

State RPS Policies and Solar Energy Impacts, Experiences, Challenges, and Lessons Learned

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Summary of State RPS Experience-to-Date

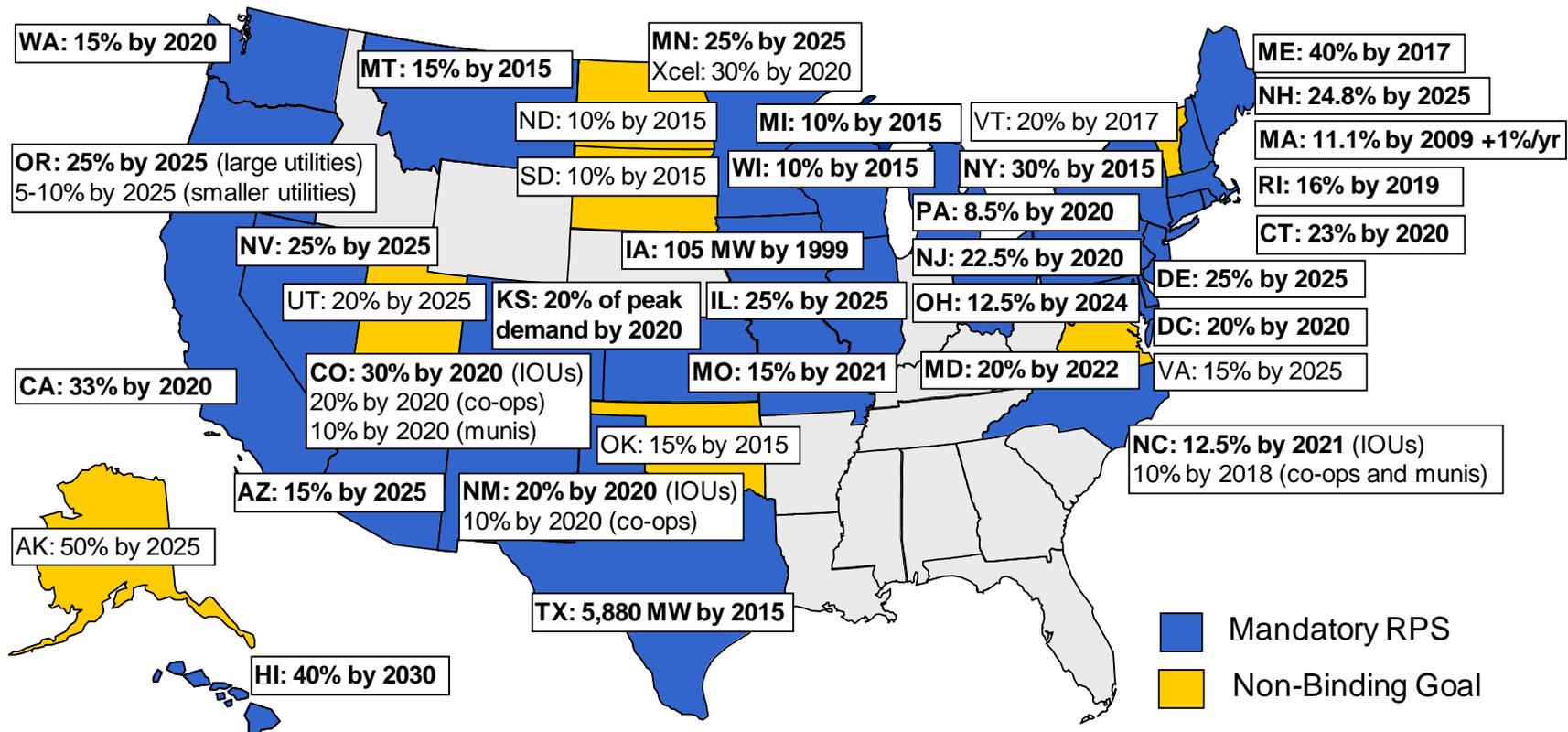
- State RPS policies have been a significant driver for renewable energy growth in the United States and have largely held up against recent political challenges
- Generally high levels of compliance achieved thus far
- Compliance costs have thus far remained relatively modest, though questions exist about future costs
- Significant solar and other RE capacity is required to meet future RPS targets, but is well in-line with pace of additions in recent years
- That said, significant challenges exist to meeting future RPS obligations in some states/regions



RPS Policies Exist in 29 States and D.C.

7 More States Have Non-Binding Goals

Existing State RPS Policies Apply to **55%** of Total U.S. Retail Electricity Sales in 2012

