



Solar in Texas

Status and Opportunities

Presentation prepared for the Greater Fort Worth Sierra Club



Kristina Ronneberg, Air Quality Planner
North Central Texas Council of Governments

Presentation Overview

NCTCOG; Who we are & Why we care about solar

Texas: The State of Solar

Solar 101 Basics: Terminology and Equipment

Considering your own solar installation? Now What?

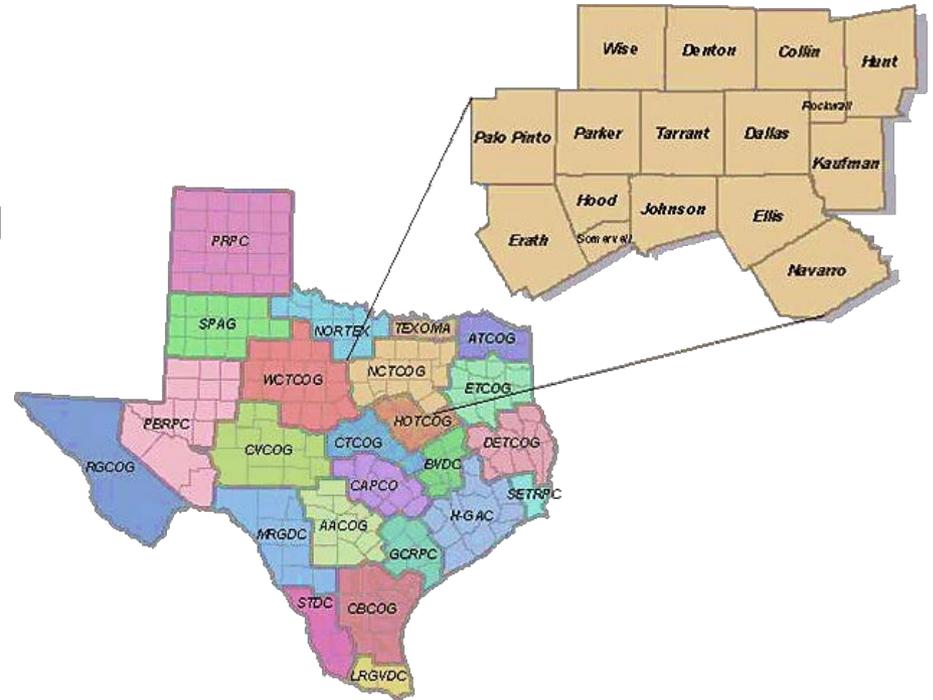
Solar Energy Resources

NCTCOG: WHO WE ARE AND WHY WE CARE ABOUT SOLAR

Solar is a low emission energy source. Increased deployment of solar has the potential to help reduce harmful emissions that contribute to ozone formation and health concerns.

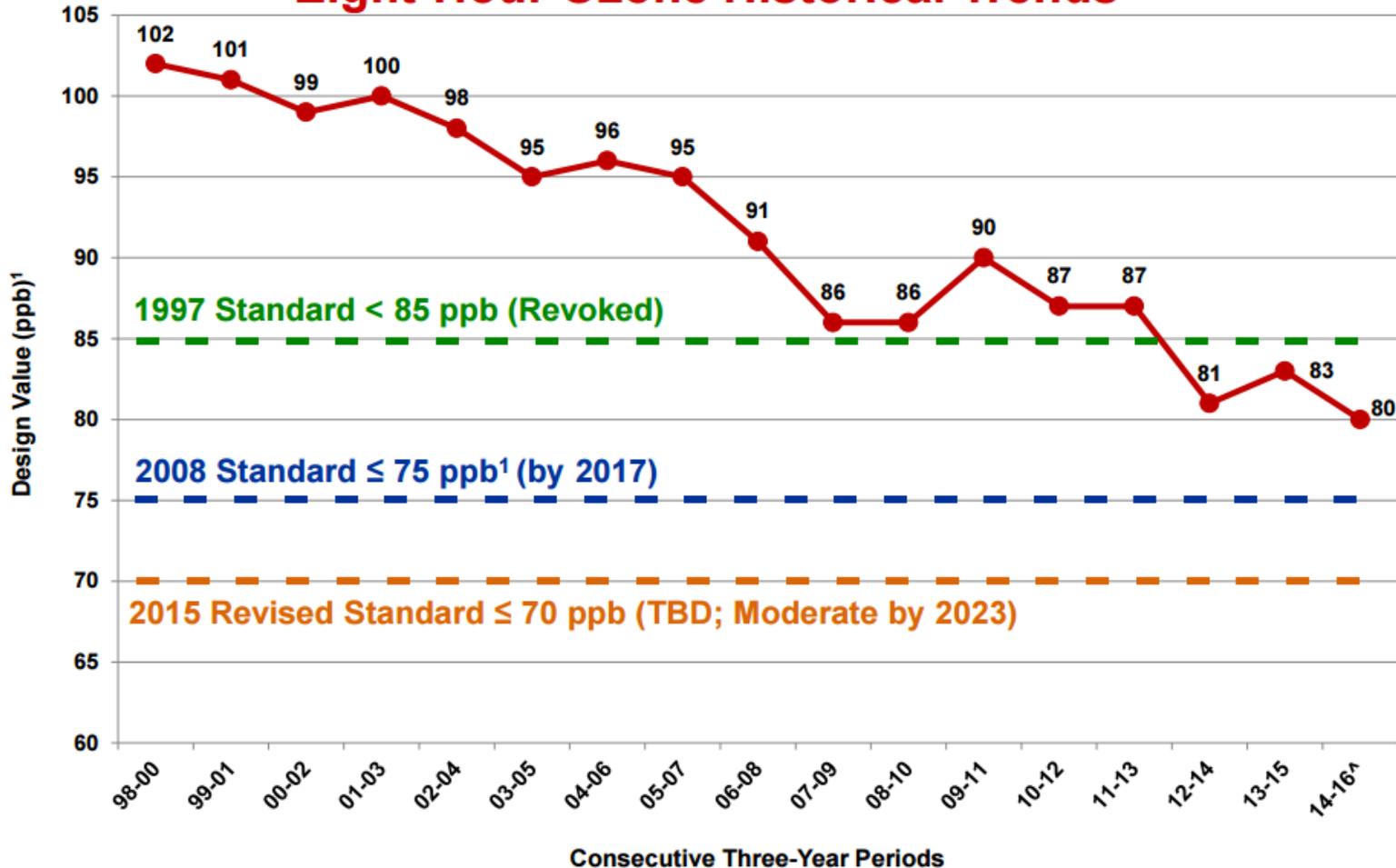
About NCTCOG

The North Central Texas Council of Governments (NCTCOG) is one of 24 Council of Governments across Texas whose main function is to transcend jurisdictional boundaries to promote sound development and facilitate cooperation among member governments. NCTCOG works on many quality of life issues such as transportation planning, air quality, environmental management, emergency preparedness, workforce development, and more. For information on all Texas regional agencies, visit the [Texas Association of Regional Councils](#).



Ozone Nonattainment & Air Quality

2016 OZONE SEASON Eight-Hour Ozone Historical Trends



¹Attainment Goal - According to the US EPA National Ambient Air Quality Standards, attainment is reached when, at each monitor, the *Design Value* (three-year average of the annual fourth-highest daily maximum eight-hour average ozone concentration) is equal to or less than 70 parts per billion (ppb).

[^]Not a full year of data, current as of 10/06/2016

Air Quality Control Strategies & Local Programs



TEXAS: THE STATE OF SOLAR

Texas has more solar energy potential than any other US state. Currently, Texas ranks 7th in the country in installed solar capacity.

