National Renewable Energy Laboratory
*Innovation for Our Energy Future*

# Solar Energy Policies and Finance
# Creating a Successful Market
# Presentation for the Minnesota State Legislature


**Jason Coughlin**
**NREL Technical Lead for the Twin Cities**
**Solar America Cities Program**
**October 2009**

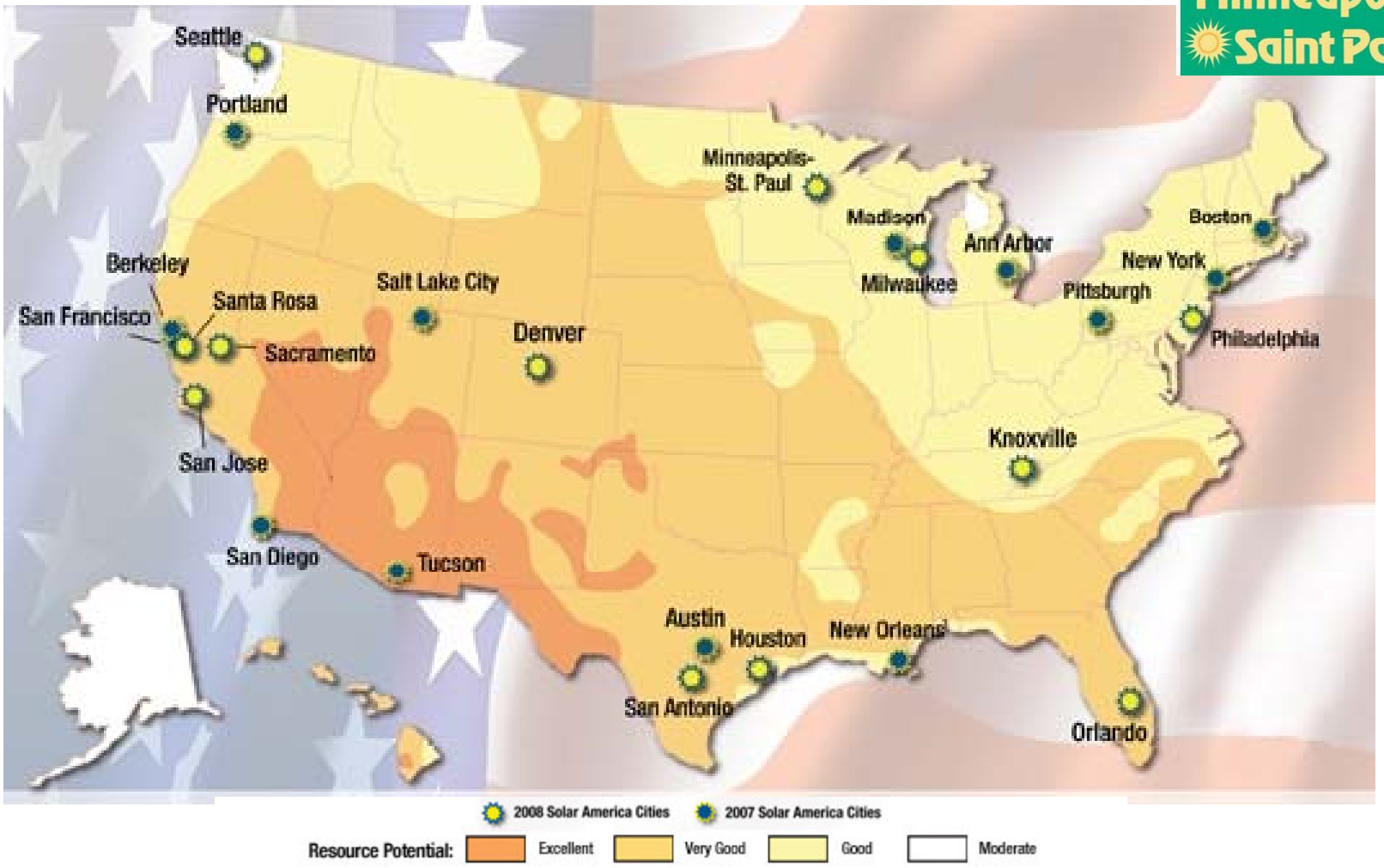
Photos courtesy of DOE, NREL and the Solar America Cities program

# Solar America Cities Reporting

*2009 Minnesota Energy Policy Omnibus (S.F. 550) requires Solar America Cities of Minneapolis and Saint Paul to submit a report to Legislative Energy Commission on October  2009 and October 2010 outlining strategies to accelerate the adoption of solar thermal and solar electric technologies in Minnesota.*

