

# The State of the Market:

## Update on the Implementation of U.S. Renewables Portfolio Standards

**Ryan H. Wiser**

Lawrence Berkeley National Laboratory

**Renewable Energy Markets Conference**

San Francisco, California

November 16, 2011

# Presentation Outline

---

- 1) Overview of State RPS Landscape
- 2) Policy Design Variations
- 3) Impacts: Past and Future
- 4) Ongoing Issues and Challenges

# What Is a Renewables Portfolio Standard?

## **Renewables Portfolio Standard (RPS):**

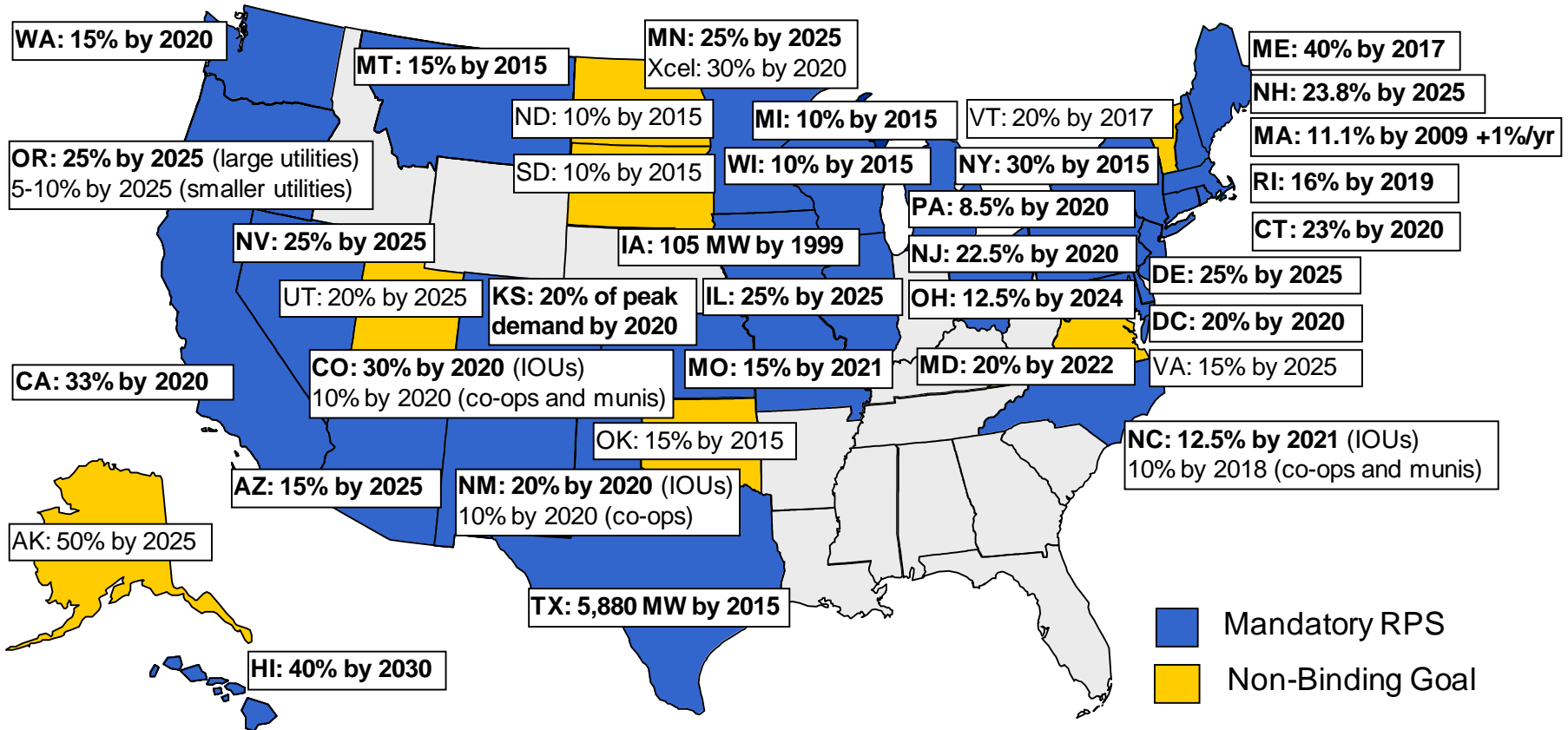
- A requirement on retail electric suppliers...
- to supply a minimum percentage or amount of their retail load...
- with eligible sources of renewable energy.