Texas' Benefits From Solar



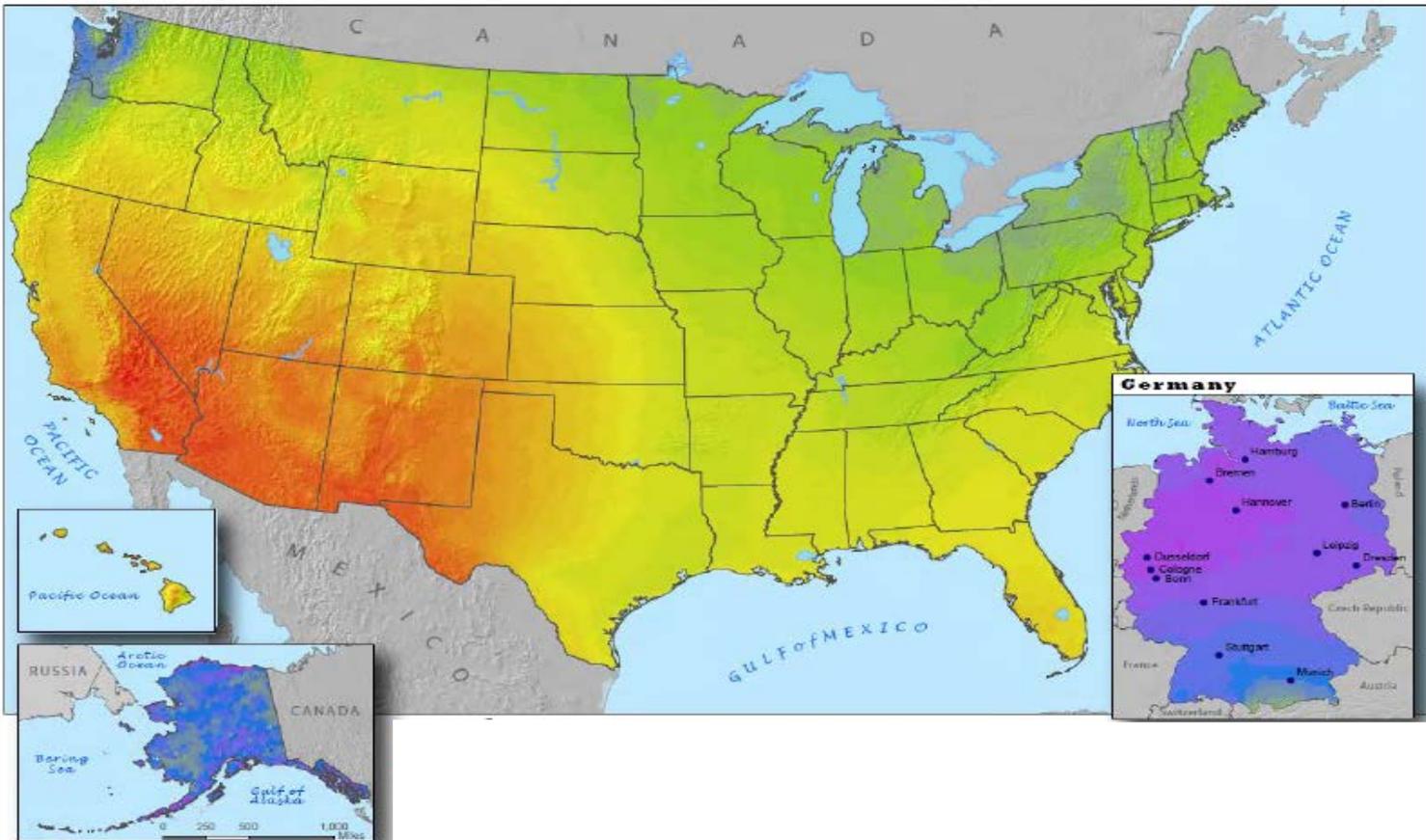
Abundant Resource

Meet Growing Energy Demand

Improve Air Quality

Economics and Financial Stability

Solar Abundance



Solar Abundance

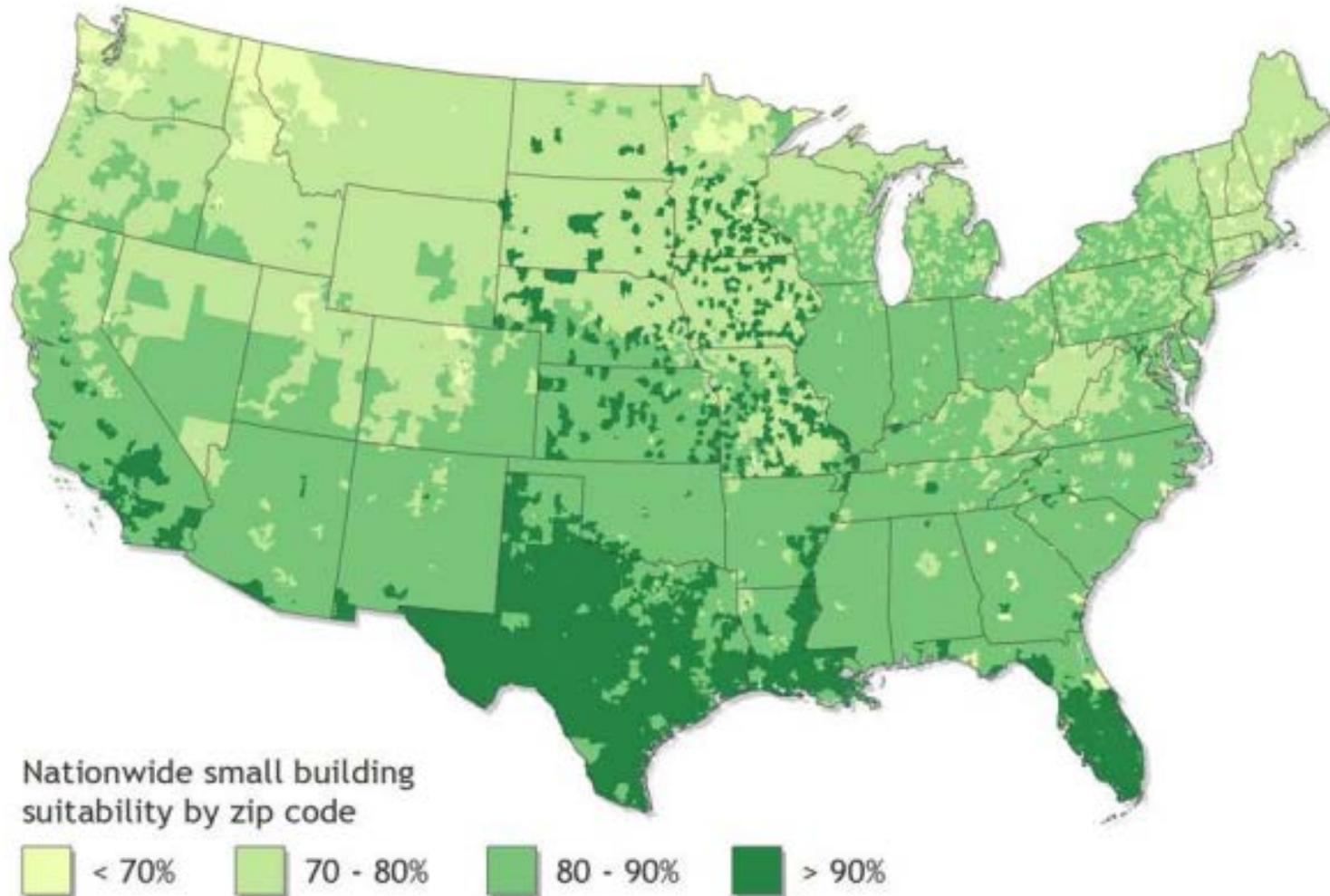


Figure ES-1. Percentage of small buildings suitable for PV in each ZIP code

Texas' Benefits From Solar



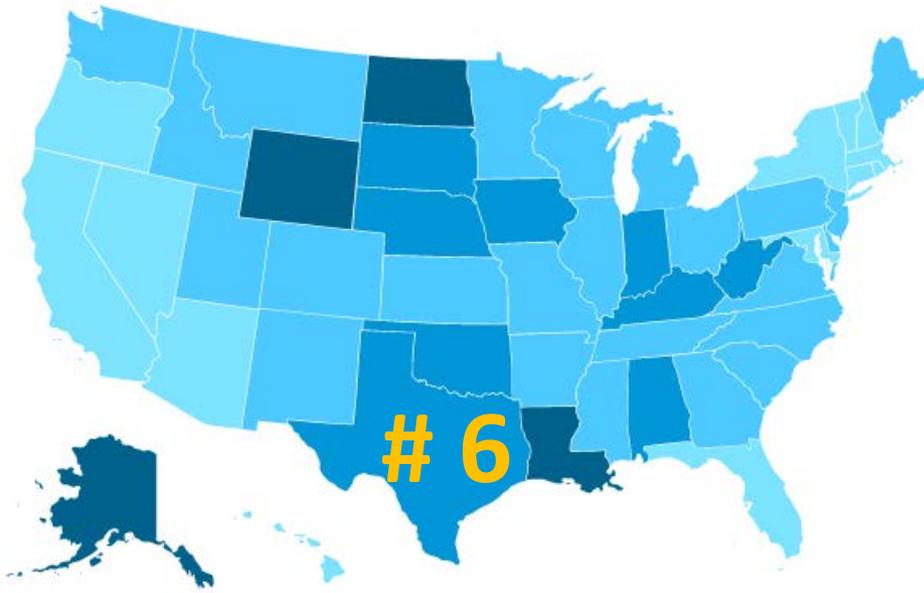
Availability of Abundant Resource

Meet Growing Energy Demand

Improve Air Quality

Economics and Financial Stability

Growing Energy Demand



New Peak Demand Records
are being set each year:

