

State Renewables Portfolio & Clean Electricity Standards: 2024 Status Update

Barbose

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

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al supporting data and documentation available at: [rps.lbl.g](https://rps.lbl.gov)

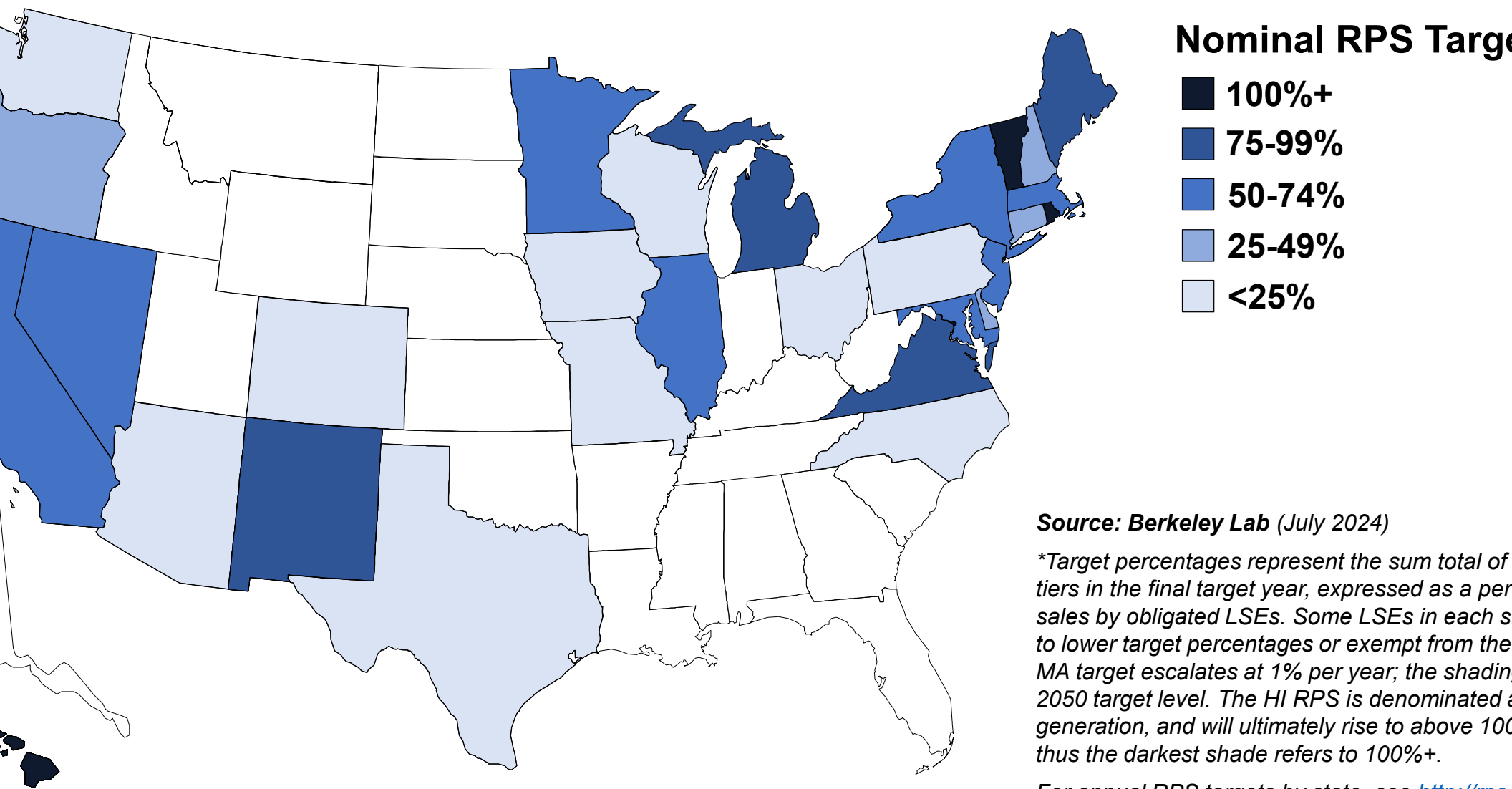
CES annual percentage targets by state

CES demand projection and underlying load forecasts

Evolution of State RPS and CES Program