**Typically** backed with penalties of some form

**Often** accompanied by a tradable renewable energy credit (REC) program, to facilitate compliance

**Never** designed the same in any two states

# RPS Policies Exist in 29 States and D.C.; 7 More States Have Non-Binding Goals



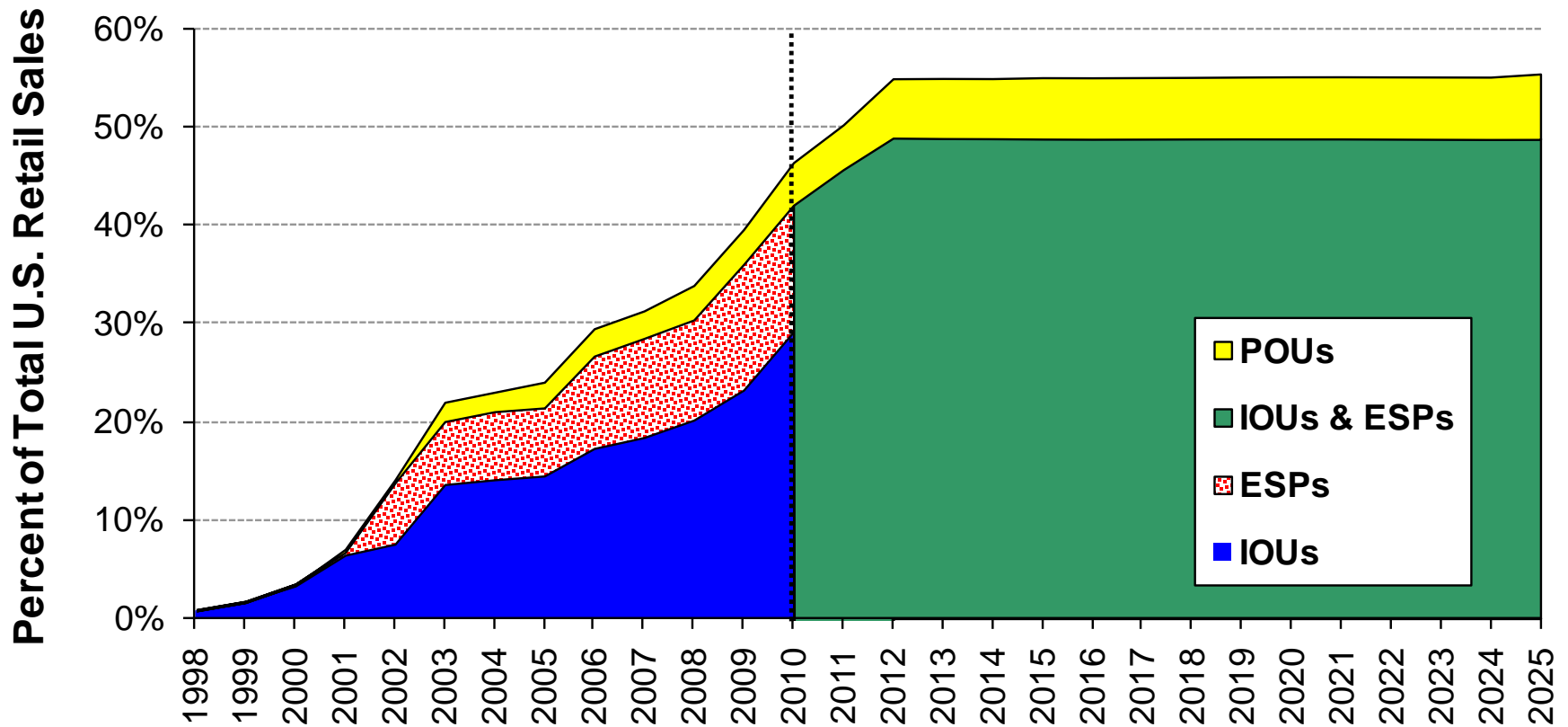
Source: Berkeley Lab

Note: Mandatory standards or non-binding goals also exist in US territories (American Samoa, Guam, Puerto Rico, US Virgin Islands) – these are not covered in this presentation

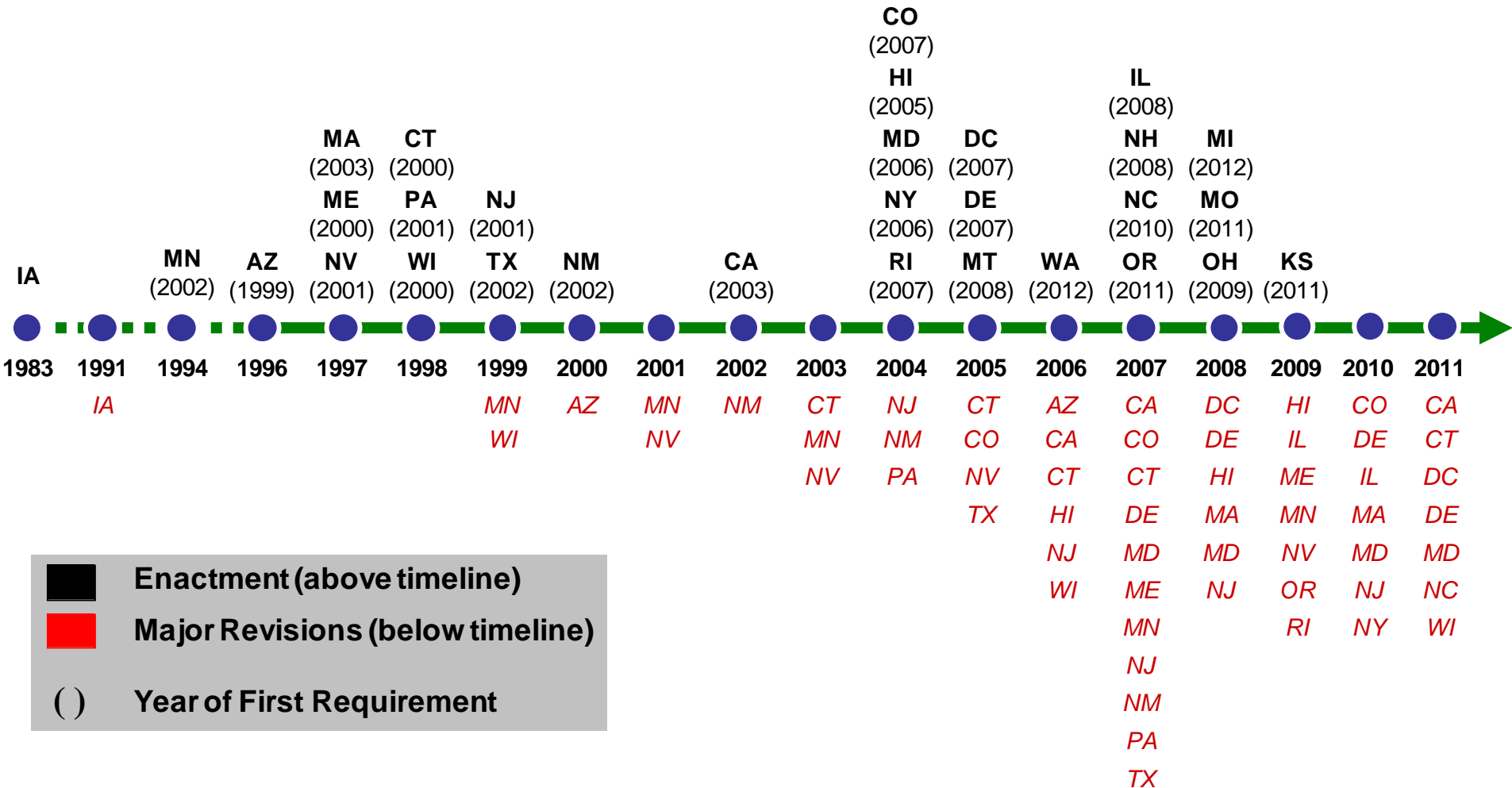
Most policies established through state legislation, but some initially through regulatory action (NY, AZ) or ballot initiatives (CO, MO, WA)

# Existing RPS' Apply to 50% of U.S. Load in 2011 (Will Apply to 56% Once Fully Implemented)

## U.S. Electrical Load with Active State RPS Obligations (Historical and Projected)



# Enactment of New RPS Policies Is Waning, But States Continue to Hone Existing Policies



Enactment (above timeline)  
 Major Revisions (below timeline)  
 ( ) Year of First Requirement



# Notable Recent Developments

## State-Specific RPS Developments (2011 to-date)

- CA: Increased/extended RPS to 33% by 2020 with specified limits on unbundled RECs and firmed/shaped products
- CT: Introduced long-term REC contracting program for small renewables
- DC: Increased solar set-aside; adopted declining SACP schedule; restricted solar set-aside eligibility to projects <5 MW connected to DC distribution system
- DE: Transferred compliance obligation to regulated distribution service provider; expanded solar set-aside eligibility to include certain fuel cell projects
- MA: Proposed long-term SACP schedule
- MD: Expanded solar set-aside eligibility to include solar water heating; reclassified waste-to-energy as Tier 1
- NC: Expanded eligibility to include direct load control/demand response
- WI: Expanded eligibility to include new large hydropower

