Solar Photovoltaic Financing: Deployment on Public Property by State and Local Governments

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Technical Assistance Project for State and Local Officials (TAP)

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Overview

- The opportunity for state/local public-sector photovoltaics (PV)
- Electricity and renewable energy certificate (REC) revenues
- State and local incentives
- Federal incentives
- Third-Party Ownership
- Insurance

Source: SunPower - Alameda County

Focus: deployment for use by state/local government

Why PV in the public sector?

- Reduce current utility electricity bills
- Add predictability to future electricity expenses
- Reduce greenhouse gas emissions
- Meet renewable energy mandates/targets
- As a model for others to deploy solar
- Local workforce development
- Emergency power benefits on critical infrastructure

Source: SunPower – Thousand Oaks, CA water treatment plant

State/Local Government: the Solar PV Opportunity

- U.S. state and local government-owned buildings in 2003: **574,000**
  - 12% of all nonresidential buildings
- Electricity consumed in 2003: **178 billion kWh**
- The opportunity
  - If 1% of their total demand was met with on-site solar PV, **1,450 MW** of capacity would be needed.
  - This is approx. **10 times** the annual U.S. grid-tied PV capacity installed in 2007 of 150 MW-dc.

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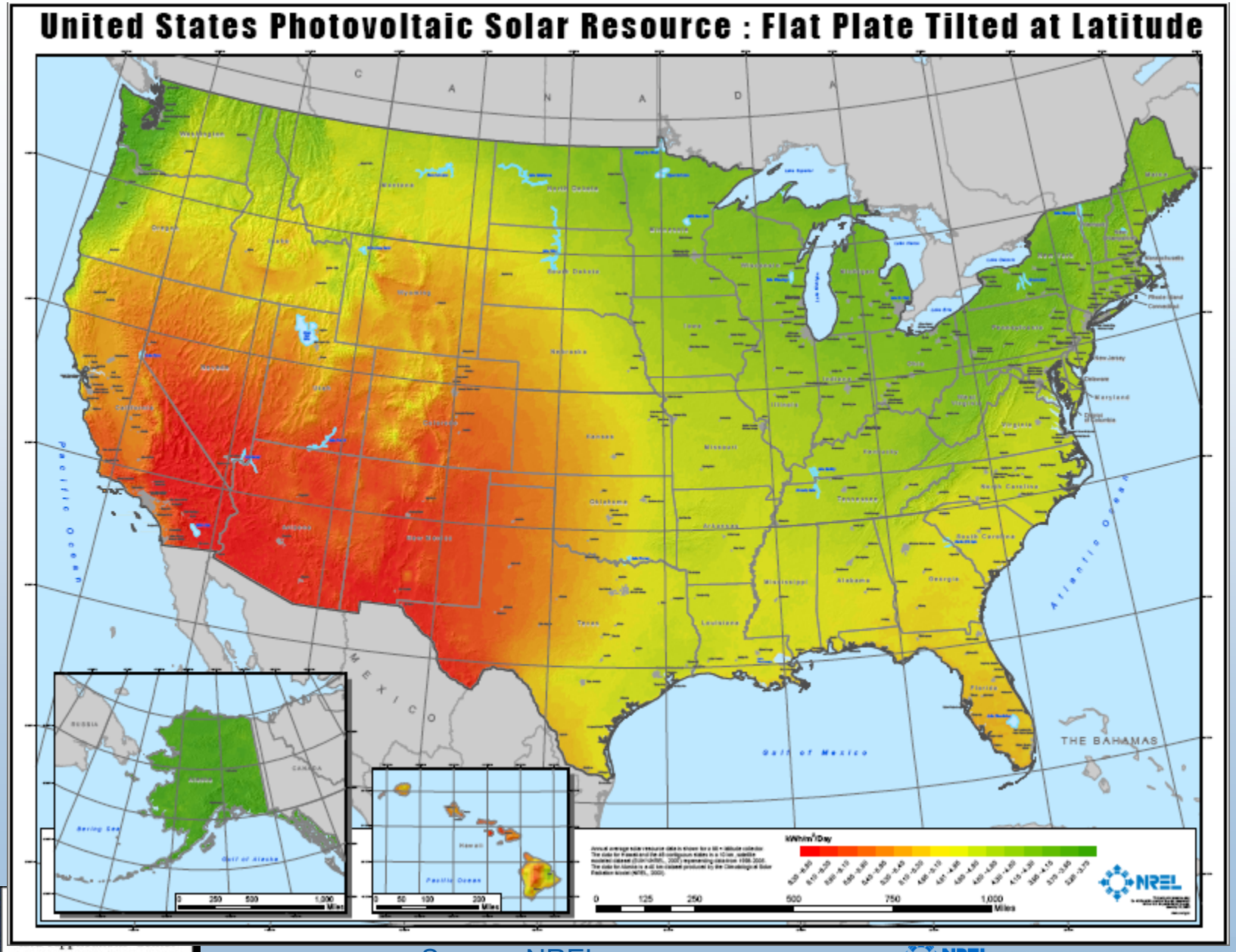
Source: EIA 2003 Commercial Buildings Energy Consumption Survey, table C-13
"U.S. Solar Industry Year in Review: 2007," Solar Energy Industry Association and Prometheus Institute, released April 21, 2008, at http://www.seia.org/Year_in_Review_2007.pdf

State and local government deployment sites

- Government building roof tops
- Water treatment plants
- Airports
- Ports
- Conference centers
- Parking
  - Shading for top level of a garage
  - Shading for flat lots
- Bus stops
- Schools/Universities
  - Electricity savings
  - PV as a teaching tool

Solar Resources



Source: NREL

Leading states for solar (MW per year)

State	2005	2006	2007	06-07
California	52	71	87	23%
New Jersey	**5.5**	**18**	**17**	**-6%**
Nevada	0.5	2.6	15	477%
Colorado	0.2	0.9	12	1233%
New York	**1.4**	**2.7**	**4.4**	**63%**
Hawaii	n/a	n/a	2.4	n/a
Arizona	1.5	2.1	2.1	0%
Connecticut	**0.2**	**0.5**	**1.8**	**260%**
Massachusetts	**0.6**	**1.5**	**1.4**	**-7%**
Oregon	**0.4**	**0.5**	**1.1**	**120%**
Others	0.7	1.5	4.4	193%
Total	**64**	**102**	**150**	**47%**

Sources: Prometheus Institute, July 2007 as presented by Mark Sinclair of the Clean Energy States Alliance at the NARUC workshop on Nov. 14, 2007.http://www.narucmeetings.org/Presentations/Sinclair_2.pdf
Solar Energy Industry Association & Prometheus Institute
http://www.seia.org/Year_in_Review_2007_lr.pdf

