Environmental Energy Technologies Division Lawrence Berkeley National Laboratory

Renewables Portfolio Standards: Compliance Costs and Related Issues

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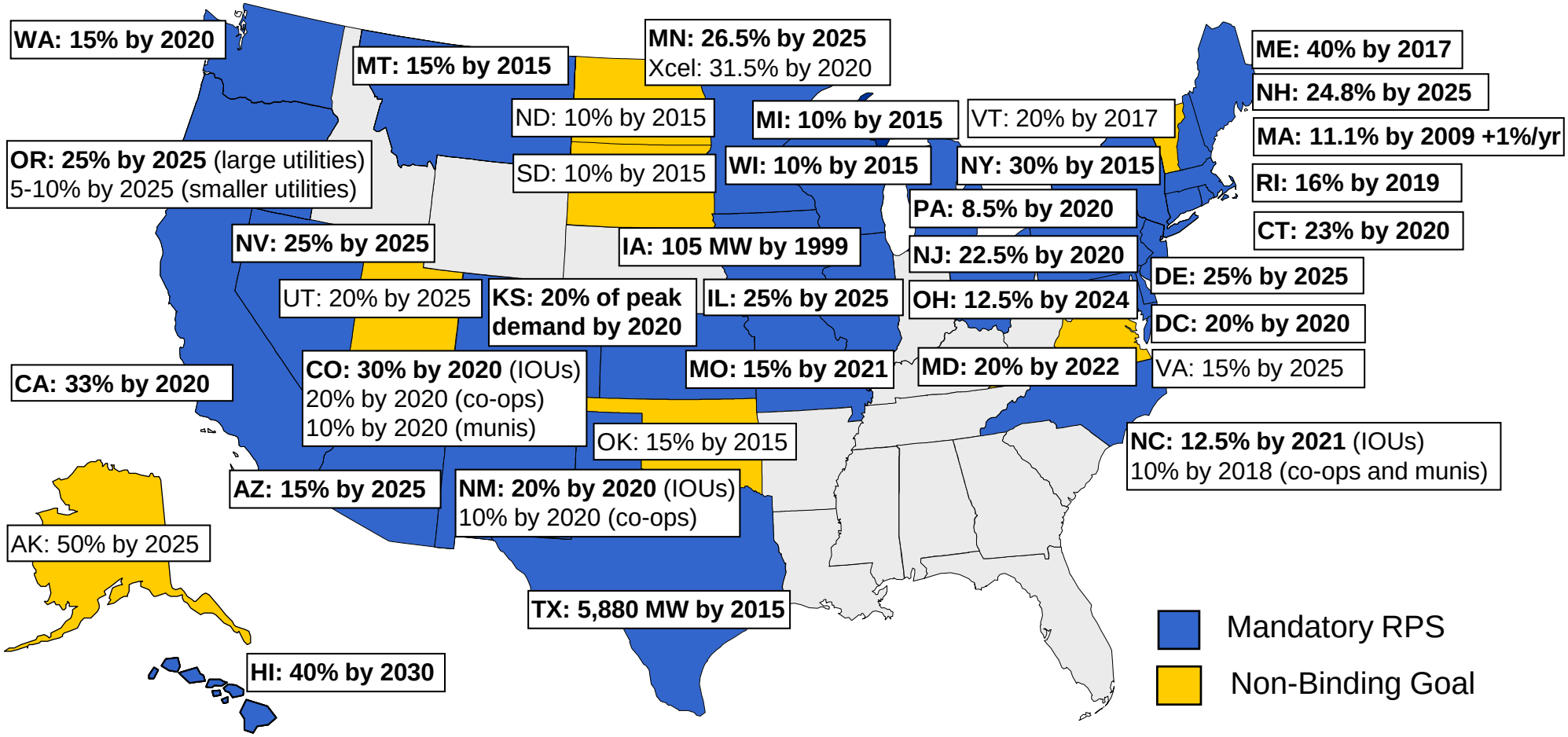
Background and Context

