Renewables Portfolio Standards in the United States:
A Status Update

Galen Barbose
Lawrence Berkeley National Laboratory

National Conference of State Legislatures
Spring Forum 2013
Denver, Colorado
May 2, 2013

Presentation Outline

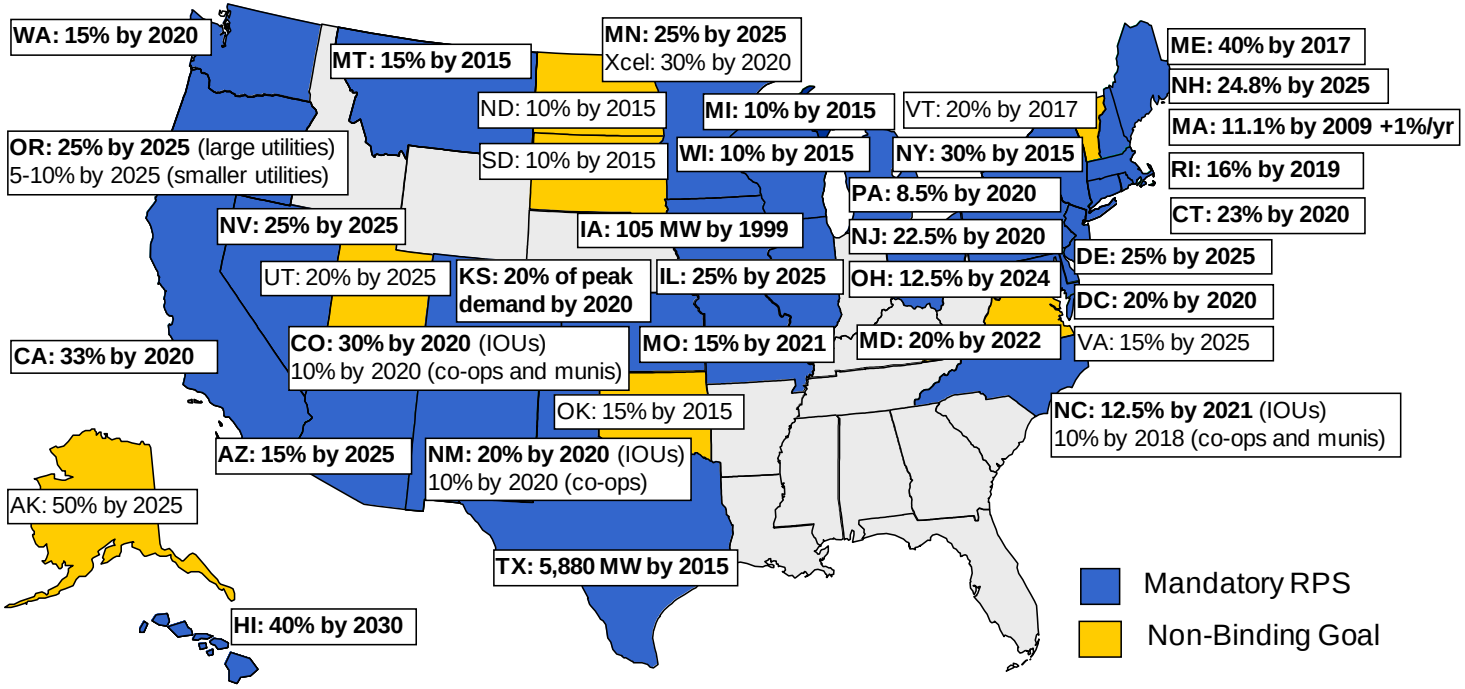
1) Overview of State RPS Landscape

2) Impacts on Renewables Development

3) Compliance Experience and Costs

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

Existing RPS policies apply to **55%** of U.S. electricity demand



Source: Berkeley Lab

Notes: Compliance years are designated by the calendar year in which they begin. Mandatory standards or non-binding goals also exist in US territories (American Samoa, Guam, Puerto Rico, US Virgin Islands)