## General Trends in New and Proposed Revisions

- Increased stringency of RPS purchase targets (though momentum has slowed)
- Honing solar set-aside provisions (eligibility rules, SACP schedules, contracting mechanisms)
- Efforts to address REC oversupply/volatility (especially SRECs)
- Upsurge in legal/political efforts to weaken RPS policies

# State RPS Policies Feature Significant Design Differences

- Renewable purchase targets and timeframes
- Entities obligated to meet RPS, and use of exemptions
- Eligibility of different renewable technologies
- Whether existing renewable projects qualify
- Treatment of out-of-state generators
- Whether technology set-asides or other tiers are used
- Use of credit multipliers for favored technologies
- Allowance for RECs, and REC definitions
- Methods to enforce compliance
- Existence and design of cost caps
- Compliance flexibility rules, and waivers from compliance
- Contracting requirements and degree of regulatory oversight
- Compliance filing and approval requirements
- Compliance cost recovery
- Role of state funding mechanisms

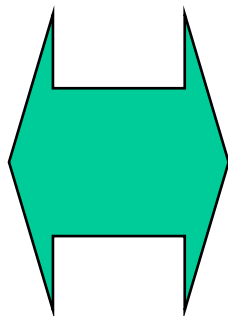


# Structure of RPS: RPS Compliance Models Vary Substantially

## Regulated Markets

Dominated by long-term bundled contracts for electricity and RECs

Utility RFP solicitations or bilateral negotiations, with regulatory oversight



## Restructured Markets

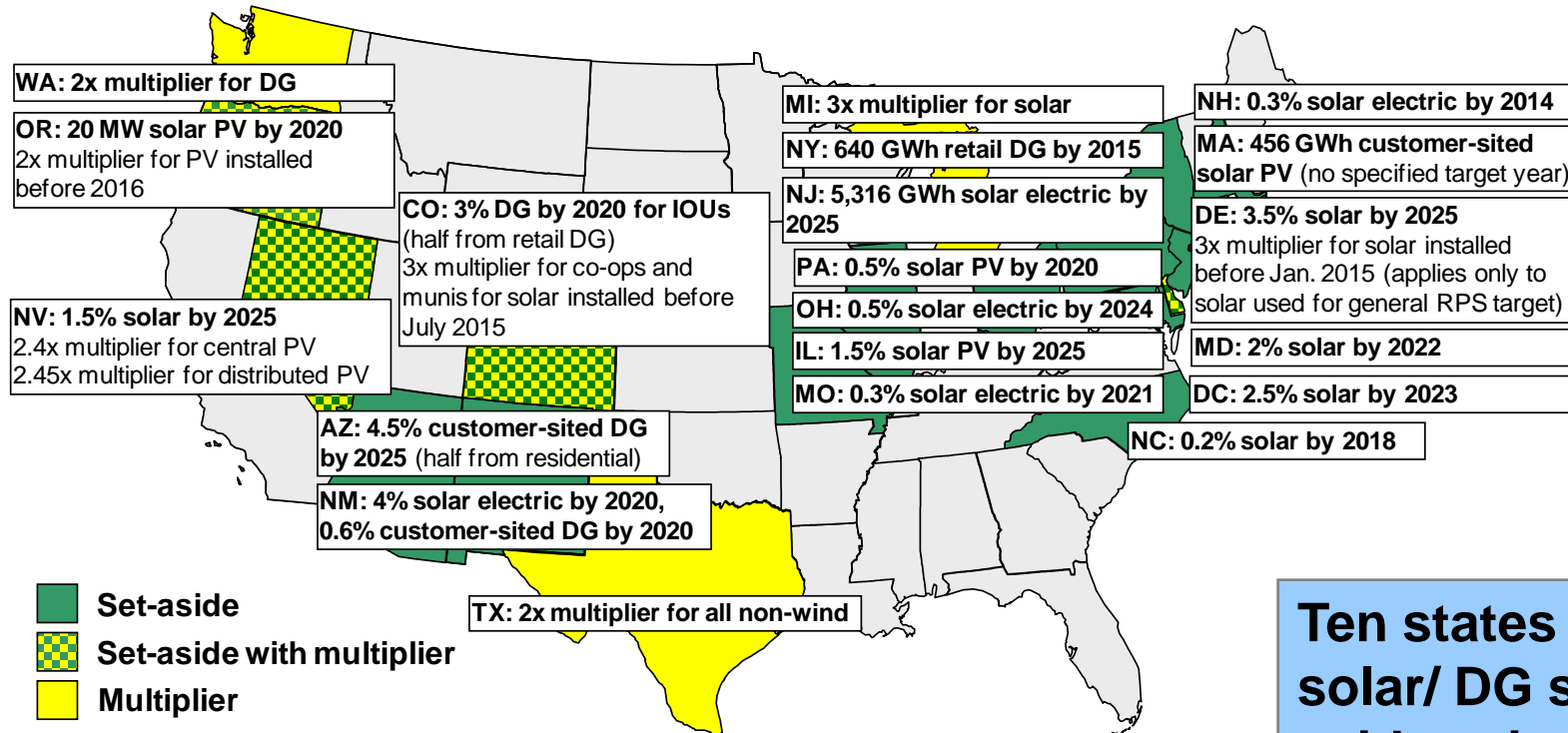
More often dominated by short-term trade in RECs, without PUC oversight

Developers often sell electricity and RECs separately

**Two states require a government-directed agency to conduct procurements under the RPS: New York and Illinois**

# RPS Increasingly Designed to Support Resource Diversity: Most Commonly Solar and DG

**16 states + D.C.** have solar or DG set-asides, sometimes combined with credit multipliers; 3 other states only have credit multipliers



Source: Berkeley Lab

Note: Compliance years are designated by the calendar year in which they begin

Differential support for solar/DG provided in CT and RI via long-term contracting programs with legislatively-established budgets or capacity targets

**Ten states created solar/ DG set-asides since 2007:**  
DE, IL, MA, MD, MO, NC, NH, NM, OH, OR

# Geographic Eligibility and Electricity Delivery Rules Vary Considerably

## Variation reflects differing:

- wholesale market structure and geography
- state interests in supporting in-state or in-region RE
- interpretations of the requirements imposed by the Interstate Commerce Clause