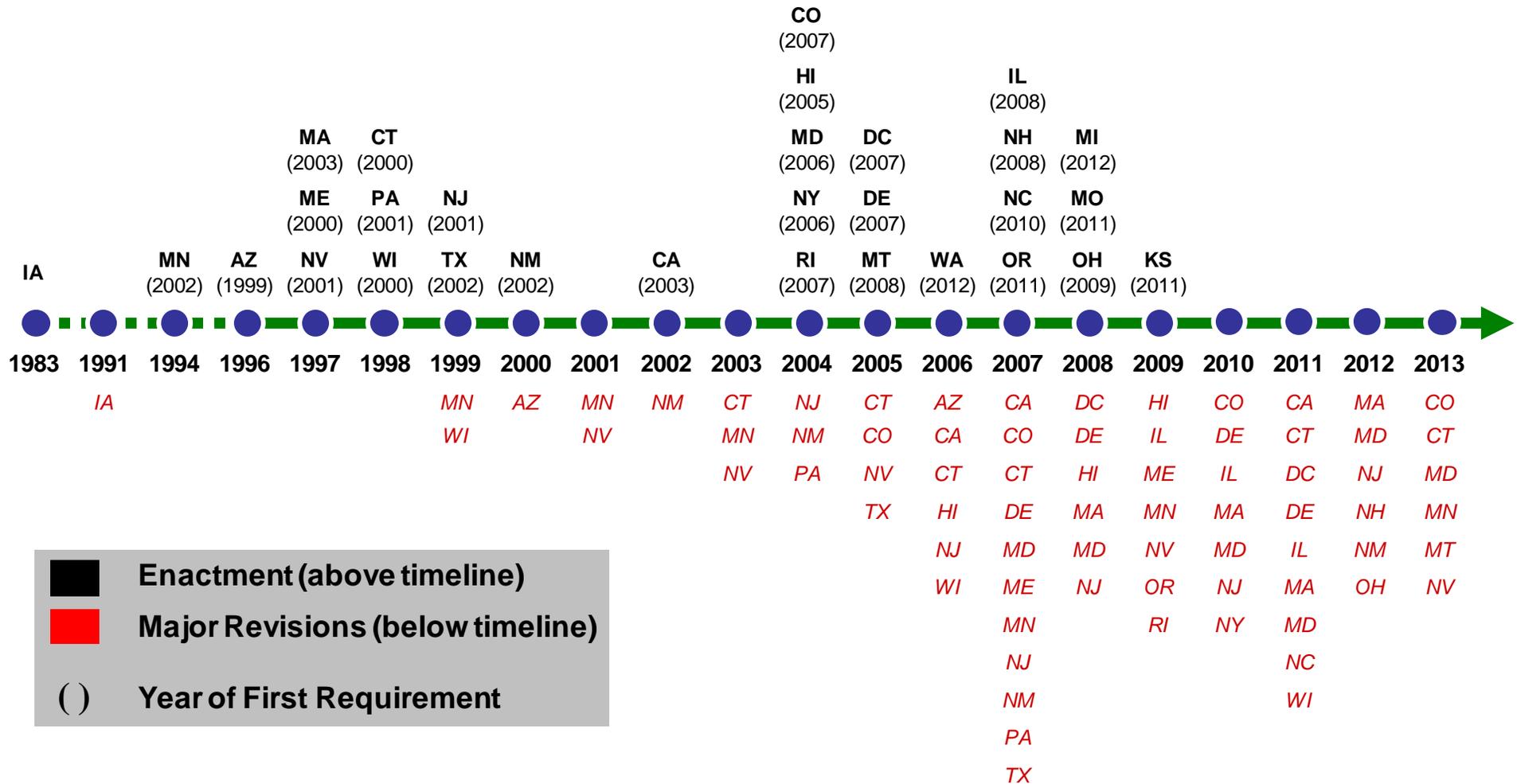


Source: Berkeley Lab

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)



Enactment of New RPS' Has Waned, But States Continue to Hone Existing Policies



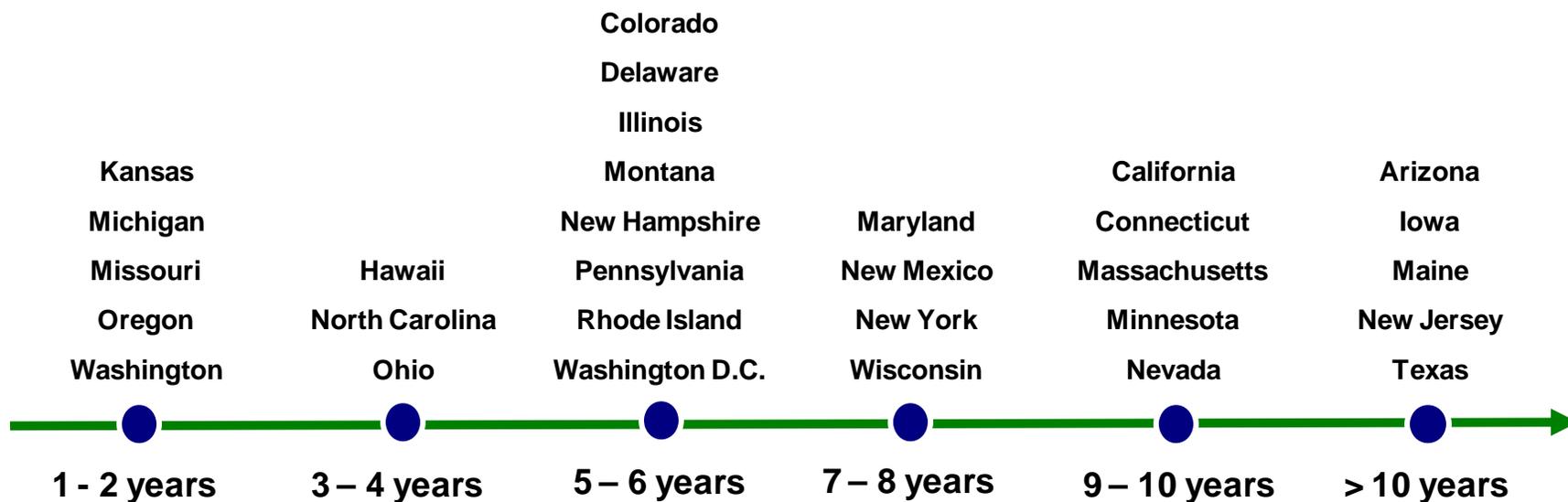
Political and Legal Challenges to RPS Policies Have Been Mounting

