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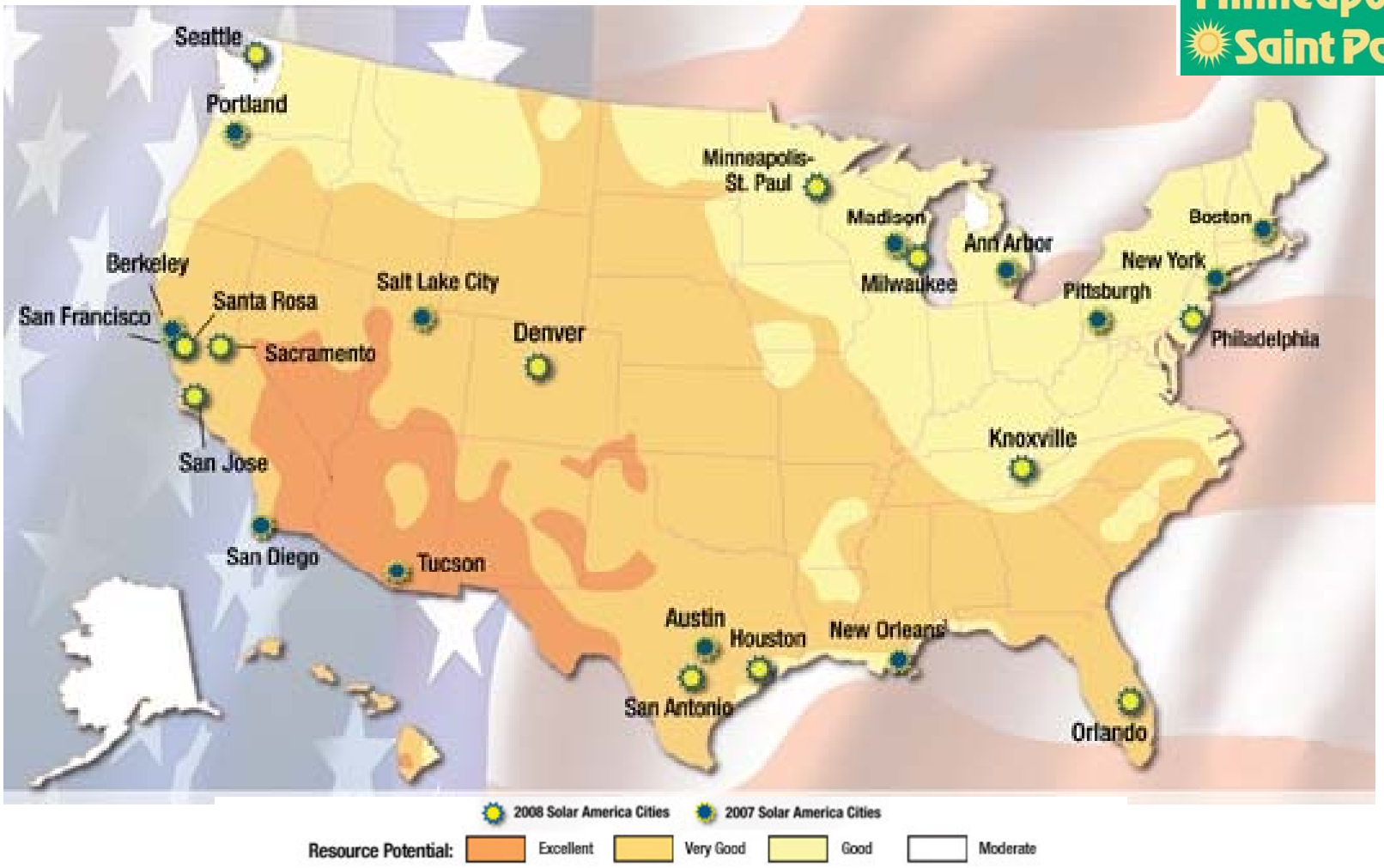
Photos courtesy of DOE, NREL and the Solar America Cities program

