

# Incentives for Solar PV in Texas

Steve Wiese, Principal



# Overview

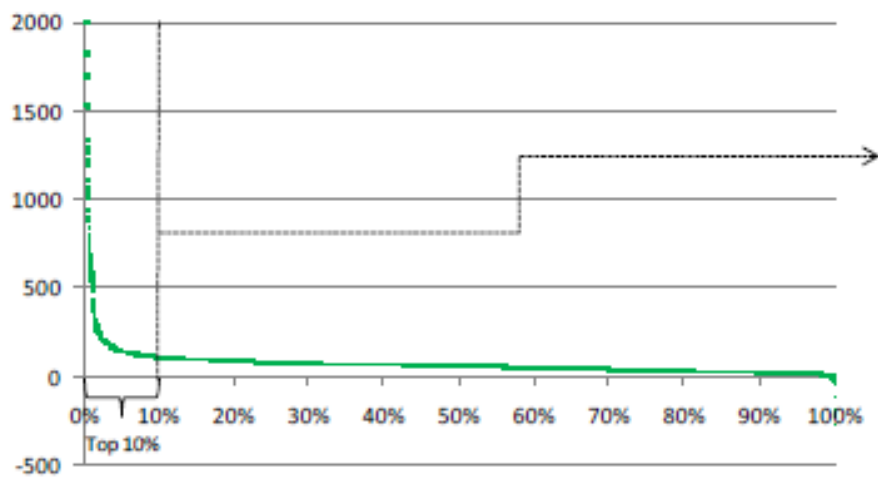
- **Clean Energy Associates**
- **The Oncor PV Incentive Program**
- **Trends shaping PV's future in Texas**
- **Incentive designs and their applicability in Texas**
- **Legislation and regulation**

# Clean Energy Associates

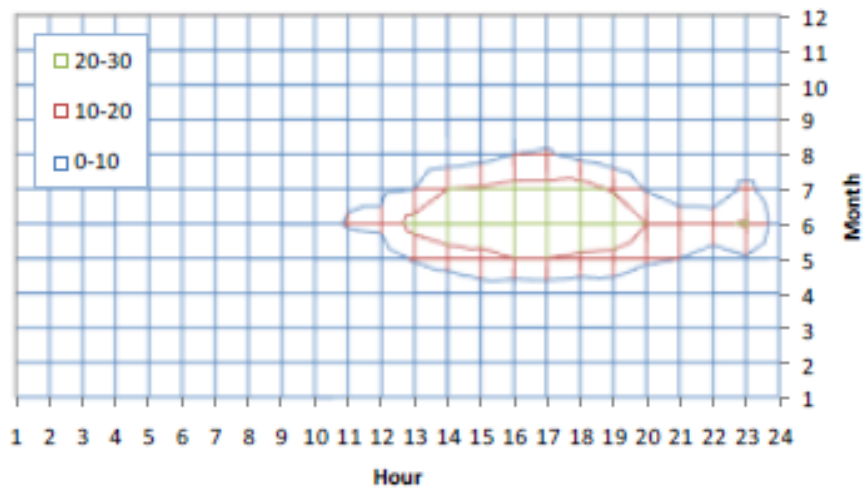
- Independent consulting firm specializing in renewable energy, particularly distributed generation
- Services
  - Renewable energy programs
  - Education and training
  - Project development
  - Technical and market analysis
  - Policy advocacy
- Clients
  - End-use energy consumers, Engineering and construction firms, Clean energy project developers, Utilities, Government agencies, and Regulators