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



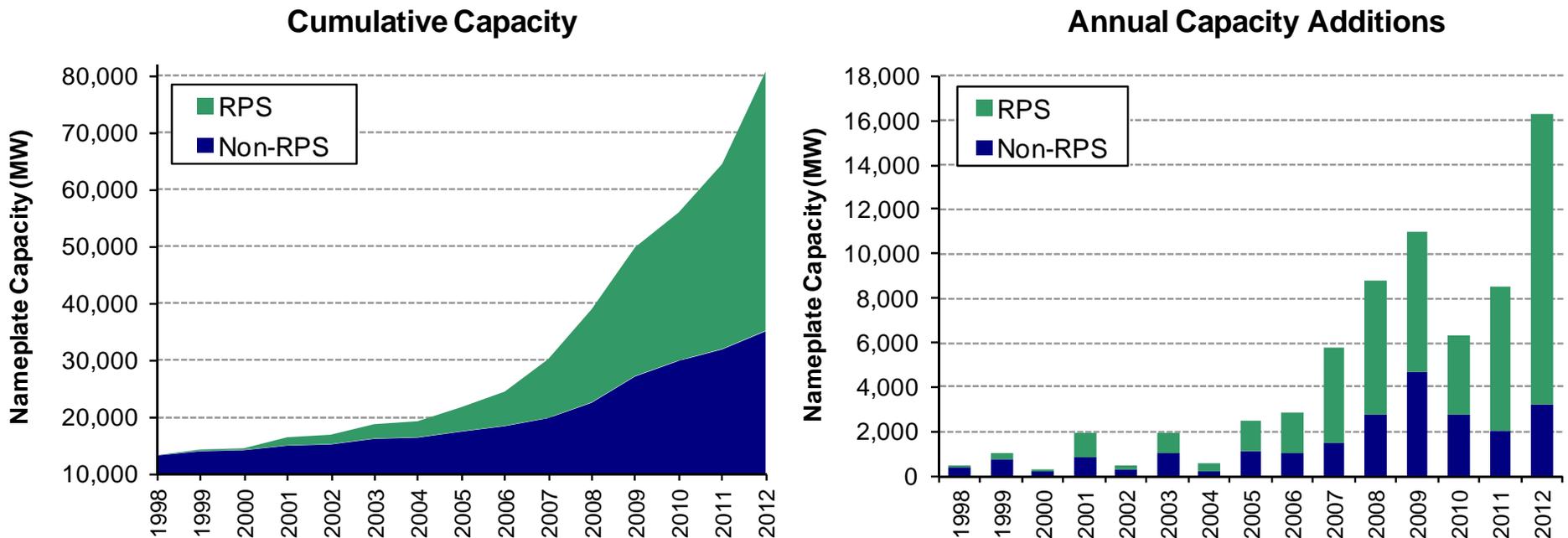
Experience with State RPS Compliance Obligations Varies Widely and is Growing

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



State RPS Policies Have Motivated Substantial Renewable Capacity Development

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



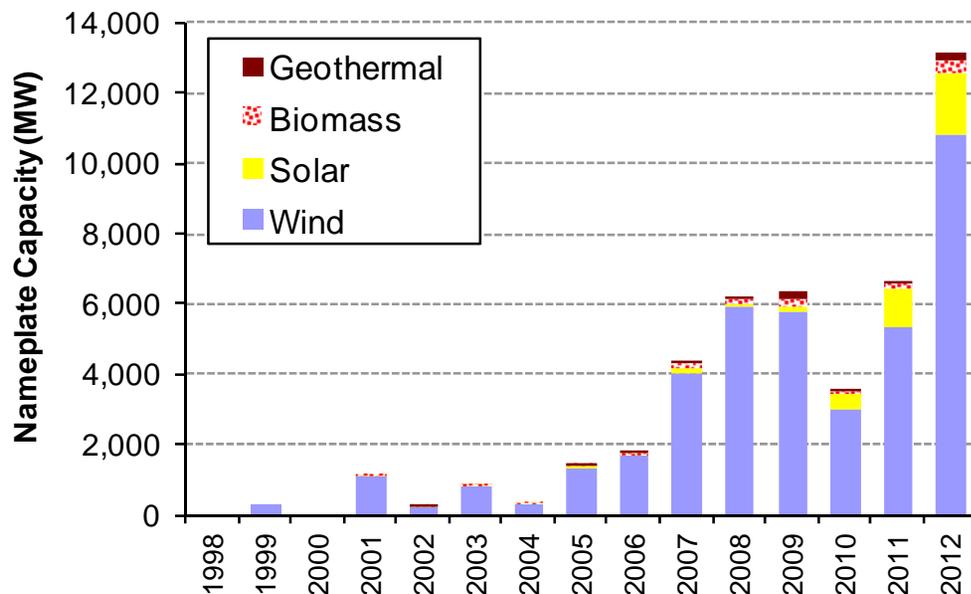
Though not an ideal metric for RPS-impact, **67% (46 GW)** of all non-hydro renewable capacity additions from 1998-2012 occurred in states with active/impending RPS compliance obligations



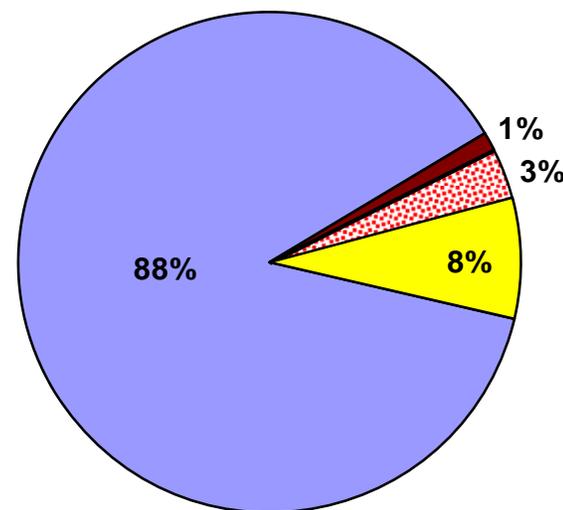
State RPS' Have Largely Supported Wind, Though Solar Has Become More Prominent