EE and RE Financing is Complex

Cost Savings and Revenues

Net metering

Power purchase agreement

RECs

Avoided electric utility payments

Financing

3rd-Party Owners

Electricity & natural gas derivatives

Cash

Lease

Debt

Equity

CREBs

Performance contracts

Bonds

Incentives

Up-front rebates

Production subsidies

Federal and State Tax Credits & Exemptions

Markets

Carbon

Electricity

Renewable Portfolio Standard

Voluntary Green Power Markets

RECs

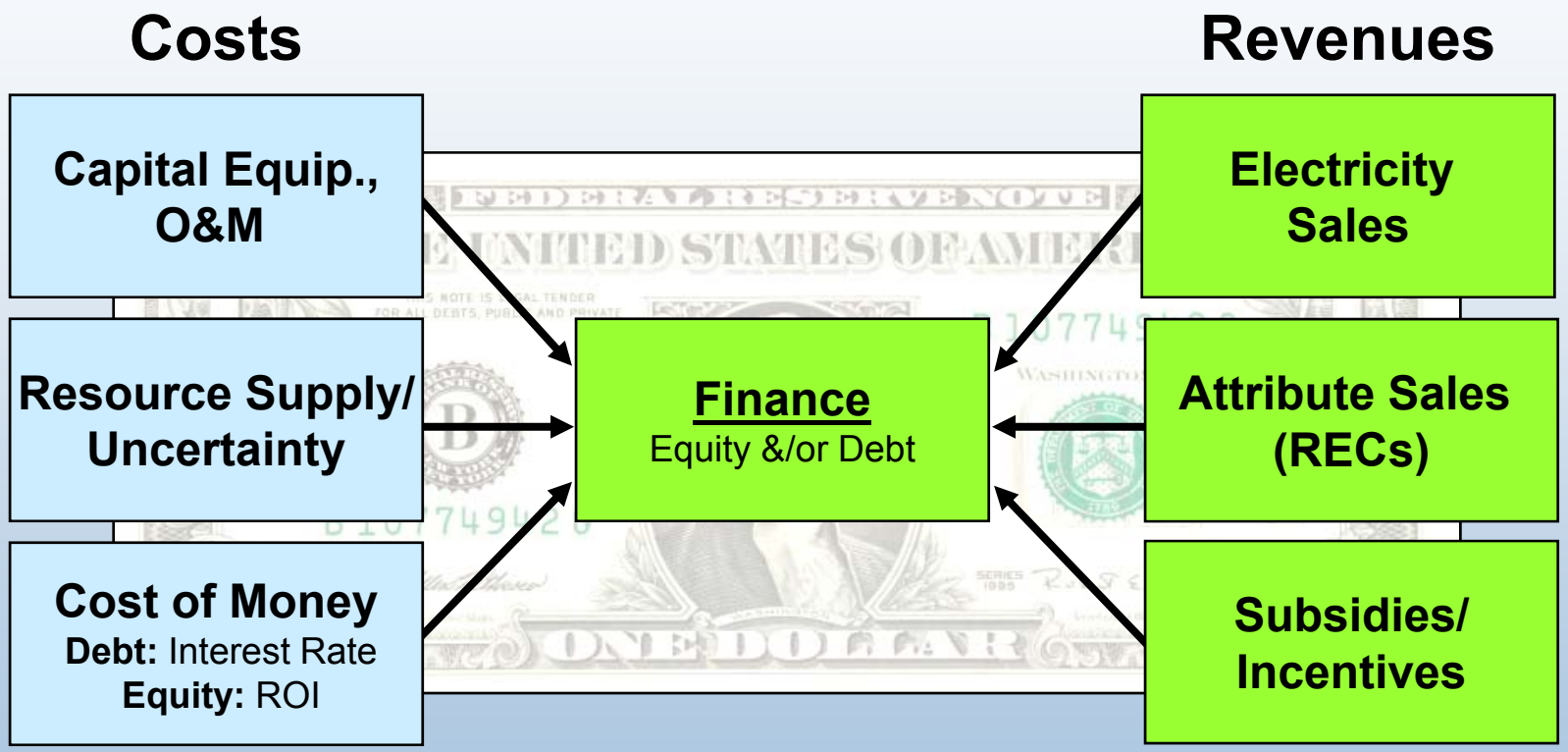
Other Issues

Transmission (utility scale)

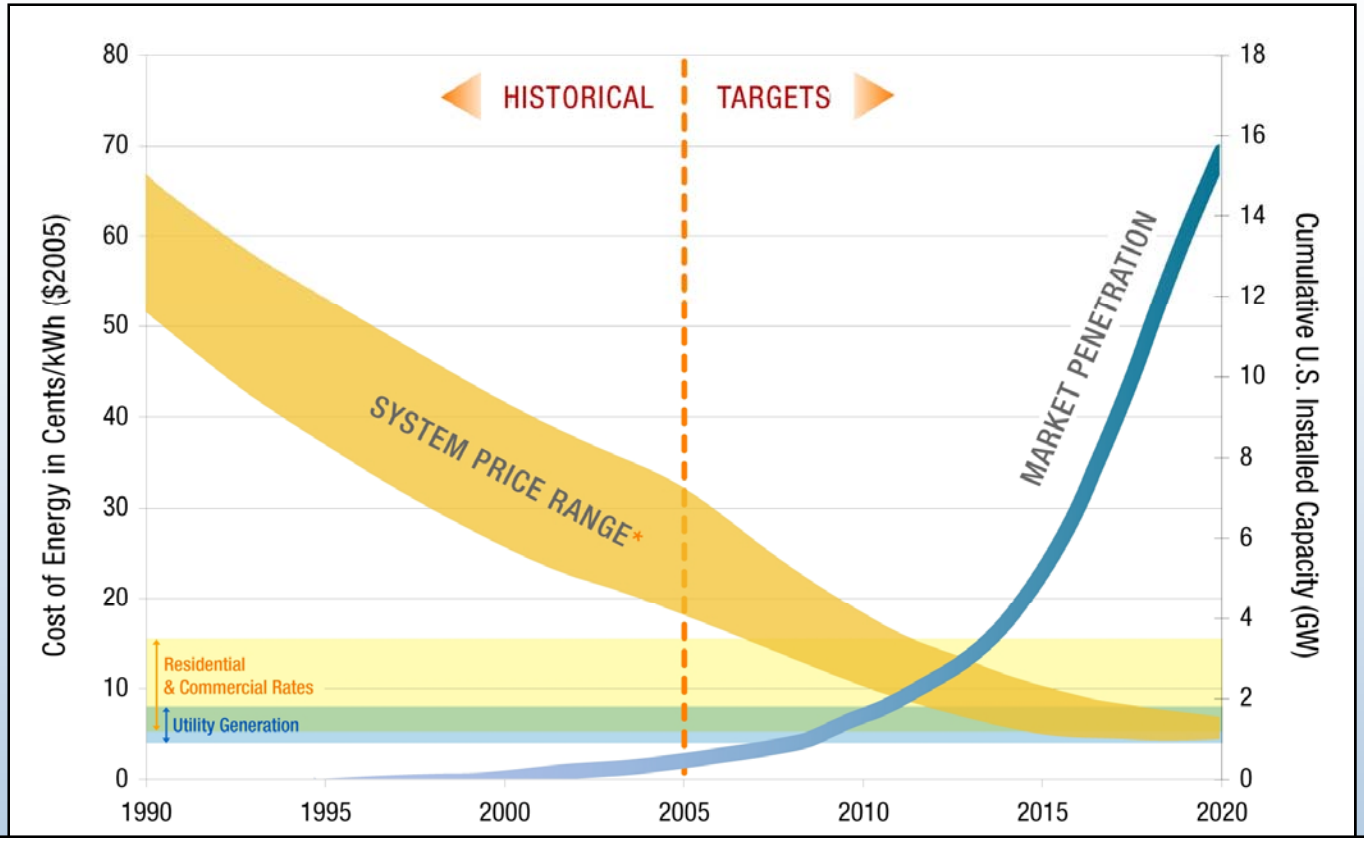
Interconnection (DG)