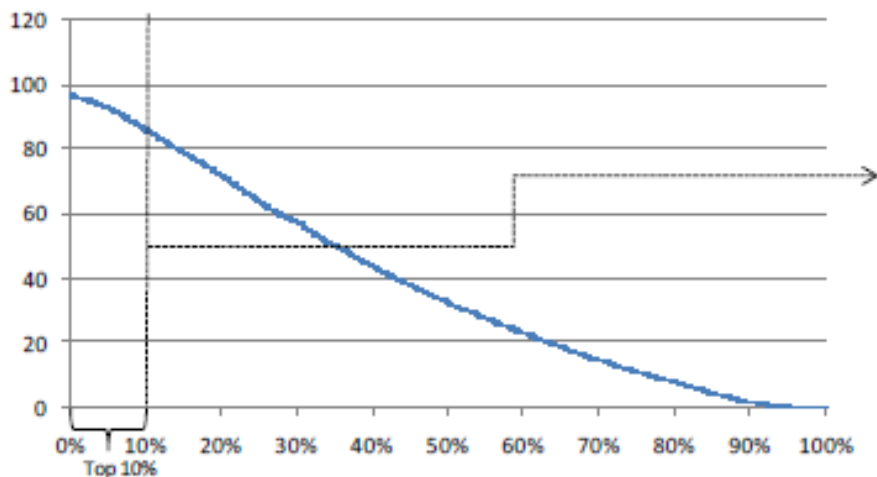
### MCPE



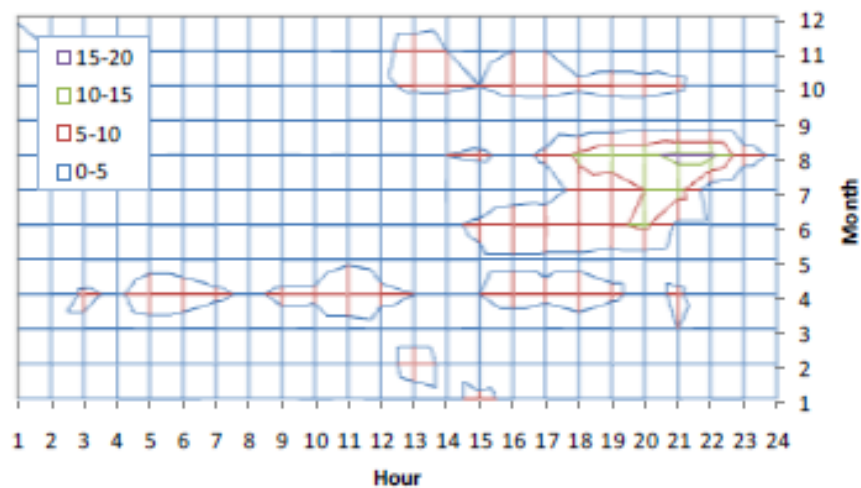
### RAN C Site Top 10% Contours



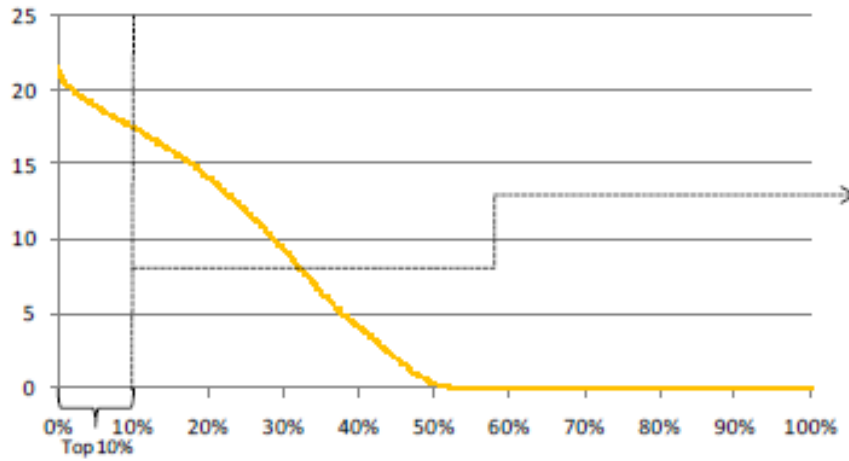
### Wind MW



### RAN C Site Top 10% Contours



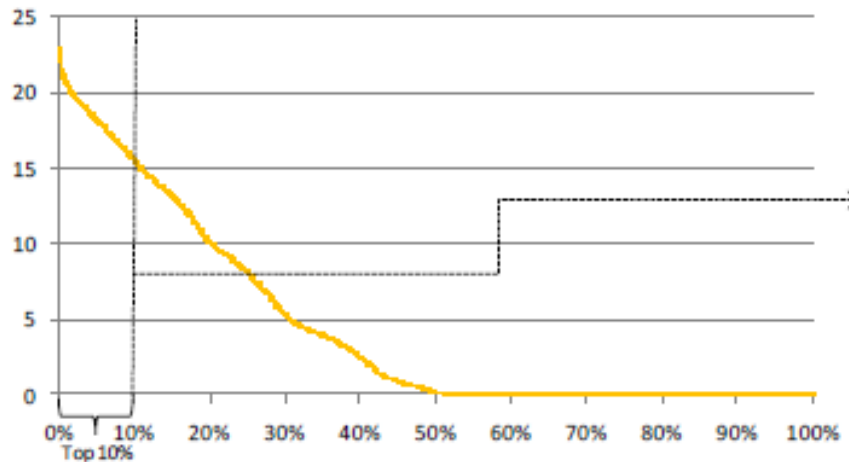
### PVT MW



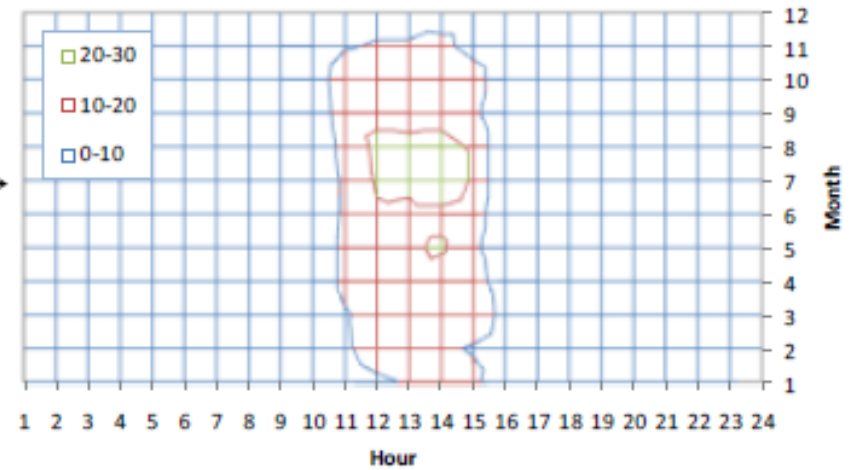
### RANC Site Top 10% Contours



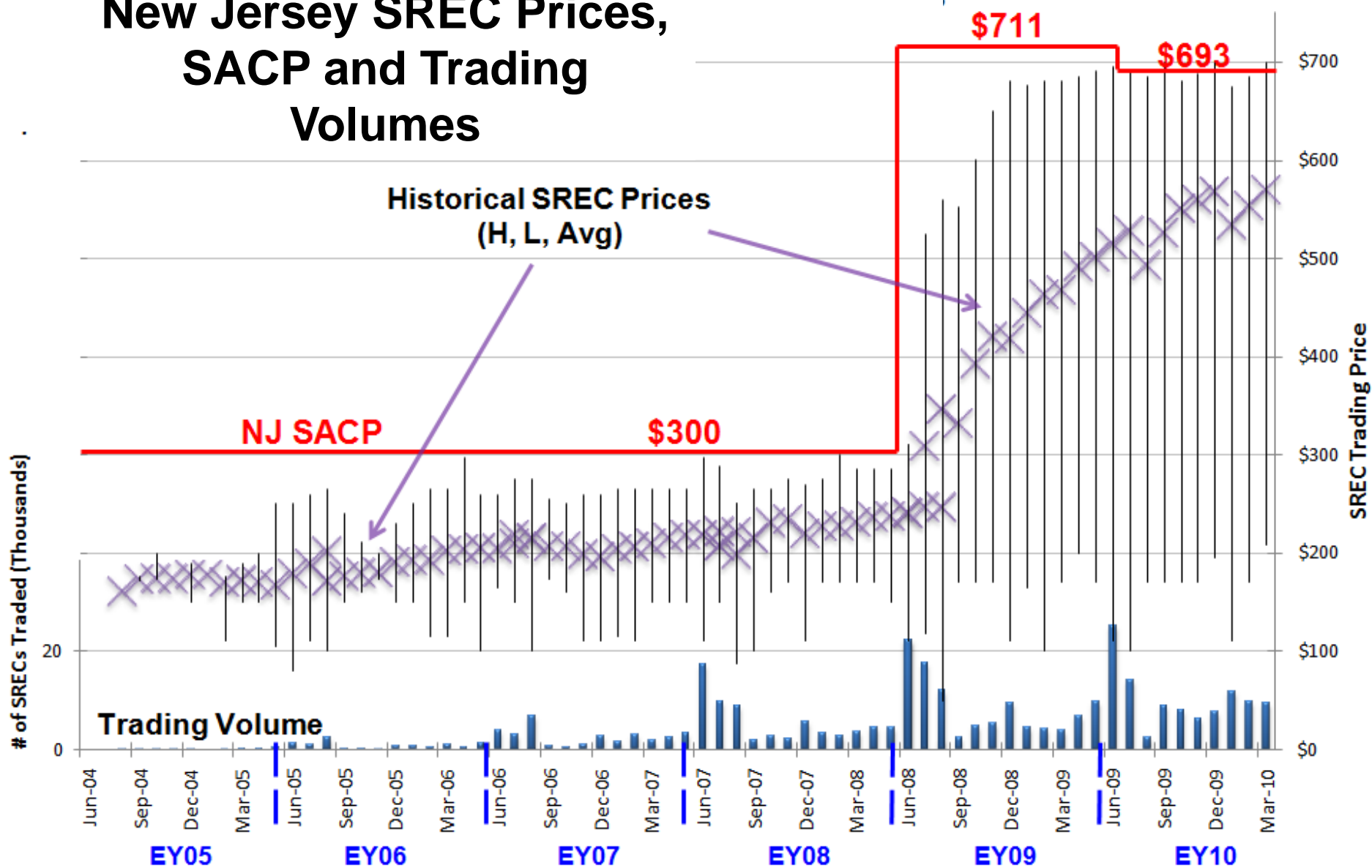
### PVF MW



### RANC Site Top 10% Contours



# New Jersey SREC Prices, SACP and Trading Volumes



**NIST**  
National Institute of Standards and Technology

**STANDARDS FOR RENEWABLE ENERGY  
- FINAL REPORT**

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Elisabeth Long, Associate Consultant  
Cecilia Hyslop, Administrative Associate