RPS Policies Exist in 29 States and DC

Apply to 56% of Total U.S. Retail Electricity Sales

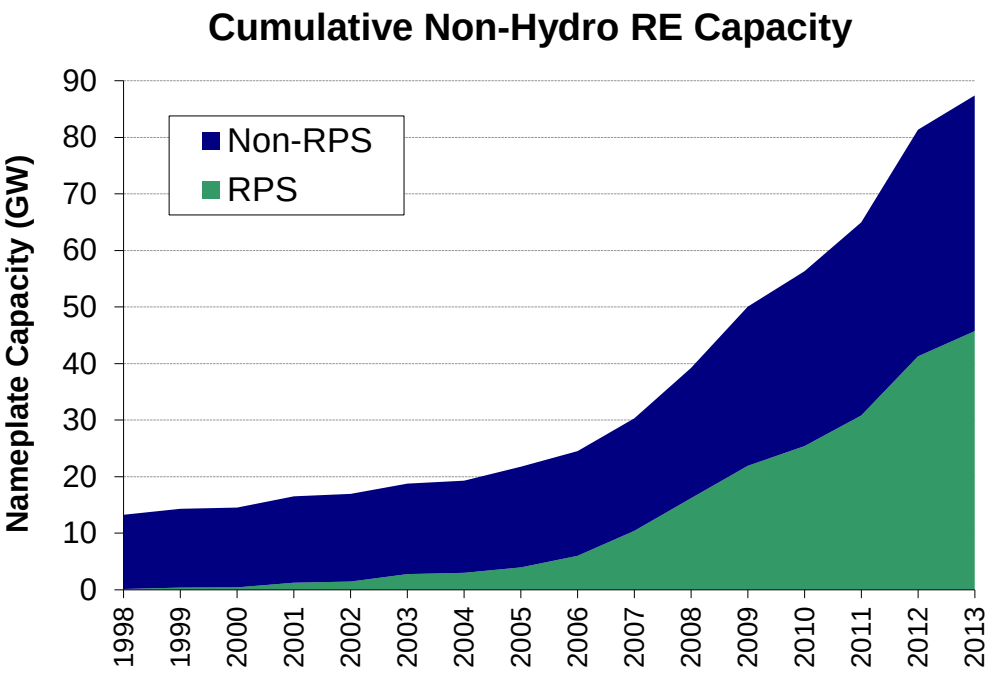


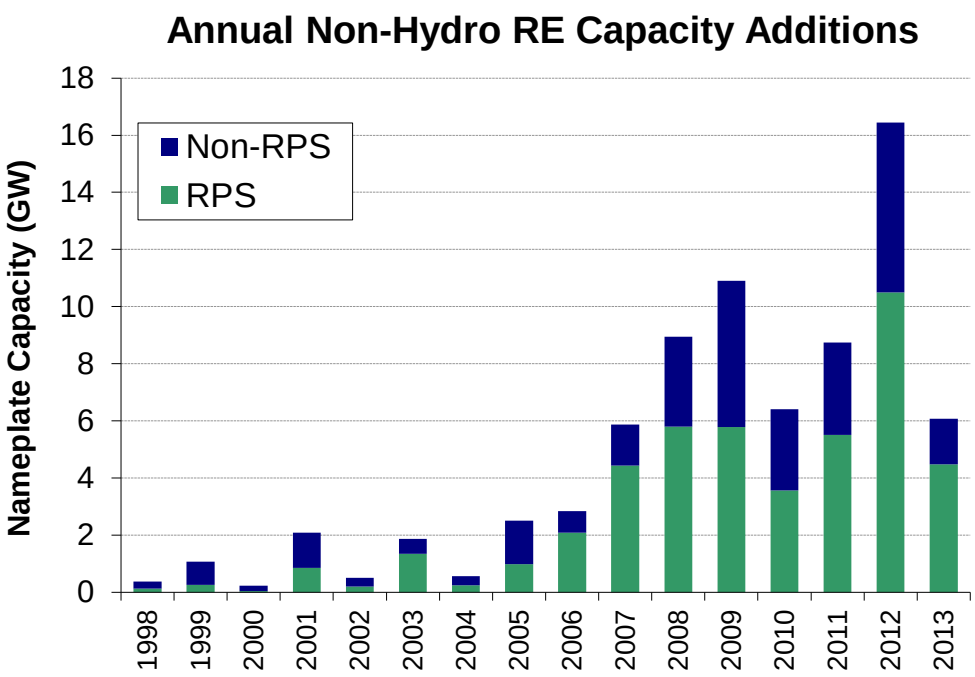
Source: Berkeley Lab

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)

A Substantial Portion of RE Capacity Additions Have (At Least Partially) Been Driven by RPS