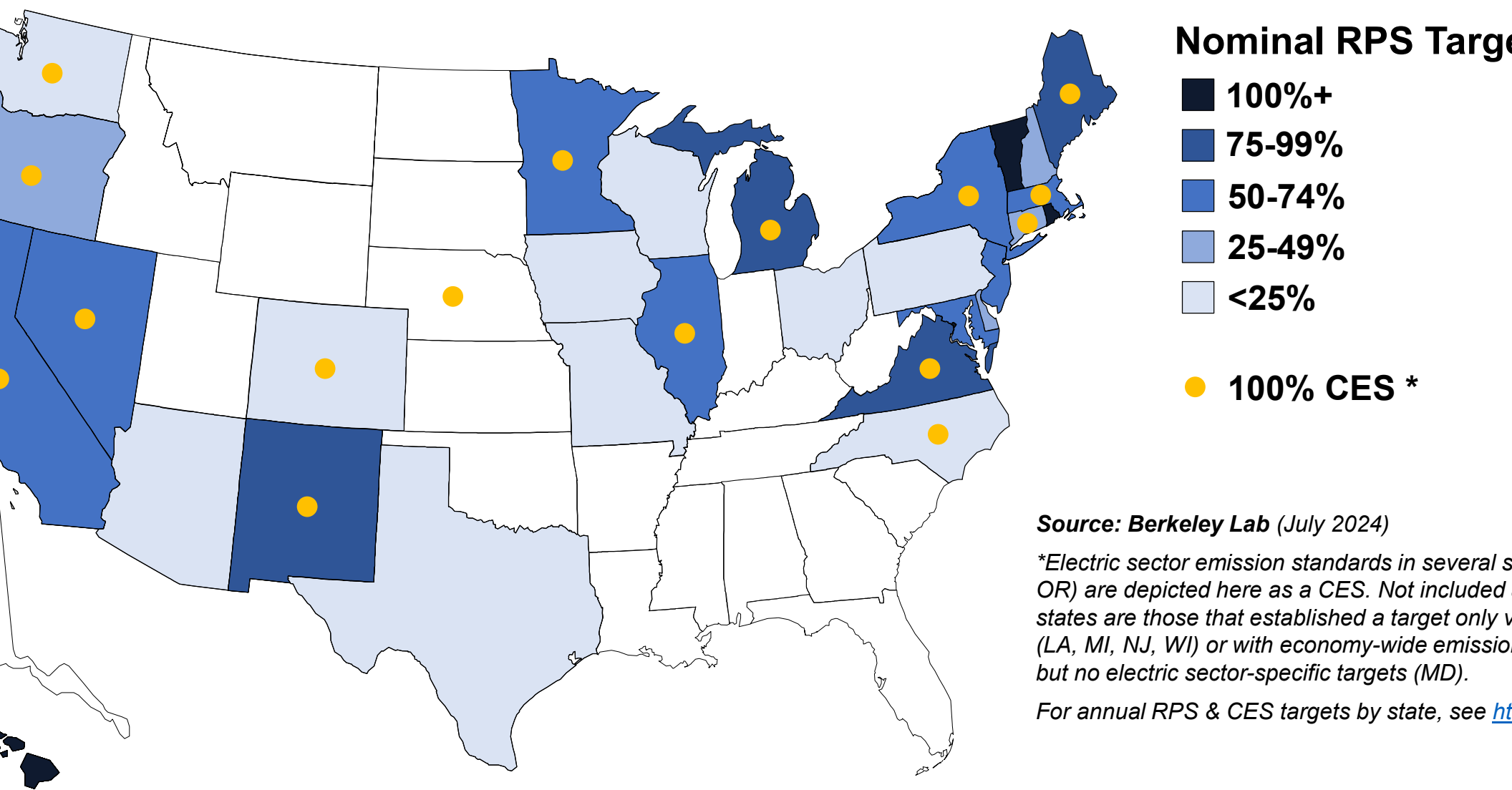
es + DC Have Mandatory RPS Policies

final targets $\geq 50\%$ of retail sales, and 4 have a 100% RPS



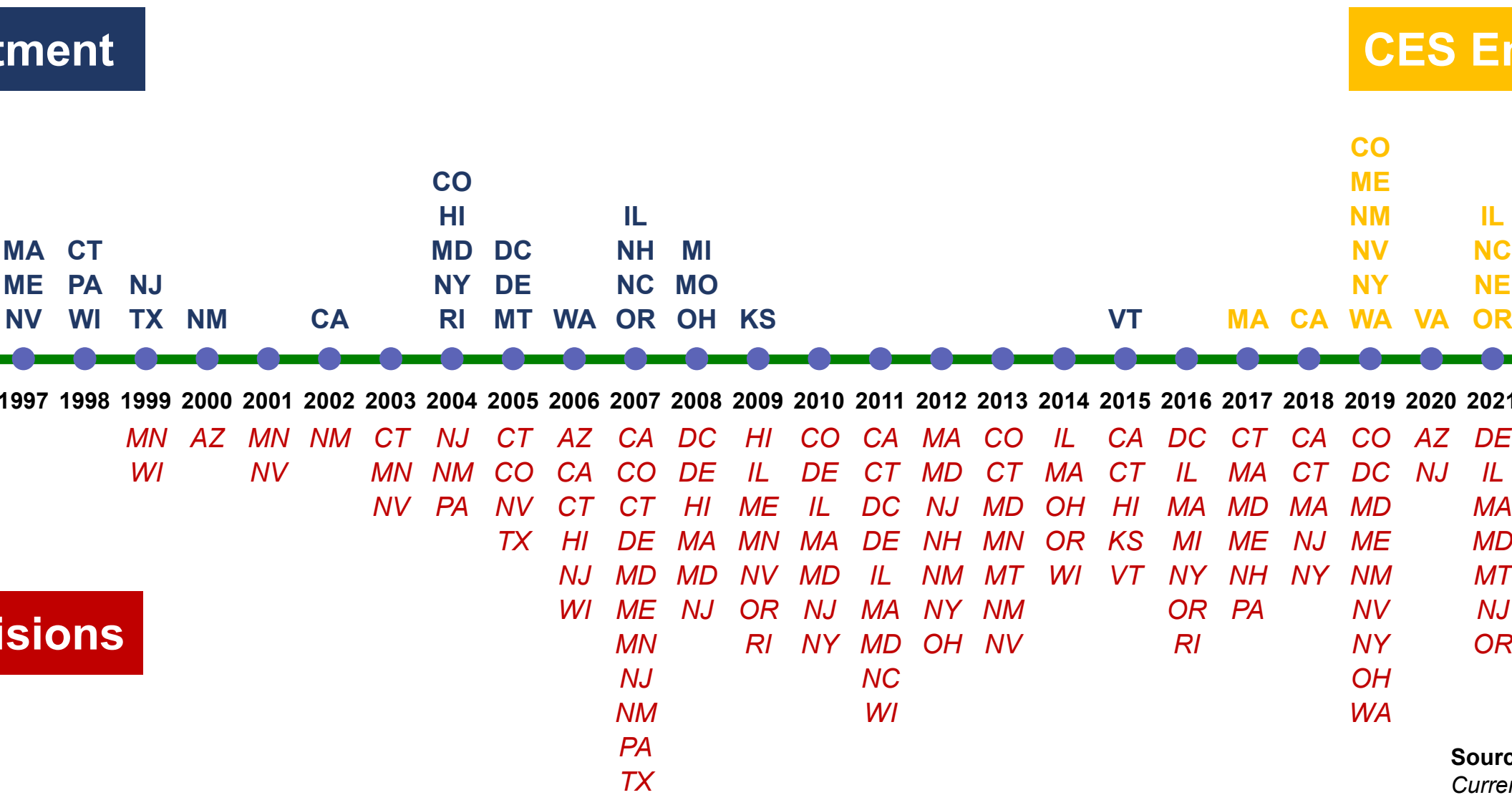
States Have Established a Broader 100% CES