Version: June 25, 2010



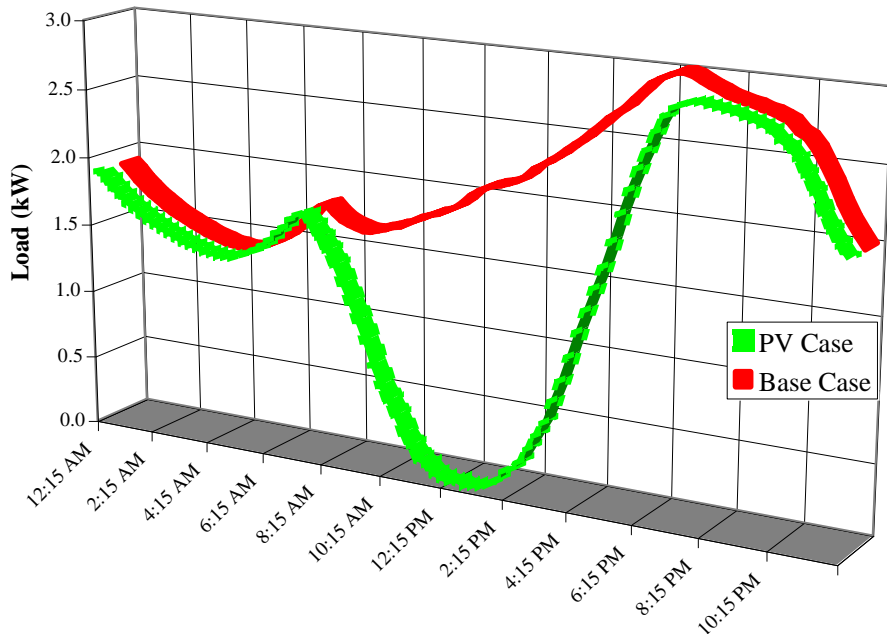
This report was completed by Clean Energy Associates, LLC, of Austin, Texas in 2009-2010 for the National Institute of Standards and Technology under contract # SB1341095E0990.

# Additional Detail - Load Profiles

## Residential

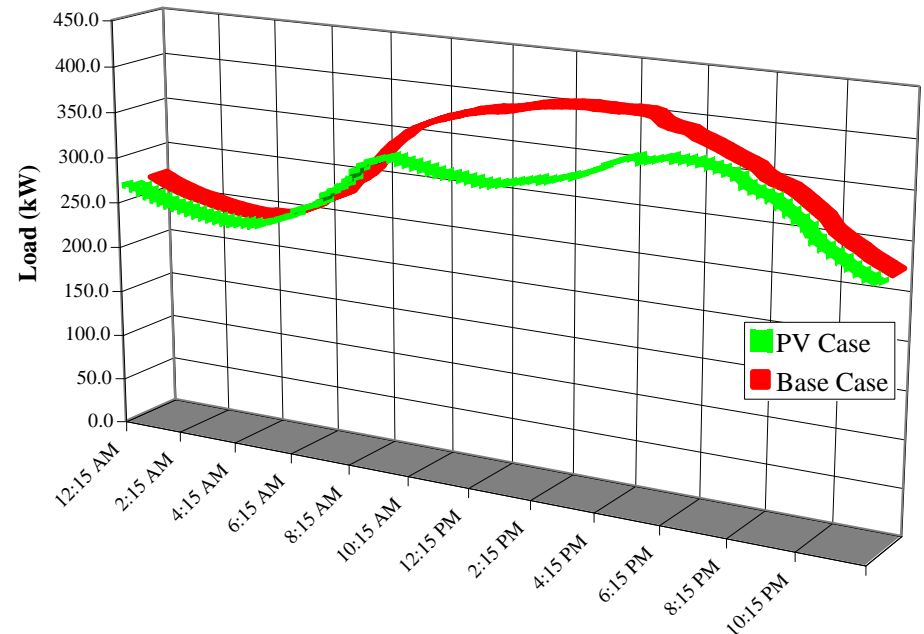
## Commercial

Average Annual Load by Interval



- PV case reduces energy consumption from grid by 4,366 kWh/year (28% of customer load) and contributes to peak reduction

Average Annual Load by Interval

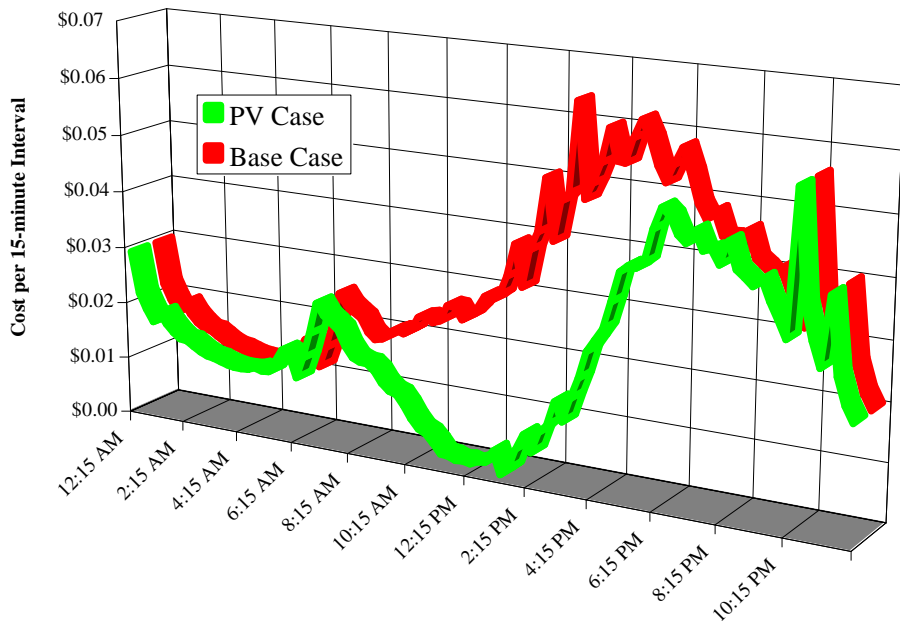


- PV case reduces energy consumption from grid by 176,000 kWh/year (6% of customer load) and contributes to peak reduction