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

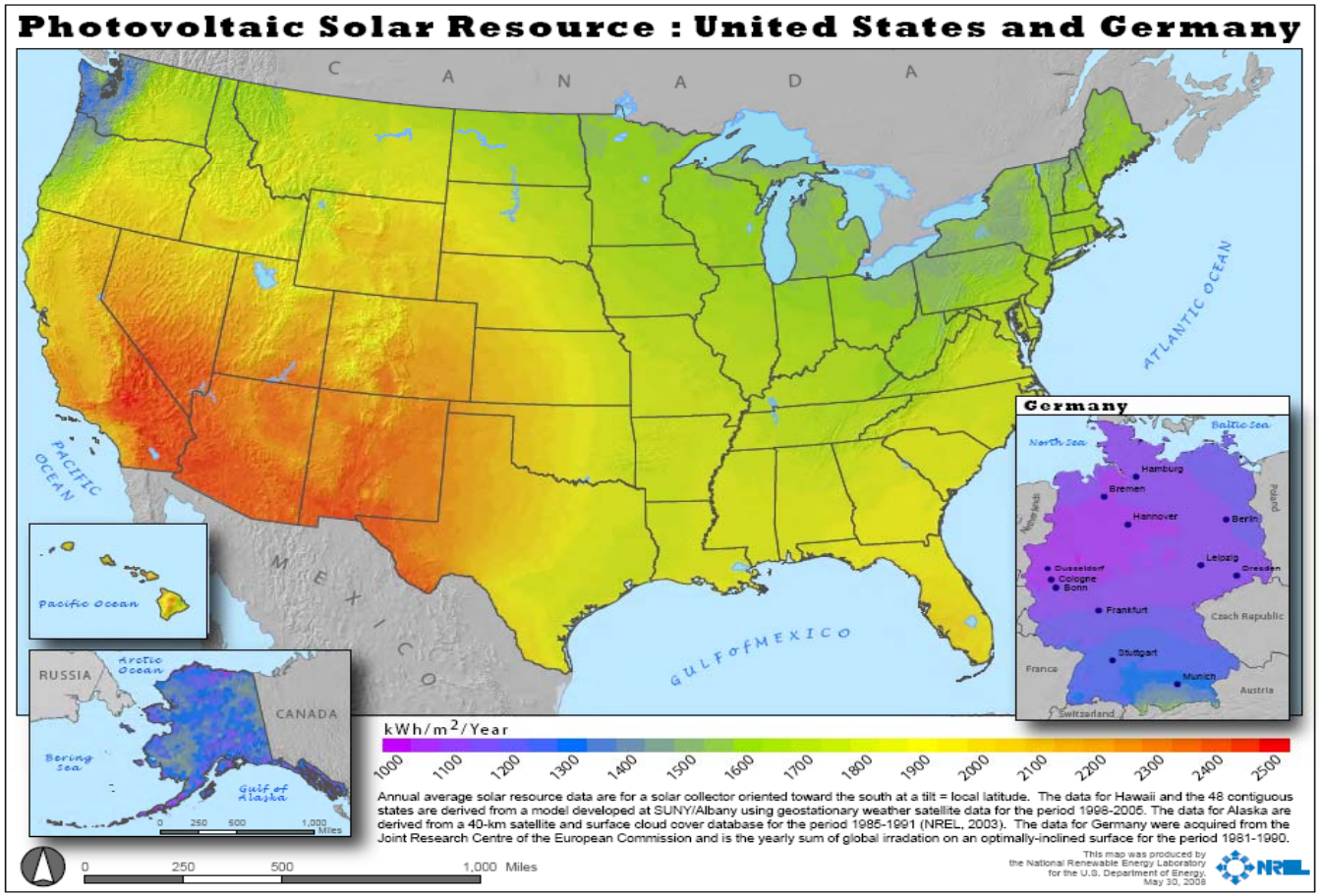
Twin Cities is one of 25 cities at the forefront of solar development in the country



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.

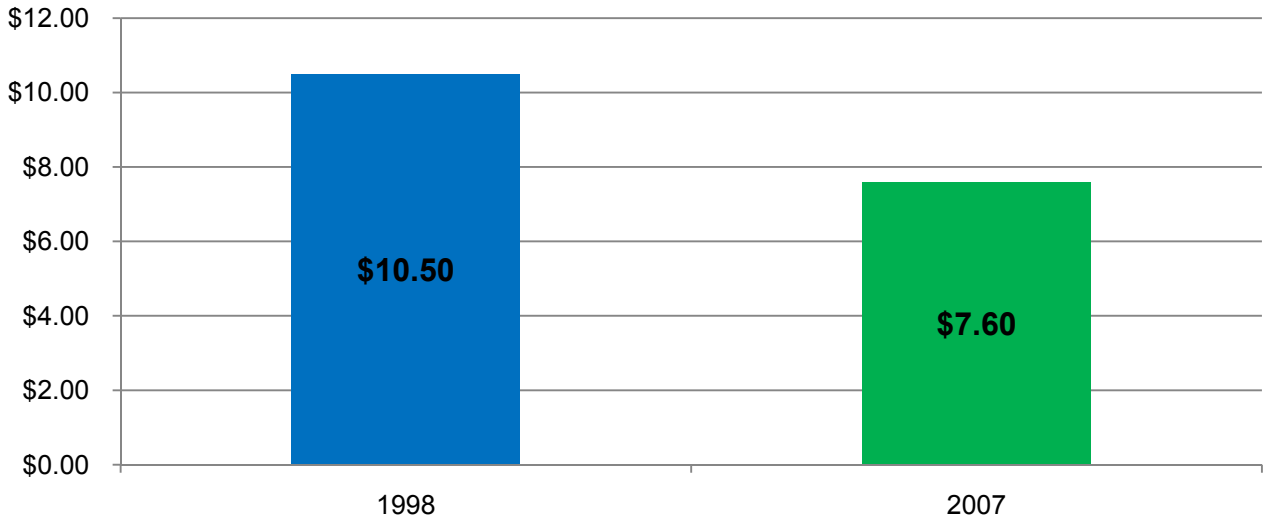
Photo courtesy of NREL

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.

