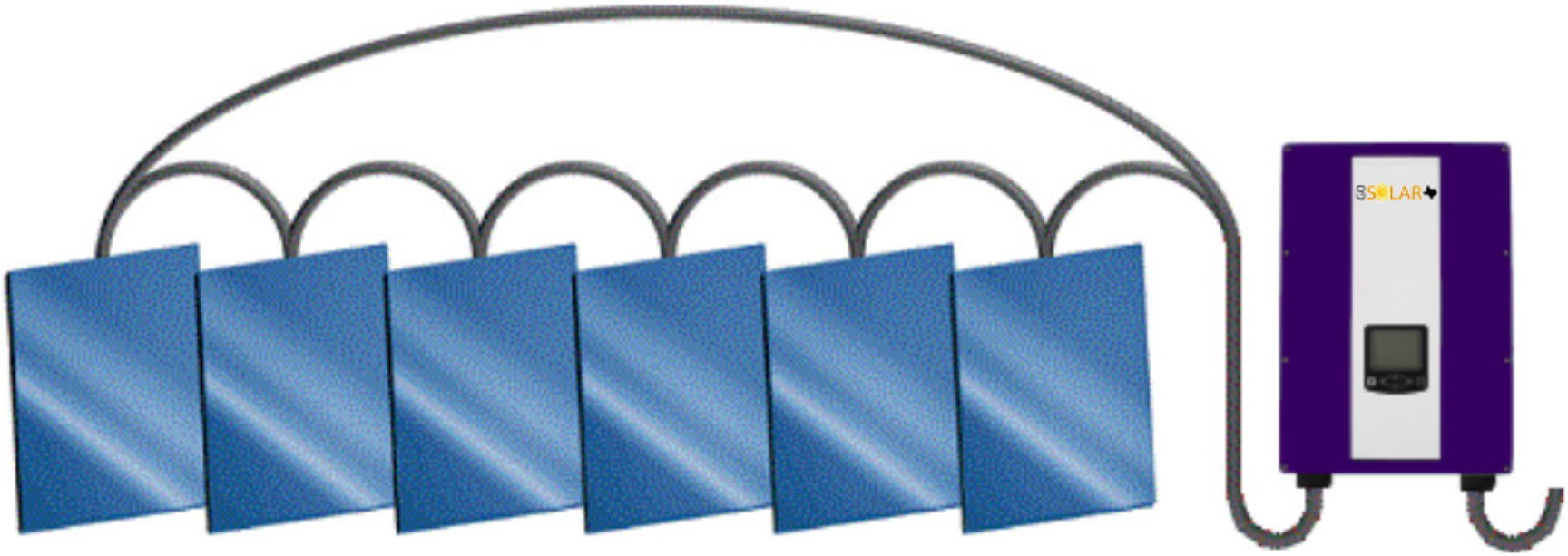
Microinverters:
Typically 200-350 Watts each.

Attach to racking or PV modules.



Basic Overview - "String" Inverter System

Solar panels are connected one to another .. in a "string".



Some Considerations for Selection and Use:

1. Slightly lower installation cost than a "microinverter" system.
2. More easily serviced than microinverter systems.
3. Requires "Rapid Shutdown" hardware in some cities.
4. Inverter may be installed in more environmentally-friendly location.

Note: Some required hardware omitted for simplicity.

QUESTIONS?

Solar Energy for Local Governments
Part 1 of 2

- Brief History & Overview of Solar Energy with Definitions
- **The Economics of Solar Energy**
- Common Concerns & Misconceptions About Solar Energy
- Strategic Planning for 10, 20, and 30 Years

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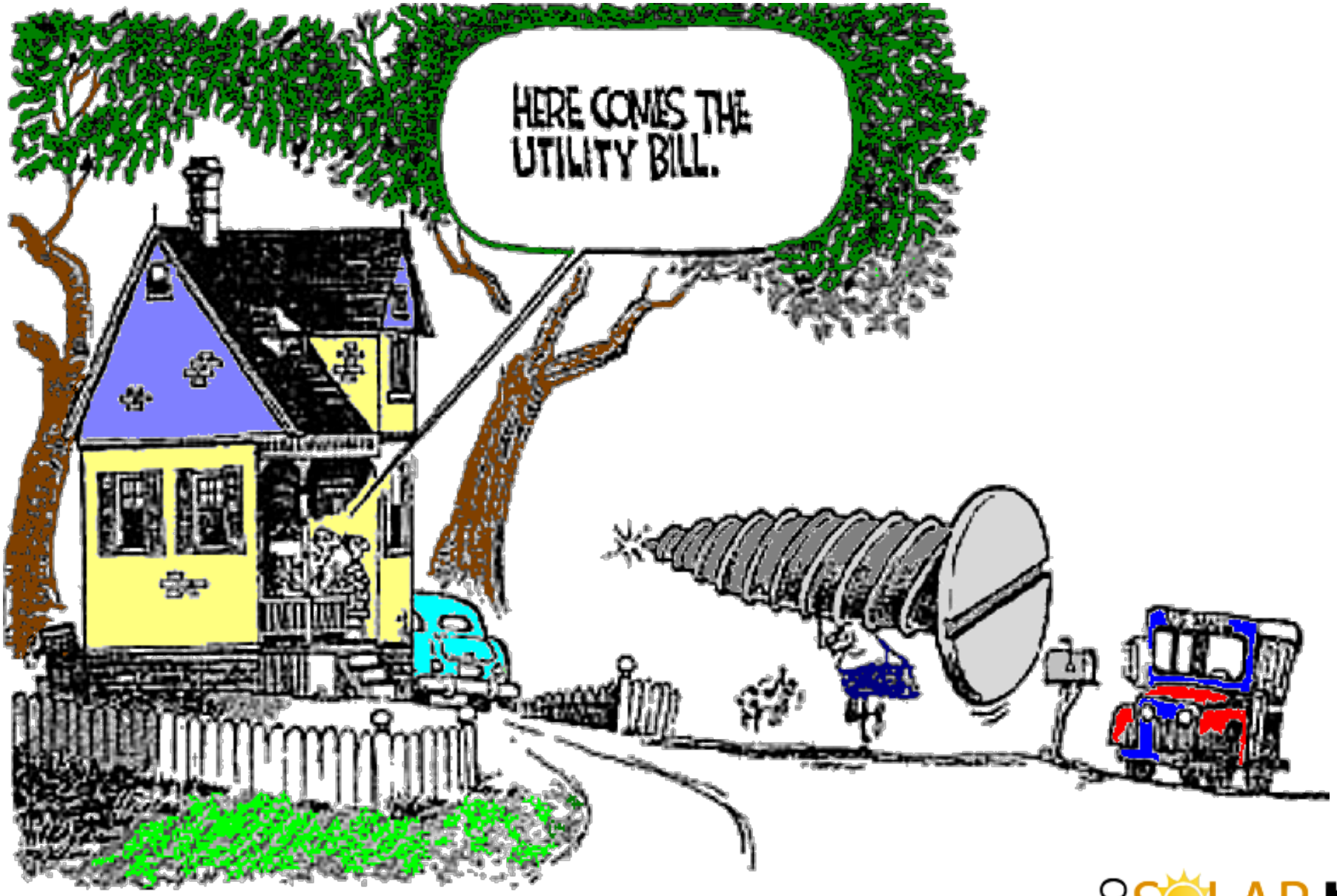
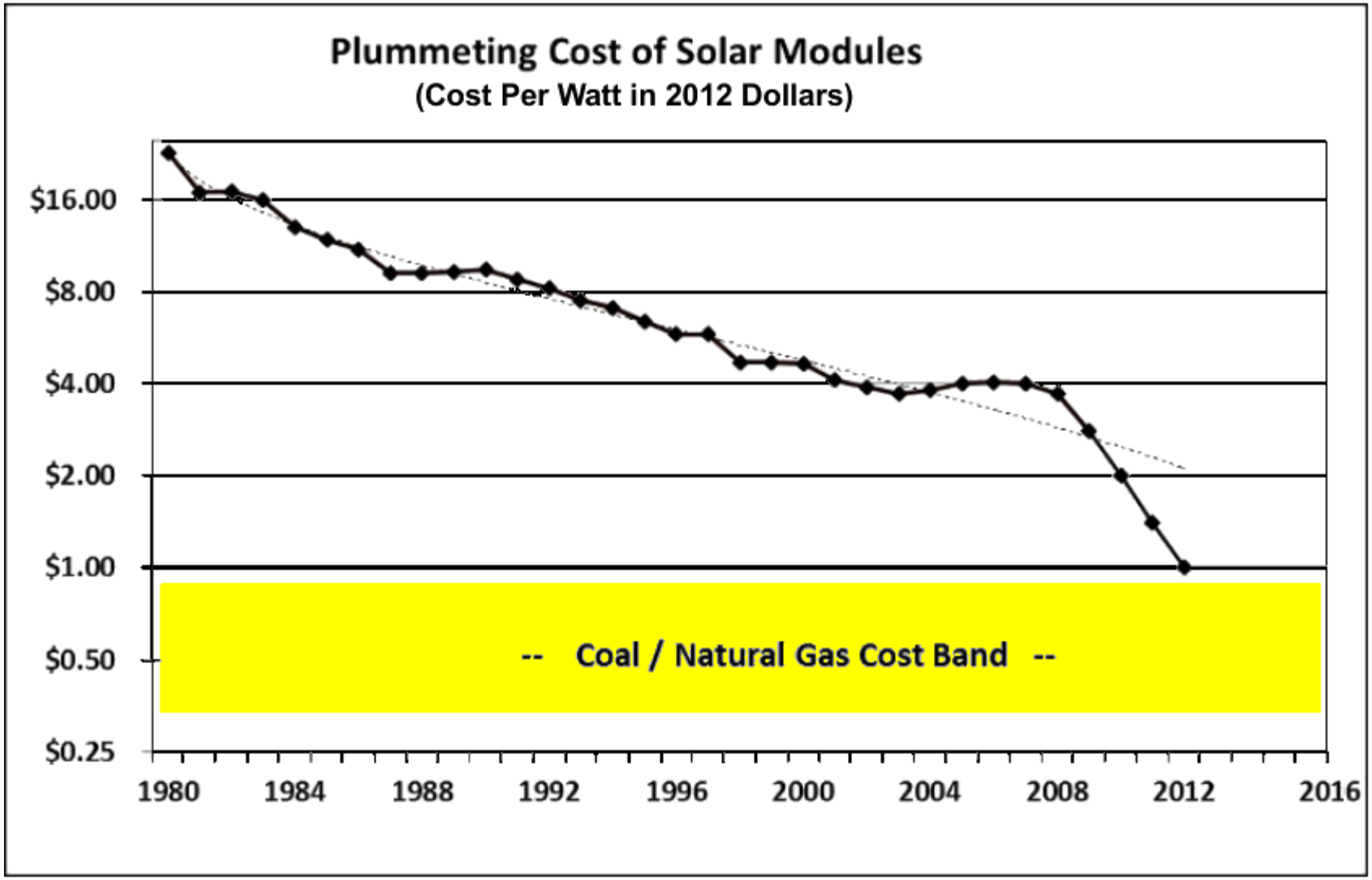
The Economics of Solar Energy…



The Economics of Solar Energy…



Source: US Dept of Energy, National Renewable Energy Laboratory Solar Market Report, www.nrel.gov

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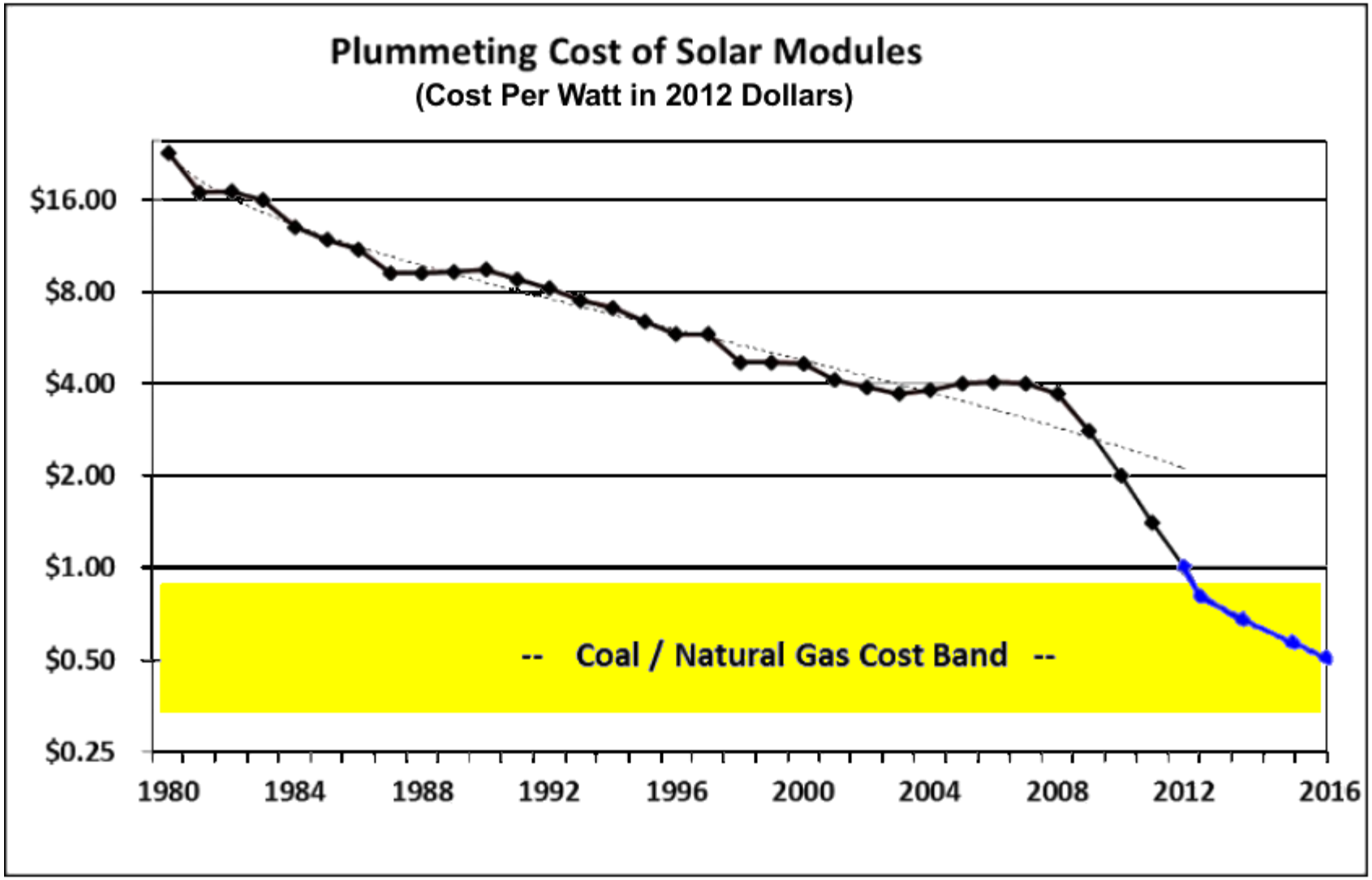
The Economics of Solar Energy…



Source: US Dept of Energy, National Renewable Energy Laboratory Solar Market Report, www.nrel.gov

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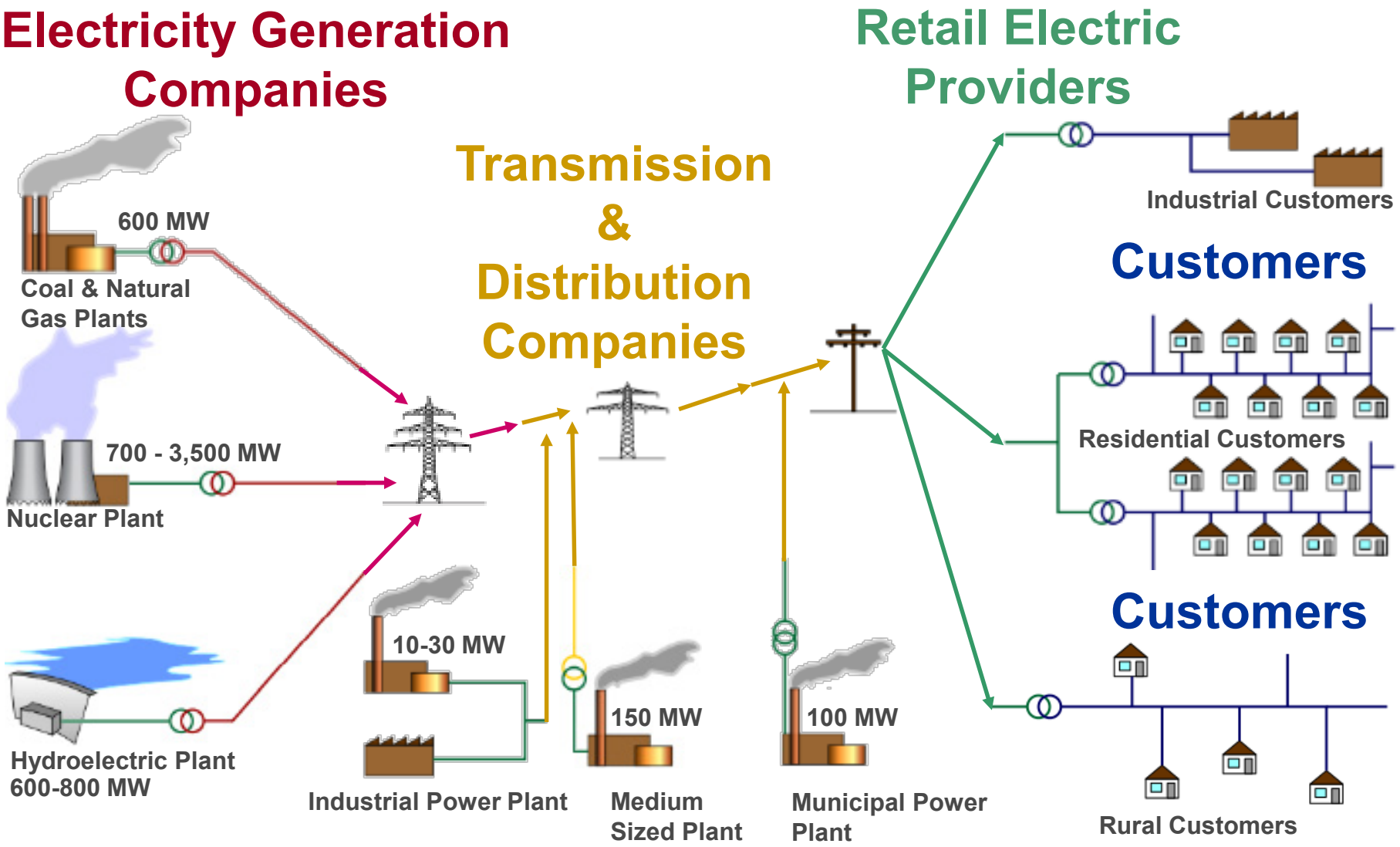
The Economics of Solar Energy…

Where does electricity come from?



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 …

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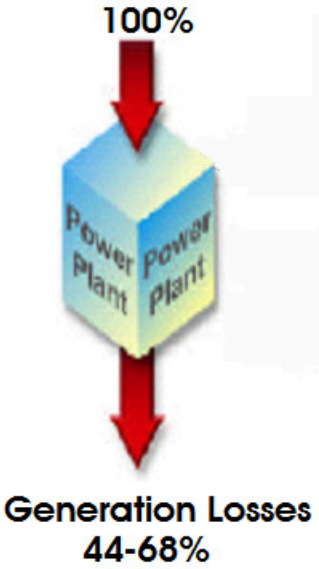
The Economics of Solar Energy…

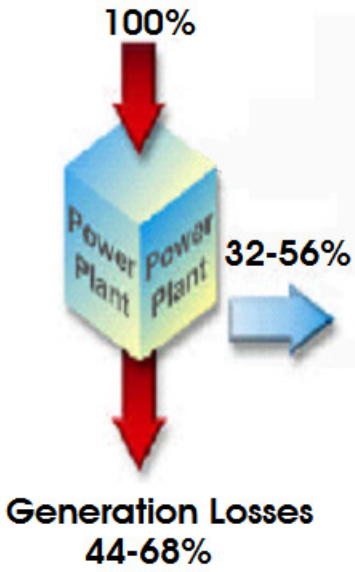
Why Is Distance Significant?



…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…

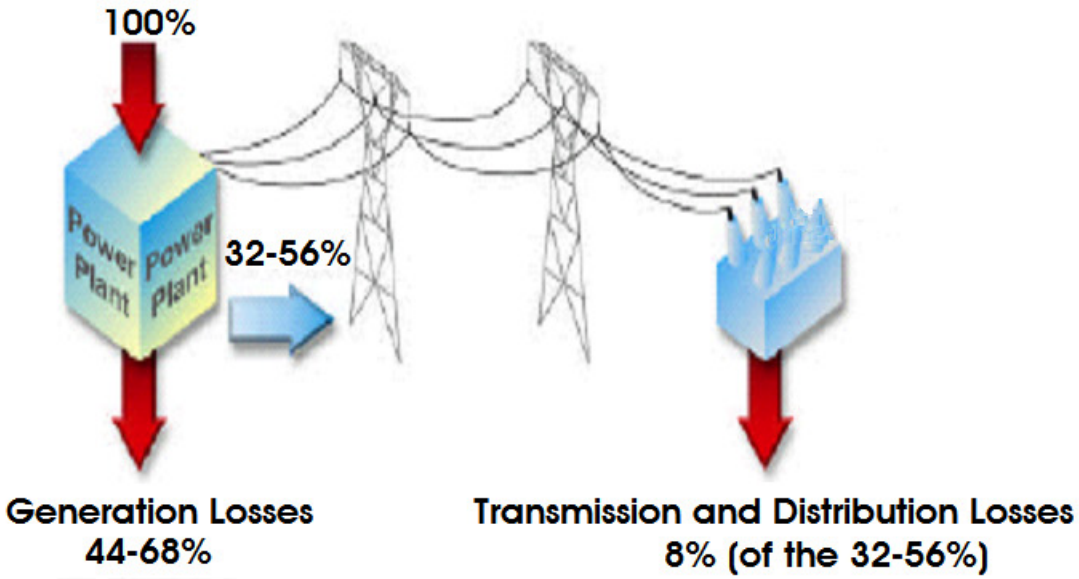
Why Is Distance Significant?



…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%.

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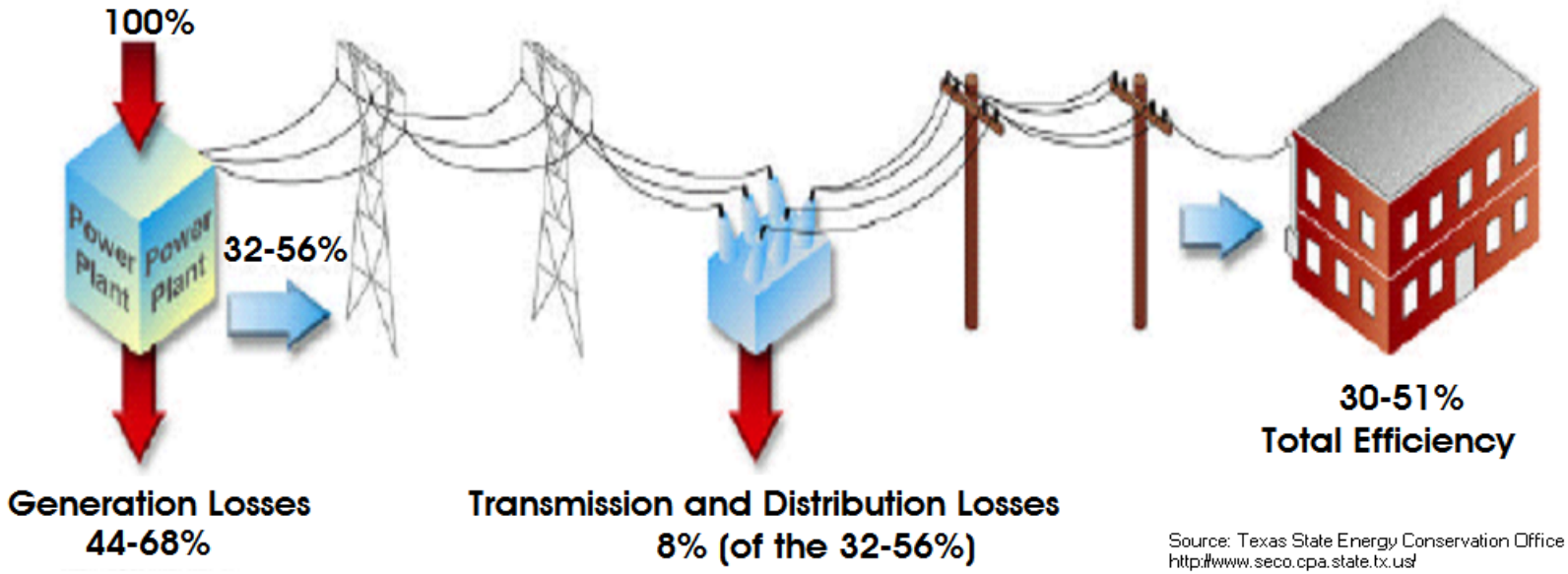
The Economics of Solar Energy…

Why Is Distance Significant?