# Additional Detail - Cost Per Interval

## Residential

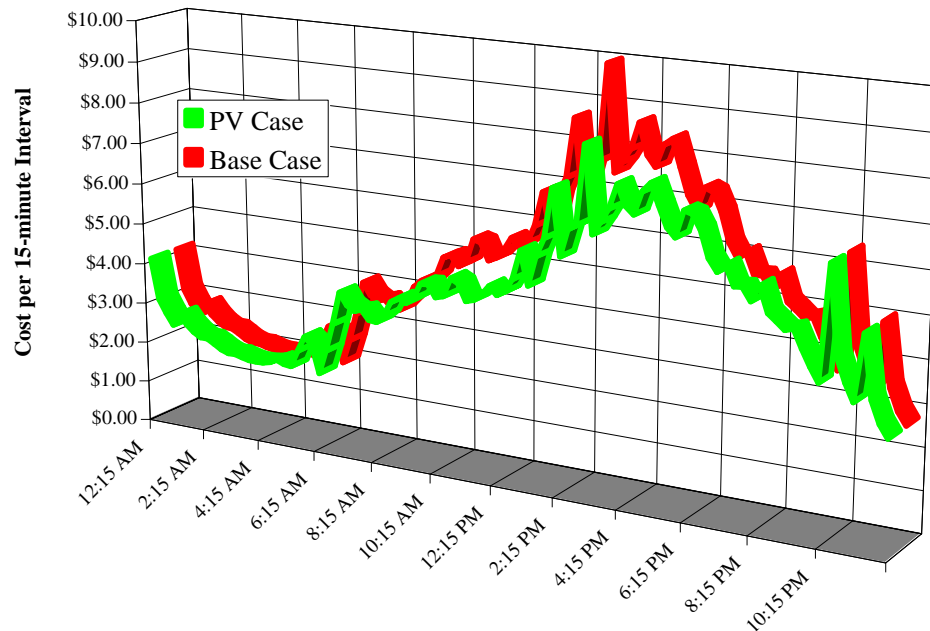
Annual Average MCPE Cost



- REP cost of supplying energy reduced by 32.2% overall, 10.97% per kWh delivered to customer

# Commercial

Annual Average MCPE Cost



- REP cost of supplying energy reduced by 7.2% overall, 1.1% per kWh delivered to customer

# The Oncor Solar PV Program

# The Oncor Solar PV Program

## PV Program Goals

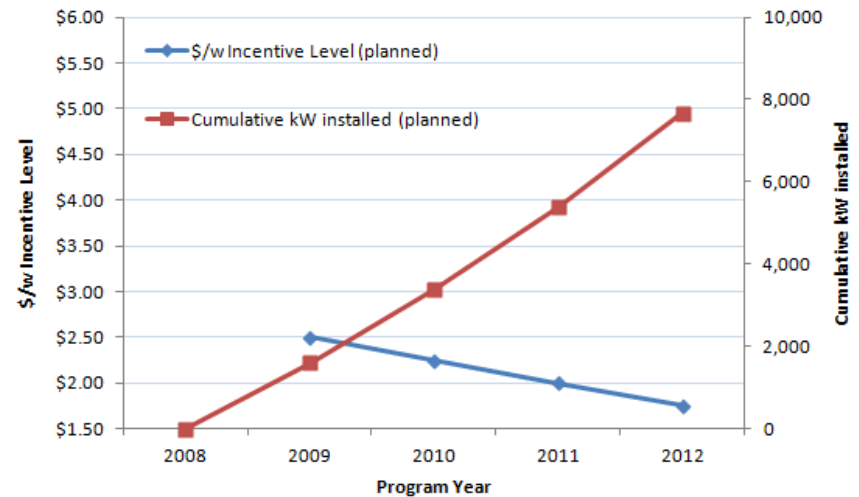
- Gain experience in PV installations (Oncor, installers, local governments/permitting authorities, customers)
- Increase the # and functional capability of local PV installers
- Gather data on costs and performance
- Decrease incentive over time



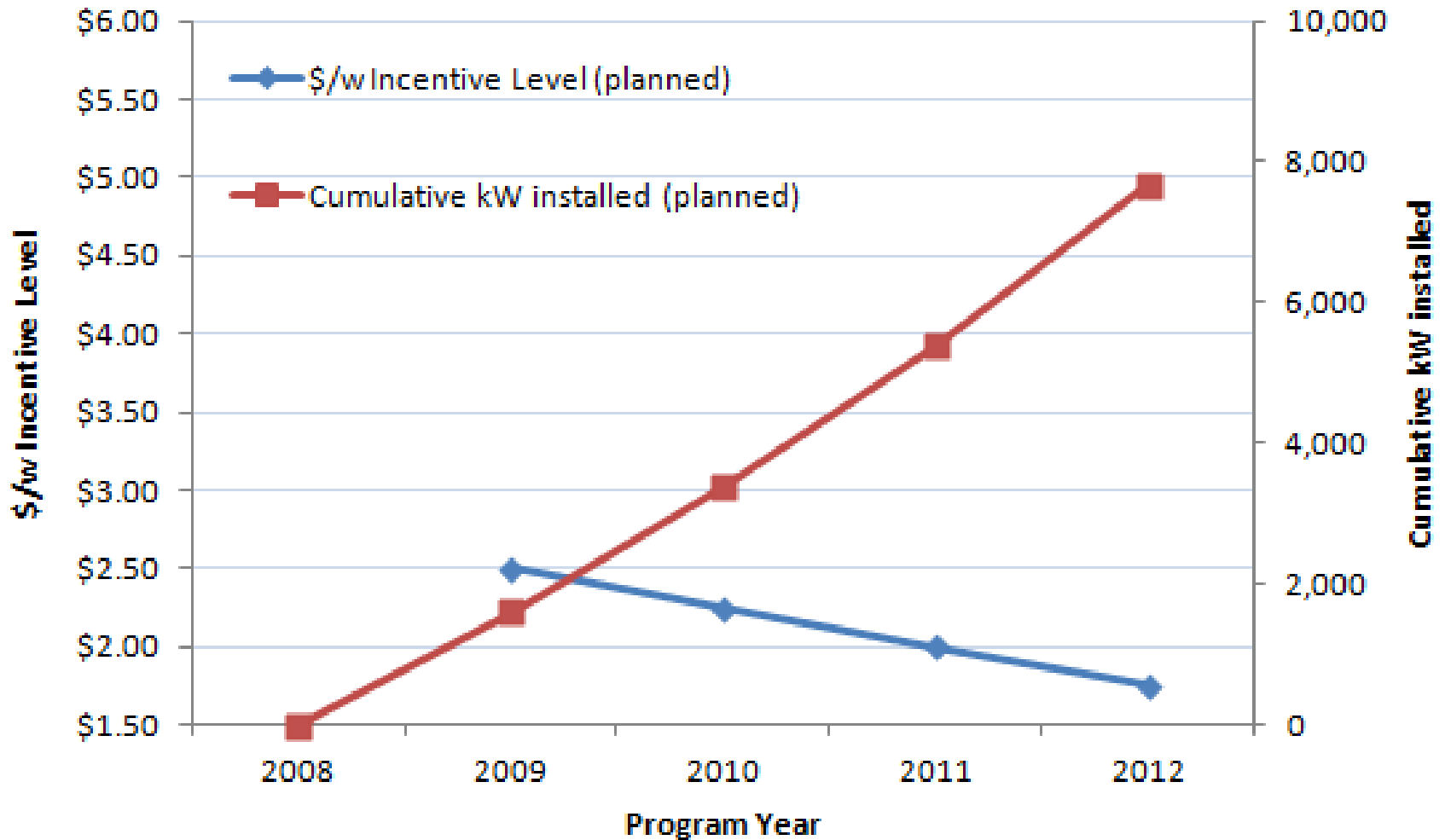
# The Oncor Solar PV Program

## Overall Program Plan

- Startup in 2009
- 4 year plan,  
~\$16 million in incentives,  
~\$4 million per year
- Capacity-based incentives starting at \$2.25-\$2.46/watt-dc, declining to \$1.50 to \$2.00/watt-dc
- Staged incentive drops over a 4 year schedule
- Program design and administration by Frontier Associates and Clean Energy Associates



# The Oncor Solar PV Program



# The Oncor Solar PV Program

## Program Year 2009

- Incentive level \$2.46/watt-dc
- Steady uptake over the year, approximately 50 installers joined the program
- Paid out about **\$2.1 million** (~50% of annual budget, other 50% carried over to 2010),
- Completed installation of just over **1 MW**
- Avg. incentive paid was **\$2.07/watt-dc** (avg is less than published incentive levels due to larger projects that exceeded incentive caps)



100 kW array at Dell, Round Rock

# The Oncor Solar PV Program

## Program Year 2010

- Incentive levels \$1.75-\$2.25/watt-dc
- Demand “exceeded our wildest dreams”
  - Repeated rushes on available incentives
  - Introduction of leasing options for customers
  - Advanced 2011 and 2012 funding to make it available at planned lower incentive levels
  - About 120 installers in the program
- Paid out about **\$8.7 million** in incentives, completed installation of about **4.2 MW**, avg. incentive paid was **\$2.08/watt-dc**