2015: 69,877 MW

2016: 71,093 MW

Meanwhile population,
and corresponding
energy needs, are
growing across North
Central Texas

Population Trends

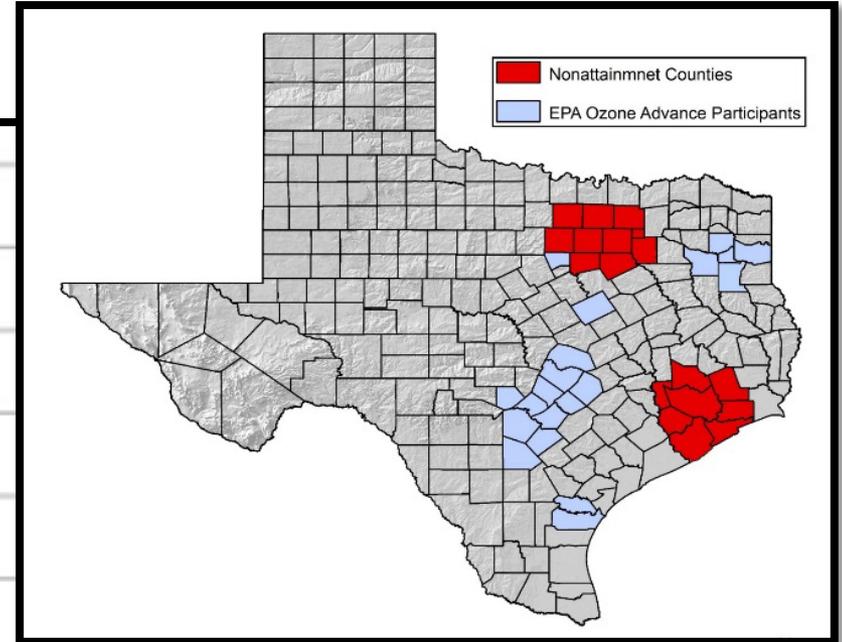
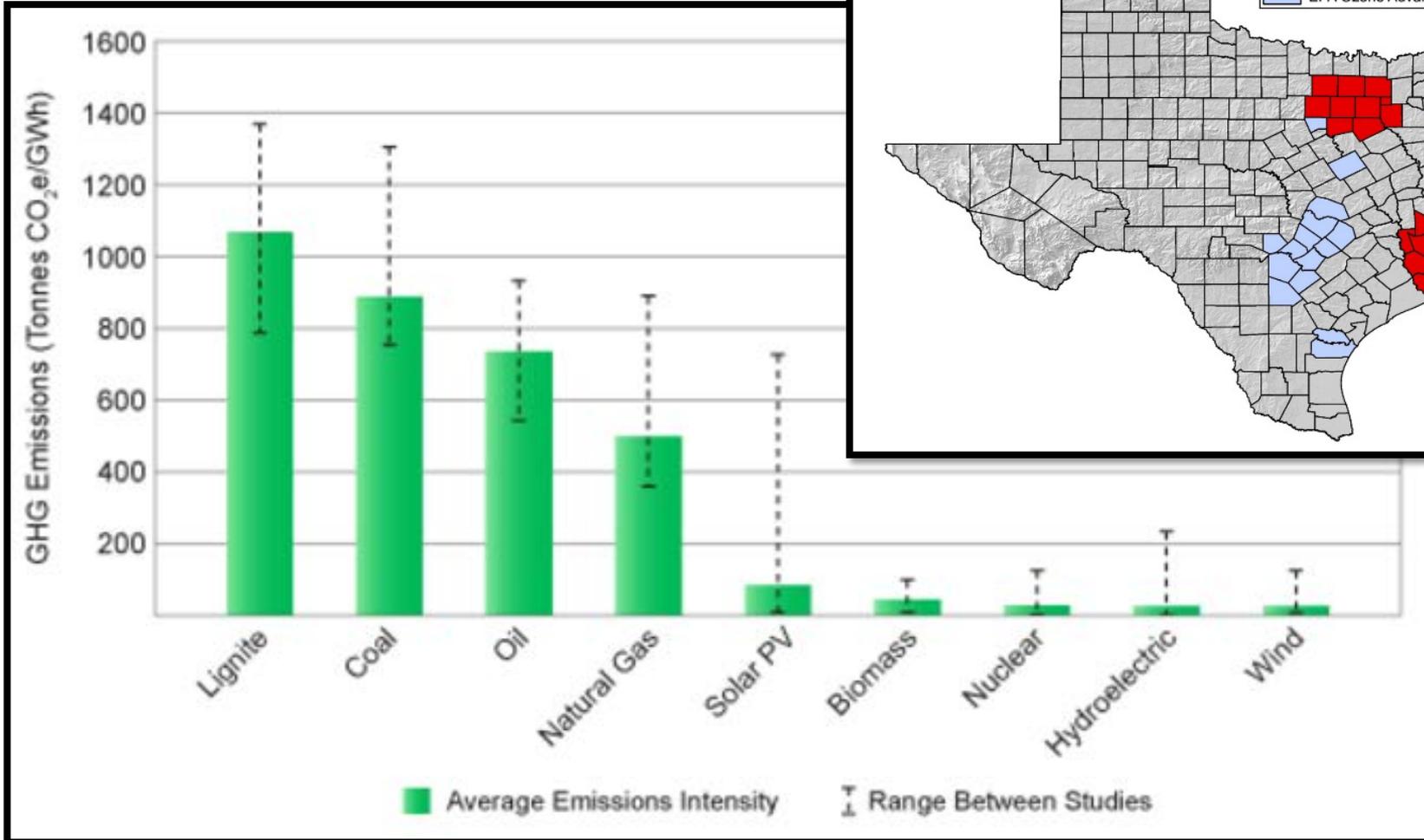
- One of the fastest growing states
- NCTCOG population forecasted to grow by 47% between 2017 and 2040, to over 10.5 million
- Per capita Income expected to increase
- Thousands of housing units being developed
- Business relocation to North Central Texas