U.S. Non-Hydro Renewable Energy Capacity

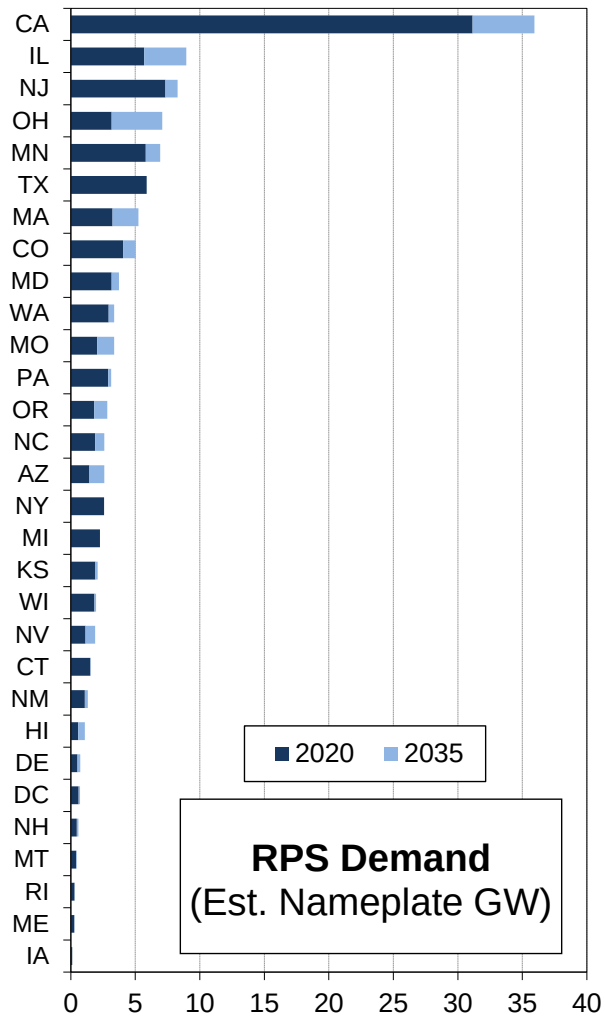


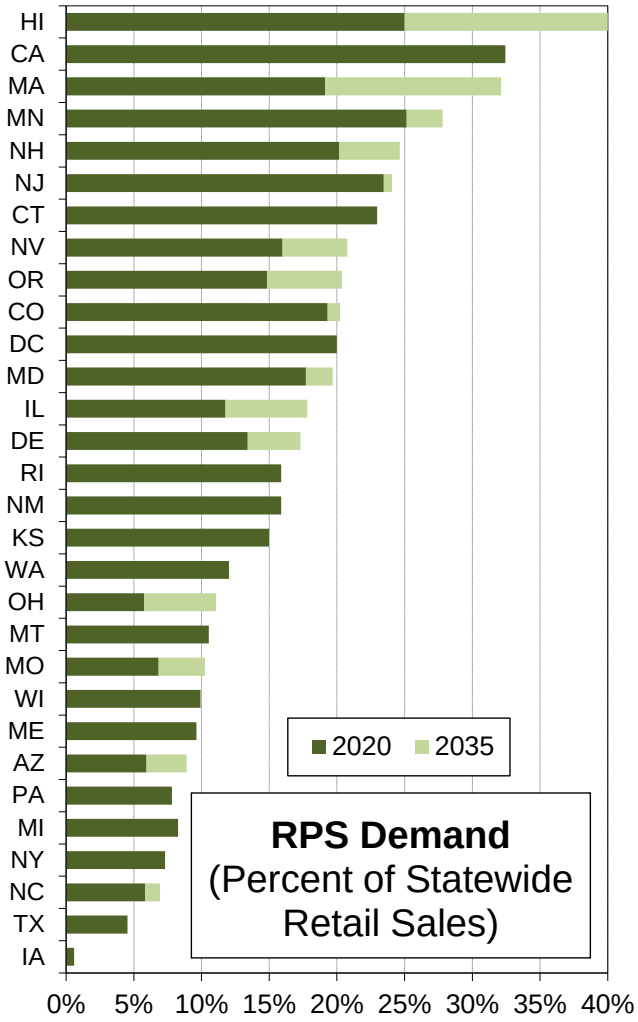


Of the 75 GW of non-hydro renewable capacity additions from 1998-2013, **61%** (**46 GW**) serve entities with RPS obligations

Future RPS Requirements are Sizable, But Within Recent RE Growth Rates

- Total of **98 GW** of RE capacity required by 2020 (**123 GW** by 2035) to meet RPS requirements
- Depending on availability of existing RE capacity, RPS will require incremental build of **3-7 GW/yr** through 2020 and 1-2 GW/yr thereafter
- By comparison, RPS-driven additions averaged ~**6 GW/yr** since 2008 (10 GW/yr for all RE)





Note: Values shown in figures represent required renewable capacity beyond what was supplied to each state at the time its RPS was enacted. <u>The values do not represent incremental renewables required relative to current supply.</u>

Recent Legislative Challenges to RPS Policies Often Founded on Concerns about Costs

- Legislation to repeal, reduce, delay, or freeze RPS targets has been introduced in many states over the past several years
  - Also includes legislation to expand dramatically eligibility to large/existing hydro, nuclear, etc.
  - Based on legislative tracking by the Center for the New Energy Economy: 14 such bills in 10 states were introduced in 2014 (vs. 26 bills in 17 states in 2013)
- Only two of these proposals have been enacted, most notably Ohio's SB 310 (2014), which freezes the RPS for two years
- Concerns about costs and rate impacts at the center of many of these proposals, though typically without underlying analysis

RPS Compliance Costs

Drawing on May 2014 LBNL-NREL Report:

A Survey of State-Level Cost and Benefit Estimates of Renewable Portfolio Standards

What do we mean by “cost”?

- **Historical vs. projected?**
- **Gross vs. net?**
- **Costs to whom?**
  - society-at-large, electric system, utilities, ratepayers
- **What gets counted?**
  - Costs: integration, transmission, tax credits?
  - Benefits: avoided capacity costs, avoided carbon or other emissions, fuel price hedge, economic development, reduced water consumption, etc.?
- **All of the above may depend on:**
  - The purpose of the cost calculation: annual reports to demonstrate compliance with cost cap, filings for RPS tariff riders, program evaluations, public policy research
  - Statutory requirements and administrative rules

Our Basic Approach

Summarize available data on incremental compliance costs over 2010-2013 period

- Represents net cost to the utility/LSE

Metric: Cost as a percentage of average retail electricity rates

- Equivalent to the average rate impact, if costs were fully and immediately passed through

Different methodology depending on state

- Restructured (competitive retail markets)
- Regulated (franchise retail markets)

