

# Solar Electricity Outlook



Source: NREL



Source: SMUD



**Solar Electric Power Association**

FACILITATING UTILITY USE AND INTEGRATION OF SOLAR ELECTRIC POWER



# Outline

- SEPA
- Solar in Florida
- Setting Policy
- Renewable Portfolio Standards
- Position of the Florida Solar Industry Association



# About SEPA

- Formed in 1992 as the Utility Photovoltaic Group
- Mission: facilitate solar solutions for **utilities**
  - Provide you with unbiased information
  - Answer your questions, big and small
  - Help you collaborate with utility peers
  - Be the bridge to the solar industry and others
- Membership
  - Electric Utilities – 100 members
  - Industry – 100 members
  - Stakeholders – 100 members



## Projects

- **Solar Incentive Program Survey**
- **Solar Capacity Methodology Project**
- **Utility Metering and Interconnection Survey**
- **Decoupling White Paper**
- **Utility Solar Case Studies**
- **Utility Solar Year in Review**
- **Utility Business Models**

## Ongoing Activities

- **Online Resource Library**
- **Solar Programs Options Tool**
- **Peer Match Tool**
- **One-on-One Utility Support**
- **Monthly Phone Seminars**
- **Utility Travel Scholarships to Solar Power Conference and Expo**
- **Solar Power Conference and Expo**
- **Bi-Weekly Electronic Newsletter and Email Alerts**
- **Membership Directory**
- **FindSolar.com**
- **PowerClerk Software Discount**



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# Solar Radiation

Total = Direct + Diffuse  
(sunlight) + (scattered)

PV = Total

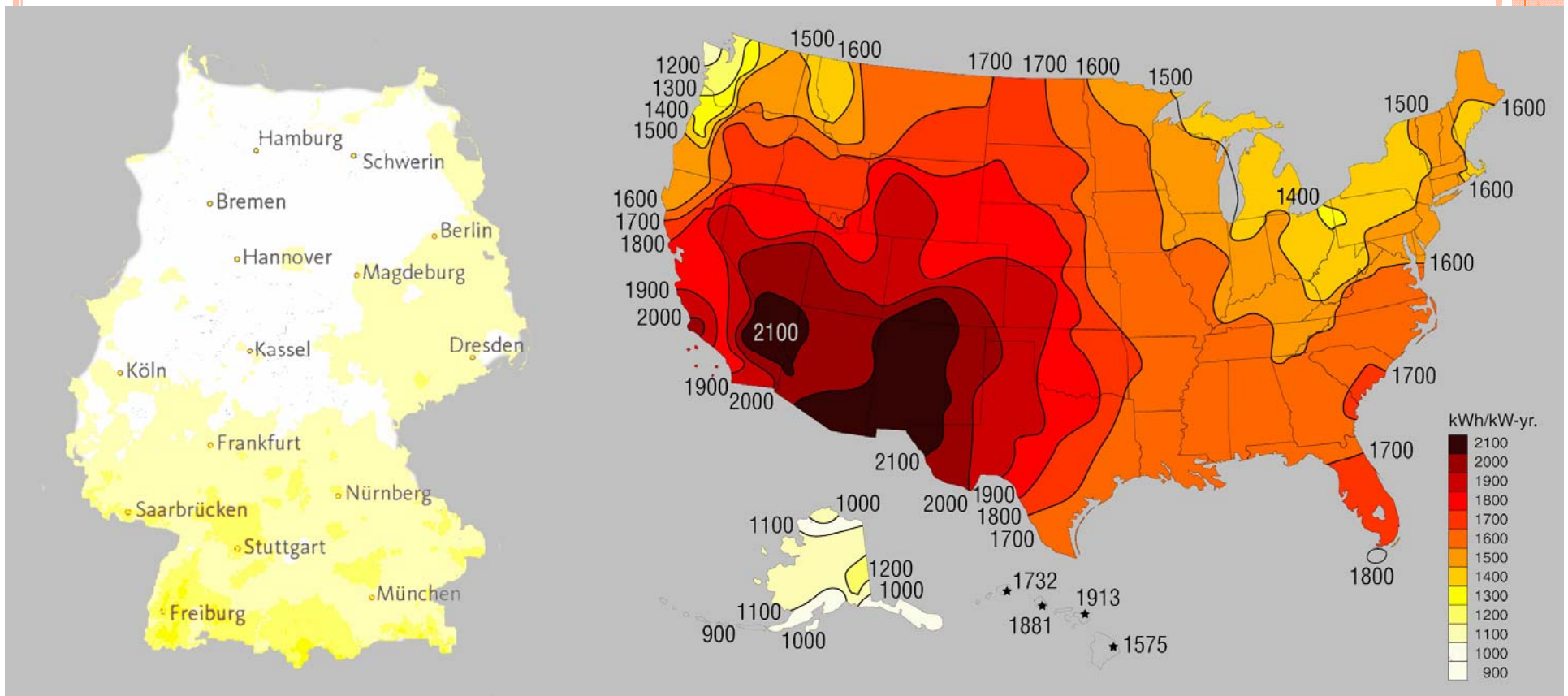
CSP/CPV = Direct only



# Total – PV Resource Comparison

1,000 MW in 2006

101 MW in 2006



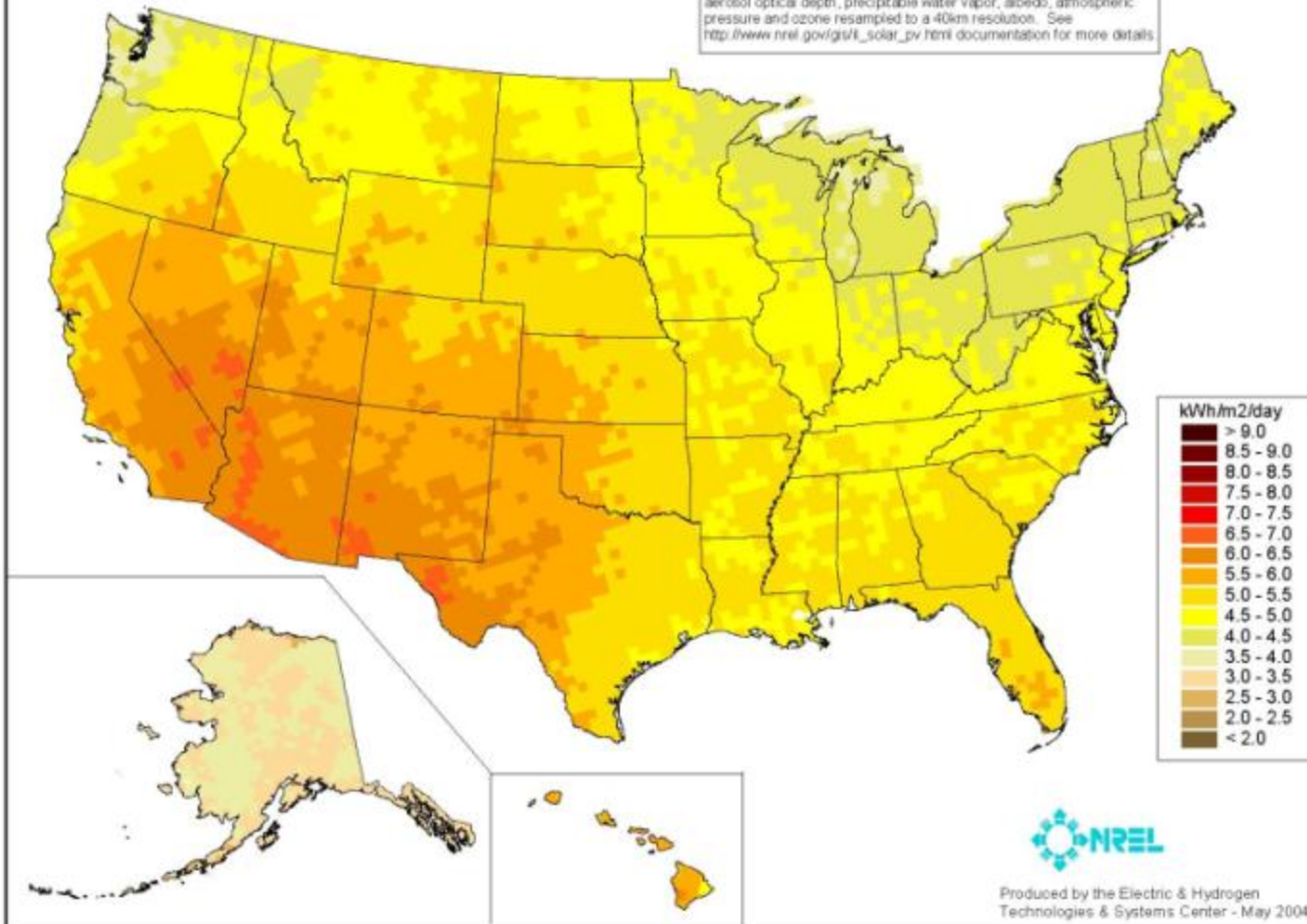
Source: SEIA



## PV Solar Radiation (Flat Plate, Facing South, Latitude Tilt)

Annual

Model estimates of monthly average daily total radiation using inputs derived from satellite and/or surface observations of cloud cover, aerosol optical depth, precipitable water vapor, albedo, atmospheric pressure and ozone resampled to a 40km resolution. See [http://www.nrel.gov/grui/solar\\_pv.html](http://www.nrel.gov/grui/solar_pv.html) documentation for more details.