Texas' Benefits From Solar



Low-Emission Energy Source

Energy Source Emission Comparison

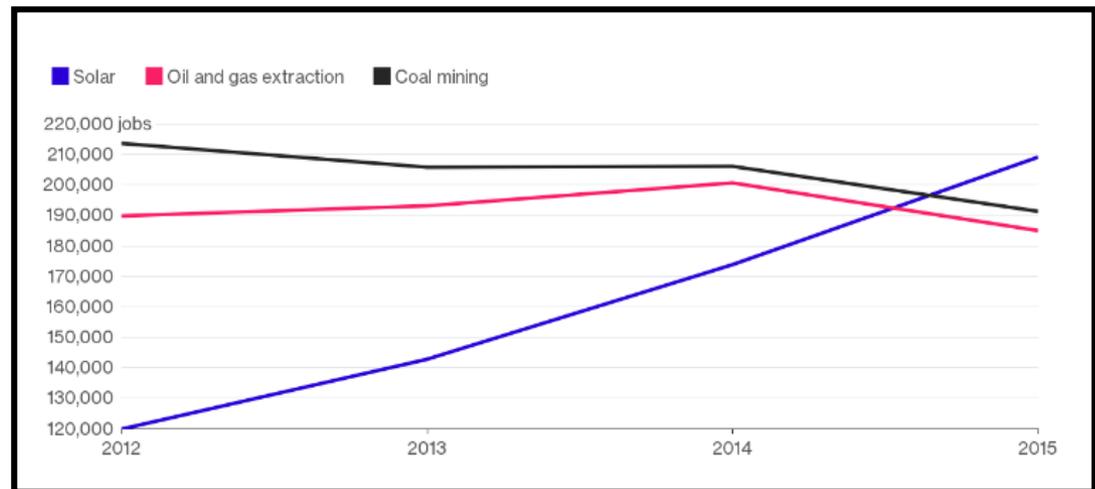
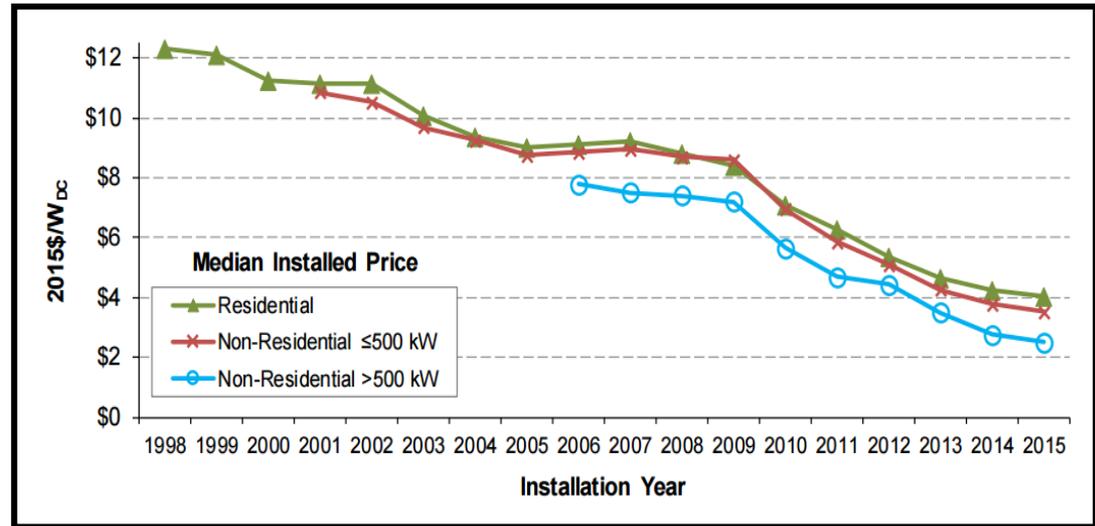


Texas' Benefits From Solar



Economics and Financial Stability

- Federal Investment Tax Credit
- Declining Solar Costs
- Solar Job Growth
- Price Stability



Solar is Here!

Municipal and School Solar Commitments



Austin, Bridgeport ISD,
Dallas, Denton,
Duncanville, Georgetown,
Irving ISD, McKinney,
Pasadena ISD, Presidio
ISD, San Antonio

Large Solar Projects and Community Solar



CPS Energy
CoServ Electric
Austin Energy
MP2 Energy
REI, Kohl's, Target, Ikea, FedEx