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

Source: State of Texas Energy Conservation Office, www.seco.cpa.state.tx.us

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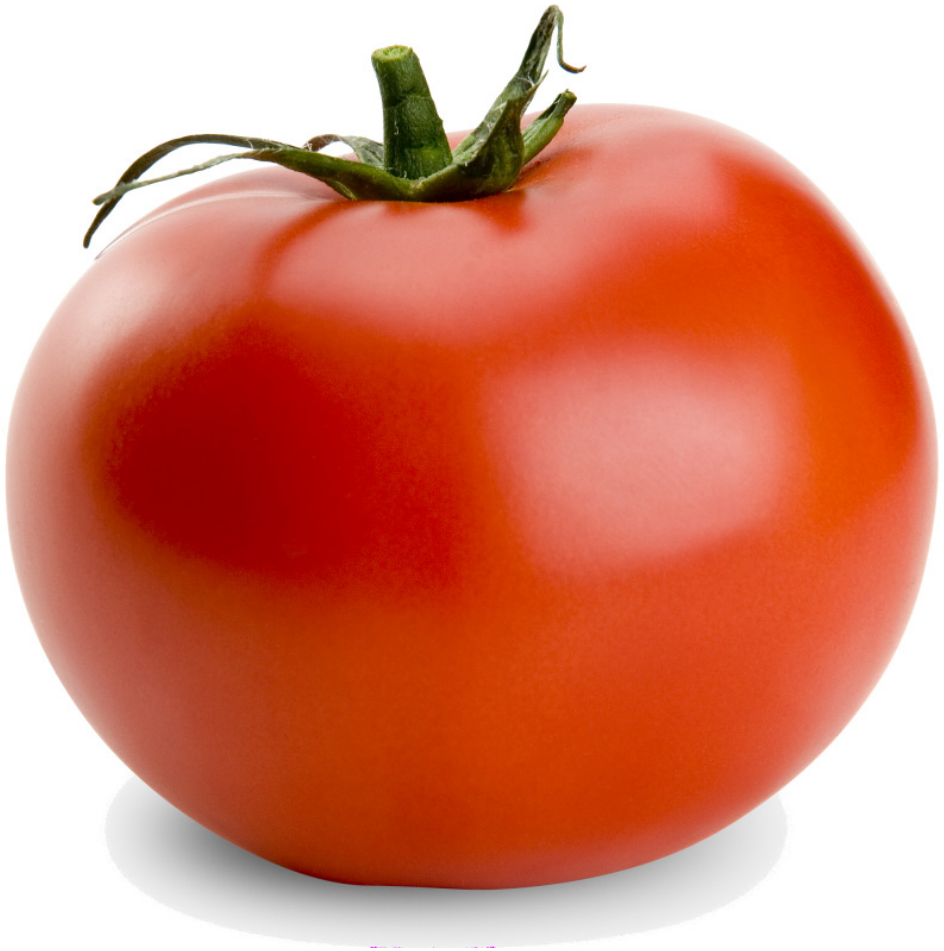
The Economics of Solar Energy…

Why Is Distance Significant?



The Economics of Solar Energy…

Benefits to A Municipality:

- ☼ "Solar-friendly" cities are viewed as "progressive", "forward thinking" .. and a more desirable place to live.
- ☼ "Solar" homes generally sell 4-50% faster[1][2] and at higher prices than non-solar homes, with a premium up to $4.00 per installed watt of solar energy equipment.[3] Thus a home with 5,000 watts of solar panels would sell for up to $20,000 more than a comparable home without solar.
- ☼ May increase the overall municipal property tax base through higher property valuation at the time of sale.

[1] Colorado Energy Office, "The Impact of Photovoltaic Systems on Market Value and Marketability", Oct 2013, www.colorado.gov/pacific/energyoffice/

[2] Phoenix Business Journal, "Solar homes move faster, sell for higher prices than non-solar homes", Dec 15, 2014, www.bizjournals.com/phoenix/news/

[3] U.S. Dept of Energy, Berkeley Laboratory study, "Selling Into the Sun", an analysis of more than 22,822 home sales in eight states from 2002 to 2013, 3,951 of the homes had solar PV. Authors include Thomas Jackson, AICP, MAI, CRE, FRICS, Real Property Analytics, Inc., Texas A&M University, and Sandra Adomatis, SRA, Adomatis Appraisal Services, Punta Gorda, Florida.

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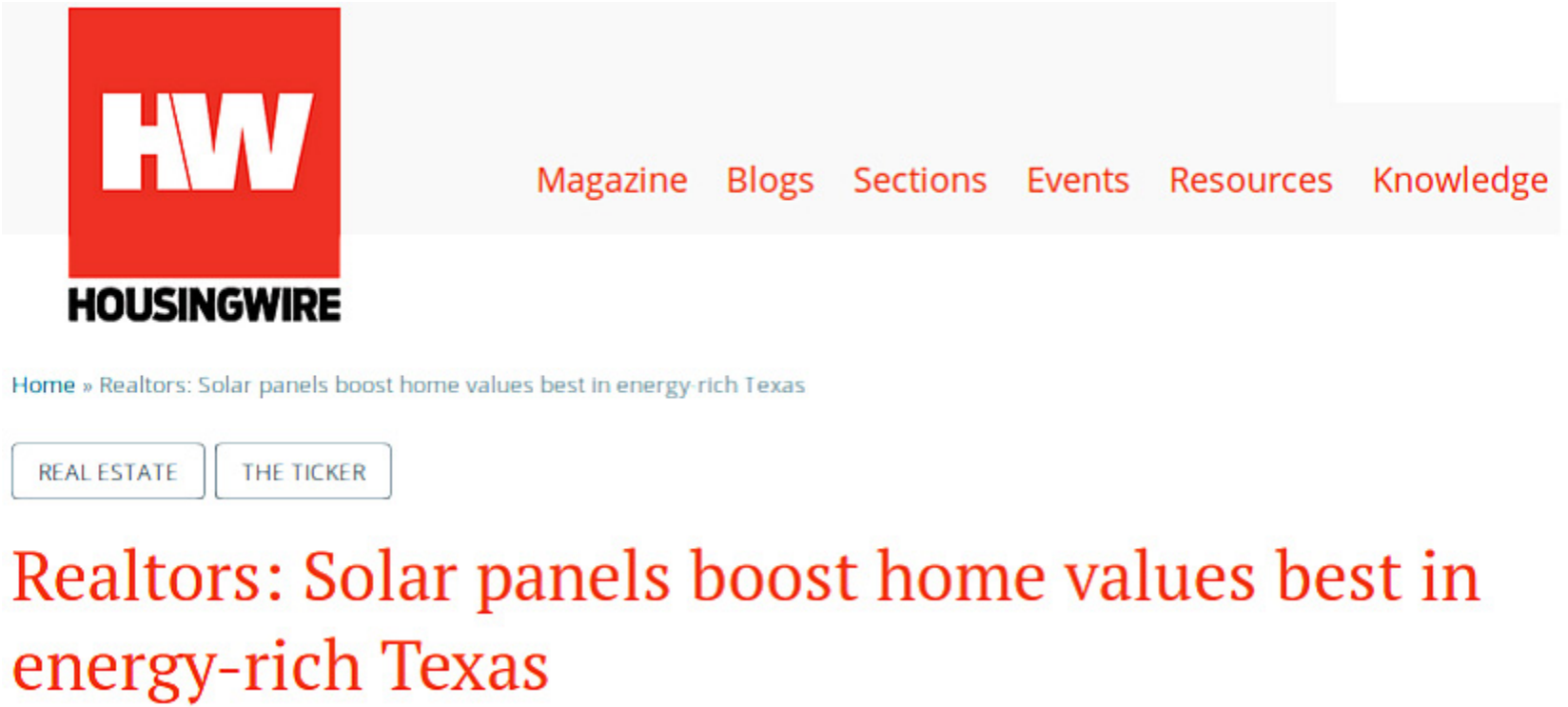
The Economics of Solar Energy…

Benefits to A Municipality:



This report studies recoup costs for 30 remodeling projects in the West South Central U.S., Austin, Dallas, El Paso, McAllen and San Antonio. And, according to the survey respondents, green energy ideas boost the value of the home the most.

Source: www.housingwire.com/articles/36674-solar-panels-help-home-values-in-energy-rich-texas, April 1, 2016

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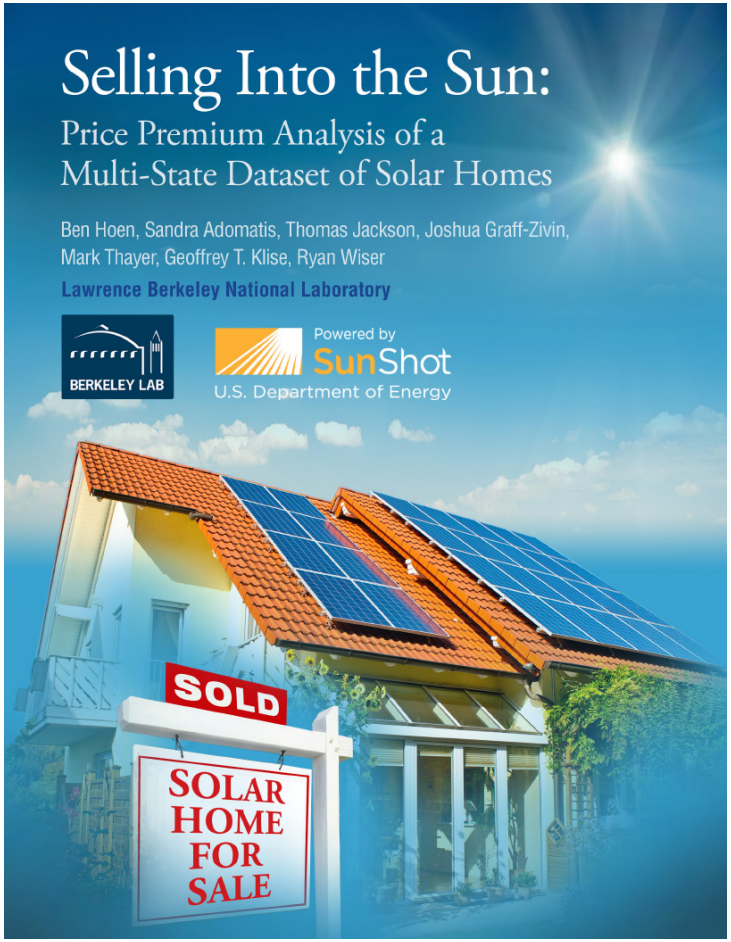
The Economics of Solar Energy…

Benefits to A Municipality:



This report analyzed sales of 22,822 homes in eight states, 3,951 of which are "solar", spanning years 2002 - 2013.

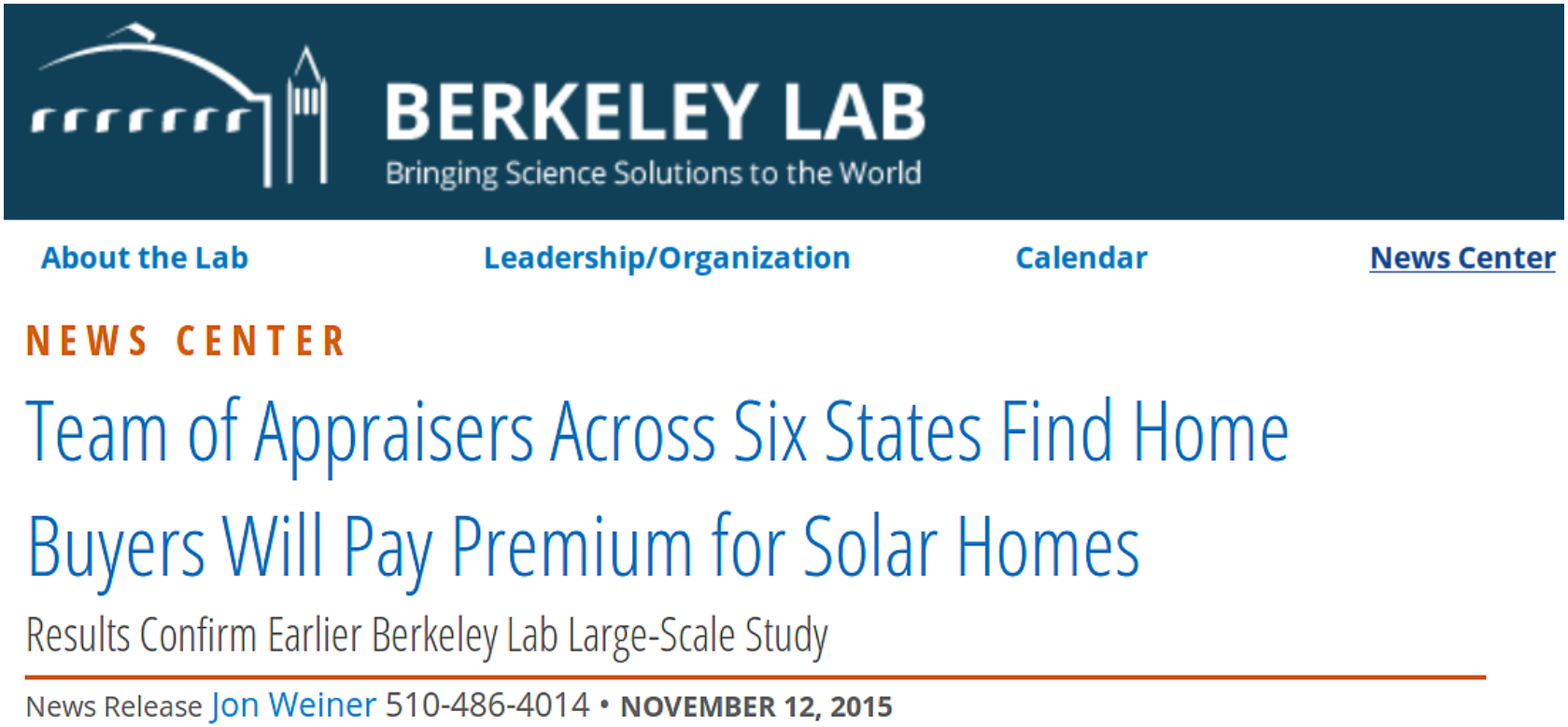
Results showed home buyers are consistently willing to pay PV home premiums across various states, housing and PV markets, and home types. Average premiums across the full sample equate to approximately $4 per watt, or $15,000 for a typical size 3.6 kW PV system.

The research team included:
Thomas Jackson, Ph.D., AICP, MAI, CRE, FRICS, Appraiser, Professor, Real Property Analytics, Inc., Texas A&M University, and Sandra Adomatis, SRA, Adomatis Appraisal Services, Punta Gorda, Florida.

Source: US Dept of Energy, Berkeley National Lab report "Selling Into the Sun", LBNL Report # 6942E, 2002 - 2013

The Economics of Solar Energy…

Benefits to A Municipality:



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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**

This follow-up study reconfirmed and reinforced results in the 2002-2013 report "Selling Into the Sun".

Source: www.housingwire.com/articles/36674-solar-panels-help-home-values-in-energy-rich-texas, April 1, 2016

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The Economics of Solar Energy…

Benefits to A Municipality:

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Students may get easier path to sue University of Phoenix

PHOENIX BUSINESS BLOG
Valley doughnut shop named best in Arizona

PHOENIX BUSINESS BLOG
Renters paying $1,200 more annually for Phoenix metro apartments

MOST POPULAR

INDUSTRY NEWS › RESIDENTIAL REAL ESTATE

Solar homes move faster, sell for higher prices than non-solar homes

Dec 10, 2014, 2:38pm MST **Updated** Dec 15, 2014, 11:02am MST

INDUSTRIES & TAGS Residential Real Estate, Commercial Real Estate

Rob Madden, Broker with Green Leaf Realty in the Phoenix area, tracked data from the Arizona Regional MLS. During November, 2014, a typically soft month for sales, 81 solar homes sold. The November time frame was 4.5 percent faster for solar than non-solar homes. Madden said his findings for solar home values are consistently higher regardless of age or location.

Source: www.housingwire.com/articles/36674-solar-panels-help-home-values-in-energy-rich-texas, April 1, 2016

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The Economics of Solar Energy…

Benefits to A Municipality:

Effect of Solar Energy Equipment on Property Values

1. "**Evidence of Rational Market Valuations for Home Energy Efficiency**"
   Author: US Dept of Housing and Urban Development (HUD) (1998, 2008)
   Finding: Homes with solar equipment **INCREASE** in value $15,000-$20,000 for every $1,000 in annual utility savings.

2. "**More Evidence of Rational Market Valuations for Home Energy Efficiency**"
   Author: US Dept of Energy, Environmental Protection Agency (EPA) (1999, 2008)
   Finding: Reaffirmed prior study. Homes with solar equipment **INCREASE** in value $15,000-$20,000 for every $1,000 in annual utility savings.

3. "**An Analysis of the Effects of Residential Photovoltaic Energy Systems on Home Sales Prices in California**" (A 9-year study, from 2000 to 2009.)
   Author: Lawrence Berkeley National Laboratory, April, 2011
   Finding: Homes with solar energy systems commanded a sales premium of approximately $17,000 for a 3,100 watt PV system (average size of systems in the study).
   This equates to $5.48 per installed watt of solar panels.

4. "**Exploring California PV Home Premiums**"
   Author: Lawrence Berkeley National Laboratory (December, 2013)
   Finding: The analysis in this study shows homes sold between 2000 and 2009, PV value's estimates are conservative, below emarket-indicated premiums.

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The Economics of Solar Energy…

Benefits to A Municipality:

Effect of Solar Energy Equipment on Property Values

5. "**The Impact of Photovoltaic Systems on Market Value and Marketability**"
   Author: State of Colorado Energy Office (May, 2013)
   Finding: 30 homes used as case studies sold between Jan 1, 2011 and May 31, 2013
   * None of the homes sold for less because they had a PV system.
   * 21 homes (70%) sold for higher because they had a PV system.
   * 26 homes (87%) had much shorter marketing times because they had PV systems.

6. "**APS Informed Perception Project Report**"
   Author: Commissioned by Arizona Public Service (Arizona's largest public utility.)
   Conducted by: Morrison Institute for Public Policy, Arizona State University (May, 2011)
   Finding: 94 % of APS' customers support increasing the use of solar energy.

7. "**Valuation Methods for Building-Mounted Solar Photovoltaic Systems**"
   Author: James Finlay, VP, Sr. Commercial Appraisal Manager, Wells Fargo Bank (July, 2011)
   Finding: "PV Systems Have Value. Buyers and sellers do indeed value saving money on energy, and this has consistently been shown to translate into market value. These statistically robust studies unquestionably refute the null hypothesis: that energy savings investments in real estate have no market value."

The Economics of Solar Energy…

Benefits to A Municipality:

Effect of Solar Energy Equipment on Property Values

8. "**Understanding the Solar Home Price Premium: Electricity Generation and "Green Social Status**"
   Author: National Bureau of Economic Research
   UCLA Ziman Center for Real Estate (July, 2011)
   Finding: Solar panels add 3.6% to the sales price of a home after controlling for observable characteristics and flexible neighborhood price trends. This corresponds to a predicted $22,554 increase in price for the average sale with solar panels installed. Homes which do not yet have solar installed but will at some subsequent time in our sample have no associated premium, indicating that our measured solar effect is not attributable to unobserved, time-invariant differences in these homes.

SUMMARY:

In **every** study, regardless whether conducted by the US Government, State Governments, Real Estate Organizations, Universities, or Financial Institutions - results for the past 20+ years show solar energy equipment INCREASES property values on which it's mounted, and has NO negative effect on neighboring homes being sold.

Appraised property valuation goes UP $2 to $4 per installed watt for a typical solar electric system.

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The Economics of Solar Energy…

Benefits to A Municipality:

- Cost of solar electricity is stable compared to other sources.
- "Solar contributes to the municipality's overall green initiative.
- It offers educational opportunities to teach children and adults the benefits of renewable energy and sustainability.
- Schools can integrate solar energy into their school curriculum.

… and more.

The Economics of Solar Energy…

Benefits to A Municipality:

North Central Texas Council of Governments

Solar Ready II

Powered by SunShot U.S. Department of Energy

This material is based upon work supported by the U.S. Department of Energy under Award Number DE-EE0006310

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The Economics of Solar Energy…

Benefits to A Municipality:

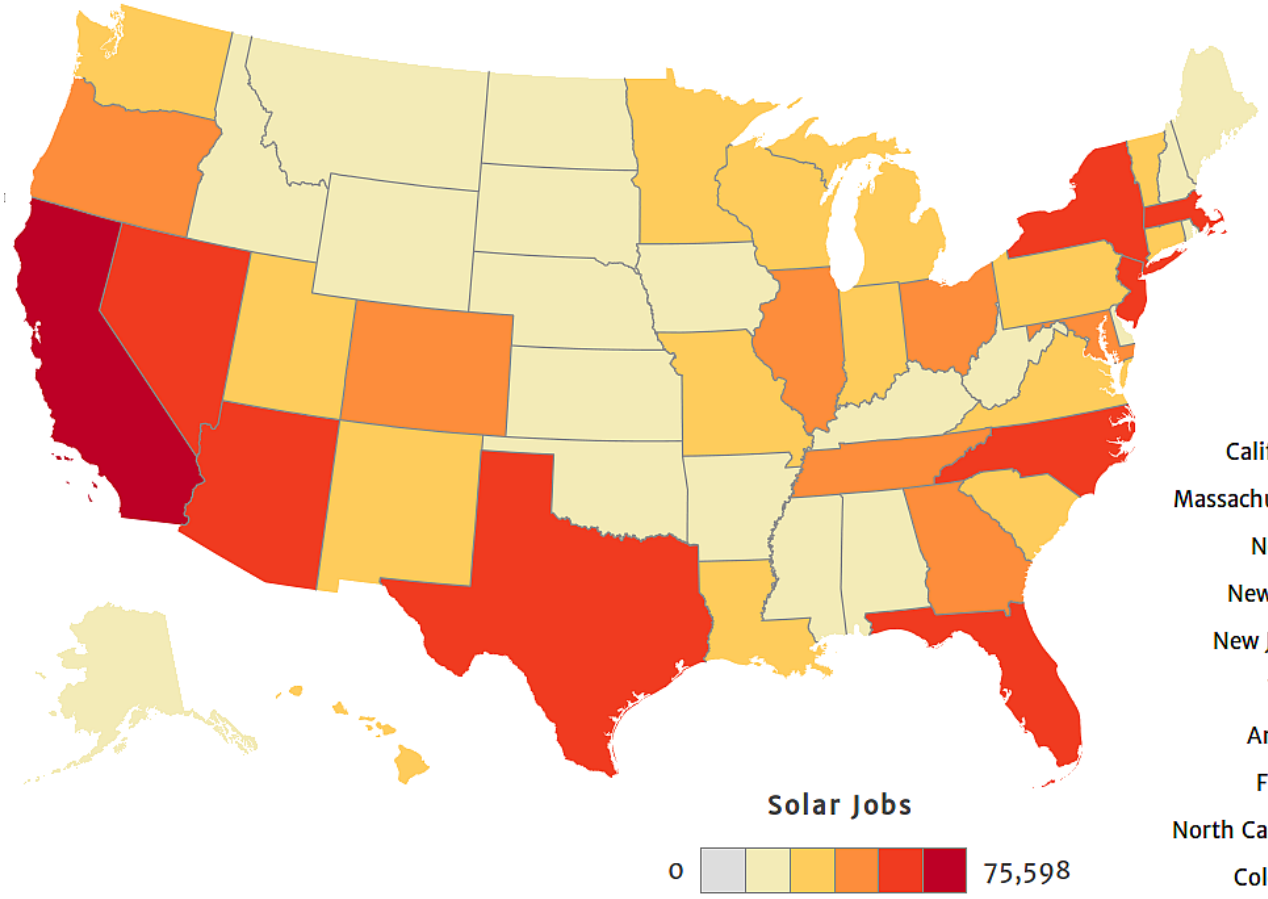
JOBS!

The Economics of Solar Energy…

Benefits to A Municipality:

The SOLAR FOUNDATION

Solar Jobs Census 2015



Solar Jobs

208,859

Nationwide

Top Ten States by

SOLAR JOBS

California	75,598
Massachusetts	15,095
Nevada	8,764
New York	8,250
New Jersey	7,071
Texas	7,030
Arizona	6,922
Florida	6,560
North Carolina	5,950
Colorado	4,998

Source: U.S. Dept of Energy, Berkeley Laboratory study of more than 22,000 home sales: "Selling Into the Sun".

