

U.S. State Renewables Portfolio & Clean Electricity Standards: 2023 Status Update

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*Renewable Energy Markets Conference
September 20, 2023*

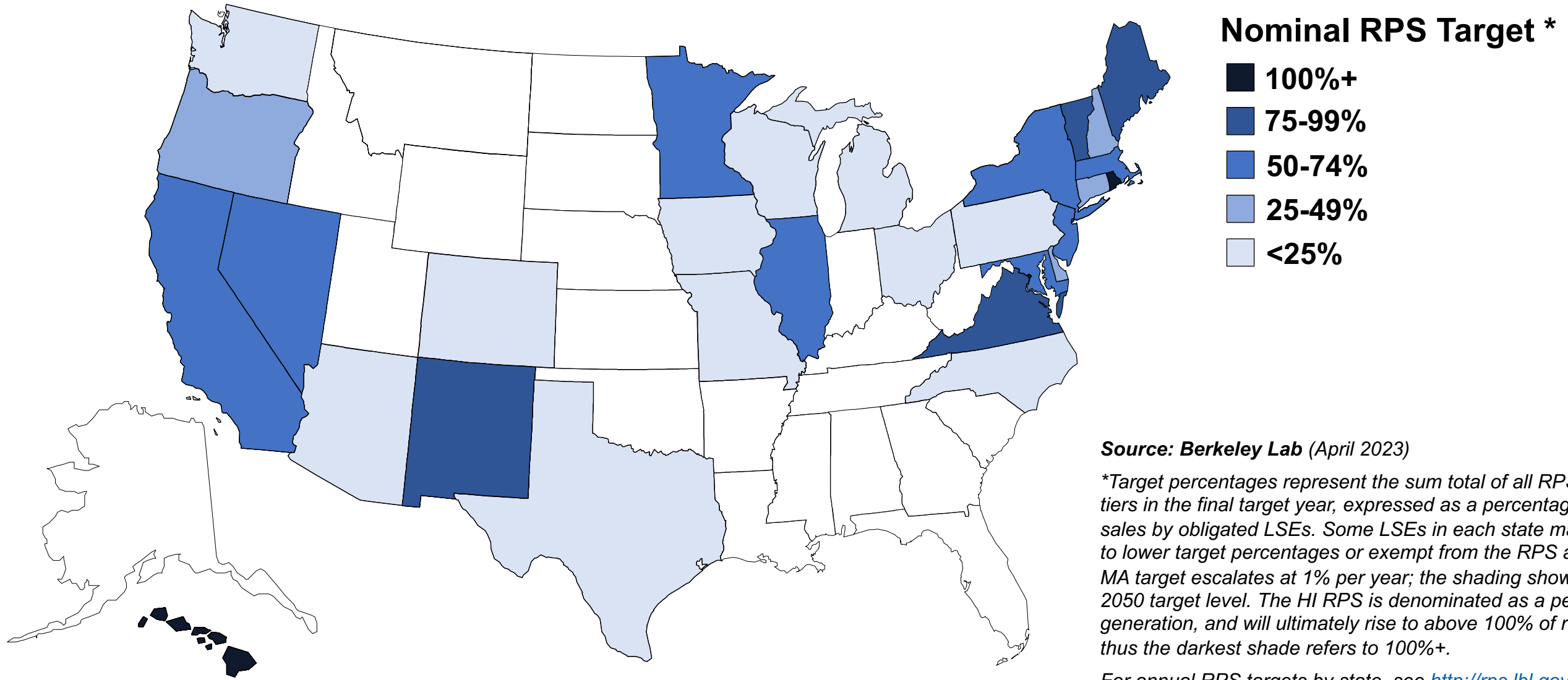
Download report and supporting materials at: rps.lbl.gov

This work was funded by the Office of Energy Efficiency and Renewable Energy (Strategic Analysis Team) of the U.S. Department of Energy under Contract No. DE-AC02-05CH11231.