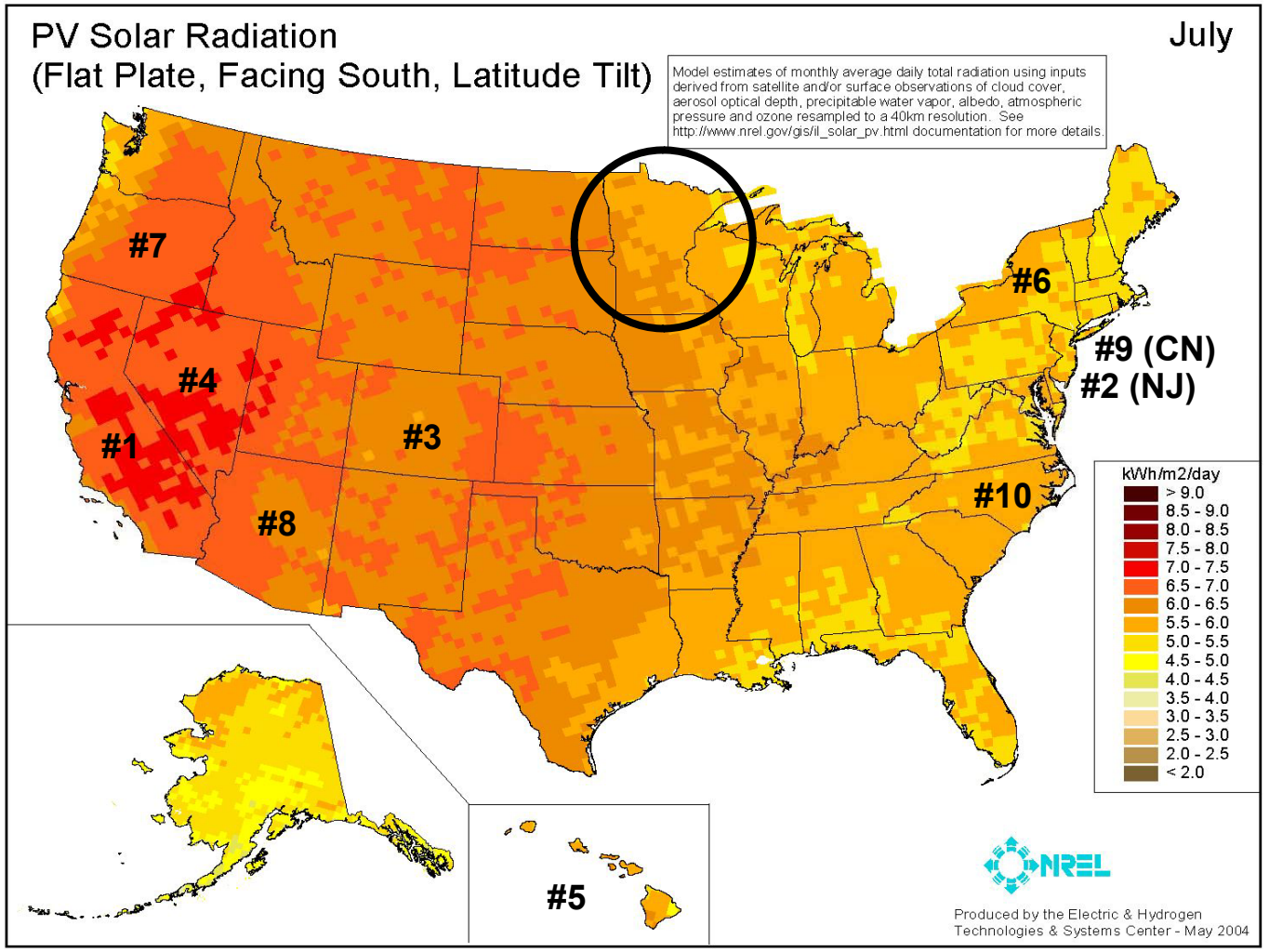
4. Renewable Portfolio Standards* with a **carve-out for solar energy** creates the opportunity for solar to compete against cheaper renewable energy technologies such as wind and biomass.