Solarize Projects

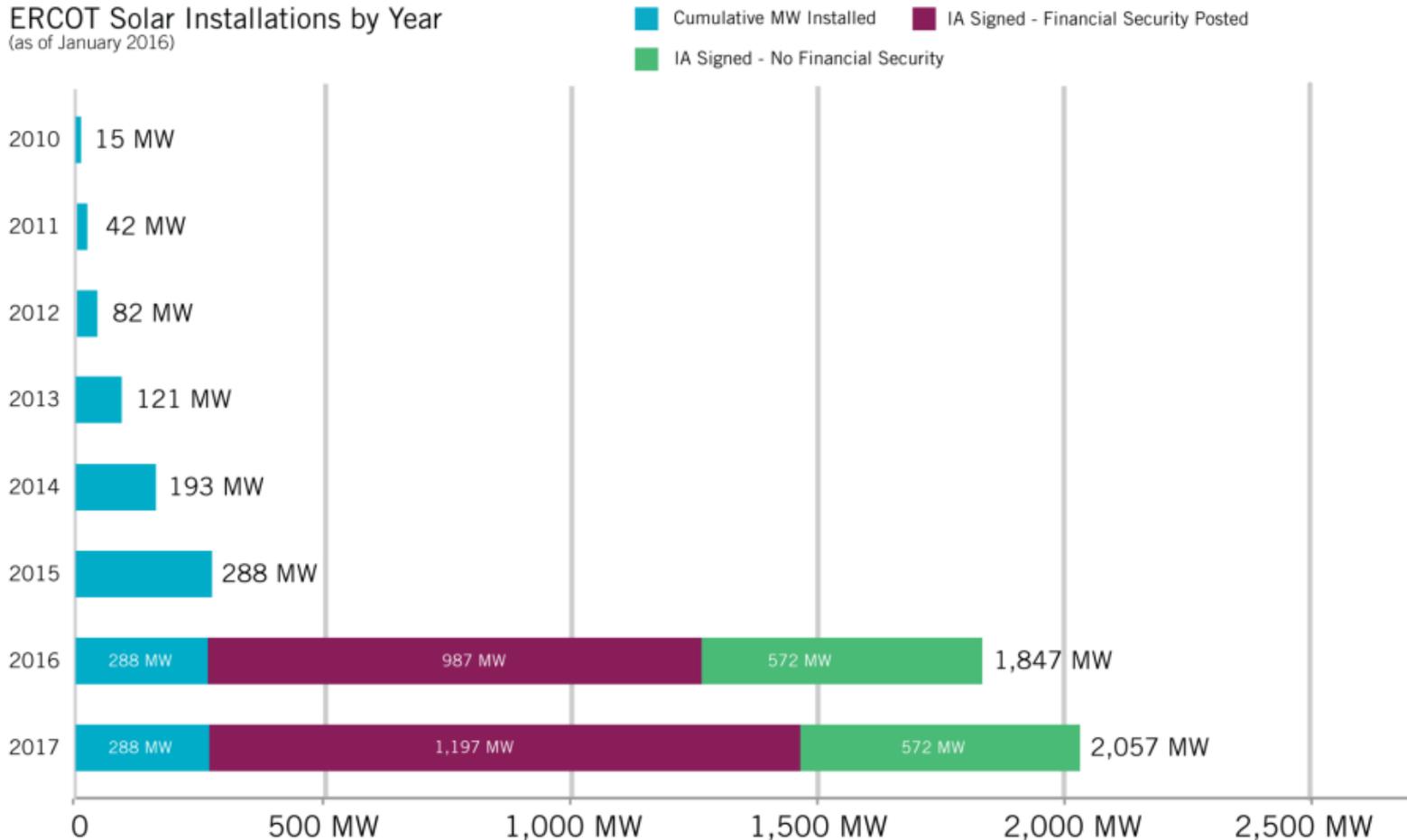


Plano
Houston
Garland
Wells Branch
Gillespie County

Solar Growth, Texas

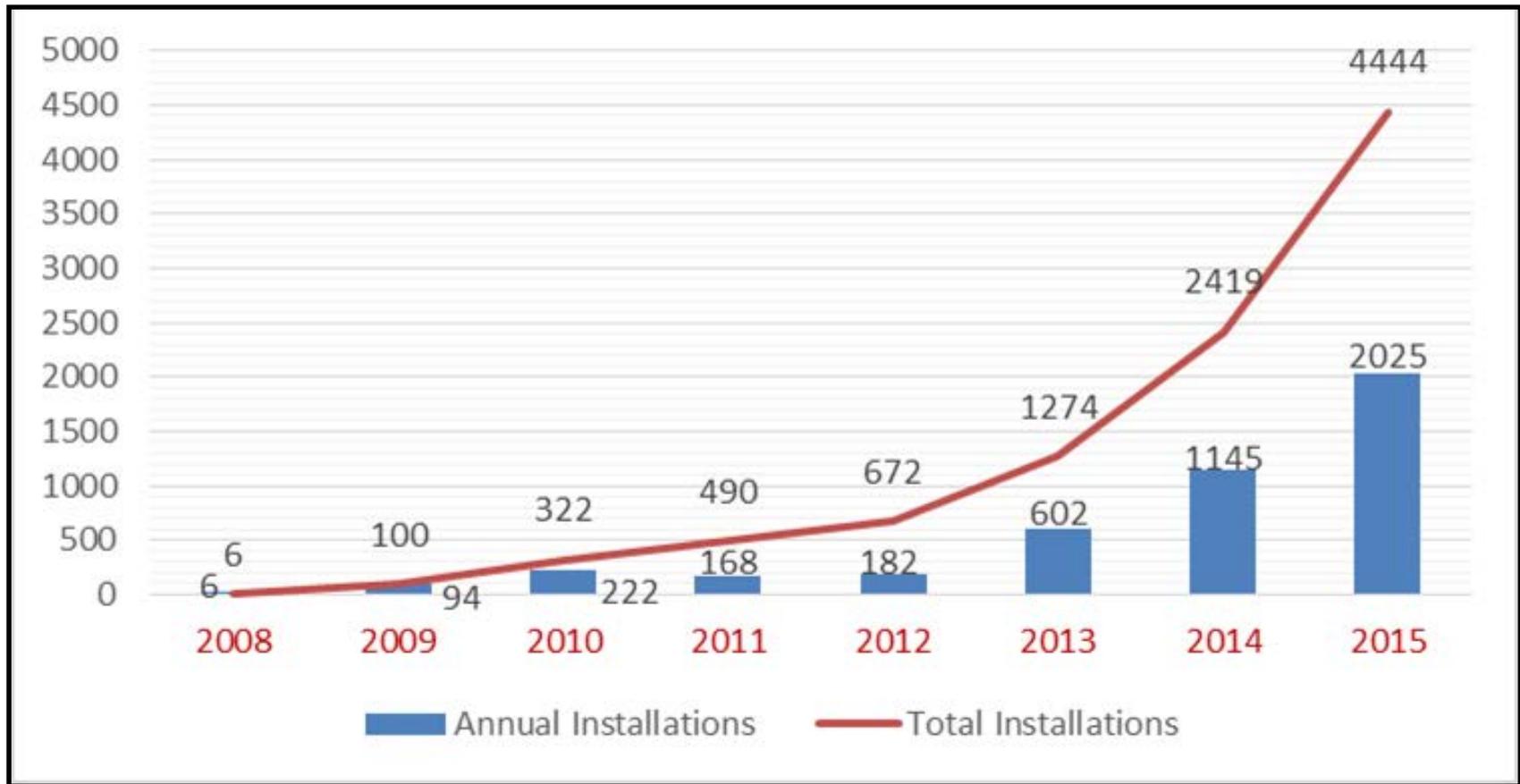
Utility Scale Solar Generation – January 2016

ERCOT Solar Installations by Year
(as of January 2016)



Solar Growth, North Central Texas

Annual and Total Rooftop Installations (2008 – 2015)



Important Solar Legislative Notices for Texas

TEXAS LAWS

HB 362 (passed in 2011)

- This bill updated the Texas Property Code, Sec. 202.010 and 202.011
- Prevents HOAs from restricting solar panels on homes. However, the home owner must follow the requirements of the law, and the HOA does have a voice in where they may be installed as determined by the amount of energy they'll generate in a given location.
- The above aside, the HOA cannot simply deny the installation.

SB 1626 (passed in 2015)

- The "neighborhood in development" loophole had allowed residential developers the option to block solar installations until the last lot was sold. Due to SB 1626, this loophole has been reduced to only apply to developments with fewer than 51 planned residential units (effective 9/1/2015).

TEXAS TAX BREAKS

- Residential renewable energy systems are also eligible for tax exemptions on assessed valuation. A form can be filed with the County of residence.
- A State of Texas property tax exemption exists involving solar, wind, biomass, and anaerobic digestion for business installation or construction of such systems.
- Businesses that either use or manufacture or install solar or wind energy can receive franchise tax deductions and/or exemptions.

SOLAR 101 BASICS: TERMINOLOGY AND EQUIPMENT

The Lone Star State has installed 534 megawatts (MW) of solar capacity, enough to power 57,000 homes.*

Solar 101 Basics: Electricity, Power, and Energy Terminology

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.

Inverter: Device that changes DC to AC.

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

Solar 101 Basics: Financial Terminology

Grid-Connected: Connected to the utility lines.

Leased System: On the business, owned by a third-party.

Net Metering: Credit for energy sent back to the utility.

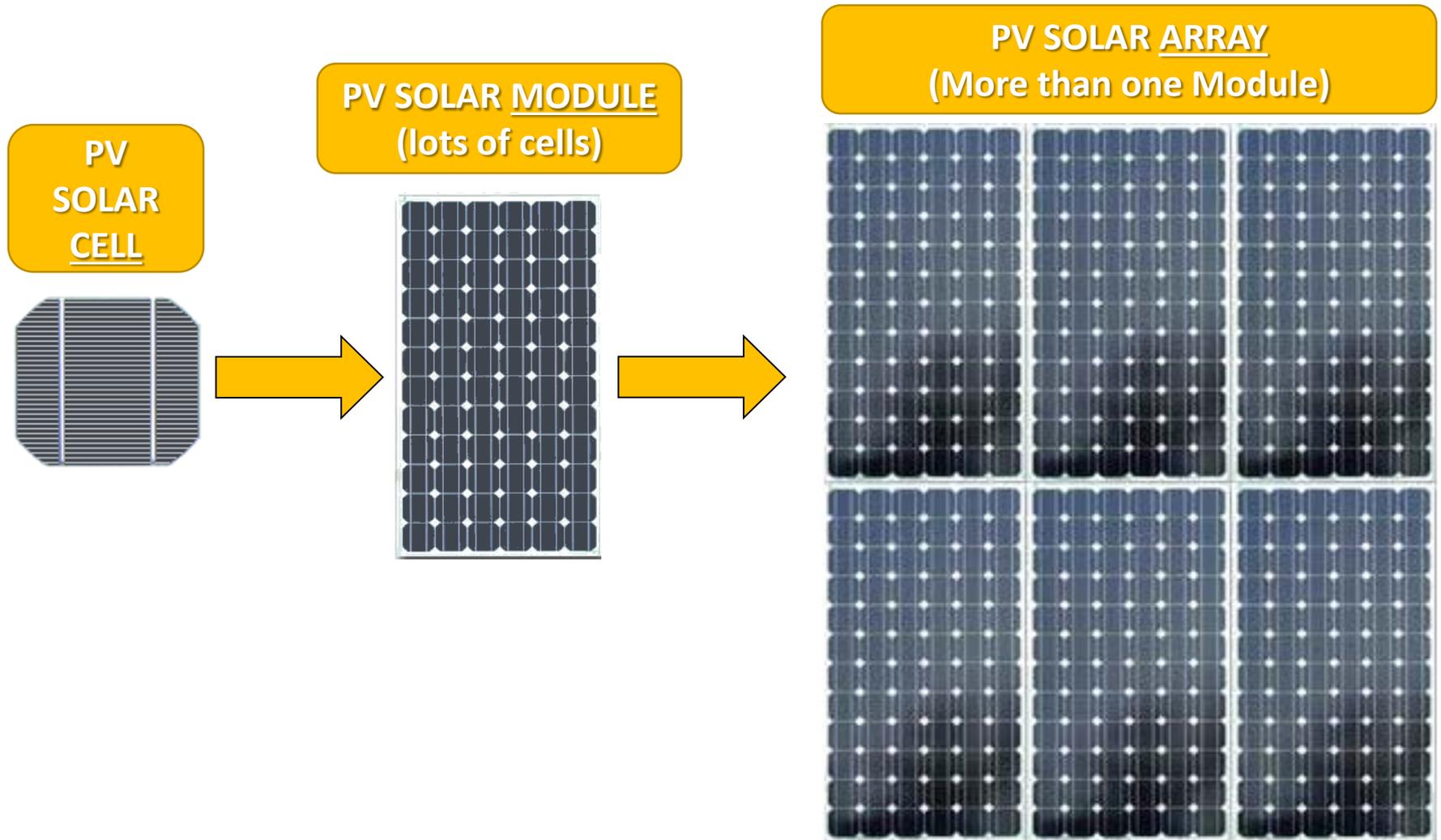
Net Zero: Energy credit balances energy consumed.

Parity: Energy value balances loan payment.

"PPA": Power Purchase Agreement.

"REP": Retail Electric Provider.

Solar 101 Basics: Equipment



Basic Overview: Solar 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.

CONSIDERING INSTALLING A SOLAR ENERGY SYSTEM?...NOW WHAT?

Homes with rooftop solar command a premium of \$15,000 (for a typical size 3.6 kW PV system) and sell up to 50% faster than non-solar homes.*

Visit GoSolarTexas.org



1. Educate Yourself



2. Is Solar Workable for My Home?



3. Financing a Solar Installation



4. Finding Certified Installers



1. Educate Yourself

Many more resources are available at gosolartexas.org

Resources for:

- Homeowners
- Business Owners
- Local Governments
- School Districts
- Utilities
- Solar Professionals (Industry, Real Estate Agents, Appraisers, etc.)

