The National Academy of Sciences

Making Big Solar Work: Achievements, Challenges and Opportunities

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U.S. State Solar Policy Trends: New State Initiatives

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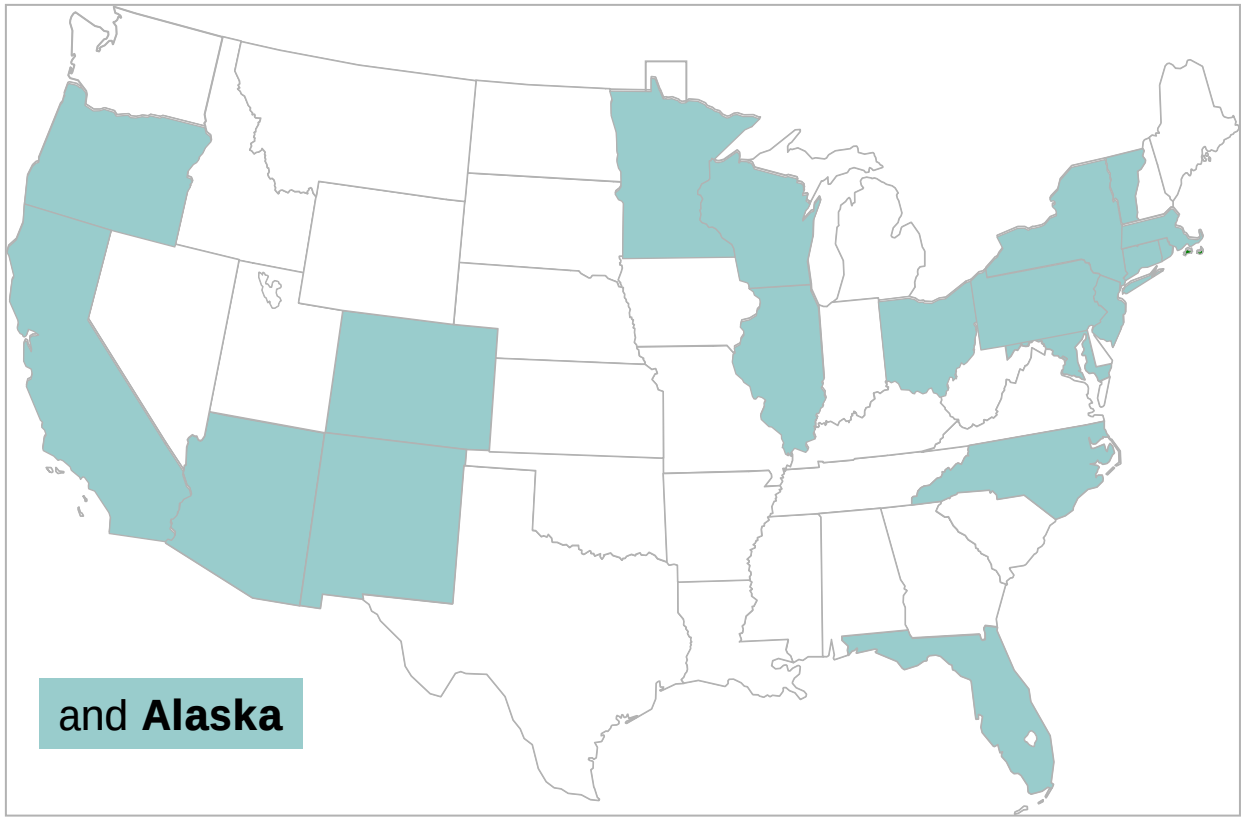
CleanEnergyGroup
Innovation in Finance, Technology & Policy

CleanEnergy States Alliance

Clean Energy States Alliance (CESA)