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

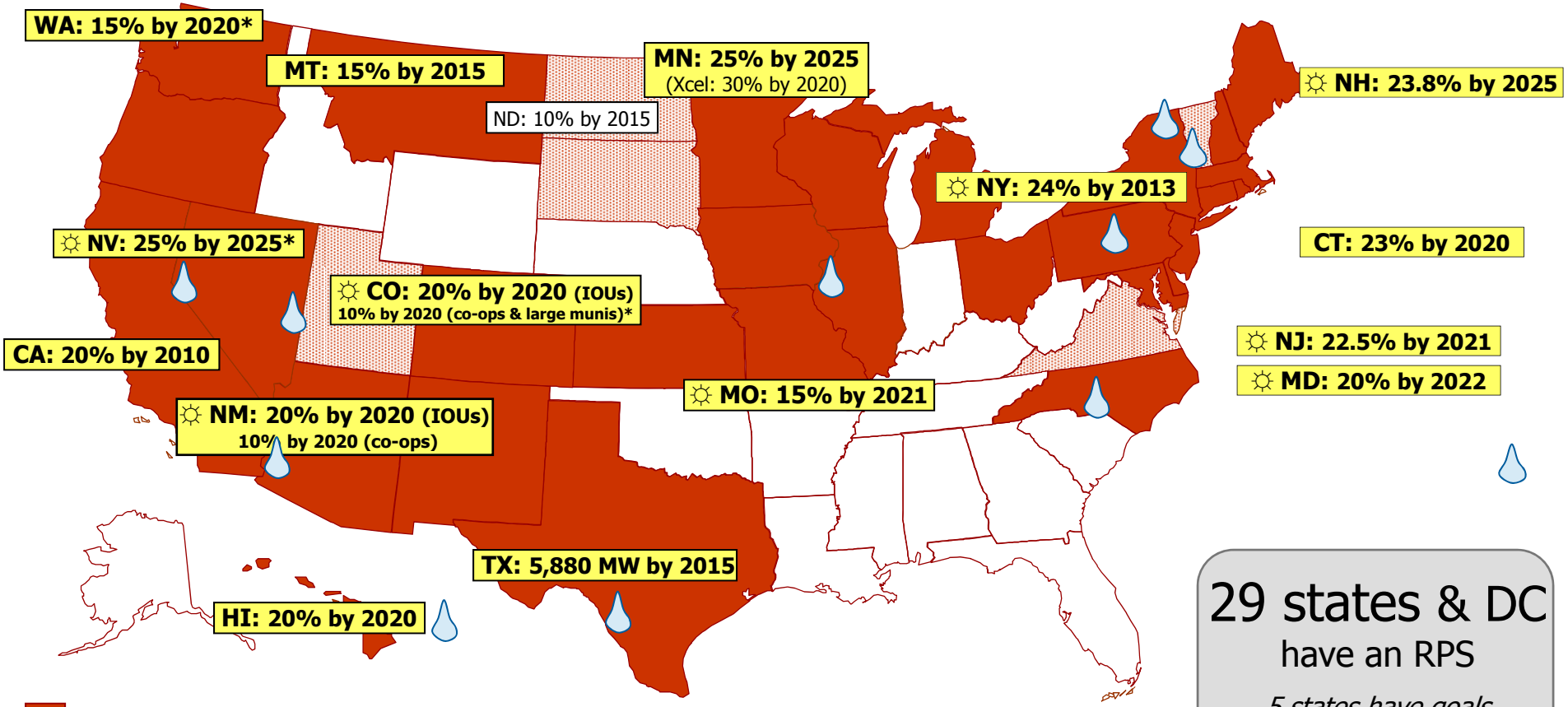
Top ten states for installed capacity



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

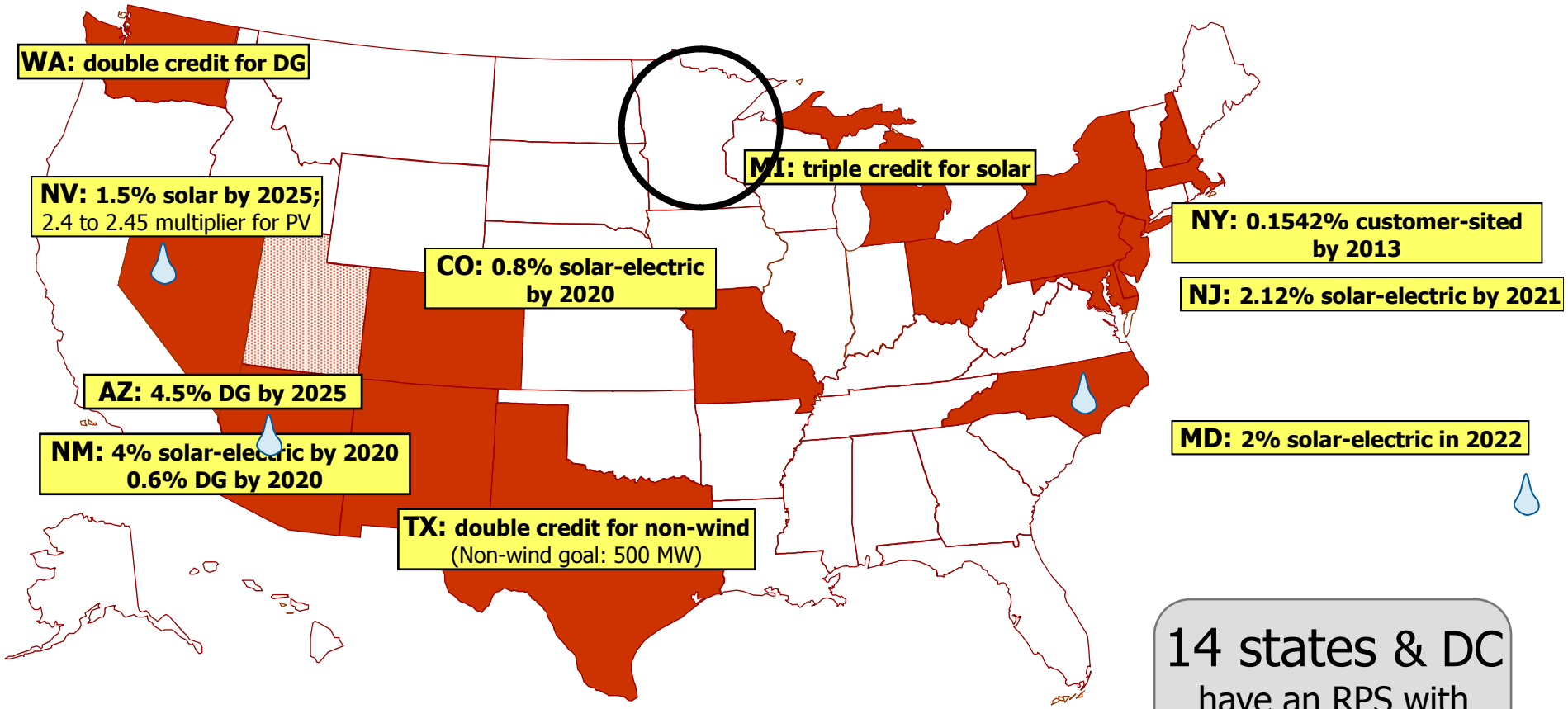