# DOE Solar America Cities Initiative

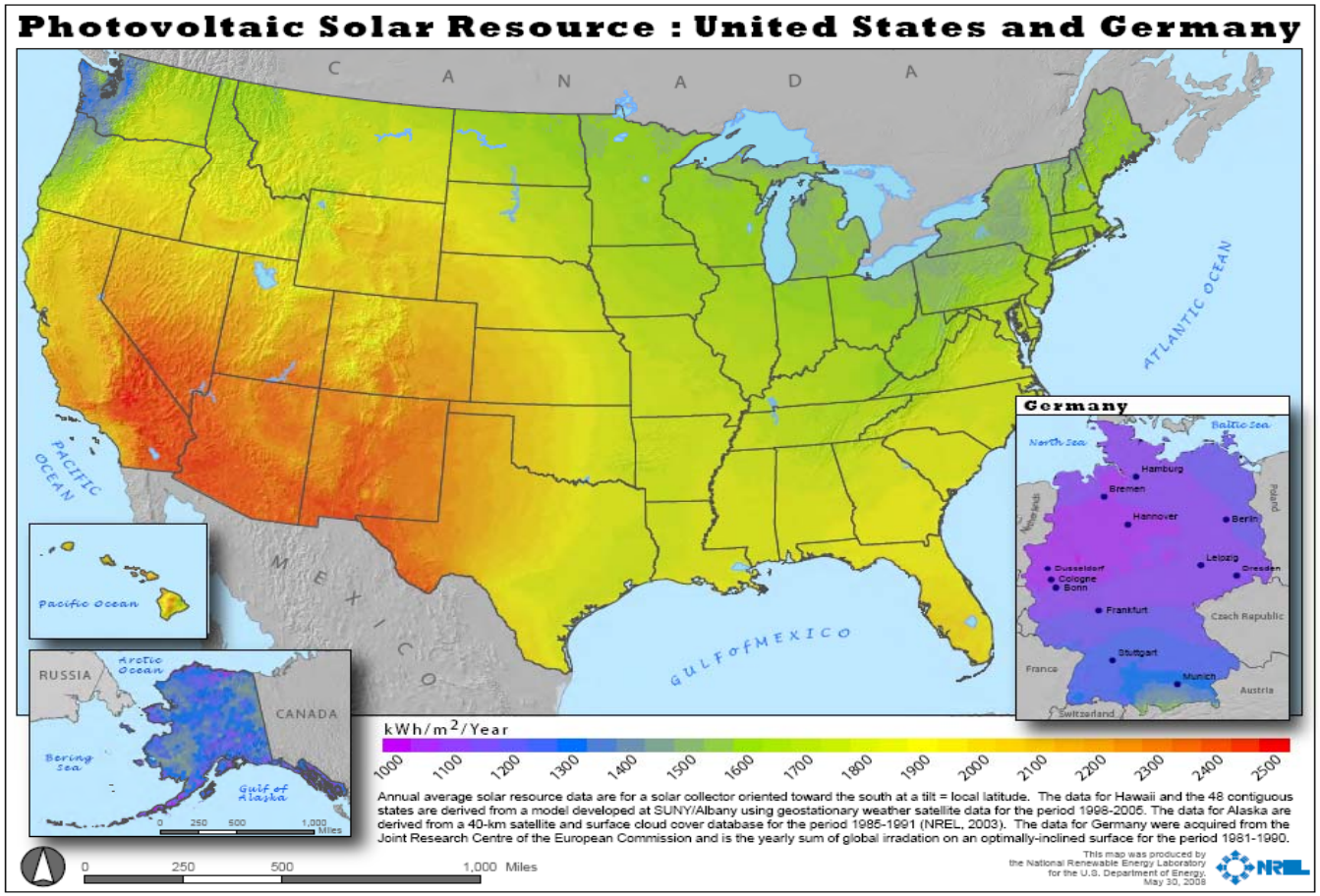
Twin Cities is one of 25 cities at the forefront of solar development in the country



# Solar Myths

**Myth:** Minnesota does not get enough sun to use PV technologies.

**Fact:** Yes it does. In fact, the U.S. in general gets more sun than Germany, the world leader in PV installations.



# Solar Myths

**Myth:** The technology is still being developed.

**Fact:** PV technology, while continuously being improved, is effective enough to use now.

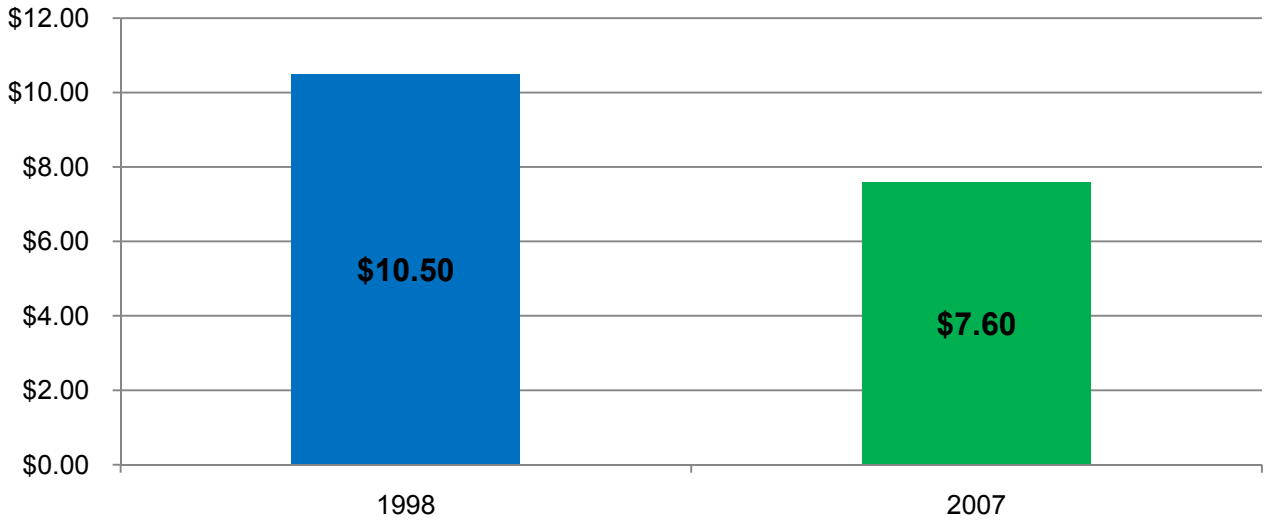
Photo courtesy of NREL

# Solar Myths

**Myth:** Solar is just too expensive.

**Fact:** Declining PV equipment prices, innovative financing structures such as Power Purchase Agreements (PPA), and state/federal incentives are making solar affordable in many areas.

Installed costs per watt are falling.




**2009 Anecdotes**

**$4/watt utility scale**

**$6/watt residential**

Source: Tracking the Sun: The installed costs of photovoltaics in the US from 1997-2008 Lawrence Berkeley National Laboratory. February 2009. http://eetd.lbl.gov/ea/emp/reports/lbnl-1516e-ppt.pdf

# But why solar?

- Unlimited resource which can be used to generate electricity, heat homes and water, and power automobiles.
- Can site solar systems close to demand reducing transmission losses and lowering transmission and distribution costs.
- Can be combined with batteries or other storage mechanism to deploy on demand.
- Increasingly cost-competitive.

# A number of barriers still exist

1. **Regulatory Issues**
   - State policies to promote solar energy installations
   - Interacting with utilities
2. **Financial Hurdles**
   - Upfront investment can still be significant
3. **Lack of Public Awareness especially in cold climates**
   - Solar is a proven technology with minimal operating risk
4. **Procedural Issues**
   - Building Codes and Standards
   - Protecting Solar Access
5. **Qualified Workforce**
   - Lack of qualified solar installers
6. **Reaching new market segments**
   - Utility Scale Solar
   - New Market Participants
   - Community Solar

# State Policy Environment

1. **Policies at the state level make a tremendous difference on the level of installed capacity of solar energy.**

2. **Consistency** of these policies is key so people can develop projects with greater certainty.