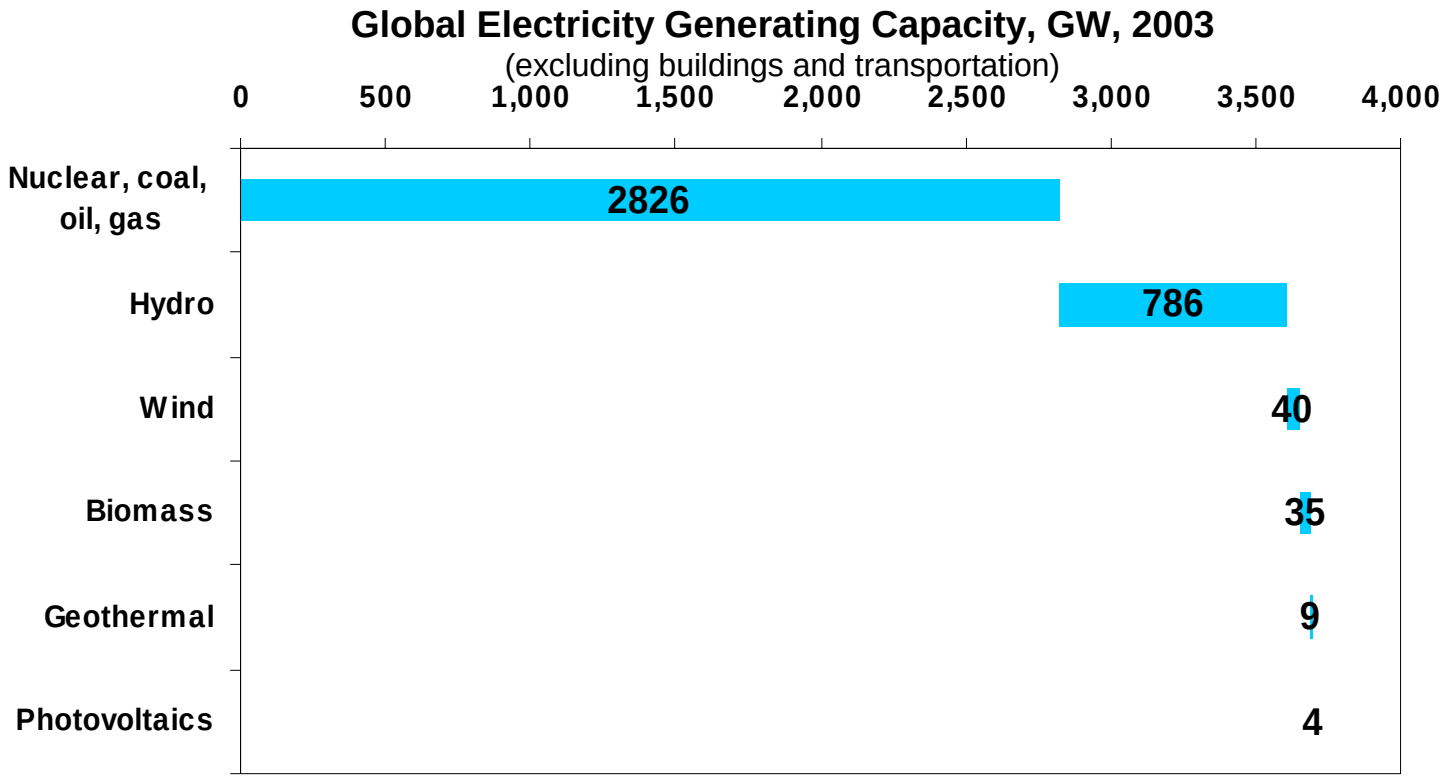
www.cleanenergystates.org



- Multi-state consortium of 18 states
- Nearly $4 billion to invest in next ten years