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The Economics of Solar Energy…

Benefits to A Municipality:

JOBS

- In the US, there are now twice as many solar workers as coal miners.[1]
- The solar industry continues to outpace most other sectors of the economy, adding workers at a rate nearly 12 times faster than the overall economy and accounting for 1.2% of all jobs created in the U.S. over the past year.[2]
- U.S. solar industry now employs more workers than oil & gas. 184,500 in oil & gas, 209,000 in solar energy.[3][4]

[1] Forbes, Jan, 2016
[2] US Bureau of Labor Statistics, National Solar Jobs Census, Jan 8, 2016
[3] The Guardian, January, 2016
[4] United States Department of Labor

The Economics of Solar Energy…

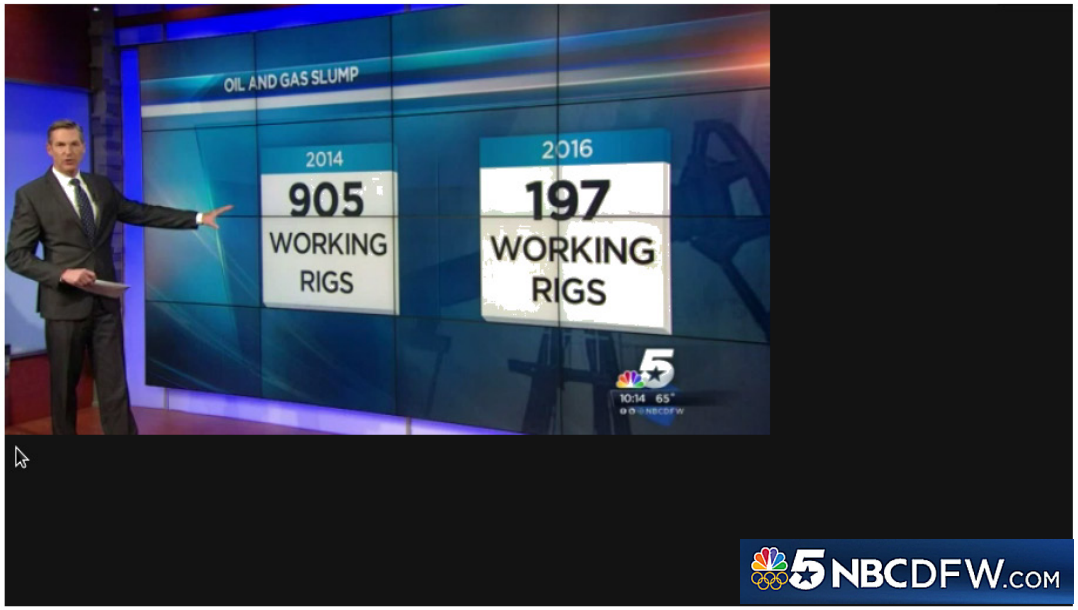
Benefits to A Municipality:

JOBS

Wind and Solar Projects Change the West Texas Landscape

Number of oil and gas rigs operating in Texas has dropped by more than 700 in less than two years

By Kevin Cokely



Two new projects are breathing life – and bringing jobs – into the heart of oil country in West Texas. (Published Monday, April 11, 2016)

The recent slump in oil prices may be nice when you fill up at the tank, but it also means a lot of Texans are now looking for work.

Just a year-and-a-half ago, Texas had 905 operating oil and gas rigs. In recent days, the count has dropped to 197.

Near the town of Haskell (about an hour north of Abilene), 450 of the unemployed oil workers have been hired to work on a 1,000 acre solar farm.

Source: KXAS NBC5, Dallas, Texas. Broadcast April 11, 2016.

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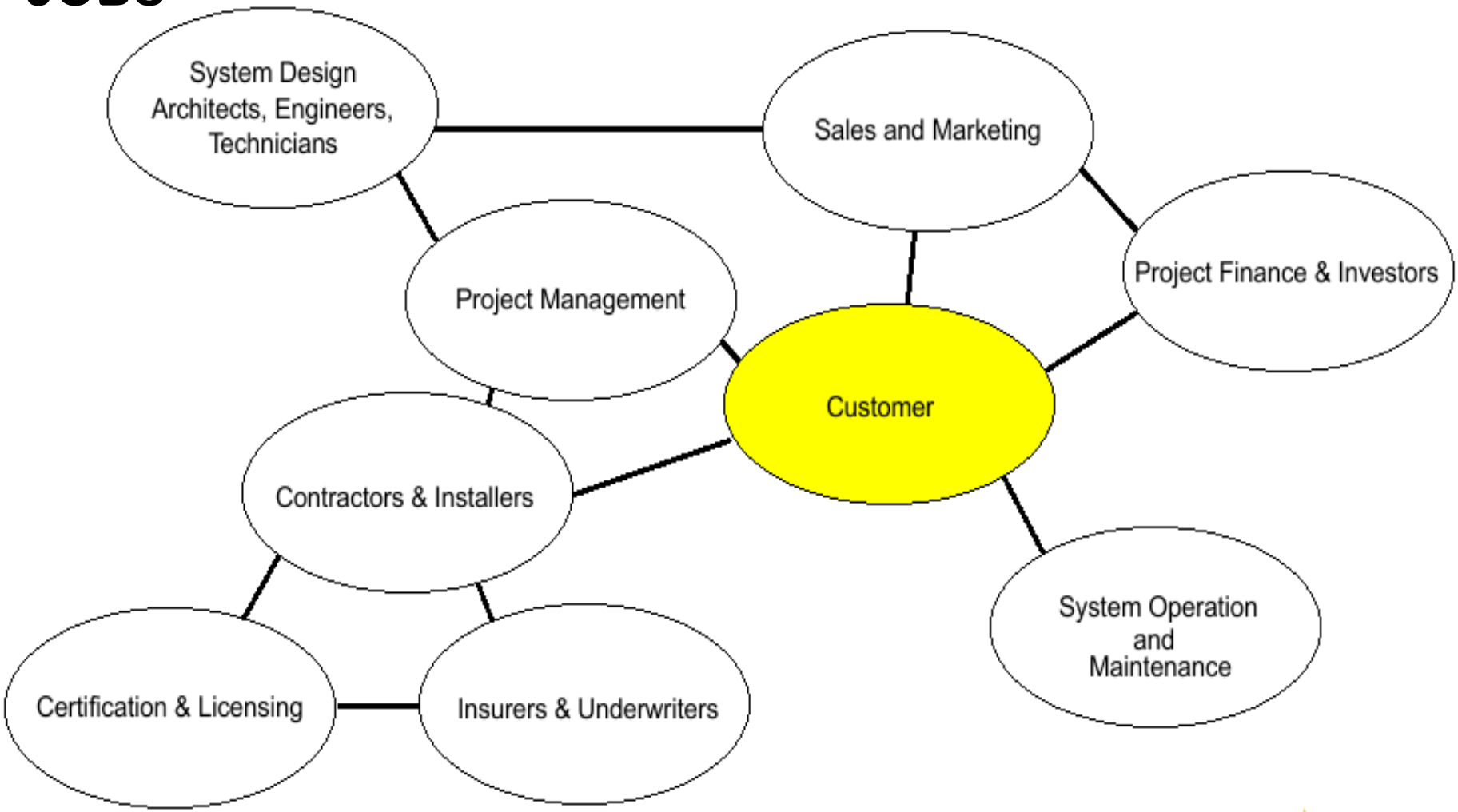
The Economics of Solar Energy…

Benefits to A Municipality:

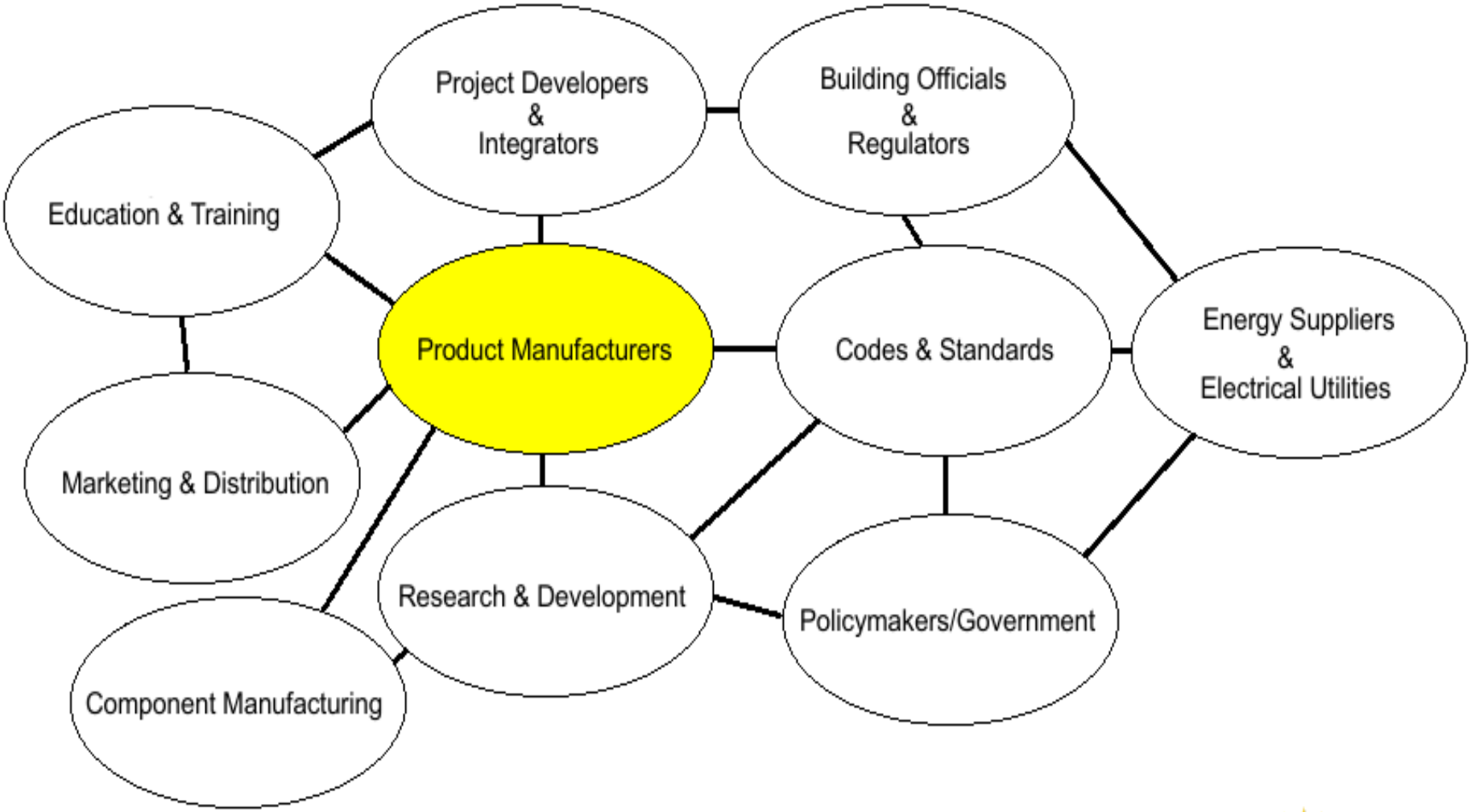
JOBS



The Economics of Solar Energy…

Benefits to A Municipality:

JOBS



The Economics of Solar Energy…

Benefits to A Municipality:

JOBS

Mission Solar, San Antonio.

400+ employees, 240,00 sq ft in a permanent facility.

Seven other companies co-located with Mission at the same time!

Net economic impact of Mission Solar + support firms: >$700 million.

Source: Texas Tribune www.texastribune.org, February, 2015.

The Economics of Solar Energy…

Benefits to A Municipality:

JOBS

This is part of a 400 million watt solar electricity project being added to the San Antonio grid by CPS Energy, our nation's largest municipal utility company.

In addition to the manufacturing, there are also maintenance jobs after the solar panels are installed to keep vegetation under control...

Source: Texas Tribune www.texastribune.org, February, 2015.

The Economics of Solar Energy…

Benefits to A Municipality:

Local sheep are "rented" to control the vegetation. CPS calls them "lamb-scapers".

… and sheep need "supervisors".

Meet "Wattson", a Great Pyrenees mix, one of several herd dogs on duty.

Photo Credit: CPS Energy, San Antonio, Texas

The Economics of Solar Energy…

Benefits to A Municipality:

JOBS

Solartec, Houston.

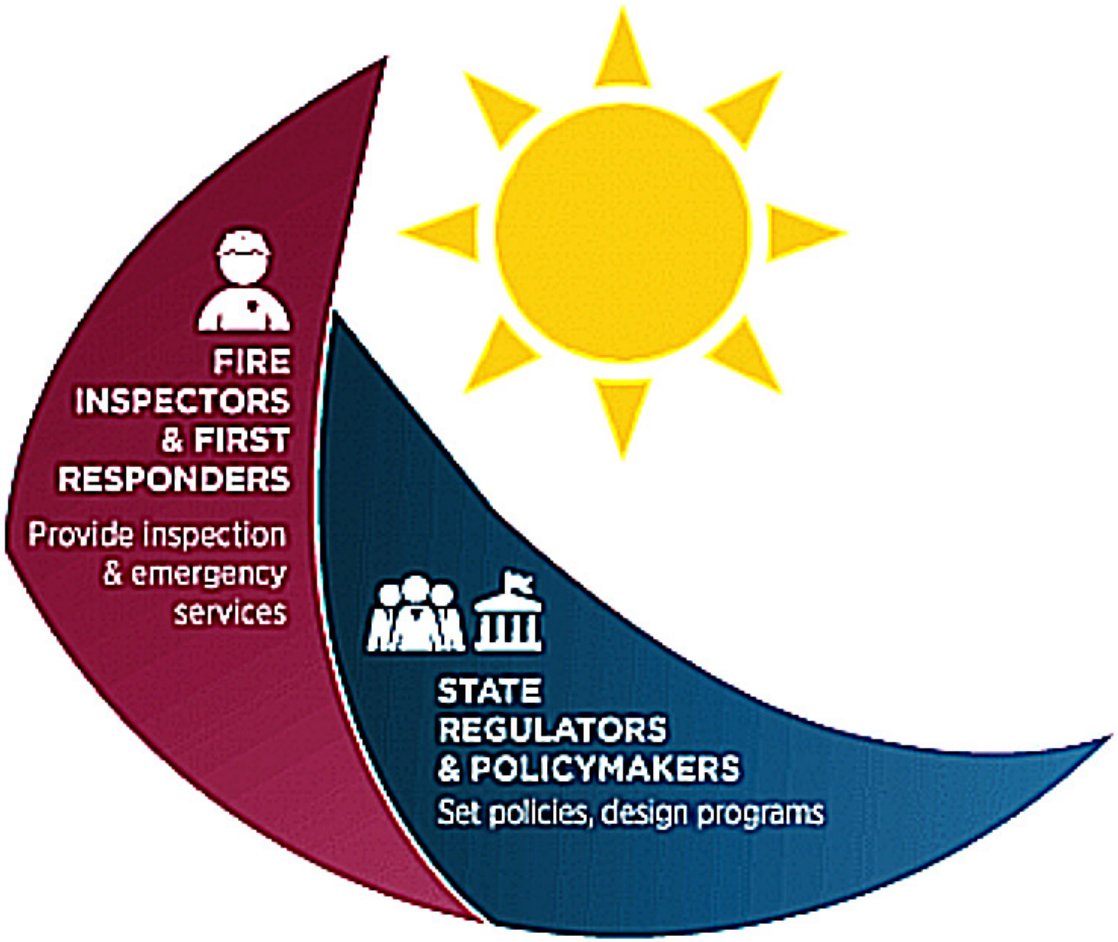
Annual economic benefit: $285 million per year by 2019 (est).

Who Is Involved in the Solar Industry?

Who Is Involved in the Solar Industry?

GO SOLAR

Who Is Involved in the Solar Industry?



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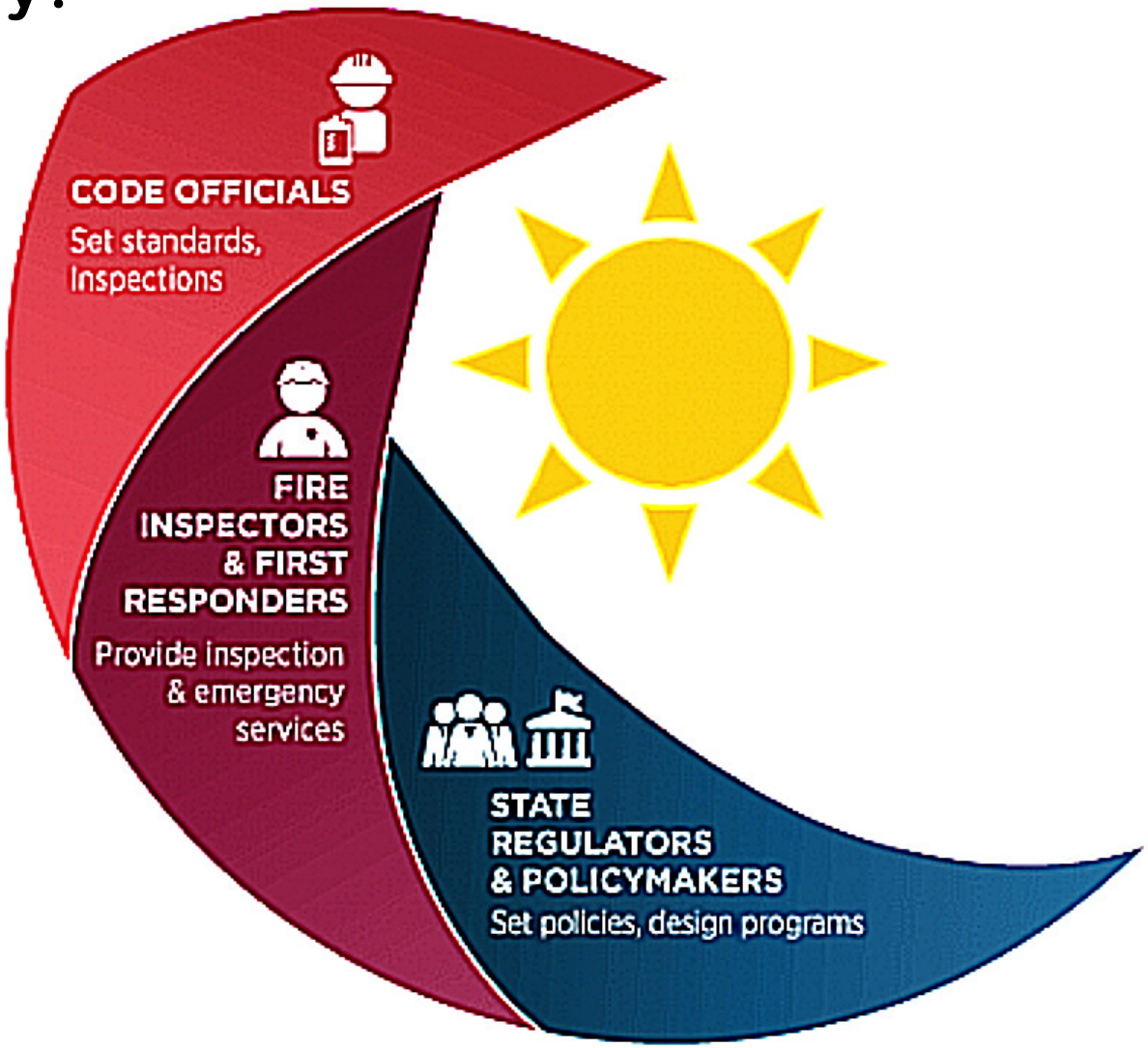

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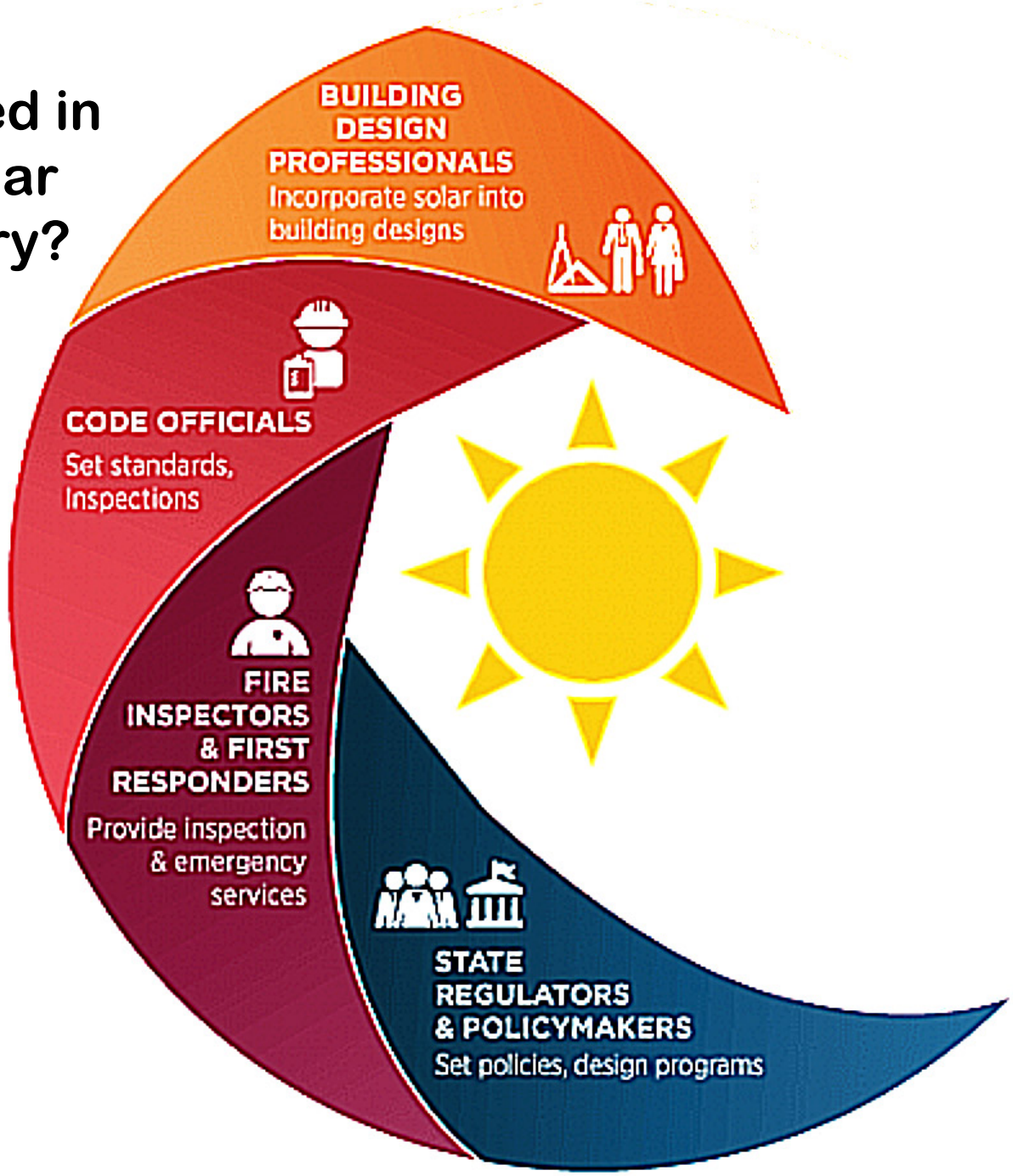

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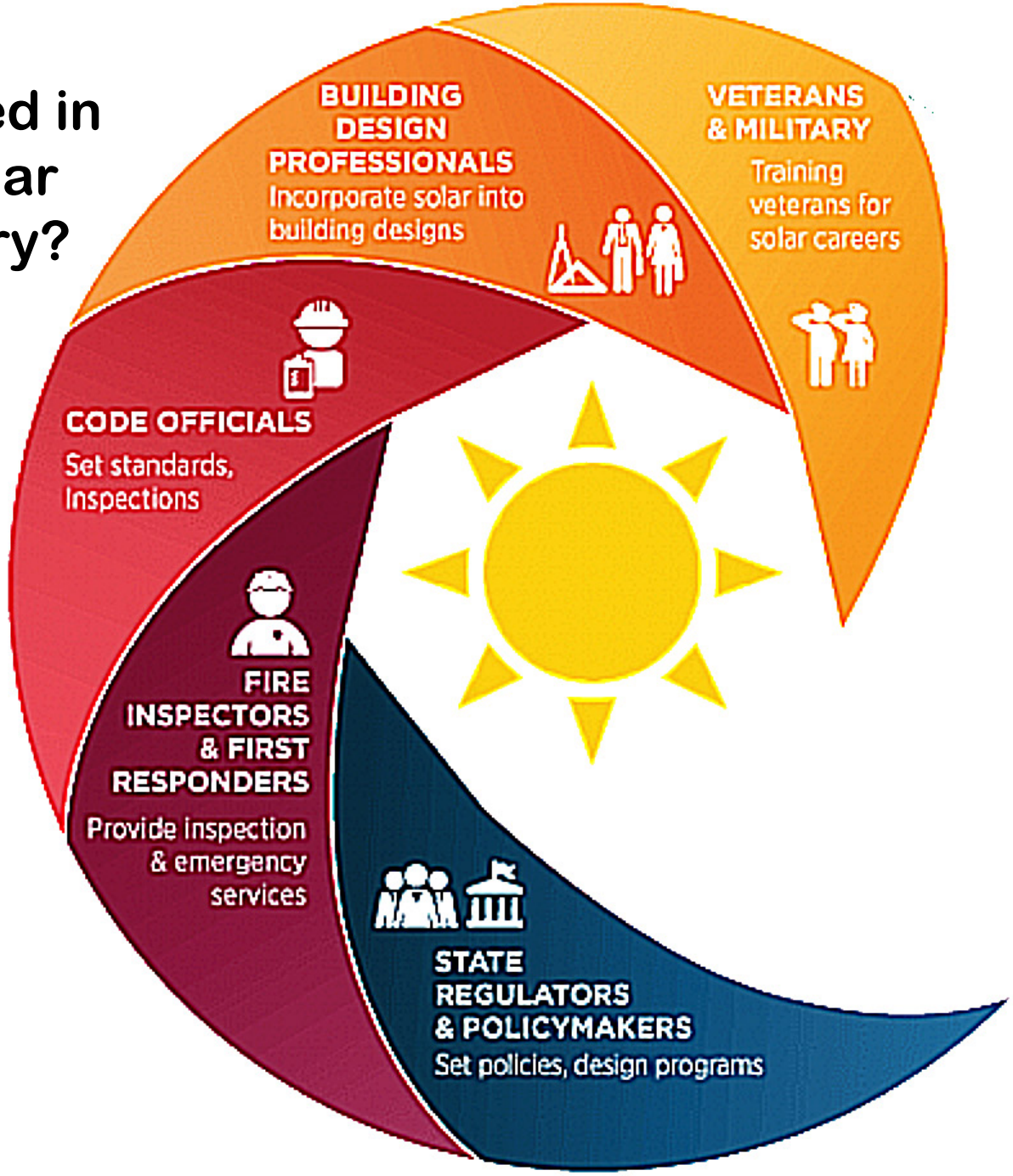