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

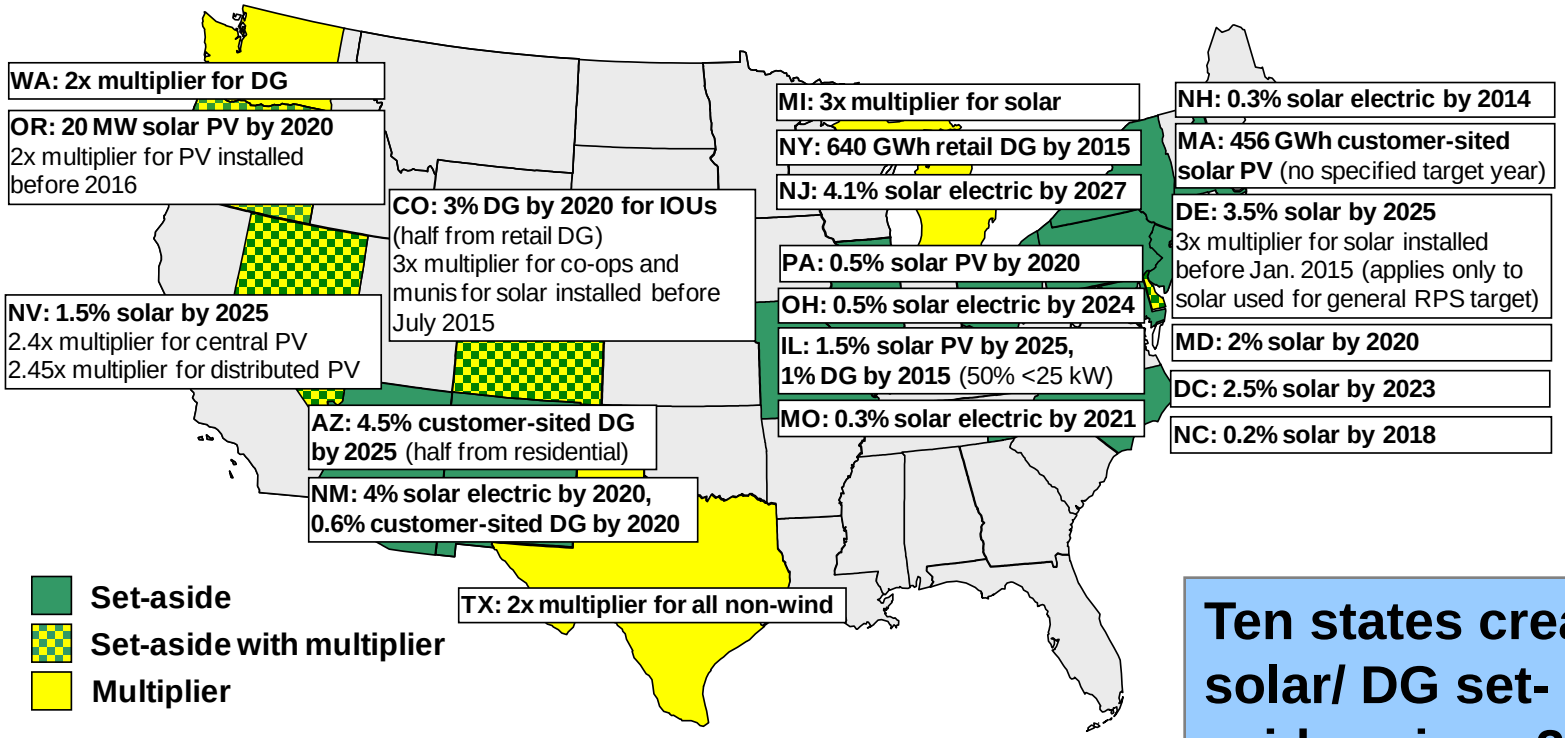
Enactment of New RPS Policies Is Waning, But States Continue to Hone Existing Policies

Year	Enactment	Major Revisions
1983	IA	
1991		IA
1994	MN (2002)	
1996	AZ (1999)	
1997	MA (2003), ME (2000), NV (2001)	
1998	CT (2000), PA (2001), WI (2000)	
1999	NJ (2001), TX (2002)	MN, WI
2000	NM (2002)	AZ
2001		MN, NV
2002	CA (2003)	NM
2003		CT, MN, NV
2004	CO (2007), HI (2005), MD (2006), NY (2006), RI (2007)	NJ, NM, PA
2005	DC (2007), DE (2007), MT (2008)	CT, CO, NV, TX
2006	WA (2012)	AZ, CA, CT, HI, NJ, WI
2007	IL (2008), NH (2008), NC (2010), OR (2011)	CA, CO, CT, DE, MD, ME, MN, NJ, NM, PA, TX
2008	MI (2012), MO (2011), OH (2009)	DC, DE, HI, MA, MD, NJ
2009	KS (2011)	HI, IL, ME, MN, NV, OR, RI
2010		CO, DE, IL, MA, MD, NJ, NY
2011		CA, CT, DC, DE, IL, MA, MD, NC, WI
2012		MA, MD, NJ, NH, NM, OH

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

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 via long-term contracting programs (CT, DE, NJ, and RI) and via up-front incentives/SREC payments

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

Political and Legal Challenges to RPS Policies Have Been Mounting

- Legislation in 9 states introduced already in 2013 to repeal, reduce, or freeze RPS targets
  - None of those bills have thus far passed
  - American Legislative Exchange Council (ALEC) has developed model legislation to repeal state RPS laws
  - Other legislation has sought revisions that would “weaken” RPS policies (e.g., by expanding eligibility for large/existing hydro)
- Legal issues also raised in court cases & regulatory proceedings
  - Commerce Clause issues, often tied to geographic eligibility rules (MA, CO, CA, MO)
  - Challenges to the jurisdictional authority of the PUC to enact an RPS (AZ)