3. Quality of a state's **solar resource** not necessarily correlated to installed.

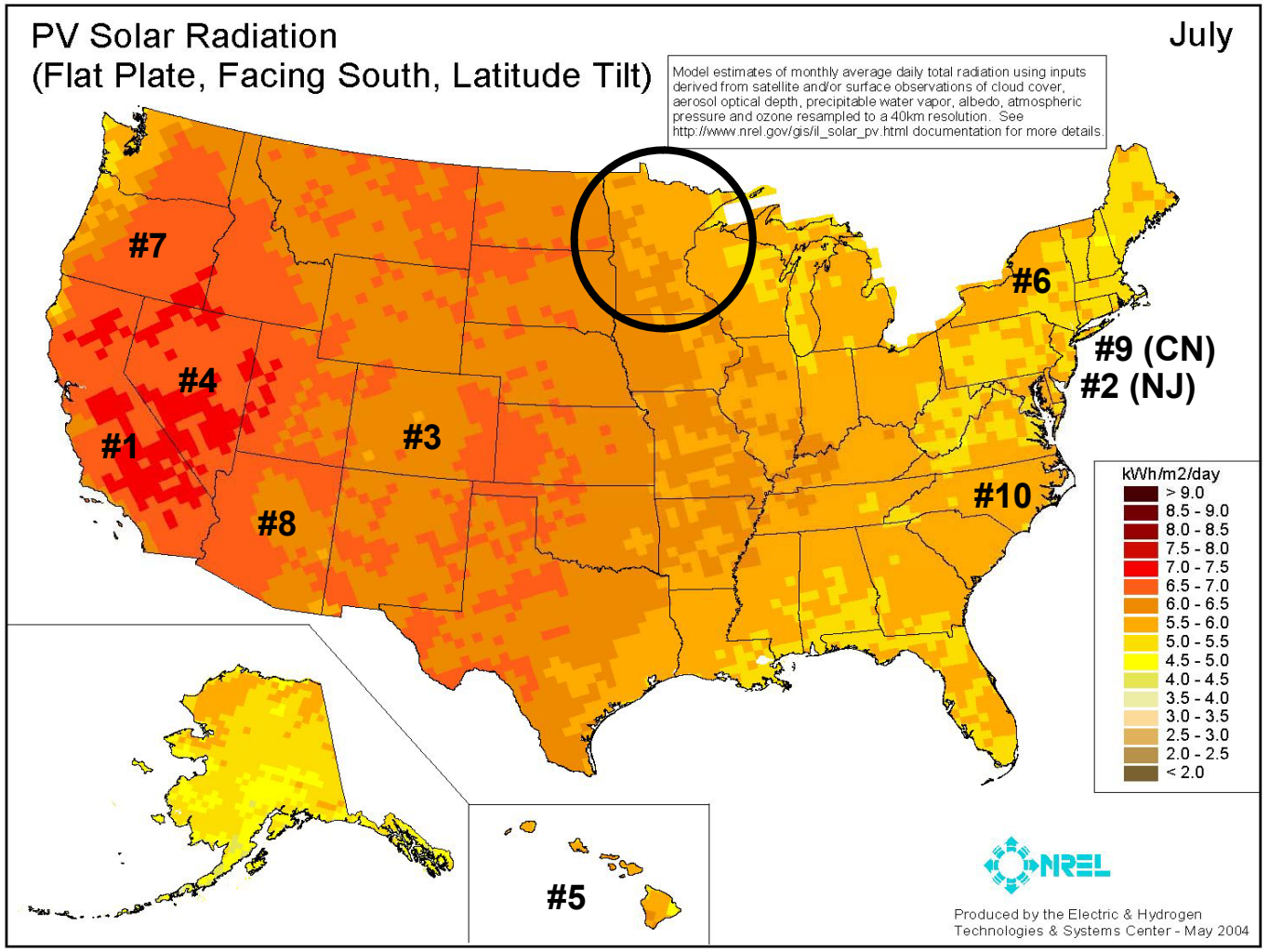
4. Renewable Portfolio Standards* with a **carve-out for solar energy** creates the opportunity for solar to compete against cheaper renewable energy technologies such as wind and biomass.

5. **Solar Renewable Energy Certificates (SRECs)** in certain states, such as New Jersey and Colorado, can be worth $150-300/MWh.

| State | 2006 | 2007 | 2008 |
|---|---|---|---|
| California | 71 | 87 | 178.6 |
| New Jersey | 18 | 17 | 22.5 |
| Colorado | .9 | 12 | 21.6 |
| Nevada | 2.6 | 15 | 13.9 |
| Hawaii | n/a | 2.4 | 11.3 |
| New York | 2.7 | 4.4 | 7.0 |
| Oregon | .5 | 1.1 | 6.6 |
| Arizona | 2.1 | 2.1 | 6.4 |
| Connecticut | .5 | 1.8 | 5.3 |
| North Carolina | n/a | n/a | 4.0 |
| Others | 1.5 | 4.4 | 15.3 |
| Total | 102 | 150 | 292 |

**Megawatts (MW) of new annual installed PV capacity**
Solar Energy Industry Association & Prometheus Institute
http://www.seia.org/Year_in_Review_2008_lr.pdf