Renewable resource potential

Balancing Costs and Revenues



U.S. Grid Parity: 2010 – 2015 expected



Market Sector	Current U.S. Market Price Range (¢/kWh)	Cost (¢/kWh) Benchmark 2005	Cost (¢/kWh) Target 2010	Cost (¢/kWh) Target 2015
Residential	5.8-16.7	23-32	13-18	8-10
Commercial	5.4-15.0	16-22	9-12	6-8
Utility	4.0-7.6	13-22	10-15	5-7

Sources:
Robert Margolis (NREL) and DOE Solar America Initiative

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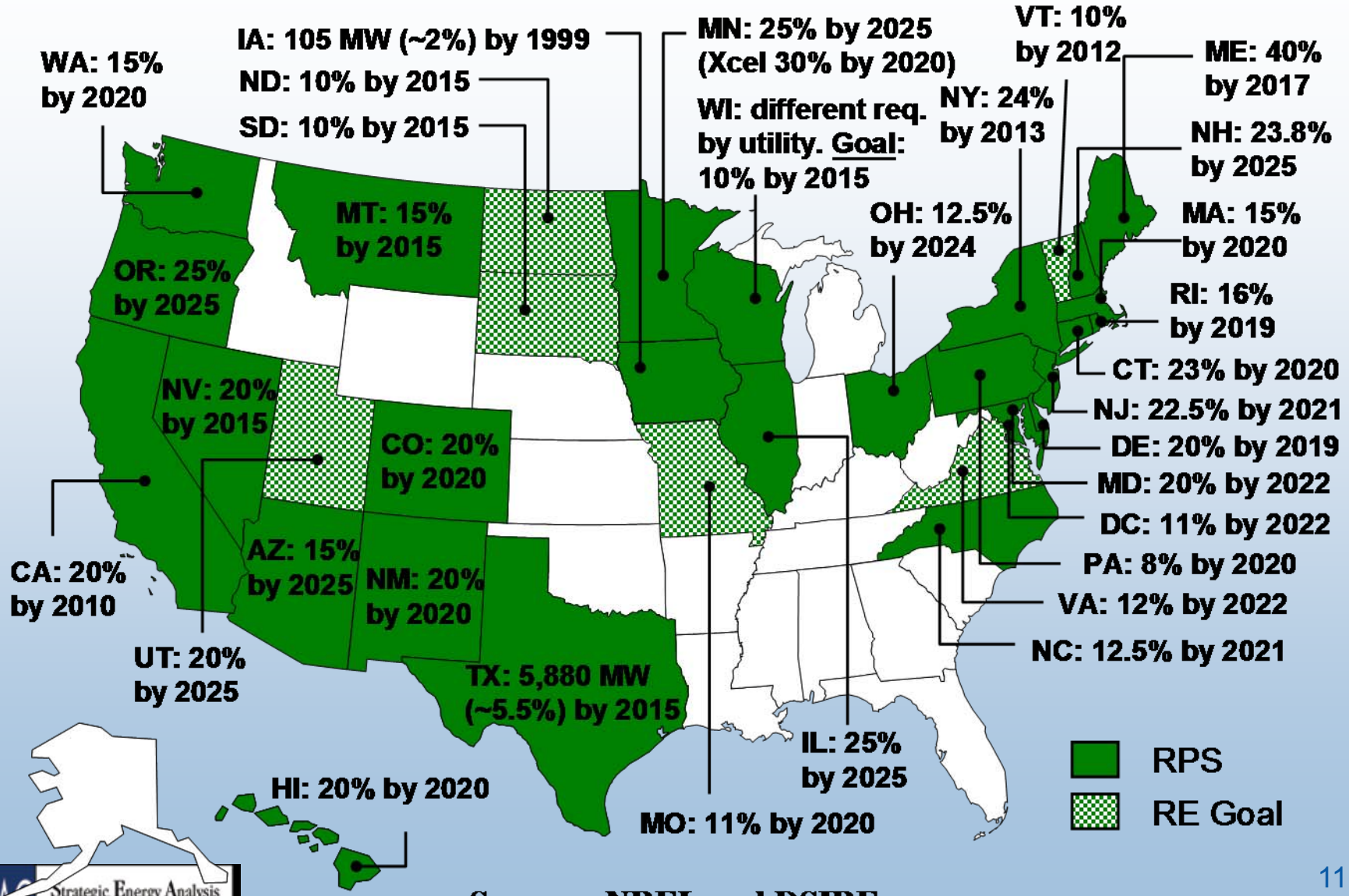
State Renewable Portfolio Standards (RPS)