# Solar America Initiative Across America



## Activities:

### Transforming Markets and Creating Demand

- Codes and Standards:**
  - Solar America Board of Codes and Standards (NM)
- Utility Technical Outreach:**
  - Solar Electric Power Association (DC)
- State Technical Outreach:**
  - Clean Energy Group (VT)
  - National Assn of Regulatory Utility Commissioners (DC)
  - National Conference of State Legislatures (CO)
- Solar America Cities:**
  - Ann Arbor (MI)
  - Austin (TX)
  - Berkeley (CA)
  - Boston (MA)
  - Madison (WI)
  - New Orleans (LA)
  - New York (NY)
  - Pittsburgh (PA)
  - Portland (OR)
  - Salt Lake City (UT)
  - San Diego (CA)
  - San Francisco (CA)
  - Tucson (AZ)

The Solar America Initiative (SAI) is accelerating the development of solar technologies, including photovoltaics (PV) and concentrating solar power (CSP) systems, with the goal of making them cost-competitive across all sectors by 2015. This work could not be successful without the collaboration of all stakeholders in the solar community. This map illustrates the location of several SAI participants... from Solar America City members who will be developing solar projects and building awareness in their respective communities to multinational corporations who will work in strategic alliances with other companies, national laboratories, and universities to tackle solar manufacturing challenges. It is truly a nationwide effort to create a Solar America.

- Solar America Showcases:**
  - City of San Jose (CA)
  - Forest City Military Communities (HI)
  - Orange County Convention Center (FL)

- PV Capacity Credit Valuation Study:**
  - State University of New York (NY)
  - Tucson Electric Power (AZ)
- SAI Federal Projects:**
  - Architect of the Capitol (DC)
  - Smithsonian Institution (DC)

### Developing Products and Building Supply

- Technology Pathway Partnerships:**
  - Amonix (CA)
  - Boeing (CA)
  - BP Solar (MD)
  - Dow Chemical (MI)
  - General Electric (DE)
  - GreenRay (MA)
  - Konarka (MA)
  - Miasolé (CA)
  - Nanosolar (CA)
  - Soliant (CA)
  - SunPower (CA)
  - United Solar Ovonic (MI)
- PV Module Incubator:**
  - AWA Solar (CO)
  - Blue Square Energy (MD)
  - CalSolar (CA)
  - EnFocus Engineering (CA)
  - MicroLink Devices (IL)
  - Plextronics (PA)
  - PrimeStar Solar (CO)
  - Solaria (CA)
  - SoloFocus (CA)
  - SoloPower (CA)



# SOLAR AMERICA CITIES



DOE's Solar America Cities will develop specific local solar infrastructure and deployment plans to provide models for other similarly situated localities



## SOLAR WATER HEATING CUMULATIVE VALUE FROM 1979 TO 2006

- Solar Water Heater has a design life of 20 years
- Florida residents installed 136,000 solar water heaters from 1978 through 2006
- \$500 million industry
- Offset nearly 100 tons of Green House Gases
- In a declining market!

**Lakeland Electric has been deploying solar water heating systems and selling thermal energy for years!**



**Table 3: Annual market growth in selected countries**

Table downloaded from the IEA-PVPS website: [www.iea-pvps.org](http://www.iea-pvps.org)  
Data may be reproduced with acknowledgement to the IEA Photovoltaic Power Systems Programme



PV power (MW) installed in calendar year												
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
AUS	2,0	3,0	3,0	3,8	2,8	3,9	4,4	5,5	6,5	6,7	8,3	9,7
AUT	0,3	0,3	0,5	0,7	0,8	1,2	1,2	4,2	6,5	4,2	3,0	1,6
DEU	5,3	10,1	14,0	12,0	15,6	44,3	80,9	83,4	153,0	<b>613,0</b>	<b>866,0</b>	<b>953,0</b>
ESP	0,8	0,4	0,2	0,9	1,1	3,0	3,6	4,8	6,5	10,4	<b>20,3</b>	<b>60,5</b>
FRA	0,5	1,5	1,7	1,5	1,5	2,2	2,6	3,3	3,9	5,2	7,0	10,9
ITA	1,7	0,2	0,7	1,0	0,8	0,5	1,0	2,0	4,0	4,7	6,8	12,5
JPN	12,2	16,2	31,7	42,1	75,2	121,6	122,6	184,0	222,8	272,4	289,9	286,6
KOR	0,1	0,3	0,4	0,5	0,5	0,5	0,8	0,7	0,6	2,5	5,0	21,2
NLD	0,4	0,9	0,7	2,5	2,7	3,6	7,7	5,8	19,6	3,6	1,7	1,5
USA	9,0	9,7	11,7	11,9	17,2	21,5	29,0	44,4	63,0	100,8	103,0	145,0



# Annual PV by State

Kilowatts  
(DC)  
(grid-tied only)

State	2006	2007
California	70.6	87.1
New Jersey	17.9	16.4
Nevada	2.6	14.6
Colorado	0.9	12.4
New York	2.7	4.4
Hawaii	0.3	2.4
Arizona	2.1	2.1
Connecticut	0.5	1.8
Massachusetts	1.5	1.4
Oregon	0.5	1.1
Other States	1.9	4.4
<b>TOTAL</b>	<b>101.5</b>	<b>148.1</b>