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

Annual RPS Capacity Additions



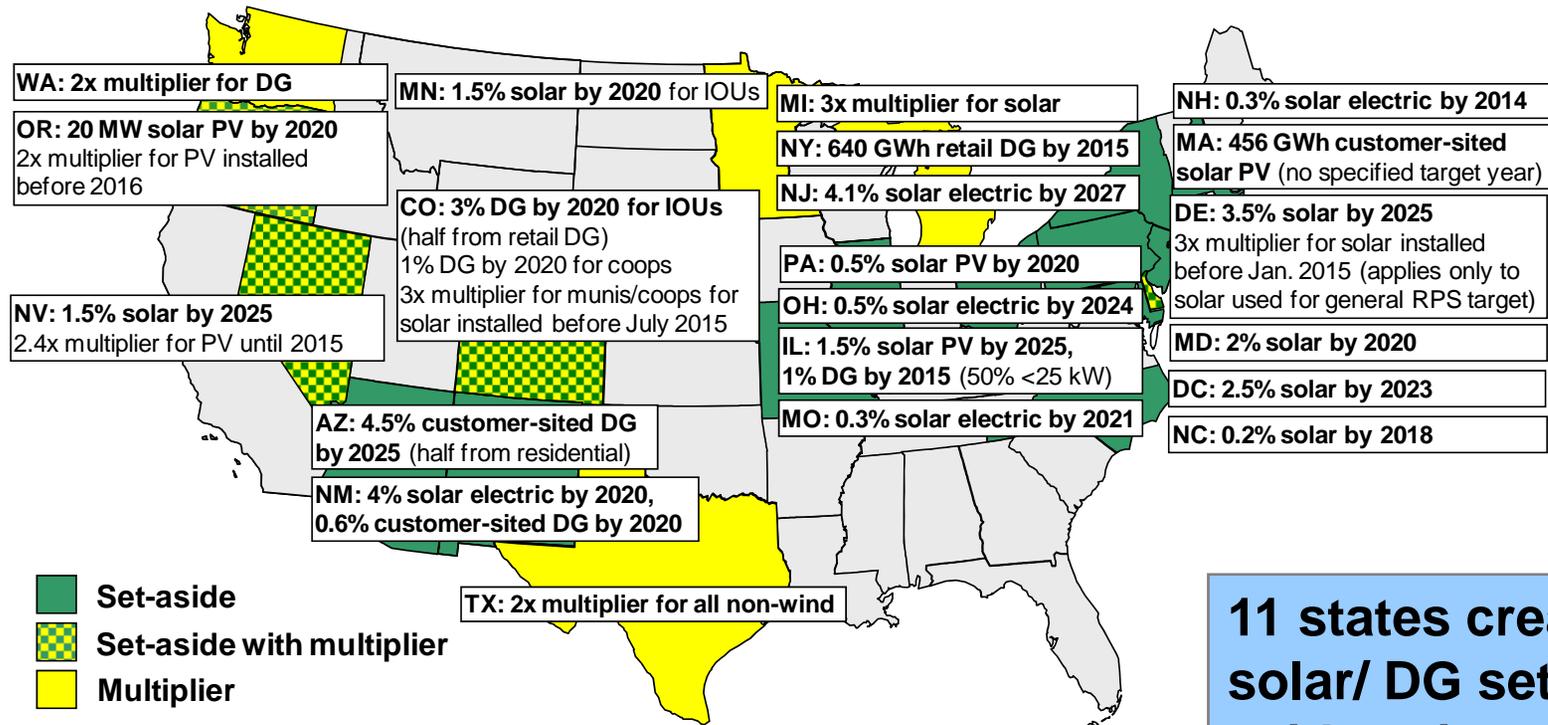
Cumulative RPS Capacity Additions (1998-2012)



* 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.