Cost Estimates for Restructured States: Direct Costs = RECs + ACPs

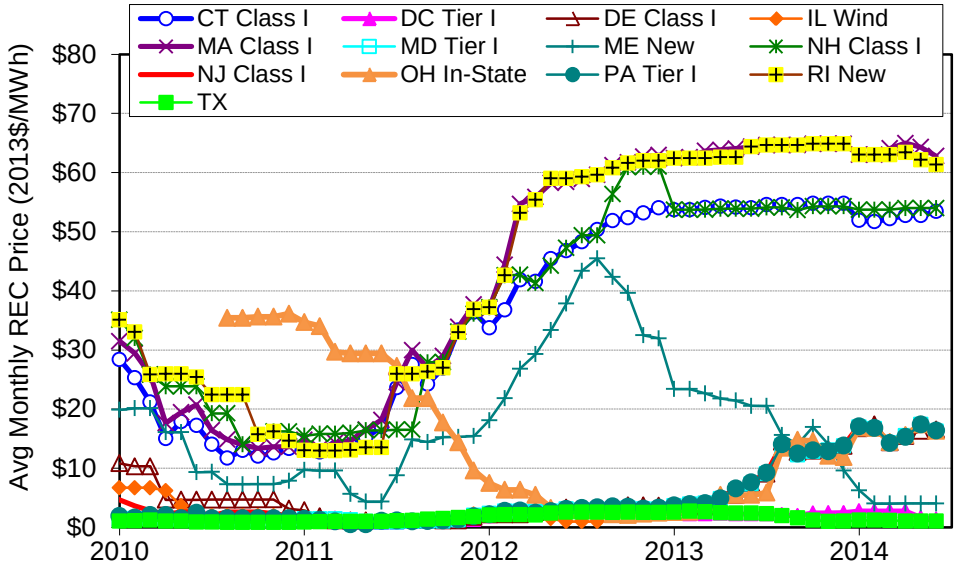
Compliance typically achieved through unbundled renewable energy certificates (RECs) and alternative compliance payments (ACPs)

- We estimate costs based on direct cost of REC procurement and ACPs (price x volume)
  - REC pricing based on data reported to PUCs where available; otherwise used broker price sheets
- Simplified approach:
  - Ignores some indirect costs to LSEs (e.g., integration and network transmission expansion)
  - Also ignores some indirect benefits (e.g., wholesale electricity price suppression)

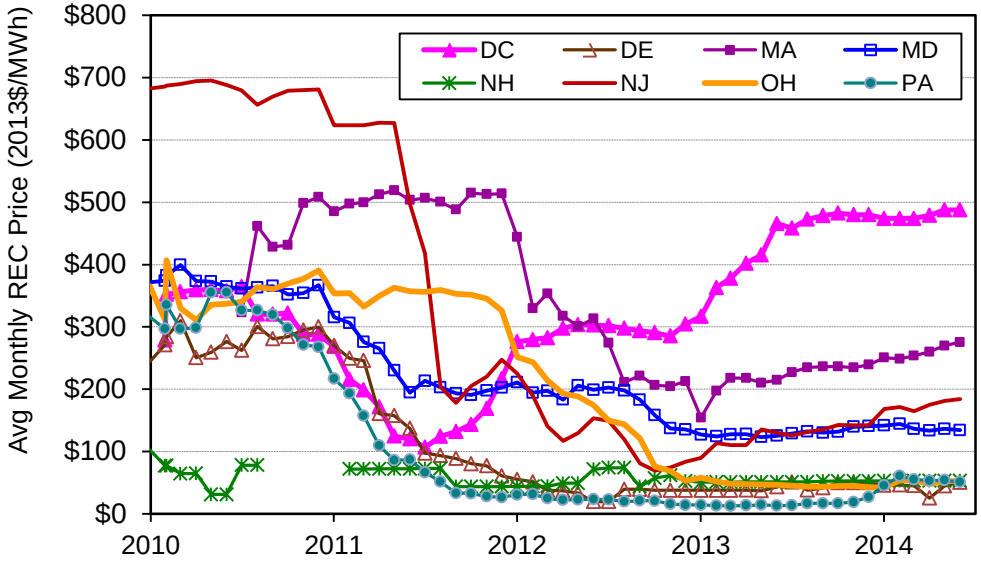
REC Prices: A Key Building Block for RPS Costs

- Class I: tight supplies in Northeast; oversupply elsewhere
- SREC prices depressed in most states due to enduring over-supply