**Table provides examples: many states employ multiple requirements, and therefore would fit in multiple rows**

Geographic Eligibility and Delivery Requirements (Main Tier)	Examples
In-state generation requirement	HI, IA
In-region generation requirement	DC, MI, MN, OR, PA
Electricity delivery required to state or to LSE	
Direct transmission inter-tie between generators and state	TX
Broader delivery requirements to state or to LSE	AZ, CA, KS, MT, NM, NV, NY, OH, WI
Electricity delivery required to broader region	
Generators <u>anywhere</u> outside region must deliver electricity to region	DE, ME, NJ, WA
Generators in <u>limited areas</u> outside region must deliver electricity to region	CT, DC, MA, MD, NH, RI
In-state generation encouragement	
In-state multipliers	CO, MO
Cost-effectiveness test	IL
Limit on RECs from out-of-state generators	NC

# Operational Experience with State RPS Policies Remains Somewhat Limited

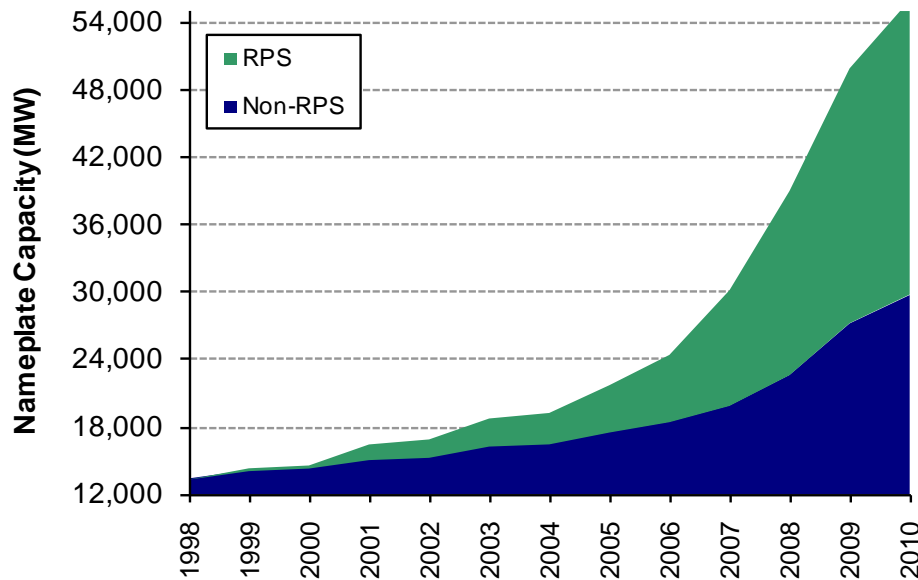
## Operational Experience with State RPS Policies (number of major compliance years completed-to-date)



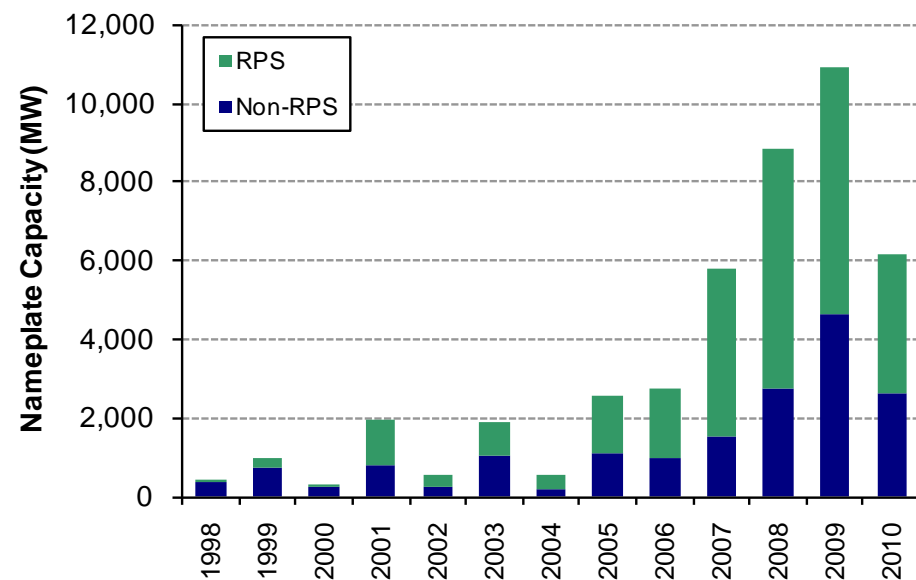
# State RPS Policies Appear to Be Motivating Substantial Renewable Capacity Development

## Cumulative and Annual Non-Hydro Renewable Energy Capacity in RPS and Non-RPS States, Nationally

Cumulative Capacity



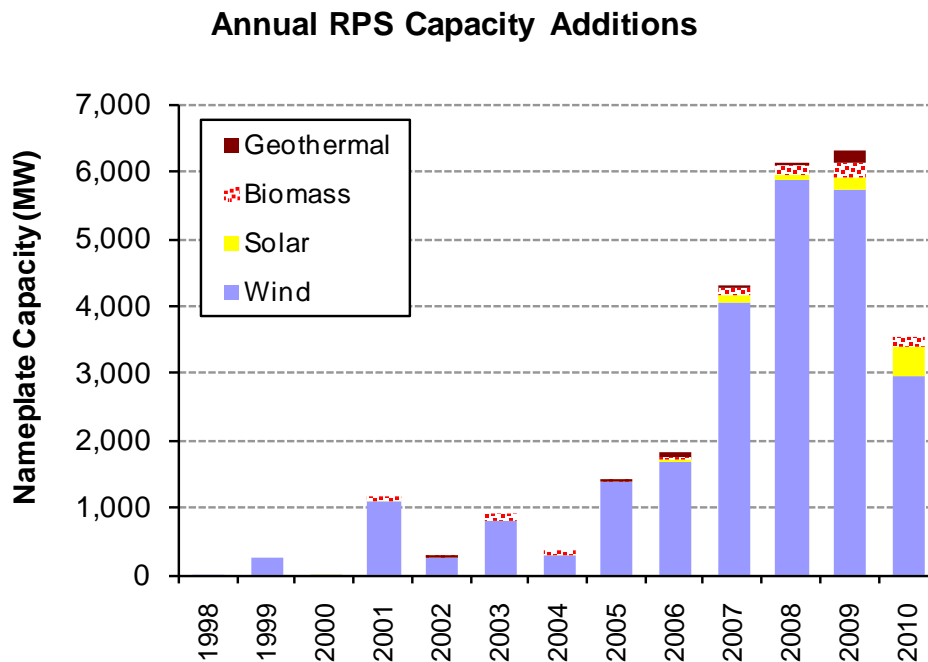
Annual Capacity Additions



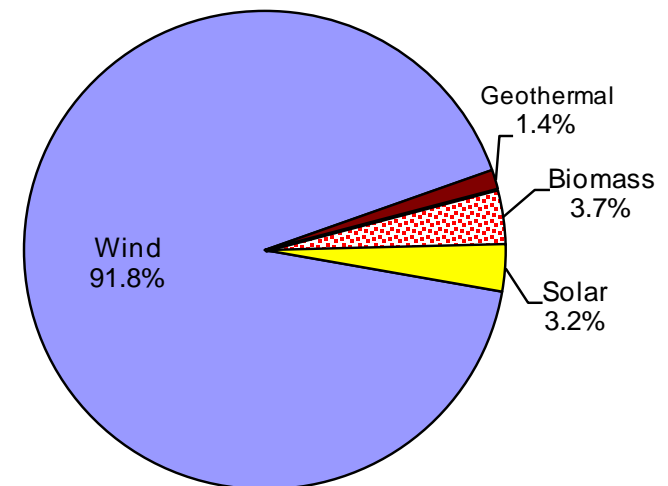
Though not an ideal metric for RPS-impact, 61% of the 44 GW of non-hydro renewable additions from 1998-2010 (**27 GW**) have occurred in states with active/impending RPS compliance obligations