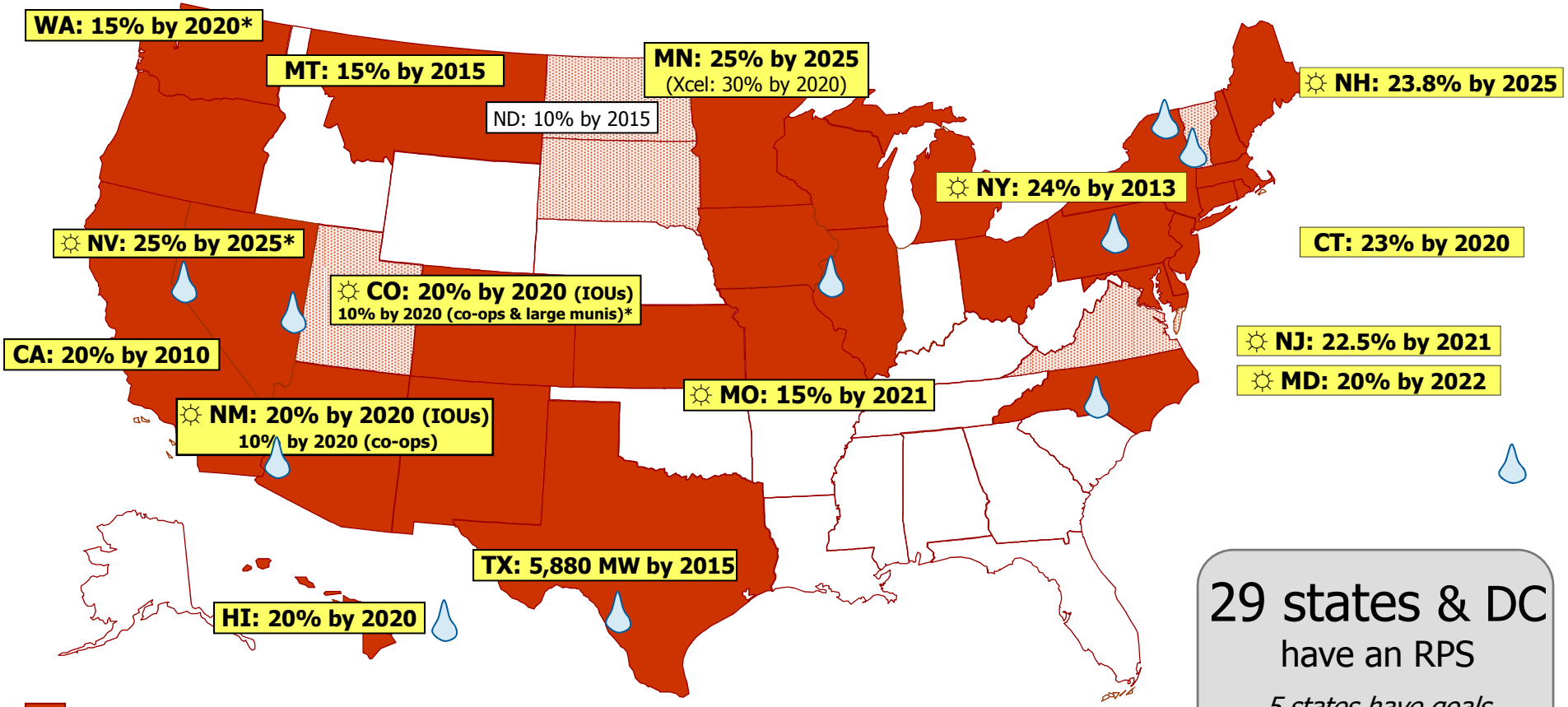
# Top ten states for installed capacity




Minnesota's resources at least as good as NJ, NY, CN and NC

# Renewable Portfolio Standards

www.dsireusa.org / July 2009




29 states & DC
have an RPS
*5 states have goals*

State renewable portfolio standard

State renewable portfolio goal

Solar water heating eligible

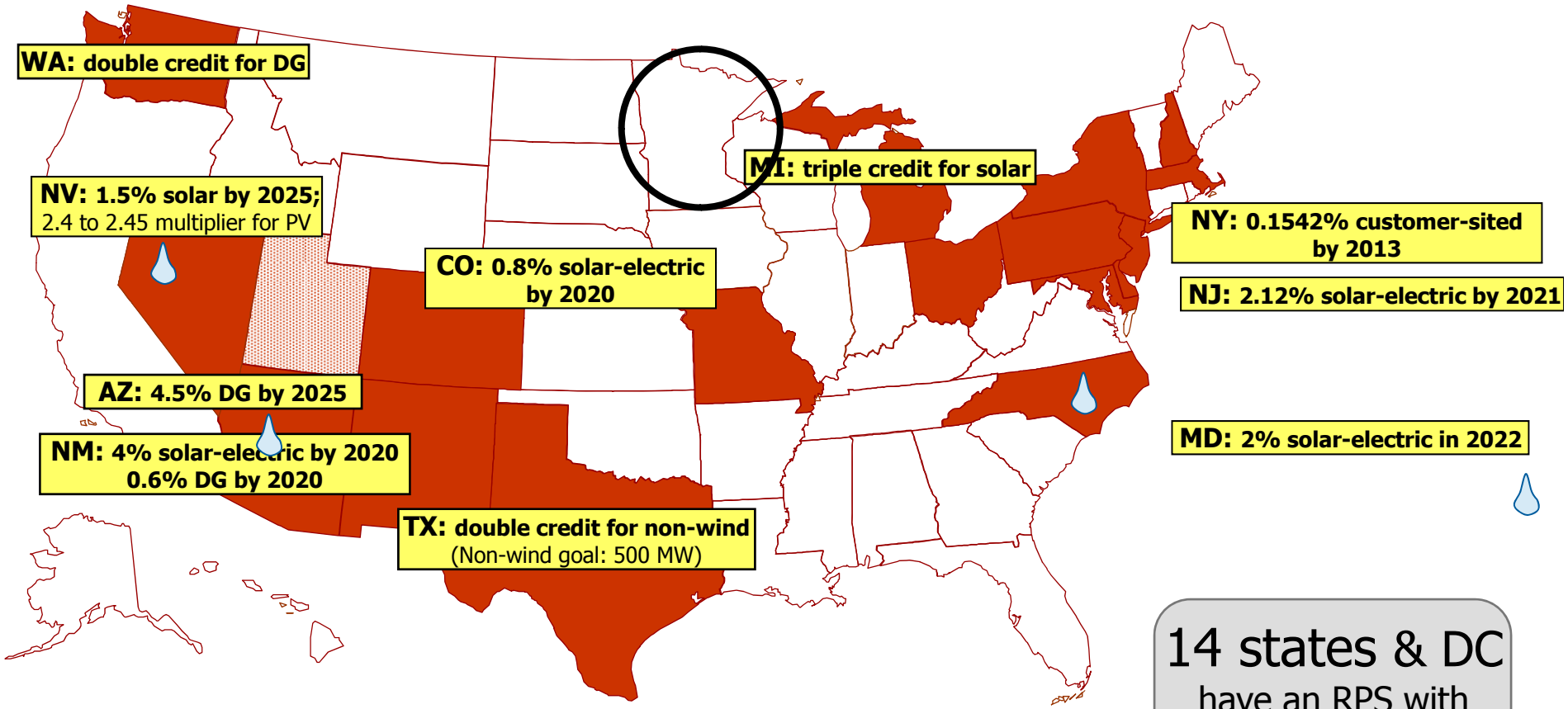
Minimum solar or customer-sited requirement