Main Tier/Class I RECs



SRECs

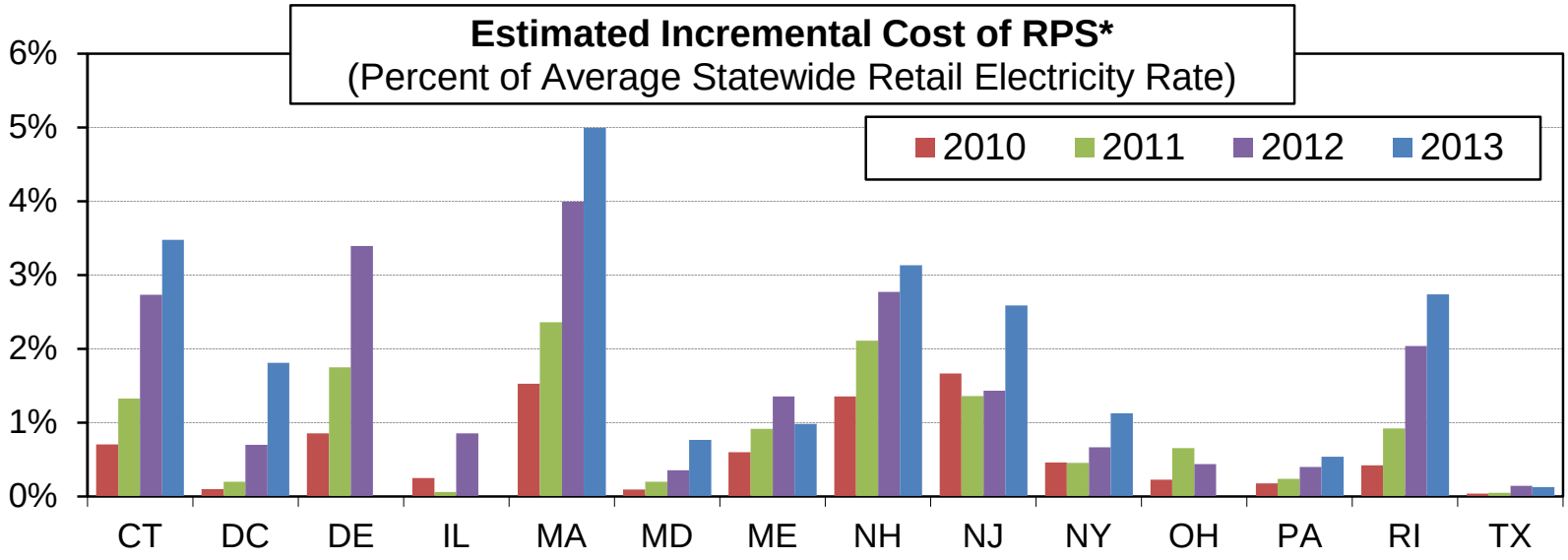


Sources: Spectron, SRECTrade, Flett Exchange, PJM-GATS, and NJ Clean Energy Program. Depending on the source used, plotted values are either the mid-point of monthly average bid and offer prices, the average monthly closing price, or the weighted average price of all RECs transacted in the month, and generally refer to REC prices for the current or nearest future compliance year traded in each month.

➡REC prices in the short-run reflect supply-demand balance, not necessarily underlying renewable technology costs

Restructured States: REC + ACP Costs Typically <3% of Average Rates, But Are Rising

Annual RPS Compliance Costs in Restructured States



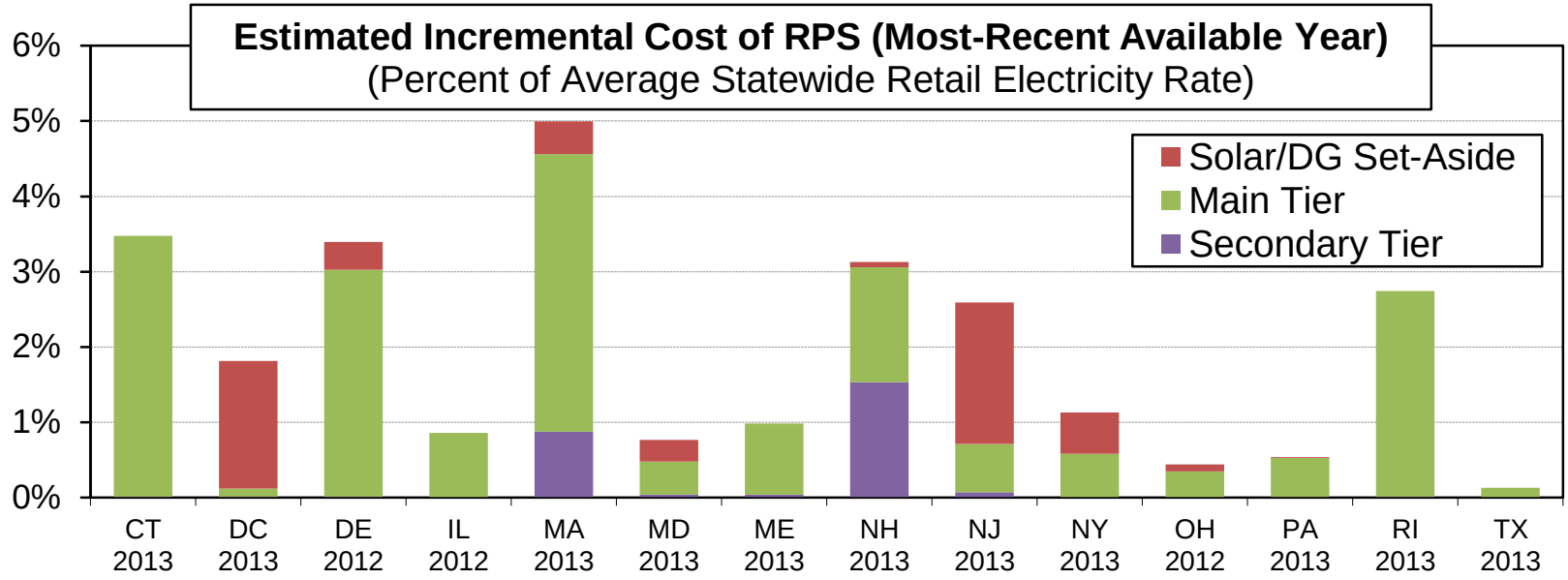
** Incremental costs are estimated from REC and ACP prices and volumes for each compliance year, which may differ from calendar years. If available, REC prices are based on average prices reported by the PUC (DC, IL, MD, ME, OH, NJ, PA); they are otherwise based on published spot market prices, supplemented with data on long-term contract prices where available. Incremental costs for NY are based on NYSERDA's annual RPS expenditures and estimated REC deliveries.*