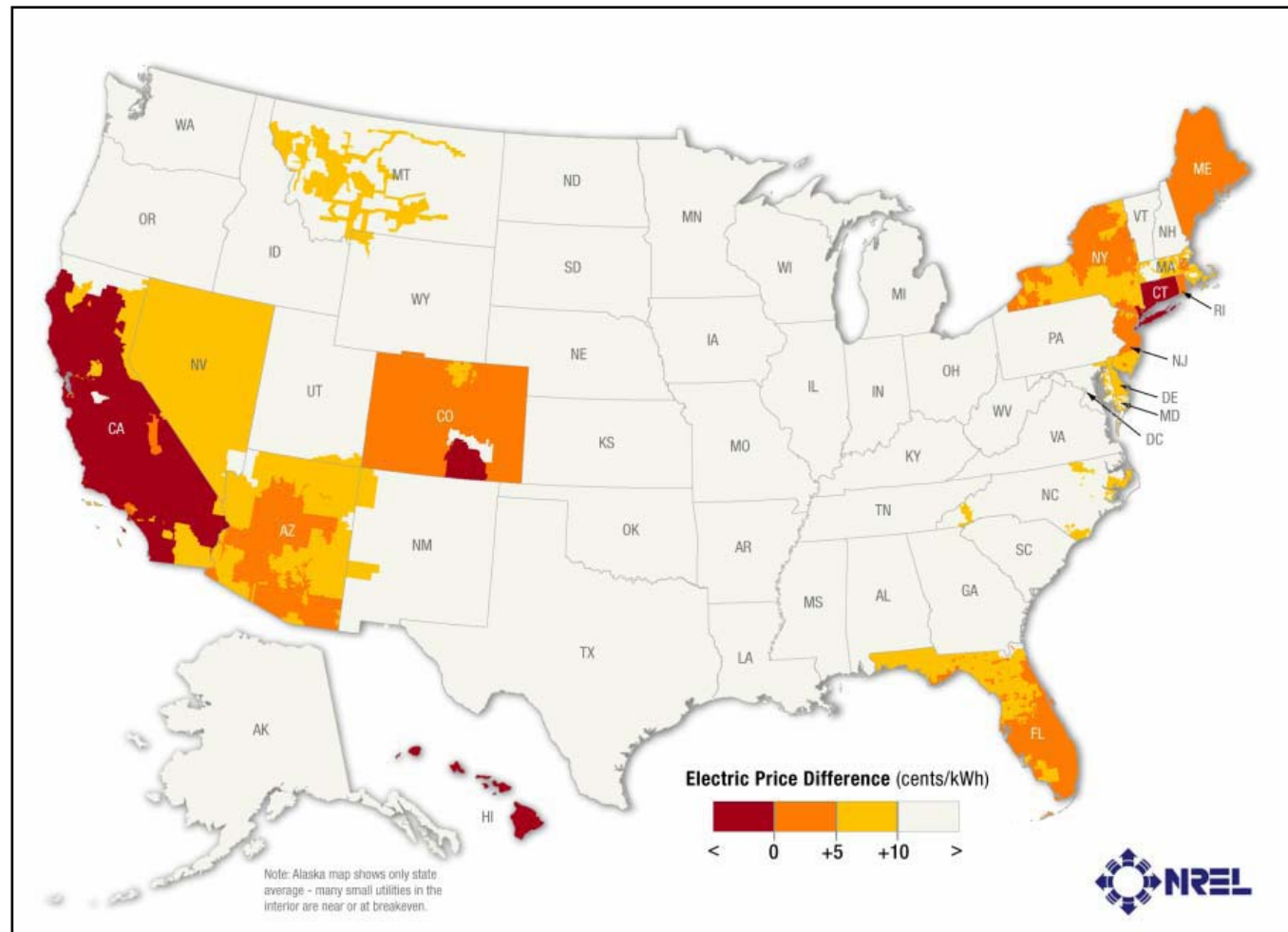
Source: IREC / Prometheus Institute

Growth: CA, FL, HI, MD, NC, NJ, NM, NY, OR, PA, TX



## MARKET PENETRATION BEGINS - 2007 RESIDENTIAL PV AND ELECTRICITY PRICE DIFFERENCES WITH EXISTING INCENTIVES

Currently PV is financially competitive where there is some combination of high electricity prices, excellent sunshine and/or state/local incentives.





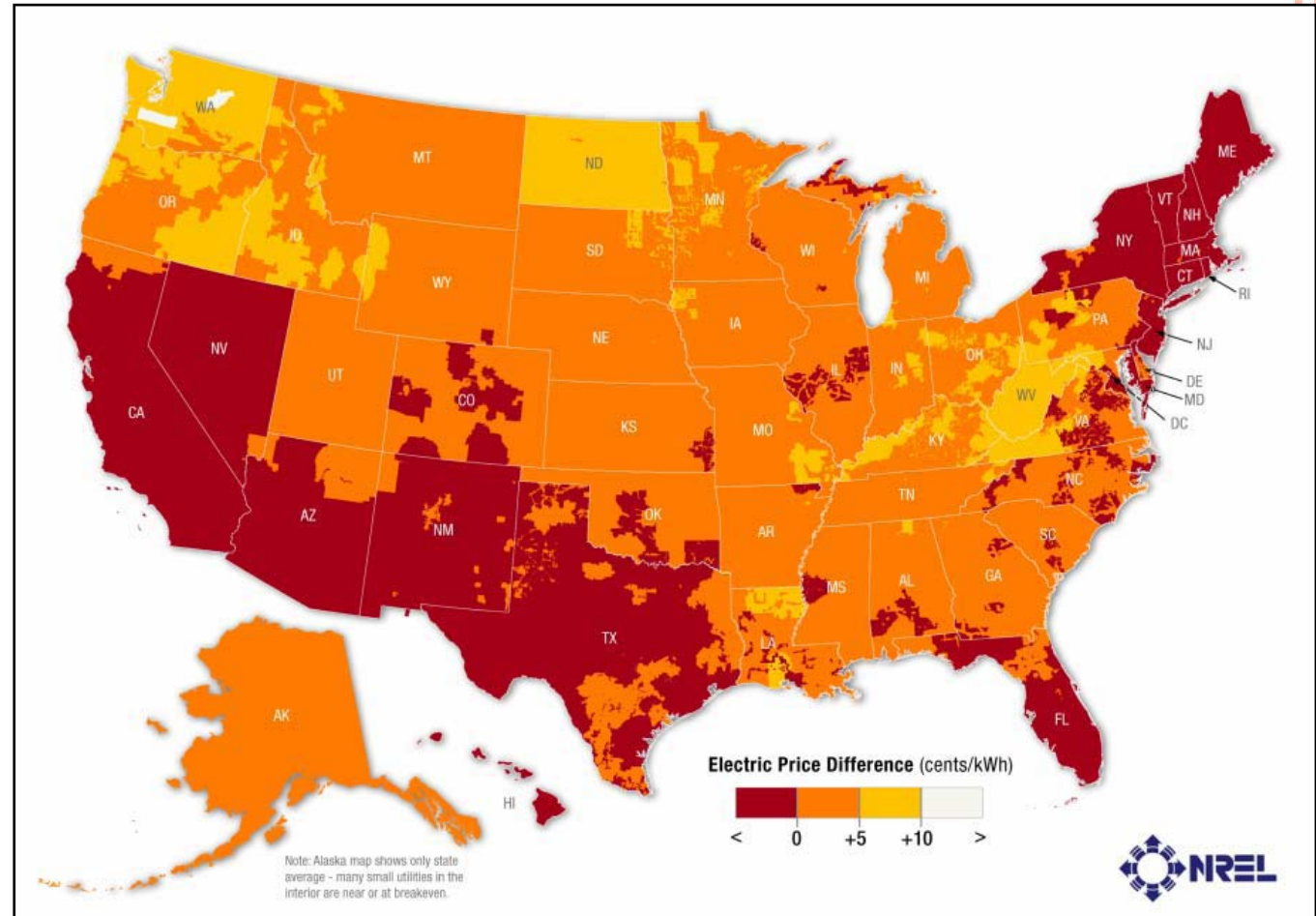
Solar Electric Power Association  
FACILITATING UTILITY USE AND INTEGRATION OF SOLAR ELECTRIC POWER

## SOLAR ACCELERATION IN A CONSERVATIVE FORECAST - 2015 RESIDENTIAL WITHOUT INCENTIVES AND MODERATE INCREASE IN ELECTRICITY PRICES

Attractive in about 250 of 1,000 largest utilities, which provide ~37% of U.S. residential electricity sales.

85% of sales (in nearly 870 utilities) are projected to have a price difference of less than 5 ¢/kWh between PV and grid electricity.