Minimum solar or customer-sited requirement

* 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



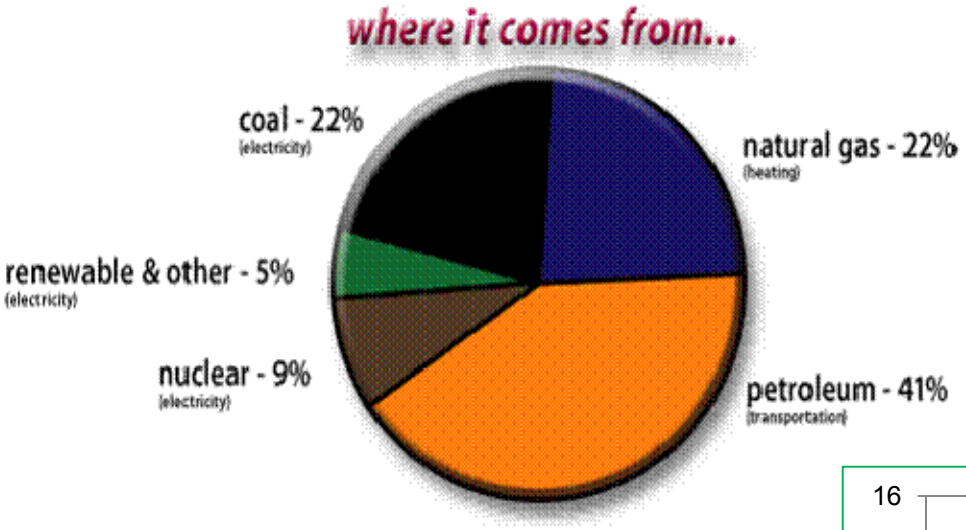
State renewable portfolio standard with solar / distributed generation (DG) provision