in combination with an RPS



PS Policies Have Been on the Books for More Than a

es continue to make significant revisions & adopt new CES

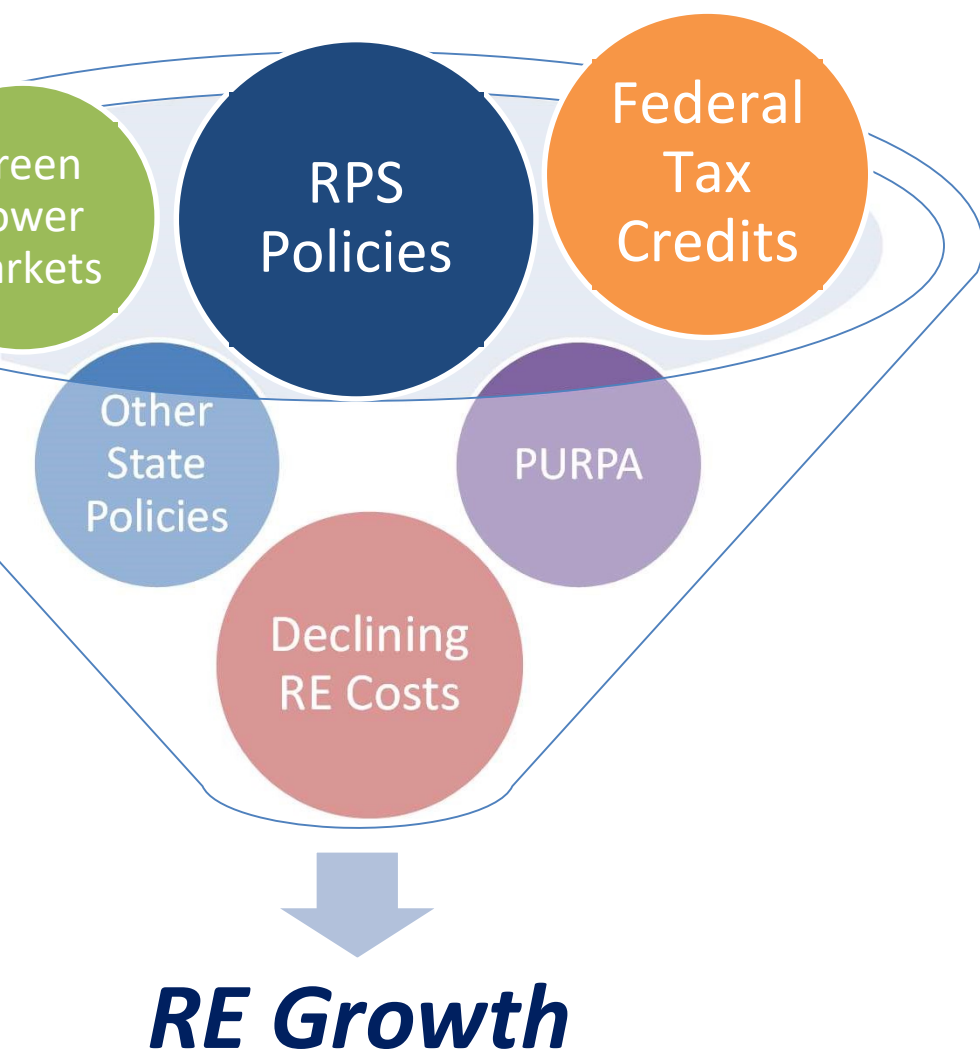


Revisions

Source: Current

Historical Impacts of State RPS and CES Policies on Renewables Development

Policies Exist amidst a Broader Array of Market Drivers for RE Growth



Parsing out the incremental impact of individual drivers for RE growth is challenging given the many overlaps and interactions.

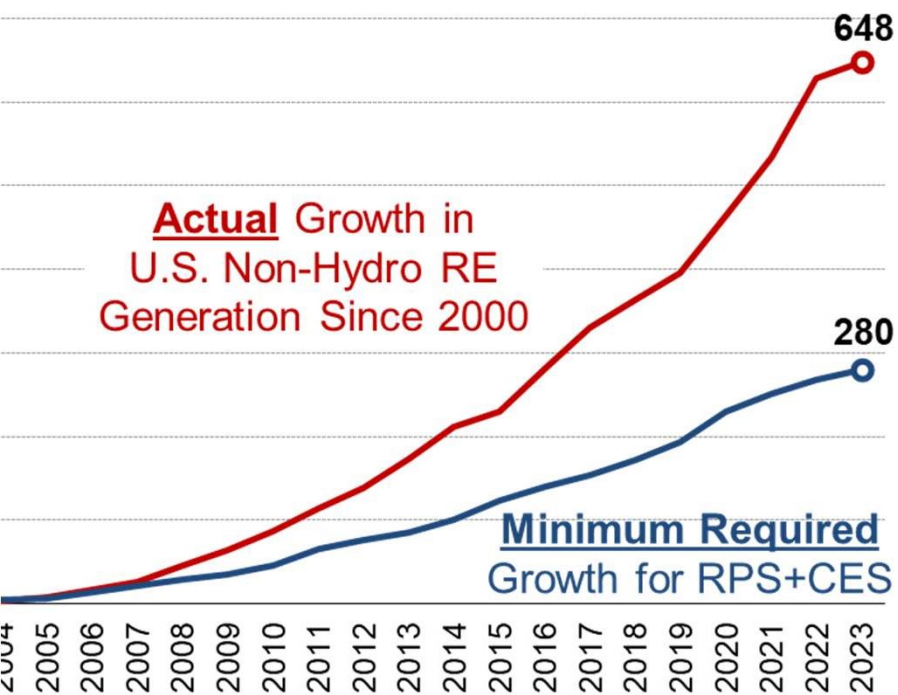
We present two simple approaches for gauging the impact of RPS policies on RE growth—*without claiming strict attribution*

1. Compare total historical RE growth to the minimum amount required to meet demand
2. Quantify the portion of historical RE capacity additions directly serving with RPS obligations or certified for eligibility

Renewable Generation Has Grown Faster than RPS Demands

Policies have been one of the key drivers

Growth in Non-Hydro Renewable Generation: 2000-2023



Minimum Required for RPS excludes contributions compliance from hydro, municipal solid waste, nuclear, and other sources. This comparison focuses on non-hydro RE, because RPS rules require non-hydro forms for compliance.