RPS Policies Exist in 29 States and DC

Half have final targets at or above 50% of retail sales



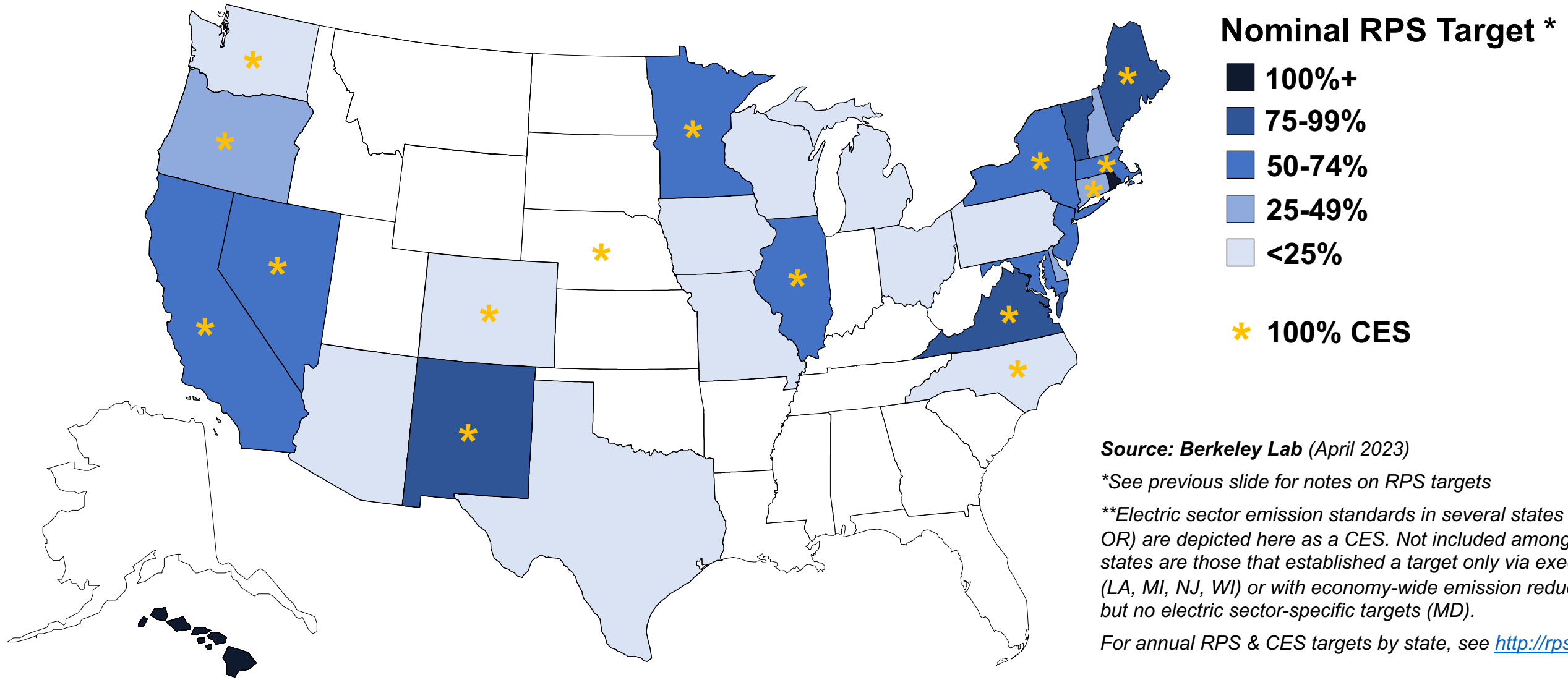
Source: Berkeley Lab (April 2023)

*Target percentages represent the sum total of all RPS resource tiers in the final target year, expressed as a percentage of retail sales by obligated LSEs. Some LSEs in each state may be subject to lower target percentages or exempt from the RPS altogether. The MA target escalates at 1% per year; the shading shown reflects the 2050 target level. The HI RPS is denominated as a percent of generation, and will ultimately rise to above 100% of retail sales; thus the darkest shade refers to 100%+.

For annual RPS targets by state, see <http://rps.lbl.gov>

15 States Have Established a Broader 100% CES **

Typically in combination with an RPS

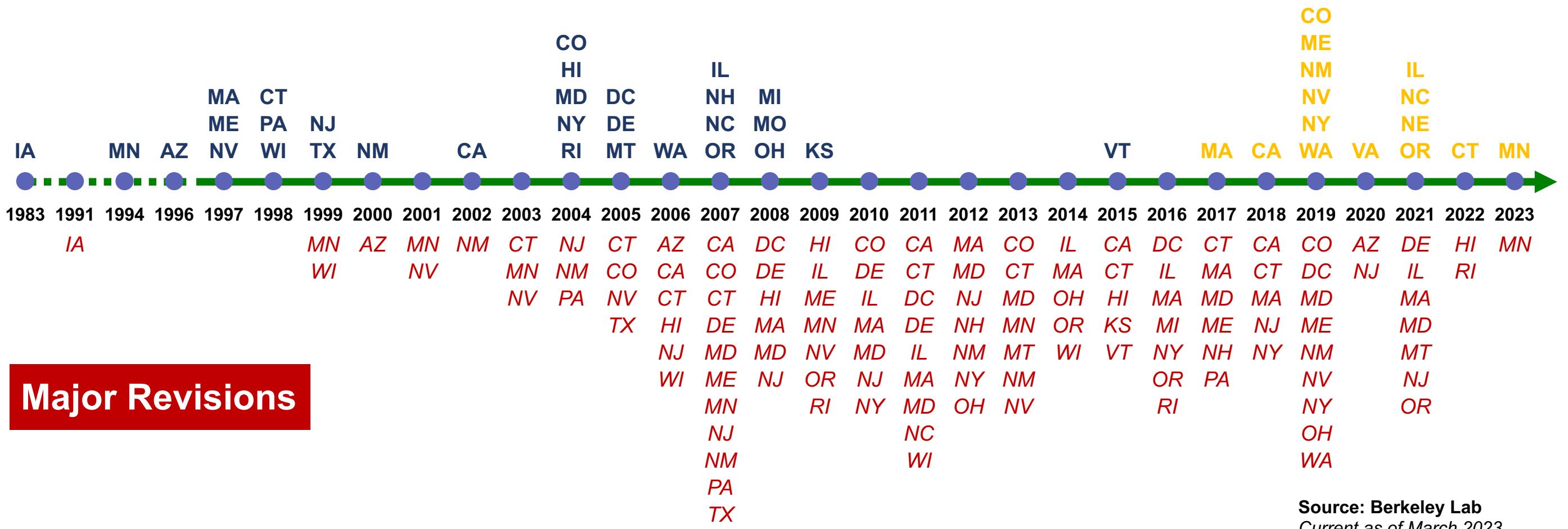


Most RPS Policies Have Been on the Books for More Than a Decade

But states continue to make significant revisions & adopt new CES'