State renewable portfolio goal with solar / distributed generation provision

Solar water heating counts toward solar provision

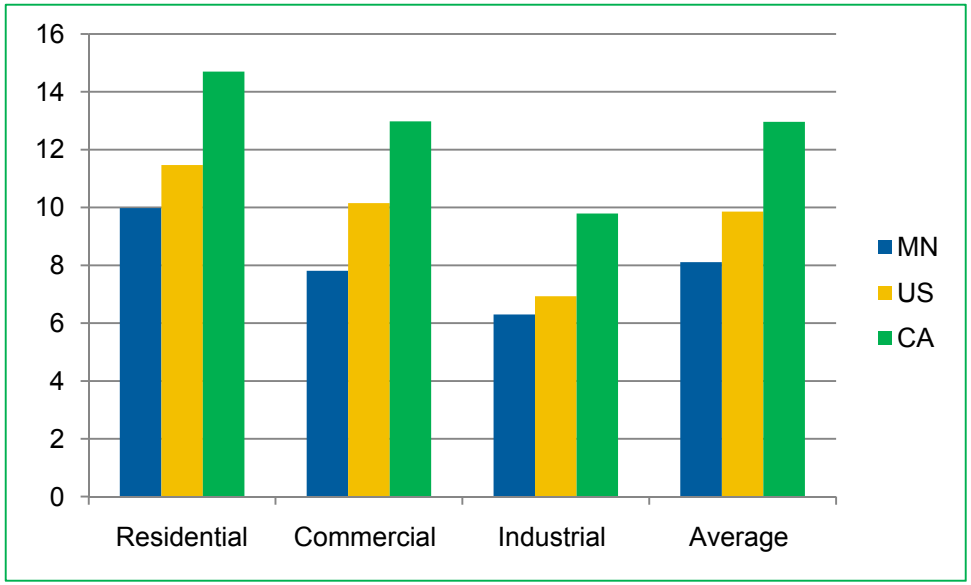
14 states & DC
have an RPS with solar/DG provisions