# State RPS' Have Largely Supported Wind: Resource Diversity Limited So Far

## RPS-Motivated\* Renewable Energy Capacity Additions from 1998-2010, by Technology Type

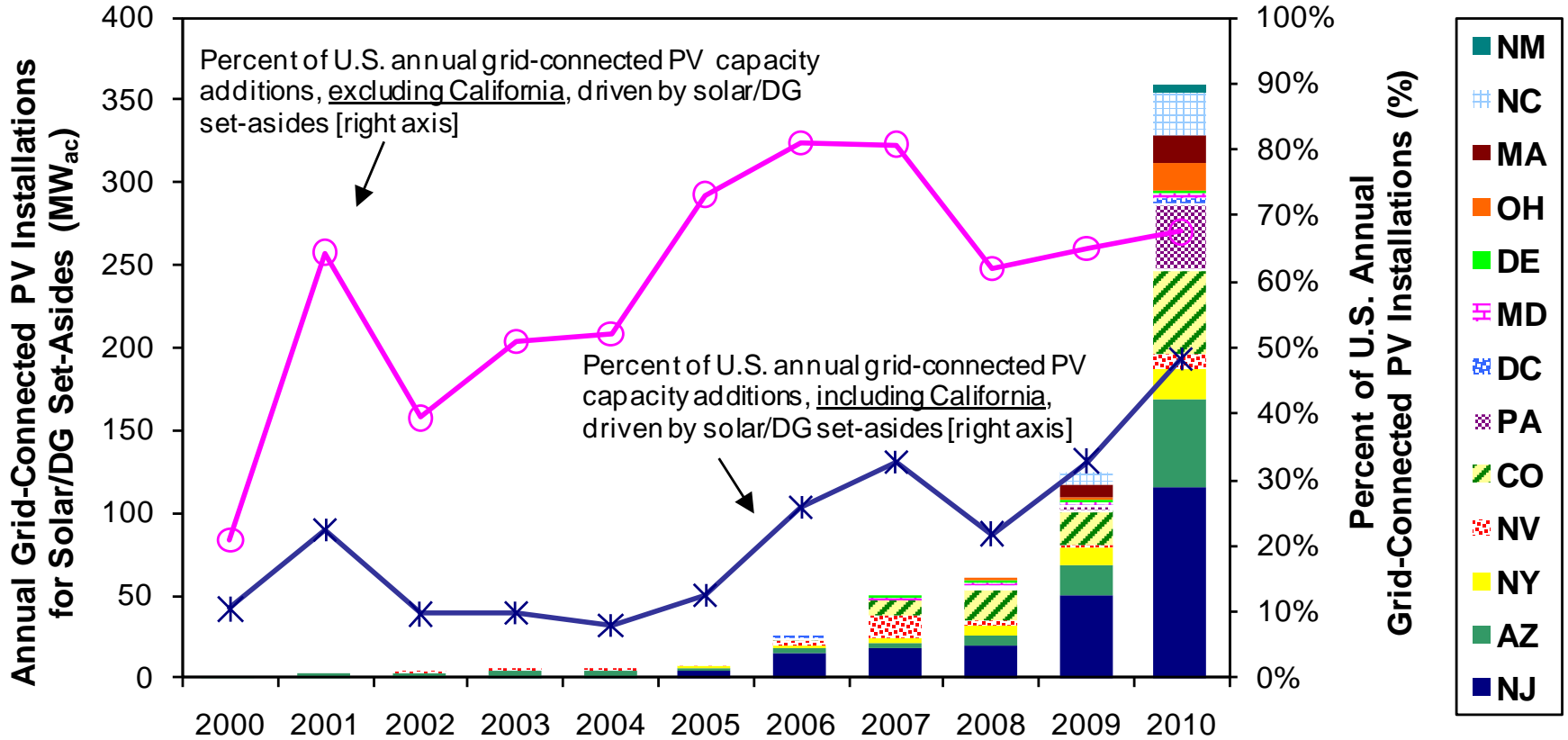


**Cumulative RPS Capacity Additions  
(1998-2010)**



\* Renewable additions are counted as "RPS-motivated" if and only if they are located in a state with an RPS policy and commercial operation began no more than one year before the first calendar year of RPS compliance obligations in the host state. On an energy (as opposed to capacity) basis, wind energy represents approximately 87%, biomass 9%, geothermal 3%, and solar 1% of cumulative RPS-motivated renewable energy additions from 1998-2010, if estimated based on assumed capacity factors.

# Impact of Solar/DG Set-Asides Is Growing: 646 MW<sub>ac</sub> PV, 65 MW CSP from 2000-10



Set-asides also benefiting solar-thermal electric (CSP): 1 MW (Arizona) constructed in 2006, and 64 MW (Nevada) in 2007

# Declining Solar Costs Will Increase RPS Resource Diversity Even without Set-Asides

Wind facing increased competition in California from solar; same is true elsewhere in SW and, to a lesser extent, in other regions

**Increased competition largely driven by price reductions for utility-scale solar**

**More than 21,500 MW of contracts with new renewable generators signed in California since 2002\***

Wind	53%
Solar	42%
Geothermal	3%
Biomass/MSW	3%
Small hydro	<1%

*\*Based on CPUC RPS contract database for IOUs and analysis of contract announcements by POUs*