9 kW residential array, Temple

# The Oncor Solar PV Program

## Program Year 2011 (ytd)

- Incentive levels \$1.50-\$2.00/watt-dc
- Increased total program incentive budget by \$2.7 million to date
- Contraction/sorting out of installer community – 82 remained in the program in 2011
- Paid out about **\$5.8 million** in incentives (ytd), completed installation of about **3.5 MW** (ytd), avg. incentive paid **\$1.68/watt-dc** (ytd)



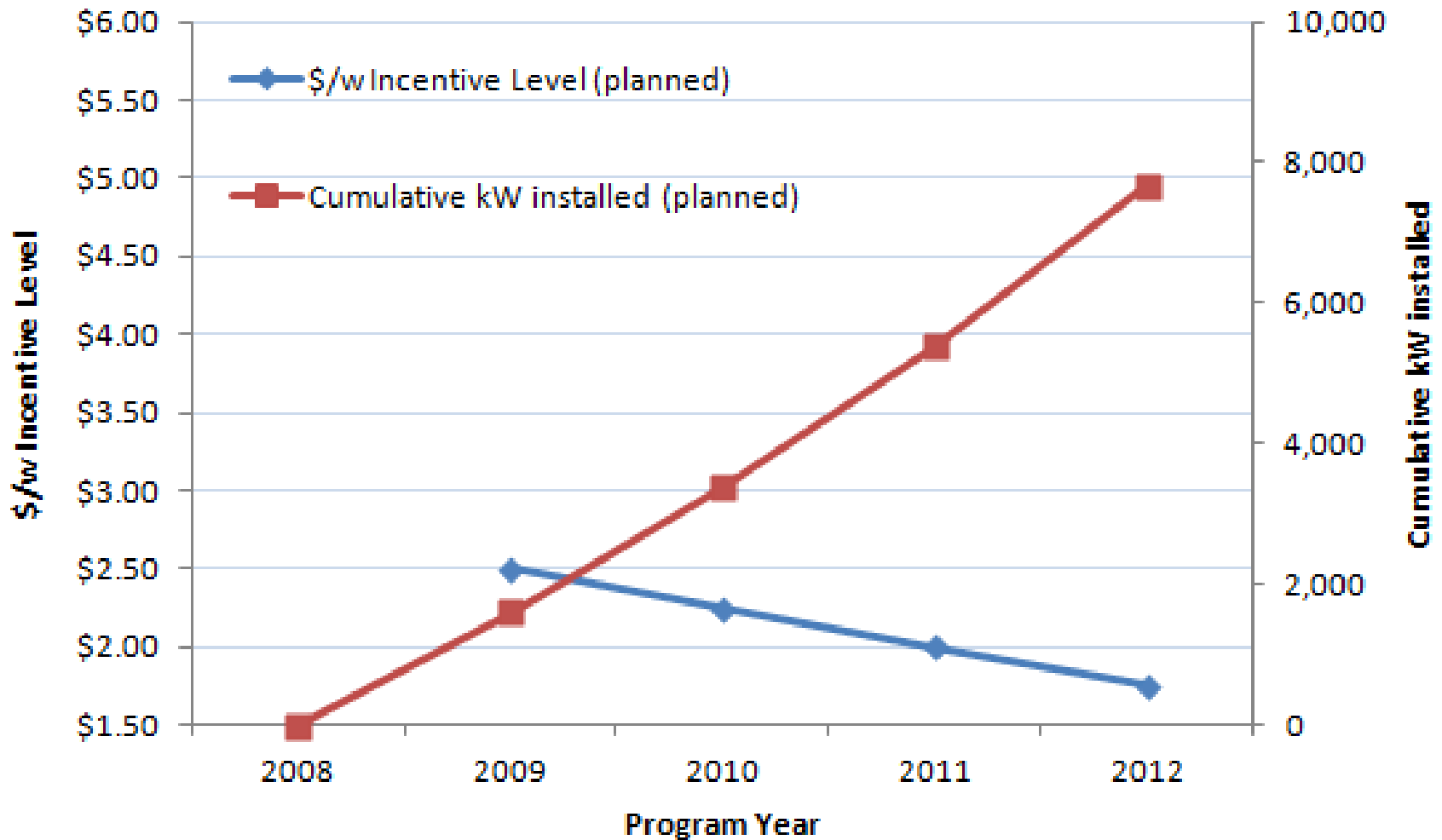
100 kW commercial array, Round Rock

# The Oncor Solar PV Program

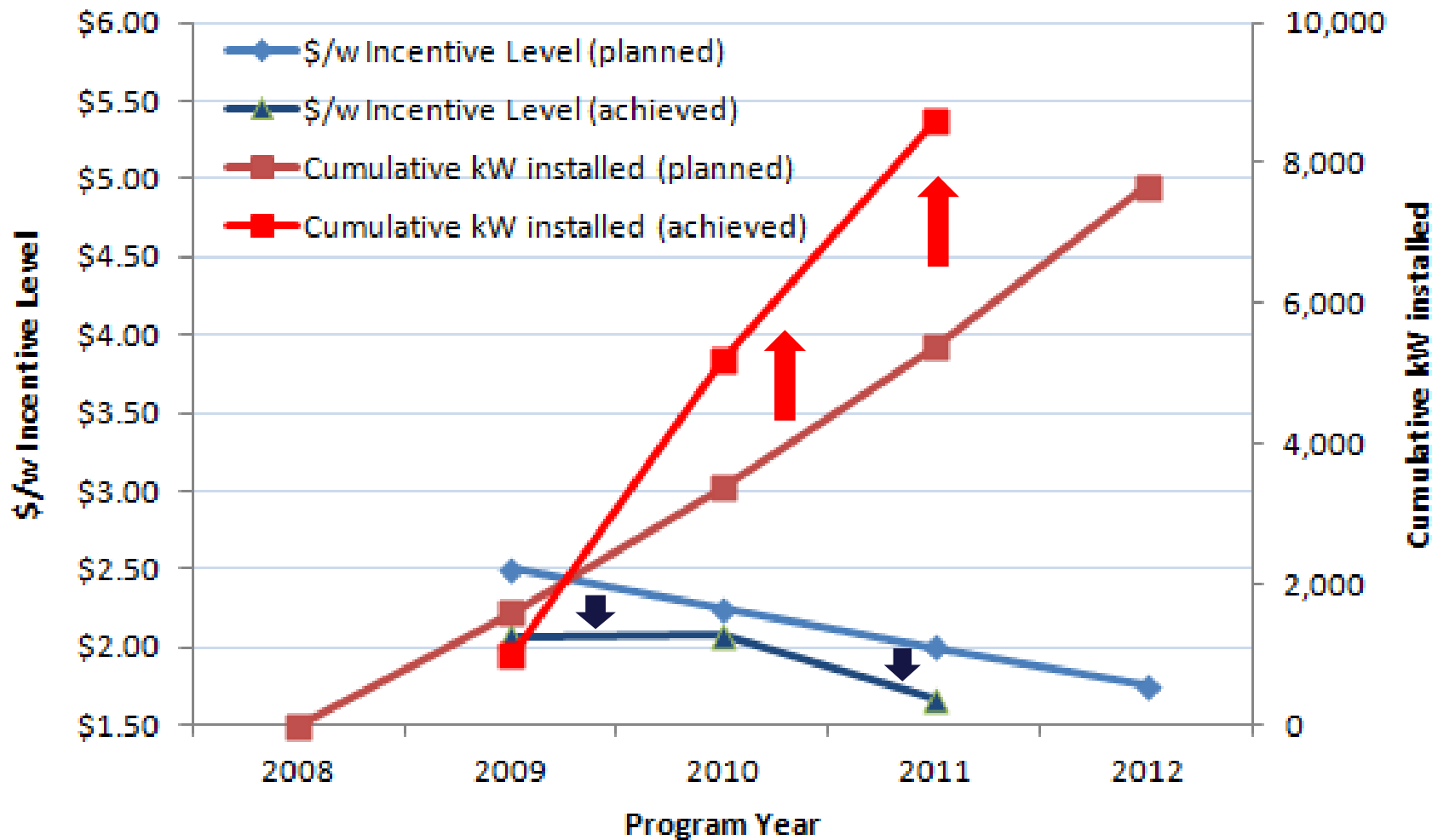
## Outcomes, 2009-2011(ytd)

- Incentive levels decreased 19-33% from program start, ahead of planned schedule (65% from Texas benchmark incentive level prior to program start)
- # NABCEP certified installers in Texas increased from 12 to 124 (Texas now ranks third to California and Colorado)
- Over 100 Texas companies offering PV installs
- Utility and installers gained experience with and made process improvements with hundreds of interconnections
- However, the program is still more expensive than most other energy efficiency programs

# The Oncor Solar PV Program



# The Oncor Solar PV Program



# Other Utility PV Programs

## Investor-Owned Utilities

- Oncor
- Entergy
- TNMP
- AEP Texas Central
- AEP Texas North
- SWEPCO
- El Paso Electric