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

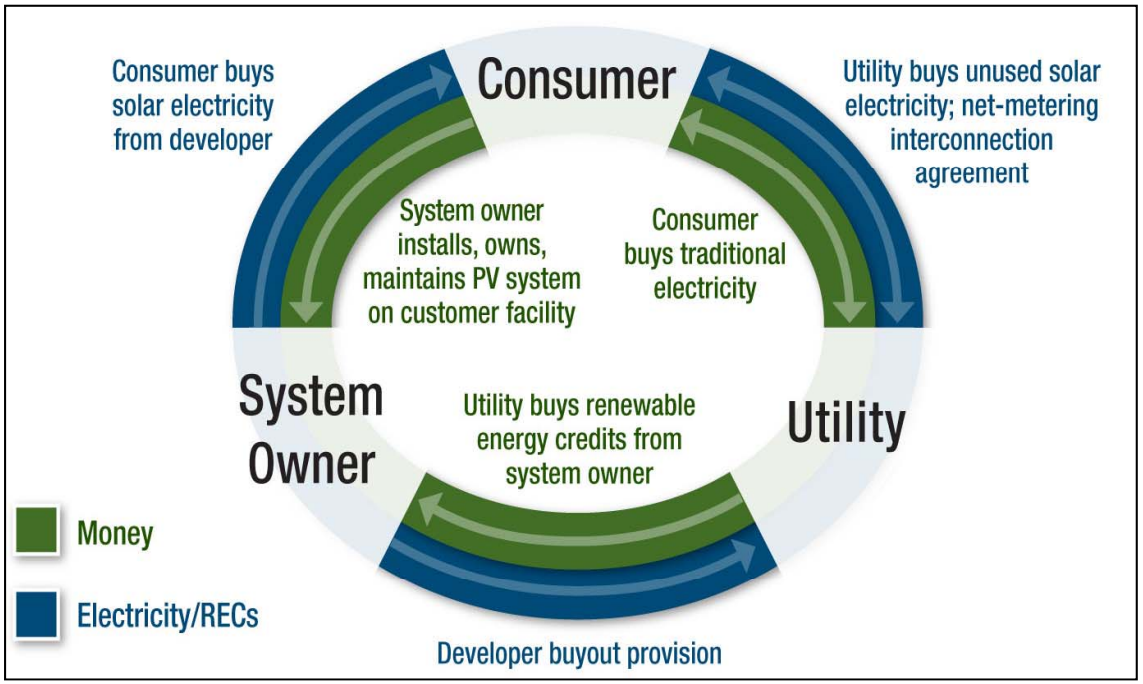
Various Utility Rebates

- 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

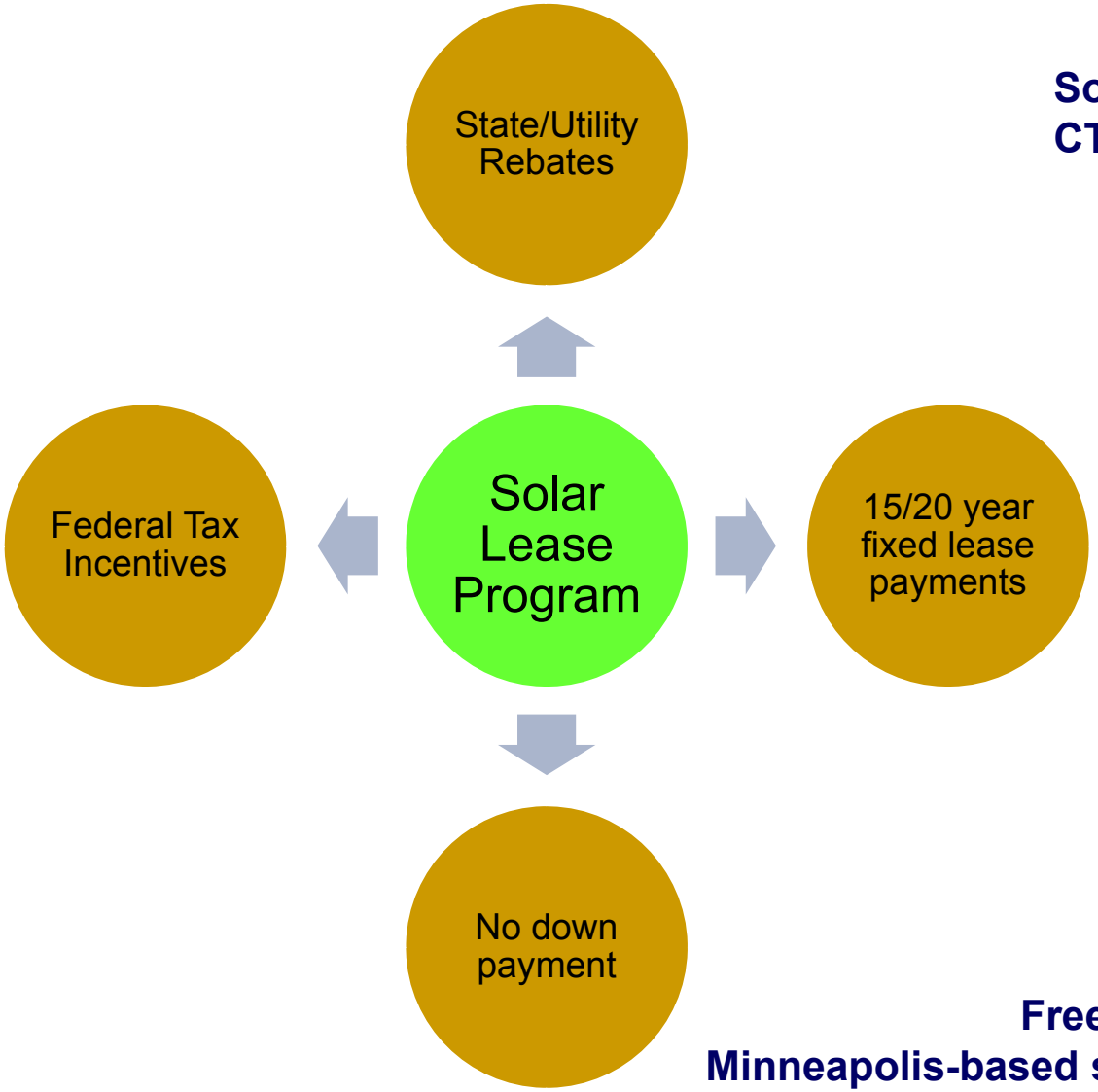
Power Purchase Agreements

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