Sources: NREL and DSIRE

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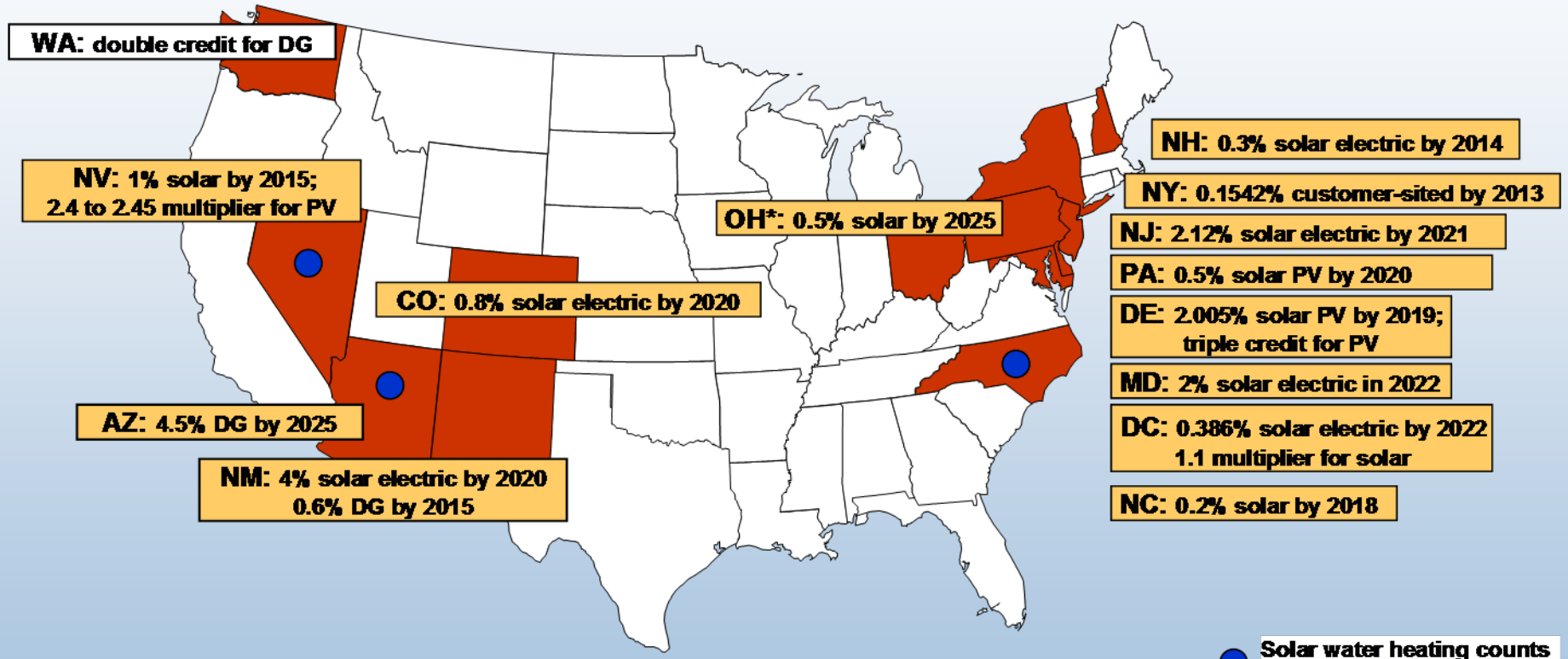
Solar/DG Provisions in State RPS Policies

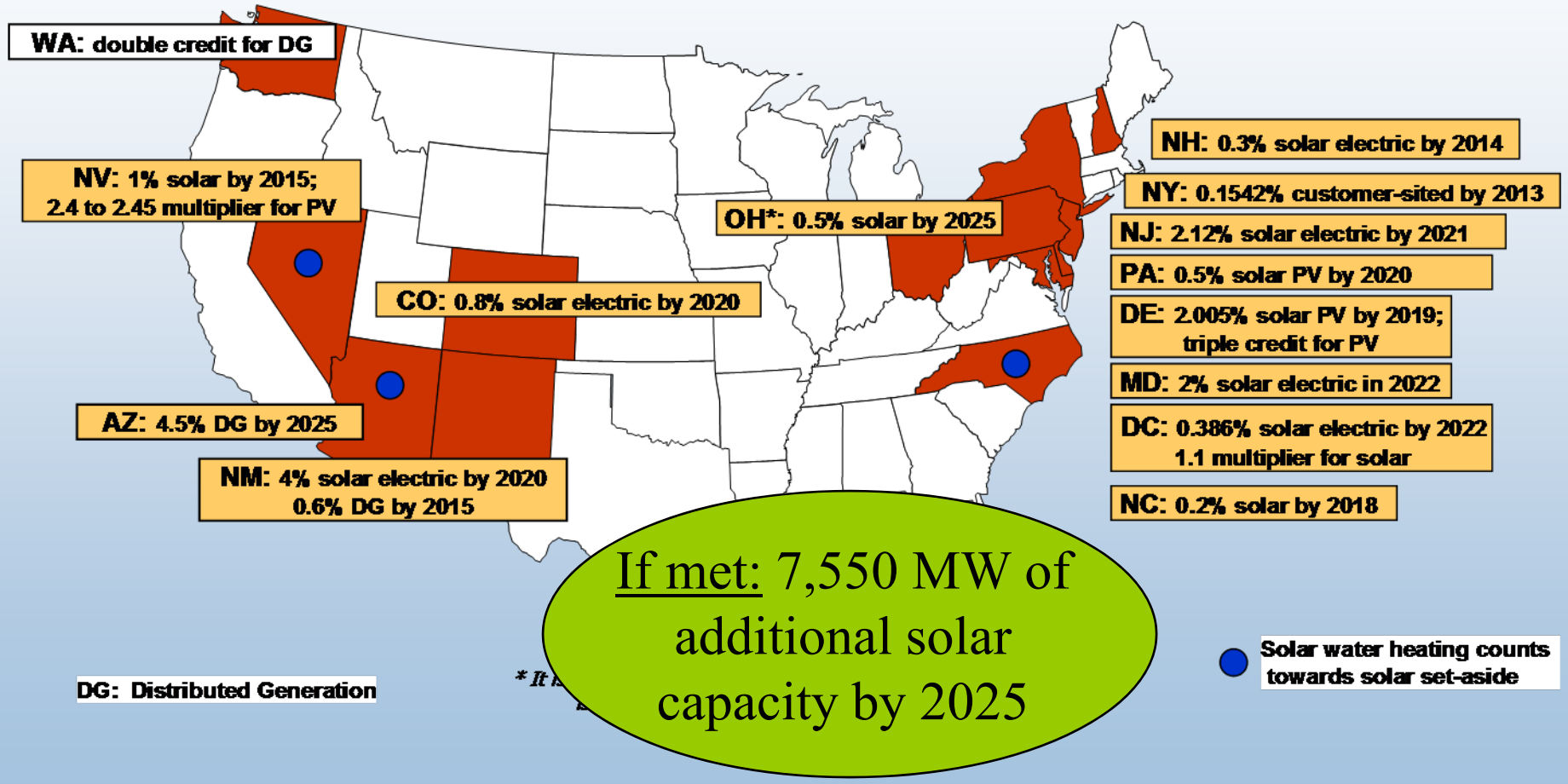


DG: Distributed Generation

** It is unclear at this point if solar water heating is eligible for OH's solar carve-out.*

Source: DSIRE (August 2008)