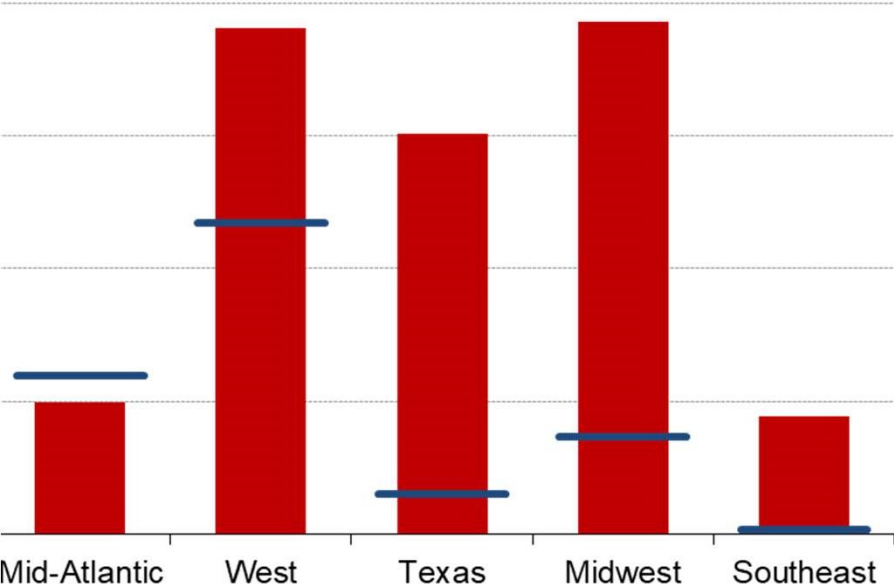
- Total non-hydro RE generation in the U.S. has reached 648 TWh since 2000
- RPS+CES policies required a 280 TWh increase over the same period (43% of total RE growth)
- Provides a rough indication of policy impact, but not precise attribution
 - Some of that growth would have occurred even without RPS+CES requirements
 - Conversely, RPS+CES policies have likely had significant spill-over effects, facilitating non-RPS-related growth
 - Also potentially some RE build out occurring in advance of future CES targets that aren't counted
- RE growth outside of RPS's associated with utility procurement, green power markets, and distributed PV

RPS Role in Driving RE Growth Varies by Region

High in the Northeast and Mid-Atlantic; less so in other regions

Growth in Non-Hydro Renewable Generation: 2000-2023

Actual Growth in Total Non-Hydro RE Generation
Minimum Growth Required for in-Region RPS



Includes states of New England plus New York. Mid-Atlantic consists primarily within PJM, in terms of load served. The comparisons shown are interpreted as indicative of compliance levels; see later sections of the report for historical compliance levels by state.

Northeast and Mid-Atlantic: RPS needs have been outpaced actual in-region RE growth (deficit met by imports), suggesting that RPS demand has been a key driver of non-hydro RE growth

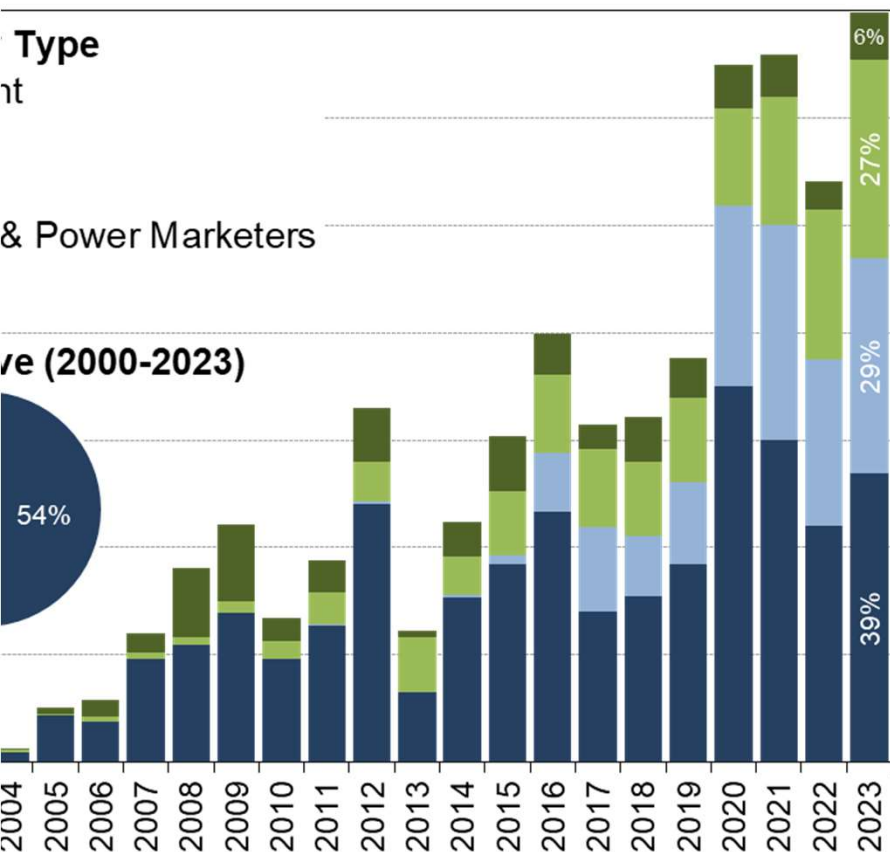
West: Actual RE growth has exceeded RPS requirements, partly due to net metered solar (which is mostly not used for RPS)

Texas and the Midwest: RE growth has outpaced RPS needs, driven by attractive economics of wind and solar