* Extra credit for solar or customer-sited renewables

† Includes separate tier of non-renewable alternative resources

# RPS Policies with Solar/DG Provisions

**www.dsireusa.org / July 2009**



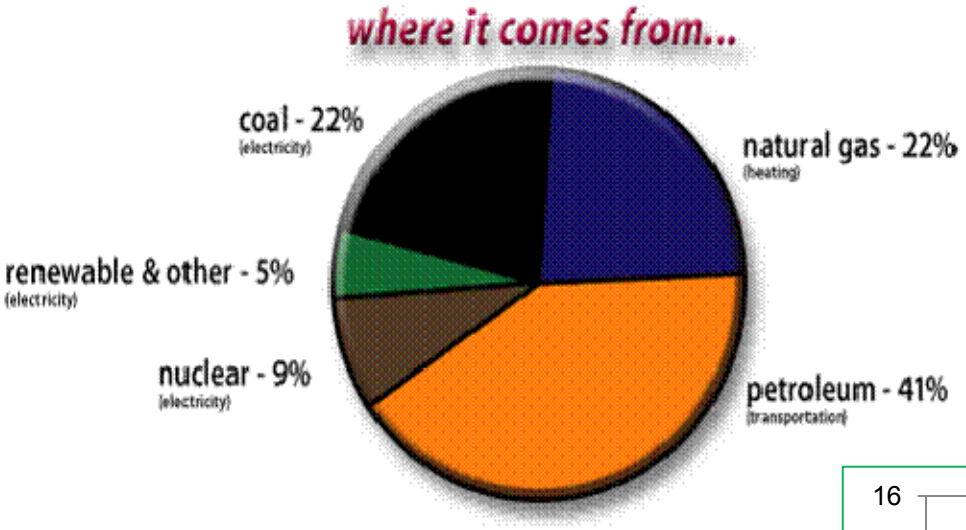

State renewable portfolio standard with solar / distributed generation (DG) provision

State renewable portfolio goal with solar / distributed generation provision

Solar water heating counts toward solar provision

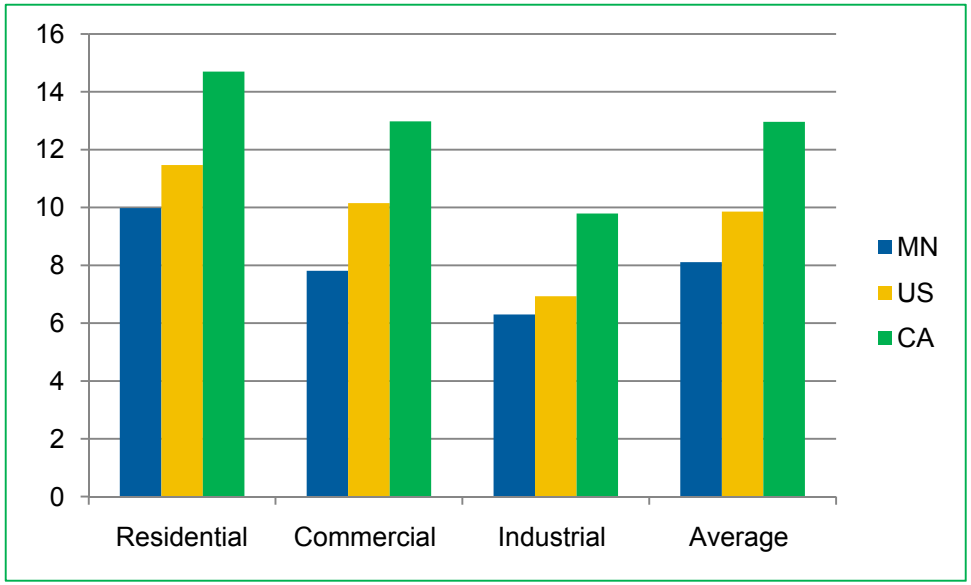
**14 states & DC**
have an RPS with solar/DG provisions

# The Minnesota Energy Landscape




*Energy Mix*

*Electricity prices*




Source: Energy Information Administration, DOE. June 2009 data

# The Minnesota Solar Landscape

**According to the MN State Energy Office, Minnesota receives more solar energy in one day than the energy consumed by the state in an entire year.**

**Installed PV capacity in the state**
- 313 PV installations in MN (avg. 4.6 kW)
- 1.4 MW of PV installed capacity in MN
- Largest system is 100 kW

**Installed SHW capacity in the state** is unknown but approximately 28 systems were installed since July 2009.

**MN Renewable Portfolio Standard**
- 25% by 2025
- 30% by 2020 for Xcel Energy
    - 24% wind
    - up to 1% solar
    - 5% other

An area of solar PV within a footprint the size of Ramsey County would produce an equivalent amount of electricity as is consumed in Minnesota on an on-going basis. Map credit: David Benbennick.

**Minnesota Solar Electric Rebate Program Report 2002-2008 April 8, 2009**

# Regulatory Issues - Utility Policies

Photo credit: AmericanProgress.org

1. **Net Metering: "Spinning the meter backwards"**
   - The ability to net meter
   - Compensation for net metering
   - Minnesota authorizes net metering and utilities pay retail rates

2. **Setting the net metering cap**
   - a low cap can penalize larger systems that would benefit from economies of scale and force customers to undersize their systems.
   - Minnesota's net metering cap is 40 kW per system

3. **Setting the maximum amount of distributed generation permitted within the utility's territory**
   - No maximum established in Minnesota

4. **REC Ownership**
   - RECS are critical to getting projects financed in many markets
   - In Minnesota, ownership of RECs varies between utility and system owner.