RPS Enactment

CES Enactment



Major Revisions

Source: Berkeley Lab
Current as of March 2023



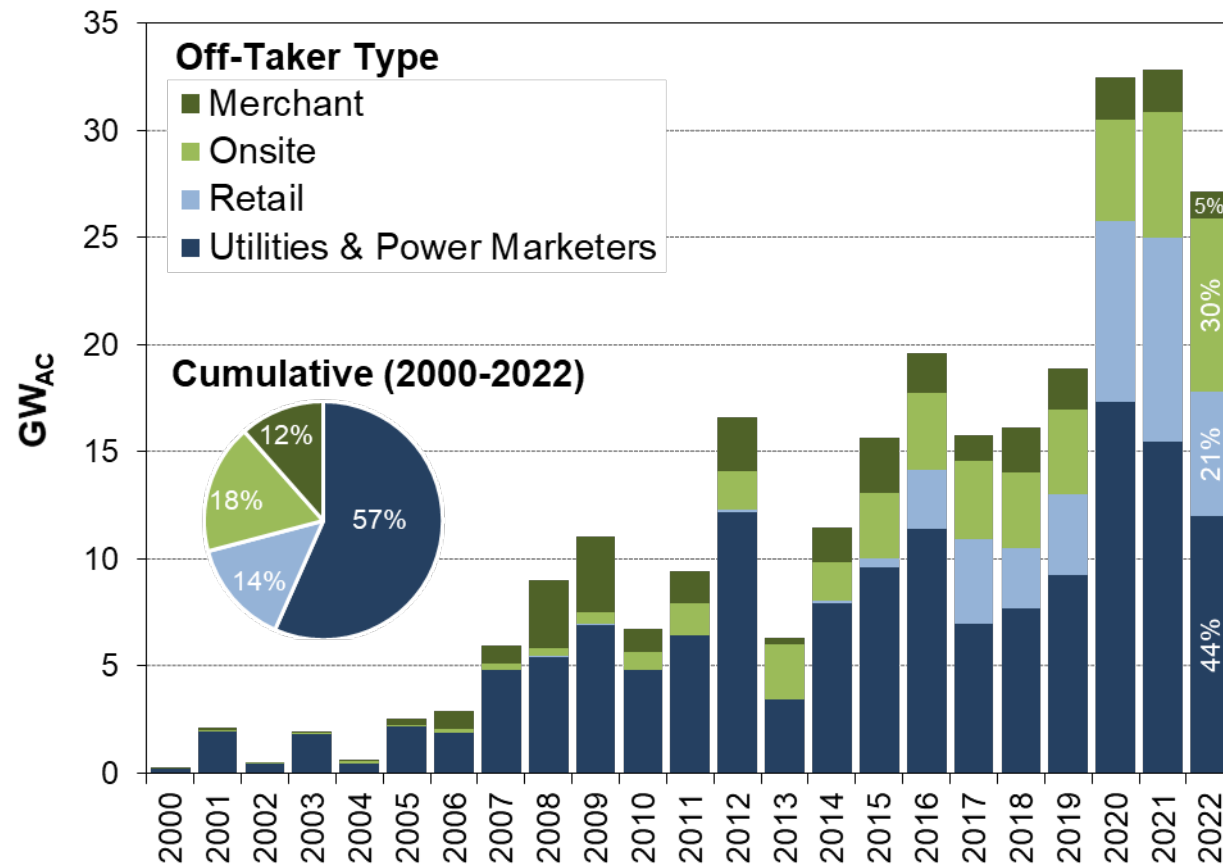


Historical Impacts of State RPS and CES Policies on Renewables Development



Most Renewable Capacity is Sold to Utilities & Power Marketers, but Retail & Onsite Projects Are a Growing Share