Variation across states and years reflect differences in REC and ACP prices, RPS target levels, and mix of resource tiers

Rising costs in some states due to increasing targets (exacerbated by elevated REC prices in Northeast)

Main Tiers Represented the Bulk of Compliance Costs in Most Restructured States

RPS Costs Disaggregated by Resource Tier



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- Relatively high solar set-aside costs in DC and NJ, which have high solar requirements and/or high SREC prices
- Significant secondary tier costs in MA and NH, which are undersupplied (though rule changes in MA may ameliorate shortage)

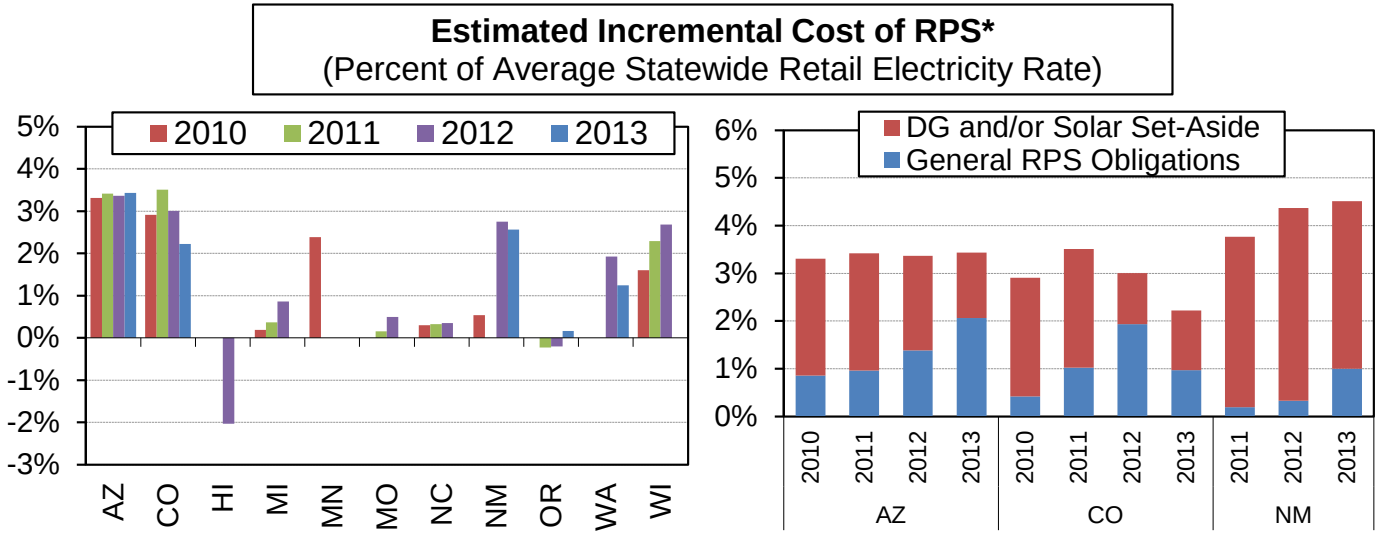
Cost Estimates for Regulated States: Synthesize RPS cost estimates in utility/PUC reports

Compliance typically achieved through long-term bundled PPAs or utility-owned renewables

- Estimating net compliance costs requires comparison to some counter-factual for what would have been procured but for the RPS
- Utilities and PUCs have taken various approaches to estimating avoided costs
  - Proxy generator: Levelized cost of generator displaced by RPS resources
  - Market price: Cost of wholesale power (and capacity)
  - Modeling: Compare system costs with and without RPS resources
- Other methodological variations as well (e.g., pre-RPS resources, rebate payments, capacity costs, short vs. long-term market prices)
- Some irreducible apples-to-oranges issues in comparing states

Regulated States: Varying Methods Generally Show Estimated Costs <3% of Average Retail Rates

Annual RPS Compliance Costs in Regulated States



** Incremental costs are based on utility- or PUC-reported estimates and are based on either RPS resources procured or RPS resources applied to the target in each year. Data for AZ include administrative costs, which are grouped in "General RPS Obligations" in the right-hand figure. Data for CO are for Xcel only. Data for NM in the left-hand figure include SPS and PNM in all years shown, but data in right-hand figure include only SPS. States omitted if data on RPS incremental costs are unavailable (CA, IA, KS, MT, NV).*