A FEW RESOURCES TO EXPLORE

The screenshot shows the Go Solar Texas website. At the top is the logo and navigation menu. Below is a banner image of Texas flags. The main content area features a video player titled "Texas: State of Solar" and a grid of six resource categories: Home Owners, Business Owners, Local Governments, School Districts, Utilities, and Solar Professionals. A paragraph of text is located between the "Local Governments" and "School Districts" categories.

Go Solar Texas

To learn more about solar resources and information available to you, select the level of solar that applies to you.

Home Owners

Business Owners

Local Governments

School Districts

Utilities

Solar Professionals

Solar power is an emerging clean energy option that can positively impact North Texas' environment and save consumers money on their electric bills. Dallas-Fort Worth is a prime location for solar technology and its growth due to the region's climate and geography. Solar power can provide much of the needed electricity when electricity demand is highest - when it's hot and the sun is shining.

With proper implementation, solar energy will help to improve air quality by decreasing the amount of fossil fuel power generation needed. This corresponds to reduced emissions that contribute to Texas' air pollution and current nonattainment status for the pollutant ozone in several regions.

[Go Solar Texas](http://gosolartexas.org)



2. Is Solar Workable for My Home?

A few considerations that will impact the Return on Investment (ROI):

- Orientation of your home or business (does it have a South or Southwest facing roof that receives ample sunlight)
- What financial incentives are currently available
- What Retail Electric Provider you have and whether there is one who will compensate you for electricity generated
- The type of system you want installed
- Price of electricity
- How much electricity you consume annually

A FEW RESOURCES TO EXPLORE

energysage 888.838.4638 Search Sign In
About Solar Solar Calculator Solar Loans Solar Marketplace

Compare your solar quotes

Get competing solar quotes online

Enter your zip code Get Started

Over 25,000 people use EnergySage each year to get multiple solar

Energy Sage: Get Competing Solar Quotes Online

SOLAR ENERGY
The Authority on the Sun's Power

LATEST SOLAR NEWS: Indian Scientists Design Solar Tree to Save Space for Solar Power Generation Search Solar

FREE Solar Power Calculator

SOLAR ENERGY CALCULATOR

1. Let's start with your location! 2. A little information about your home. 3. Solar Systems Estimate 4. Your information

Let's start with your location!
Zip Code
Is your home shaded?
No Shade
PREVIOUS NEXT

Eliminate Your Electric Bill and Lock In Your Power Costs

Our FREE solar calculator can help you determine the yearly savings you will earn when installing a PV solar system for your home. See the difference a solar system can save you over the next 25 years vs. having a fluctuating power bill every month. As fuel and power costs go up, your electricity bill will be sure to follow. Who would not like to power their home using free power that the sun supplies every day? A solar system may be cheaper than you think to install, see the solar calculator below to get started!

Solar Energy: Free Solar Power Calculator



3. Financing a Solar Installation

Like buying a car, there are different options to consider to best meet your needs, and a variety of incentives can help make the economics work:

Step 1) Calculate the Return on Investment (ROI)

- Ask your installer to include an ROI estimate on their quote or, develop your own or validate an installers quote by using the tools provided here
- Most installer quotes take existing incentives into account, so make sure you can claim incentives for an accurate ROI

A FEW RESOURCES TO EXPLORE

Solar Estimate
Solar Estimate is America's leading solar calculator showing solar prices and the cost of a solar system after rebates.

Home Solar Calculator Solar Incentives Solar Financing Solar Guide Installer Resources About Us

America's leading solar calculator tells you:

- What size solar system you need
- How much solar panels cost
- What rebates are available
- Your returns and payback period; and
- The best solar installers in your area (www.solarreviews.com)

\$250 p.m bill Attleboro, MA	\$150 p.m bill Queens New York	\$280 p.m bill San Diego, CA
Utility: NSTAR Electric	Utility: National Grid	Utility: Southern Cal
System Size: 11.47 kw	System Size: 8.76 kw	System Size: 7.2 kw
System Cost: \$27,695	System Cost: \$24,856	System Cost: \$20,854
Rebates: \$13,508	Rebates: \$13,298	Rebates: \$9,000
Payback period: 5.6 years	Payback period: 4.61 years	Payback period: 8.7 years

ESTIMATE MY SYSTEM

Solar Estimator: Shows Solar Prices and Cost of Systems after Rebates

EXPLANATION OF ON-LINE COST ESTIMATOR CALCULATIONS

This cost calculation spreadsheet file will help you calculate

1. The Total Installed Cost and Total Installed Net Cost
2. An equivalent \$/kWh for comparison to current utility rates
3. Estimated Cost savings over 30 and 40 years for four different size solar PV systems assuming solar paid for upfront (i.e. no financing costs are included in this simplified spreadsheet)

Installed PV solar systems on a typical home can range from 2kW(dc) to over 10kW(dc). The average capacity is about 5.0 kW. In mid-2013 in the DFW area, an average complete installed price was app \$3.75/Watt. This price in kW would be \$3.75/Watt x 1000 Watt/kW = \$3,750/kW of installed power.

The worksheets in this file are:

Notes-Overview - this worksheet page

Calculations - the main calculations worksheet page. The two key inputs for users to enter is their electricity usage in kWh and their current effective utility rate in \$/kWh.

Worksheets **33**, **50**, **67**, and **100** are detail worksheets for annual and summary calculations. No user required for these worksheet pages. The calculation results from these pages are fed back to the "Cal worksheet to provide summary information.

Plano Solar Advocates: On-Line Cost Estimator Tool



3. Financing a Solar Installation

Like buying a car, there are different options to consider to best meet your needs, and a variety of incentives can help make the economics work:

Step 2) Evaluate Payment Options (see Slide 23/25 also)

- One important distinction is whether the system is for residential or commercial application (incentives differ as does the payment options available)
- Consider differences between a Purchase, Lease, or Power Purchase Agreement model
- Consider Shared Renewables/Community Solar program if your home/business is not suitable for solar energy installation

A FEW RESOURCES TO EXPLORE

The screenshot shows the Residential Solar 101 website. The header includes the logo and navigation links: HOME, GETTING STARTED, COST OF SOLAR, FINANCING SOLAR, STATE INCENTIVES, OUR BLOG, and VIDEOS. The main content area is titled "Solar Finance Overview" and contains the following text:

Going Solar doesn't have to cost an arm and a leg. It used to be the case that putting solar panels on your roof would cost tens of thousands of dollars and would take over 20 years to pay off. That is no longer the case.

Recent industry developments have allowed the cost of solar power to come way down. Federal, state, and local incentives have increased, lowering the payback period dramatically. Additionally, companies have come up with new and better ways to help you finance your solar installation.

If you would like to learn more, please fill out our [free evaluation form](#) and we will have a solar expert contact you to determine which option is best suited for your situation.

Here is a brief overview of the different ways in which you can go solar.

Residential Solar 101: Solar Finance Overview

The screenshot shows the SEIA (Solar Energy Industries Association) website. The header includes the logo and a link for "Español". The main content area is titled "Issues & Policies" and contains the following text:

HOME » ISSUES & POLICIES » DISTRIBUTED SOLAR

Shared Renewables/Community Solar

Shared renewable energy arrangements allow several energy customers to share the benefits of one local renewable energy power plant. When the power is supplied strictly by solar energy, it is sometimes called "community solar." The shared renewables project pools investments from multiple members of a community and provides power and/or financial benefits in return.

SEIA: Shared Renewables/Community Solar



3. Financing a Solar Installation

Three Typical Financing Options

Purchase	Lease	Power Purchase Agreement
Requires capital to finance	Often requires down payment	Typically no down payment
Property owner responsible for operations/maintenance	System owner is responsible for operations/maintenance	System owner is responsible operations/maintenance
Property owner claims rebates/incentives	System owner (3 rd Party) monetizes rebates/incentives	System owner (3 rd Party) monetizes rebates/incentives
Generally most advantageous to private (taxable) entities	Lease payment is fixed rate not tied to the power generated – typical 15 year term	Purchase the power generated at a fixed rate – typical 15 year term
Not a common approach for government entities due to lack of tax benefits (unless grants or loans are available)	Common for government entities where PPA is not allowed	

A FEW RESOURCES TO EXPLORE

The screenshot shows the Institute for Local Self-Reliance (IISR) website. The main article is titled "Ultimate Solar Calculator: 'App' Helps You Choose: To Own or Lease?". The article text includes a note that the calculator has been updated and simplified, and a warning that the calculator is for general information only and not financial advice. It also mentions that the calculator compares the cost of solar ownership relative to leasing, and that the cost of rooftop solar PV continues to fall and new financing options make ownership easier than ever. The article is dated Sep 6, 2014.