In large areas, PV is cheaper than grid electricity





Solar Electric Power Association

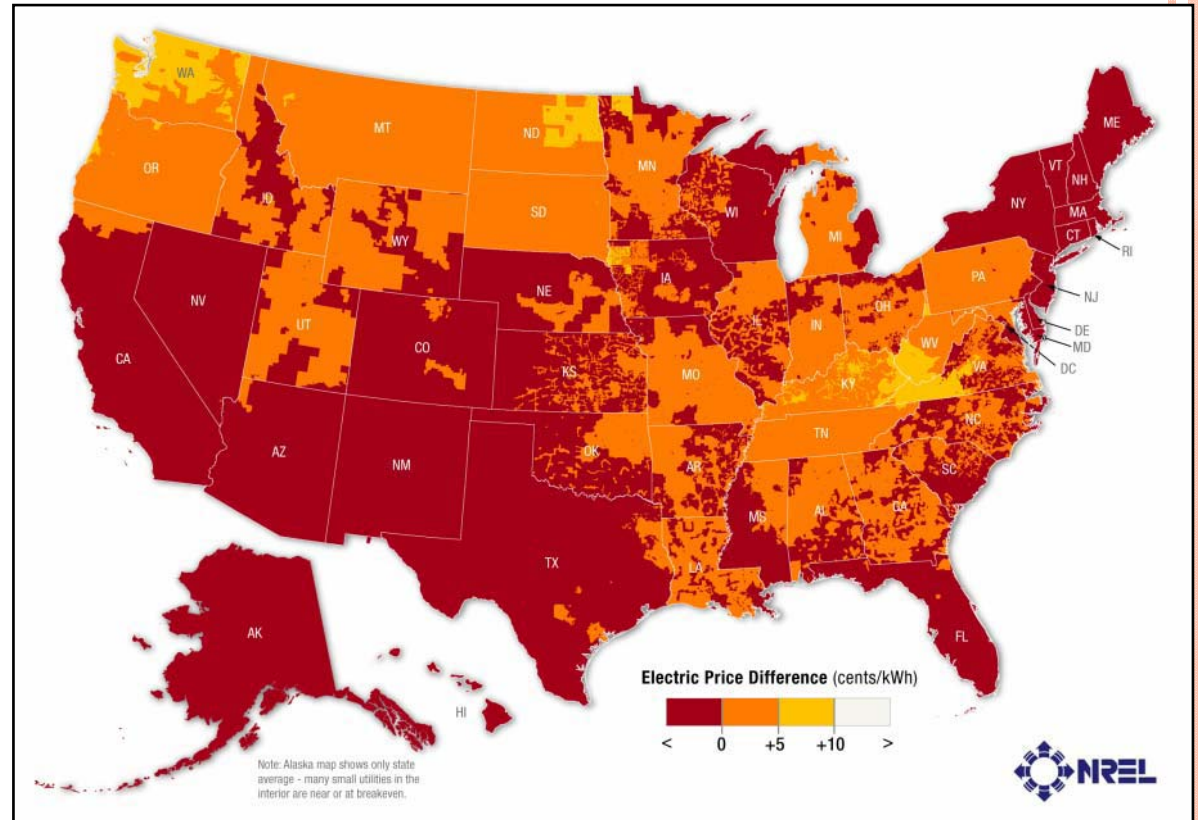
FACILITATING UTILITY USE AND INTEGRATION OF SOLAR ELECTRIC POWER

## 2015 RESIDENTIAL INSTALLATIONS WITHOUT INCENTIVES AND AGGRESSIVE INCREASE IN ELECTRICITY PRICES

**Attractive in about 450 of 1,000 largest utilities, which provide ~50% of U.S. residential electricity sales.**

**91% of sales (in nearly 950 utilities) have a price difference of less than 5 ¢/kWh between PV and grid electricity.**

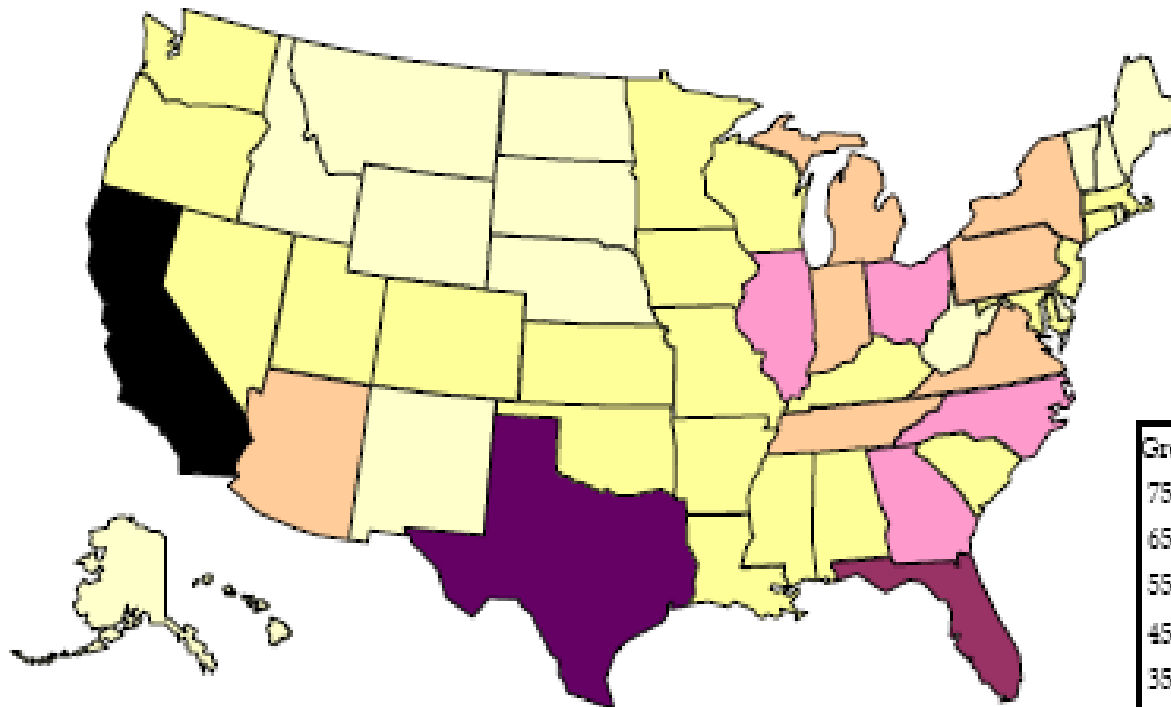
**Across most of the highest U.S. population areas, PV is cheaper than grid electricity.**







# Rooftop Potential (2015)



Range	Unit	Color
Greater than 75000	MW	Black
75000 to 65000	MW	Dark Purple
65000 to 55000	MW	Medium Purple
55000 to 45000	MW	Bright Purple
45000 to 35000	MW	Red-Orange
35000 to 25000	MW	Pink
25000 to 15000	MW	Light Orange
15000 to 5000	MW	Yellow
5000 to 1000	MW	Light Yellow
1000 to 0	MW	White

720 GW potential

Source: DOE/NREL



## **PV installation**

- some 440 kWp
- some 150 inverters

## **strong grid**

- PV on 4 feeders
- transformer Sn: 400 kVA
- Sk: 11 MVA
- main feeder: 150 mm<sup>2</sup> Al
- apartment branch: 35 mm<sup>2</sup> Al