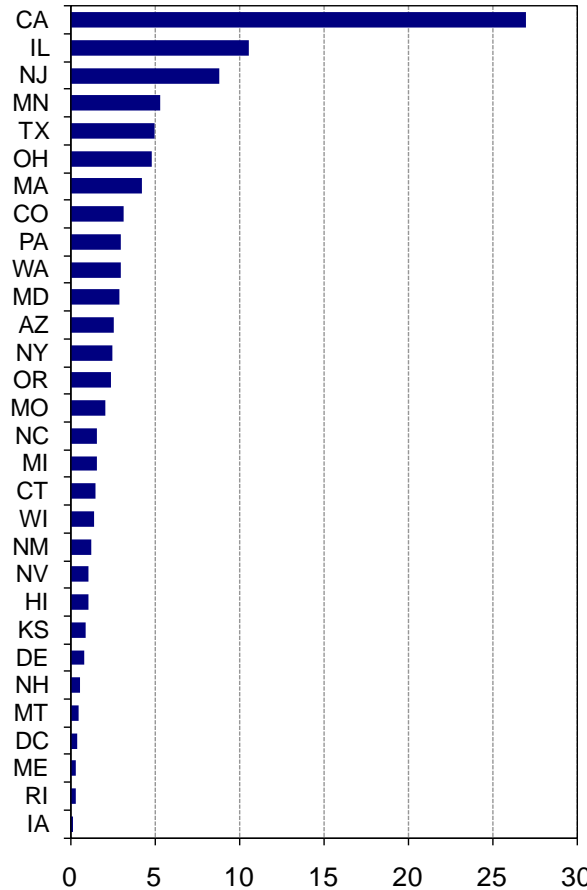


# Future Impacts of Existing RPS Policies Are Projected To Be Relatively Sizable

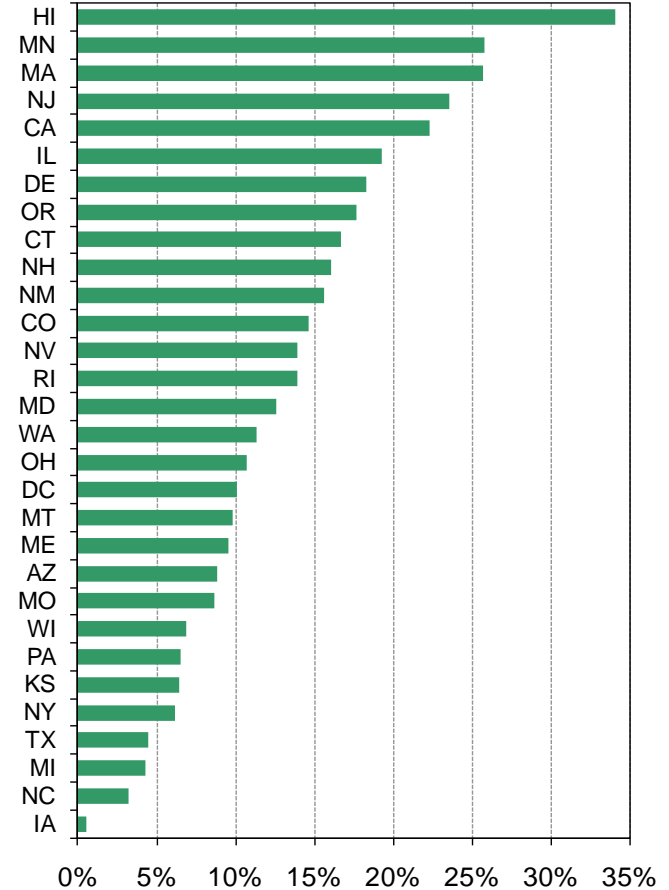
**~100 GW** of new\* RE by 2035, if full compliance is achieved  
**(109 GW including voluntary goals)**

7% of projected generation in 2035;  
 32% of projected load growth from 2000-2035

**New Renewable Capacity by 2035  
 (Nameplate GW)**



**New Renewable Generation by 2035  
 (Percent of Statewide Retail Sales)**

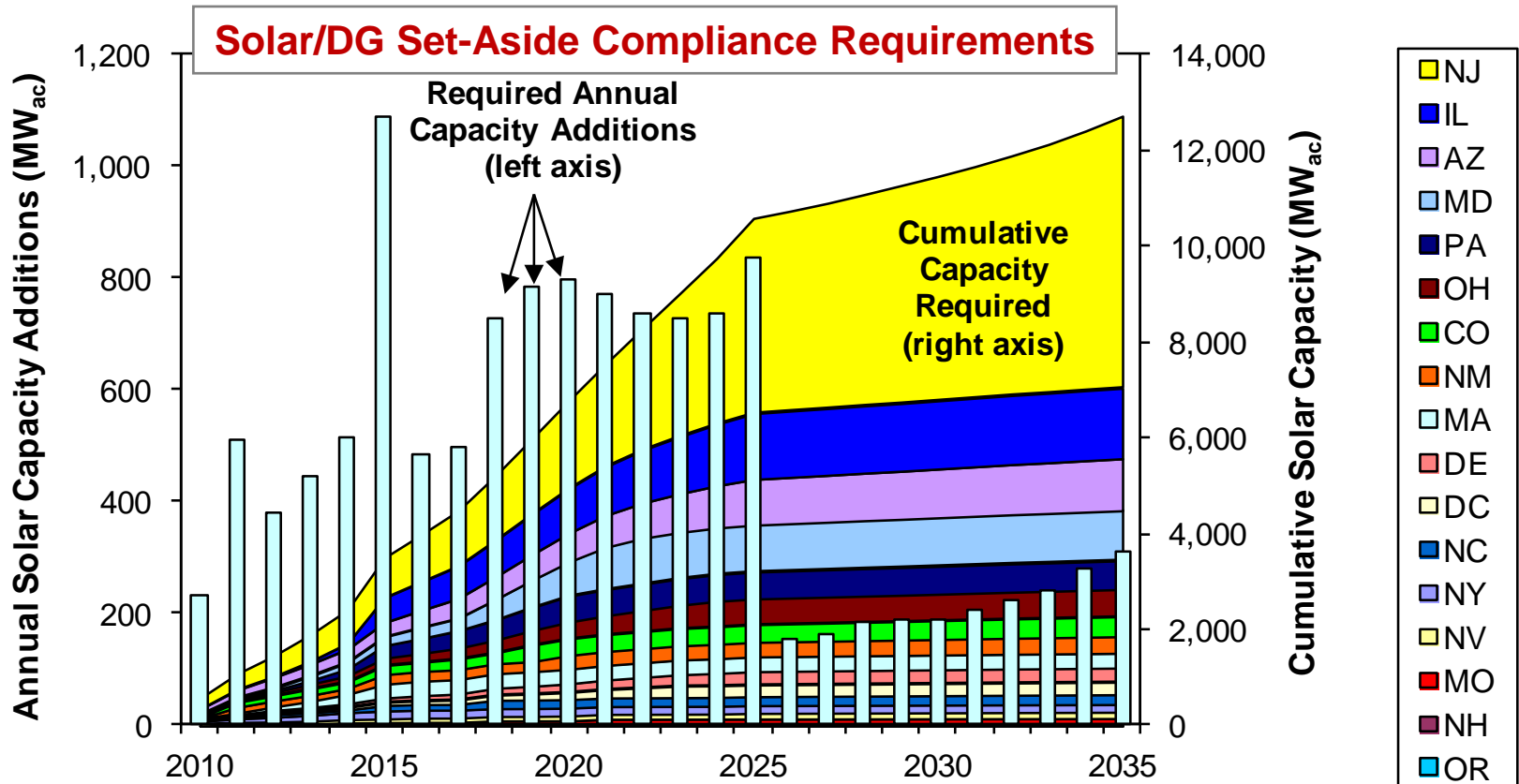


\* *New renewables* defined based on state-specific distinctions between new vs. existing or on the year in which the RPS was enacted