Annual Renewable Capacity Additions



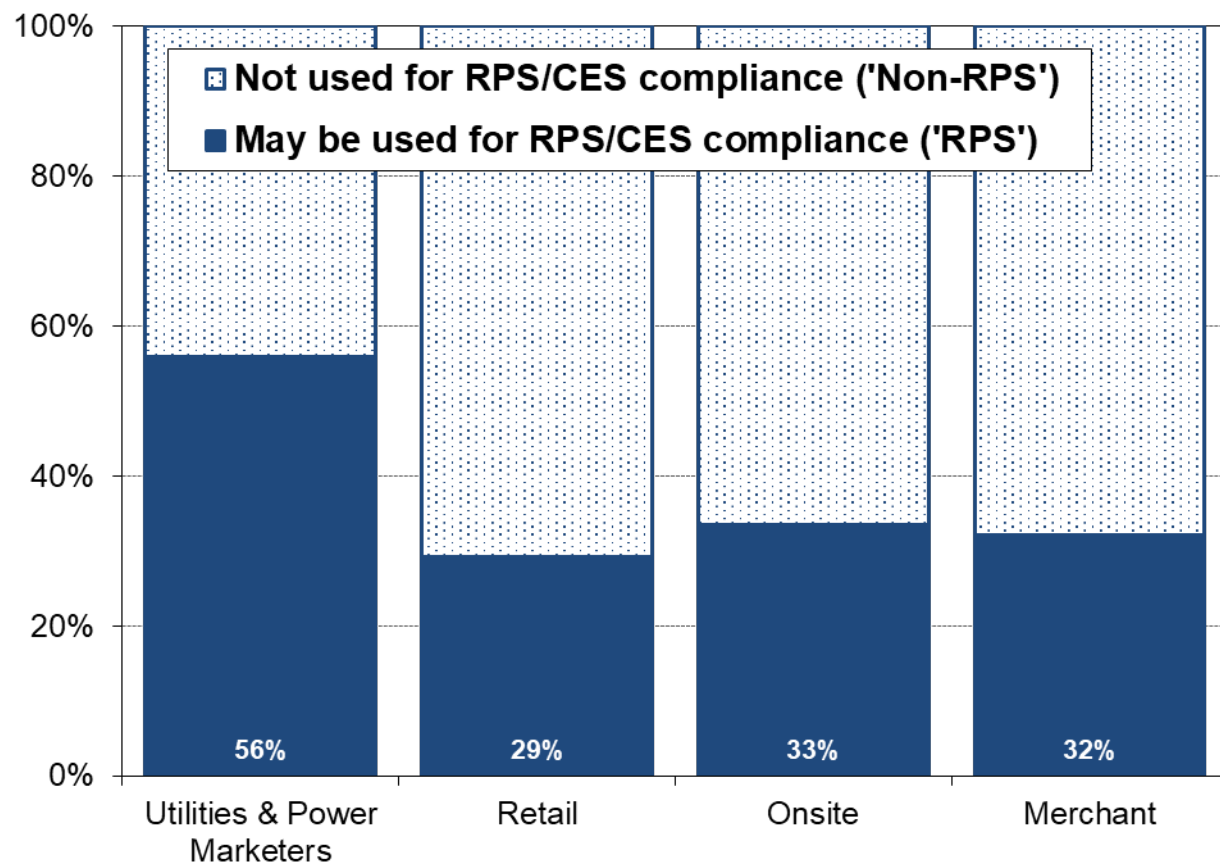
Sources: LBNL, ABB Ventyx, EIA, American Clean Power Association

- Utilities and power marketers represent the largest class of off-takers
- Retail off-takers (corporate PPAs and community solar), have become more prominent in recent years, though their share dipped in 2022
- Onsite projects have seen slow but steady growth in recent years, but surged to 30% of RE adds in 2022 (the only category that grew last year)
- Merchant sales have a long history but are presently a small share of new RE additions

Definitions: **Utilities & Power Marketer** projects are those where the power is sold to or owned by utilities or competitive retail electricity suppliers. **Retail** projects are those where the power is sold to specific end-use customers through either corporate PPAs or community solar arrangements. **Onsite** projects are those installed at customer facilities and used to directly serve onsite load (i.e., behind-the-meter). **Merchant** projects are those where the power is sold into wholesale spot markets.

Within Each Class of Off-takers, a Portion of RE Capacity Additions Is—or May Be—Used for RPS/CES Compliance

Percent of Cumulative Renewable Capacity Additions by Off-Taker (2000-2022)



Notes: Going forward, we use the shorthand “RPS” and “Non-RPS” to refer to the categorization shown here, based on the decision-rules explained to the right.

The criteria for assessing whether a project may be used for RPS compliance depend on the off-taker type and region:

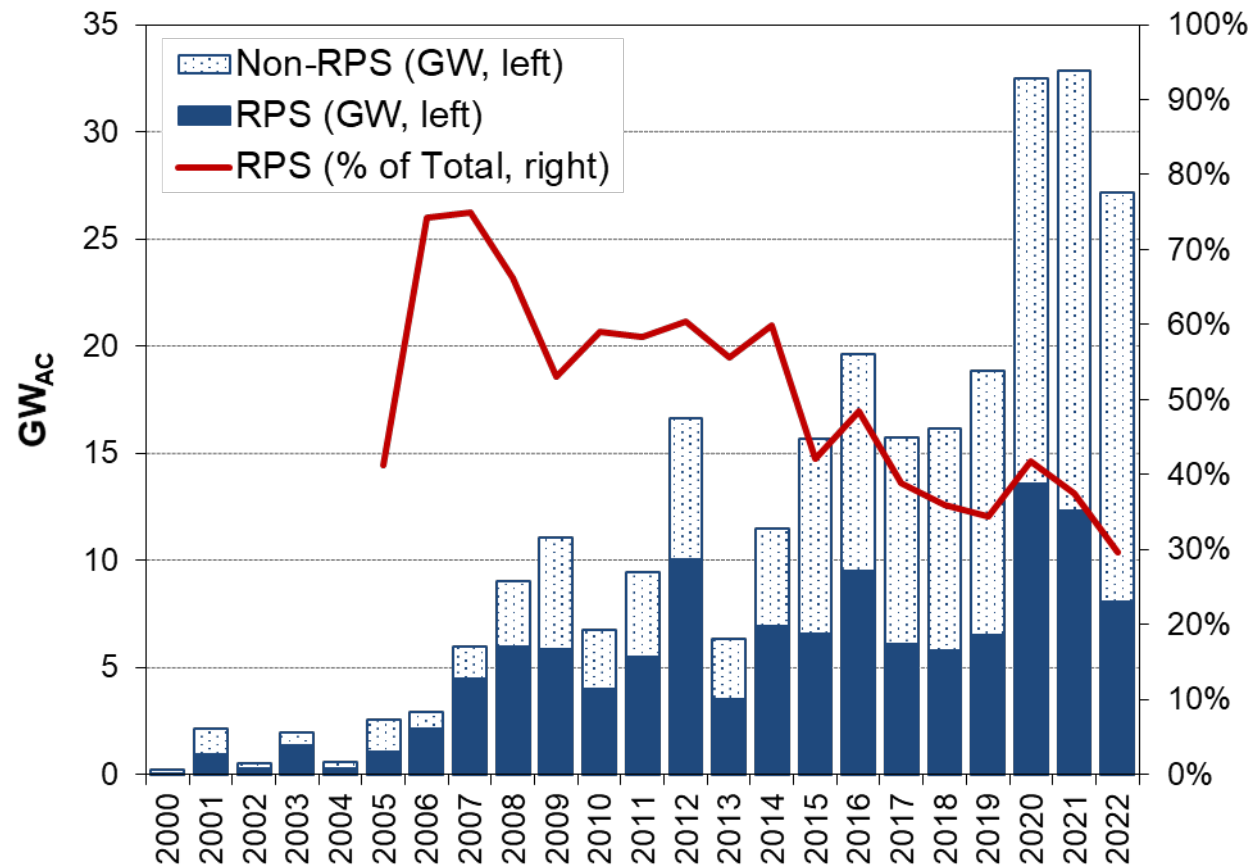
- **Utilities & Power Marketers:** RPS capacity additions are owned by or contracted to load serving entities with active RPS or CES compliance obligations
- **Retail:** RPS additions have been certified for RPS eligibility in one or more state, meaning that the RECs *could* be re-sold for RPS compliance (and potentially “swapped out” with cheaper voluntary-market RECs)
- **Onsite:** RPS capacity adds (almost all DG PV) is either being claimed by a utility for RPS compliance (typically through an incentive program) or is RPS-certified in one or more state and thus potentially selling its SRECs for RPS needs
- **Merchant:** RPS capacity additions have been certified for RPS compliance in PJM or ISO-NE, or was developed in Texas during the period when the state’s RPS was binding

These percentages represent upper bounds on the portion of new RE capacity actually being applied toward RPS compliance

RPS' Have Provided a Stable Source of Demand for RE New-Builds

Even if RPS *portion* of annual RE capacity additions has declined over time

Annual Renewable Capacity Additions



- The RPS share of total RE capacity additions has been falling steadily over time (30% of RE additions in 2022)
- The absolute quantity of RPS-related RE capacity additions has grown over time
- However, RE capacity growth outside of RPS programs has simply been more rapid, consisting of:
 - ▣ Utility/power marketer procurement in non-RPS states (7 GW in 2022; mostly TX, Midwest, Southeast)
 - ▣ Onsite solar not used for RPS (6 GW in 2022; half from CA, FL, TX)
 - ▣ Corporate PPAs and community solar not certified for RPS eligibility (5 GW)

Notes: The criteria for assessing whether a project may be used for RPS compliance depend on the off-taker type and region. See previous slide for further details.