## **VdEW guidelines**

- > 2 % voltage rise permitted
- > 220 kVA inverter power



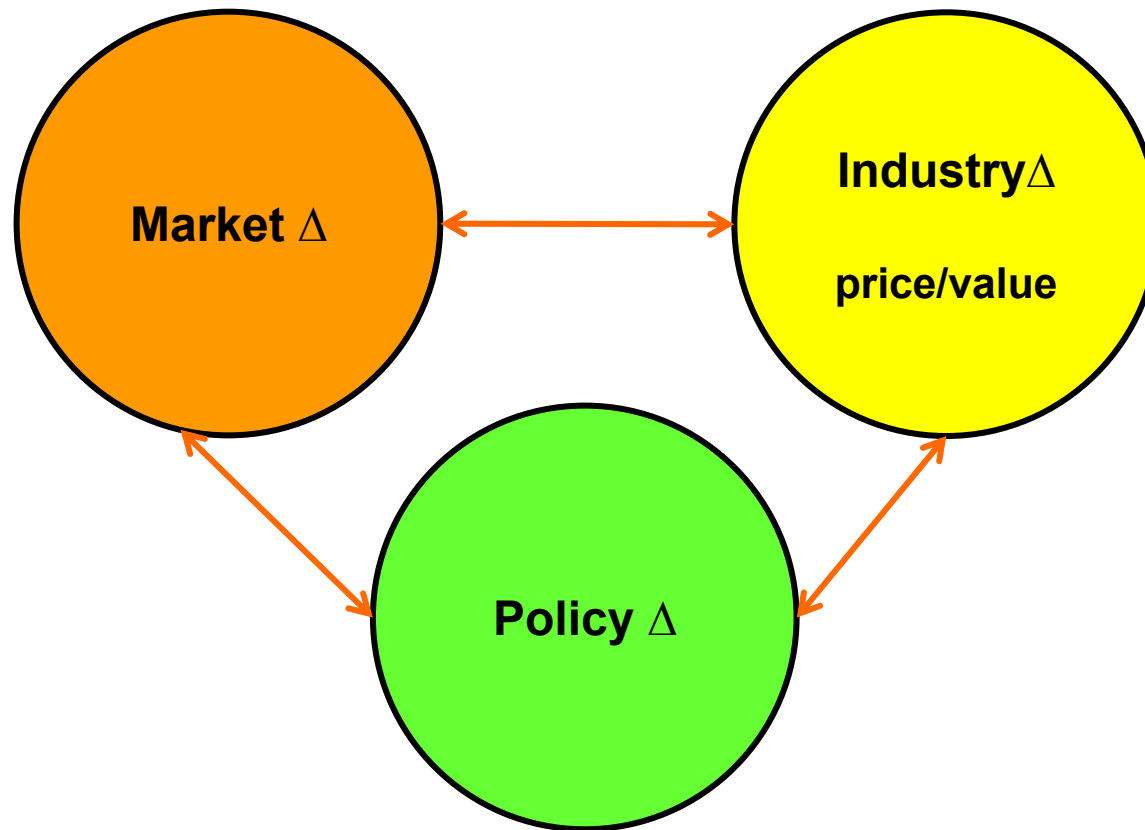


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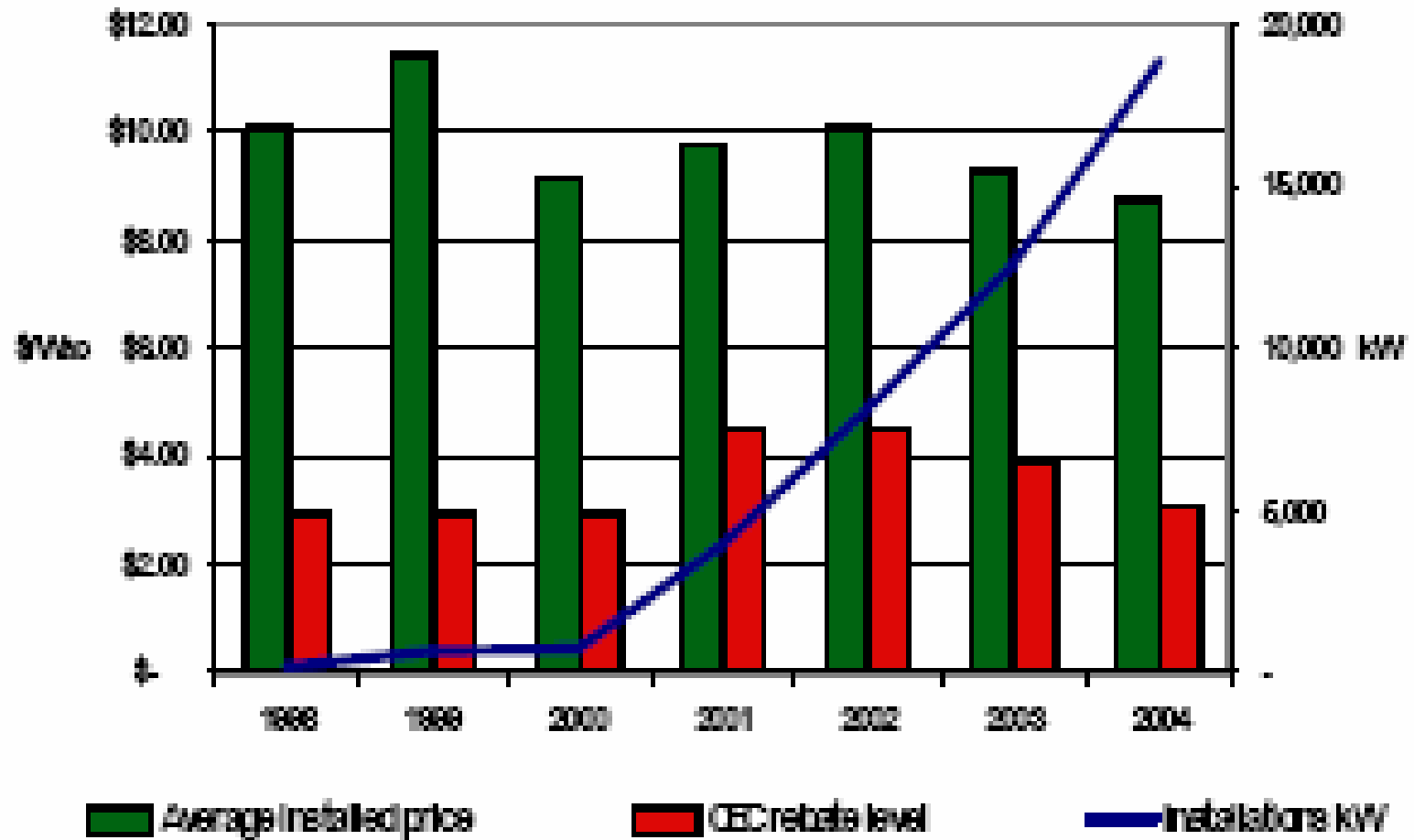
# PV Value