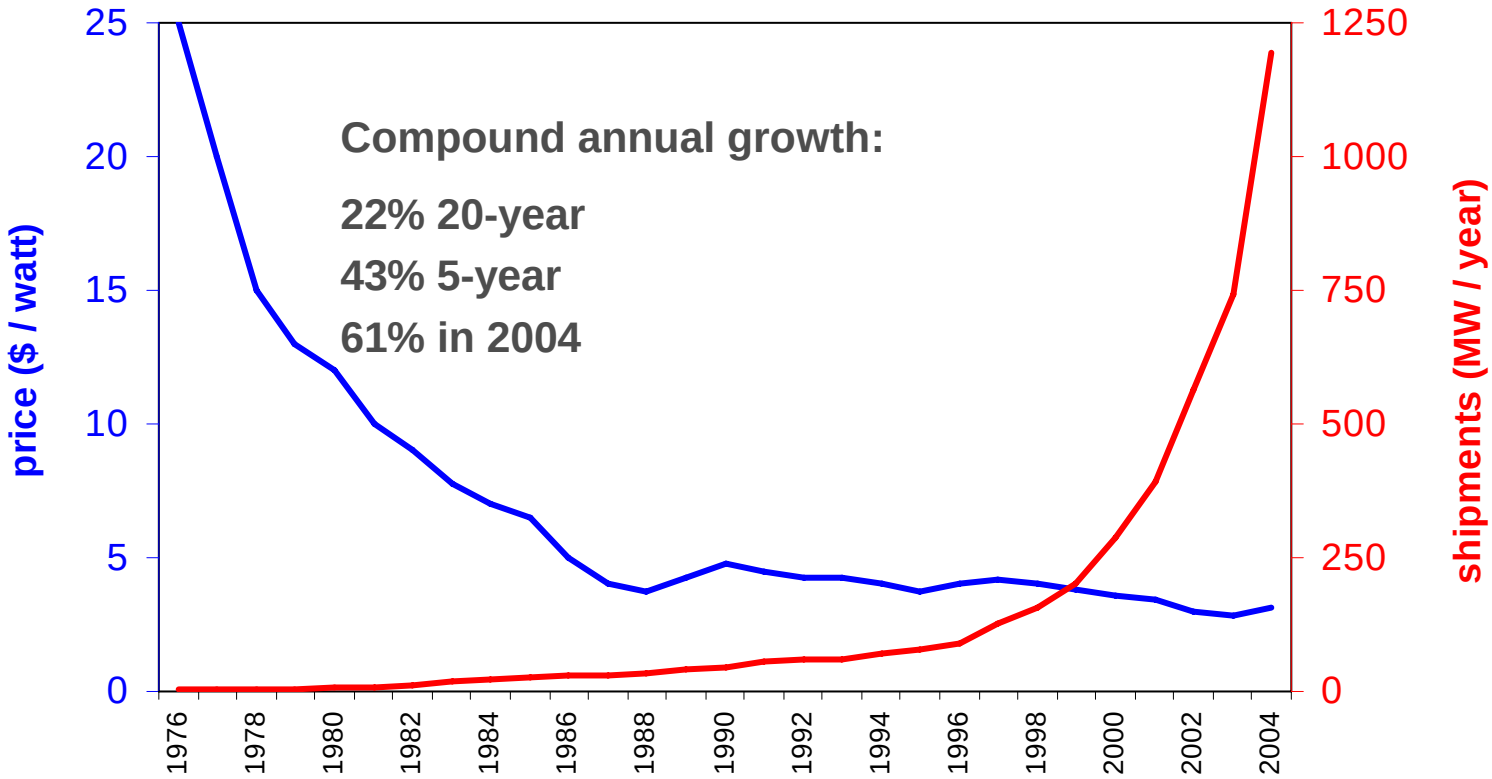
Renewables in perspective

PV is 0.1% world market share of electric utility capacity



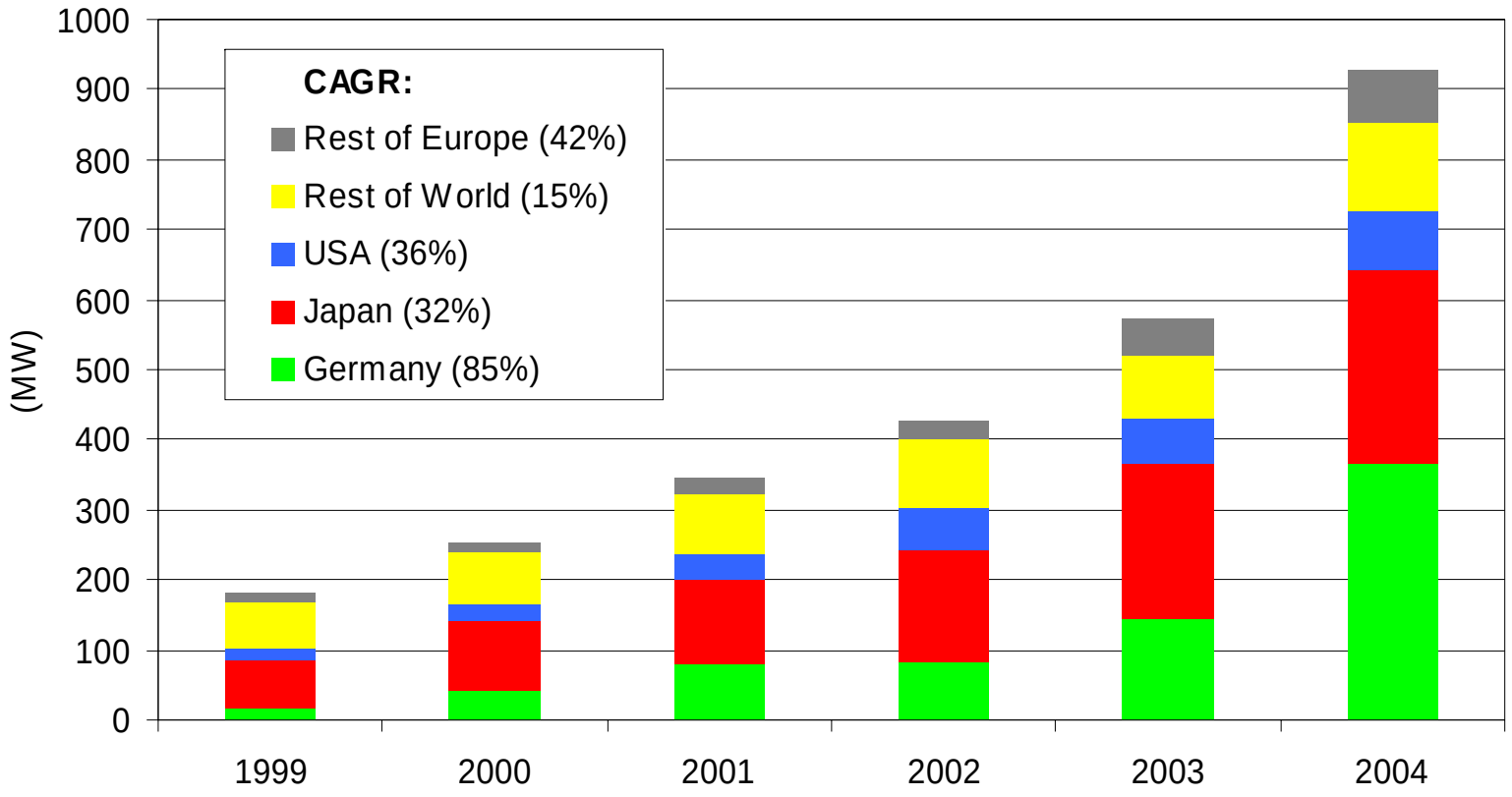
Source: Eric Martinot, World Bank; PV Energy Systems