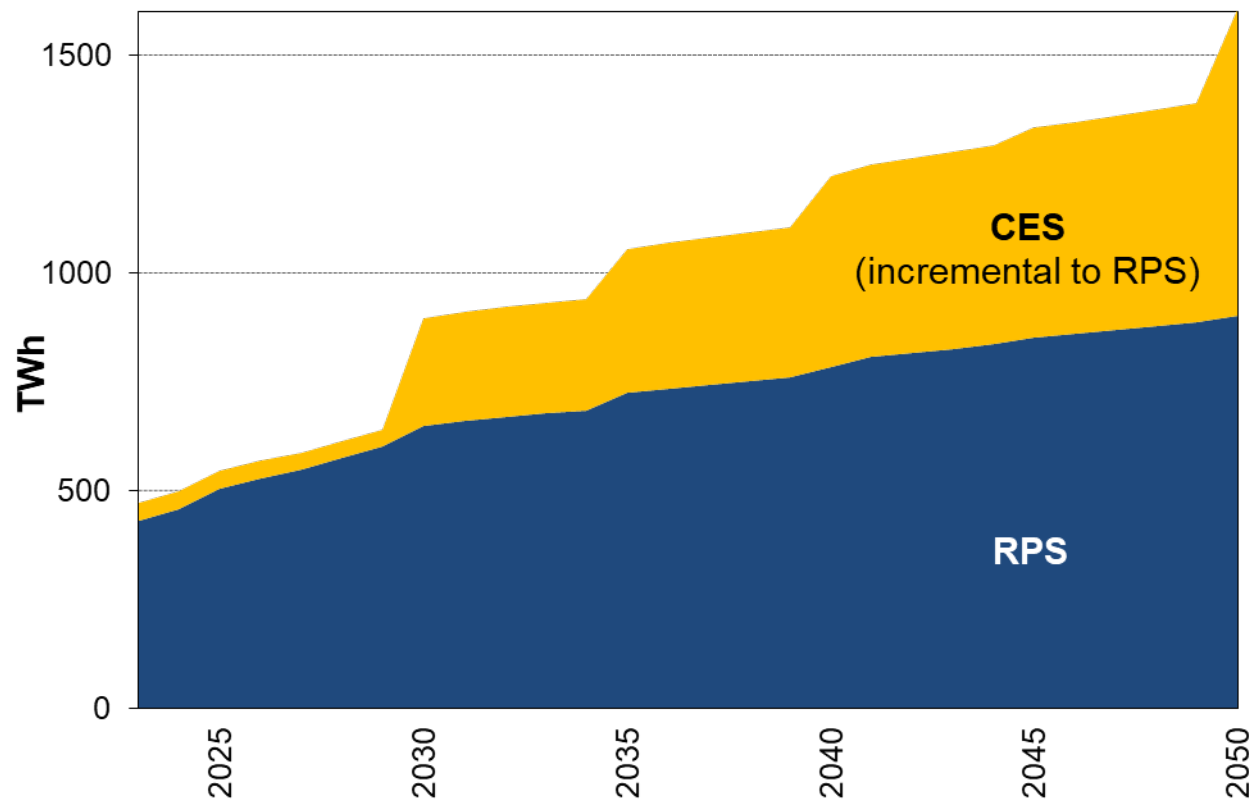


Projected RPS & CES Demand and New Supply Needs



Aggregate U.S. RPS and CES Requirements

Projected RPS + CES Demand



Notes: Projected RPS+CES demand is estimated based on current targets, accounting for exempt load, likely use of credit multipliers, and other state-specific provisions. Underlying retail electricity sales forecasts are based on regional growth rates from the most-recent EIA Annual Energy Outlook reference case.

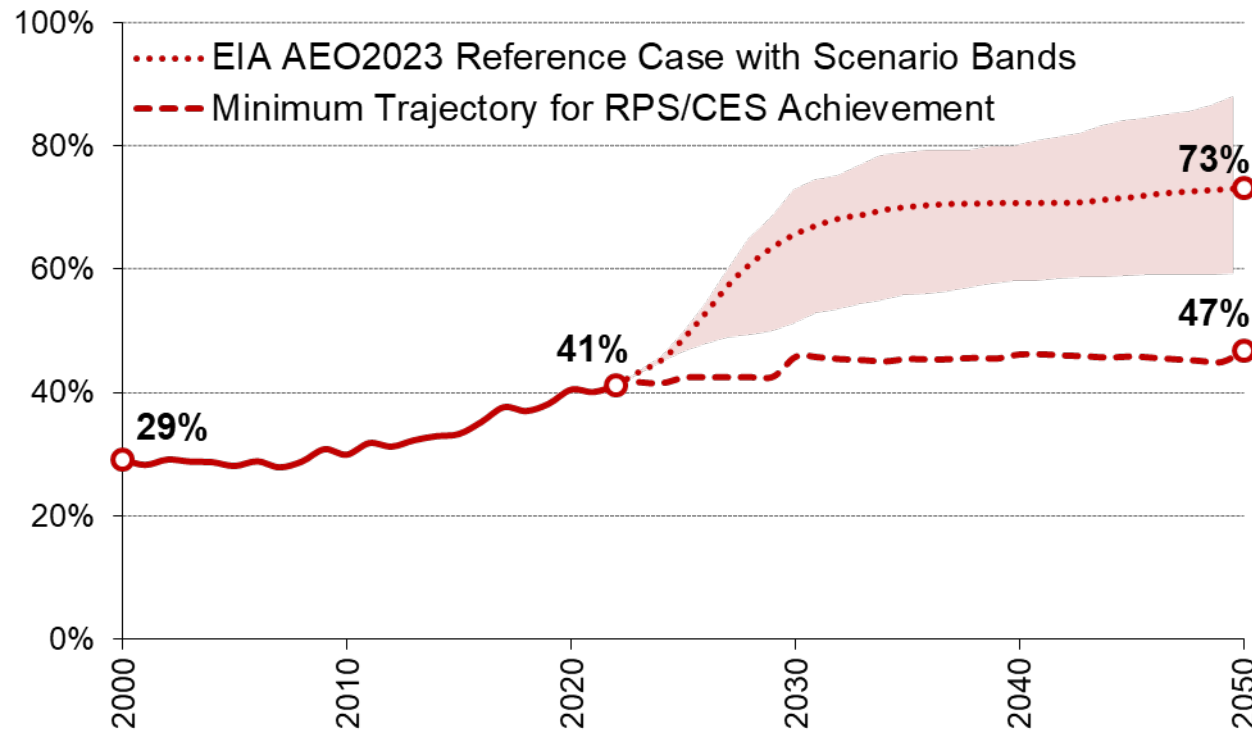
- RPS demand grows over time with rising targets and load growth
- Most RPS percentage targets peak by 2030
- CES targets pick up starting in 2030
 - ▣ Lumpy growth, reflecting staggered targets; corresponding supply growth likely smoother
 - ▣ CES targets may not be binding in the same manner as RPS policies
- Aggregate RPS+CES demand roughly triples from today to 2050

State-level RPS & CES demand projections through 2050 available for download at: rps.lbl.gov

Impact of RPS+CES Obligations for U.S. Generation Mix

And comparison to total projected clean electricity growth

Renewables + Hydro + Nuclear (% of U.S. Generation Mix)



Notes: The minimum trajectory for RPS/CES achievement takes into consideration the potential contributions from existing resources, including banked RECs and existing nuclear and large hydro that may be applied toward CES targets. The scenario band surrounding the EIA reference case projection reflects the min and max across all AEO2023 side cases excluding the “no IRA” case.