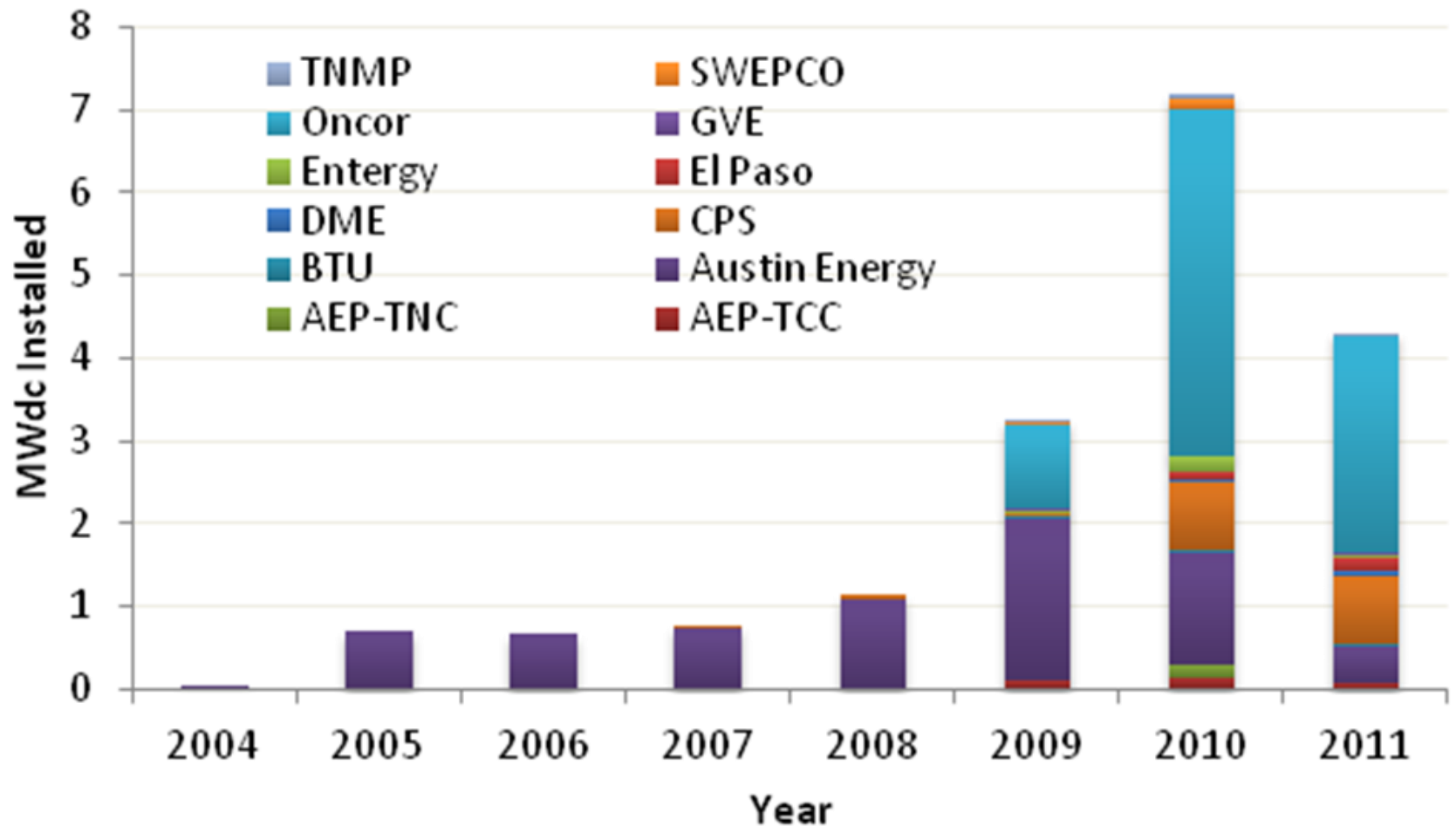
## Municipals

- Austin Energy
- CPS Energy
- Denton Muni. Electric
- Bryan Texas Utilities

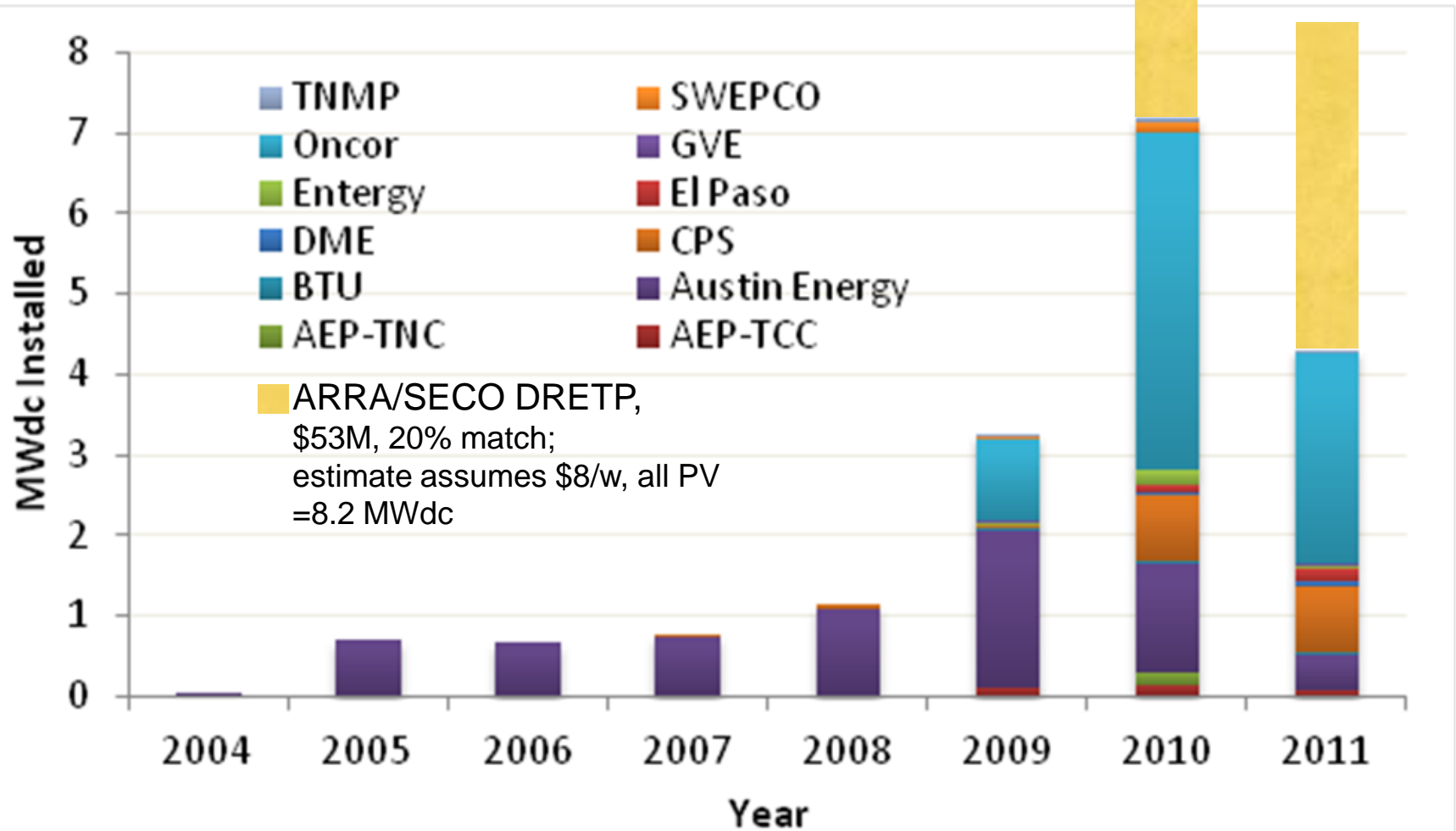


Residential array in El Paso Texas

# Oncor's Impact Statewide



# Oncor's Impact Statewide



# Trends Shaping Solar's Future in Texas

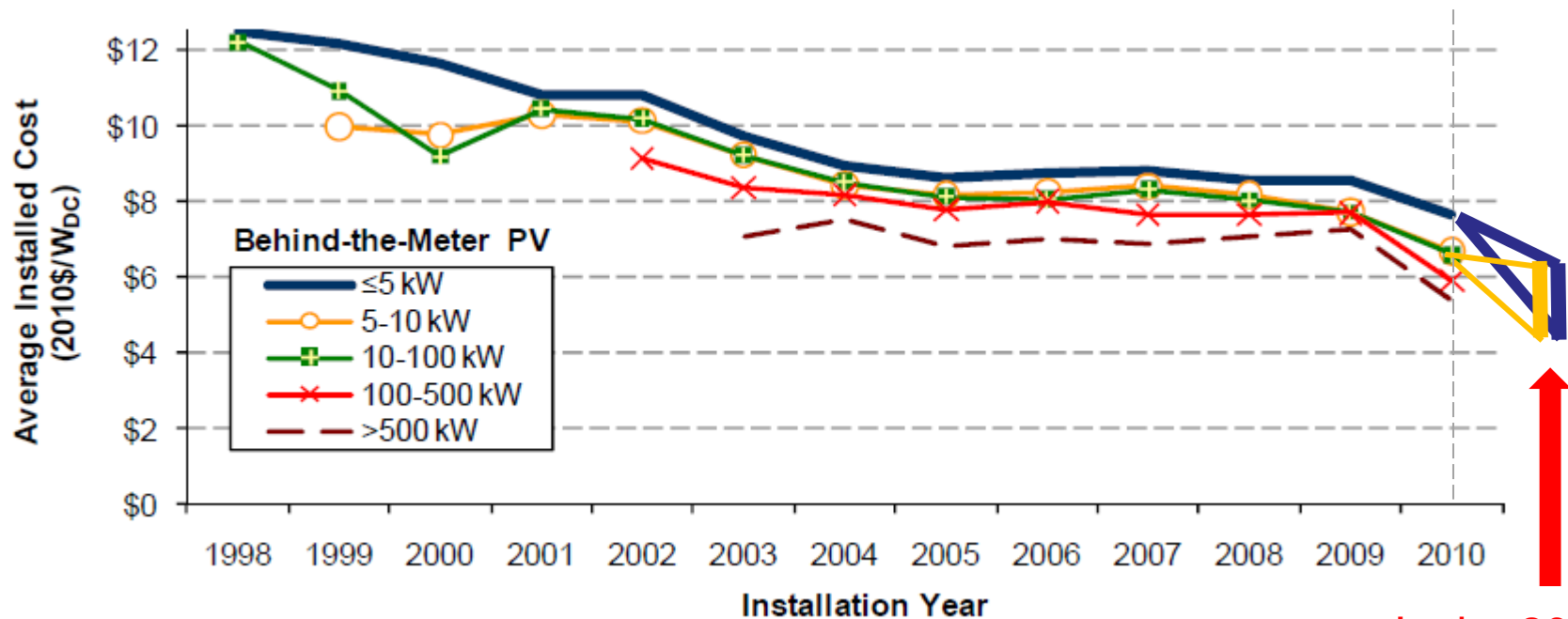
**#1: Declining Costs/Prices**

**#2: Top Down/Bottom Up Market Dev.**

**#3: Business Models/Learning**

# Trend #1: Declining Costs/Prices

- Installed costs declined significantly in the past two years

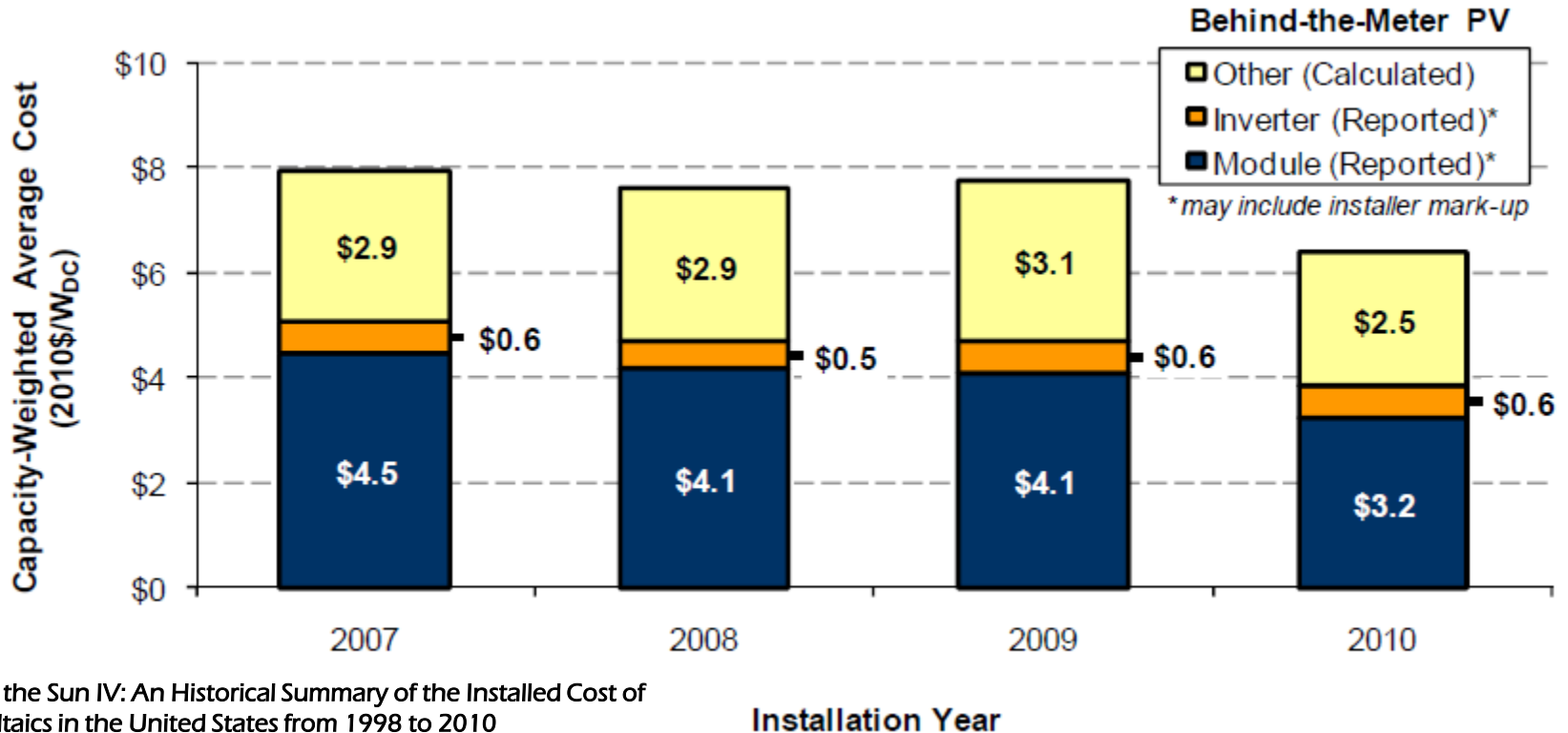


Tracking the Sun IV: An Historical Summary of the Installed Cost of Photovoltaics in the United States from 1998 to 2010  
Lawrence Berkeley National Laboratory  
Galen Barbose, Naim Darghouth, Ryan Wiser, Joachim Seel  
September 2011

In the 2011  
Oncor program  
we are seeing  
installed costs for  
residential systems  
in the range  
of \$4.5-\$6.5/watt.

# Trend #1: Declining Costs/Prices

- Declining costs are due to declining module prices and to declining balance of system (BOS) costs



Tracking the Sun IV: An Historical Summary of the Installed Cost of Photovoltaics in the United States from 1998 to 2010