Presentation Outline

1) Overview of State RPS Landscape

2) Impacts on Renewables Development

3) Compliance Experience and Costs

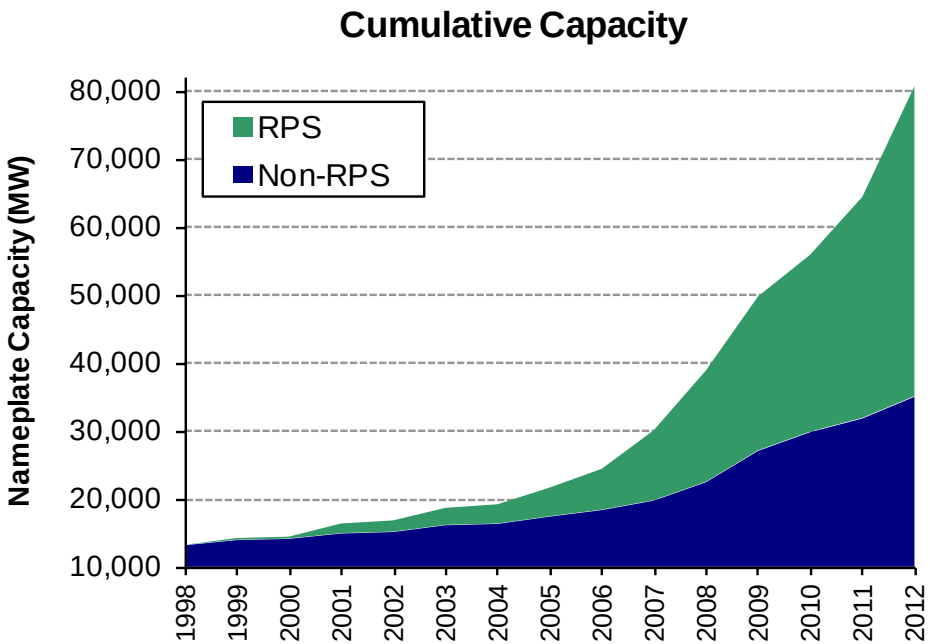
Experience with State RPS Compliance Obligations Varies Widely and is Growing

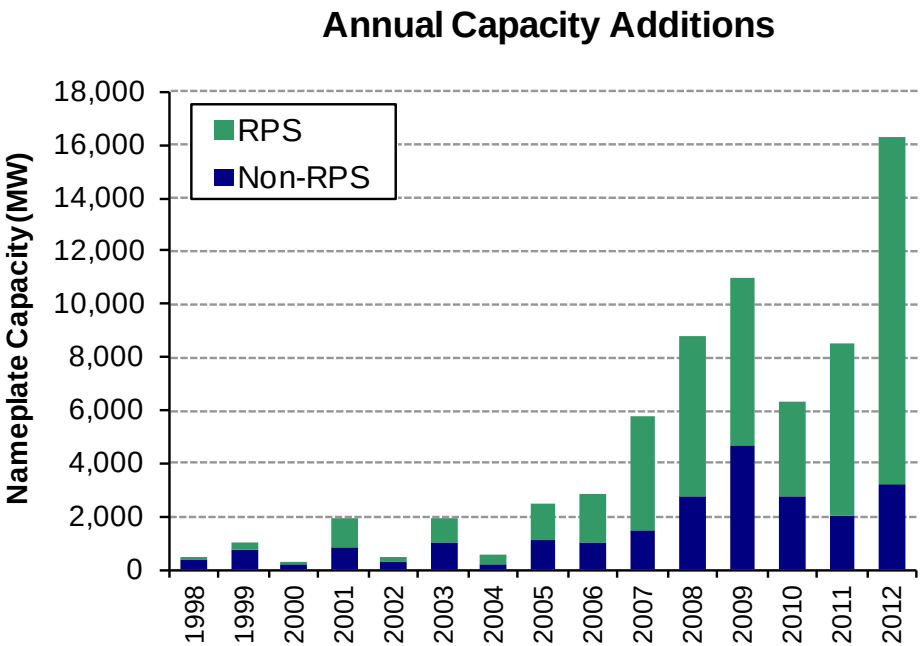
Operational Experience with State RPS Policies
(number of major compliance years completed-to-date)

1 - 2 years	3 – 4 years	5 – 6 years	7 – 8 years	9 – 10 years	> 10 years
Kansas		Colorado			
Michigan		Delaware			
Missouri	Hawaii	Illinois			
Oregon	North Carolina	Montana		California	Arizona
Washington	Ohio	New Hampshire	Maryland	Connecticut	Iowa
		Pennsylvania	New Mexico	Massachusetts	Maine
		Rhode Island	New York	Minnesota	New Jersey
		Washington D.C.	Wisconsin	Nevada	Texas

State RPS Policies Appear to Have Motivated Substantial Renewable Capacity Development