**Most energy technologies have been subsidized – the trick is to adjust subsidies with the market and price changes**

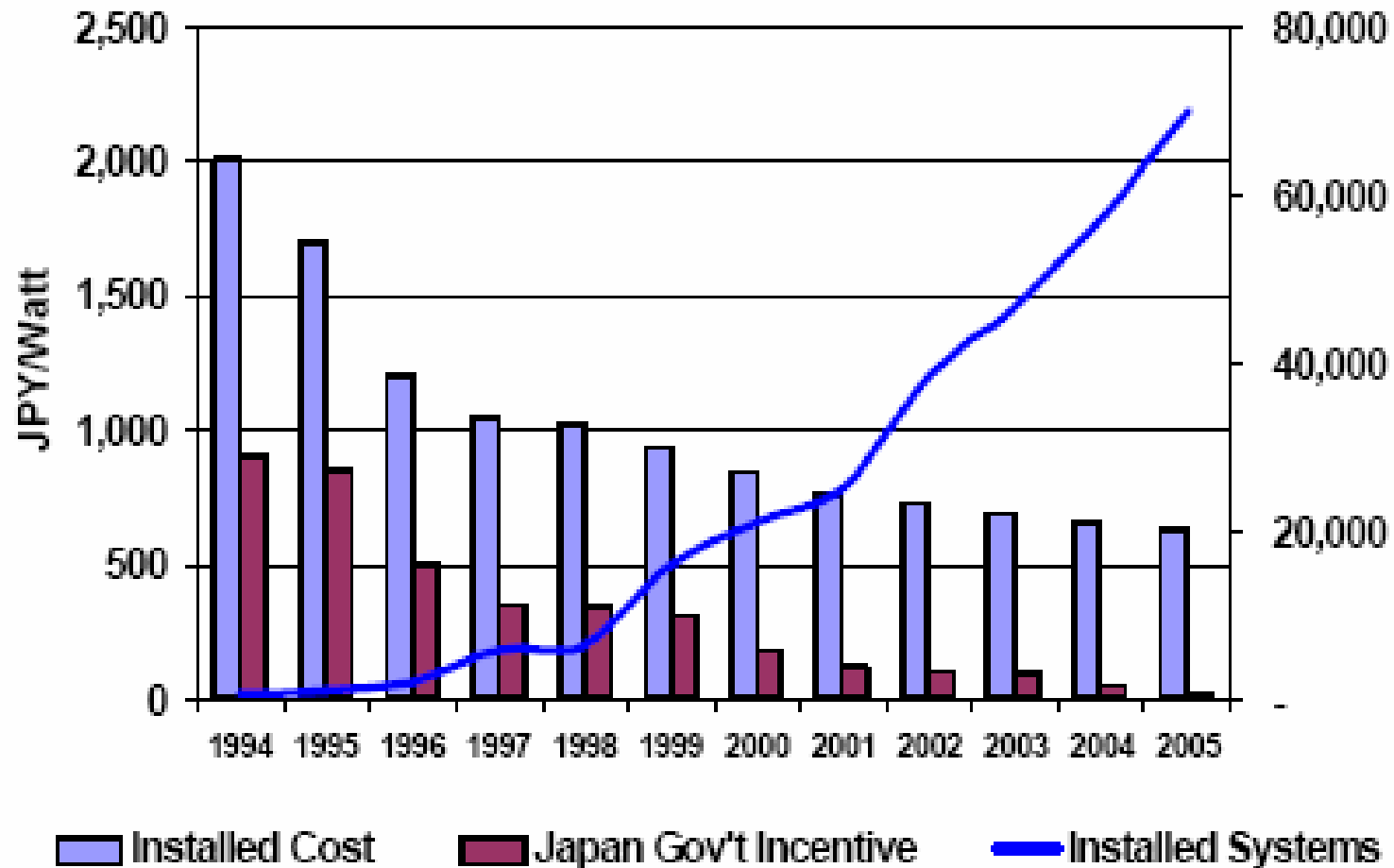


# CALIFORNIA PROGRAM HISTORY





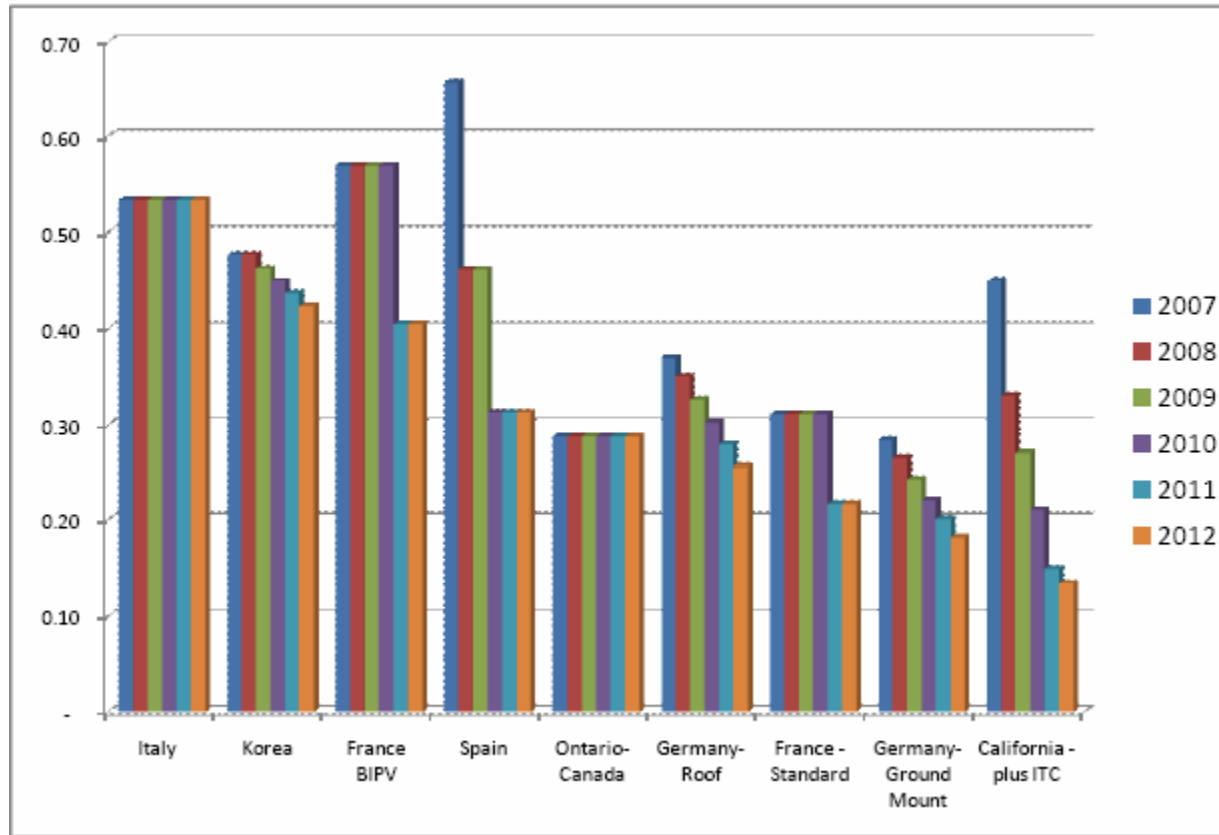
## Japanese Residential Program History



Source - NEDO/NEF and Sharp estimate



# STANDARDIZED INCENTIVES FALLING



○ Incentives Dropping – some quickly!!!  
Source: Prometheus Institute



## POLICY OBJECTIVES

- **Market diversity**
  - **Customer and application variety**
  - Retrofit and new construction
  - Small to large scale
  - Solar thermal and solar electric systems.
- **Economic development & job**
- **Distributed solar market**
- **Reduction of system installed cost**
- **Long-term program**
- **Flexible program**
- **Adequate Funding**
- **Value grid benefits:**
- **Value societal and environmental benefits:**
- **Public awareness**





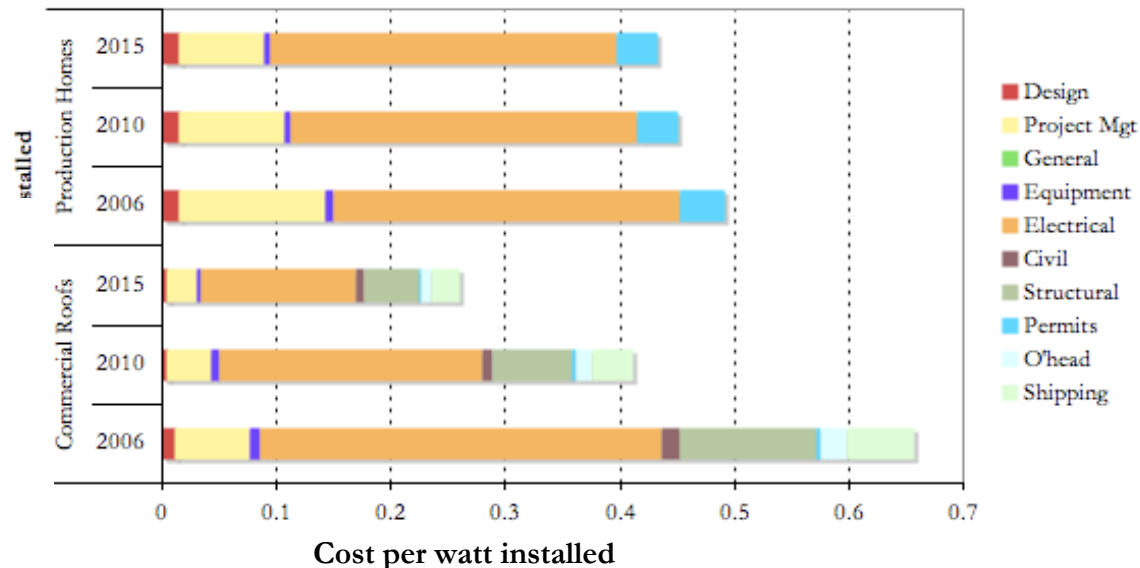
## POLICY DESIGN CRITERIA

- **Maximize investor confidence**
- **Economic Efficiency**
- **Program Incentive Monitoring**
- **Program Administrative transparency and simplicity**

## Balance of system / installation costs will fall as policy becomes more solar friendly



Breakdown of installation costs



- **State/local governments and utilities can have major impacts on the local price of solar electricity by impacting installation costs**

- **Solar production is global but every installation is local**

**State/local governments and utilities can promote solar by:**

- **streamlining solar permitting**
- **facilitating interconnection to the grid**
- **establishing solar-friendly net metering regulations**
- **banning homeowner association restrictions against solar**
- **establishing installer and code official training centers at community colleges**
- **offering tax incentives (sales, income, property) to solar purchasers**
- **creating public outreach and information campaigns**