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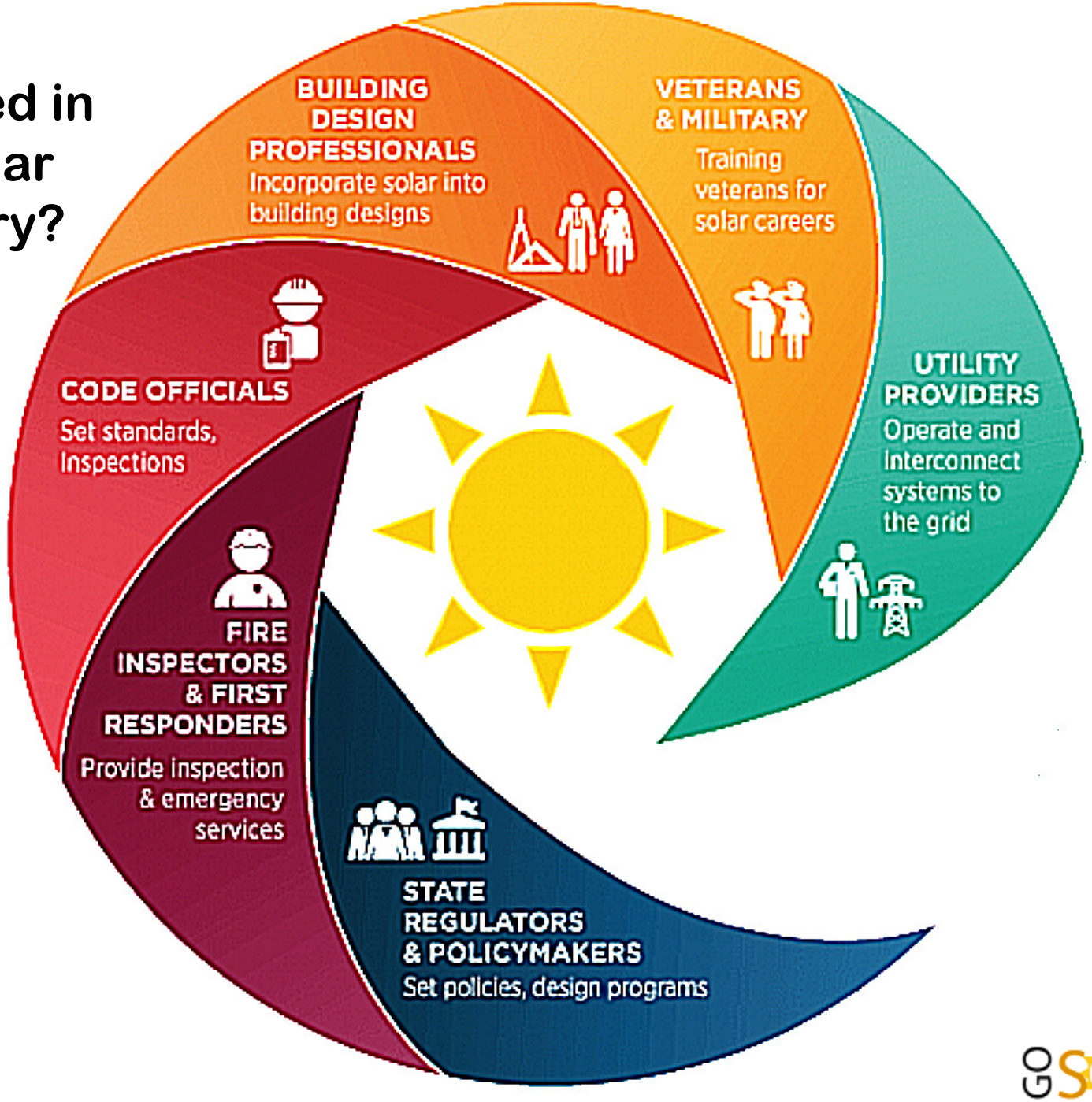

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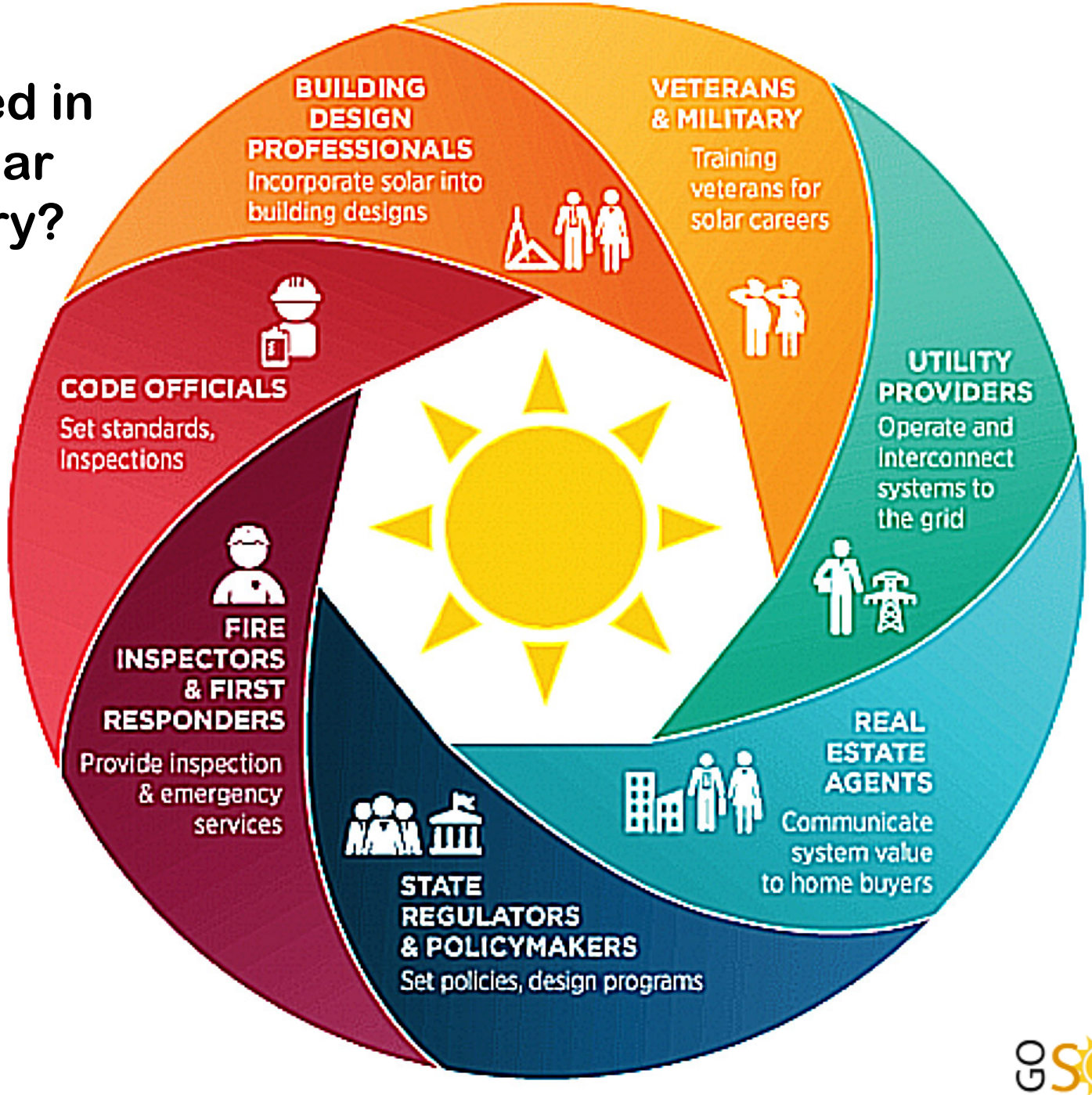
Who Is Involved in the Solar Industry?



GO SOLAR

The Economics of Solar Energy…

Benefits to A Municipality:

JOBS - Important News…

On May 18, 2016, the United States Department of Energy launched five new "Solar Ready Vets" training locations, including $10 million for national solar training programs.

http://energy.gov/eere/sunshot/solar-ready-vets

or search

"Solar Ready Vets"

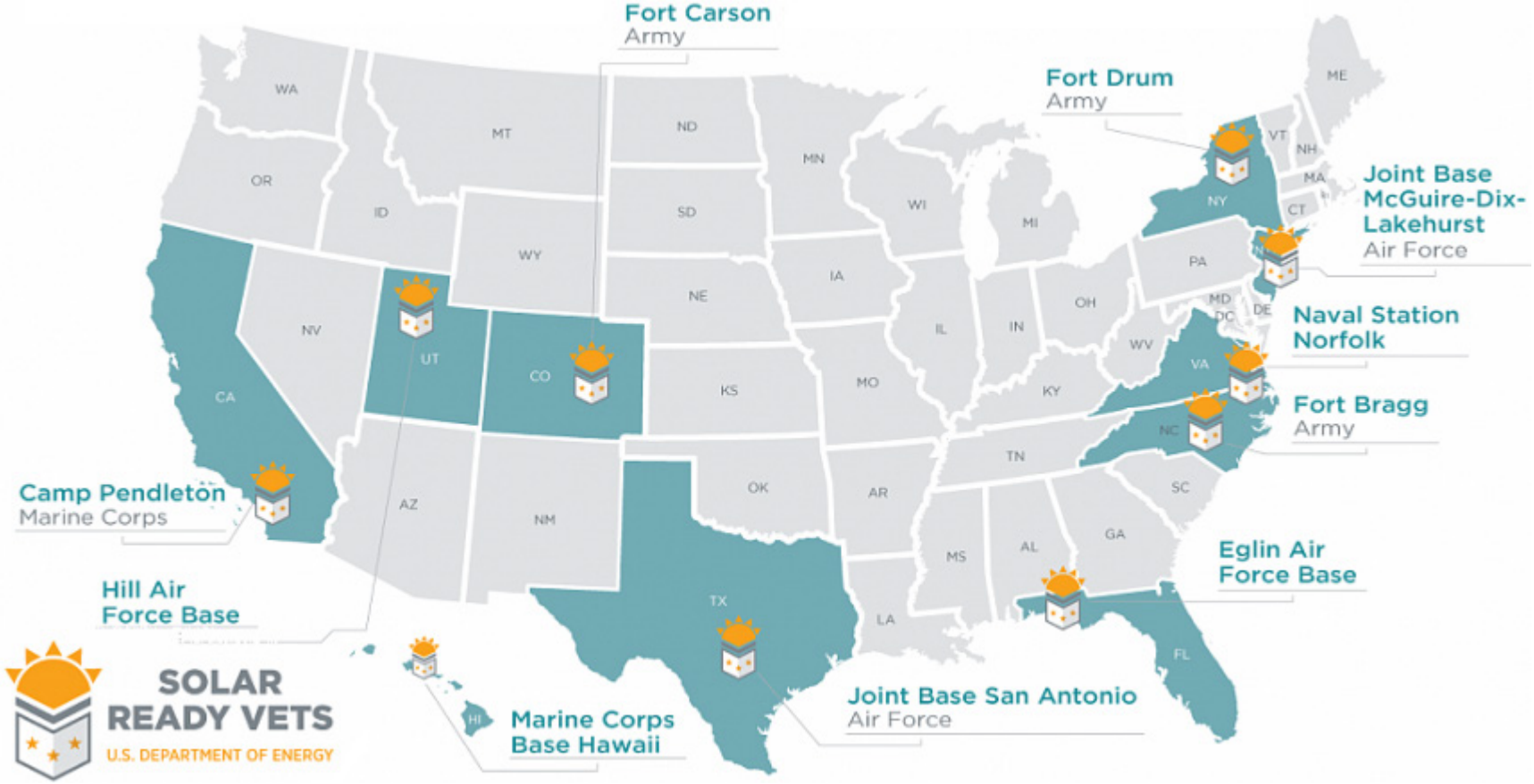
One of the Training Sites Is In Texas!

Joint Base San Antonio - U.S. Air Force and Army

The Economics of Solar Energy…

Benefits to A Municipality:

JOBS - Important News… "Solar-Ready Vets" Locations



Training 75,000 Veterans in Solar Energy by 2020.

The Economics of Solar Energy…

What Can Municipal Government Do?

Consider “Expedited Permitting”.

- Permit Requirements are easily amended as needed.
- Lower cost to your city compared to an ordinance.
- Decreases permit costs to the citizen / customer.

Expedited Permitting Template available from:

North Texas Council of Governments

www.nctcog.org/solar/

GO SOLAR

The Economics of Solar Energy…

What Can Municipal Government Do?

Consider "Expedited Permitting".

- **NCTCOG Program Goals:**
  - **Provide resources for cities.**
  - **Improve air quality by reducing demand for electricity during peak load periods.**
  - **Increase local energy and grid reliability.**
  - **Reduce costs.**

The Economics of Solar Energy…

What Can Municipal Government Do?

Consider "Expedited Permitting".

- **NCTCOG Program Results – 2013 - 2016:**
  - **33 total local governments participated in meetings & trainings.**
  - **345 city-staff participants attended NCTCOG trainings or events.**
  - **Addressed city-specific questions, concerns, barriers, and technical parameters.**
  - **Developed three permit process guideline documents and website clearinghouse: www.gosolarnorthtexas.org**
  - **Six jurisdictions adopted the solar panel checklist.**
  - **Led to a contract with the State of Texas Energy Conservation Office to Support Statewide solar energy efforts.**

GO SOLAR

The Economics of Solar Energy…

Expedited Permitting

Basics: Address, etc.

Site Info: Type, building age, roof material.

System Size, weight, make and models…

GO SOLAR

SOLAR PV EXPEDITED PERMIT CHECKLIST

This Expedited Permit Checklist is intended to be used as a best management practice when establishing local government requirements for **rooftop** residential and commercial solar photovoltaic (PV) system permits. Local governments may modify this checklist to accommodate their local ordinances, code requirements, and permit procedures. This expedited permit checklist will facilitate the decision timeline for all solar PV systems meeting all pre-defined criteria in Section 4.

SECTION 1: SITE AND OWNER INFORMATION

Site Address:_____ **Name:**_____
Parcel ID:_____ **Email:**_____
Street:_____ **Phone:**_____
City:_____ **Zip Code:**_____

SECTION 2: TYPE OF SOLAR PV APPLICATION

☐ **Residential**
- **Year Home Built**: _____ *(Homes built prior to 1975 may, at the discretion of the building official or designated representative, require additional structural review and may not qualify for the expedited permit process)*
- **Roof Covering Type:**
  ☐ Composite Shingles ☐ Tile ☐ Other:_____

☐ **Commercial**
- **Year Building Built:**_____ *(Additional structural review may be required based on the commercial building age and will be at the discretion of the building official or designated representative)*
- **Roof Covering Type:**
  ☐ Composite Shingles ☐ Tile

SECTION 3: SOLAR PV SYSTEM INFORMATION

☐ Provide manufacturer specification sheets for all system components
- Is the mounting system an engineered product designed to mount solar panels? ☐ **YES** ☐ **NO**
  If no, provide structural attachment details in a letter certified by a design professional.

	MODULE	INVERTER	MOUNTING SYSTEM (IF PRE-ENGINEERED PRODUCT)
Manufacturer			
Quantity			
Model			

System Weight/Arrangement
- Total weight of module(s) and rails (lbs.): _____
- Number of attachment points:_____
- Weight per attachment point (lbs.):_____
- Maximum spacing between attachment points (inches):_____
- Total surface area of modules (sq. ft.):_____
- Total system weight per sq. ft. (lbs.):_____

This document was produced by the North Central Texas Council of Governments for use by local governments through partnerships with the Texas State Energy Conservation Office and the Solar Ready II program (National Association of Regional Councils, the Mid-America Regional Council, Meister Consultants Group, Inc., and the Council of State Governments).

Page 1

The Economics of Solar Energy…

Expedited Permitting

Contractor Information

Electrical Information

Code Compliance

Zoning District

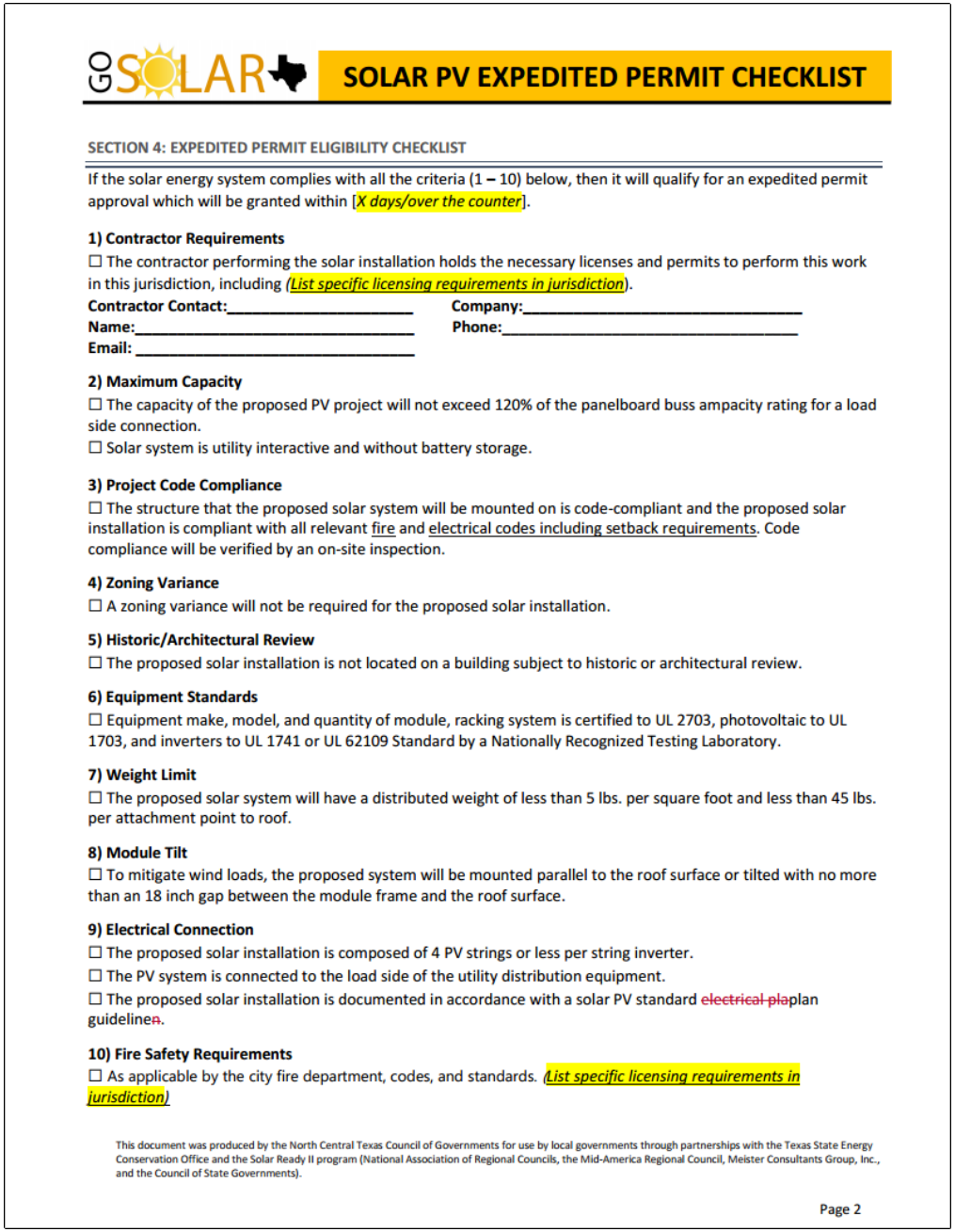
Equipment Standards

Weight Limit

Module Tilt

Electrical Connection

Fire Safety Requirements



GO SOLAR

SOLAR PV EXPEDITED PERMIT CHECKLIST

SECTION 4: EXPEDITED PERMIT ELIGIBILITY CHECKLIST

If the solar energy system complies with all the criteria (1 – 10) below, then it will qualify for an expedited permit approval which will be granted within [*X days/over the counter*].

1) Contractor Requirements

☐ The contractor performing the solar installation holds the necessary licenses and permits to perform this work in this jurisdiction, including (*List specific licensing requirements in jurisdiction*).

Contractor Contact:_____ **Company:**_____
Name:_____ **Phone:**_____
Email: _____

2) Maximum Capacity

☐ The capacity of the proposed PV project will not exceed 120% of the panelboard buss ampacity rating for a load side connection.
☐ Solar system is utility interactive and without battery storage.

3) Project Code Compliance

☐ The structure that the proposed solar system will be mounted on is code-compliant and the proposed solar installation is compliant with all relevant fire and electrical codes including setback requirements. Code compliance will be verified by an on-site inspection.

4) Zoning Variance

☐ A zoning variance will not be required for the proposed solar installation.

5) Historic/Architectural Review

☐ The proposed solar installation is not located on a building subject to historic or architectural review.

6) Equipment Standards

☐ Equipment make, model, and quantity of module, racking system is certified to UL 2703, photovoltaic to UL 1703, and inverters to UL 1741 or UL 62109 Standard by a Nationally Recognized Testing Laboratory.

7) Weight Limit

☐ The proposed solar system will have a distributed weight of less than 5 lbs. per square foot and less than 45 lbs. per attachment point to roof.

8) Module Tilt

☐ To mitigate wind loads, the proposed system will be mounted parallel to the roof surface or tilted with no more than an 18 inch gap between the module frame and the roof surface.

9) Electrical Connection

☐ The proposed solar installation is composed of 4 PV strings or less per string inverter.
☐ The PV system is connected to the load side of the utility distribution equipment.
☐ The proposed solar installation is documented in accordance with a solar PV standard ~~electrical pla~~plan guideline~~n~~.

10) Fire Safety Requirements

☐ As applicable by the city fire department, codes, and standards. (*List specific licensing requirements in jurisdiction)*

This document was produced by the North Central Texas Council of Governments for use by local governments through partnerships with the Texas State Energy Conservation Office and the Solar Ready II program (National Association of Regional Councils, the Mid-America Regional Council, Meister Consultants Group, Inc., and the Council of State Governments).

Page 2

The Economics of Solar Energy…

What Can Municipal Government Do?

Standardize Permit Requirements Among Cities

- Remove unnecessary restrictions. (Weight, glare, etc.)
- Post concise permit requirements on the city's website.
- Educate Permit Inspectors, Code Inspectors, and other city staff involved in the end-to-end process.
- Inform your city HOAs of Texas State Law HB 362, the "Solar HOA" law.

The Economics of Solar Energy…

What Can Municipal Government Do?

What is "HB 362?"

- Enacted into Texas Law in 2011.
- Prohibits a Property Owner's Association (aka "HOA") from restricting homeowners from installing solar energy equipment.
- Passed by overwhelming bi-partisan votes in the Senate & House. (S: 31-0, H: 143-1 .. 2 not voting.)
- Procedures must be followed.
- HOA has a limited voice in the system details.

The Economics of Solar Energy…

What Can Municipal Government Do?

If you must have an ordinance …

Here's a suggested simplified list of uniformly enforceable solar-related ordinance language:

1. *Solar energy devices are allowed. Along with energy efficiency investments, residents are encouraged to use available renewable energy technology to reduce their electric load on the electric utility grid.*
2. *Installed solar energy devices must meet all applicable safety requirements including electrical, fire, and building codes. Standard installation permits (i.e. not special use permits) are required, and this process will ensure applicable safety codes are met.*
3. *Solar energy devices that are to be interconnected to the electric grid must meet applicable interconnection requirements and approval of the local electric utility.*

The Economics of Solar Energy…

What Can Municipal Government Do?

If you must have an ordinance … keep this in mind:

- Ordinance restrictions for solar energy devices beyond those related to safety will be difficult to uniformly apply and enforce.
- Aesthetic restrictions about “no street visibility” may be easily challenged because it does not treat all homeowners equally.
- City regulations should focus on safety - electric, fire, and building codes.
- Extraneous rules requiring “non-functional” systems be repaired or removed are essentially impossible to enforce. Such systems are not readily detected. Moreover, owners have economic reasons to keep systems in good working order.