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

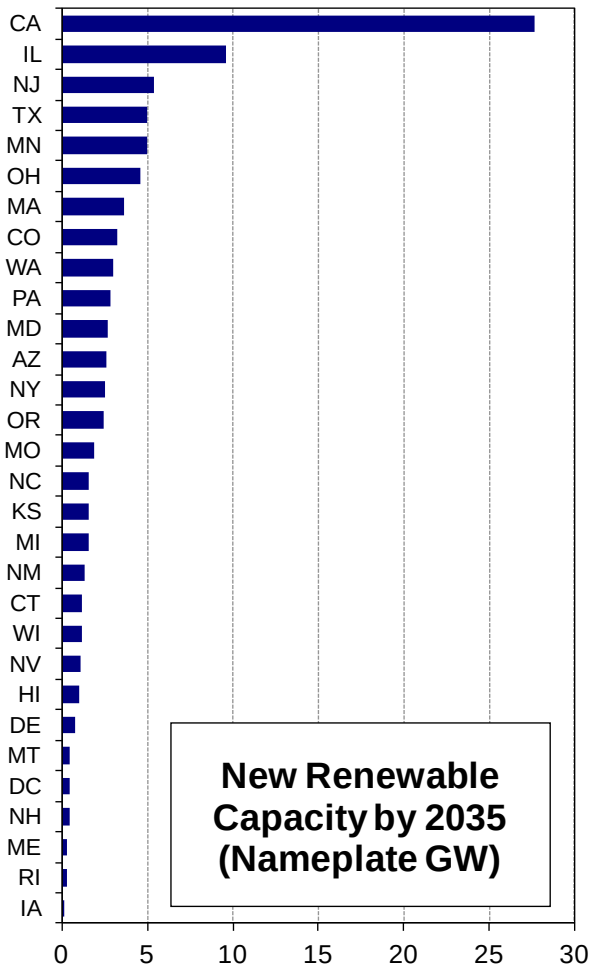


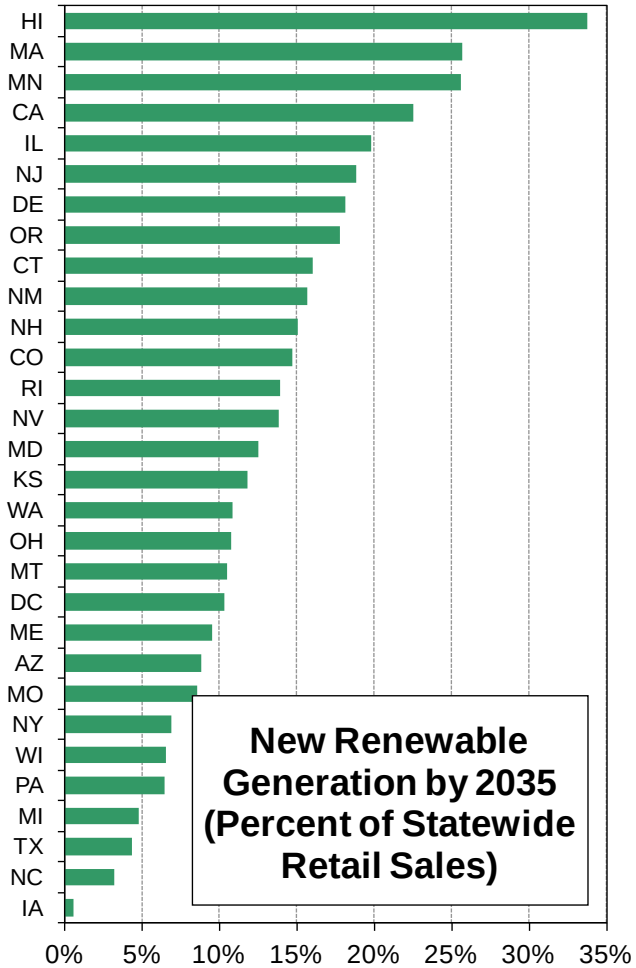


Though not an ideal metric for RPS-impact, **67%** (**46 GW**) of all non-hydro renewable capacity additions from 1998-2012 occurred in states with active/impending RPS compliance obligations

Future RPS Requirements Are Sizable, But Well Within Recent RE Growth Rates

- **94 GW** of "New RE" required by 2035, <u>if</u> full compliance is achieved
- Equates to roughly **3-5 GW/yr** through 2020 and 2-3 GW through 2035
- By comparison, RPS-driven RE additions have ranged from **6-13 GW/yr** in all but one year since 2008