Solar/DG Provisions in State RPS Policies



If met: 7,550 MW of additional solar capacity by 2025

Source: DSIRE (August 2008) and LBNL

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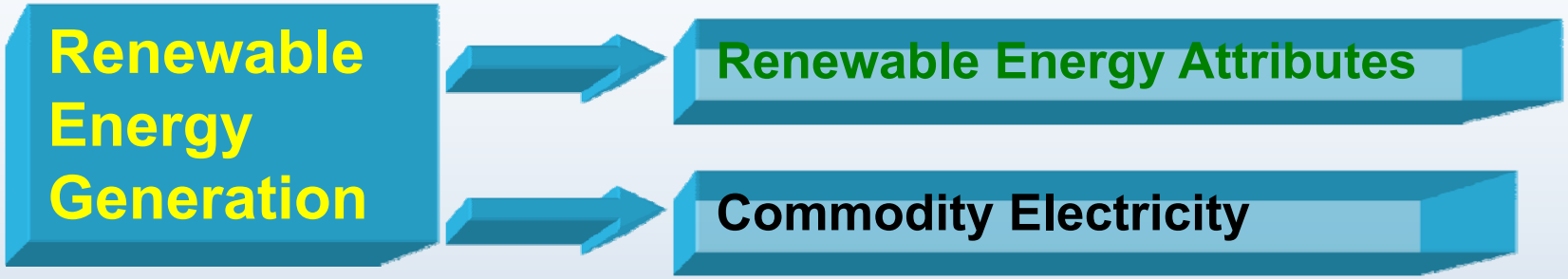
Renewable Energy Certificates (RECs)



- Commonly used for mandatory and voluntary markets
  - Not allowed for RPS compliance in AZ, CA, HI and IA
- A REC represents the non-electrical attributes of 1 MWh of renewable energy generation
- Has value separate from commodity electricity
- RECs can be critical to getting projects financed

REC Market Value Factors

- Compliance vs. voluntary market
- Regional Issues
  - Quality of resource
  - Incremental cost of development above energy market
  - REC supply-demand balance
- Long-term policy stability/uncertainty
- Other market rules/conditions (e.g. technology, price cap)

	RECs	Solar RECs
Voluntary	$1-7*/MWh	$18-21/MWh
RPS	$3-22/MWh	$205-265/MWh**
RPS (shortage)	$48-56/MWh	**???**

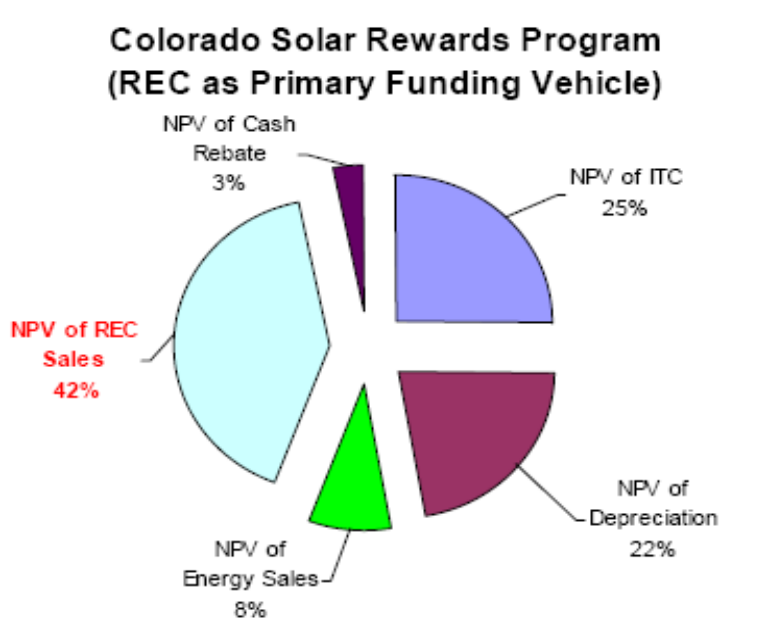
2009 NJ SREC cap: $711/MWh

Sources: Evolution Markets, NREL, Xcel, NJ Clean Energy Program

** Not counting biomass* *** NJ and CO only*

Solar REC Revenues Can Be Critical

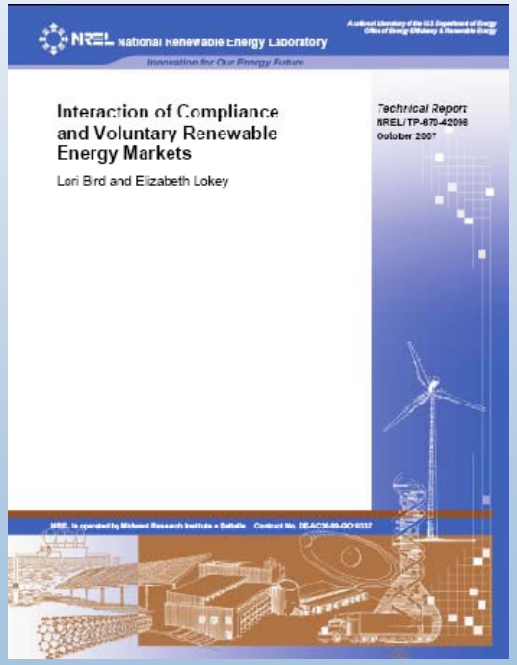
- Solar REC revenues higher in states with RPS solar set-aside
  - CO ~40% of total cash flow
  - NJ ~50% of installation costs
  - RECs can be 40-80% of total project revenue stream
- REC revenues expected to be increasingly important as state incentives ramp down (e.g. CA, NJ)