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

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



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

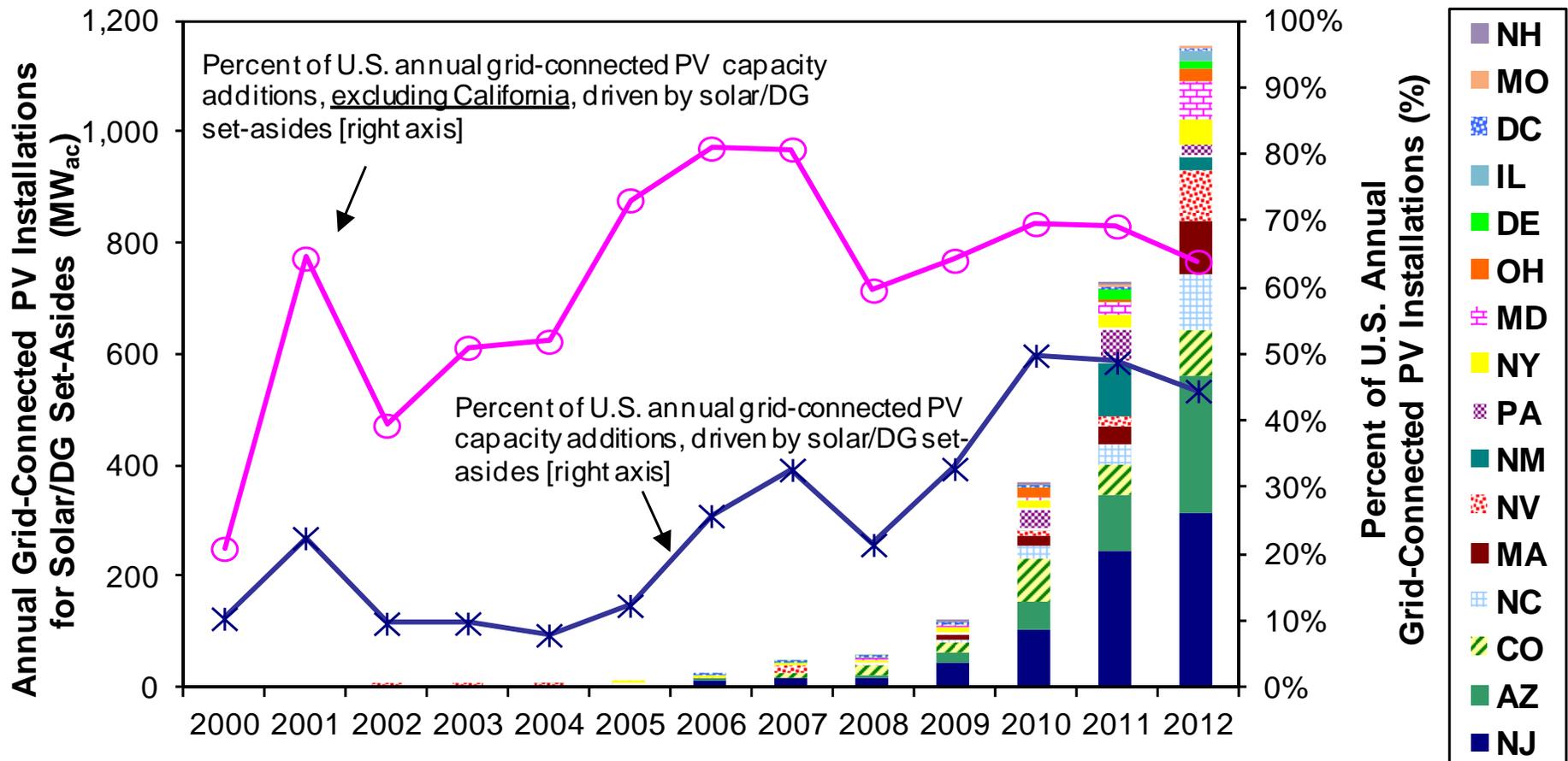
Source: Berkeley Lab

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



Impact of Solar/DG Set-Asides Is Growing: Drove ~50% of U.S. Solar Additions in 2010-12

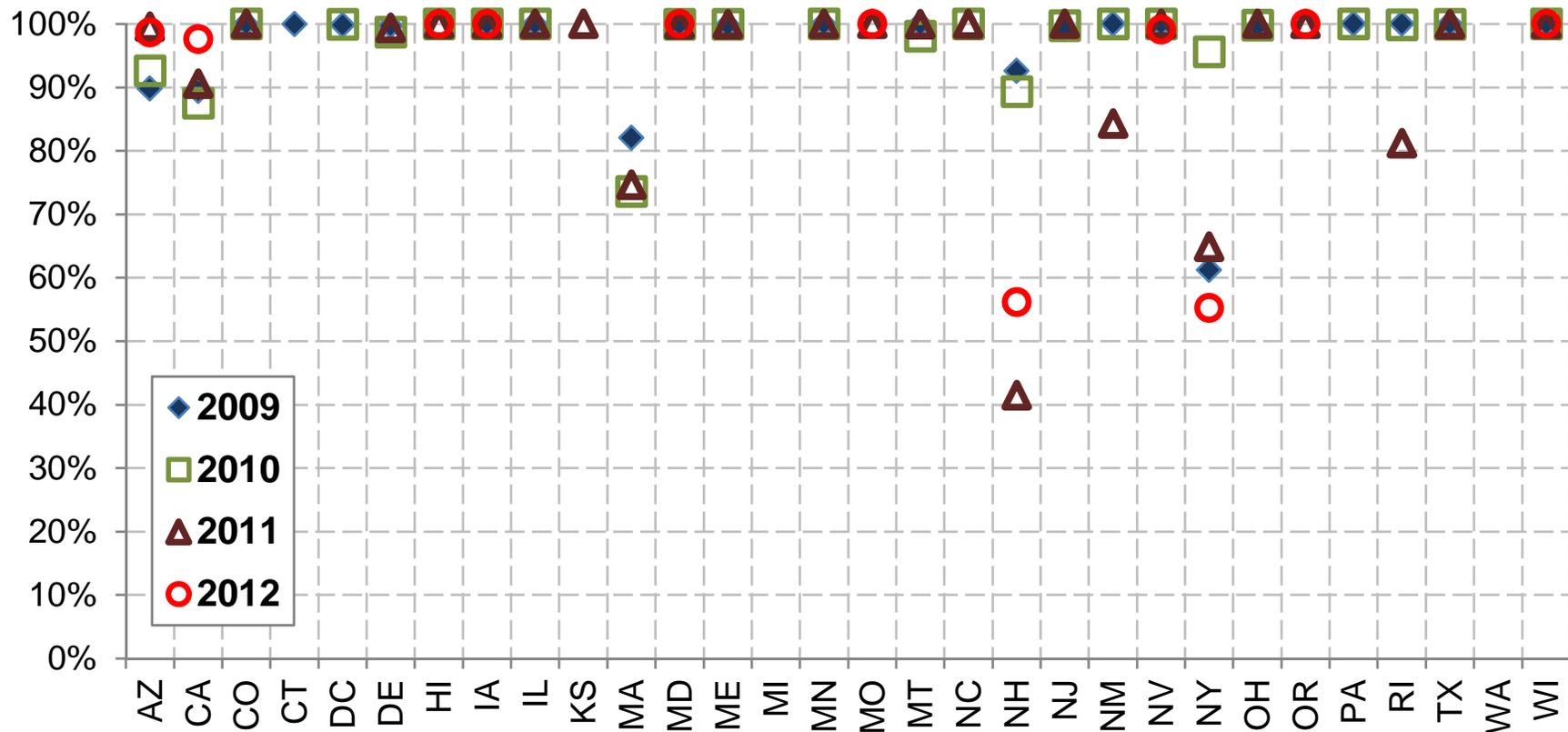


Set-asides also benefiting solar-thermal electric (CSP): 1 MW (Arizona) constructed in 2006 and 64 MW (Nevada) in 2007



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)