Close-up view of PV's 4 GW



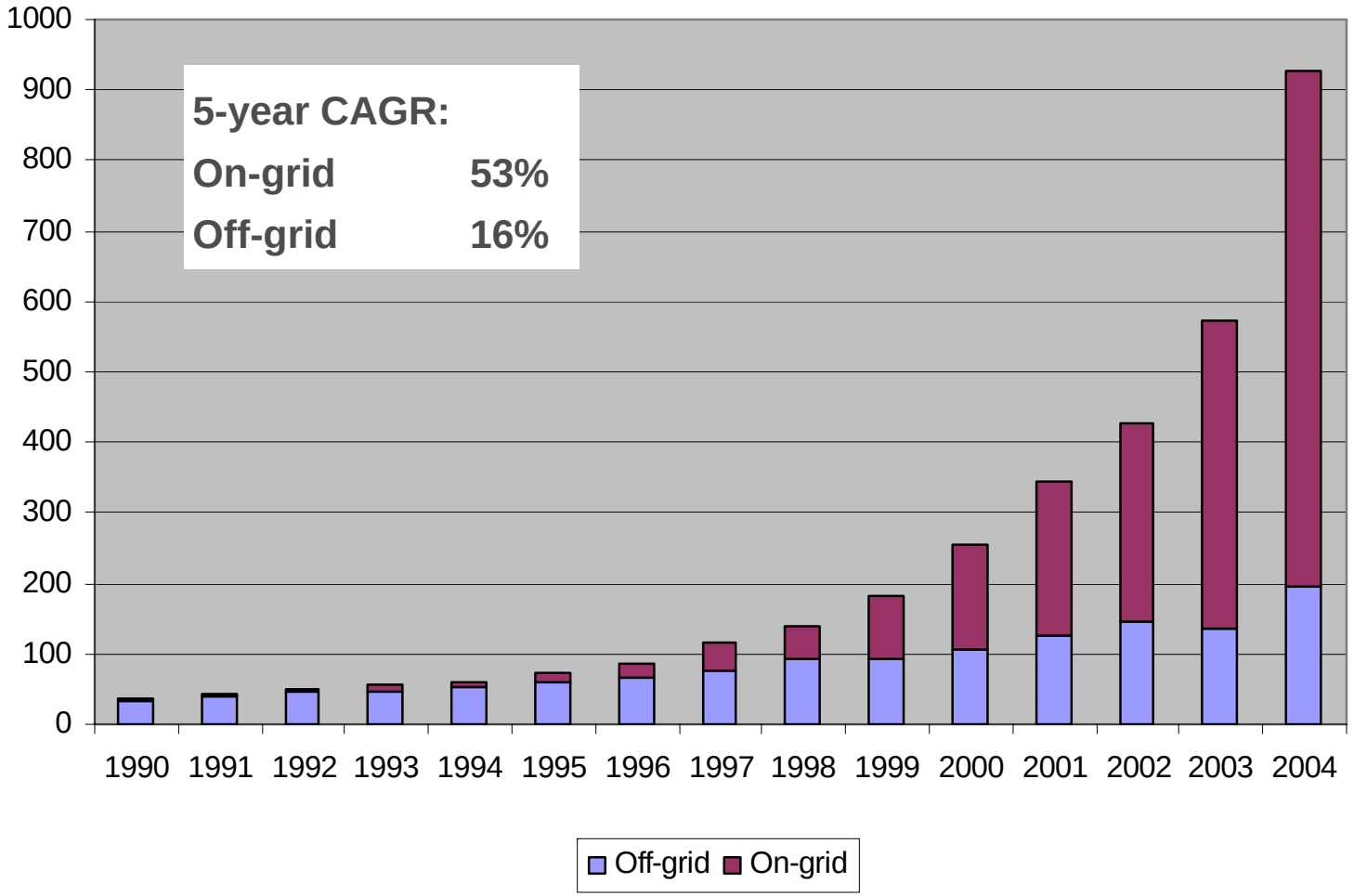
Source: PV Energy Systems

Germany, Japan dominate



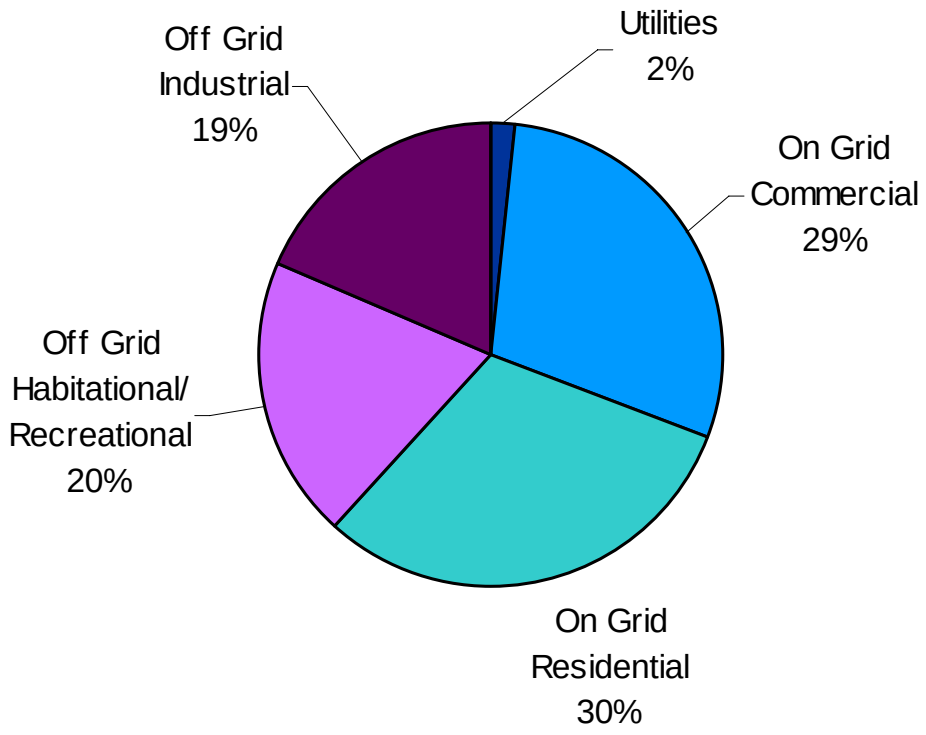
Source: Solarbuzz, Evergreen analysis

On-grid applications drive growth



Source: Solarbuzz

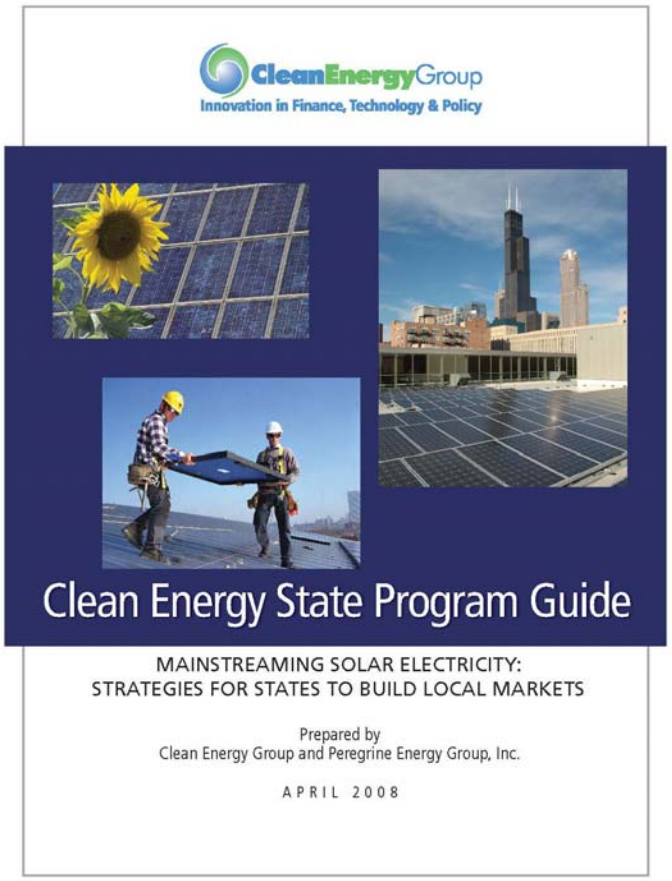
U.S. market somewhat more balanced



- Off-grid still nearly 40%
- On-grid fastest growing, particularly commercial