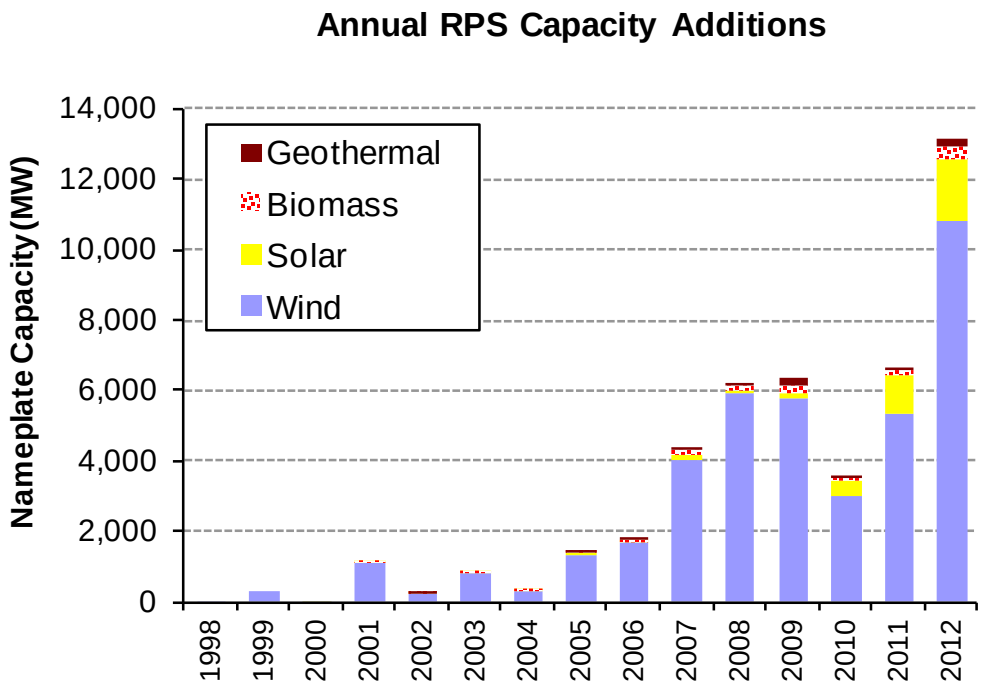


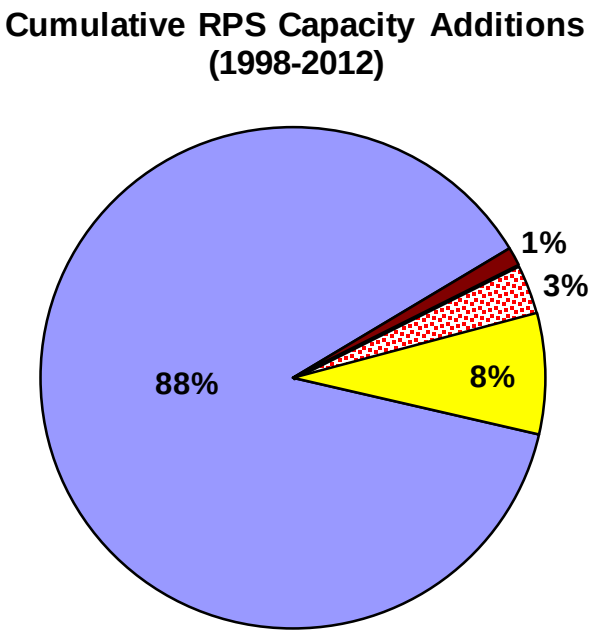


* New RE is defined based on state-specific distinctions between new vs. existing, or based on the year in which the RPS was enacted; <u>it does not represent new renewables relative to current supply</u>

State RPS' Have Largely Supported Wind, Though Solar Has Become More Prominent

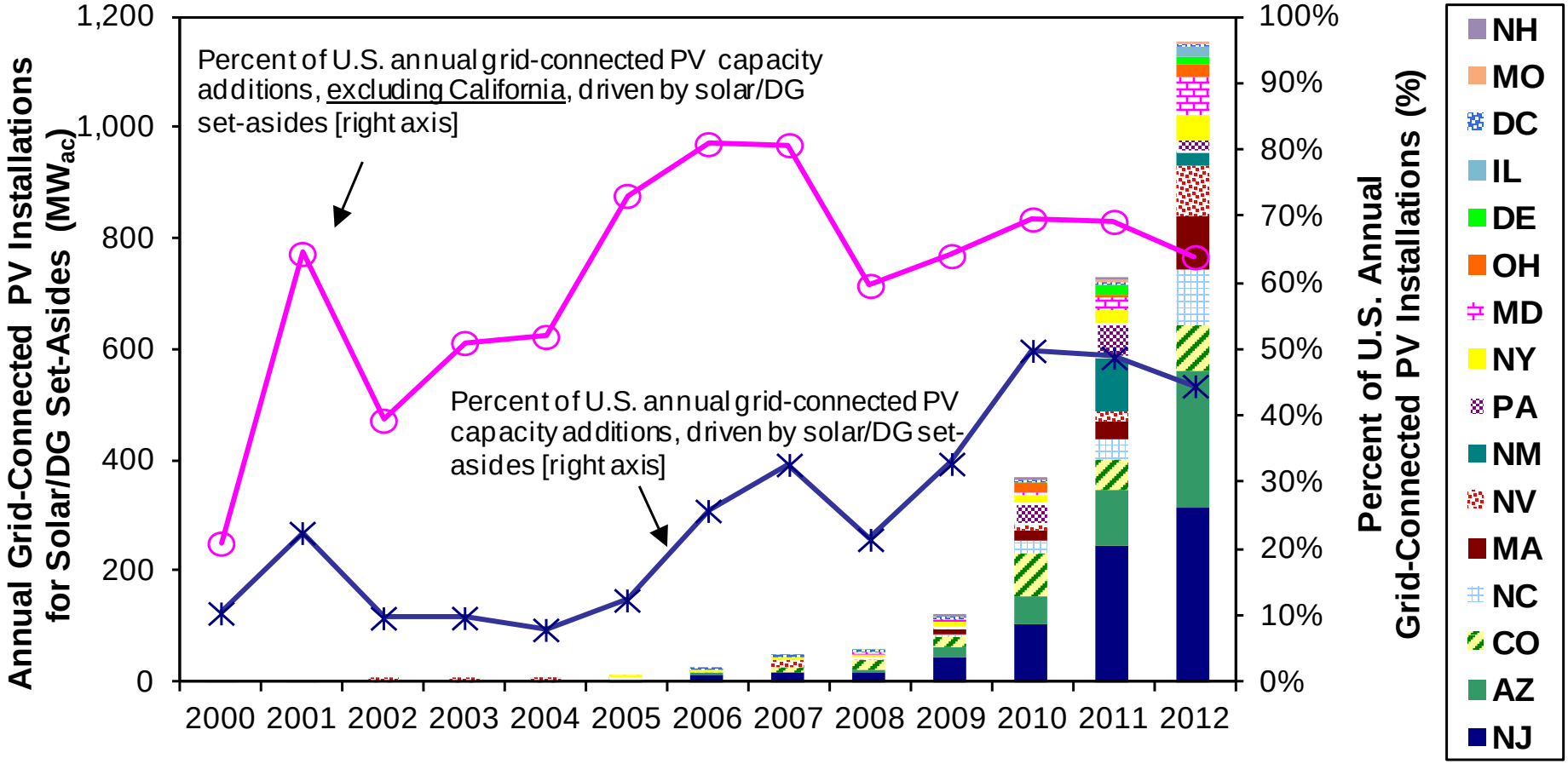
RPS-Motivated* Renewable Energy Capacity Additions from 1998-2012, by Technology Type





** 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 year of RPS compliance obligations in that state. On an energy (as opposed to capacity) basis, wind energy represents approximately 85%, biomass 8%, solar 4%, and geothermal 3% of cumulative RPS-motivated renewable energy additions from 1998-2012, if estimated based on assumed capacity factors.*