An App That Helps You Choose To Own or Lease



3. Financing a Solar Installation

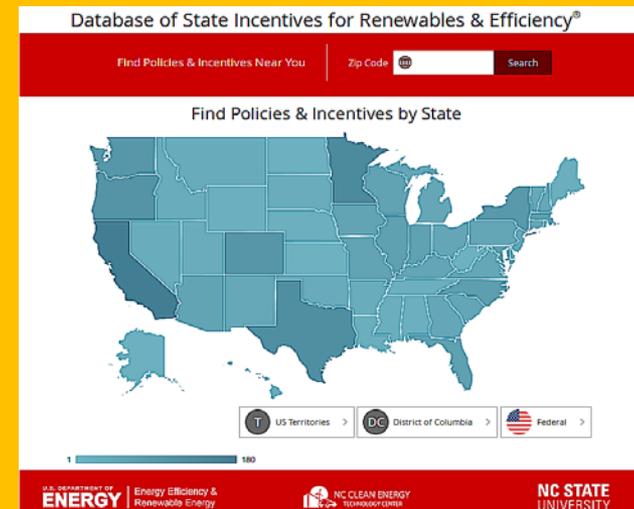
Step 3) Evaluate Available Incentives

Incentives for Solar Installations: The [Database of State Incentives for Renewables & Efficiency](https://www.dsireusa.org)[®] (DSIRE) lists all known state, regional, and local incentives and is the best initial resource to use to identify incentives for residential or business.

Utility Company Pay/Credit:

There are some utility companies that pay or give credit for excess solar energy. Visit www.powertochoose.com to find a utility company offering these programs.

A FEW RESOURCES TO EXPLORE



www.dsireusa.org

- Power to Choose Available Purchase Offers
- Property Tax Exemption
- Fannie Mae Green Initiative Loan Program
- Business Energy Investment Tax Credit (ITC)
- Property Assessed Clean Energy (PACE)
- Rural Energy for America Program (REAP)
- Renewable Energy Buy-Back Programs
- Residential Renewable Energy Tax Credit/Business Energy Investment Tax Credit
- Property Tax Exemption
- SECO LoanSTAR
- Rapid Depreciation (MACRS)



4. Finding Certified Installers

Texas does not have any specific licensing requirements for solar installers.

A few best practices to consider when selecting an installer:

- Obtain at least 3 quotes from different companies
- Consider Oncor's [Take a Load Off, Texas Provider Search](#); [Texas Solar Energy Society](#) members; or [North American Board of Certified Energy Practitioners \(NABCEP\)](#) certified professionals
- Check quotes using the [Department of Energy PV Watts Calculator](#) (check 'TMY3' for Weather Data)

A FEW RESOURCES TO EXPLORE



[TAKE A LOAD OFF, TEXAS PROVIDER SEARCH](#)



[TXSES: HOW TO CHOOSE A SOLAR INSTALLER](#)



[NREL PV WATTS ONLINE TOOL](#)



Could solar not be right for me?

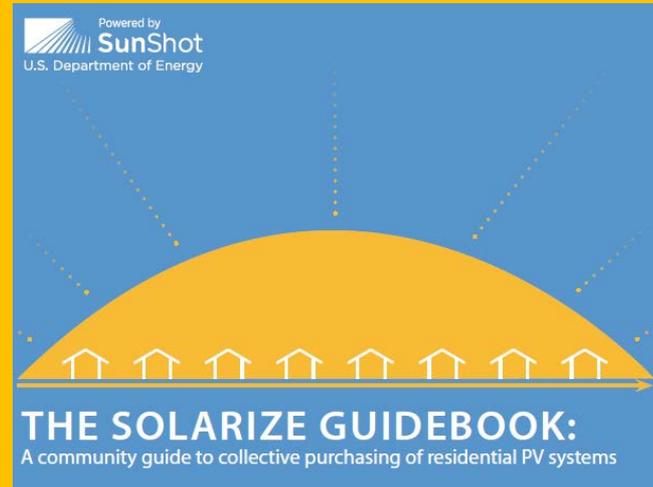
Other Ways to Purchase Solar Energy:

Solarize Campaigns: Group purchase option where participants benefit from economies of scale – resulting in a lower cost per installed KW. Several examples of Solarize campaigns are here that could be replicated:

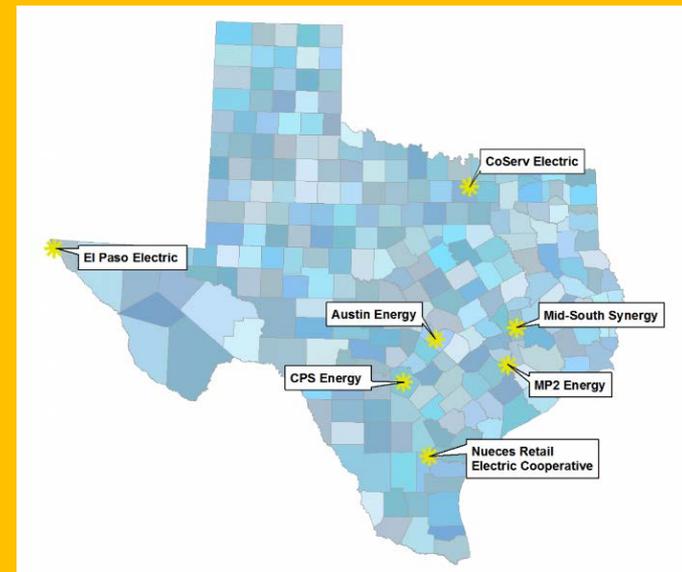
- [Solarize Plano](#)
- [Solarize Garland](#)
- [Solarize Wells Branch](#)

Community Solar (aka shared solar or solar gardens): Community solar is the sharing of renewable solar power from a centralized source. Realize the benefits of solar without requiring an solar installation of their own

A FEW RESOURCES TO EXPLORE



[NREL: The Solarize Guidebook](#)



Community Solar Projects in Texas

Key Resources To Assist in Evaluating Solar Energy Options or to Learn More

HELPFUL TOOLS

- [The Solar Roadmap](#)
- [Google Project Sunroof \(not in Texas yet\)](#)
- [Energy Sage](#)
- [Mapdwell \(not in Texas\)](#)
- [Geostellar](#)
- [DOE PV Watts](#)
- [Solar Energy.com Solar Power Calculator](#)
- [Solar Estimate Calculator](#)
- [Worksheet courtesy of Solar Plano Advocates](#)
- [Smart Meter Texas](#)
- [Database of State Incentives for Renewables and Efficiency \(DSIRE\)](#)
- [Power to Choose Available Purchase Offers \(electric companies who purchase excess renewable energy\)](#)
- [Property Tax Exemption](#)
- [Fannie Mae Green Initiative Loan Program](#)
- [Business Energy Investment Tax Credit](#)
- [Property Assessed Clean Energy \(PACE\)](#)
- [Go Solar Texas Solar Glossary](#)

INDUSTRY ASSOCIATIONS AND GROUPS

- [Solar Energy Industries Association \(SEIA\)](#)
- [Solar Electric Power Association \(SEPA\)](#)
- [Texas Solar Energy Society](#)
- [Texas Renewable Energy Industry Alliance \(TREIA\)](#)
- [North Texas Renewable Energy Group](#)
- [Plano Solar Advocates](#)
- [Solarize Texas](#)
- [Solar Instructor Training Network \(SITN\)](#)
- [Solar Energy International Solar Professionals Certificate Program](#)
- [North American Board of Certified Energy Practitioners \(NABCEP\)](#)
- [Oncor Take a Load Off, Texas Service Provider website](#)