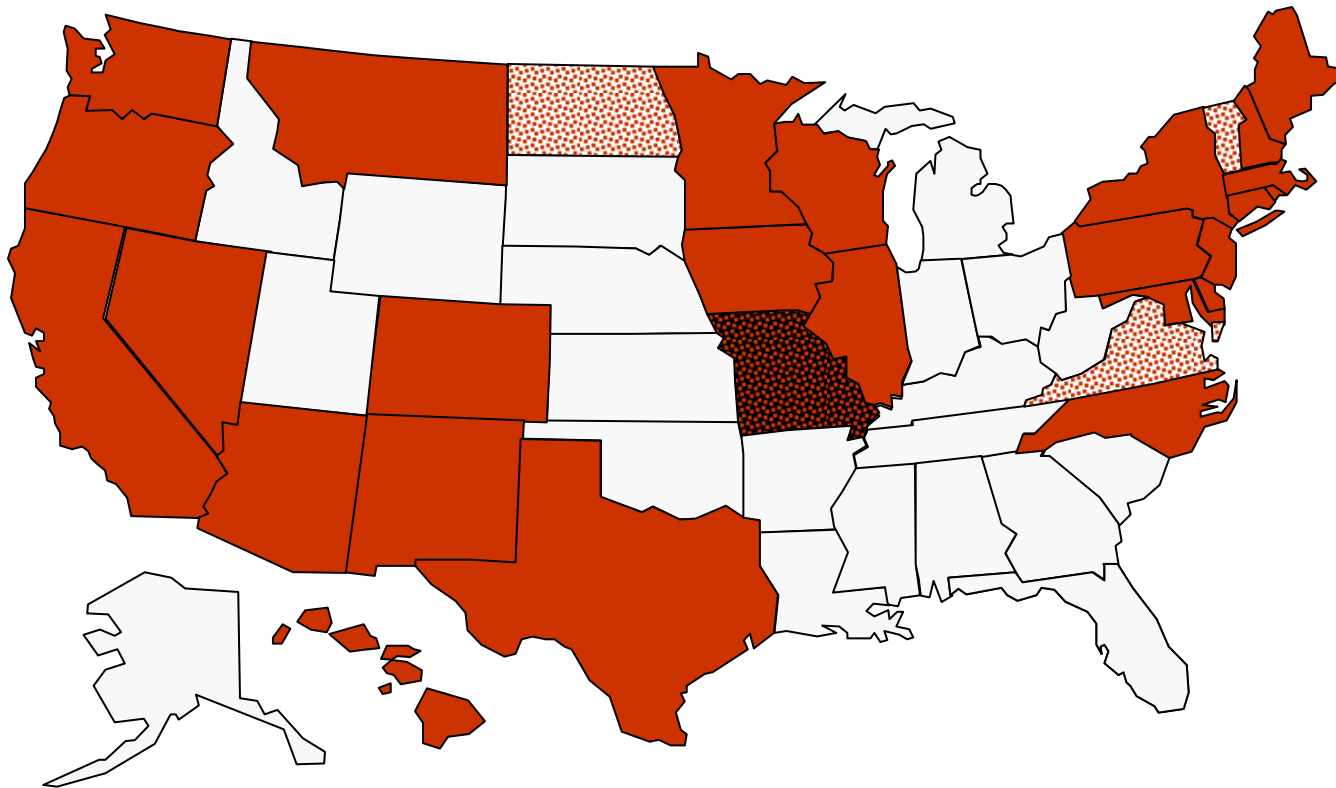


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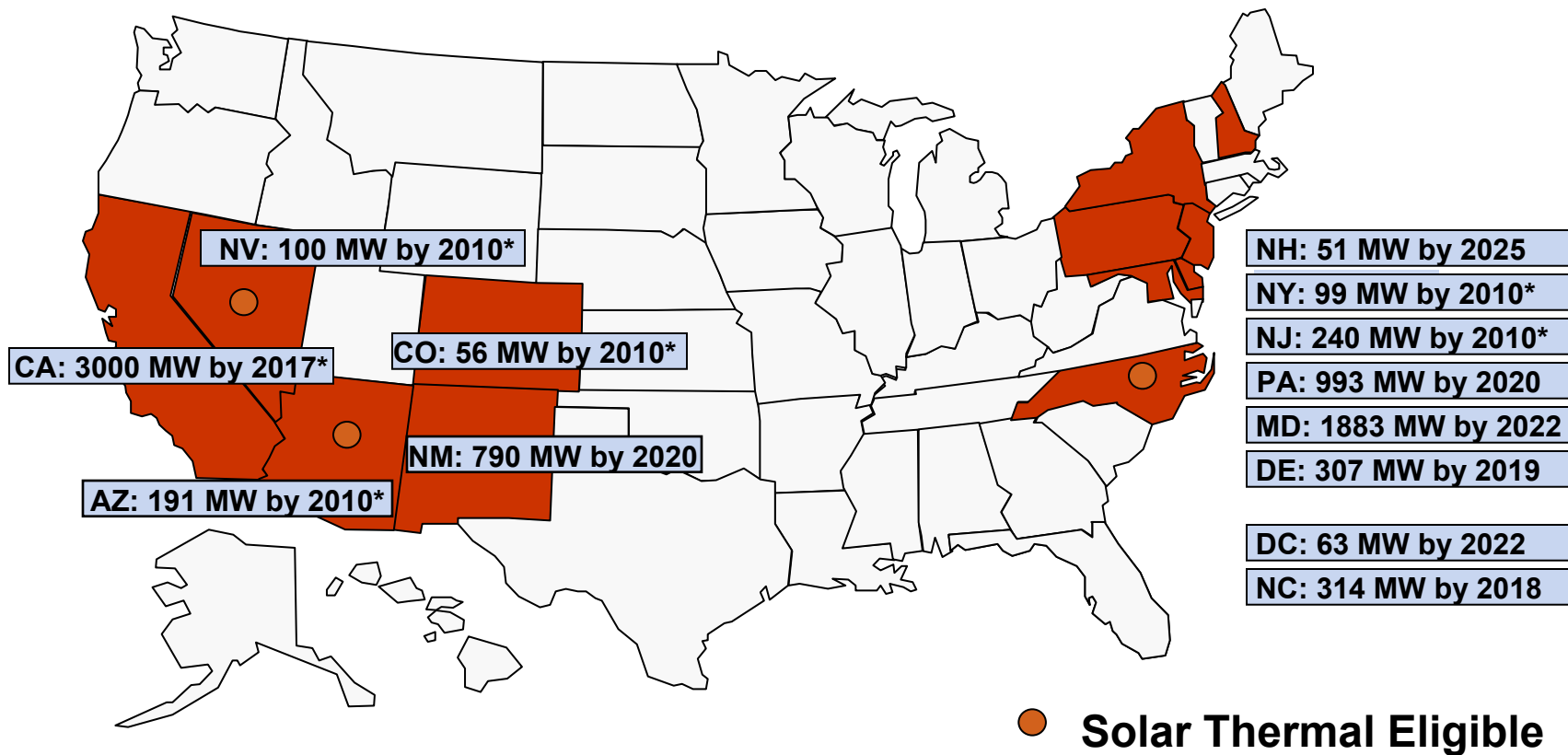
# State - RPS



Data: IREC



# State – RPS Solar



**~ 9,000 MW @ ~500,000 sites**

Data: IREC, SEPA



## FLORIDA ENERGY RELATED GOALS

- Reduce current emission levels 10 % by 2012, 25% by 2025 and 40% by 2050

*Though an Executive order is just guidance to legislative agencies, this is assumed to be the initial target*

- To meet this target, both a 20% Renewable Portfolio Standard and energy efficiency are necessary.



## What are the emission goals?

	Millions kWh*			
Base Year and Goal Years	2007**	2012	2025	2050
<b>Electric Consumption with Business as Usual - All Sectors* @ 2.8% Average Growth</b>	225,889	259,335	371,339	740,626
<b>Less Energy Efficiency Reductions increasing at 2.5%/yr***</b>		241,688	301,985	612,047
<b>Less emission neutral RPS of 8% 2012 (19,335 million kWh) and 20% 2025 &amp; 2050 (60,000&amp;122,000 million kWh)</b>		222,353	241,588	489,638
<b>Emissions</b>	Base	Less 10%	Less 25%	Less 40%
<b>CO<sub>2</sub> (1000 metric tons)</b>	130325	117,293	97,744	78,195
<b>lbs/kWh</b>	1.1539	1.0550	0.8092	0.3194
<b>SO<sub>2</sub> (1000 metric tons)</b>	412	371	309	247
<b>lbs/kWh</b>	0.0036	0.0033	0.0026	0.0010
<b>NO<sub>x</sub> (1000 metric tons)</b>	227	204	170	136
<b>lbs/kWh</b>	0.0020	0.0018	0.0014	0.0006

**Both a RPS and Energy efficiency through utility measures, codification and builder mandates can result in both immediate and long term air quality benefits to Florida.**



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TO ASSURE A REASONABLE SOLAR FACTOR OF THE RPS, A 2% PV PLUS A 2% SOLAR THERMAL SET ASIDE ARE PROPOSED, ALONG WITH A SUITE OF POLICIES (MOST OF WHICH ALSO PROMOTE OTHER RENEWABLES)

- ✓ Net Metering
- ✓ Interconnection
- ✓ Property tax exemption
- ✓ Licensing, certification
- Building code requirements (new, remodel, disaster rebuild, existing incentive program)
- Delete the eminent domain regulatory issue
- When undergrounding neighborhoods, design the distribution plant for DG compatibility
- A market responsive renewable energy payment