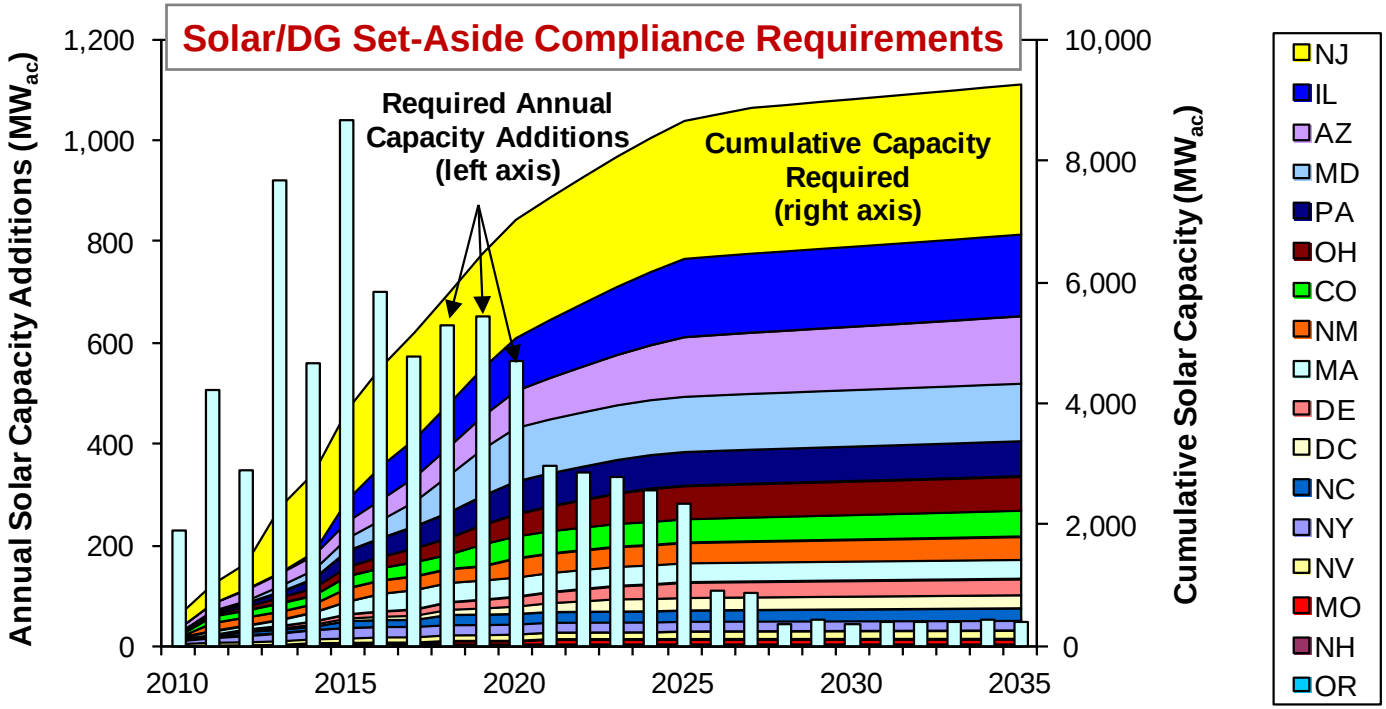
Impact of Solar/DG Set-Asides Is Growing: 2,500 MW_{ac} PV from 2000-2012



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

Solar Market Growth is On Pace to Meet Future Solar/DG Set-Aside Requirements

- Cumulative capacity requirement grows to **9,200 MW by 2035**
- Required average annual solar capacity additions of **700 MW/yr through 2020**, tapering off thereafter
- By comparison, set-aside PV additions reached 1,200 MW in 2012