The Economics of Solar Energy…

What Can Municipal Government Do?

If you must have an ordinance … keep this in mind:

- ☼ Remove “overly-cautious” restrictions and concerns from existing permitting process and ordinances, such as “glare”, “screening”, weight concern on newer homes, directional limitations, and others.

- ☼ Be receptive to “Community Solar”. It’s here.

- ☼ Make brownfield and otherwise unusable land available for “community solar” systems.

The Economics of Solar Energy…

What Can Municipal Government Do?

What is "Community Solar"?

- Not all homes or buildings are suitable for installation of solar energy systems. "Community solar" provides an option.

- "Community solar" is the installation of grid-connected solar energy systems on land unsuitable for building or other purposes, where people may purchase and own "shares" of the system and get credit for the energy it generates. Community solar may also be third-party owned.

- Community solar projects are already common in many parts of America .. including Texas.

The Economics of Solar Energy…

What Can Regional Government Do?

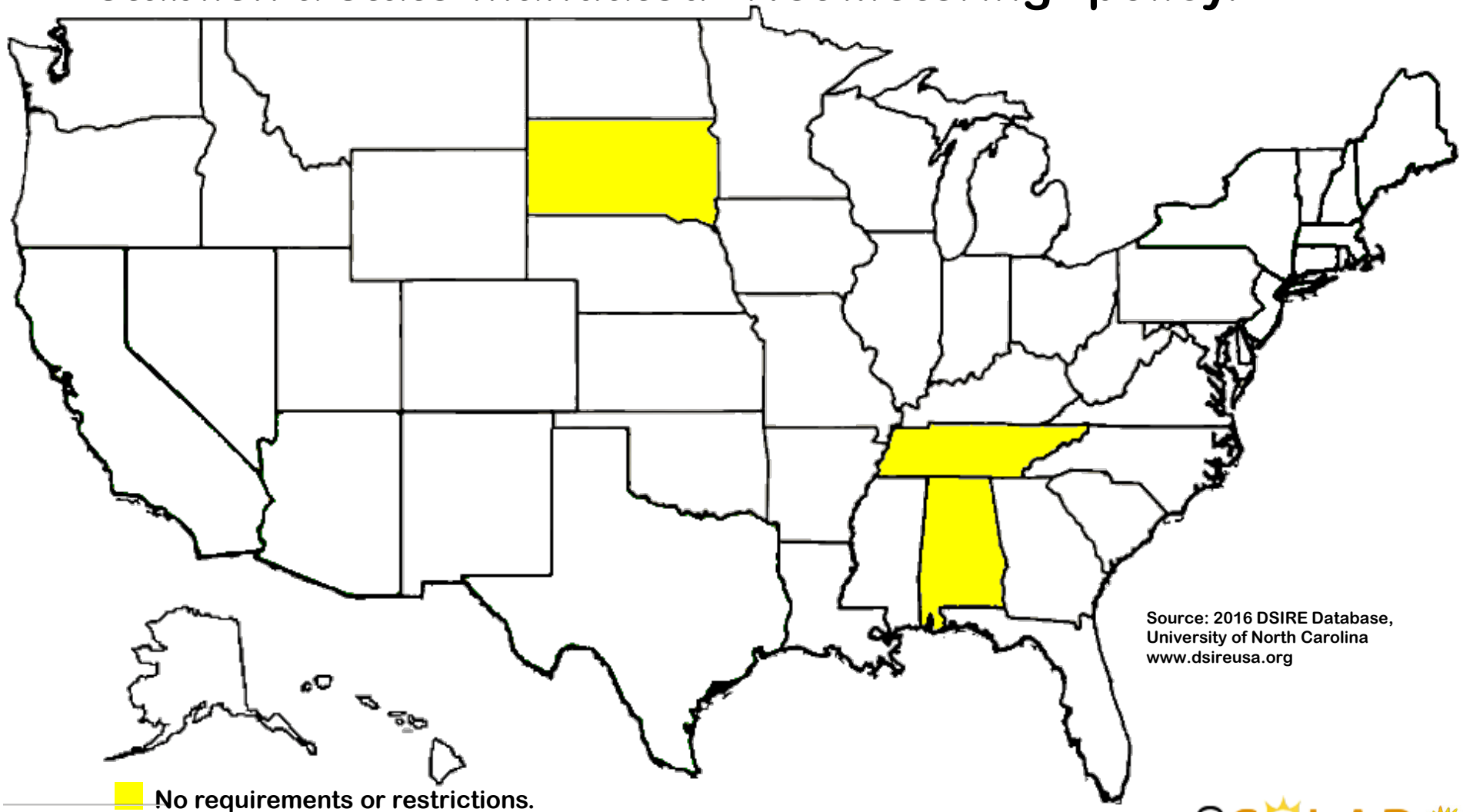
"PACE"

- Enact “PACE” in your County (or City). Legislation passed in Texas in 2013 authorizing "PACE".
- PACE = Property Assessed Clean Energy.
- PACE is financing, **NOT** a government hand-out, rebate, or government funding.
- PACE is only for business (for now), and is voluntary.
- Allows low-interest, low-risk financing up to 100% of the cost of solar equipment. Repaid through property tax assessment. Assessment removed when loan is paid.

The Economics of Solar Energy…

What Can State Government Do?

Establish a state-mandated "Net Metering" policy.



Source: 2016 DSIRE Database,
University of North Carolina
www.dsireusa.org

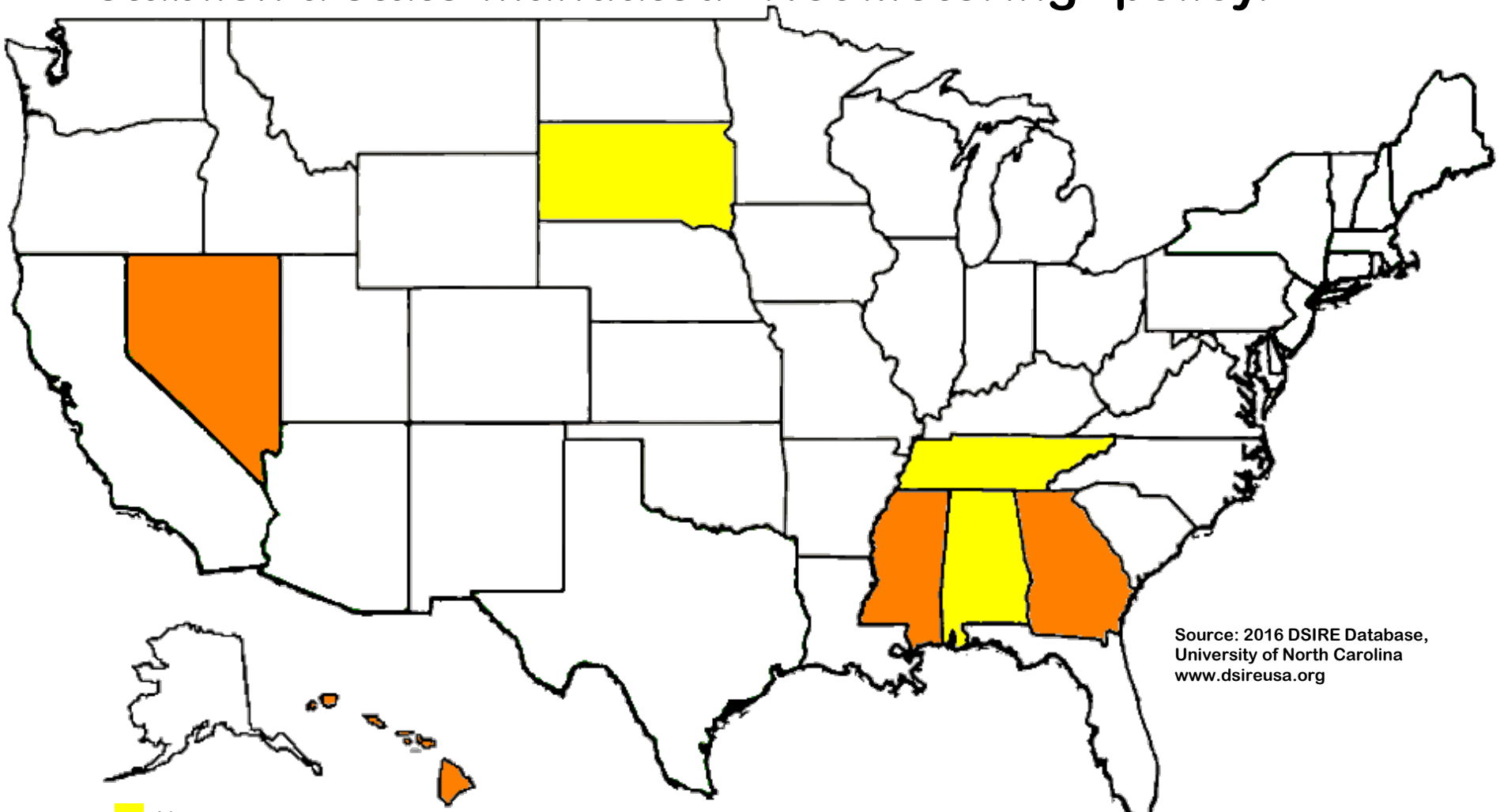
No requirements or restrictions.

GO SOLAR

The Economics of Solar Energy…

What Can State Government Do?

Establish a state-mandated "Net Metering" policy.



GO SOLAR

The Economics of Solar Energy…

What Can State Government Do?

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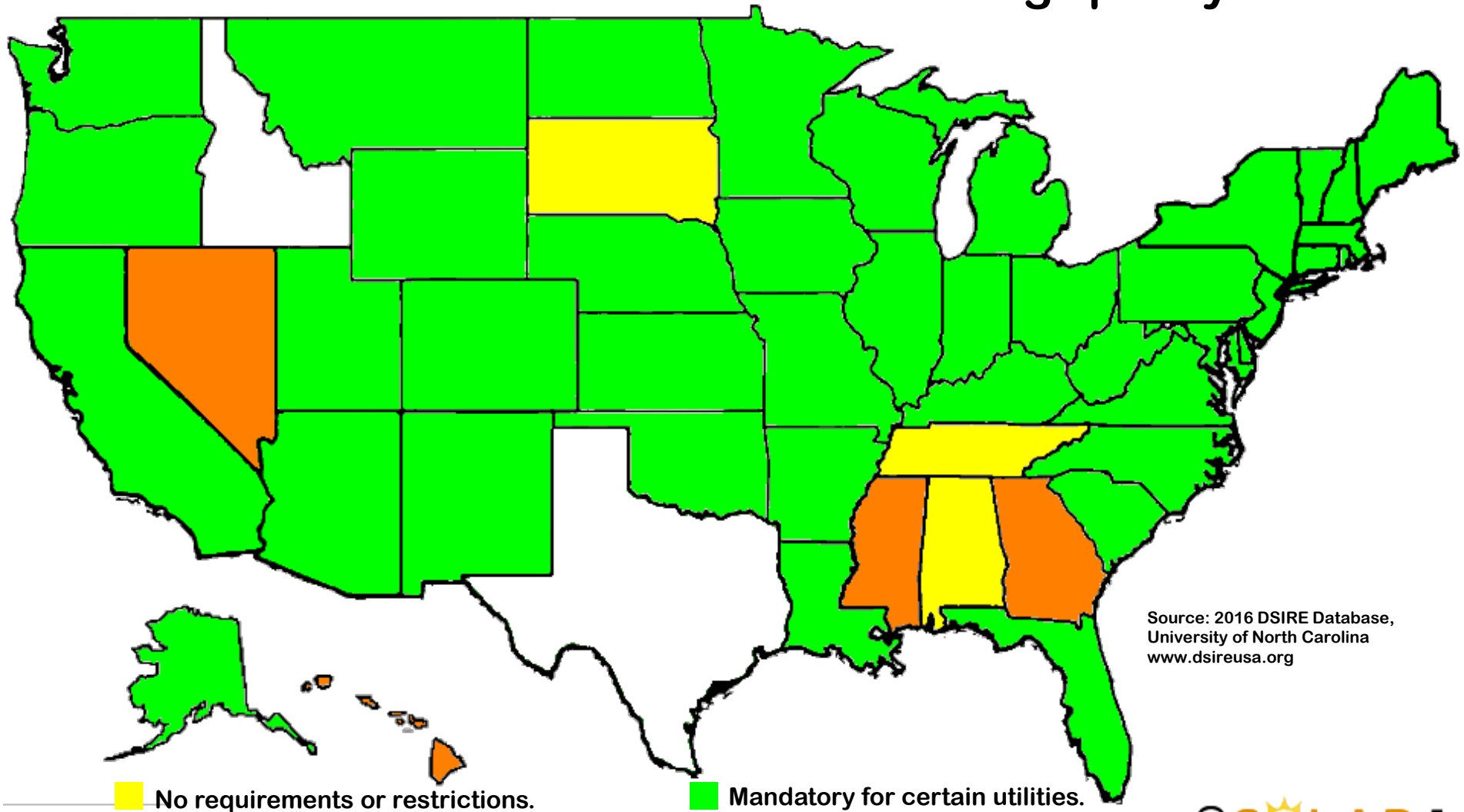

Source: 2016 DSIRE Database,
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GO SOLAR

The Economics of Solar Energy…

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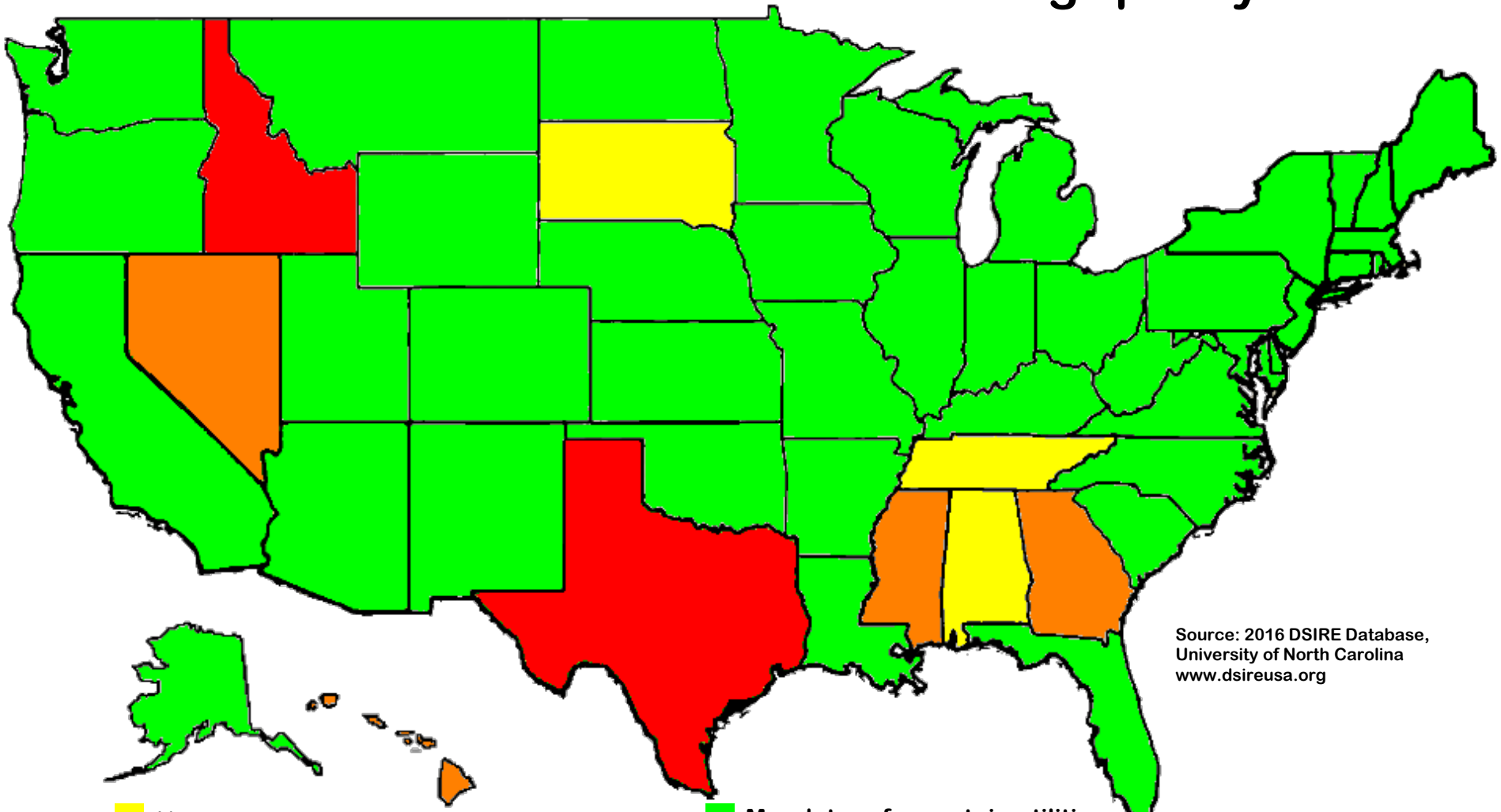
Establish a state-mandated "Net Metering" policy.



Source: 2016 DSIRE Database,
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GO SOLAR

The Economics of Solar Energy…

What Can State Government Do?

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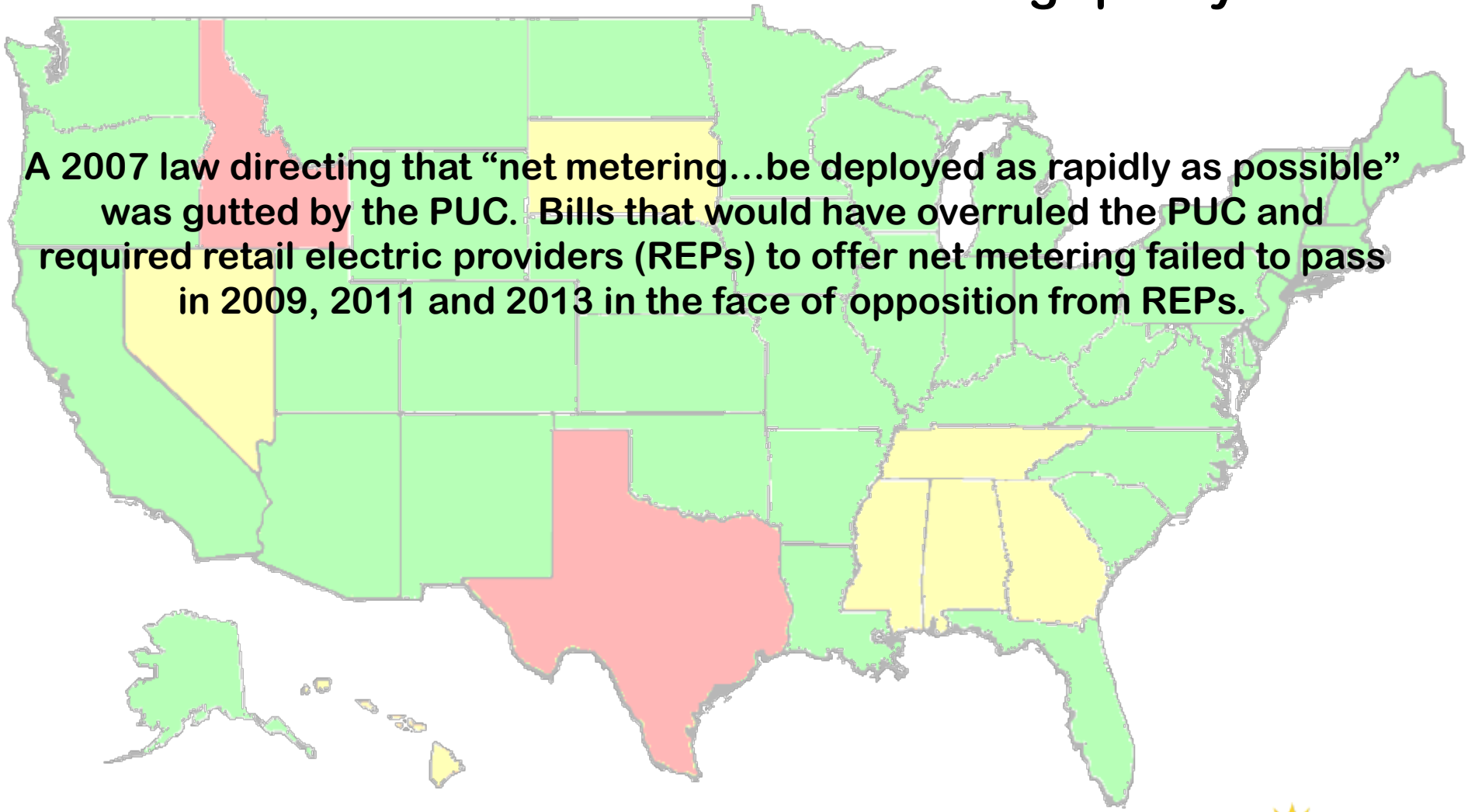


A 2007 law directing that "net metering…be deployed as rapidly as possible" was gutted by the PUC. Bills that would have overruled the PUC and required retail electric providers (REPs) to offer net metering failed to pass in 2009, 2011 and 2013 in the face of opposition from REPs.

The Economics of Solar Energy…

What Can State Government Do?

Create Statewide Solar Incentives for Citizens.

Chron Local US & World Sports Business A&E Life Jobs Real Estate

NEWSWATCH: ENERGY

Lights go out on Texas solar bills… for now

By Tom Fowler on June 2, 2009 at 8:06 AM

The solar power and environmental communities (no, they're not always synonymous) had high **hopes this legislative session** that a bunch of proposed laws would give a big boost to the industry in Texas. Those hopes were dashed on Friday night however, largely on a technicality.

The bills sought to provide $500 million in incentives for homes and businesses to install solar panels, require retail electric companies to buy a customer's surplus electricity at a fair market price and make it so homeowners associations didn't have blanket powers to prohibit solar panels on roofs (among other things).

Like many bills the solar efforts were trapped by House Democrats who delayed business in order to avoid a vote on picture IDs for voters. Several of the bills seemed to have **found new life** after a vote deadline passed last week when they were attached to a related Senate bill. But a point raised by **Houston Democrat Sylvester Turner** about how much low-income consumers would pay to fund the solar incentives delayed the bill long enough that it didn't reach a vote before the Friday midnight deadline.

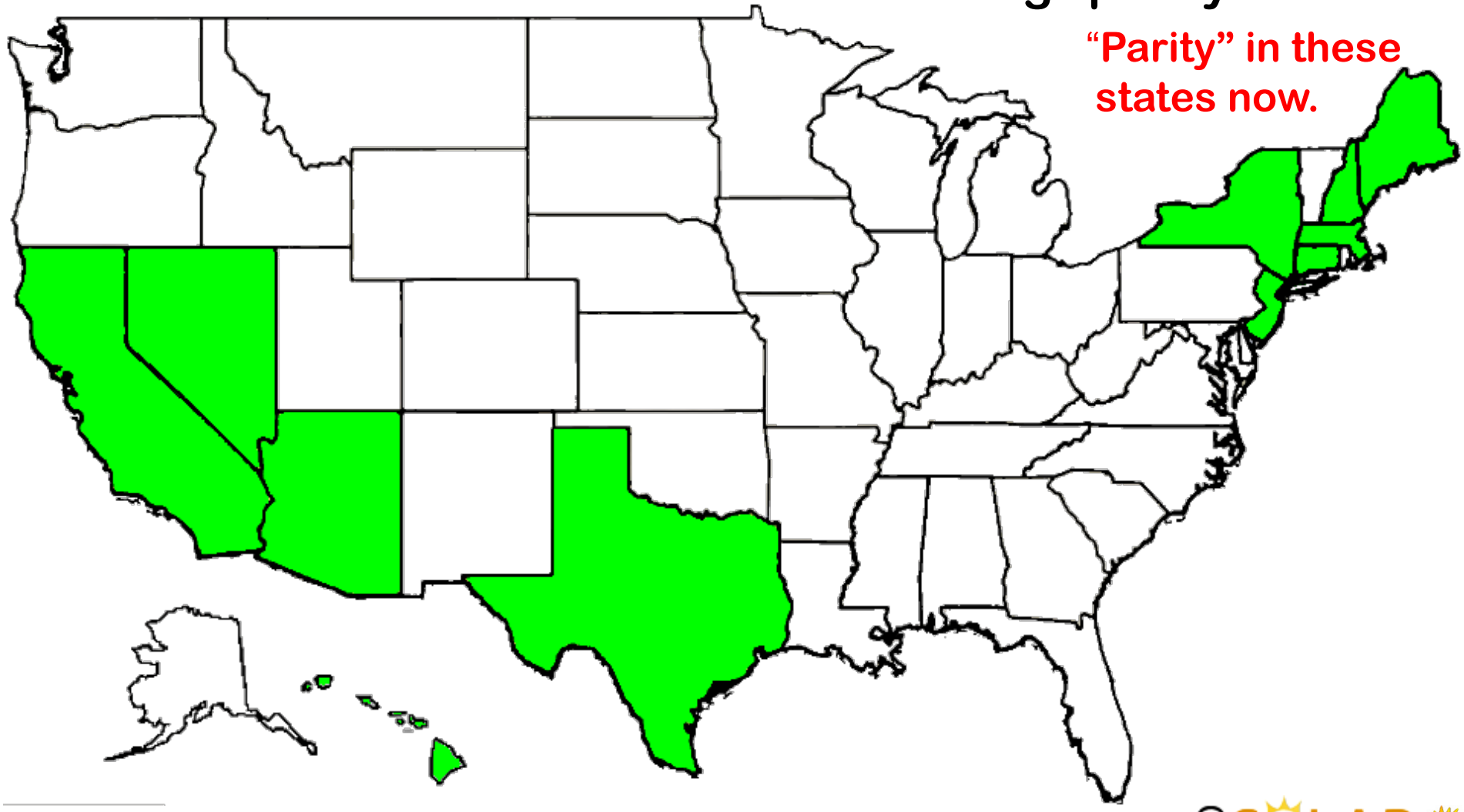
Source: Houston Chronicle, Houston, Texas, June 2, 2009

GO SOLAR

The Economics of Solar Energy…

What Can State Government Do?