5. **Streamlining the interconnection process**
   - Systems up to 10 MW can interconnect in Minnesota
   - MN interconnection process is rated unfavorably*

6. **Feed in tariffs**

*Freeing the Grid, October 2008. Produced by New Energy Choices, &IREC
http://www.newenergychoices.org/uploads/FreeingTheGrid2008_report.pdf

# Financial Barriers

## High upfront costs limit the size of the solar energy market

- Before incentives, a 4 kW residential PV system can cost $30,000-$40,000 in Minnesota
- The unsubsidized cost of electricity on a per kWh basis can be as much as $0.25-0.30 cents in certain locations.
- While much cheaper (in MN, $10-12,000) most solar hot water systems are competing against very low natural gas prices.

## To combat this high upfront cost, policy makers and utilities offer a number of financial incentives

- Federal Investment Tax Credits and Cash Grants
- Accelerated Depreciation for Commercial Systems
- Many states and utilities offer upfront rebates (up to 50% of the cost of the system)
- Ongoing payments based on electricity produced.
- State income tax credits
- Property tax exemptions
- Sales tax exemptions

## In addition, creative new financial mechanisms are expanding the market.

# Minnesota Financial Incentives for Solar

**State Incentives**

- Solar PV Rebates
  - $1.75-$2.00/watt
    - Up to 5 kW for a residential system
    - Up to 10 kW for small business system
- Solar Water Heating Rebates
  - Amount of rebate per system TBD
  - Draft guidelines
  - $25/sq foot for residential with a $2,000 maximum
  - $15/sq ft for commercial/multi-family dwelling with a $20,000 maximum

**Various Utility Grants and Loan Programs**

- Xcel Energy's Renewable Development Grant Fund is one example

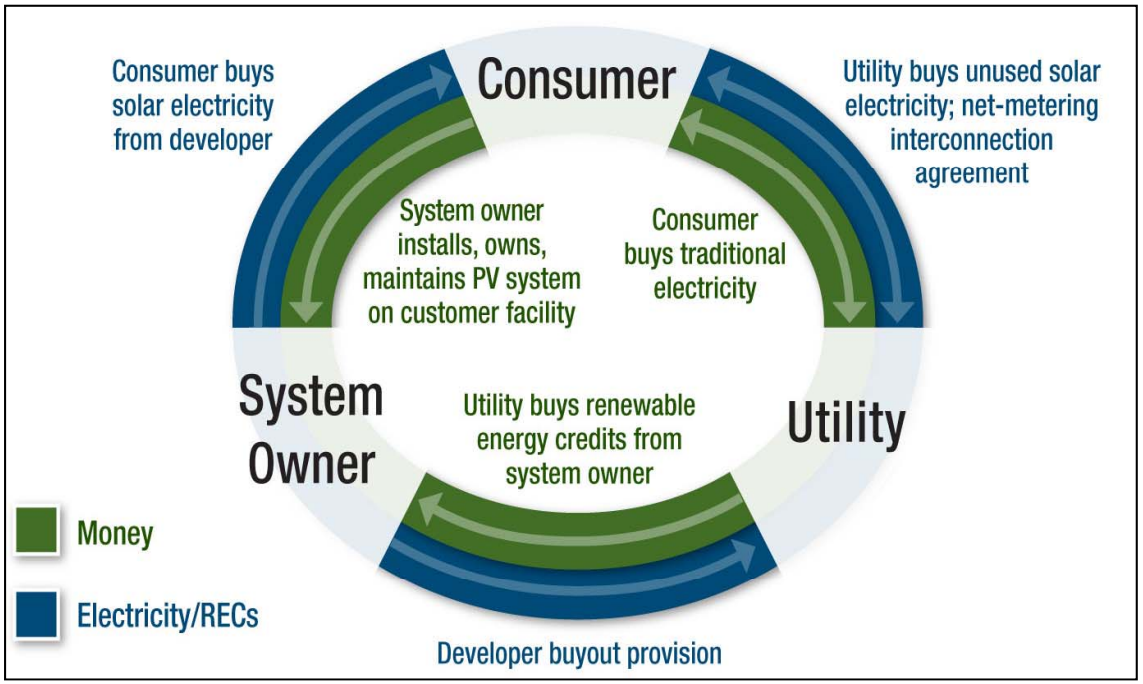
**Various Utility Rebates**

- Usually a $/watt rebate with a cap on system size and/or amount
- Utility may take ownership of RECs in return for rebate
  - **Minnesota Power**
    - $2 per watt through 2010 with a 2kW maximum
  - **Great River Energy Coop**
    - $2 per watt through Dec 31, 2009 with a 2 kW maximum