Source: Solarbuzz, 2003 data

CEG: *Mainstreaming Solar* Report



- Highlights policies and programs that states can implement to advance local solar photovoltaic (PV) markets.

- Funded by DOE and CESA

- Download at:

http://www.cleanegroup.org/Reports/CEG_Mainstreaming-Solar-Electricity_Apr2008.pdf

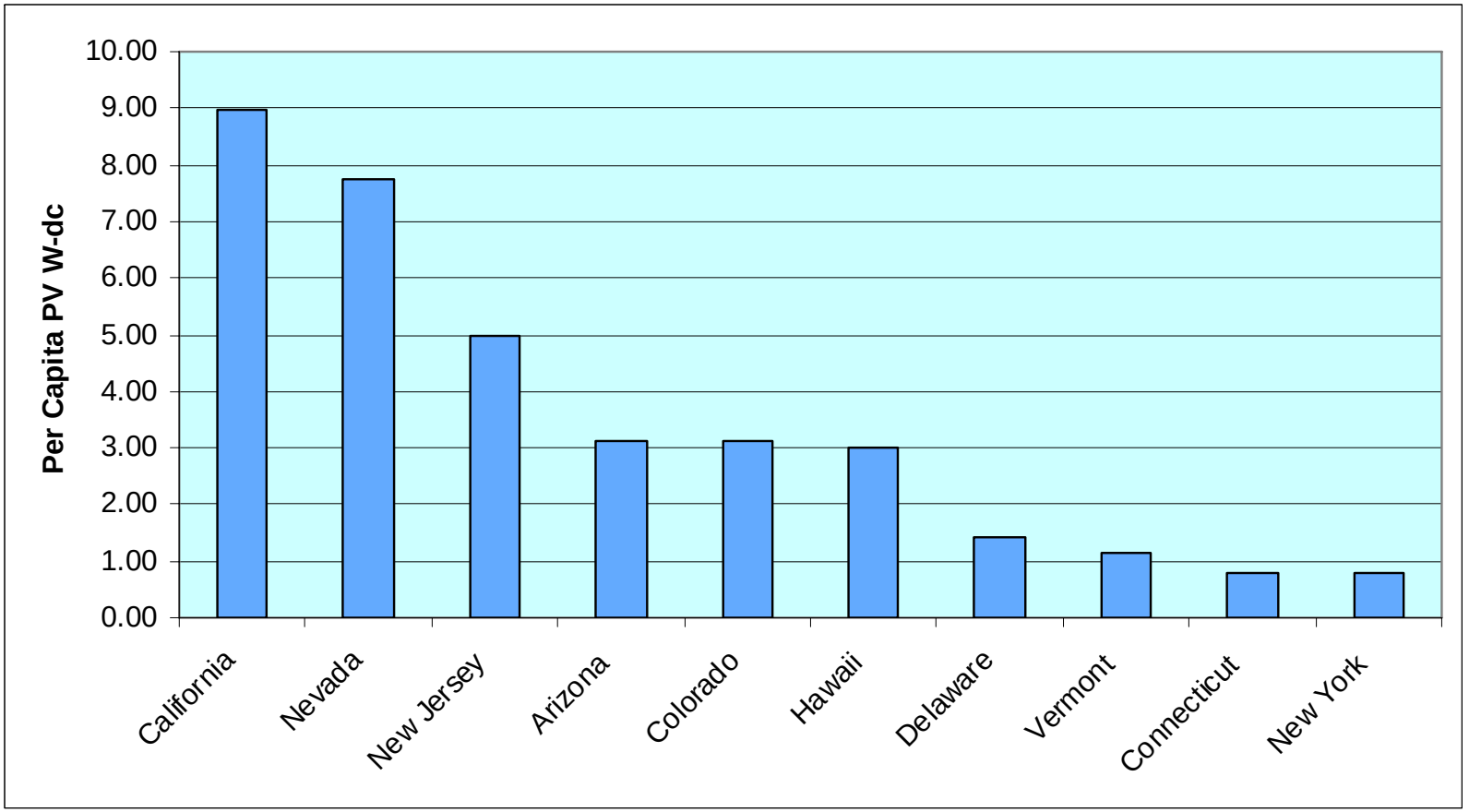
Top States for PV Installations in 2006 (Grid-Connected)