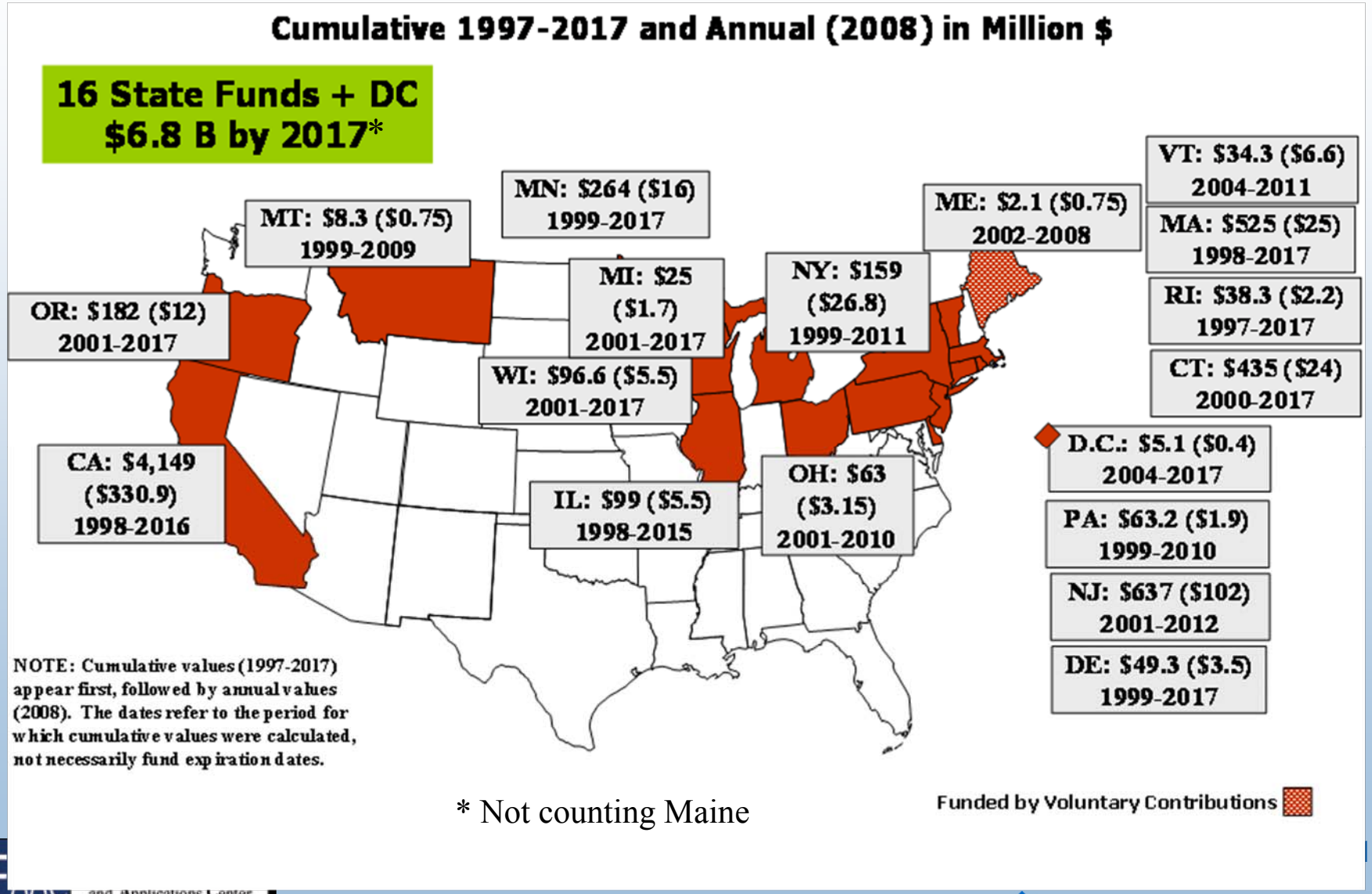
Source: "Selling Solar with RECS," Presentation by 3 Phases Energy Services, January 31, 2007, California Solar Forum

To Sell RECs or Not?

- Selling RECs generated by an on-site facility can help re-coup the project costs
- However, once you sell a REC you sell the right to claim using green power
  - Can still claim the system is hosted on-site
  - Can also purchase (cheaper) replacement RECs
- Most states do not allow double counting
  - NREL recently completed a report that examined interactions between voluntary and compliance markets: http://www.nrel.gov/docs/fy08osti/42096.pdf



State – Public Benefit Funds for RE



* Not counting Maine

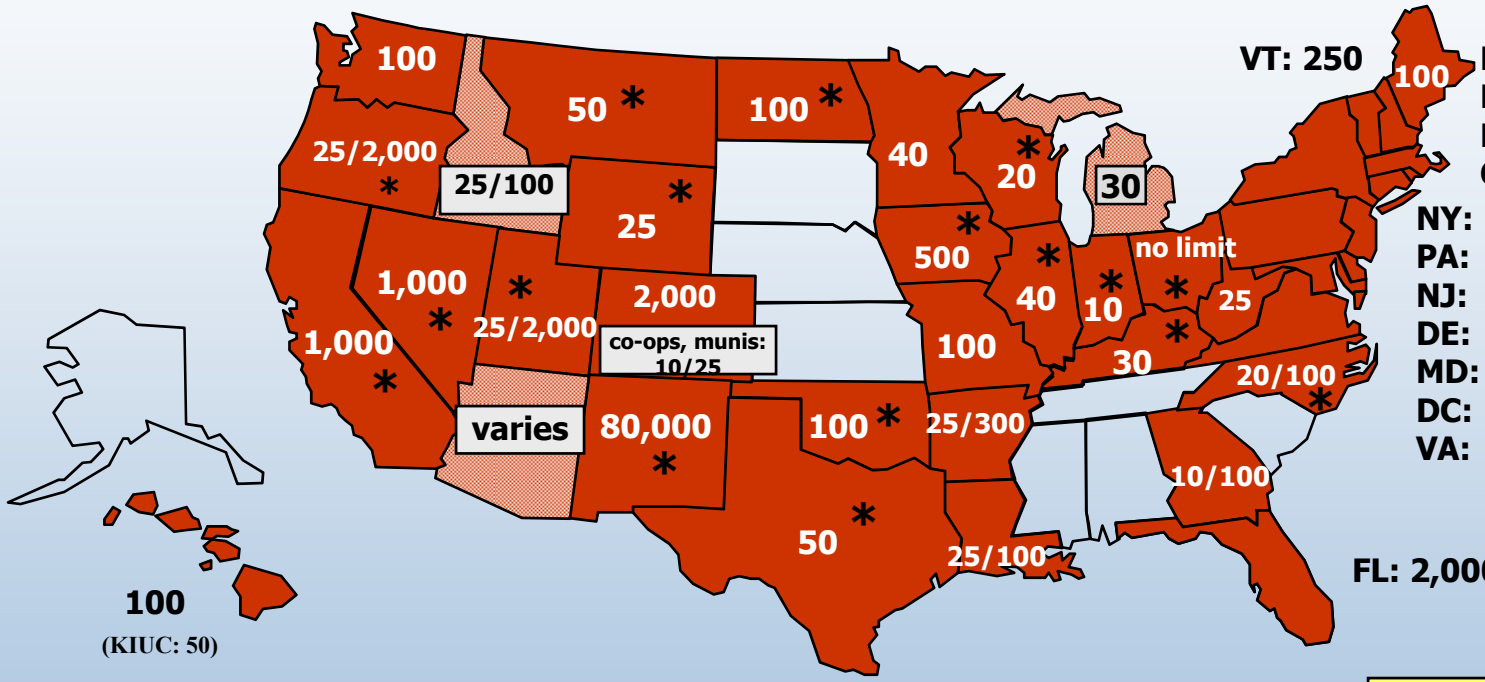
Source: www.DSIREusa.org –updated Feb. 2008