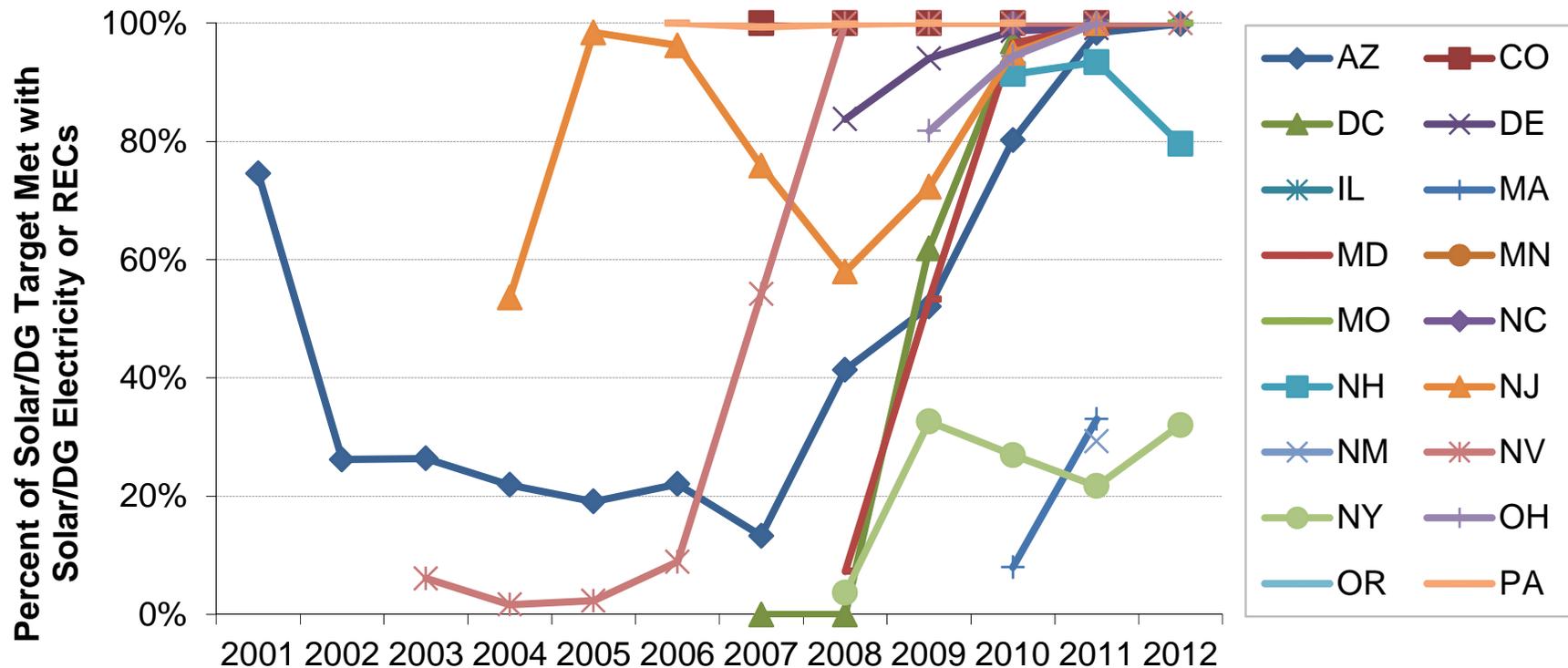


Note: Percentages less than 100% do not necessarily indicate that "full compliance" was not technically achieved, because of ACP compliance options, funding limits, or force majeure events.



Achievement of Solar/DG Set-Aside Targets Has Steadily Increased in Most States

Percent of Solar/DG Set-Aside Target Met with Solar/DG Electricity or RECs
(including available credit multipliers and banking, but excluding SACPs and borrowing)

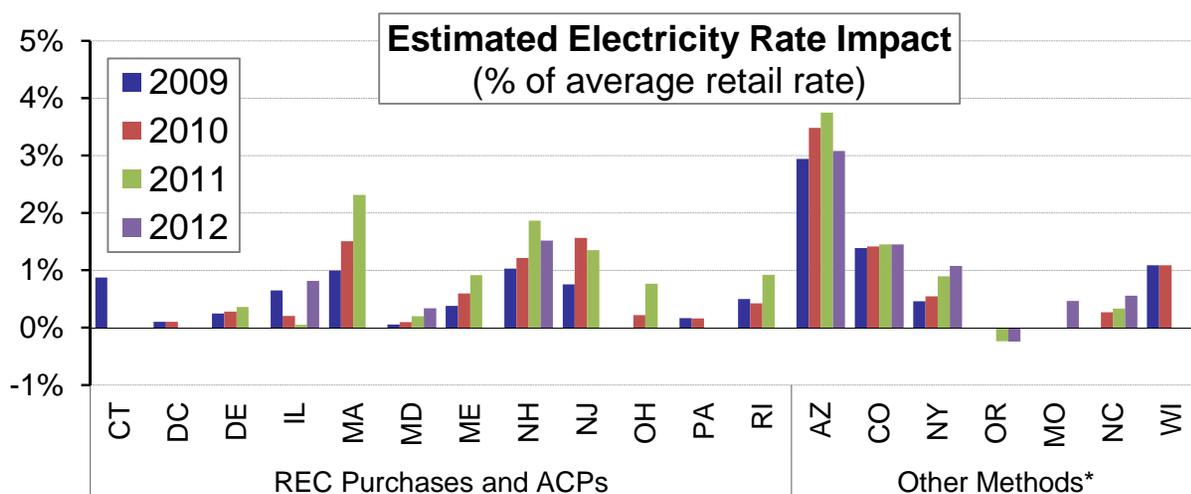


Note: "Percent of Solar/DG Target Met with Solar/DG Electricity or RECs" excludes ACPs but includes applicable credit multipliers. In cases where this figure is below 100%, suppliers may not have been technically out of compliance due to solar ACP compliance options, funding limits, and force majeure provisions.



RPS Policies Have Generally Resulted in <2% Increase in Electricity Rates So Far

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



* Other Methods include utility-reported incremental expenses or costs (MO, OR), RPS tariff rider collections (AZ, 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, MI, MN, MT, NM, NV, TX, WA).