Establish a state-mandated "Net Metering" policy.



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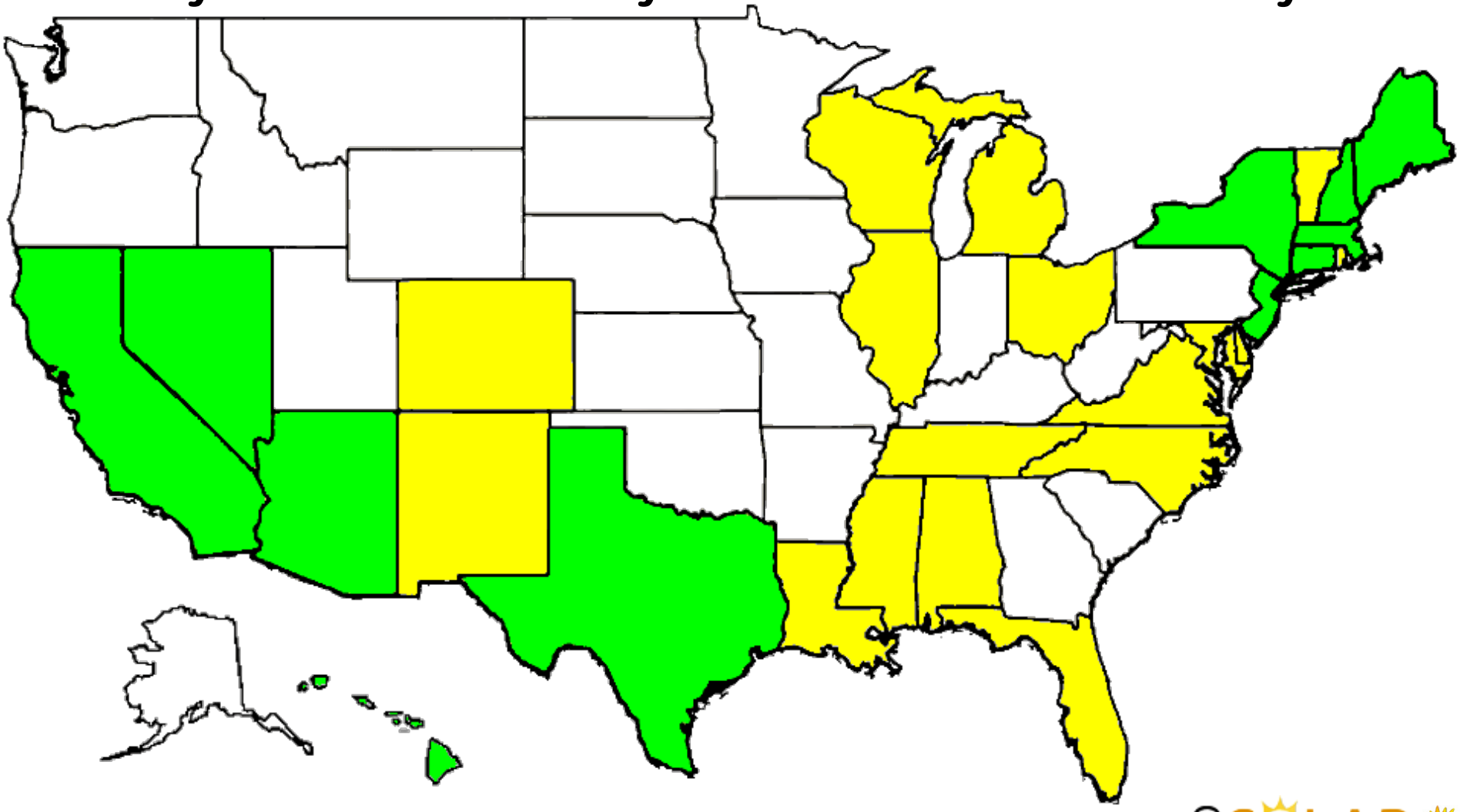
The Economics of Solar Energy…

What Can State Government Do?

"Parity" in these states by 2018.

What is "Parity" ?



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The Economics of Solar Energy…

What Can State Government Do?

What is "Parity" ?

Parity: If a homeowner obtains a low-interest loan to purchase solar energy equipment .. "parity" is when the value of the energy savings is equal to or greater than the monthly payment on the loan.

Example: Monthly payment on a $10,000 home-equity loan for 10 years at 3.5% would be approximately $98.

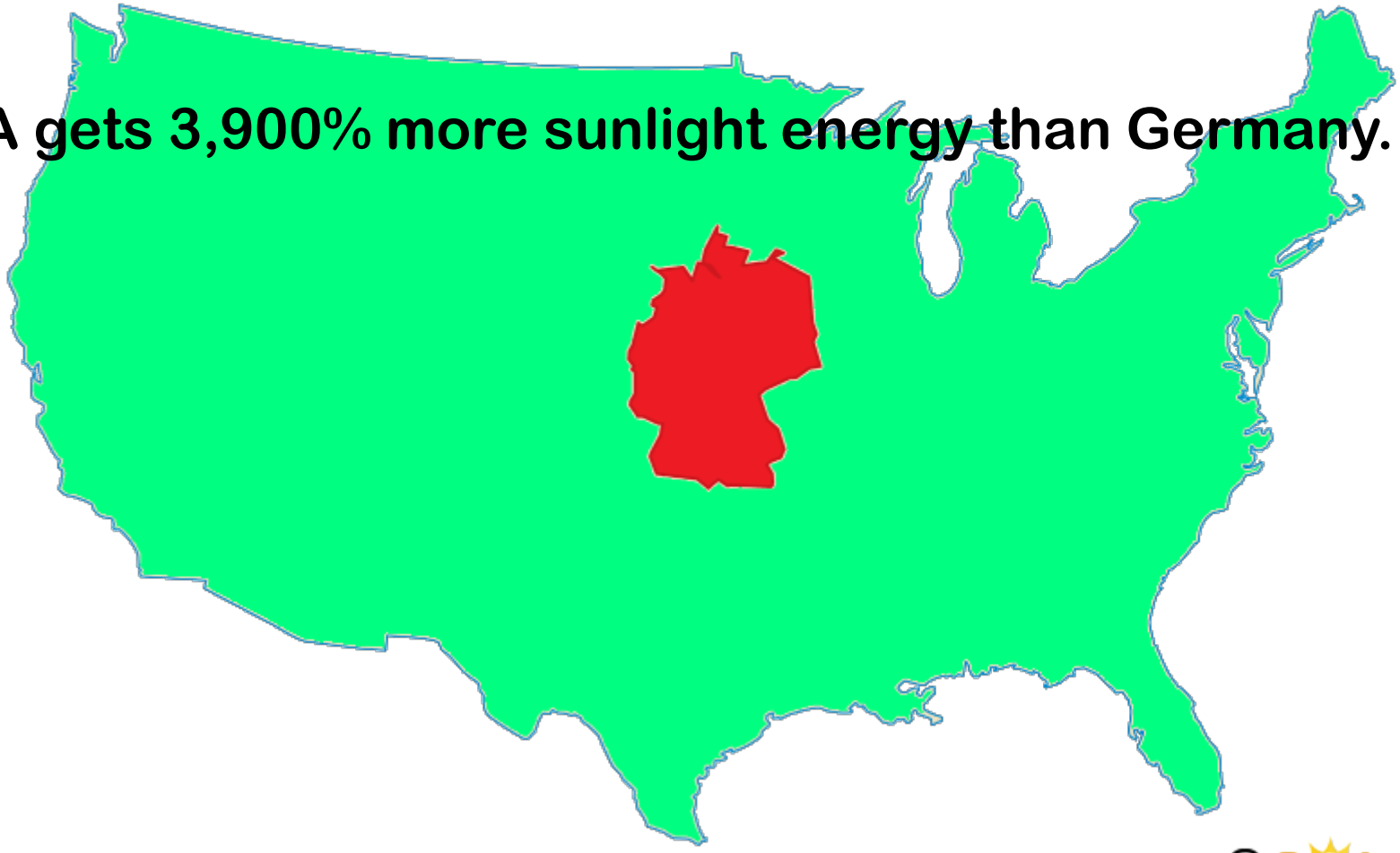
A solar energy system that costs $10,000 after all incentives are applied will typically generate energy value more than $98 per month in Texas. Thus, the savings is greater than the payment.

The Economics of Solar Energy…

What Can State Government Do?

Net Metering: Germany vs. USA.

USA gets 3,900% more sunlight energy than Germany.



Source: US Dept of Energy, LBNL Report DE-AC02-05CH11231.

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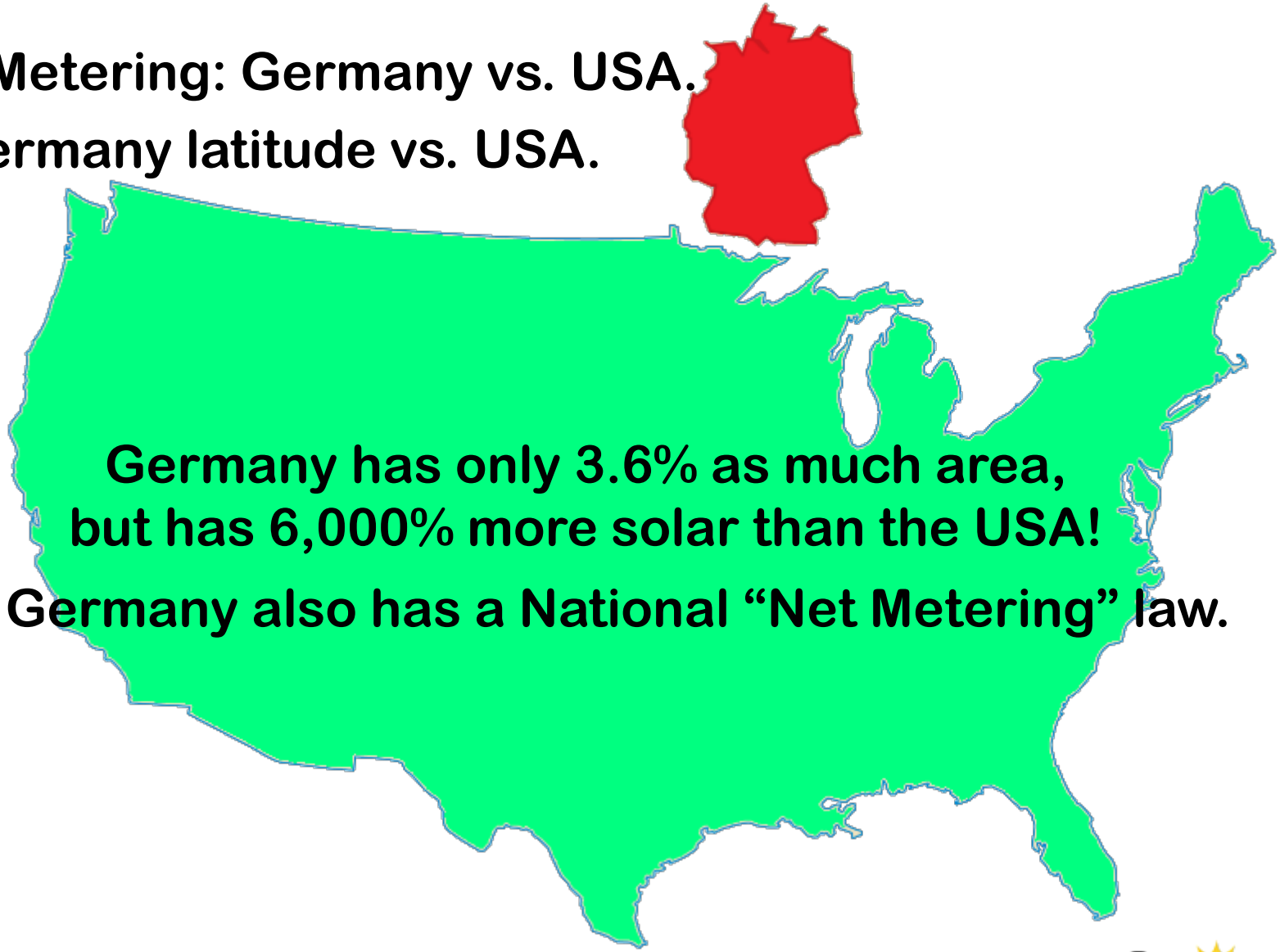
The Economics of Solar Energy…

What Can State Government Do?

Net Metering: Germany vs. USA.

Germany latitude vs. USA.



Germany has only 3.6% as much area, but has 6,000% more solar than the USA!

Germany also has a National "Net Metering" law.

Source: US Dept of Energy, LBNL Report DE-AC02-05CH11231.

The Economics of Solar Energy…

What Can State Government Do?

- **Require "solar ready" features in new construction.**
  - Adds very little to the overall cost.
  - Saves up to 10% or more for solar installations.

- **Strengthen "Solar Access" laws.**
  Protect homeowner access to the sun. Laws have existed in some states for up to 30 years, such as Hawaii, Florida, California, Arizona, Massachusetts, New Jersey, Wisconsin, and elsewhere.

- **Prohibit misleading fees and tariffs.**
  Power companies allege solar customers "don't pay their 'fair' share".

The Economics of Solar Energy…

What Can State Government Do?

Prevent Unwarranted "Fees" on Solar Customers

Smith Home

Add insulation

Upgrade windows

Install high-efficiency HVAC

New Energy-Star appliances

Net Electric Savings: 50%

Utility Bill Now: $150.00

Praised for conservation.

Both start with average utility bills of $300 per month.

Jones Home

Install Solar Panels

Become "energy-conscious"

Net Electric Savings: 50%

Utility Bill Now: $150.00

"Aren't paying their 'fair' share."

GO SOLAR

The Economics of Solar Energy…

What Can State Government Do?

- **Increase the state "Renewable Portfolio Standard" to require a more realistic quantity of solar energy generation.**
  - In 2005, Texas set a goal of 10,000 megawatts by 2025.
  - That goal was achieved in five years - in 2010.

- **Strengthen "Net Metering" and "Interconnect" standards.**
  As of early 2016, 44 states and Washington, D.C. had net-metering policies in place[1]. In at least 34 of these states, customers are credited at full retail rates of electricity, rather than lower wholesale rates. Texas is one of the 6 states lacking a policy[2]. Use criteria outlined in Interstate Renewable Energy Council and Vote Solar's "Freeing the Grid" report.

- **Community Solar and Low-Income Assistance**
  Create a community solar program and low-income financing program to help diversify access to residential solar.

Source: [1], [2], North Carolina Clean Energy Technology Center. (2015)

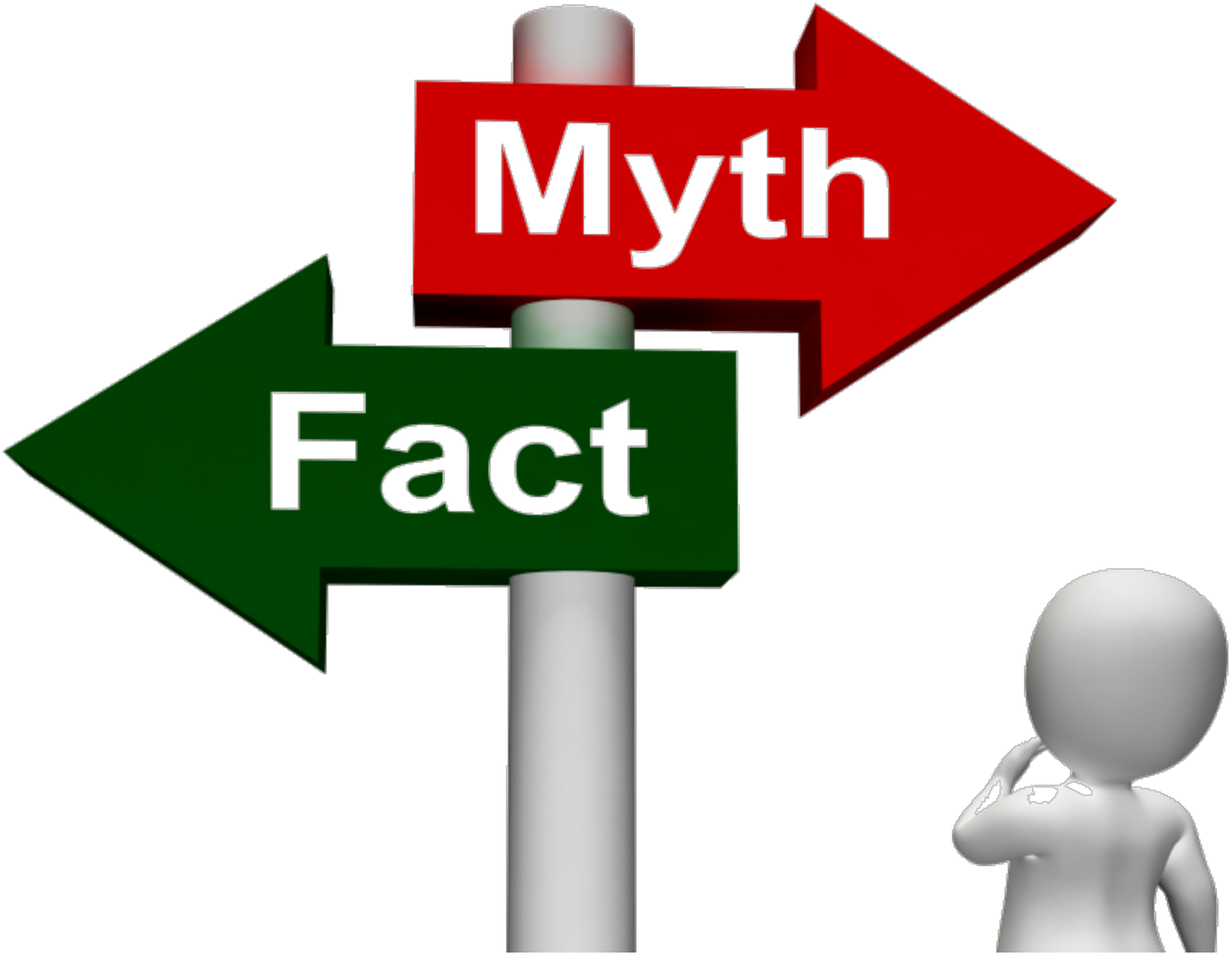
GO SOLAR

QUESTIONS?

Solar Energy for Local Governments
Part 1 of 2

- Brief History & Overview of Solar Energy with Definitions
- The Economics of Solar Energy
- **Common Concerns & Misconceptions About Solar Energy**
- Strategic Planning for 10, 20, and 30 Years

Common Concerns 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.

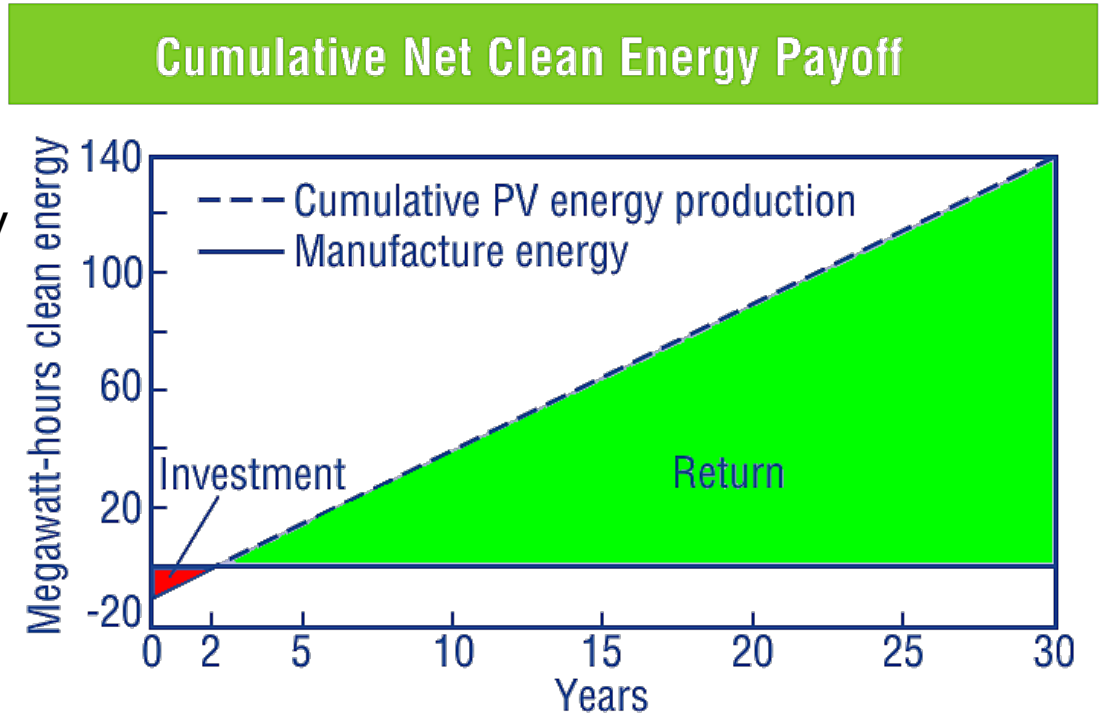
Solar energy is the same…

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.

Source: US Dept of Energy, National Renewable Energy Laboratory, "PV FAQ Sheet", Report 35489.pdf, updated Sept 05, 2013.

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 systems are heavily subsidized.
9. If I/we put solar panels on my/our house/business, we'll have electricity if the lights go out.
10. Everything will wear out in 10 years (or less) and will require replacement.

<u>NONE</u> of these myths are true!

The Economics of Solar Energy … Subsidies 1950-2010

Summary of Federal Energy Incentives, 1950–2010

(Billions of 2010 Dollars[1])

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.

GO SOLAR

Solar Energy for Local Governments
Part 1 of 2

- Brief History & Overview of Solar Energy with Definitions
- The Economics of Solar Energy
- Common Concerns & Misconceptions About Solar Energy
- **Strategic Planning for 10, 20, and 30 Years**

GO SOLAR

Strategic Planning.

What should we as government be planning for the next 10 .. 20 .. and 30 years?

1. Understand the Federal, State, and Utility Policy Landscape.
2. Think about your community's "solar goals".
3. Review Current Policies and Procedures.
   a. Permitting
   b. Planning and Zoning
   c. Financing (PACE, local lenders, federal programs).
   d. Market Development. Educate staff and elected officials about solar energy - facts AND fiction.
4. Municipal Electric Departments .. Review Current Policies.
   a. Interconnection (connection of solar to the "grid").
   b. "Net Metering" and other compensation policies.

Strategic Planning.

What should we as government be planning for the next 10 .. 20 .. and 30 years?

5. Align zoning and building codes to make them more “solar friendly”.

6. Compare current policies & procedures to “Best Practices”.
   a. “Solar Access Toolkit”. (Solar Outreach Partnership)
   b. Use NCTCOG "Solar Toolkit": www.nctcog.org/solar/

7. Identify areas for improvement and new opportunities.

8. Reach out to others for input and guidance:
   - North Central Texas Council of Governments ("NCTCOG")
   - Interstate Renewable Energy Council ("IREC")
   - Texas PACE Authority
   - Texas Solar Energy Society (for subject matter experts)

Strategic Planning - What Does the Future Hold?

- “Smart” homes.
- “Time of Use Metering”, and “TOU” energy credits.
- Home Energy Storage.
- Increased Efficiency in Solar Equipment.
- Continued Decrease in Costs of Solar Equipment.
- “Solar” Offered as a Standard Feature in New Homes.

Strategic Planning - What Does the Future Hold?

Homebuilders offering solar energy 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. Attaching panels to roofs during construction is about 20% cheaper than adding 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.

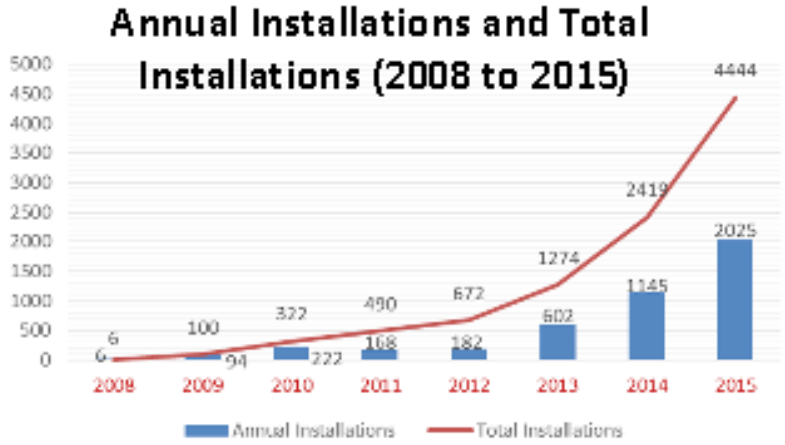
A few other developers and homebuilders offering solar as a standard feature are:

- 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)

Source: National Association of Homebuilders, McGraw Hill Financial report, 2014.