	2006 (MW)	2007 (MW)	06-07%	Incentives Paid in 2007
California	**69.5**	**87.1**	**25%**	$198.1 million
New Jersey	**17.9**	**19.2**	**7%**	$ 64.5 (1)
New York	**2.9**	**4.4**	**52%**	Not available
Nevada	**3.2**	**14.6**	**356%**	Not available
Arizona	**2.1**	**2.8**	**33%**	Not available
Massachusetts	**1.5**	**1.4**	**-7%**	$ 5.4 million
Colorado	**1.0**	**12.5**	**1150%**	$ 3.5 million
Texas	**0.6**	**0.7**	**20%**	$ 14.8 million
Connecticut	**0.7**	**1.8**	**157%**	$ 7.7 million
Oregon	**0.5**	**1.1**	**120%**	$ 1.9 million
All Others	**3.0**	**4.4**	**47%**	
TOTAL	**103.0**	**151.7**	**47%**	

IREC, March 08

(1) Incentives in addition to Solar-REC

Top 10 States for Cumulative Per Capita PV



Why States are Supporting Solar

- **PV – a growing success because of state incentive programs**
  - High visibility
  - Most practical technology for residential sector
  - Desirable in long-term capacity mix – energy security, fuel diversity, environment, peak coincidence

Barriers Facing States in Mainstreaming Solar

- **Public's lack of knowledge and confidence in solar technology**
- **Large initial investment**
  - Residential systems average $35-$40k
  - Commercial systems: $50k to $6 mm
- **Lack of streamlined interconnection standards and best permitting practices**

State Solar Policy Tools

- State incentives – capital rebates or performance-based incentives
  - More than 30 states with solar incentives
  - Funded by system benefit charge
  - “Come & Get It” approach
- Simplified interconnection standards, net metering, and rate structures that reward solar production during critical peak periods
- Exemption from state and local property taxes
- RPS & Renewable Energy Credits create new demand and revenue streams
- www.dsireusa.org provides database of incentives

State Solar Program Objectives

- **Encourage PV system cost reductions through increasing manufacturing volume, with progressively lower levels of public support needed**
- **Directly engage public with minimal transaction costs**
- **Set incentive level right**
- **Encourage PV system performance**
- **Build local market infrastructure**

Common State PV Support Programs

- Buy-down programs (most states)
- Low interest loans (NJ, OR)
- Technical support (WI, NY)
- Installer training/certification (NY)
- High-value PV installations (NY)
- Low income housing (MA, CA, NJ)
- Funding of PV manufacturers (MA)
- Marketing (CA)

Characteristics of Effective Solar Incentive Programs

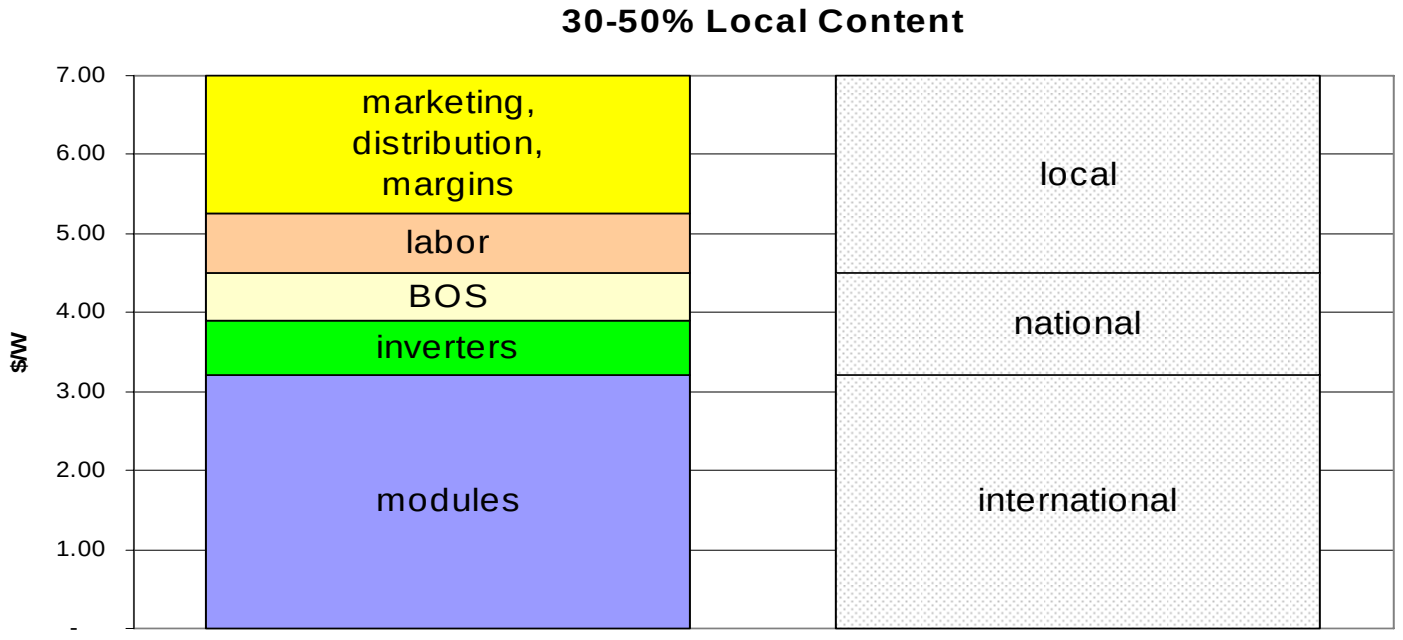
- **Incentives**
  - Sufficient scale to drive investment:
    - CA 3000 MW by 2017
    - NJ 2300 MW by 2021
    - MD 1400 MW by 2022
    - NY 100 MW PV and 1100 SHW by 2011
  - Long-term program with rational phase-out plan so market can plan
  - Decrease incentives over time
  - Grow local infrastructure: lower costs of marketing, distribution, installation
  - Kick-start financing programs