- Seemingly higher costs in AZ, CO, NM party an artifact of front-loaded incentives for DG
- Low costs in states with low RPS targets during analysis period and/or where targets met primarily with pre-existing renewables
- Negative costs in OR and HI signify net cost savings
- Estimated costs also impacted by avoided cost methodology

California: An Illustration of Why Methods Matter

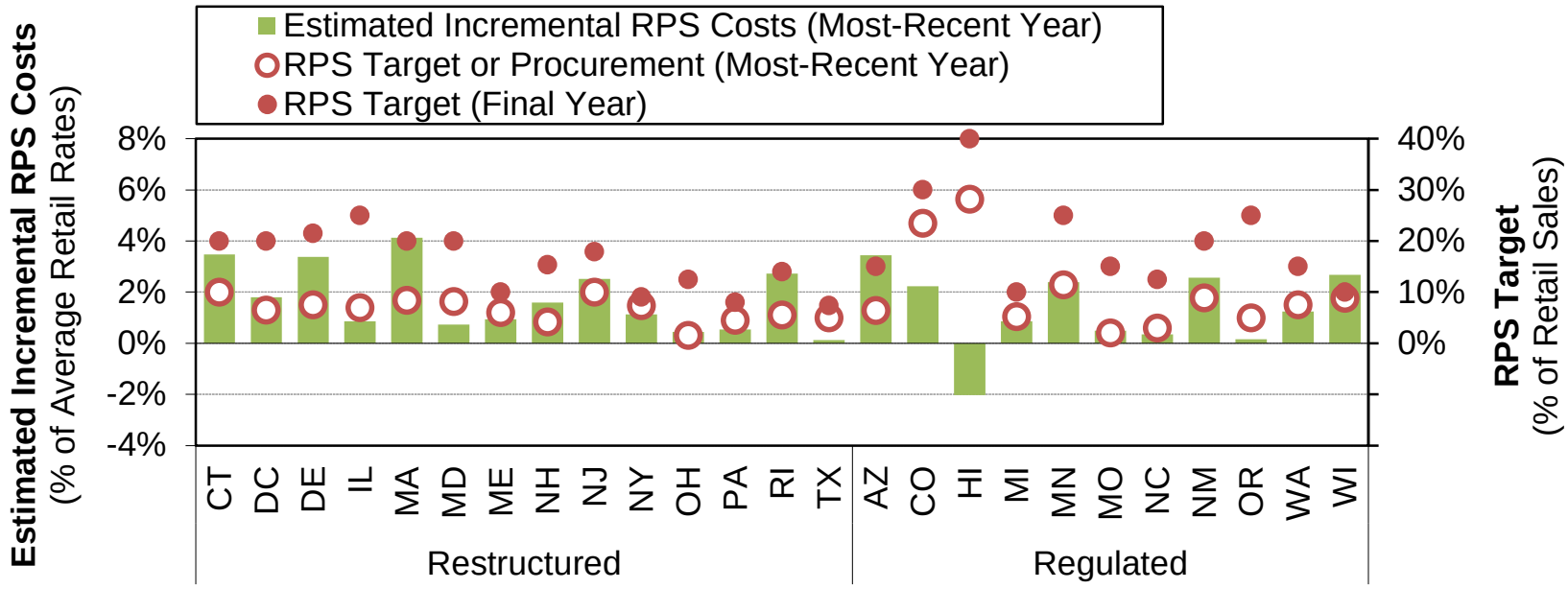
- California PUC RPS cost reports includes two alternate methods for computing avoided costs from RPS procurement:
  1. Proxy Generator: Estimated all-in cost of a CCGT (Market Price Referent/MPR)
  2. Market Price: CAISO energy and capacity market prices in the compliance yr.
- Derived incremental costs estimates diverge widely between methods

Year	RPS Procurement (% of Retail Sales)	RPS Compliance Cost (% of Retail Rates)*	
		Proxy Generator (MPR) Approach	Market Price Approach
2011	20%	-3.6%	6.5%
2012	20%	-0.6%	7.5%

* Derived from data in *Report to the Legislature in Compliance with Public Utilities Code Section 910* (Feb 2014 and March 2013)

Rising RPS Targets Could Put Upward Pressure on Future Compliance Costs

The figure shows RPS costs for the most-recent year along with recent and final RPS targets