Strategic Planning - What Does the Future Hold?

Solar isn't "in the future" .. It's here NOW!



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

Program Goal: 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

Program Results (2013 – 2016):

- 33 total local governments participated in meetings and trainings
- 345 city-staff participants attended NCTCOG trainings or events
- Addressed city-specific questions, concerns, barriers, and technical parameters
- Developed three permit process guideline documents and website clearinghouse (www.gosolarnorthtexas.org)
- Six jurisdictions adopted the solar permit checklist
- Led to contract with State Energy Conservation Office to support statewide solar PV efforts

Source: North Central Texas Council of Governments

Strategic Planning - What Does the Future Hold?

Solar isn't "in the future" .. It's here NOW!

Source: North Central Texas Council of Governments

QUESTIONS?

15 Minute Break…

Part 2 – Solar Energy for Local Governments

- Permitting & Ordinance Considerations
- Expedited Permitting
- Solar Technologies - Present and Future
- Open Q & A and Displays

Part 2 – Solar Energy for Local Governments

- Permitting & Ordinance Considerations
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Permitting and Ordinance Considerations

- When faced with regulating the unknown, Municipalities tend to err on the side of caution.
- Provided with input from the public and subject-matter experts, unnecessary restrictions, time, and expense may be avoided.
- Ordinances are more time-consuming to implement and require more effort and city resources to amend compared to "Best Practices" permitting processes.
- North Central Texas Council of Governments has "Best Practices" permitting and other templates on their website. These were developed over a two-year period with input from national experts, State, and regional City members.

www.nctcog.org/solar

GO SOLAR

Ordinance Considerations … Public Opinion

2,330 Member HOA

In 2010, 2,332 homeowners in the Wellington Home Owner's Association in Flower Mound, Texas were asked by their Executive Board for their opinion of solar panels on roofs. 690 (30%) responded as shown:

From: Web Admin [mailto:WellingtonHOA@verizon.net]
Sent: Wednesday, April 07, 2010 3:38 PM
To: Wellington HOA Residents
Subject: Solar Panel Survey Results - Wellington of Flower Mound e-Mail Bulletin to All

Solar Panel Survey Results
Date: 4/7/2010

"The majority of our respondents voted in favor of allowing roof-mounted solar panels…"

Solar Panel Survey Results:

Thank you for your support and participation in the solar panel survey. We had a response rate of 690 households or 29.6% of our residents as of the March 31, 2010 deadline. The majority of respondents voted in favor of allowing roof mounted solar panels in the neighborhood. We have currently drafted a solar panel bulletin based upon the survey input. Once the bulletin is adopted and recorded with Denton County it will be posted on the website. We anticipate completion within the next 30 days. Attached are the results of the survey.

Thank you,

The Board of Directors and the Architectural Control Committee

Visit Wellington of Flower Mound online at http://www.wellingtonhoa.net

Ordinance Considerations … Public Opinion

Flower Mound, Texas

Solar Ordinance As Requested by an HOA President - All Aesthetics - 5/8/2014:

a) System shall not cover more than 80% of the roof.
b) All PV modules shall be screened from view, including ground-mounted arrays.
c) Minimum lot size of 2 acres for ground-mounted solar arrays.
d) Ground-mounted systems only allowed upon approval of special use permit.
e) Ground-mounted solar panels shall be lower than 5 feet.
f) Roof-mounted solar arrays shall not face any public street.
g) Ground-mounts screened equal to or greater than the highest point of the array.
h) Systems shall not exceed total number of kilowatts needed for a house.
i) Ground-mounts shall have only one system. No multiple locations.
j) Professional Engineer stamp required on all systems.
k) Ground-mounted arrays shall be counted toward accessory structure limit.

Ordinance As Approved by Flower Mound City Council - All Safety - (8/4/2014)

a) City Council **REMOVED** the 80% maximum roof coverage limit.
b) City Council **REMOVED** all screening requirements - roof AND ground.
c) City Council **REMOVED** minimum lot size requirement.
d) Special Use Permit requirement **REMOVED** for **ALL** systems.
e) Ground-mount array height limit **INCREASED** to eight feet.
f) Street-facing restriction **REMOVED**. Solar arrays may face ANY direction.
g) Ground-mount array screening requirement **REMOVED**. See item 'b' above.
h) System size and power limits **REMOVED**. May be ANY size.
i) Multiple-ground-mount location restriction **REMOVED**.
j) City Council **REMOVED** Professional Engineer seal requirement.
k) City Council **REMOVED** accessory usage rules. Does **NOT** count towards area of accessory structures.

Ordinance Considerations … Public Opinion

Southlake, Texas

In 2013 and 2014, the City of Southlake mailed "Solar Survey" Response Forms to 450 residents in areas where other residents had submitted solar energy system applications. Of the 450 Forms, 52 were returned.

Of the 52 .. 39 (**75%**) responded **in FAVOR** of solar energy on Southlake rooftops. These were all sent to the city by neighbors of the proposed systems.

Summary of All Southlake Solar Survey Response Forms from 2010 to present:

Number of Surveys Sent:	450
Number of Surveys Received:	52
Number of Respondents in Favor of Roof-mounted Solar Energy:	39 (75.0%)
Number of Respondents Opposed to Solar Energy:	9 (17.3%)
Nunber of Respondents Undecided:	4 (7.7%)
	52 (100%)

Ordinance Considerations ... HOA Concerns

State of Texas "HOA"

The State of Texas has a statute (HB 362) that prohibits HOAs from restricting the installation of solar energy equipment on homes.

The statute allows some discretion. If a location selected by a homeowner does not meet with the approval of the HOA, but the HOA's preferred location would result in more than a 10% energy reduction compared to the homeowner's location, then the HOA may not enforce their preference and instead **MUST** allow the homeowner to install the PV in their preferred location.

Reference: HB 362, Sec. 202.010 (2)(d)(4)(A).

HB 362 passed the Texas House on April 11, 2011, by a vote of:
Yeas 143, Nays 3, 1 present, not voting.

HB 362 was passed by the Texas Senate on May 31, 2011, by a vote of:
Yeas 31, Nays 0.

Ordinance Considerations … Developers - Wilbow Corp.

An International, Award-Winning, Multi-million Dollar Real Estate Development Corporation.

Founded in Melbourne, Australia in 1976
Opened offices in 1988 in the USA, based in Dallas, Texas.

Have completed and sold over 4,300 lots since 1988.

Acquired new properties to supply the acute shortage of new home sites in the most desirable locations, including Flower Mound, Colleyville, and the SH 114 corridor in the DFW area.

Has major developments under construction in 16 cities around Texas, including Roanoke, Flower Mound, Carrollton, Colleyville, Keller, Prosper, McKinney, Celina, Fort Worth, Benbrook and other communities.

Homes range in value from $300,000 to more than $5,000,000.

Adalina at Keller, Texas

Barton Woods, at Conroe, Texas

Ordinance Considerations - from Chaz Fitzgerald

CEO, Wilbow Development Corporation.

North Richland Hills

Subject: North Richland Hills
From: Chas Fitzgerald <cfitz@WilBowUSA.com>
Date: 09/18/2014 06:50 PM
To: Dan Lepinski <Dan@ntree.org>
CC:

Dan,

As a residential property developer with headquarters in Australia, I have the advantage to learn how a country that is far more keen on resource conservation to sustain a booming economy and growing population with finite resources. From that context as well as being aware of industry innovations here in the US, we elect not to prohibit solar panels in our residential communities.

There is a misperception that it lowers property values. In fact, solar panels represent a significant capital investment which then becomes a permanent improvement to the property and therefore translates to higher appraisal for the property. If the operating cost of the property decreases as a result of the electricity generation, then it stands to reason that the property is more valuable to the owner as well.

There was an industry leading residential community north of Houston, near Spring, that mandated that all homes built feature some basic level of solar electric generation as part of its green living theme. The homes cost about $10,000 more than the conventional same home built by the same builders without the solar arrays. This was only half the actual cost of adding this per my discussions with the builders. The operating costs of the homes were lower and this was part of the sales pitch to buyers, that even though they were paying more on the price, they would more than make it up in time in operating cost savings. The biggest takeaway was the appraisers and mortgage companies got on board that the houses were more valuable with this equipment.

We take the wrong approach to regulate technology by aesthetics. Some folk see wind turbines as ugly and others see them as beautiful, but it is a personal view either way and most would agree that wind energy is a worthy pursuit. Aren't the nostalgic windmills just an old technology version of the wind turbines today? I would say that in time we will all get used to see solar panels. I see vast fields of them in other parts of the country and they are awe inspiring.

As regulators of building, cities should not impede technological advances nor energy conserving features, be they rain water catchment, foam insulation, reduced framing techniques, or solar energy. We all react to things that are new to us, but aesthetic reasons are simply the wrong criteria for this. Flower Mound seems to in the end, got it right when they abandoned aesthetic criteria and adopted safety criteria instead.

Regards,

Chas Fitzgerald
Wilbow Corporation, Inc.

1 of 1 09/30/2014 11:41 AM

As a residential property developer with headquarters in Australia, I have the advantage to learn how a country that is far more keen on resource conservation to sustain a booming economy and growing population with finite resources. From that context as well as being aware of industry innovations here in the US, we elect not to prohibit solar panels in our residential communities.

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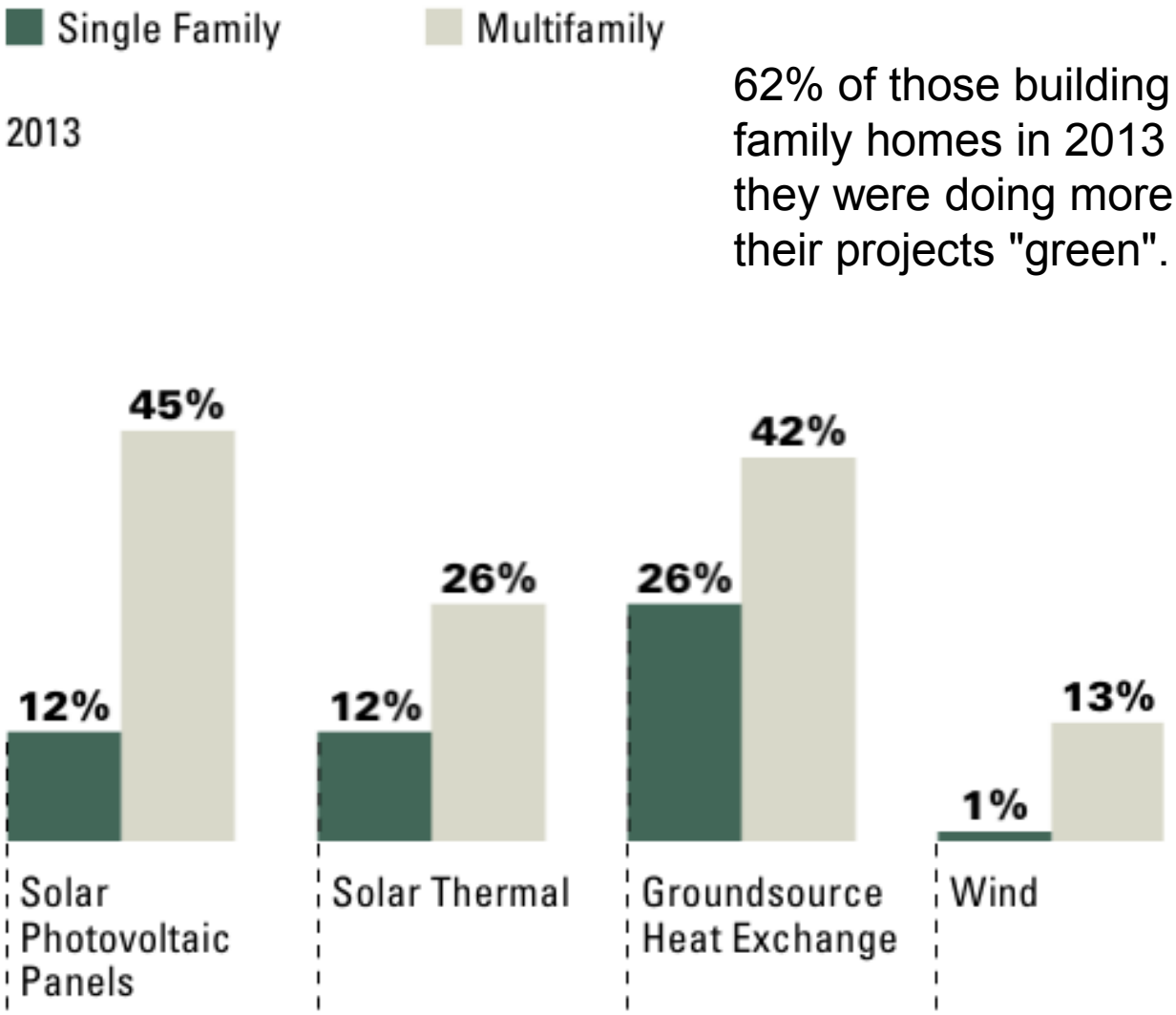
Ordinance Considerations … Homebuilders

Homebuilders Offering Solar as a Standard Feature



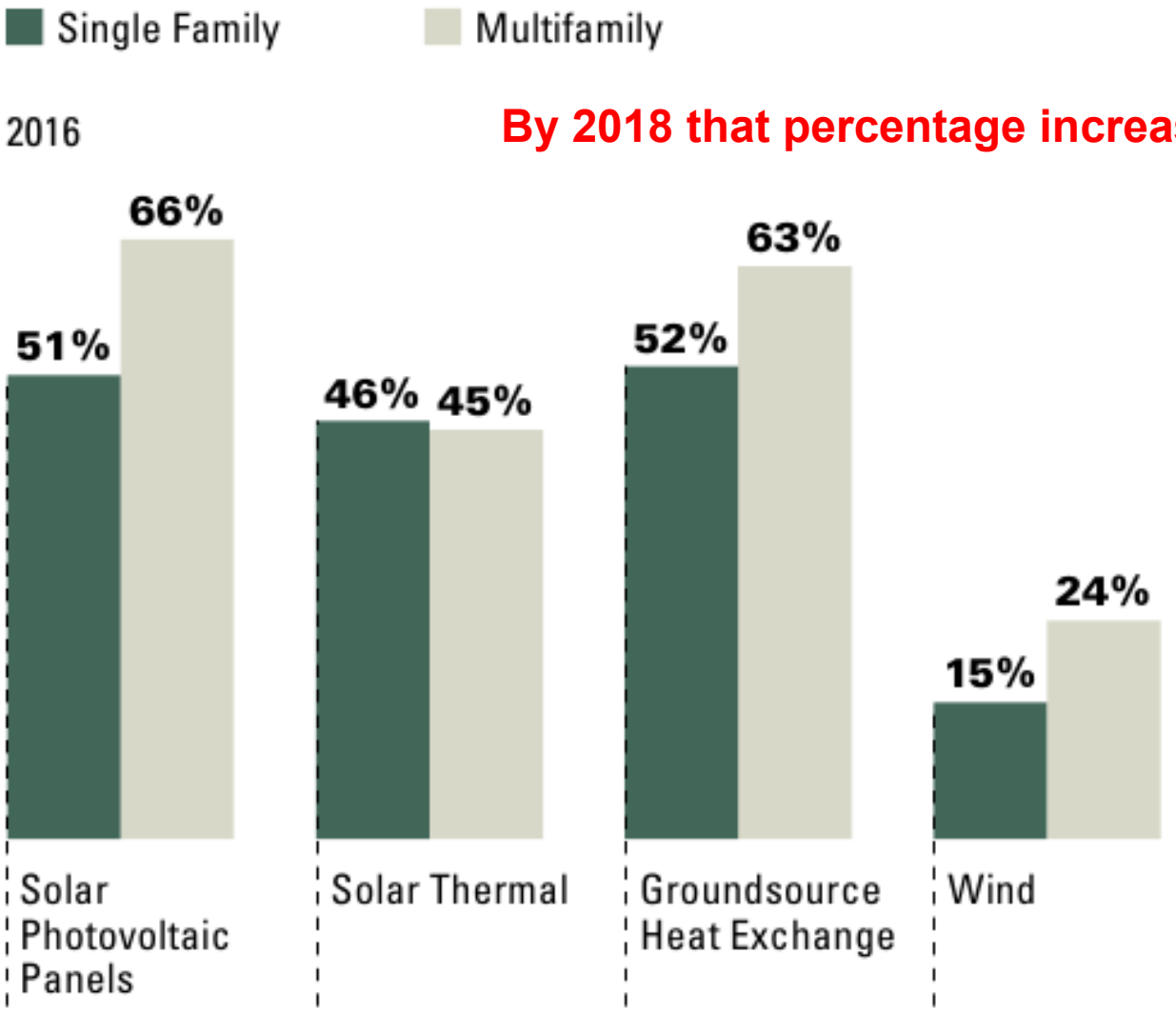
62% of those building new single family homes in 2013 reported they were doing more than 15% of their projects "green".

Source: National Association of Homebuilders, McGraw Hill Financial "Smart Market" Report, June, 2014 (Pg 50).

GO SOLAR

Ordinance Considerations … Homebuilders

Homebuilders Offering Solar as a Standard Feature



Source: National Association of Homebuilders, McGraw Hill Financial "Smart Market" Report, June, 2014 (Pg 50).

GO SOLAR

Ordinance Considerations … Equipment Concerns

Hail
Solar panels are certified to Underwriters Laboratories Safety Standards to withstand a MINIMUM of one-inch diameter hailstones falling at 55 mph. Solar panels often protect roofs!

Solar Panels Are Heavy
False. Solar panels only LOOK heavy due to the frame, which is needed to support snow loads in cold climates. Actual weight ranges from 2.4 to 2.7 pounds per square foot – including mounting rack! This weight is evenly distributed over a large area.

Shock Hazard
Per Underwriters Laboratories Safety Standards, and the National Electric Code, solar electric systems must cease operating if the utility power fails. Solar electric systems will not provide power to the home or the utility in the event of a power outage.

Ordinance Considerations … Equipment Concerns

Solar Panels Can Be Mounted Flat Against the Roof.

False. Solar panels need cool air. If mounted flat on the roof, solar panel energy output will be reduced by up to 50%, and the heat will significantly shorten their life, and/or cause them to fail.

Solar Panels Can Generate Maximum Power in Any Direction.

False. Solar panels must face south for maximum energy generation. East and west directions may be used for morning and afternoon energy production. Restricting solar panel direction and/or location may decrease system energy output and reduce the value of the system.

Solar panels will generate very little energy if facing north compared to south.

For maximum energy production, solar panels are tilted 20-30 degrees from horizontal in Texas to optimally face the sun, but may be somewhat more or less than 20-30 degrees, with a corresponding reduction in energy.

Ordinance Considerations … Structural Concerns

A Professional Engineer Must Analyze and Stamp Every Roof Plan.

Not necessarily.

Municipalities express concern a residence roof won't be able to support the weight of a solar panel array.

A team of experts at Sandia National Laboratory in New Mexico, in partnership with the University of New Mexico, conducted two extensive series of tests on residential roof structures constructed using 2x6 rafters on 24" centers. **Testing took more than three years - from 2013 to 2016.**

The team was headed by Dr. Steve Dwyer, Ph.D, P.E., Structural Engineer, with 31 years experience as an Engineer, 25 of which are at Sandia Labs.

Here are the findings of the research published in April, 2016:

Source: Sandia National Laboratory Report, April 14, 2016, http://energy.sandia.gov/

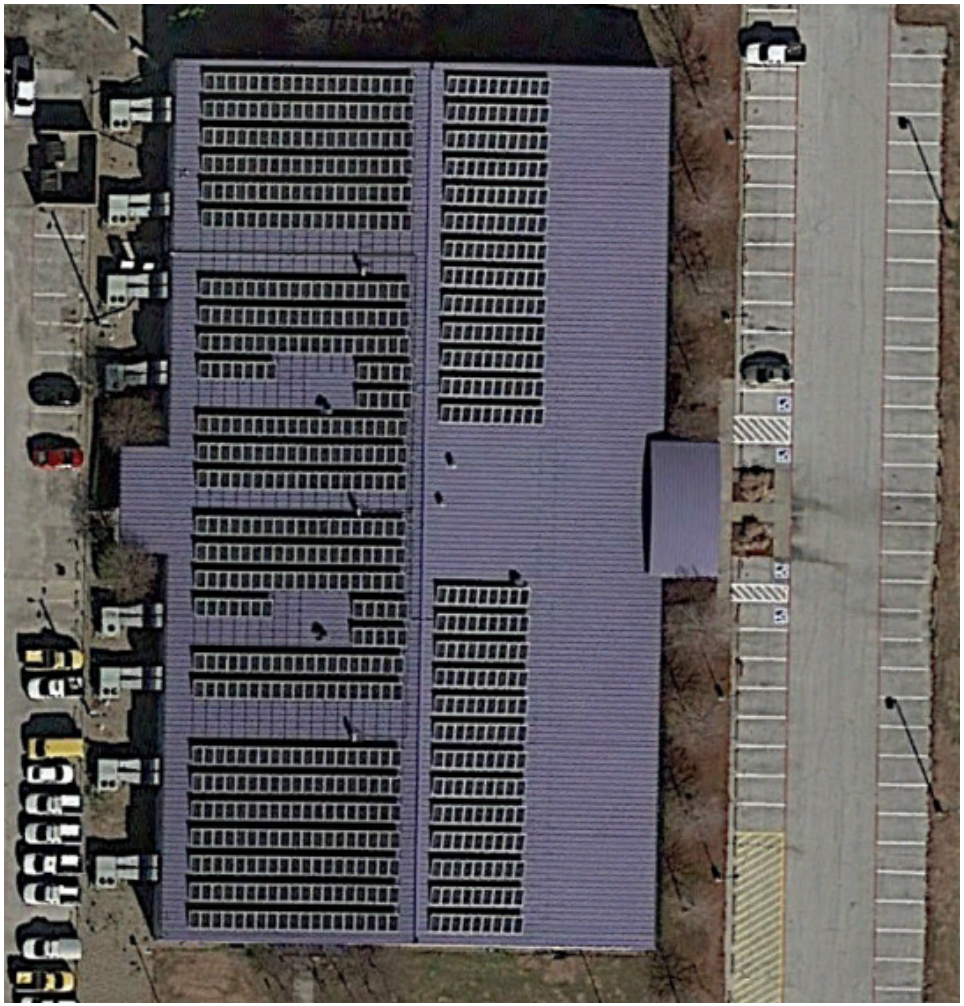
Ordinance Considerations … Structural Concerns

Sandia National Labs / UNM Roof Strength Research

- Sandia stressed wood rooftop structures to the point of failure and compared the data with allowable loads identified in the International Residential Code (IRCC) and the National Design Standard.
- Tests were conducted on a variety of roofs with rafter lengths ranging from 8 feet to 20 feet in length.
- Results proved the actual load-bearing capacity for residential rooftop structural systems is several times higher than the calculated values.
- On average, the rafter-based tests demonstrated a 330% excess load-bearing capacity compared to values computed in the National Design Standard.
- Report and PDF here:
  www.sandia.gov/news/publications/labnews/articles/2016/15-04/rooftop.html

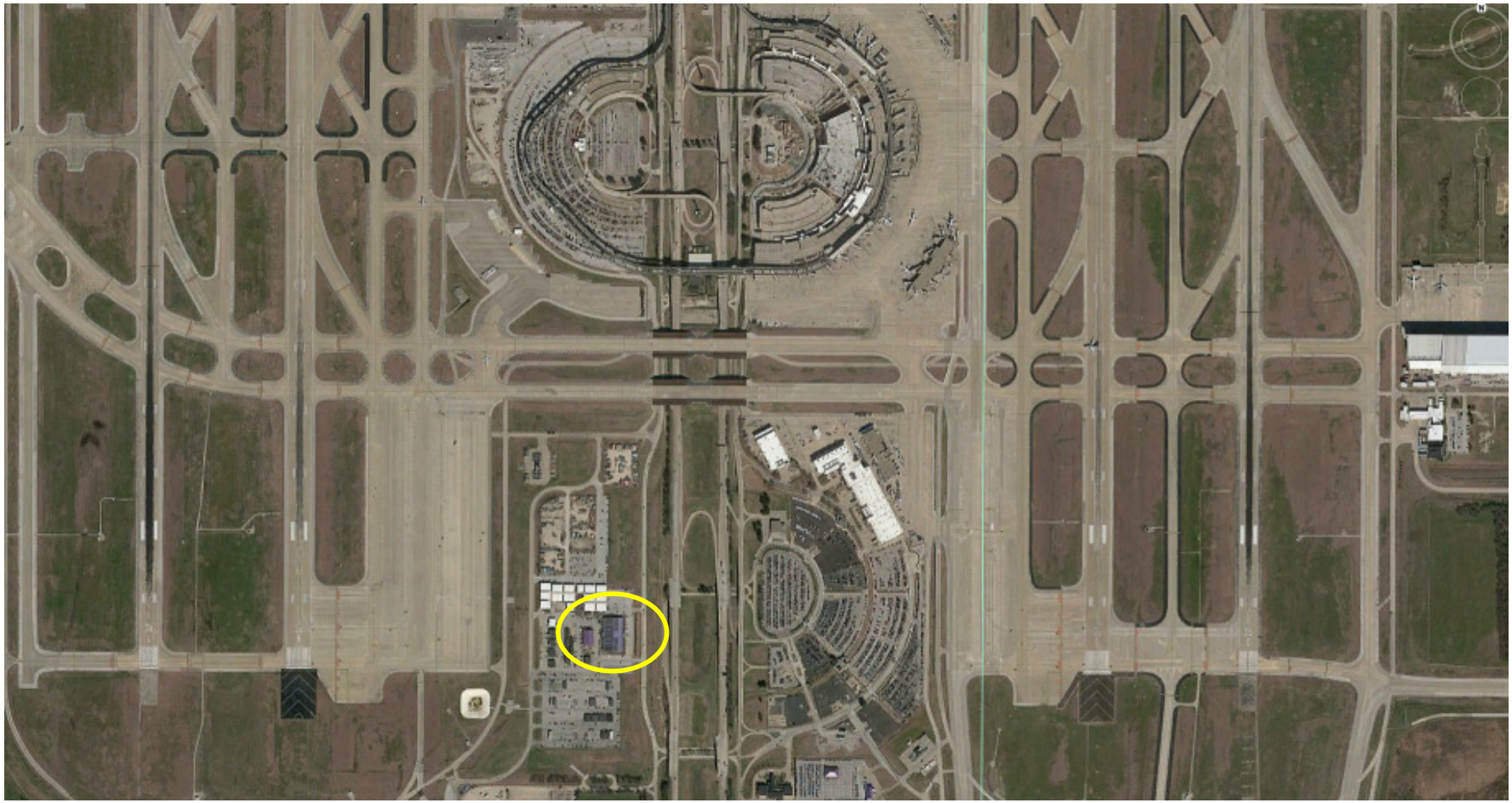
Ordinance Considerations … Glare

Recognize this building?