Presentation Outline

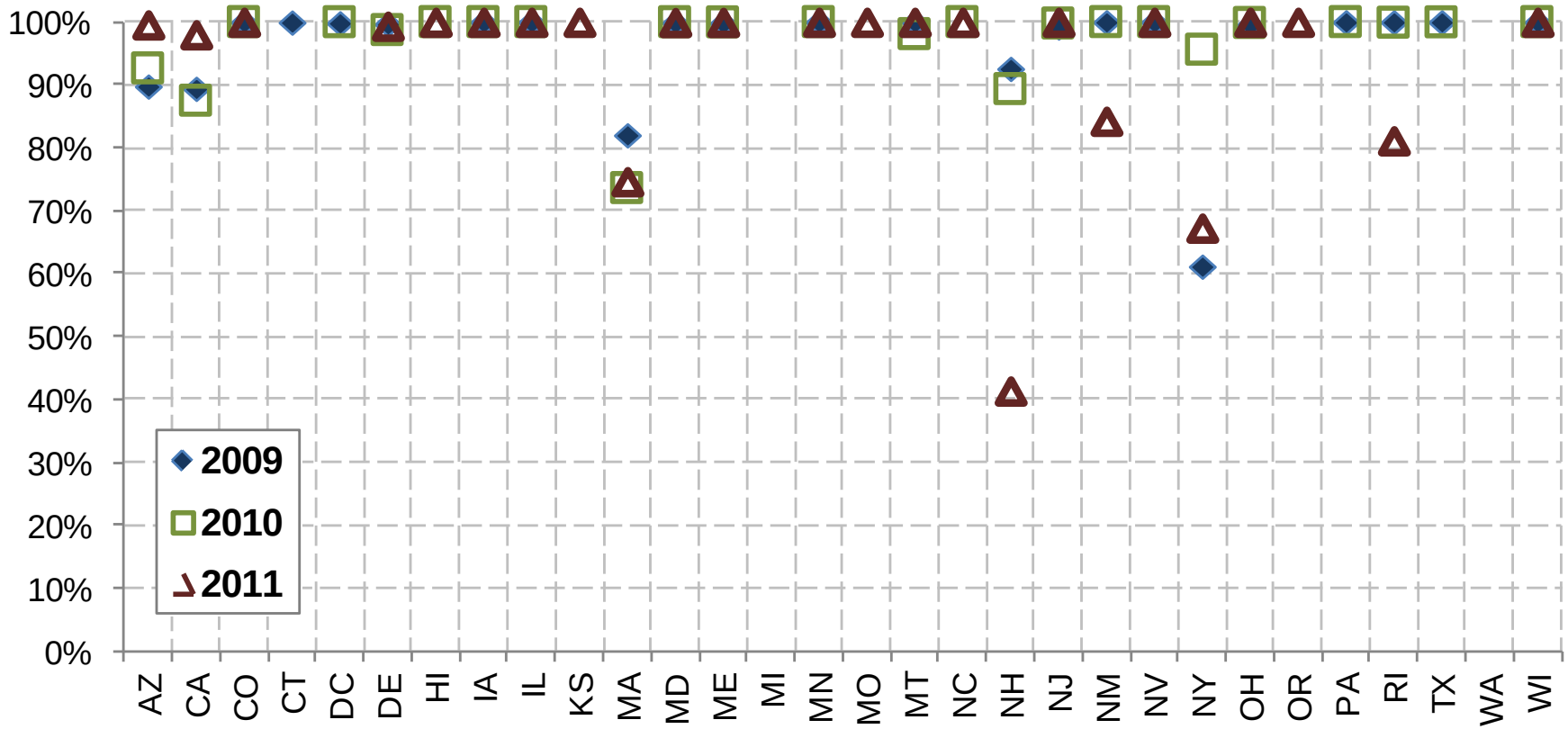
1) Overview of State RPS Landscape

2) Impacts on Renewables Development

3) Compliance Experience and Costs

Targets Largely Met with Renewable Energy or RECs; Isolated Struggles Apparent

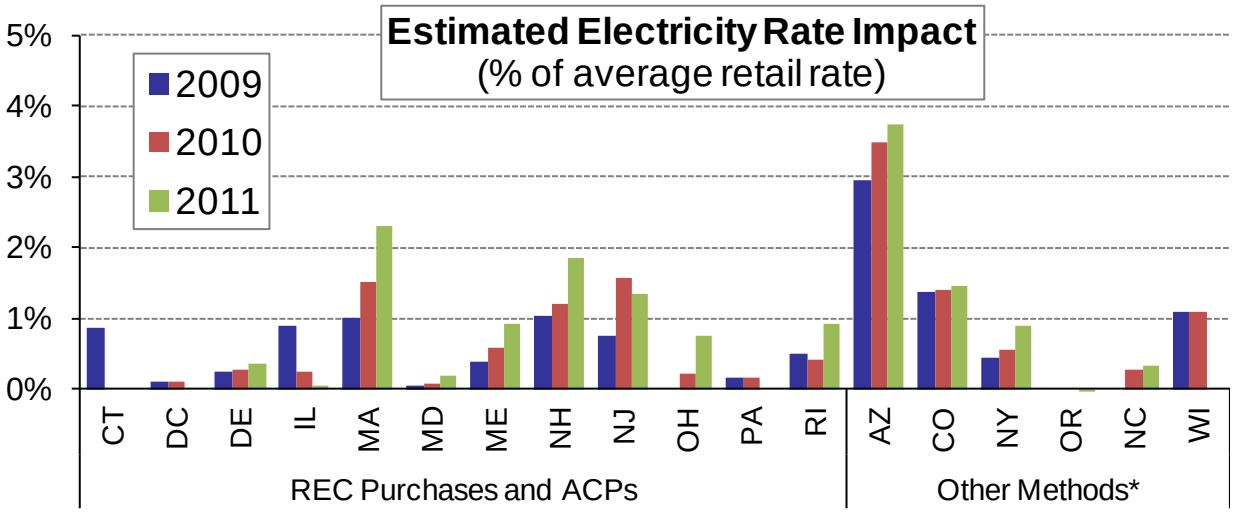
Percent of RPS Target Met with Renewable Electricity or RECs
(including available credit multipliers and banking, but excluding ACPs and borrowing)



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.

Rate Impacts of State RPS Policies Have Generally Been 'Modest' So Far

Translating REC prices or other available data on net incremental costs into retail rate impacts yields the results shown below



Other Methods include utility-reported incremental costs (AZ, OR), RPS tariff rider collections (CO, NC), approved budget (NY), and PUC analysis (WI). States not included if data on incremental RPS compliance costs are unavailable (CA, IA, HI, KS, MN, MO, MT, NC, NM, NV, OH, TX, WI) or if RPS did not apply in 2009-11 (MI, WA).