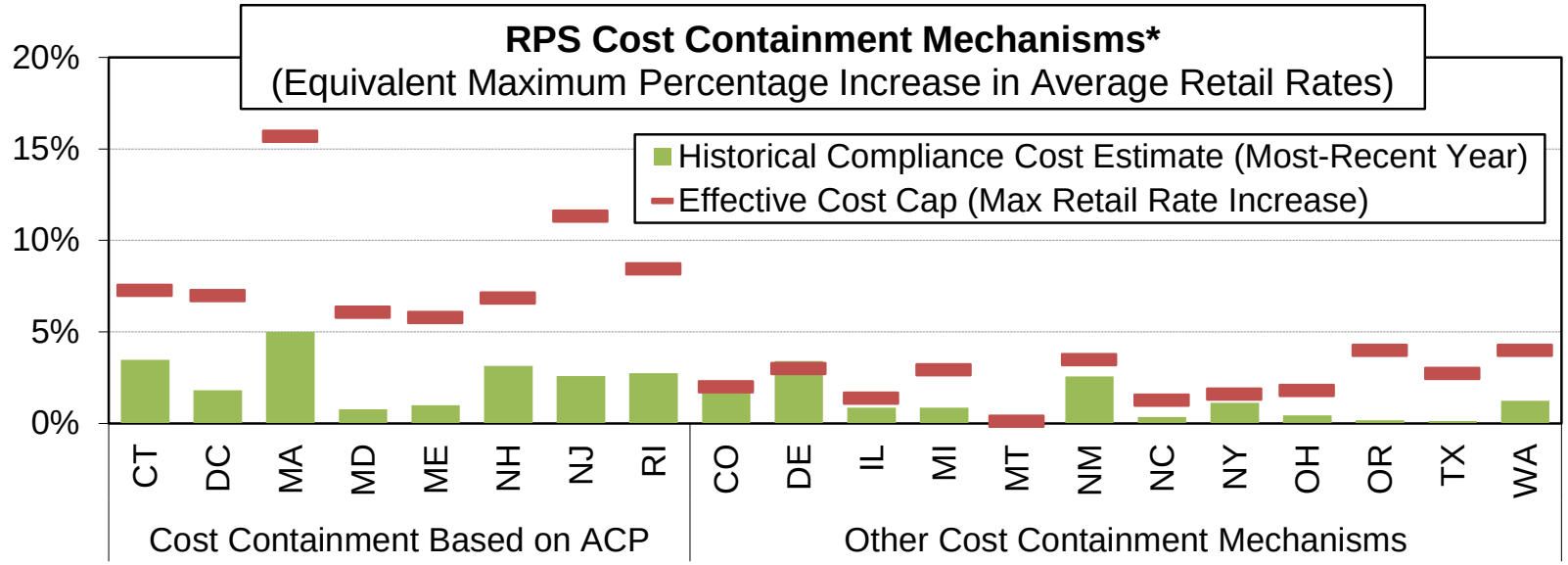


** For most states shown, the most-recent year RPS cost and target data are for 2012 or 2013. MA does not have single terminal year for its RPS; the final-year target shown is based on 2020. Excluded from the chart are those states without available data on historical incremental RPS costs (CA, KS, HI, IA, MT, NV). The values shown for RPS targets and costs exclude any secondary RPS tiers (e.g., for pre-existing resources). For most regulated states, data for the most-recent historical year reflect actual RPS procurement percentages in those years .*

- Final-year RPS targets (closed circles) constitute, on average, roughly a three-fold increase in RPS obligations compared to most-recent year targets (open circles)
- Future RPS costs will depends on many factors: RE technology costs, natural gas prices, federal tax incentives, environmental regulations, and RPS cost caps

Most States Have Capped Rate Impacts Below 10% and Many Below 5%

The figure compares each state's "effective" cost cap with actual costs for the most-recent year



** For states with multiple cost containment mechanisms, the cap shown here is based on the most-binding mechanism. MA does not have a single terminal year for its RPS; the calculated cost cap shown is based on RPS targets and ACP rates for 2020. "Other cost containment mechanisms" include: rate impact/revenue requirement caps (DE, KS, IL, NM, OH, OR, WA), surcharge caps (CO, MI, NC), renewable energy contract price cap (MT), renewable energy fund cap (NY), and financial penalty (TX). Excluded from the chart are those states currently without any mechanism to cap total incremental RPS costs (AZ, CA, IA, HI, KS, MN, MO, NV, PA, WI), though some of those states may have other kinds of mechanisms or regulatory processes to limit RPS costs.*

- Where ACPs used, costs are typically capped at 6-9% of average retail rates
- Among states with some other form of cost containment, effective cost caps are more restrictive (1-4%) and have already become binding in several states

Summary and Conclusions

Although the analysis here takes a relatively narrow approach – ignoring broader impacts, both positive and negative, that may be important to policy-making – it nevertheless provides a few key insights:

- Direct compliance costs thus far generally ranged from 1-3% of average retail rates in most states, averaging 1.6% in the most-recent available years
- Rising RPS targets have led to increasing RPS costs in some states; may place continued upward pressure on compliance costs going forward
  - Other external market/policy dynamics (RE technology costs, gas prices, federal tax incentives, environmental regulations) may mitigate or exacerbate that pressure
- Cost caps within most RPS policies will limit compliance costs to <10% of average retail rates in most and <5% in many states
  - Though in doing so they may also curtail achievement of RPS targets
- Methods for estimating RPS compliance costs vary widely, especially among "traditionally regulated" states
  - Methodological issues will become more meaningful as cost caps become binding

Thank You!

For further information:

LBNL RPS publications and resources:
rps.lbl.gov

LBNL renewable energy publications:
emp.lbl.gov/reports/re

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