State – A Sample of Significant Solar PV Incentives

State	Utility	Incentive	Maximum
CA	California Solar Initiative	$2.30/W PGE (step 5) $2.30/W SCE (step 5) $2.65/W CCSE (step 4)	$3.2 **billion** total; incentive ramps down as cumulative state MW targets are met (currently ahead of schedule)
CO	Xcel	$4.50/W (small) $2/W + $115/MWh (med) REC auctions: $205-265/MWh (est.) +$200k	0.5 kW – 10 kW PV systems (small) 10 kW – 100 kW PV systems (med.) 100kW – 2 MW/project on customer site; 20 year contract; Round 3 closed: 04/08
CT	a/CL&P, UI b/ RE fund	a/ $5/$W_{DC}$ b/ 1 kW public PV system	a/ <10 kW, $50k each ($11.5 MM total) b/ 20% RE electricity, plus residential & business sign-ups
NJ	PSE&G	$475/MWh set as REC price floor	15-yr loan repaid with SRECs. Max capacity of 9MW for munis / non-profits
NY	NYSERDA	$5/W for 1st 25kW $4/W for balance	50 kW/site, 100 kW/ municipal government
OH	Energy Fund	Starting at $3.50/W, decreasing to $1.50/W	Rebate depends on system size and is capped at 75 kW for nonresidential

Source: SEIA, Xcel, DSIRE, CSI (http://www.sgip-ca.com/)

State Net Metering



NH: 100
MA: 60/1,000/2,000*
RI: 1,650/2,250/3,500*
CT: 2,000*
NY: 10/25/125/400*
PA: 50/3,000/5,000*
NJ: 2,000*
DE: 25/500/2,000*
MD: 2,000
DC: 100
VA: 10/500*
FL: 2,000*

Net metering is available in 42 states + D.C.

- State-wide net metering for all utility types
- * State-wide net metering for certain utility types only (e.g., investor-owned utilities)
- Net metering offered voluntarily by one or more individual utilities

(Note: Numbers indicate individual system size limit in kilowatts. Some states' limits vary by customer type and/or technology.)

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Source: DSIRE - July 2008

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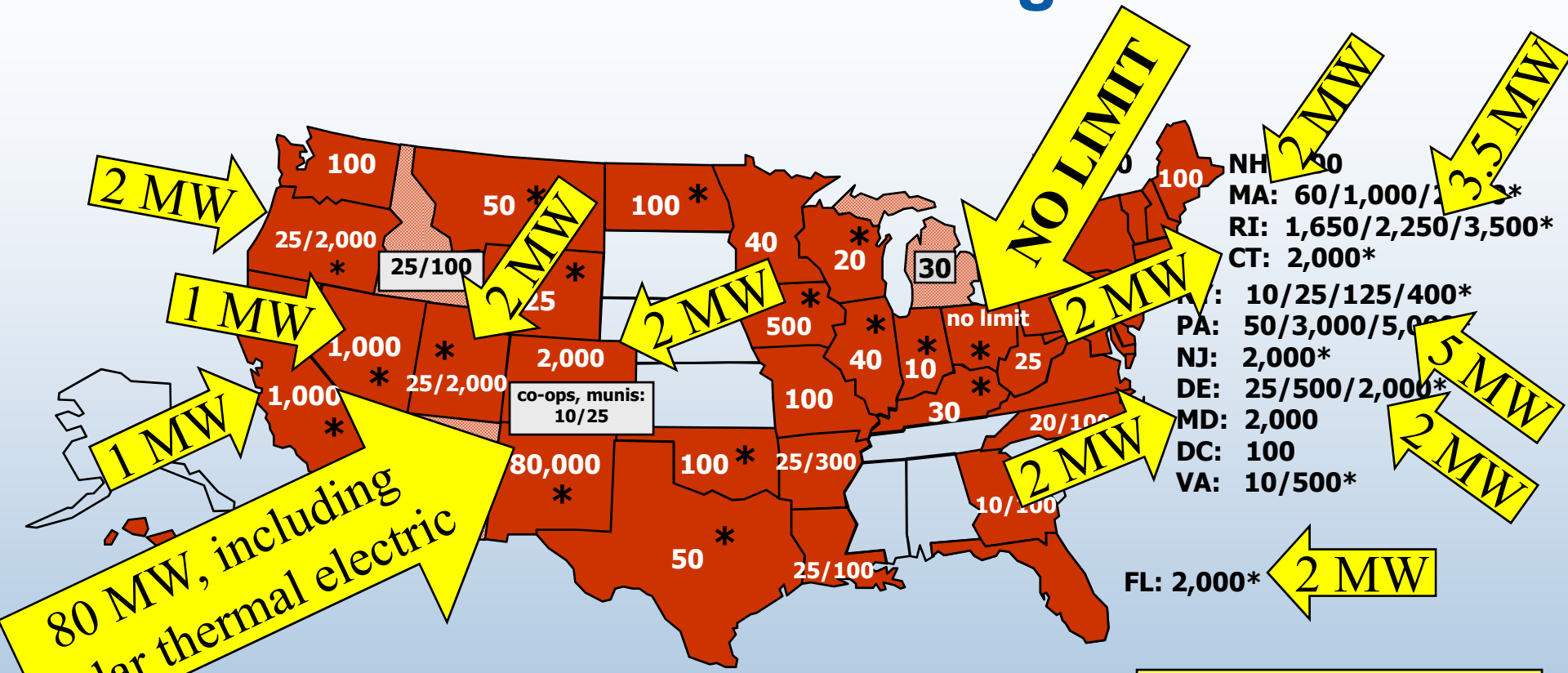

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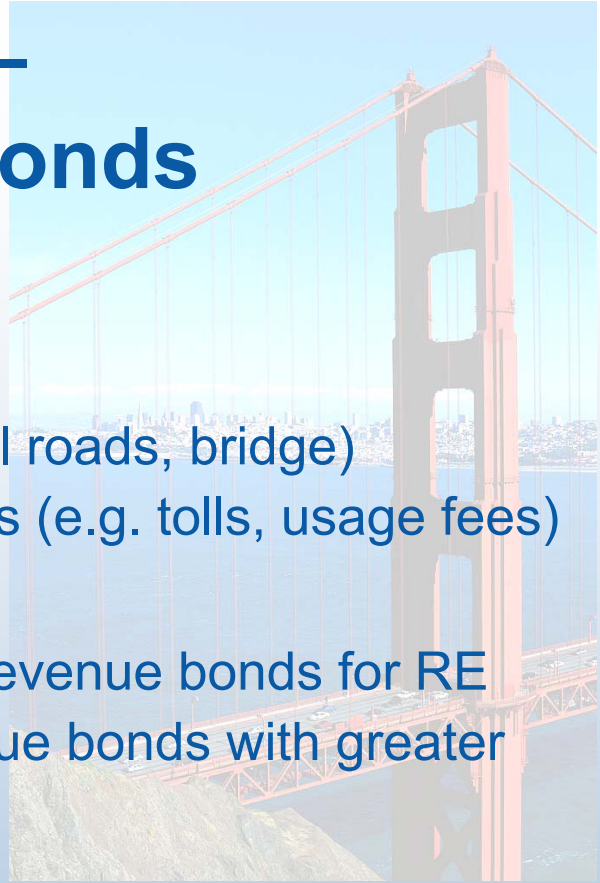
State Tax Incentives