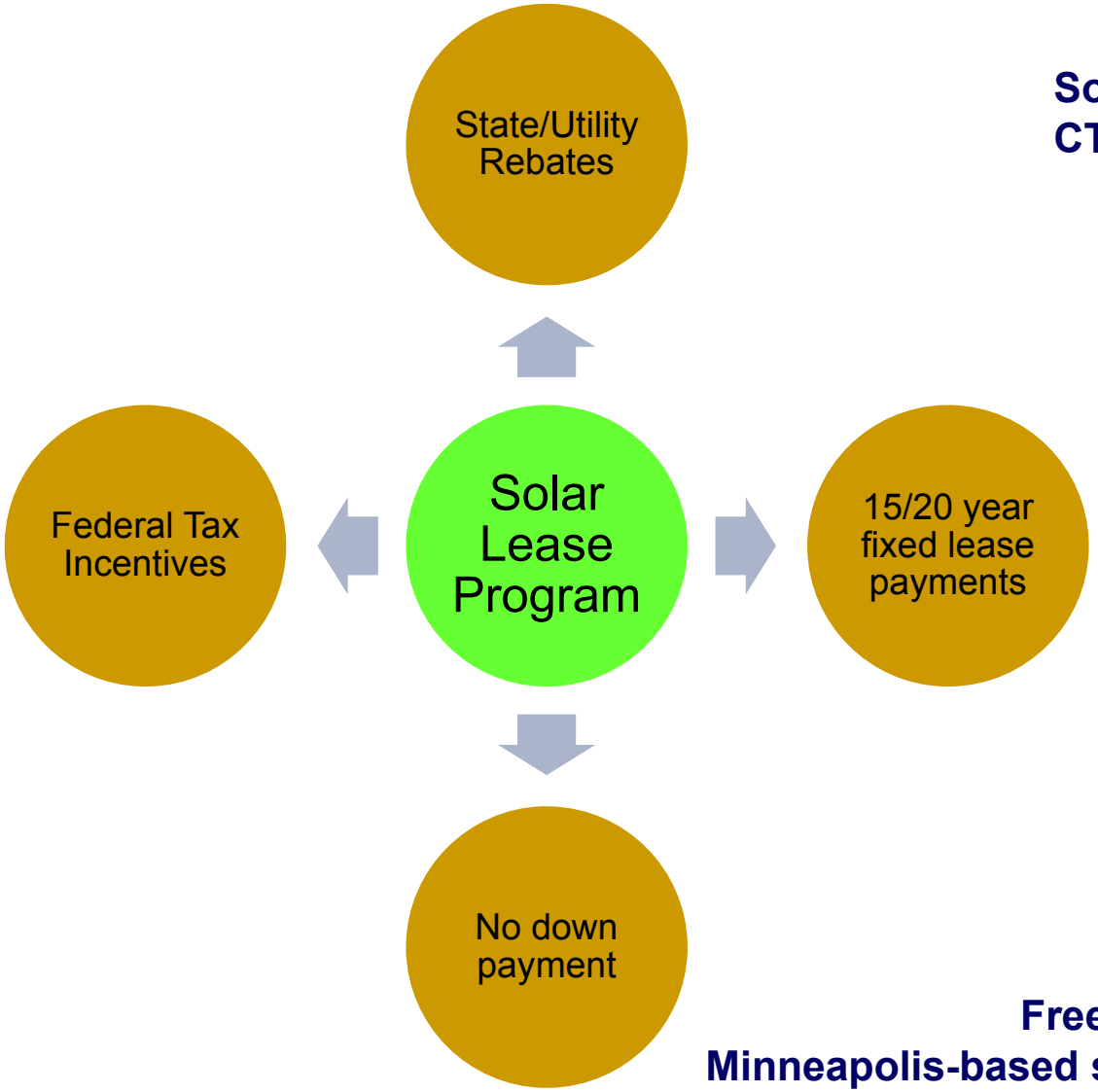
# Power Purchase Agreements

**Third party financed power purchase agreements (PPA)**

- Outside investor owns system and sells electricity to the host
- PV system is usually on the host's rooftop
- Hosts can be commercial entities, public entities, non-profits or homeowners
- More efficiently allocates and monetizes tax benefits
- No upfront capital cost for the host



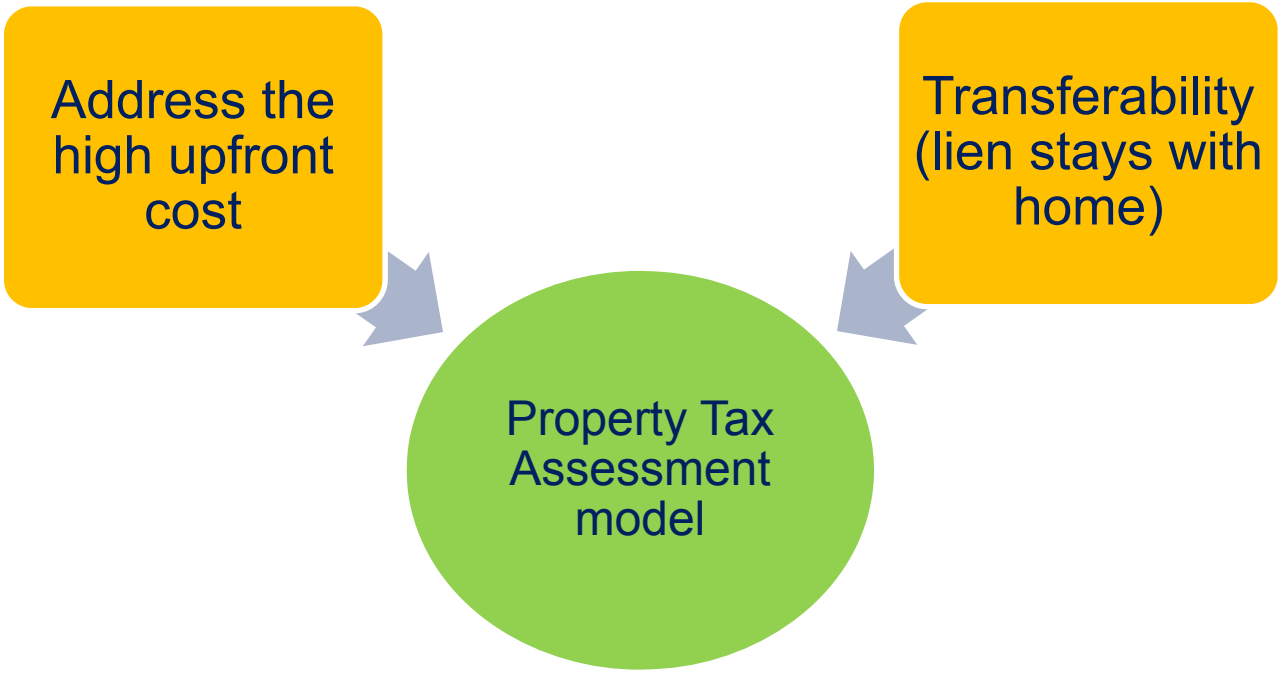
# Residential Solar Leasing




**SolarCity (CA)**
**CT Solar Leasing**

**Freener-g**
**Minneapolis-based solar leasing company**
**(www.freener-g.com)**

# Property Tax Assessment Model




- Based on special assessment districts
- County/city finances project
- Loan repaid via property taxes over 10-25 years
- Lien has priority over mortgage
- Some push back from mortgage lenders

**Enabling Legislation**

Arizona*
California
Colorado
Florida
Hawaii
Illinois
Louisiana
Maryland
Nevada
New Mexico
New York*
Ohio
Oklahoma
Oregon
Texas
Vermont
Virginia
Wisconsin

*pending

www.pacenow.org

# Improving public awareness

Continued emphasis on outreach and education to communicate that solar is a low risk, commercial technology experiencing material reductions in the cost to purchase and install systems.