Southeast: Negligible regional RPS demand, though some RE growth serves RPS demand in PJM

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

Renewable Capacity Additions



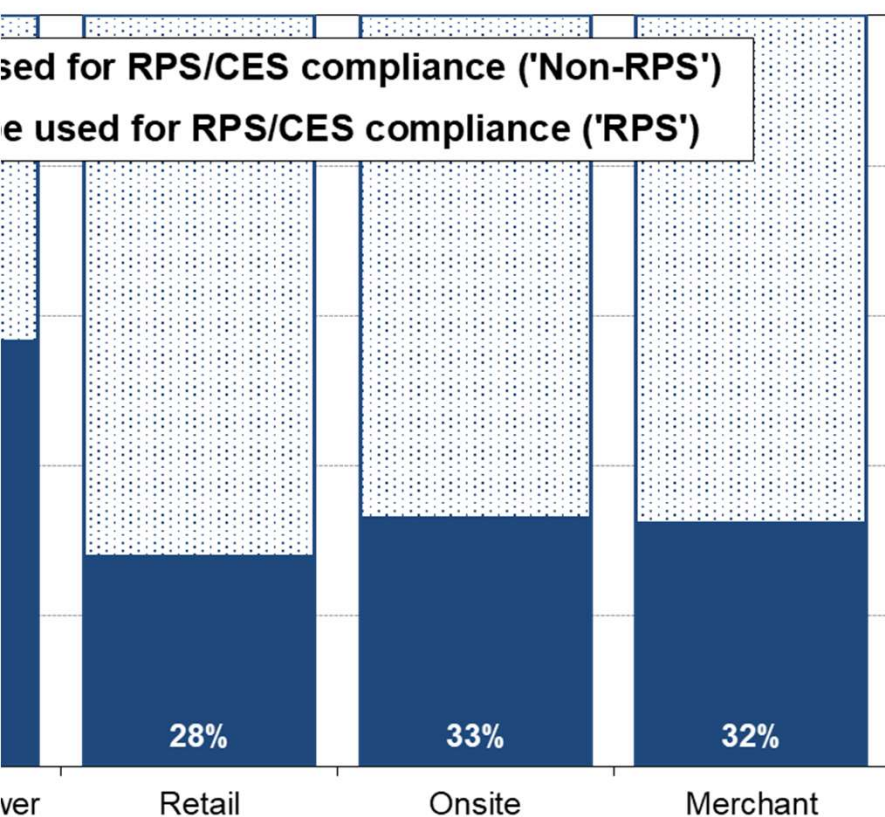
Source: IHS Markit, EIA, American Clean Power Association

- Total renewable capacity additions in 2023 totaled 13.5 GW
- Utilities and power marketers (load-serving entities) continue to represent the largest class of off-taker for RE capacity capacity (39% in 2023, 54% cumulative from 2000-2023)
- Retail off-takers (corporate PPAs and community choice aggregation) have become more prominent since 2020, comprising 29% of new RE capacity added in 2023
- Onsite projects (primarily distributed solar) have grown steadily over time, representing 27% of RE additions in 2023
- Merchant sales have a long history but are presently a small share of new RE additions (6% in 2023)

Definitions: **Utilities & Power Marketer** projects are those where the power is sold to utilities or competitive retail electricity suppliers. **Retail** projects are those where power is sold to specific end-use customers through corporate PPAs, commercial green power tariffs, or community solar arrangements. **Onsite** projects are those installed at customer facilities and serve the onsite load (i.e., behind-the-meter). **Merchant** projects are those where the power is sold to spot markets. In cases where details about the off-taker have not been disclosed, we made a best guess as to the most likely type of off-taker, based on project attributes and location.

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

Cumulative Renewable Capacity Additions by Off-Taker (2000-2023)



We use the shorthand “RPS” and “Non-RPS” to refer to the capacity additions, respectively, that are or may be used for RPS/CES compliance, based on the decision-rules explained to the right.