# Future Impacts of Solar/DG Set-Asides Are Also Projected To Be Substantial

- Cumulative capacity requirement grows to **10,600 MW** by 2025
- Required average annual solar capacity additions of **~450 MW/yr** from 2011-14, **~700 MW/yr** from 2015-25



# Ongoing Issues and Challenges

---

- Price trends and near-term over-supply of RE
- Required additional RE deployment is “limited”
- State RPS compliance challenges in some cases
- Rate impacts and cost concerns
- Other emerging state policy design issues

# REC Prices Have Dropped Substantially in Many Regions Over the Last Two Years

---

- **REC prices historically volatile - dropped substantially in many regions recently (main tier and solar RECs)**
- **Recent price trends reflect “over-supply” to meet RPS (CA the obvious exception)**
  - Wholesale electricity prices have also declined substantially over the same period...
  - In concert with low REC prices, make RE economics more challenging in near term despite drop in RE costs
- **States have considered and implemented various measures to mitigate these effects**
  - Increasing or accelerating RPS targets
  - Long-term contracting programs/requirements
  - Price support mechanisms
  - Various other approaches

# State RPS, and Proposed Federal RPS, Require Fewer RE Additions than Experienced in 2008-10

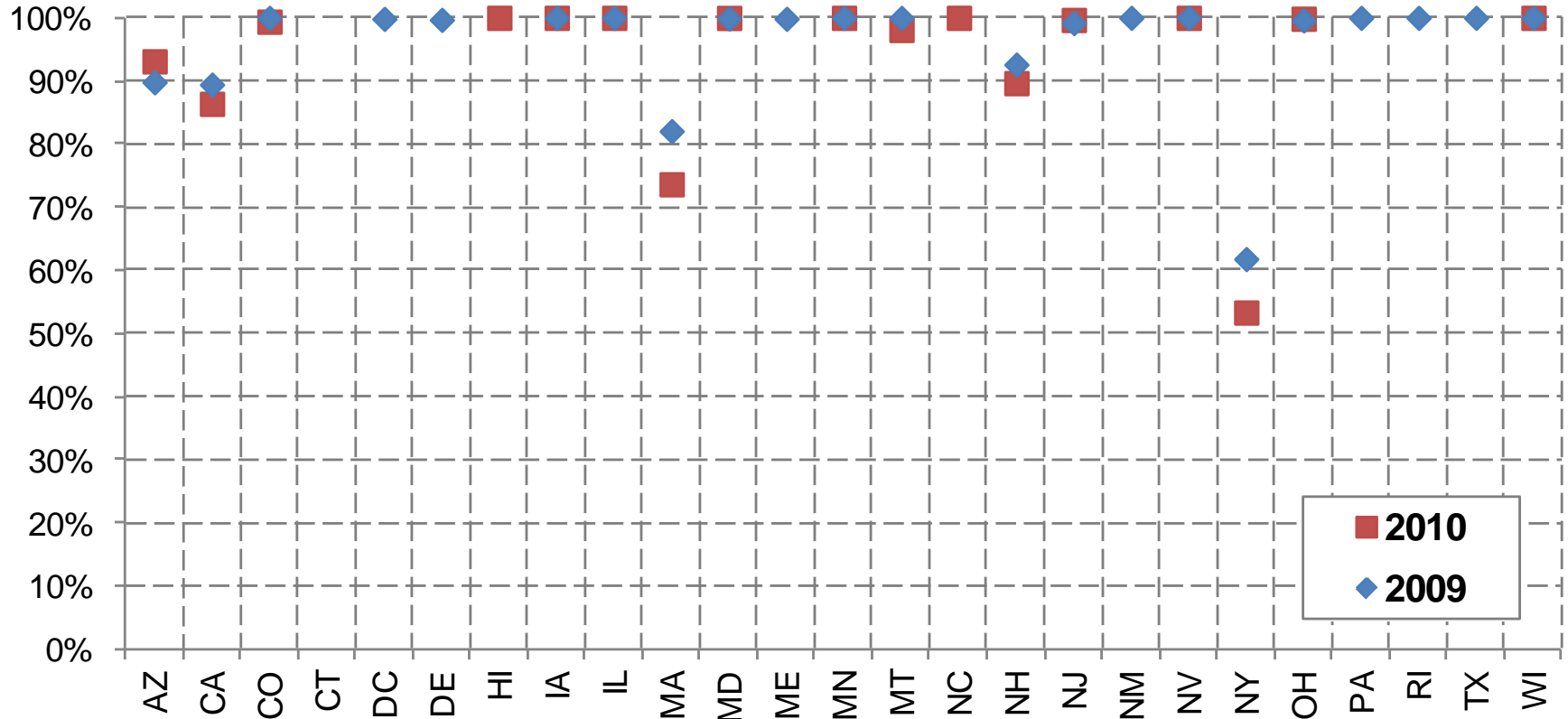
## Recent RE capacity additions vs. RE additions required to meet current state RPS policies and proposed Federal RPS

<b>Recent Renewable Capacity Additions (2008-2010)</b>	6-11 GW/yr
<b>Average Annual Renewable Capacity Additions (2011-2025)</b>	
State RPS Requirements	4-5 GW/yr
Proposed Federal RPS (Bingaman 2010) + State RPS	4-9 GW/yr

- ➔ Continued growth at 2008-10 rate exceeds level required to meet state RPS'; would be sufficient to meet the most recent Federal RPS proposal
- ➔ Federal clean energy standards (CES) could yield more or less RE capacity than historical growth, depending on the specific proposal
- ➔ New/increased state RPS policies appear less likely going forward in near term, (policy weakening possible)
- ➔ Demand from non-RPS markets (green power, IRP, least cost) needed to maintain 2008-10 installation rate

# Targets Largely Met with Renewable Energy or RECs, But Some Struggles Are Apparent

**Percent of RPS Target Met with Renewable Electricity or RECs**  
(including available credit multipliers and banking, but excluding ACPs and borrowing)