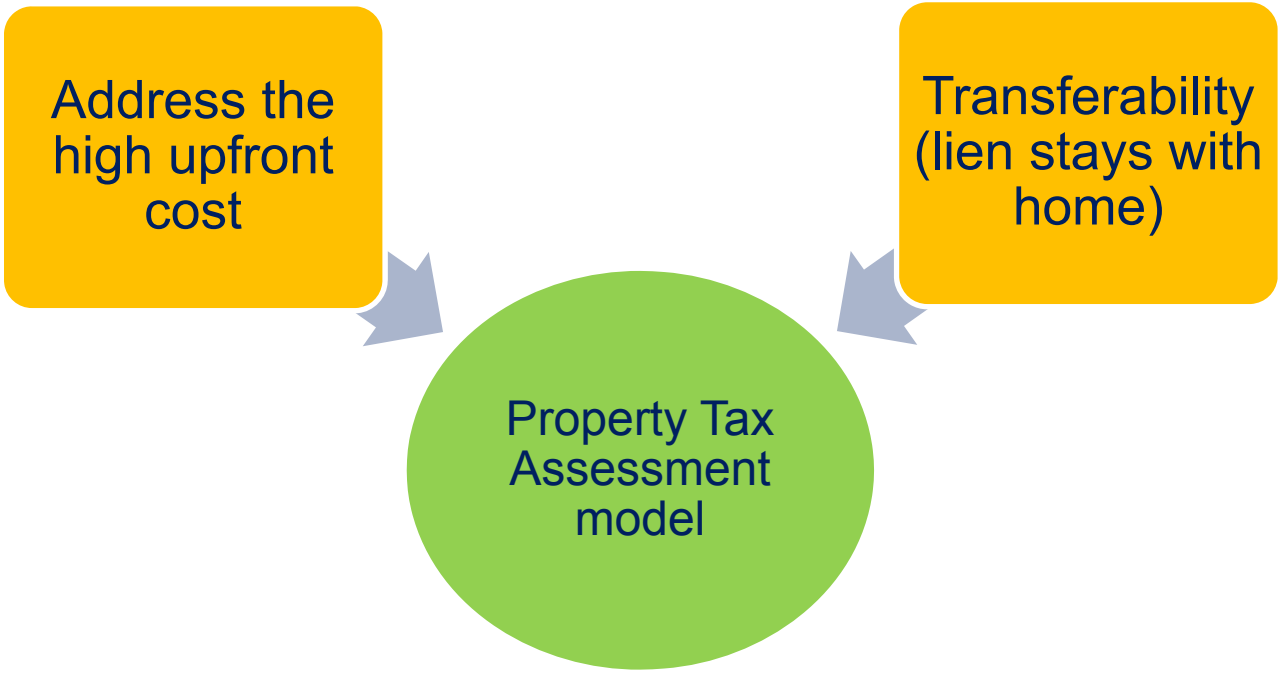
Residential Solar Leasing



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

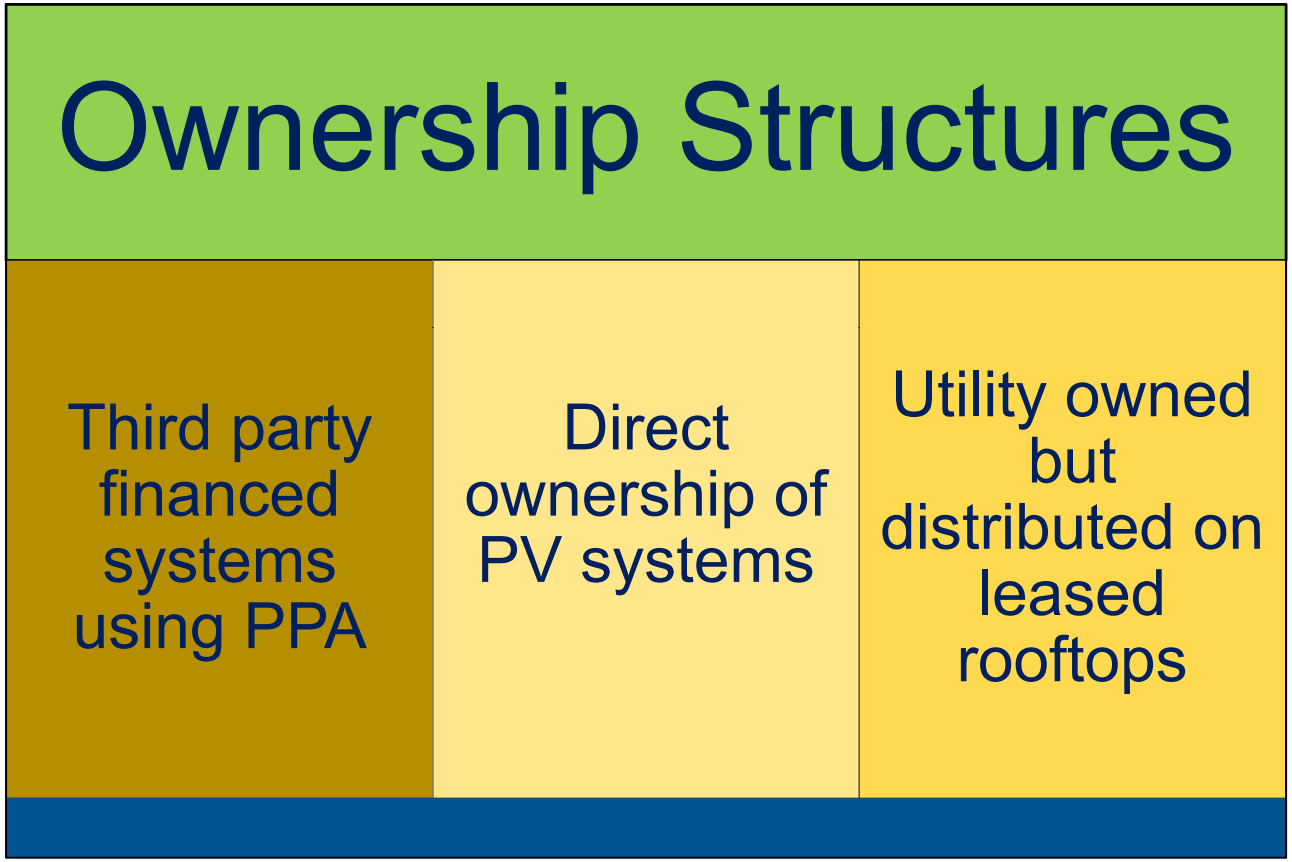
- Domestic renewable energy production offers significant job creation opportunities

- 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