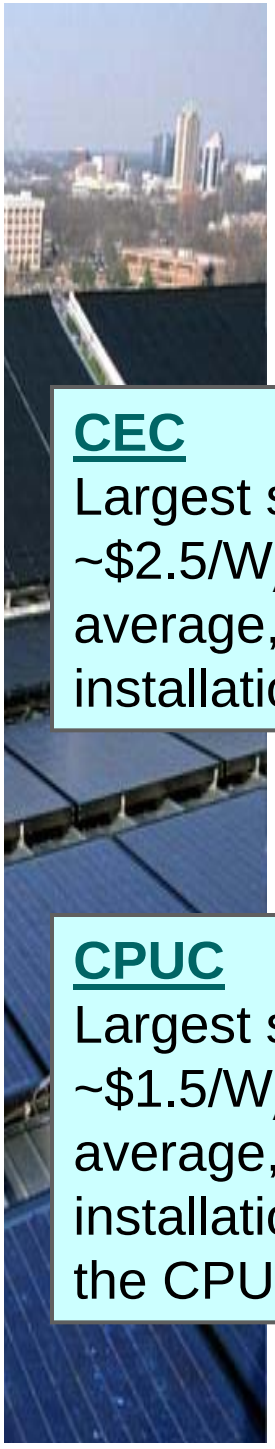
Leading State Solar Programs

State	*Incentive*
Arizona	$2 - $3/W system rebate
Massachusetts	$2+/W <10kW, $2.25+ >10kW rebate
Colorado	$2/W rebate + $2.50 REC payment
New Jersey	$3.80/W to $4.40/W rebate + SREC payment
New York	$4/W to $4.50/W rebate
California	$2.50/W ($2.60 new homes), expected performance-based payment, 10% declining block incentive

State Program Strategic Bet: Reduce Non-module Costs

- Incentive programs can drive down ***non-module*** costs
- LBL study found that, in CA, non-module costs dropped $0.30/W/yr from 1998 – 2005





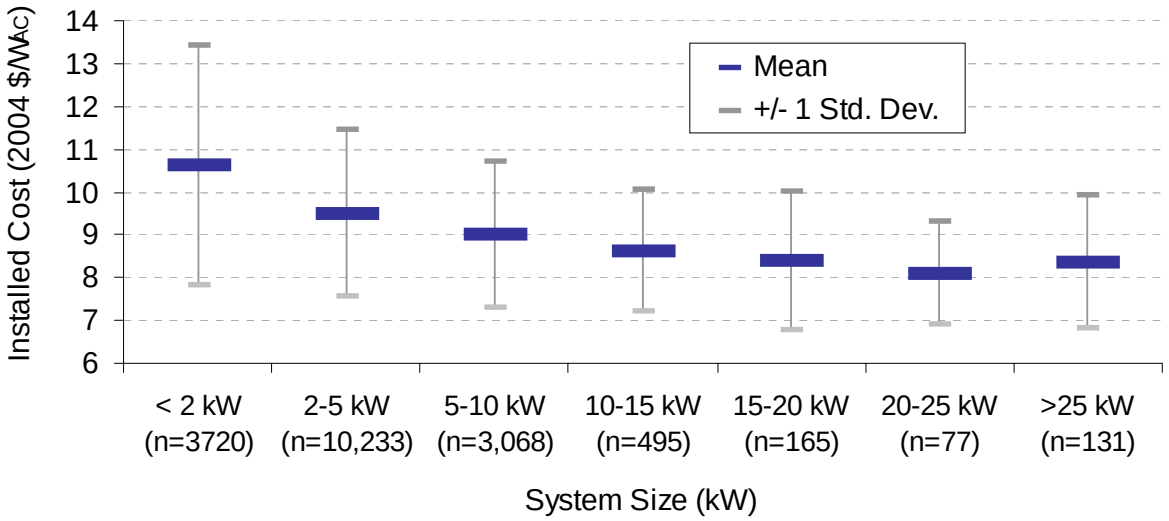
California Experience: Economies of Scale Have Driven Down Costs as System Size Increases