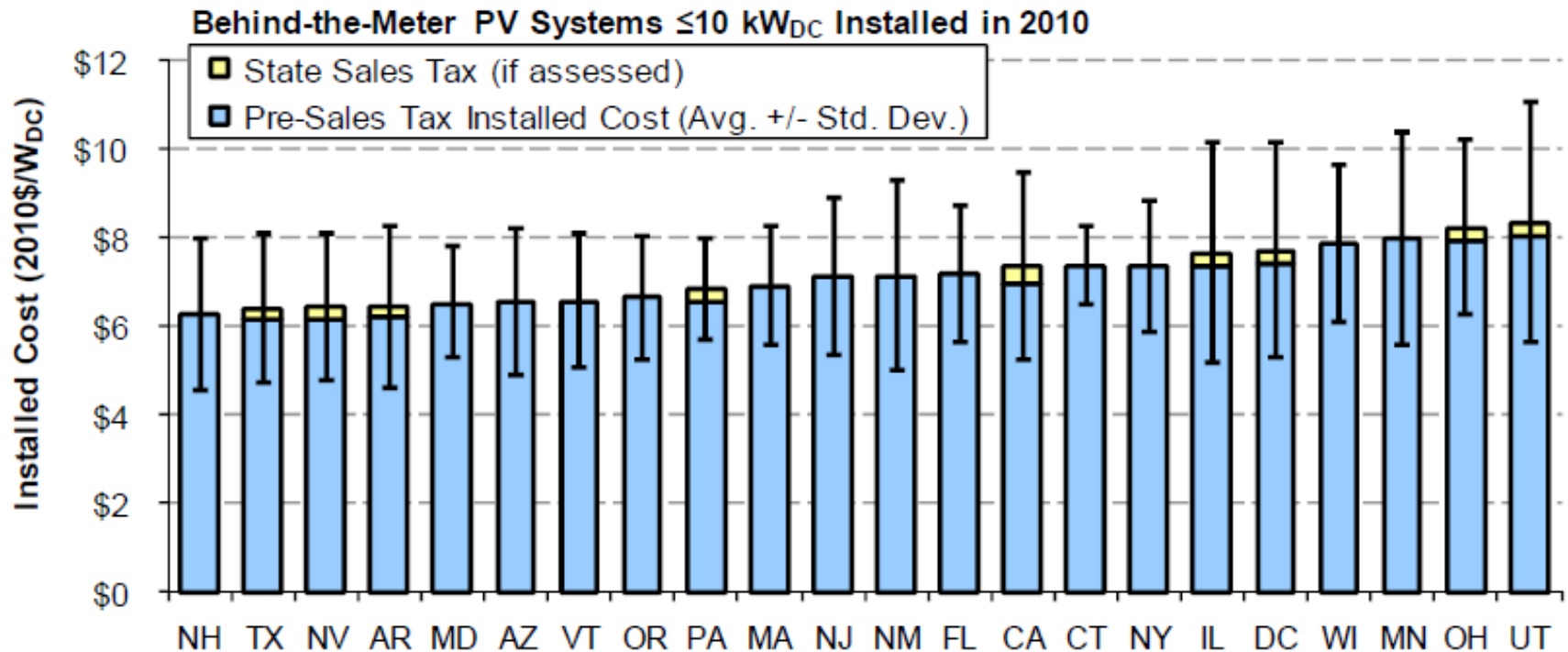
Lawrence Berkeley National Laboratory

Galen Barbose, Naim Darghouth, Ryan Wiser, Joachim Seel

September 2011

# Trend #1: Declining Costs/Prices

- Texas' installed costs are already among the lowest in the US



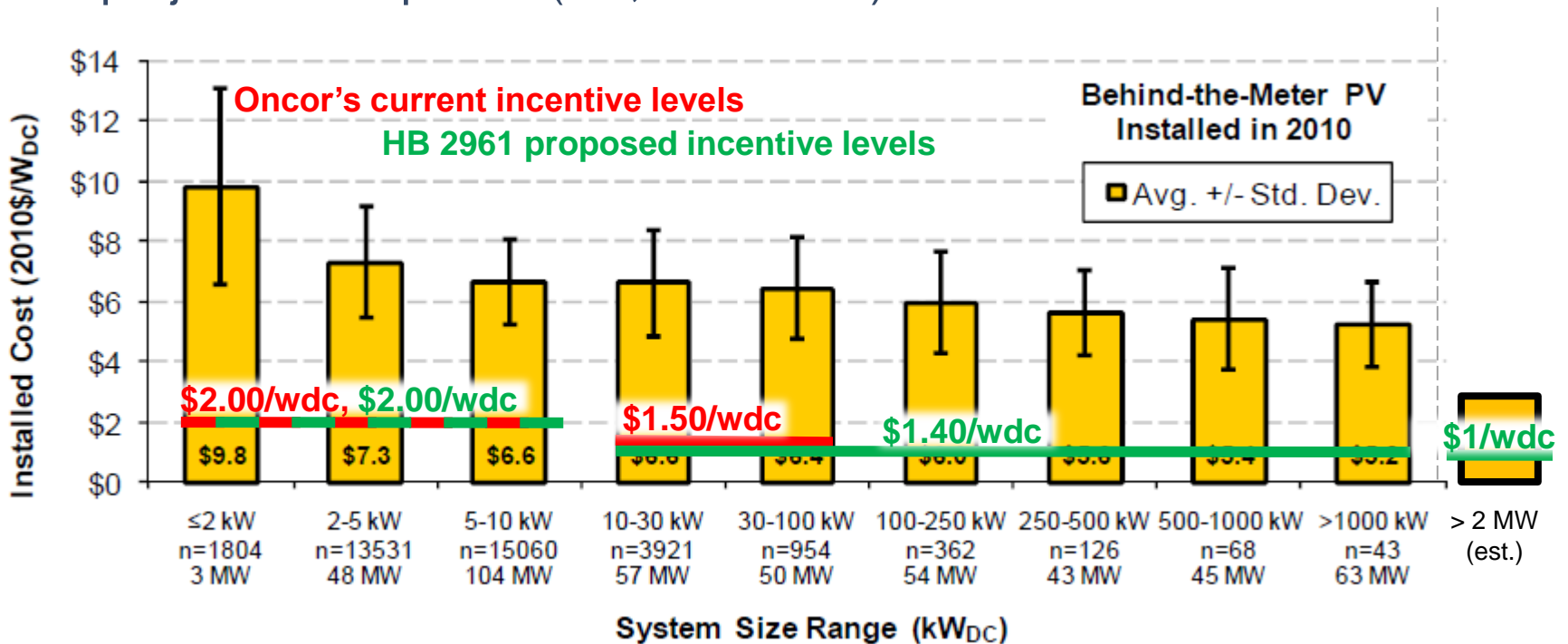
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September 2011

# Trend #2: Top Down/Bottom Up

- How does a PV market develop in response to market and regulatory levers?
  - Bottom Up – Market begins with large amounts of small distributed systems, develops an ecosystem of installers who work their way up to larger and larger projects
  - Top Down – Market is driven by scale and finance, begins with traditional generation companies making large investments in utility-scale generation
- Some Examples
  - Germany – All at once – FIT-driven
  - California – Bottom Up – Incentive driven, then other mechs.
  - New Jersey – Bottom Up – Incentive driven, then SREC driven
  - Texas – Bottom up (but small), about to start looking top-down?

# Trend #2: Top Down/Bottom Up

- Solar is least expensive when developed at scale
- But “socialized costs” are least when individuals voluntarily invest in project development (i.e., incentives)



Clean Energy Associates (overlays)

Tracking the Sun IV: An Historical Summary of the Installed Cost of Photovoltaics in the United States from 1998 to 2010

Lawrence Berkeley National Laboratory, Galen Barbose, Naim Darghouth, Ryan Wiser, Joachim Seel, September 2011

# Trend #2: Top Down/Bottom Up

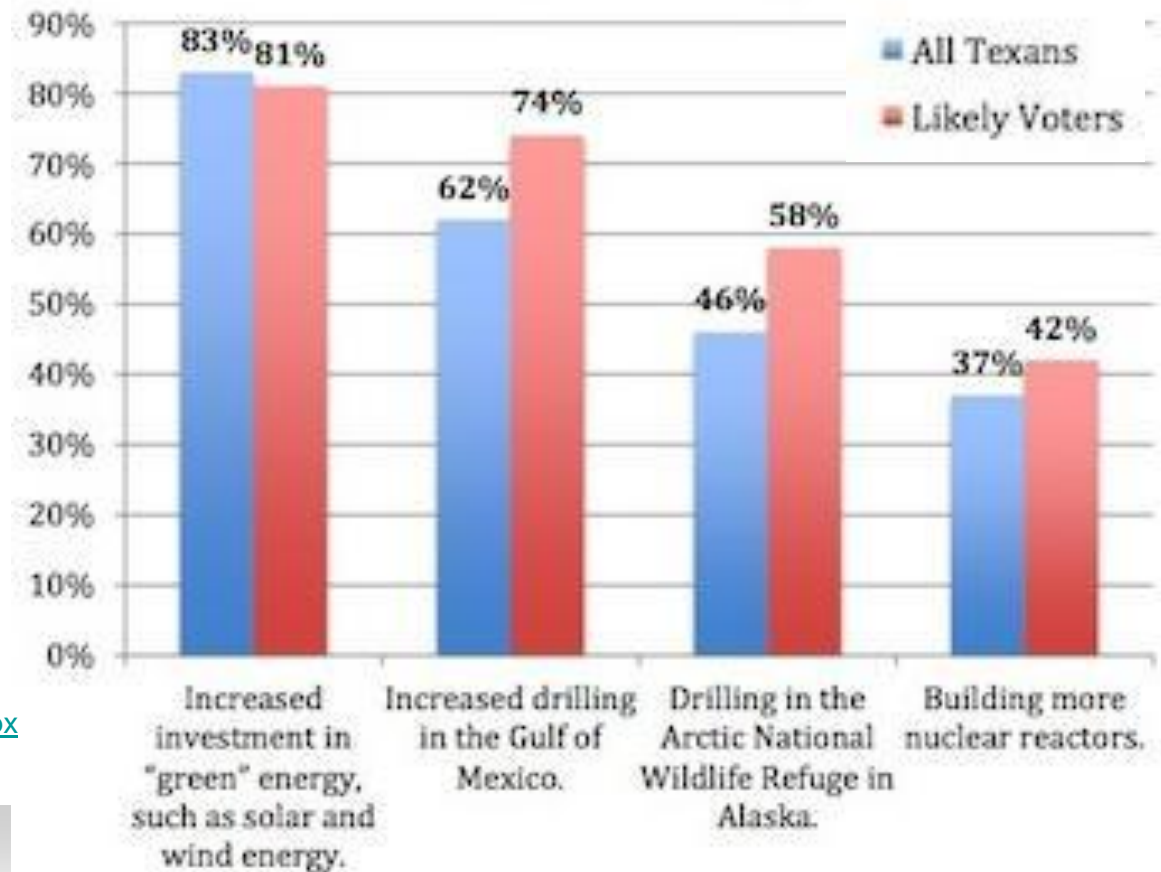
- Bottom-up market development requires political support that is hard to come by in Texas (though public support is present)

...The main bill on which solar proponents pinned their hopes this year died in a House committee...

[ June 17, 2011 ]

By 7-1 margin, Texans back investment in renewable energy

<http://www.texaslyceum.org/PollPage2011.aspx>



# Trend #2: Top Down/Bottom Up

- We are beginning to see serious evidence of interest in large, utility scale solar projects in Texas
- Projects Operating or Under Construction
  - CPS Energy/Duke Energy Generation Services - 16 MW DC PV near San Antonio, commenced operation 11/2010
  - Austin Energy/Fotowatio Renewable Ventures - 30 MW near Webberville, under construction
- Public solicitation
  - CPS Energy 50 → 400 MW RFP
- ERCOT Interconnection Queue
  - >1,500 MW under study

Project Description	Capacity (MW)		
	Wind	Solar	Biomass
Projects with Interconnect Agreement/Public Letter	5,149	90	100
Projects Under Full Interconnect Study	27,971	734	50
Confidential Projects	4,292	740	0
<b>Total</b>	<b>37,412</b>	<b>1,564</b>	<b>150</b>

Emerging Technologies Integration Plan  
 Quarterly Update for the Period Ending  
 June 30, 2011



# Trend #3: Business Models/Learning

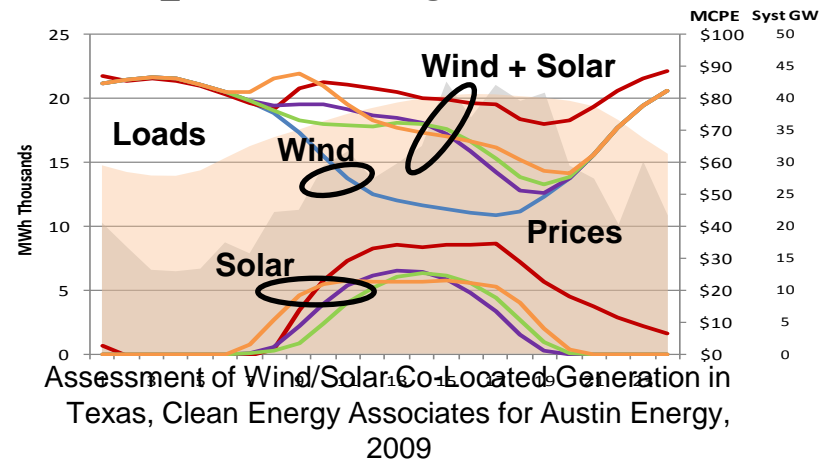
- 2010 saw the introduction of third party ownership models (solar leases and PPAs) in Texas. In 2011 the legislature removed unintended legal ambiguity about these models (SB 981, Carona).



- Other advances in products and processes have reduced the time and cost of installation while improving quality/consistency.



- Smart grid enables real-time pricing and time of use rates – these may present more interesting business models for solar.