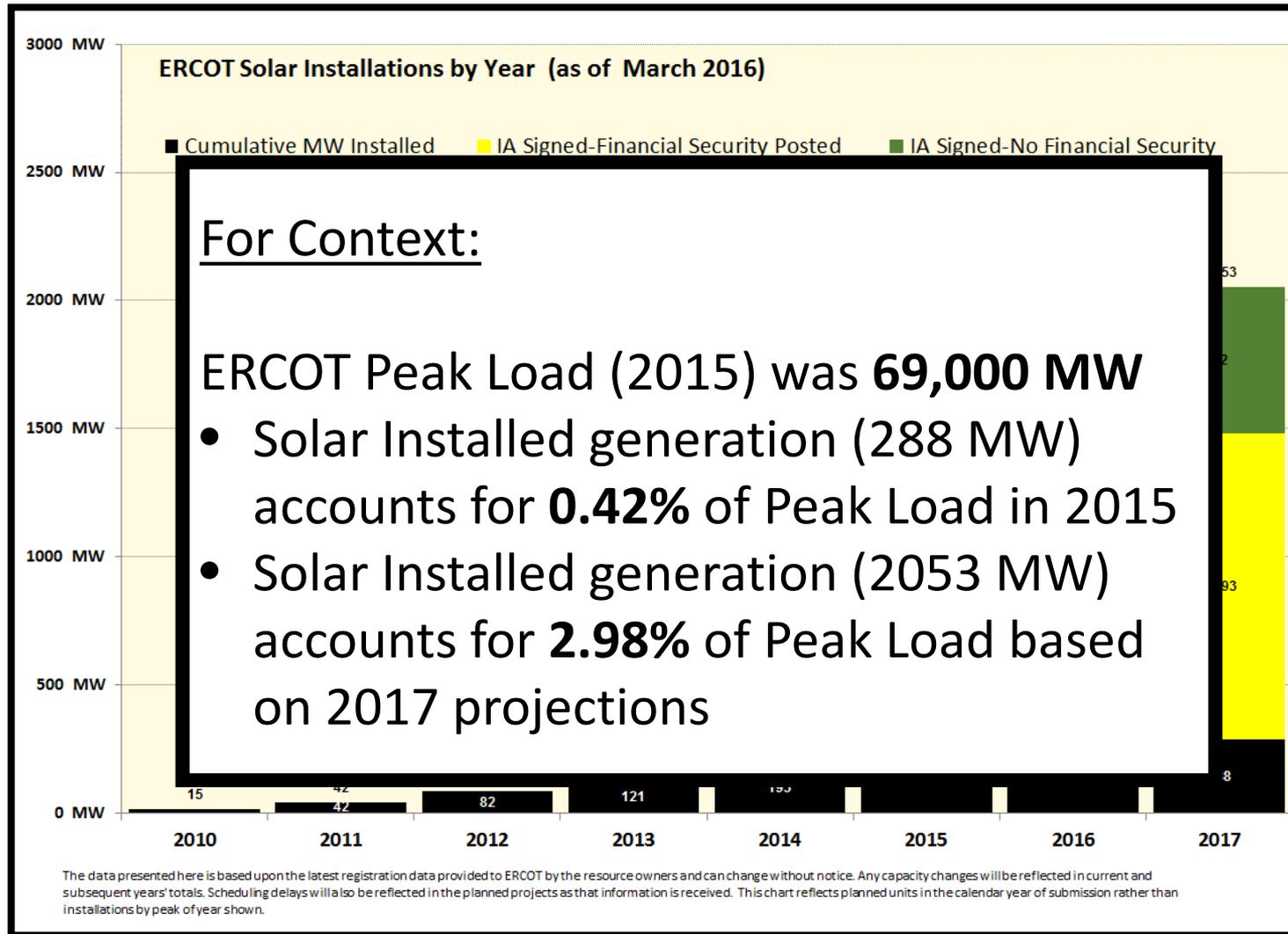
GOVERNMENT AND OTHERS

- [North Central Texas Council of Governments - Gosolartexas.org](#)
- [Texas State Energy Conservation Office](#)
- [Open PV Project](#)
- [Department of Energy Solar Energy Resource Center](#)
- [Department of Energy Sunshot Initiative](#)
- [Solar Outreach Partnership \(SolarOPs\)](#)
- [Environmental Protection Agency Re-Powering America's Land Initiative](#)
- [National Association of Regional Councils Solar Energy](#)
- [Texas Solar Facts](#)



www.gosolartexas.org

Parting Thoughts



Questions and Contact

Visit

GoSolarTexas.org

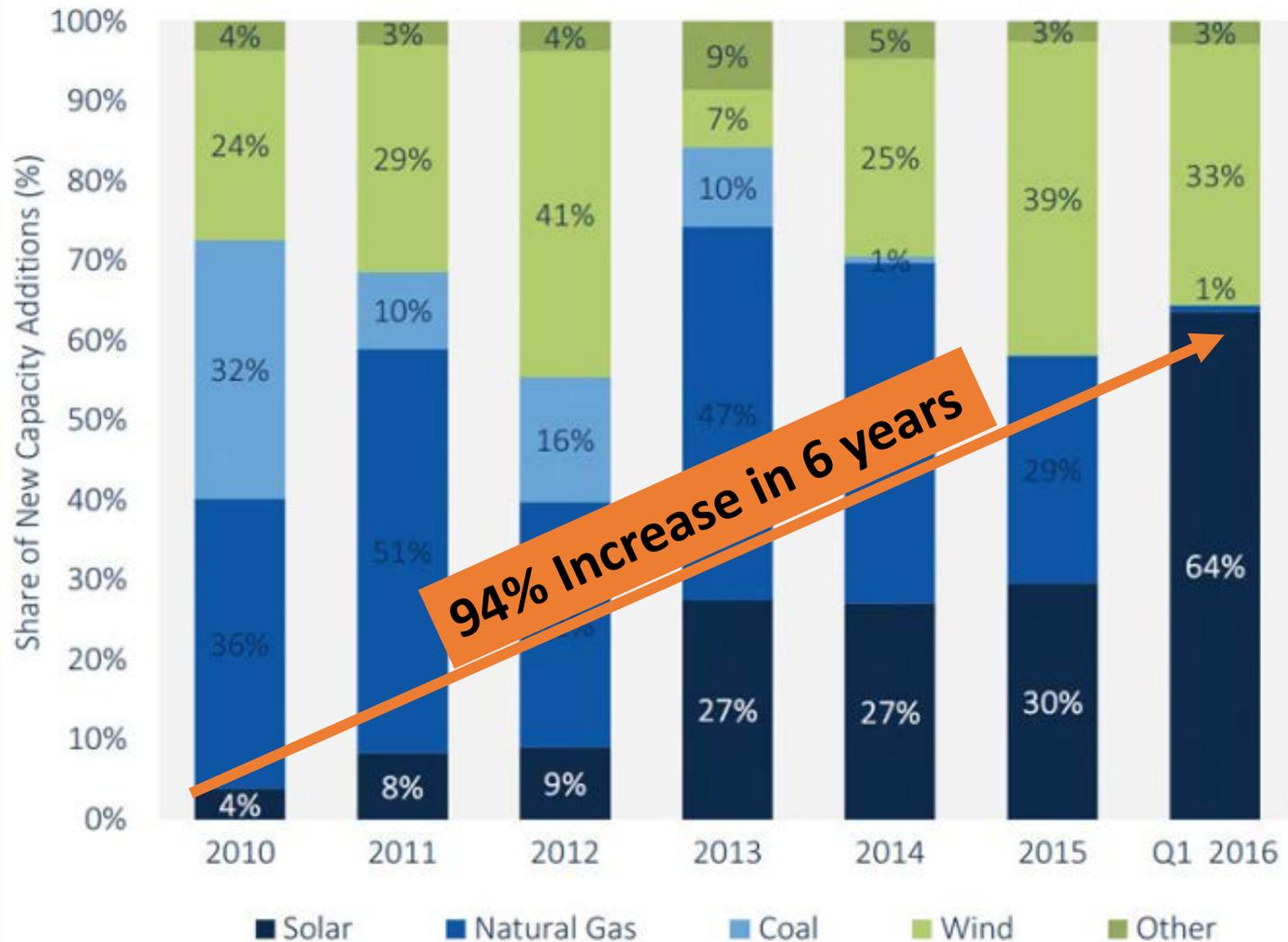
Kristina Ronneberg, kronneberg@nctcog.org
North Central Texas Council of Governments

www.nctcog.org
(817) 695-9210
616 Six Flags Drive
Arlington, Texas 76011



BACKUP

Share of New US Electric Generating Capacity Additions (2010 – Q1 2016)



94% Increase in 6 years