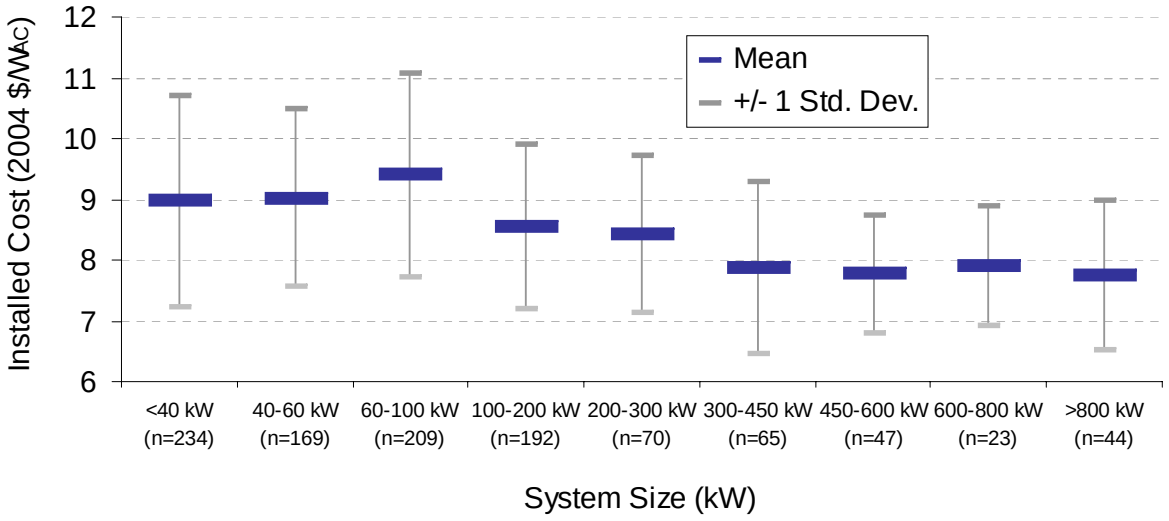
CEC

Largest systems are ~$2.5/$W_{AC}$ cheaper, on average, than 1 kW installations

CPUC

Largest systems are ~$1.5/$W_{AC}$ cheaper, on average, than smaller installations funded by the CPUC





Systems Installed in New Construction Have Had Substantially Lower Costs

Compared to the general retrofit market, certain applications demonstrate higher, or lower, average installed costs

Application Type	Number	Relative Cost
Large new residential developments	1,946	↓ $1.2/WAC
Single new homes or small clusters	771	↑ $0.18/WAC
Affordable housing projects	340	↓ $1.9/$W_{AC}$
Schools	60	No Impact

Policy Implications

Reducing non-module costs should be a primary goal of local PV programs

- Unlike module costs (which are set in a worldwide market, and passed through directly to customers), non-module costs may be affected by local programs
- Policymakers should consider programmatic activities aimed specifically at improving the PV installation infrastructure and driving down non-module costs
  - Examples: encourage “plug-and-play” standardized products; provide consumer tools to evaluate costs and select suppliers; help remove regulatory and technical barriers; support installer training and certification; encourage system performance; focus on new construction

Policy Implications

Sustained, long-term programs may enable more significant cost reductions

- Cost reductions in CA are significant, but experience from Japan demonstrates that a sustained, long-term program may yield greater reductions
- Annual average cost declines from 1999 through 2004 were greater in Japan (8.9%) than in California (5.2%) for similar-sized residential systems

Policy Implications

Targeted incentives that account for the relative economics of different systems may be appropriate

- Significant cost variations by system size, application type, and installer type suggest that a further targeting of incentives may be appropriate
- This may be especially true with Federal ITC, which offers incentives whose value is highly variable by system size and customer type

New Solar Financing Approach: New Jersey Solar RPS

- NJ – a national leader
- Fastest growing state solar market
  - Generous rebates
  - Best state rules on net metering
  - Solar REC revenues
- Ambitious RPS Solar Set-aside
  - 2.12% of electricity use from solar by 2021; 2300 MW (cumulative)
- Rebate popularity: program too expensive

New Jersey's New Solar Financing Approach

- NJ adopts solar REC-based financing program
- Goal: phase out rebates in favor of market-based financing program
- De-couple solar program from annual state budget fights
- Retain rebates only for small systems
- Set 8-year, competitive Solar Alternative Compliance Payment
  - Increase investor certainty in solar REC market
  - Reduce regulatory risk that state will change RPS rules

State Innovation: California Solar Initiative

- **Ambitious**: 3000 MW (new generation) goal
- **Comprehensive**: combined utility, PUC and CEC effort
- **Regulatory Bargain:** 10 year, declining incentive structure for solar industry to become self-sufficient
- **New Home Emphasis**: solar on 50% of new homes; 50+ home developments must offer PV as option in 2011
- **Reward System Performance:** transition to performance-based incentives
- **Leverage Energy Efficiency**: exceed building standards to receive incentive

New Directions for State Solar Programs

- **Primary goal of incentive programs: encourage cost reductions**
- **Traditional solar buy-down programs: not driving cost reductions fast enough**
- **States now targeting incentives to encourage high value applications**
  - Using solicitations and differing incentive levels
  - Targeting large new residential & affordable housing projects with lower average installed costs and economies of scale
- **States establishing financing and lease programs**

New State Focus: Solar on New Homes

- **Advantages of residential new construction**
  - Better performance (no shading, proper orientation)
  - Easy to roll solar costs into mortgage
  - Lower up-front costs (bulk purchases, standardization)

- **But also unique barriers**
  - Builders risk averse to new technologies
  - Builder concerns:
    - Impact on home prices & profits
    - Scheduling delays
    - Perceived lack of interest by homebuyers

Emerging State Strategies: PV on New Homes

- **Target adequate program funding to large homebuilders**
  - CA New Solar Homes Partnership
- **Provide higher incentives for new homes**
  - MA, NJ, NY provide higher incentives for BIPV and PV on high efficiency homes
- **Adopt builder-friendly program rules**
  - CA, NJ & MA provide longer reservation periods
  - CA simplifies documentation

State Strategies: PV on New Homes

- **Fund outreach to building professionals**
  - NYS funds training for builders, lenders, appraisers, inspectors
  - Oregon and Wisconsin conduct builder outreach
- **Other state program strategies**
  - Builder mandates
  - Financing programs
  - Entitlements for local permitting
- **See LBNL/CESA case study**: *Supporting PV In Market-Rate Residential New Construction* (2006)

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