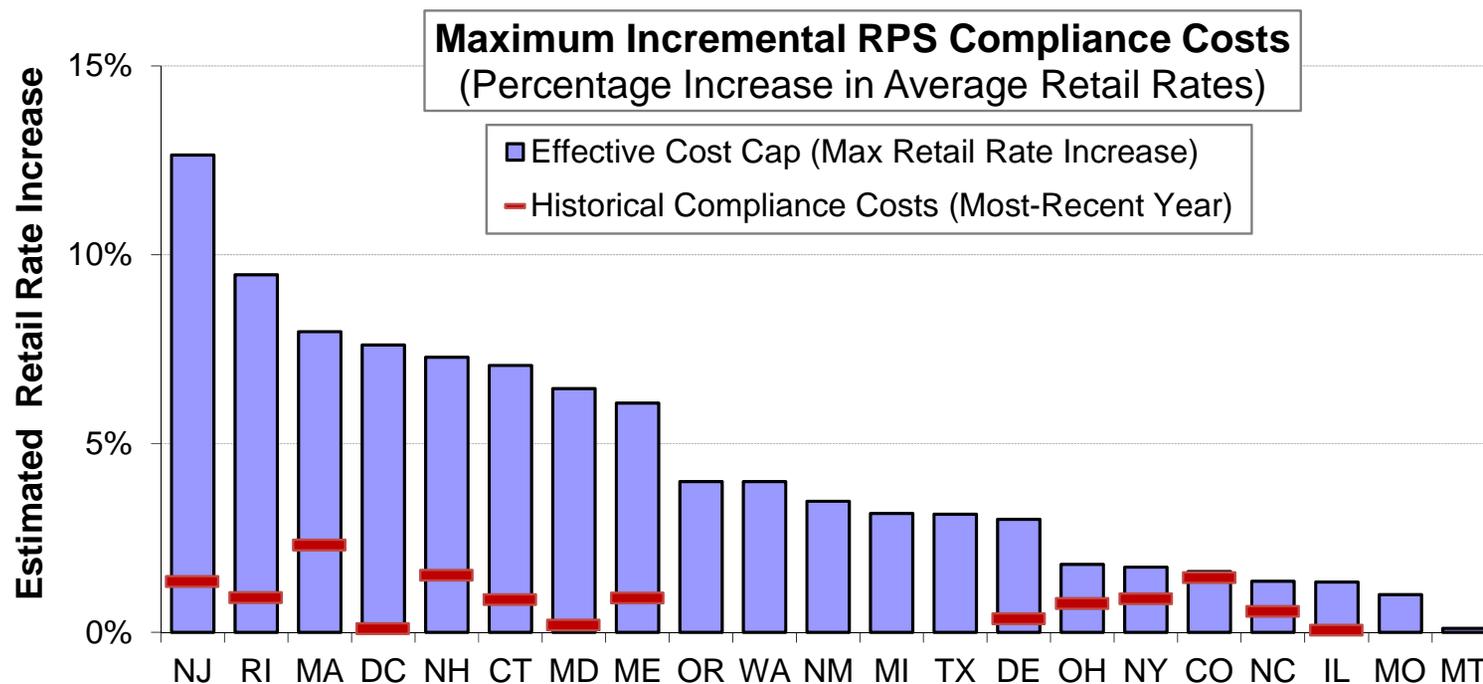
- Simplified approach ignores some ratepayer costs (e.g., integration) *and* some benefits (e.g., wholesale electricity price suppression)
- Rate impacts differ with target levels, REC prices, presence of set-asides, whether up-front incentives are provided
- Little data on rate impacts for states dominated by bundled contracts

Future compliance costs impacted by increasing RPS targets, changes to fed. tax incentives, cost trajectories for RE, and natural gas prices (among other factors)



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

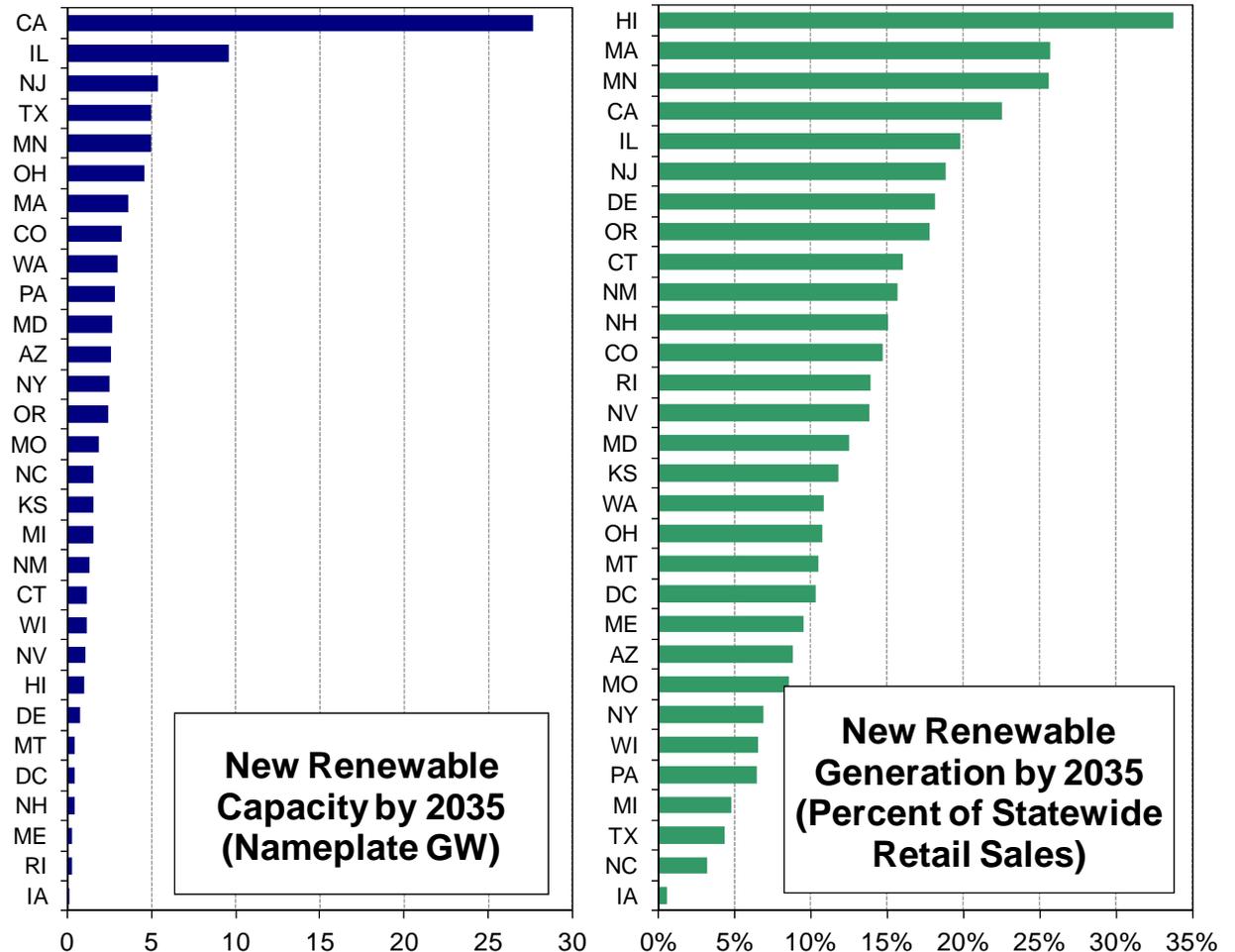
Many states cost containment mechanisms can be translated into an estimated maximum increase in retail rates