- High visibility demonstration projects
- Websites
- K-12 Renewable Energy Curriculum
- Solar Kiosks
- Solar Tour of Homes and Businesses
- Greater media coverage (TV, print, radio)
- Partnering with market allies – trades, corporations,
- Fact Sheets
- Solar Conferences and Workshops
- Solar America Cities Program
- Solar Decathlon


Photos courtesy of the Solar America Cities program and DOE

# Procedural Issues – Codes and Standards

## Creating a Solar-Friendly Environment

- Implementing "**Solar-Ready**" building codes
- Revising **building codes and standards**, with input from the solar community, to increase the use of best practices in solar installations.
- **Streamlining** and standardizing the permitting process within and across jurisdictions
- Reducing or eliminating **solar permit fees**, particular for small installations
- Passing **solar access** ordinances
- Preventing **Home Owner Associations** from discriminating against solar installations.
- Educating **building code officials** about solar
- Creating policies to allow solar on **historic buildings** while still preserving the integrity of such sites.

**But don't ignore energy efficiency**

**In fact, consider making it a requirement**

# Workforce Development

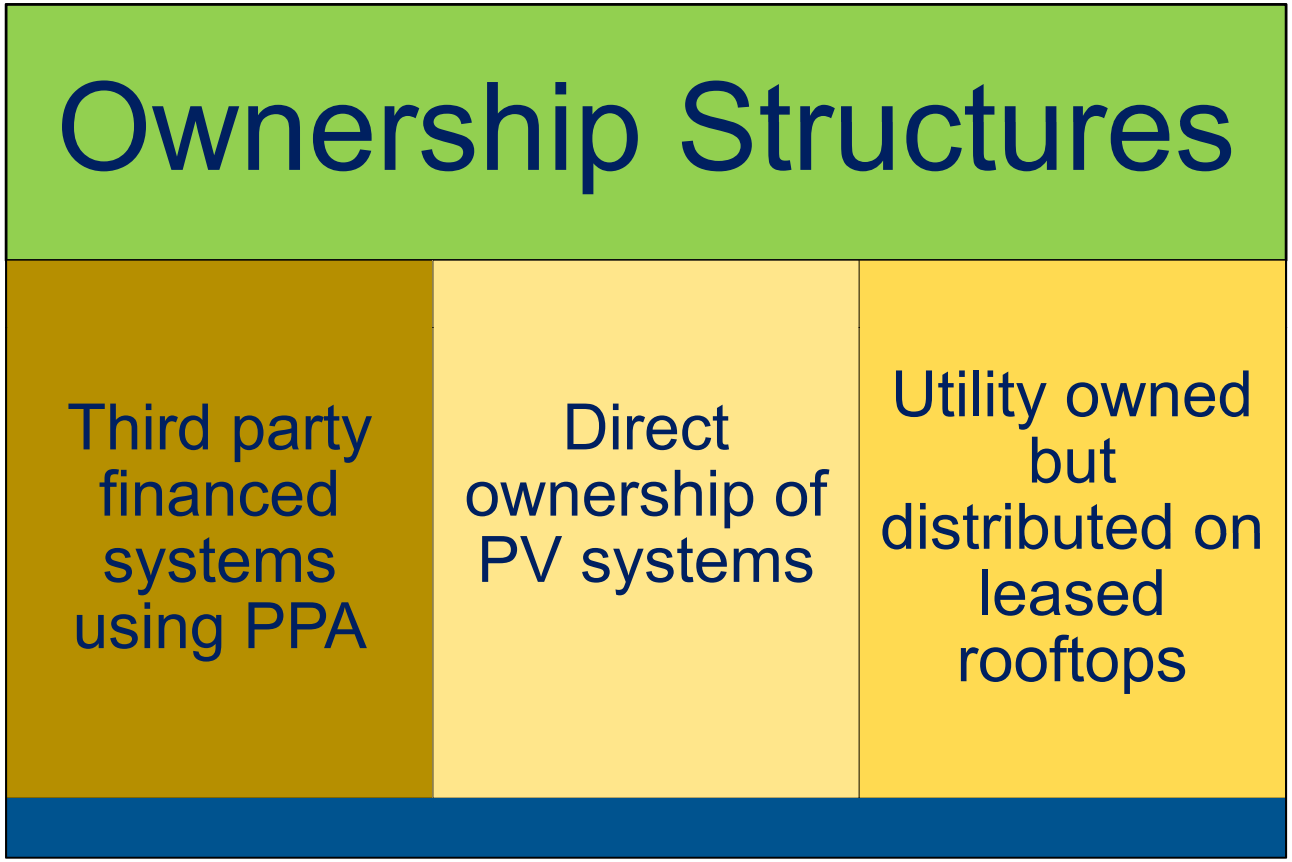
- Domestic renewable energy production offers significant job creation opportunities

- As the market expands rapidly in its early stages, a lack of qualified solar installers can lead to higher costs and quality issues.

- This creates the need for a number of training-related outreach activities

Photos courtesy of the Solar America Cities program

# Utility Trends



# Opportunities for Utility Scale PV Systems

**Source: SunEdison and NREL. Alamosa Colorado. 8.2 MW**

# New Participants in Facilitating Change

**It is important to consider solar energy applications across a wide range of activities rather than a niche solution for homeowners**

- Solar energy as a component of all **infrastructure planning**
- **Local governments** working with the community to develop solar programs
- Incorporating solar into **district energy systems**
- Attracting **solar manufacturing** to Minnesota
- Solar as a component of **Urban Renewal** initiatives
- Solar Recharging for **Plug-in Vehicles**
- Solar and **Affordable Housing**

# Community Solar

1. **This is not a Windsource program**
2. **One large PV system with many participants or subscribers**
   - Option for those who want to do more than participate in a voluntary green power program but who can't afford to install their own PV system.
   - Option for building owners with poor solar resources (e.g. trees in the way)
   - Option for renters and condo owners
3. **Benefit from cost savings due to the economies of scale of larger projects**
4. **More states are enacting policies to promote community solar by allowing participants to benefit from certain state tax credits (Utah) and electricity production incentives (Washington).**

SMUD Solar Shares

**Sacramento, CA**

SunSmart

**St. George, Utah**

**Ellensburg, WA**

# Summary

- Solar is ready today
- State driven marketplace with lots of models to learn from
- Technology constantly being enhanced
- Costs continue to fall
- Solar will benefit from any future carbon policies
- It is an industry that creates domestic jobs


The U.S. Department of Energy's
National Renewable Energy Laboratory
www.nrel.gov
Contact Information
Jason.Coughlin@nrel.gov
303-384-7434
Golden, Colorado