- State incentives
  - Investment tax credits
  - Production tax credits
  - Income tax credits
  - Property and sales tax exemptions
- Example: OR Business Energy Tax Credit
  - State income tax credit up to 50% of installed cost
  - Tax credits can be sold by public entities

State & Local – General Obligation Bonds

- General Obligation Bond Mechanism
  - Repayment secured by issuer's taxing authority
  - Require voter approval
  - Total debt obligations are limited
- Example: Honolulu
  - Issued $7.85MM solar general obligation bonds in FY05
  - For: Solar parking lot lights, energy retrofits, and LED streetlamp
- Example: New Mexico Finance Authority (NMFA)
  - Approval to issue $20MM general obligation bonds (none yet)
  - For: Loans to state agencies, universities, and public schools to implement EE and RE
  - 90% of the energy savings expected to fund debt service

State & Local – Energy Revenue Bonds



- Energy Revenue Bond Mechanism
  - Issued by “special authority”
  - Designated for a specific purpose (e.g. toll roads, bridge)
  - Repayment supported by project revenues (e.g. tolls, usage fees)
- Example: San Francisco
  - Proposition B passed for $100 million of revenue bonds for RE
  - Proposition H passed for additional revenue bonds with greater flexibility as to the issuer and the amount.
  - Not yet issued
- Example: Delaware’s Sustainable Energy Utility
  - Special purpose, tax-exempt bonds up to $30 million
  - For energy efficiency, weatherization, and distributed RE
  - Energy savings are expected to generate funds for repayment

Federal Incentives – CREBs, or Clean Renewable Energy Bonds

- CREBs
  - Apply to the IRS for an allocation
  - Federal tax credit to bond owner in lieu of interest payment from bond issuer
  - May be more attractive than tax-exempt municipal bonds
    - Issuer only pays back bond principal (for most part)
- Total allocation of $1.2 B
  - Up to 62.5% for public sector projects (rest: coops)
  - Round 1: 401 of 610 public sector PV projects
  - Round 2: $262MM for public-sector PV projects
  - Additional rounds possible

CREBs Challenges

- Not truly equivalent to interest-free bond
  - Assumes bond issuer is equiv. to AA corporate
  - Public entities with weaker credit must either
    - Make supplemental interest payments, or
    - Sell the bond at a discount
- Transaction costs are high
  - Allocations made from smallest to largest projects
  - Solution: MA bundled 12 projects (1MW)
- First principal payment due in December of the year the CREB is issued

Federal Incentives – Renewable Energy Production Incentive (REPI)

- Authorized under EPAct 1992
  - Amended under EPAct 2005
- Program funding is uncertain
  - Subject to annual congressional appropriations
  - To date, have been unable to meet the total requests each year.
- Uncertainty means that REPIs are not bankable in project financing

Federal Tax Incentives

- Investment Tax Credit (ITC)
  - Upfront tax credit for solar, fuel cells, geothermal and mictroturbines
  - 30% credit for solar through 12/31/08
    - Residential: up to $2,000
    - Commercial: no cap
  - Reverts to 10% for solar if not reauthorized
- Modified Accelerated Cost Recovery System (MACRS)
  - Accelerated depreciation of assets over 5 years
  - In addition to ITC for solar
  - 2008 Bonus depreciation (50% in year 1)

The Third-Party Ownership Model

- Public-sector "hosts", but does not own PV
- Signs a long-term power purchase agreement (PPA)
- Third-party owns the system and benefits from tax incentives; passes benefit on to public sector host in PPA contract.

Benefits

-Pre-determined electricity price for 20-25 years
  hedge vs. volatility, fossil prices
-No upfront outlay of capital
-No O&M responsibilities
-Path to ownership
  if included as option in PPA

Public PV Third-Party Ownership PPA Examples

- Third-party ownership grew from 10% in 2006 to 50% in 2007 for comm. and industrial sectors
- Denver International Airport, CO
  - 25-year contract for 2 MW of solar PV
  - Option to buy the system in year 6 (at market value)
- Port of Oakland, CA
  - 756 kW ground-mounted system
  - Driver: “clean and predictably priced electricity”
- San Diego Alvarado Water Treatment Plant
  - 1 MW of solar PV
  - Covers 20% of plant’s power needs

Sources: Greentech Media, Denver Post, Port of Oakland, City of San Diego

Caveats with Third-Party Ownership

- Truth in advertising: green power claims
- Legality concerns – compete with utility monopoly?
- Leased buildings – will landlord allow?
- Delayed ownership
- Legal transaction costs
- Access to site is critical

Solar Financing Challenges-1

- Up-Front System Cost

- Federal - 30% ITC Expiration on 12/31/08
  - Will it be reauthorized before it expires?
  - Effect: Solar ITC will revert to 10%, putting many PV projects in jeopardy
- State Incentives Changing
  - Challenge: States ramping down up-front rebates in lieu of:
    - Production-based incentives (CA), or
    - To rely on the SREC market (NJ)

Solar Financing Challenges-2

- Net metering and interconnection issues
  - Not consistently applied nationwide
  - Challenge: Critical for solar projects
- On-site REC tracking and verification
  - Separate meter usually required to create RECs
  - Smaller systems may use engineering estimates

- REC Price Uncertainty
  - Cause: RPS policy changes, regional disparities, uncertain eligibility of DG generators, lack of RPS enforcement/penalty
  - Effect: Long-term REC value questioned; little/no REC forward market has developed

Insurance Issues for Public PV

- State and local govts typically self-insure
- Utility interconnection agreements may require additional insurance (varies by state)
  - Potentially significant additional cost to the project
- Solution: State-wide public group policy (Massachusetts)
  - Group public projects together
  - Secure umbrella insurance policy
  - Reduced incremental cost/project

Conclusions

- Solar PV can make sense, even in states without great solar resources
  - Policies and incentives are key
- Renewable energy valuation depends on:
  - Regional electricity revenues
  - Value of federal, state, local and utility incentives
  - Ability to secure REC revenues to cover incremental costs
    - Better if RPS solar set-aside
- Third-party ownership with PPA is emerging as a dominant model for financing
  - Challenges with CREBs implementation
  - Challenges with issuing successful bonds
- Insurance is important issue to consider

Full report:
http://www.nrel.gov/docs/fy08osti/43115.pdf

Thank you for your attention!

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Two Models for Third-Party Ownership

- **Sale-Leaseback**
  - Tax equity investor buys the PV system and leases it to the third-party PPA provider/developer
  - In turn, the third-party PPA provider signs the contract with the state or local government agency
  - After tax benefits are exhausted, developer provider usually purchases the system; can have PPA option for host to purchase the system
- **Partnership-Flip**
  - Developer partners with the tax-equity investor as an LLC or special purpose entity to install and operate the PV system
  - This entity then enters into a PPA with the public-sector host,
  - After tax benefits are exhausted, ownership transfers to the developer; can have PPA option for host ownership