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

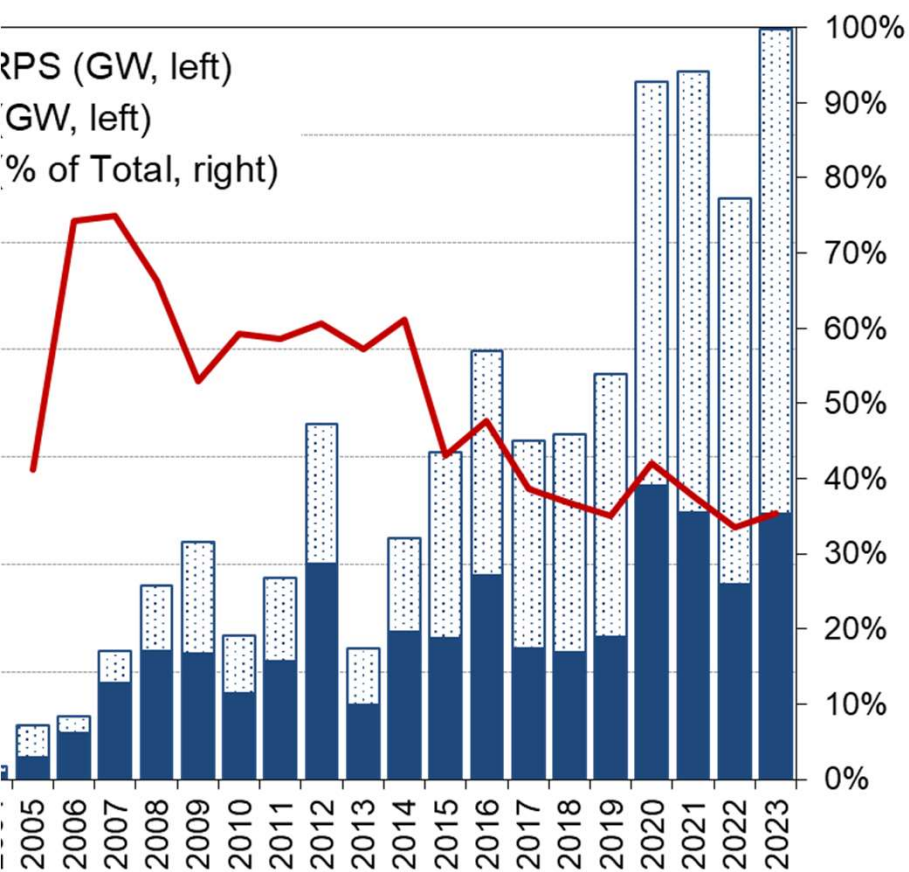
- ❑ **Utilities & Power Marketers:** Roughly **57%** of RE capacity additions since 2000 is owned by or contracted to local entities with active RPS or CES compliance obligations.
- ❑ **Retail:** Roughly **28%** of capacity additions has been claimed for RPS eligibility in one or more state, meaning that the capacity may be re-sold for RPS compliance (and potentially “swapped” with cheaper voluntary-market RECs)
- ❑ **Onsite:** Roughly **33%** of capacity adds (almost all DCEC projects) are either being claimed by a utility for RPS compliance (or are being sold through an incentive program) or is RPS-certified in one or more state and thus potentially selling SRECs into the RPS market.
- ❑ **Merchant:** Roughly **32%** of capacity additions has been claimed for RPS compliance in PJM or ISO-NE, or was developed in Texas during the period when the state’s RPS was in effect.

These percentages represent upper bounds on the potential for RE capacity actually being applied toward RPS compliance.

ve Provided a Stable Source of Demand for RE New-B

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

Renewable Capacity Additions



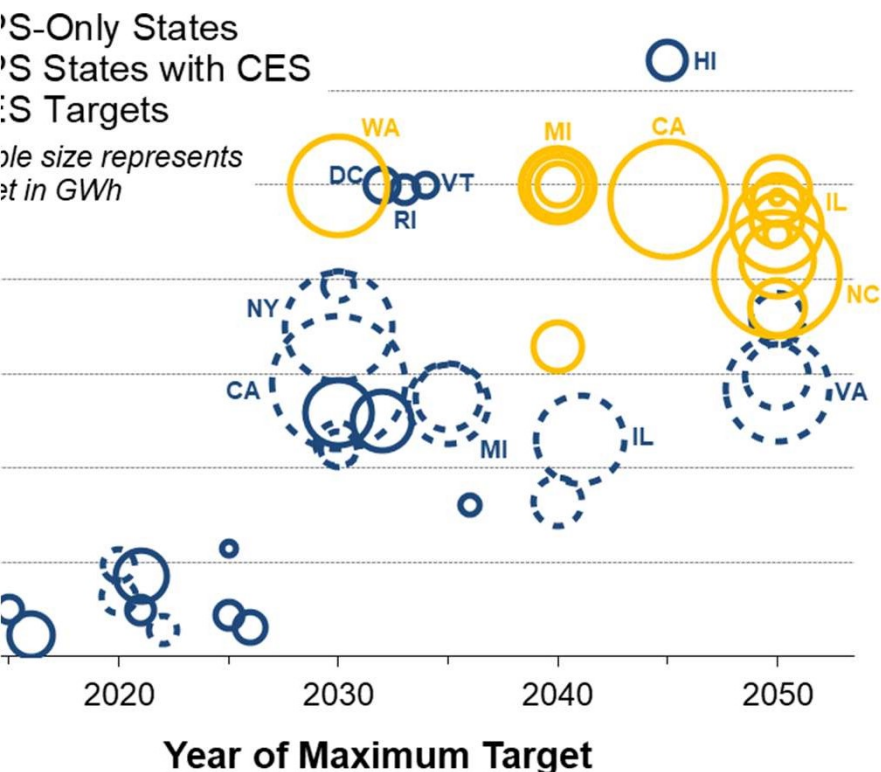
assessing whether a project may be used for RPS compliance
er type and region. See previous slide for further details.