- To meet future state RPS and CES targets, clean electricity will need to grow from 41% of the U.S. generation mix today to 47% by 2050
- Clearly insufficient to meet decarbonization objectives
- Represents small fraction of projected total clean electricity generation growth from EIA’s latest reference case, which includes the effects of IRA
- But also lots of uncertainty around those projections; RPS and CES policies can help to reduce that uncertainty

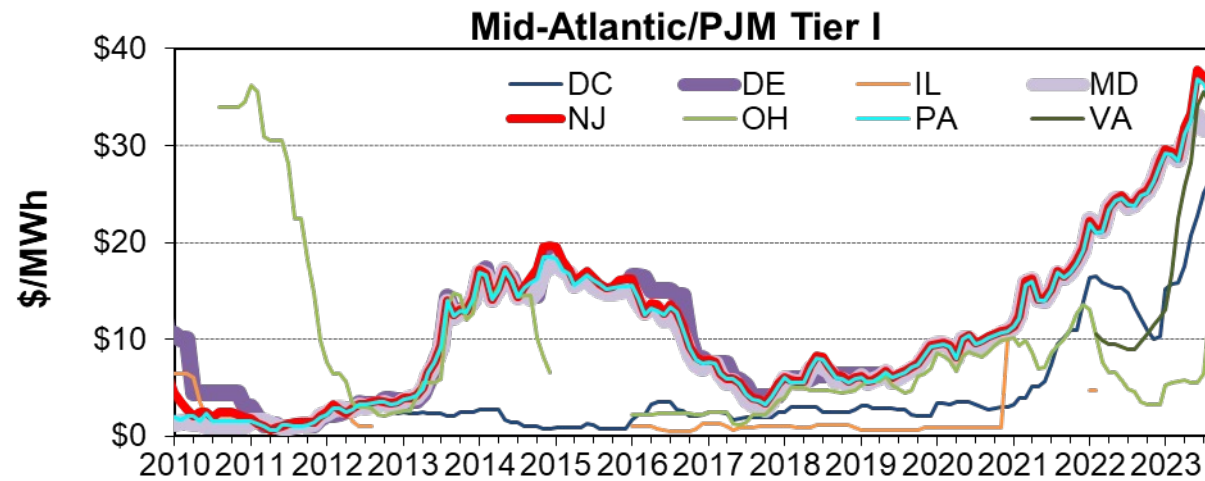
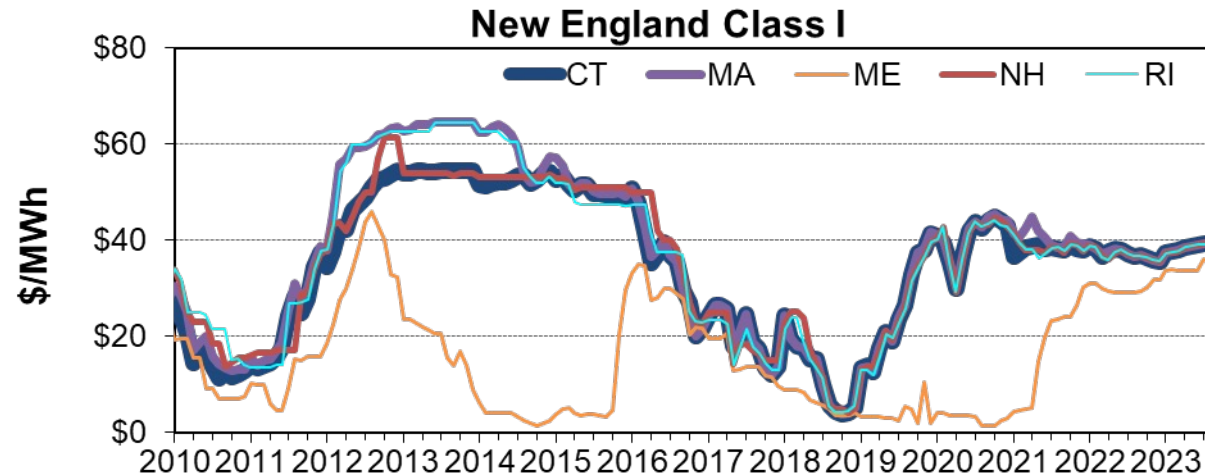


REC Pricing and RPS Compliance Costs



REC Pricing Trends for Primary Tier RPS Obligations

Prices in 2023 holding steady in New England, while continuing to rise in PJM



Source: Marex Spectron. Plotted values are the mid-point of monthly average bid and offer prices for the current or nearest future compliance year traded in each month.