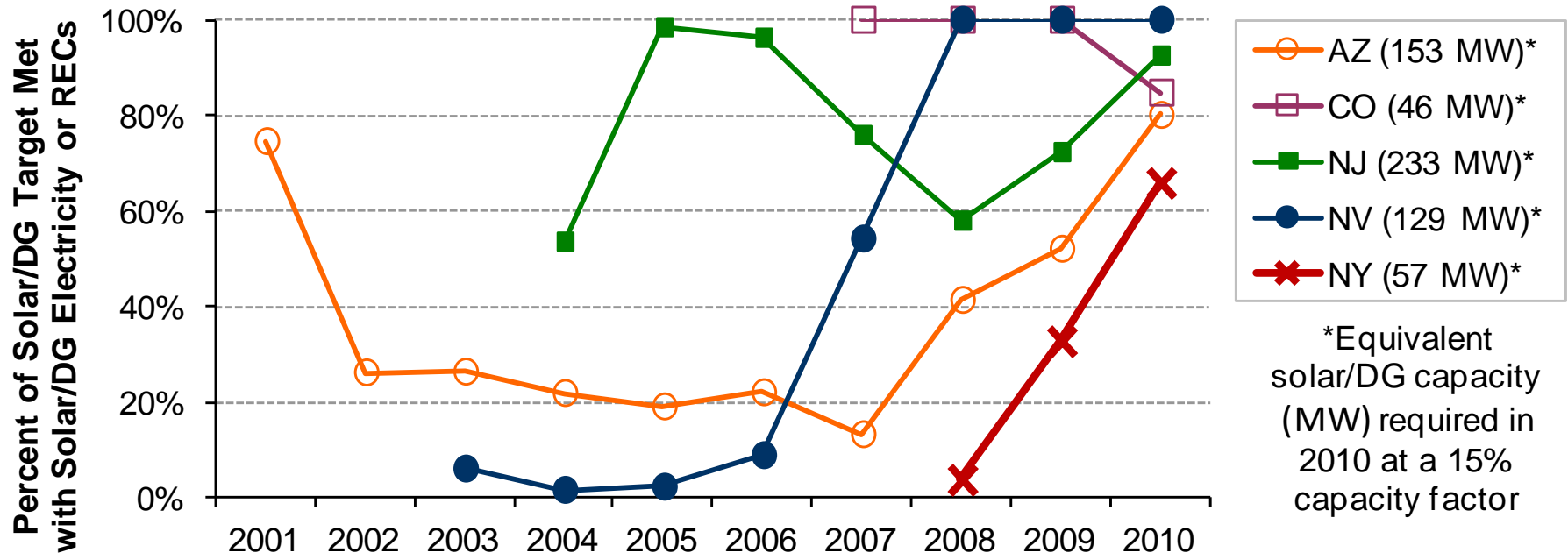


*Note: Percentages less than 100% do not necessarily indicate that "full compliance" was not technically achieved, because of ACP compliance options, funding limits, or force majeure events.*

# Solar Set-Asides Not Universally Achieved with RE or RECs, But Signs of Improvement

Early-year retirement of solar electricity/RECs, relative to set-aside requirements, mixed: average level in 2010 = **86%**

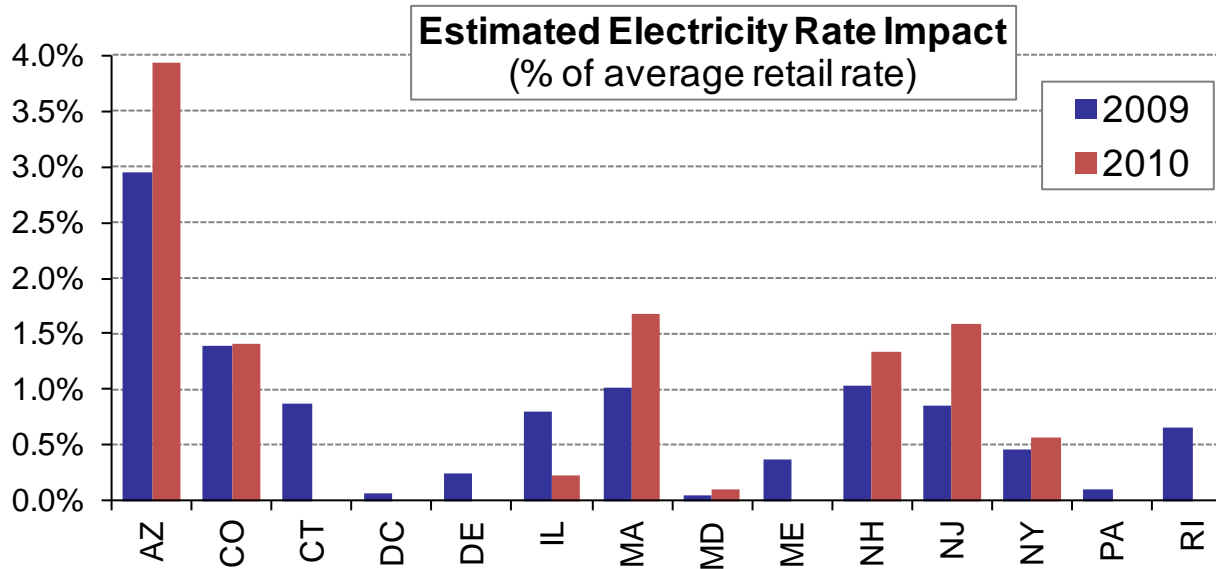
**States with Large (>40 MW) Solar/DG Targets in 2010**



Note: Percentages less than 100% do not necessarily indicate that "full compliance" was not technically achieved, because of ACP compliance options, funding limits, or force majeure events.

# Rate Impacts of State RPS Policies Have Generally Been 'Modest' So Far (< 5%)

Translating REC prices or state-specific funding to rate impacts in 2009 and 2010 yields the results shown below



States not included if data on incremental RPS compliance costs are unavailable (CA, IA, HI, MN, MT, NC, NM, NV, OH, TX, WI) or if RPS did not apply in 2009-10 (KS, MI, MO, OR, WA).

- Rate impacts differ due to target levels, REC/ACP prices, and presence of set-asides
- Rate impacts in some states (AZ, CO, NY) include up-front incentives for solar/DG, which contribute to compliance in future years
- Rate impacts of RPS policies in states that are dominated by long-term contracts are generally unknown, but anecdotal evidence suggests limited impacts so far, and quite possibly even rate reductions in several states



# Other Emerging and Continuing Issues Facing State RPS Programs

---

- Long-term contracting needs in “restructured” markets otherwise dominated by short-term REC transactions
- Addressing the dual desires for liquid RE markets *and* in-state benefits in the face of the Commerce Clause
- Managing compliance enforcement procedures, force majeure events, and cost caps as targets become binding
- Maintaining some stability and predictability in the face of numerous ongoing policy design changes
- Interactions between state and possible future Federal policies
- Addressing the other barriers to renewable energy: transmission, integration, siting, etc.