Ordinance Considerations … Glare

How about now? **Hint: It's at DFW International Airport.**

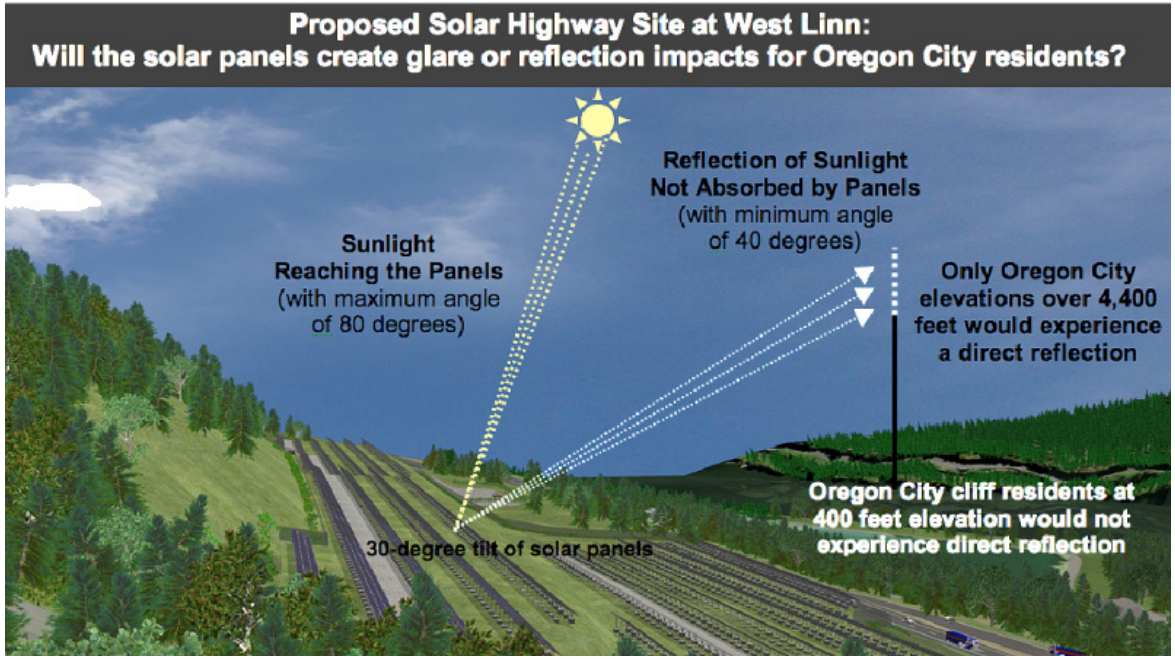


693 photovoltaic panels on the Airport Development and Engineering Building, between and directly in line with all of the main runways.

GO SOLAR

Ordinance Considerations … Glare

- 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, and restricted where solar panels could be placed and the direction they could face. Benbrook rescinded the ordinance in 2015 after the City discovered glare was not an issue.
- Solar panels are tilted to face the sun. Reflection that *may* occur goes skyward.



Source: Glendale Unified School District Glare Study, West Linn, Oregon, www.gusd.net/

Ordinance Considerations … Historic Districts

- Interest is in keeping the district visually true to its origins.
- Typical approach is to require solar panels be mounted out of sight, or not at all. This is often not workable.
- Planners, preservationists, and solar advocates recognize the value of adding solar energy systems to historic structures and are eager to find solutions to this tension between aesthetics and historic preservation.
- A recent report, "*Implementing Solar PV Projects on Historic Buildings and in Historic Districts*", co-authored by the National Renewable Energy Laboratory and the National Trust for Historic Preservation includes a series of guidelines for siting solar energy systems on historic properties.

Link: www.nrel.gov/docs/fy11osti/51297.pdf

Source: United States Department of Energy, National Renewable Energy Laboratory. National Trust for Historic Preservation.

Ordinance Considerations … NCTCOG

North Central Texas Council Of Governments "Solar Ready II" Program (Sponsored by the U.S. Dept of Energy)

Goal: Reduce "Soft Costs": Permitting is less expensive for everyone.

GO SOLAR

Ordinance Considerations - "Soft Costs"

- More than 90% of all DFW Metroplex Cities Use Simple Permitting System.[1]
- A permitting process is lower cost for the City and the citizens.
- Establish clear rules and guidelines for permit approval.
- Publish permit application requirements on your City's website.
- Utilize "Expedited Permitting" whenever possible. NCTCOG has Templates.

www.nctcog.org/solar

[1] Source: Dan Lepinski, P.E., Research of all 237 incorporated communities in the DFW Metroplex, (c) 2014, 2015.

Ordinance Considerations - "Soft Costs"

- Solar energy is still in its relative infancy as an industry.

- The American public feels "solar is still too expensive".
  A 7 - 12 year ROI (after incentives) is often considered "too long".

- Forward-thinking cities are requiring "solar". In April, 2016, San Francisco became the first large city in the USA to require solar on all new buildings less than 10 stories tall. Partisan? No. The law passed unanimously, and takes effect January, 2017.[1]

- San Francisco was followed one month later by the City of Santa Monica, requiring solar on all new single-family dwellings, multi-family dwellings, and all non-residential hotel and motel structures. Lancaster California began requiring solar on all new homes in 2014, joining cities such as Tucson, Arizona and others that have begun requiring "solar" on new buildings.

- Why is this important? California has been the American leader in solar energy for more than 20 years. Actions in California often become a template for the rest of America.

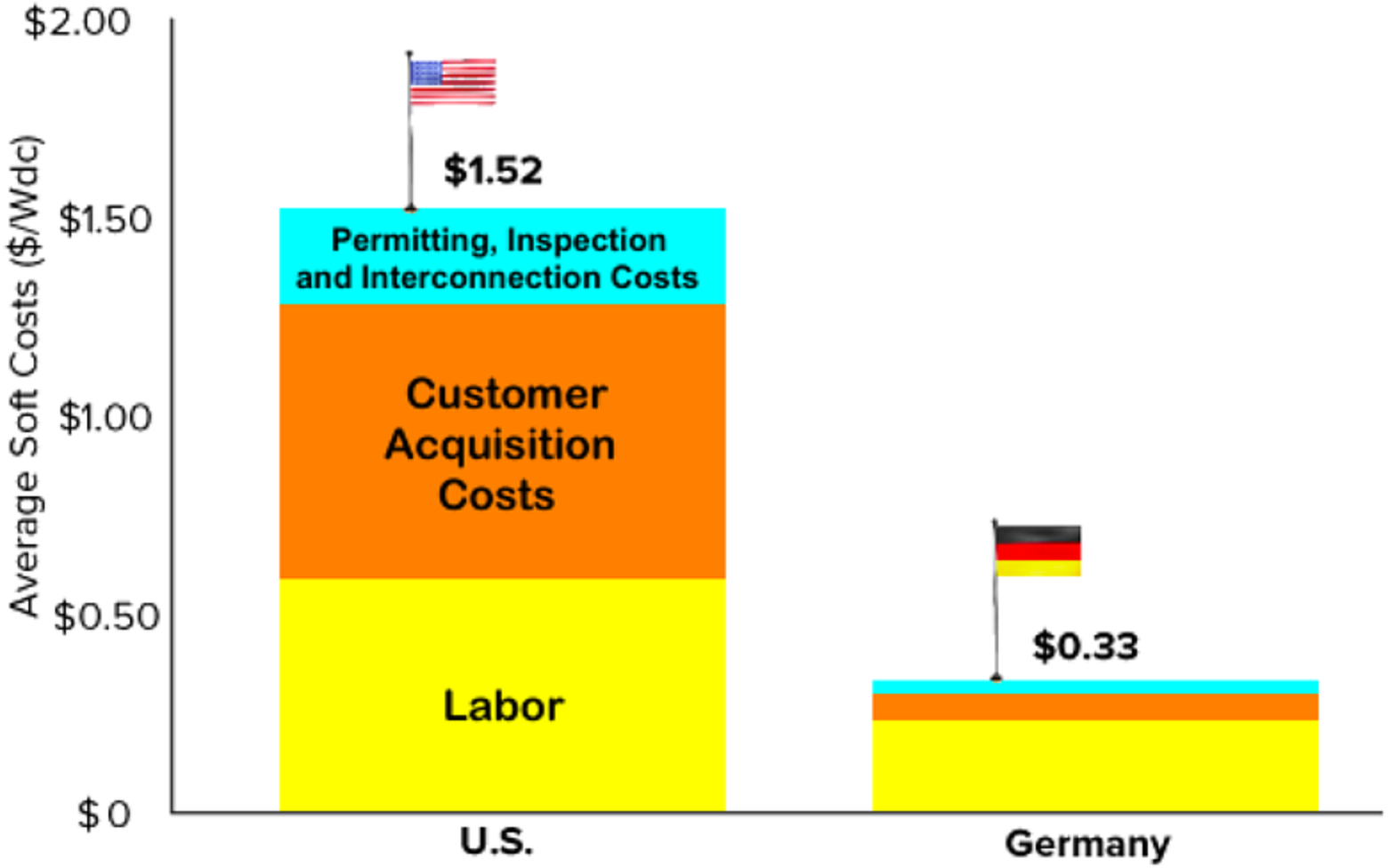
[1] Source: CNN, April 21, 2016, http://money.cnn.com/2016/04/21/technology/san-francisco-solar-power/

Ordinance Considerations - "Soft Costs"

- Elected officials, government staff, and consumers may not know what questions to ask, nor whom to contact for accurate information.
- Efforts are underway to educate officials and consumers.
- In Germany, officials AND citizens are well educated about solar .. and costs of the benefits of solar energy reflect this knowledge.

Ordinance Considerations - "Soft Costs"

In Germany, "Soft Costs" are nearly 80% less than in the USA....



Source: Rocky Mountain Institute, http://blog.rmi.org/blog_2013_02_11_Whos_the_BoS, Feb 11, 2013.

GO SOLAR

Ordinance Considerations - "Soft Costs"

Municipal Level - What Can Be Done for Reduction?

- Implement "Expedited Permitting" processes for qualified residential installations.
- Establish a single, low-cost flat-rate fee for Expedited Permitting for residential systems up to 10 kW in size.
- Implement on-line permitting applications for eligible systems.
- Clearly state permit submittal requirements on your City's website. If a system doesn't qualify for Expedited Permitting, use standard application steps.
- Provide a standardized template for eligible permit applicants.
- Reduce the processing time for permit approval.
- Minimize the number of inspections required.

Ordinance Considerations … Property Values

Subject: RE: North Richland Hills
From: Beth Johnson <beth.johnson.realtor@gmail.com>
Date: 09/17/2014 09:31 PM
To: "Dan Lepinski" <Dan@ntree.org>

Dan,

As to a home's resale value, the presence of either roof-mounted or ground-mounted solar electric or solar hot water on a residence in the Metroplex is at worse a neutral factor, and at best brings added value. There is no evidence to suggest that it lowers values, regarding either the subject property itself or neighboring homes.

I have taken dozens of hours of appraisal courses, including some addressing how to appraise properties with green features such as solar. There has never been any suggestion in these courses that the presence of solar equipment would subtract value for the subject property or nearby properties. Rather, discussions and presentations center on methodologies for how to appropriately add value for the subject property relative to comparable properties lacking solar.

Beth Johnson, REALTOR, Keller Williams Realty
"Connecting and respecting buyer, seller, builder, community, Earth"
LEED AP, EcoBroker Certified, Certified Green Professional, NAR GREEN
• First REALTOR on the planet to earn "Quad Crown" of greenbuilding credentials from USGBC, EcoBroker, NAHB, and NAR
• Texas' first LEED Accredited Professional REALTOR
• Texas' first Certified EcoBroker
"Let me help you buy, build, sell, or upgrade your green home!"
Phone: 972.732.6000
Fax: 972.468.7480
Cell: 214.415.5089
Home office: 972.635.9774
Beth@BethJohnson.com
www.BethJohnson.com
www.kwpreston.com
18383 Preston Rd., Suite 150, Dallas, TX 75252

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Ordinance Considerations … Property Values

Effect of Solar Energy Systems on Sales of Neighboring Property

7421 Hightower Drive,
North Richland Hills, TX.

Listed: May, 2014.
Contract: July, 2014!
This home is in direct view of a solar PV array on a two-story home.
Selling agency: Century 21-Tim Gauntt Company (Keller, TX).
Sold for the asking price! The array had NO impact on this sale!

Part 2 – Solar Energy for Local Governments

- Permitting & Ordinance Considerations
- **Expedited Permitting**
- Solar Technologies - Present and Future
- Open Q & A and Displays

Solar Energy for Local Governments
What Is "Expedited Permitting"?

- Expedited Permitting is a process that reduces solar permitting costs to a municipality, and its citizens.

- Expedited Permitting consists of:
  1. Prequalifying solar systems to establish eligibility for the process.
  2. Eliminating inconsistencies in the permitting process.
  3. Simplifying and standardizing the application and approval process.
  4. Pre-qualifying installers.
  5. Pre-qualifying specific system configurations and topologies.
  6. Minimizing expenses to the City and the citizen.

- Related cost-reduction steps in addition to or beyond permitting:
  1. Reduce the number of inspections required.
  2. Eliminate the need for Structural PE analysis and seal when not indicated.

- Compare the NCTCOG "Expedited Permitting" template to your present process:

NCTCOG "Expedited Permitting" Template…

Basics: Address, etc.

Site Info: Type, building age, roof material.

System Size, weight, make and models…

GO SOLAR

SOLAR PV EXPEDITED PERMIT CHECKLIST

This Expedited Permit Checklist is intended to be used as a best management practice when establishing local government requirements for **rooftop** residential and commercial solar photovoltaic (PV) system permits. Local governments may modify this checklist to accommodate their local ordinances, code requirements, and permit procedures. This expedited permit checklist will facilitate the decision timeline for all solar PV systems meeting all pre-defined criteria in Section 4.

SECTION 1: SITE AND OWNER INFORMATION

Site Address:_____ **Name:**_____
Parcel ID:_____ **Email:**_____
Street:_____ **Phone:**_____
City:_____ **Zip Code:**_____

SECTION 2: TYPE OF SOLAR PV APPLICATION

☐ **Residential**
- **Year Home Built**: _____ *(Homes built prior to 1975 may, at the discretion of the building official or designated representative, require additional structural review and may not qualify for the expedited permit process)*
- **Roof Covering Type:**
  ☐ Composite Shingles ☐ Tile ☐ Other:_____

☐ **Commercial**
- **Year Building Built:**_____ *(Additional structural review may be required based on the commercial building age and will be at the discretion of the building official or designated representative)*
- **Roof Covering Type:**
  ☐ Composite Shingles ☐ Tile

SECTION 3: SOLAR PV SYSTEM INFORMATION

☐ Provide manufacturer specification sheets for all system components
- Is the mounting system an engineered product designed to mount solar panels? ☐ **YES** ☐ **NO**
  If no, provide structural attachment details in a letter certified by a design professional.

	MODULE	INVERTER	MOUNTING SYSTEM (IF PRE-ENGINEERED PRODUCT)
Manufacturer			
Quantity			
Model			

System Weight/Arrangement
- Total weight of module(s) and rails (lbs.): _____
- Number of attachment points:_____
- Weight per attachment point (lbs.):_____
- Maximum spacing between attachment points (inches):_____
- Total surface area of modules (sq. ft.):_____
- Total system weight per sq. ft. (lbs.):_____

This document was produced by the North Central Texas Council of Governments for use by local governments through partnerships with the Texas State Energy Conservation Office and the Solar Ready II program (National Association of Regional Councils, the Mid-America Regional Council, Meister Consultants Group, Inc., and the Council of State Governments).

NCTCOG "Expedited Permitting" Template…

Contractor Information

Electrical Information

Code Compliance

Zoning District

Equipment Standards

Weight Limit

Module Tilt

Electrical Connection

Fire Safety Requirements

GO SOLAR

SOLAR PV EXPEDITED PERMIT CHECKLIST

SECTION 4: EXPEDITED PERMIT ELIGIBILITY CHECKLIST

If the solar energy system complies with all the criteria (1 – 10) below, then it will qualify for an expedited permit approval which will be granted within [*X days/over the counter*].

1) Contractor Requirements

☐ The contractor performing the solar installation holds the necessary licenses and permits to perform this work in this jurisdiction, including (*List specific licensing requirements in jurisdiction*).

Contractor Contact:_____ **Company:**_____
Name:_____ **Phone:**_____
Email: _____

2) Maximum Capacity

☐ The capacity of the proposed PV project will not exceed 120% of the panelboard buss ampacity rating for a load side connection.
☐ Solar system is utility interactive and without battery storage.

3) Project Code Compliance

☐ The structure that the proposed solar system will be mounted on is code-compliant and the proposed solar installation is compliant with all relevant fire and electrical codes including setback requirements. Code compliance will be verified by an on-site inspection.

4) Zoning Variance

☐ A zoning variance will not be required for the proposed solar installation.

5) Historic/Architectural Review

☐ The proposed solar installation is not located on a building subject to historic or architectural review.

6) Equipment Standards

☐ Equipment make, model, and quantity of module, racking system is certified to UL 2703, photovoltaic to UL 1703, and inverters to UL 1741 or UL 62109 Standard by a Nationally Recognized Testing Laboratory.

7) Weight Limit

☐ The proposed solar system will have a distributed weight of less than 5 lbs. per square foot and less than 45 lbs. per attachment point to roof.

8) Module Tilt

☐ To mitigate wind loads, the proposed system will be mounted parallel to the roof surface or tilted with no more than an 18 inch gap between the module frame and the roof surface.

9) Electrical Connection

☐ The proposed solar installation is composed of 4 PV strings or less per string inverter.
☐ The PV system is connected to the load side of the utility distribution equipment.
☐ The proposed solar installation is documented in accordance with a solar PV standard ~~electrical pla~~plan guideline~~n~~.

10) Fire Safety Requirements

☐ As applicable by the city fire department, codes, and standards. (*List specific licensing requirements in jurisdiction)*

This document was produced by the North Central Texas Council of Governments for use by local governments through partnerships with the Texas State Energy Conservation Office and the Solar Ready II program (National Association of Regional Councils, the Mid-America Regional Council, Meister Consultants Group, Inc., and the Council of State Governments).

NCTCOG "Expedited Permitting" Template...

Section 1: Site and Owner Information.

GO SOLAR

SOLAR PV EXPEDITED PERMIT CHECKLIST

This Expedited Permit Checklist is intended to be used as a best management practice when establishing local government requirements for **rooftop** residential and commercial solar photovoltaic (PV) system permits. Local governments may modify this checklist to accommodate their local ordinances, code requirements, and permit procedures. This expedited permit checklist will facilitate the decision timeline for all solar PV systems meeting all pre-defined criteria in Section 4.

SECTION 1: SITE AND OWNER INFORMATION

Site Address:_____ **Name:**_____

Parcel ID:_____ **Email:**_____

Street:_____ **Phone:**_____

City:_____ **Zip Code:**_____

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NCTCOG "Expedited Permitting" Template...

Section 2: Type of Solar Application

SECTION 2: TYPE OF SOLAR PV APPLICATION

☐ **Residential**

- **Year Home Built**: _____ *(Homes built prior to 1975 may, at the discretion of the building official or designated representative, require additional structural review and may not qualify for the expedited permit process)*
- **Roof Covering Type:**

  ☐ Composite Shingles ☐ Tile ☐ Other:_____

☐ **Commercial**

- **Year Building Built:**_____ (*Additional structural review may be required based on the commercial building age and will be at the discretion of the building official or designated representative*)
- **Roof Covering Type:**

  ☐ Composite Shingles ☐ Tile

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NCTCOG "Expedited Permitting" Template...

Section 3: Solar PV System Information

SECTION 3: SOLAR PV SYSTEM INFORMATION

☐ Provide manufacturer specification sheets for all system components

- Is the mounting system an engineered product designed to mount solar panels? ☐ **YES** ☐ **NO**
  If no, provide structural attachment details in a letter certified by a design professional.

	MODULE	INVERTER	MOUNTING SYSTEM (IF PRE-ENGINEERED PRODUCT)
Manufacturer			
Quantity			
Model			

System Weight/Arrangement

- Total weight of module(s) and rails (lbs.): _____
- Number of attachment points:_____
- Weight per attachment point (lbs.):_____
- Maximum spacing between attachment points (inches):_____
- Total surface area of modules (sq. ft.):_____
- Total system weight per sq. ft. (lbs.):_____

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NCTCOG "Expedited Permitting" Template…

Section 4: Expedited Permit Eligibility Checklist

SECTION 4: EXPEDITED PERMIT ELIGIBILITY CHECKLIST

If the solar energy system complies with all the criteria (1 – 10) below, then it will qualify for an expedited permit approval which will be granted within [*X days/over the counter*].

1) Contractor Requirements

☐ The contractor performing the solar installation holds the necessary licenses and permits to perform this work in this jurisdiction, including *(List specific licensing requirements in jurisdiction)*.

Contractor Contact:_____ **Company:**_____

Name:_____ **Phone:**_____

Email: _____

NCTCOG "Expedited Permitting" Template...

Section 4: Expedited Permit Eligibility Checklist

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NCTCOG "Expedited Permitting" Template...

Section 4: Expedited Permit Eligibility Checklist

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9) Electrical Connection

☐ The proposed solar installation is composed of 4 PV strings or less per string inverter.

☐ The PV system is connected to the load side of the utility distribution equipment.

☐ The proposed solar installation is documented in accordance with a solar PV standard plan guidelines.

10) Fire Safety Requirements

☐ As applicable by the city fire department, codes, and standards. *(List specific licensing requirements in jurisdiction)*

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Part 2 – Solar Energy for Local Governments

- Permitting & Ordinance Considerations
- Expedited Permitting
- **Solar Technologies - Present and Future**
- Open Q & A and Displays

Solar Technologies - Present and Future

- **“Smart” homes**
  Homes with appliances and controls that make more intelligent use of the energy we consume.

- **“Time of Use Metering”, and “TOU” energy credits**
  Energy use is greatest from 4 p.m. to 8 p.m. Energy is most expensive when it's in greatest demand.

- **“Tiered” Billing**
  The more you use, the more it costs. In extensive use in California. Watch for other utility companies to follow.

- **Home Energy Storage**
  As batteries improve and decrease in cost, it will become more economical to store excess energy, and use it on site during periods of expensive electricity.

Solar Technologies - Present and Future

- **Increased Efficiency in Solar Equipment**
  New materials such as "perovskite" show evidence of doubling solar panel efficiency. Half the size .. or double the energy in the same area as present technologies. Lower cost too.

- **Continued Decrease in Costs of Solar Equipment**
  Price for solar energy equipment will continue to incrementally decrease for the foreseeable future.

- **“Solar” Offered as a Standard Feature in New Homes**
  According to surveys conducted by the National Association of Homebuilders, 84% of their members will offer "solar" as a standard feature by 2018. 52% already offer solar today.

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…

GO SOLAR

Questions?

Thank You!

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

<u>Training Contact:</u>

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Thank You!

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

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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!