## Benefits from solar investment

Solar Electric-PV based on 4 GW new	Solar Thermal based on 105 million sq.ft. new
6000 MWh	6000MWh
123 million tons of CO <sub>2</sub>	49 million tons of CO <sub>2</sub>
290,000 tons of SO <sub>2</sub>	155,000 tons of SO <sub>2</sub>
522,000 tons of NO <sub>x</sub>	85,000 tons of NO <sub>x</sub>
54,000 job-years in state	18,000 job-years total
83,000job-years in US	
1700 MW dispatchable equivalent	820 MW of demand reduction
26 peakers	
Peak Energy Values ?? CA 23-35, NY 9-16 ¢/kWh	



**Solar Electric Power Association**  
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## **Email quote: Ed Reagan Gainesville Regional Utilities after SEPA fact finding mission to Germany with 31 US utilities**

**I've been really torn – we were heading down the path for a big group purchase (through Coelectric or more recently SEPA based on your comment).**

**On the other hand, as a muni this leaves lots of federal incentives on the table. Monetizing the tax issues is pretty complicated. It also locks in a system type etc etc.**

**I also really liked the economic stimulus package features of an FIT, the ability to allow residential, commercial, and green field projects, and the opportunity it gives for small investors. A utility project just does not do this.**



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# Thank you...



Solar Electric Power Association  
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The Solar Electric Power Association is a 501(c)3 nonprofit membership organization, formed in 1992 as the Utility Photovoltaic Group. SEPA has more than 300 utility, electric service provider, manufacturer, installer, government, and research members. Our mission is to facilitate solutions for the use and integration of solar electric power by utilities, electric service providers, and their customers. To achieve this mission, SEPA:

1. Provides products, services, and strategies;
2. Fosters business to business networking;
3. Shares information on solar electric technologies, applications, programs, and business solutions; and,
4. Reports on and evaluates policies, regulations, and legislation.

## **Current Projects**

SEPA has a number of projects underway. If you are interested in serving an advisory or other role for any of these projects, please let us know.

### **1. Solar Incentive Program Survey**

SEPA has coordinated the design of a standard survey that solar incentive program managers, at utilities or state organizations, can distribute to their past participants that have installed a solar system on their home or business. Learning about why consumers participate in the solar incentive and their experiences with the process will help program managers improve them for future participants. SEPA is collecting individual results for each program, performing a broad analysis across the programs, and publishing a final aggregated report.

### **2. Solar Capacity Methodology Project**

SEPA has partnered with SUNY Albany, Clean Power Research, and Vote Solar on a consensus building project through the Solar America Initiative to bring utilities and stakeholders together to develop and agree on 1-3 methodologies for calculating photovoltaic capacity value. While the diversity of solar resources, installation variables, and utility operations prevent consensus on any one number, the development of 1-3 standard methodologies through a consensus process will bring legitimacy and understanding among the various stakeholders.

### **3. Utility Metering and Interconnection Survey**

SEPA has completed a survey effort, in collaboration with IREC, to better understand utility metering and interconnection practices - costs, requirements, etc. The final report, to be released in February 2008, will take an objective look at the results and make best practices recommendations that provide win-win situations for utilities and customers.

### **4. Decoupling White Paper**

SEPA is currently collaborating with the Regulatory Assistance Project on a white paper related to decoupling and solar. While decoupling has received increased attention in the energy efficiency world, it is not commonly known in the solar industry as a policy method for reducing the issue of "lost revenues" due to decrease sales of electricity when a customer installs a solar system.

### **5. Utility Solar Case Studies**

SEPA is developing a series of 15-20 case studies of successful and replicable utility solar projects or programs that will be integrated into SEPA's SPOT and Peer Match tools (see descriptions below), as well distributed directly to utilities around the country. The intent is to demonstrate utility program types and structures that benefit both the utility and the solar industry.

### **6. Utility Solar Year in Review**

SEPA will publish a "Utility Solar Year in Review," to summarize and categorize utility solar activities and the results of SEPA's projects, which will include highlights of:

- Historical, 2007, and forecasted utility owned/contracted solar installations;
- Summary of customer-owned solar installations;
- Major utility solar projects of note initiated in 2007; and
- SEPA activity and project results as outlined above

### **7. Utility Business Models**

Over the next 5-10 years, the customer-utility relationship will change as onsite generation, storage, and efficiency make commercial and residential customers more dynamic participants in the electric industry. Even today commercial customers in some states can reduce their annual consumption by 20-30% with a solar system that is owned and operated by a third-party developer, paying nothing up-front for the system. While these situations and electricity amounts are currently small, they will increase in scale, and SEPA is undertaking an effort to understand ways that utilities can transform their business approach to retain customer and utility benefits.

## Ongoing Activities

As always, we are continuing our ongoing activities and are always looking for new ones to add to the list.

### 1. Online Resource Library

The Resource Library located at [www.SolarElectricPower.org](http://www.SolarElectricPower.org) has over 200 solar documents categorized by individual topic and date. Reports from around the industry are added as they become available.

### 2. Solar Programs Options Tool

SEPA has built and is currently putting the final tweaks on the Solar Programs Options Tool (SPOT). SPOT is an online evaluation tool that recommends and prioritizes solar electricity options for electric utilities, including:

Residential & Commercial Incentives

- Solar Generating Plants
- Power Purchase Agreements (PPAs)
- Renewable Energy Credits (RECs)
- Green Power Pricing Programs
- Education, Demonstration, and Research

SPOT users provide basic information about their utility and then identify and rank their solar goals and objectives. The result is recommendations and information about program options that are most likely to help the utility meet its stated goals.

### 3. Peer Match Tool

SEPA's online Utility Peer Match tool launched in April/May 2007. This tool allows utility employees to identify and contact other utility employees more experienced in the solar programs and/or technologies of interest.

### 4. One-on-One Utility Support

SEPA staff provides one-on-one direct support on a regular basis to utilities and other SEPA members with questions about solar technologies, programs, and projects, which directly and indirectly results in increased utility and/or customer use of solar electric power.

Through the Solar America Initiative, SEPA will be developing a Utility Solar Toolkit that provides a comprehensive resource for utilities of all experience levels, geographies, and types, including an interface designed to filter the experience to a utility's specific criteria. Additionally, SEPA will be hiring three regional directors in 2008 responsible for developing on-going relationships with target utilities in their region and providing resources, materials, and events for utilities at-large, as well as one-on-one utility interaction.

### 5. Monthly Phone Seminars

SEPA hosts monthly phone seminars on topics of interest to both utilities and the solar industry. Details can be found on the [SEPA Events](#) page.

### 6. Utility Travel Scholarships to Solar Power Conference and Expo

SEPA offers \$1,000 travel scholarships to utility employees who could not otherwise attend the conference due to budget or travel restrictions. The intent of the scholarships is to increase the geographic and experience diversity of utility attendees and over time, the areas where solar projects and programs develop. For more information, contact Emily Brown at 202-857-0898 x2.

### 7. Solar Power Conference and Expo

This event, jointly presented by SEPA and SEIA, is the largest U.S. solar event. SEPA members receive significant discounts on registration and exhibition fees. The conference includes tracks on policy, technology, markets, and finance.

### 8. Bi-Weekly Electronic Newsletter and Email Alerts

SEPA members automatically receive the most relevant and important news on solar technologies, policies, and programs. An archive of past newsletter is available to members in the Members Only section of this website.

### 9. Membership Directory

The membership directory in the Members Only section of our website allows you to pick up the phone to call other members any time to ask questions, request advice, or discuss potential business opportunities.

### 10. FindSolar.com

SEPA, together with the American Solar Energy Society, manages this online national solar directory and costs/savings estimator. FindSolar.com provides a tool for SEPA members and their customers no matter where they are located in the U.S.

### 11. PowerClerk Software Discount

PowerClerk allows managers of solar programs to efficiently and effectively receive incentive applications, process incentive applications, analyze programs, and report on program results. PowerClerk is offered by Clean Power Research, and SEPA members receive a significant discount on the set-up fee.

Christy Herig, Regional Director, East Coast – [cherig@solarelectricpower.org](mailto:cherig@solarelectricpower.org) – 727-543-1285

[www.solarelectricpower.org](http://www.solarelectricpower.org)