New England:

- Pricing relatively stable over the past few years
- Current prices are effectively at MA/CT ACP rate of \$40/MWh, suggestive of a tight market

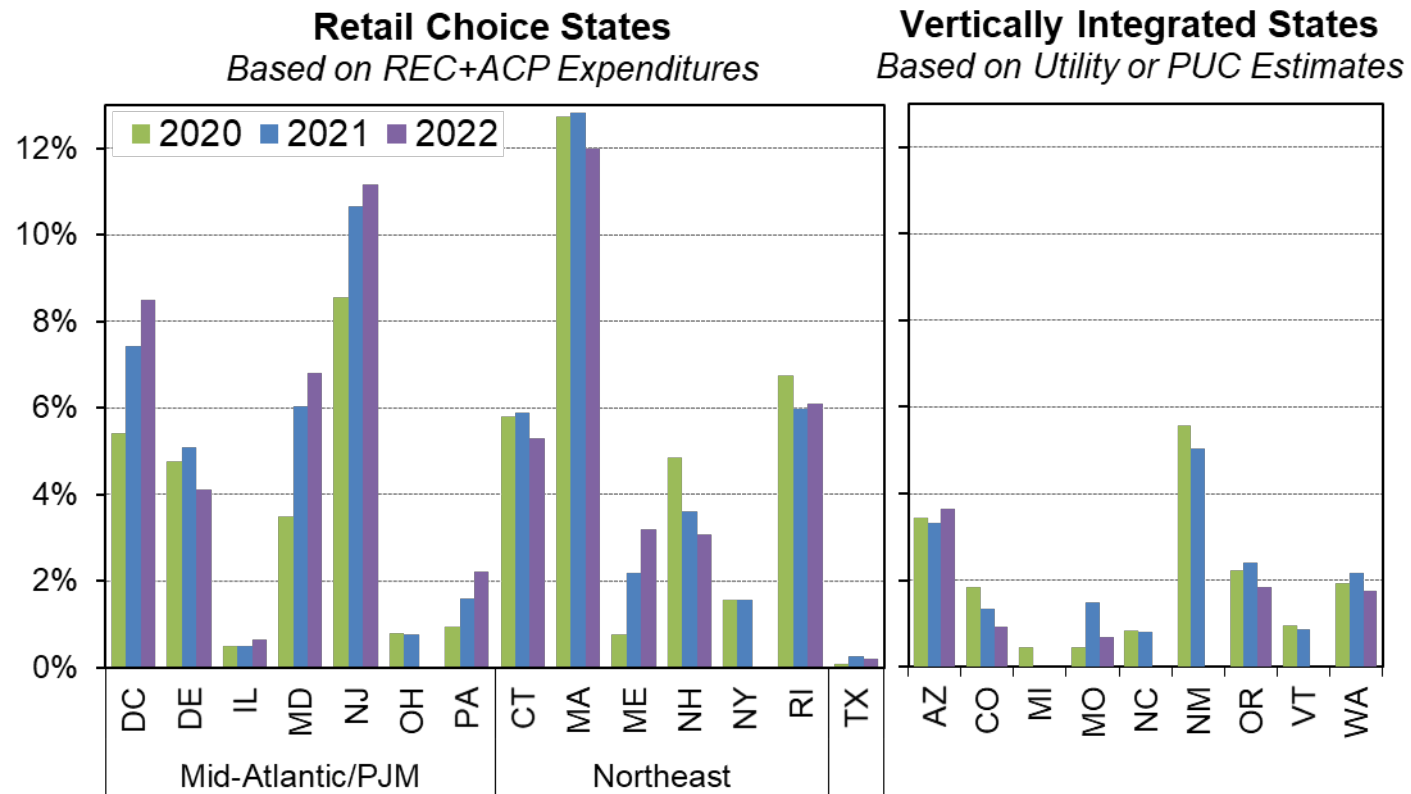
Mid-Atlantic/PJM:

- Prices steadily rising over the past 4-5 years, now at an all-time high
- Regional RPS demand growing much faster than supply, depleting reservoir of banked RECs
- REC prices have breached the MD ACP (\$30/MWh) but still below ACP in NJ and PA

RPS Compliance Cost Trends (2020-2022)

Rising in some states while holding steady or declining in others

RPS Compliance Costs (Percentage of Average Retail Electricity Bill)



- RPS compliance costs averaged 3.5% of retail bills in 2022, but vary considerably across states; high costs in a number of states associated with solar carve-outs
- Time trend driven by underlying trajectory for RPS targets and REC prices and/or PPA prices
- Greater reliance on long-term contracts in vertically integrated and some retail choice states mutes YoY changes in compliance costs

Notes: See earlier slide for general explanation of compliance cost estimates. For NY, costs are based on NYSERDA expenditures for CES and NY-Sun. For other northeastern states, costs also account for long-term PPAs, where REC costs are imputed based on comparison to wholesale energy and capacity market prices, Compliance cost data are unavailable for states not shown.



Outlook



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

- ➔ Whether additional states decide to increase and extend RPS targets and/or adopt broader CES
- ➔ What kinds of implementation and enforcement mechanisms are ultimately established to meet longer-term CES targets
- ➔ Efficacy of IRA, BIL, and other federal policy in stimulating new clean electricity supplies and transmission
- ➔ Complementary efforts to address RE integration, permitting, transmission, and interconnection issues
- ➔ RE cost and REC price trajectories, and the attendant impacts on RPS compliance costs

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Acknowledgements

This work was funded by the Office of Energy Efficiency and Renewable Energy (Strategic Analysis Program) of the U.S. Department of Energy under Contract No. DE-AC02-05CH11231.