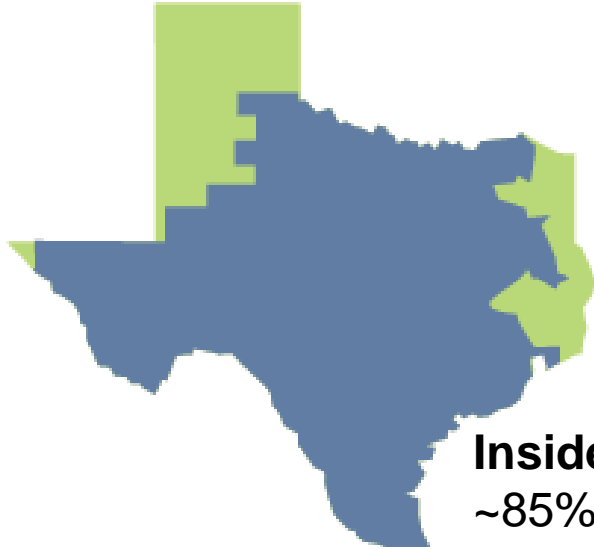


# Trend #3: Business Models/Learning

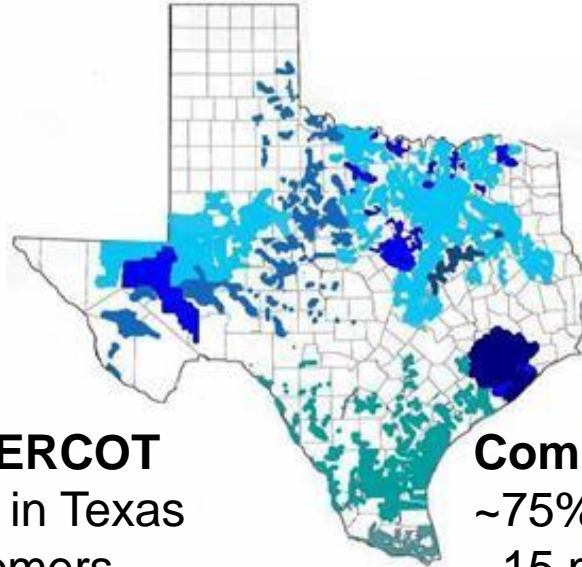
- First projects have to clear a path, often at great expense; others more easily follow.
- Learning has real value: consumers, installers, utilities, local code enforcement officials, legislators, regulators, etc.
- Learning, as much as technology and manufacturing improvements, drives cost reductions and creates a more robust market.



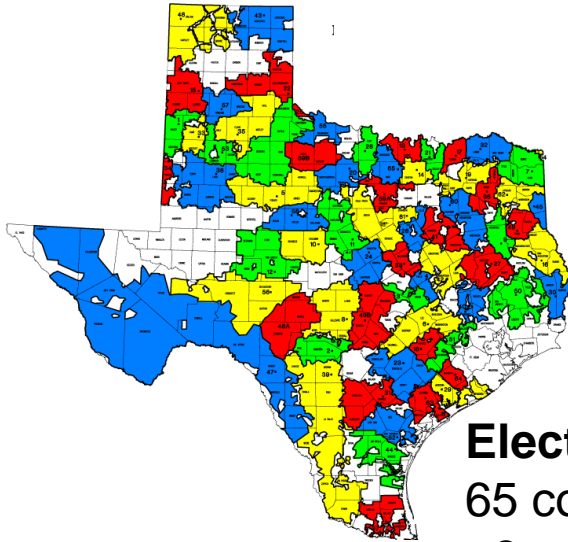
# Incentive Designs and their Applicability in Texas



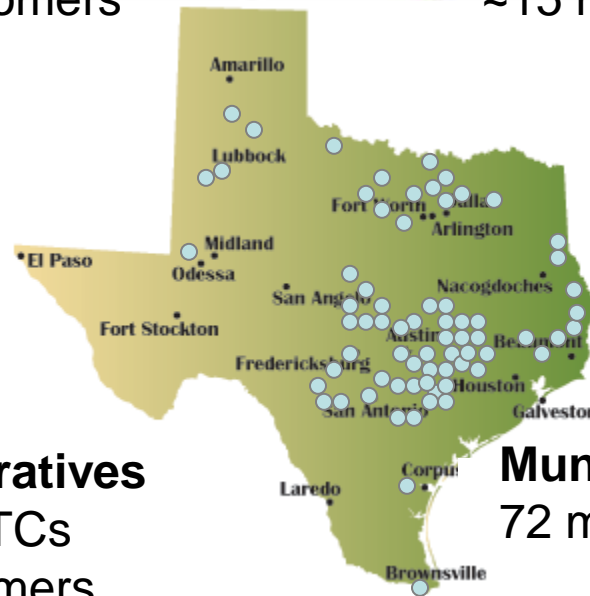
**Inside/Outside ERCOT**  
 ~85% of all kWh in Texas  
 ~20 million customers



**Competitive Areas**  
 ~75% of all kWh in Texas  
 ~15 million customers



**Electric Cooperatives**  
 65 coops + 9 GTCs  
 ~3 million customers



**Municipal Utilities**  
 72 munis

- 148 unique jurisdictions, rate structures, and control over interconnection and net metering requirements
- Some are fully vertically integrated, traditional utilities while others operate in competitive environments
- The vast majority (coops and munis) have little or no outside jurisdiction compelling uniform treatment of distributed renewables
- In thinking about incentive designs “for Texas”, we need to be cognizant of the local environments onto which those designs are placed

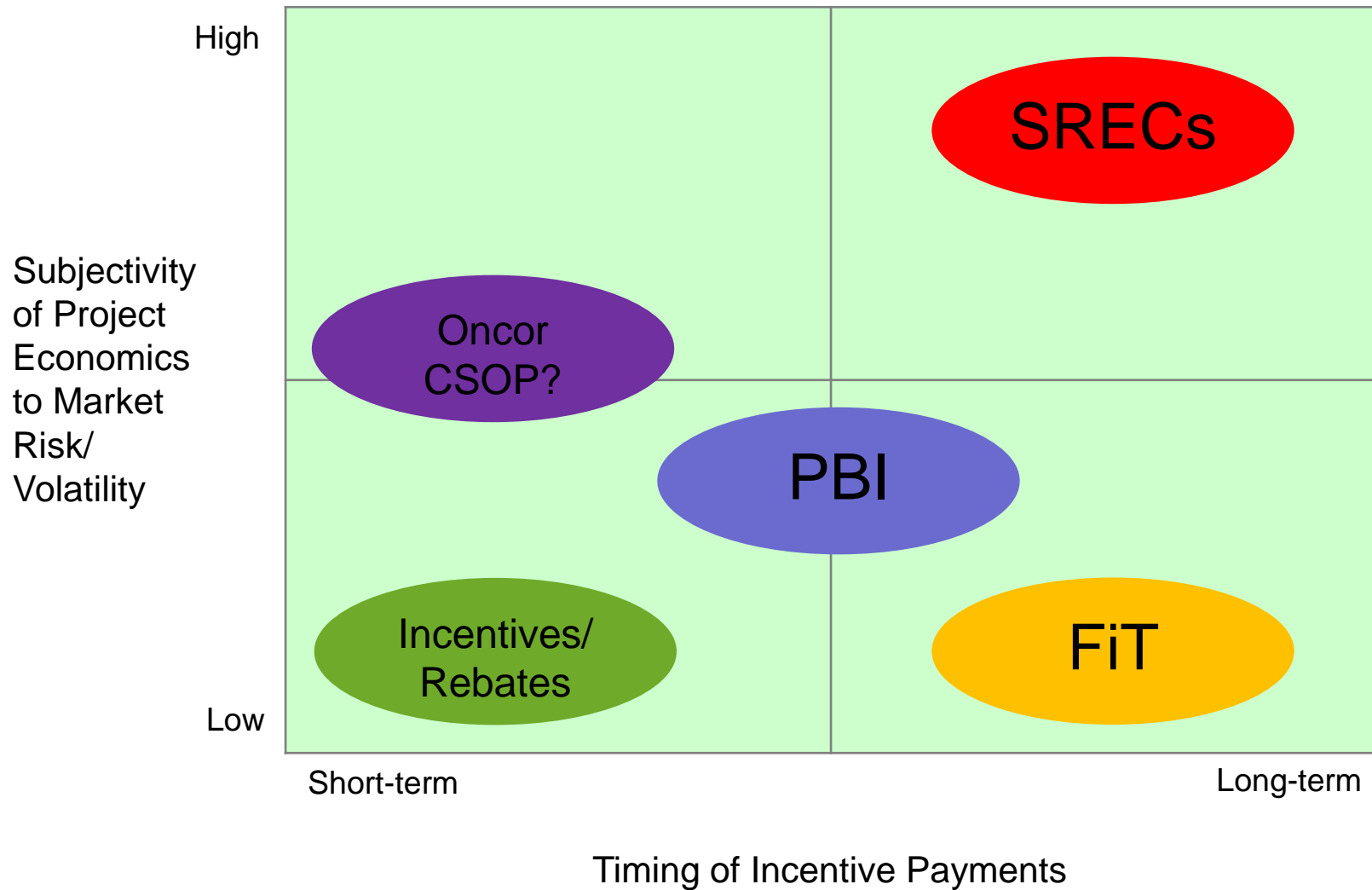
**How will any particular incentive design fit?  
regulatory, market, utility culture, rate structure, political**

# Incentive Design “Flavors”

- **Feed-in Tariffs** (FiTs or Standard Offer Contracts)
- **Portfolio Standards** (RPS/RECs/SRECs)
- **Performance-Based Incentives** (PBIs)
- **Up-front Incentives/Rebates** (reserved or not)

We'll ignore others for now

# Incentive Design Options



# Legislation and Regulation

**SB 981** (Carona, third party ownership, PASSED)

**HB 362** (Solomons/Workman, HOAs and solar, PASSED)

Also PASSED, net metering for El Paso Electric, energy storage regulation, energy efficiency, financing

**SB 15** (Fraser, state energy plan, DEFEATED)

**SB 661** (Nichols, PUCT/ERCOT sunset, gasified waste as RE amendment, DEFEATED)

**SB 1590** (Ogden, repeal Ch. 313 tax code, DEFEATED)

**RPS and Solar Incentives** DID NOT PASS

# Legislation and Regulation

## NOW

Energy efficiency program implementation (PUCT) – cost caps pose a problem for PV incentives

## Next Session

Direct incentive model for new capacity by 2016 (EOY) that is

on peak    water efficient    sustainable    reliable    renewable

relieves transmission congestion

Prohibit rural electric cooperatives from requiring liability insurance for DRG

# Legislation and Regulation

What are your priorities?



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