- No explicit cap on incremental compliance costs in 9 states (AZ, CA, IA, KS, HI, MN, NV, PA, WI), though KS caps gross revenue requirements and CA is currently developing its cost containment mechanism

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

- **94 GW** of “New RE” required by 2035, if 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

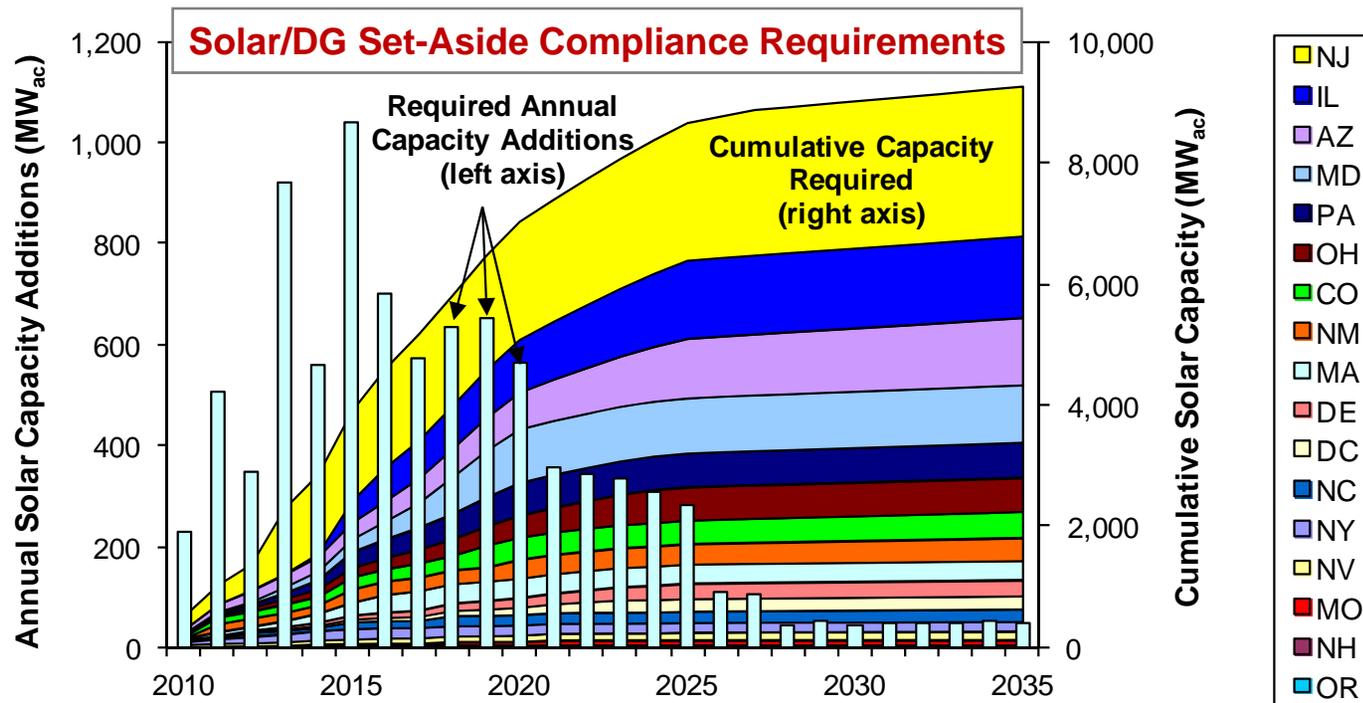


* New RE is defined based on state-specific distinctions between new vs. existing, or based on the year in which the RPS was enacted; it does not represent new renewables relative to current supply



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

- Cumulative capacity requirement grows to **9,300 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



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

- The outcome of ongoing and future legislative and legal challenges
- Whether cost caps become binding (which in turn depends upon RE cost trajectories vis-à-vis natural gas)
- How policymakers re-tune RPS' in response to changed conditions (federal tax credits, RE costs, gas prices)
- Efforts to address challenges associated with volatile REC prices and lack of long-term contracting options in restructured retail electricity markets
- How other related policy issues affecting RE deployment are addressed (transmission, integration, siting, net metering, etc.)



Thank You!

For further information:

- **LBNL RPS publications and resources:**

rps.lbl.gov

- **Other LBNL renewable energy publications:**

<http://emp.lbl.gov/reports/re>

- **Contact information:**

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