- Rate impacts in states dominated by long-term contracts are generally unknown, but anecdotal evidence is mixed, with net rate reductions suggested in some cases

- This simplified approach ignores some ratepayer costs (e.g., integration) and benefits (e.g., wholesale electricity price suppression)
- Rate impacts differ with target levels, REC/ACP prices, and presence of set-asides
- Up-front incentives in some states (AZ, CO, NY) create "front-loaded" rate impacts

Given Uncertainty in Future Costs, Cost Caps of Various Designs Are Common

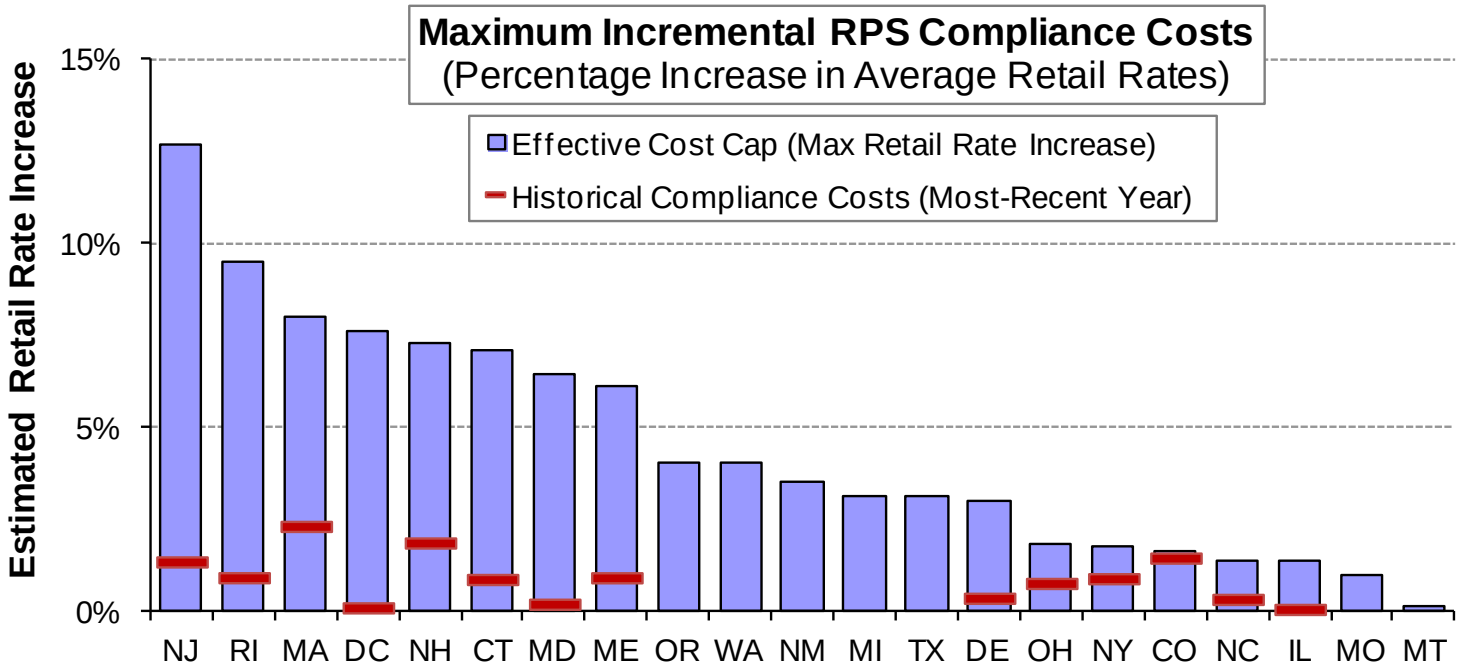
1) **ACP with automatic cost recovery:** MA, ME, NH, NJ, RI
2) **ACP with possible cost recovery:** DC, DE, MD, OR
3) **Retail rate / revenue requirement cap:** CO, KS, IL, MD, MO, NM, OH, OR, WA
4) **Renewable energy contract price cap:** MT, NM
5) **Per-customer cost cap:** MI, NC, NM
6) **Renewable energy fund cap:** NY
7) **Financial penalty may serve as cost cap:** CT, HI, OH, PA, TX

Emerging cost-containment issues:

- Challenges in calculating "incremental" RPS procurement costs in order to assess whether cap is reached (especially with bundled RE contracts)
- Costs for wind/solar have declined, but shale gas has reduced electricity market prices → some cost caps may become limiting, reducing RPS impacts from actual target levels

Most States Have Capped Rate Impacts Well Below 10% (13 States Below 5%)

Many states cost containment mechanisms can be translated into an estimated maximum increase in retail rates



- No explicit cap on <u>incremental</u> compliance costs in 8 states (AZ, CA, IA, KS, HI, NV, PA, WI), though KS caps gross revenue requirements and CA is currently developing its cost containment mechanism

Summary of State RPS Experience-to-Date

- State RPS policies have been a significant driver for renewable energy growth in the United States
- Generally high levels of compliance achieved thus far
- REC prices historically quite volatile; some markets currently over-supplied (esp. for set-asides, depressed SREC prices)
- Significant RE capacity required to meet future RPS targets, but well in-line with pace of RE additions in recent years
- Compliance costs have thus far remained relatively modest, though concerns exist about increasing costs

The Future Role and Impact of State RPS Programs Will Depend On…

- Whether cost caps become binding
- The outcome of ongoing and future legal and legislative challenges
- How policymakers re-tune RPS' in response to changed conditions (RE costs, gas prices, federal tax credits)
- Efforts to address challenges associated with volatile and depressed REC prices and lack of long term contracting options
- How other related issues affecting RE deployment are addressed (transmission, integration, siting, etc.)

Thank You!

For further information:

LBNL renewable energy publications:
http://emp.lbl.gov/research-areas/renewable-energy

Contact information:
Galen Barbose, *glbarbose@lbl.gov*, 510-495-2593
Ryan Wiser, *rhwiser@lbl.gov*, 510-486-5474