- “RPS-related” RE capacity additions have generally declined over time, representing 12.4 GW of new RE additions since 2000
- Cumulatively, RPS-related capacity additions represent 45% of all RE capacity adds since 2000 (134 GW of 300 GW)
- That share has declined over time, dropping to around 35-40% for additions in 2023, compared to 60-70% in early 2000s, owing to more-rapid growth in the voluntary market
- Non-RPS capacity additions in 2023 consisted of three equal shares of:
 - ▣ Corporate PPAs and community solar not eligible for RPS (7.3 GW)
 - ▣ Onsite solar not used for RPS (7.1 GW, largely in CA, FL, TX)
 - ▣ Utility/power marketer procurement in non-RPS regions (6.7 GW, mostly in TX, Midwest, Southeast)

Projected RPS & CES Demand and New Supply Needs

Levels and Timeframes Vary Widely

RPS & CES Targets and Target Years



Shows each state's maximum RPS and CES percentage target and when that target must be reached. Targets are shown here as a percentage of statewide retail sales, which may differ from nominal targets if only a subset of LSEs in a state. The RPS target for HI is denominated as a percentage of statewide generation, and thus is greater than 100% of retail sales. The CES target represents the target in GWh terms; in the case of the CES target, it reflects only the incremental GWh above and beyond the RPS.

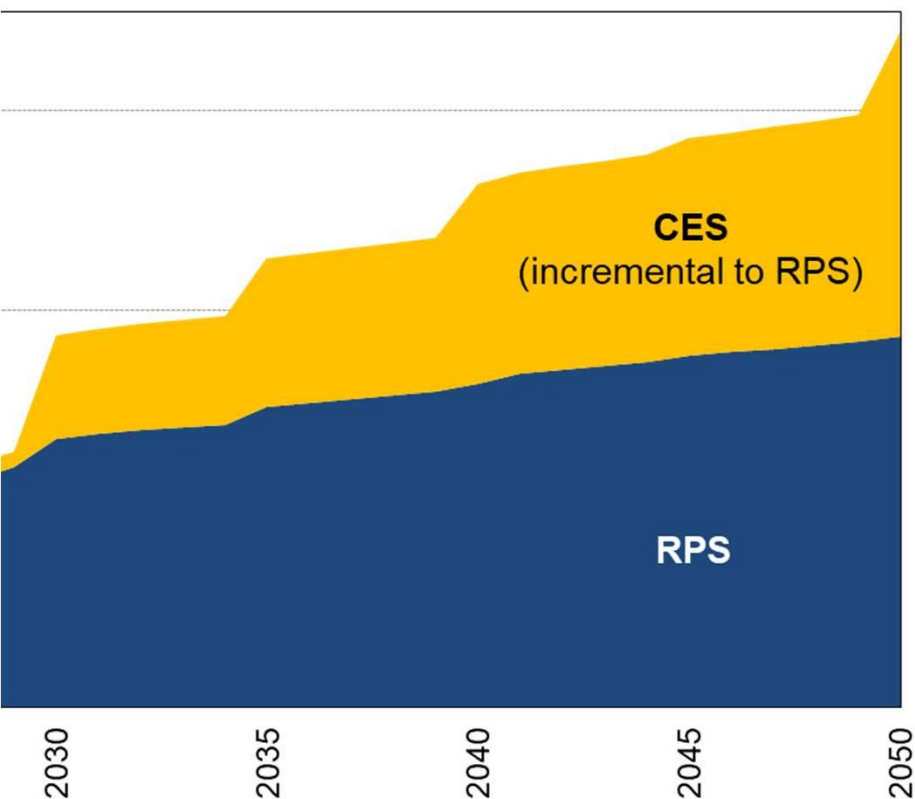
- Targets translated into a percentage of *statewide* retail sales (to provide comparability)
- RPS states can be grouped into three categories:
 - ▣ Legacy RPS programs with final target of roughly 15-25% by 2015-2025
 - ▣ A sizeable contingent of states with high targets ($\geq 50\%$) in the 2030-2035 timeframe
 - ▣ States with similarly high targets but longer timeframes (2040-2050)
- Most of the states in the latter two groups have relatively high RPS targets, have also set even higher, longer-term CES targets

Annual RPS & CES percentage targets by state
available for download at: rps.lbl.gov

Aggregate U.S. RPS and CES Requirements

over time with rising targets and load growth

Projected RPS + CES Demand



+CES demand is estimated based on current targets, load, likely use of credit multipliers, and other state-specific retail electricity sales forecasts are based on regional growth percent EIA Annual Energy Outlook reference case.

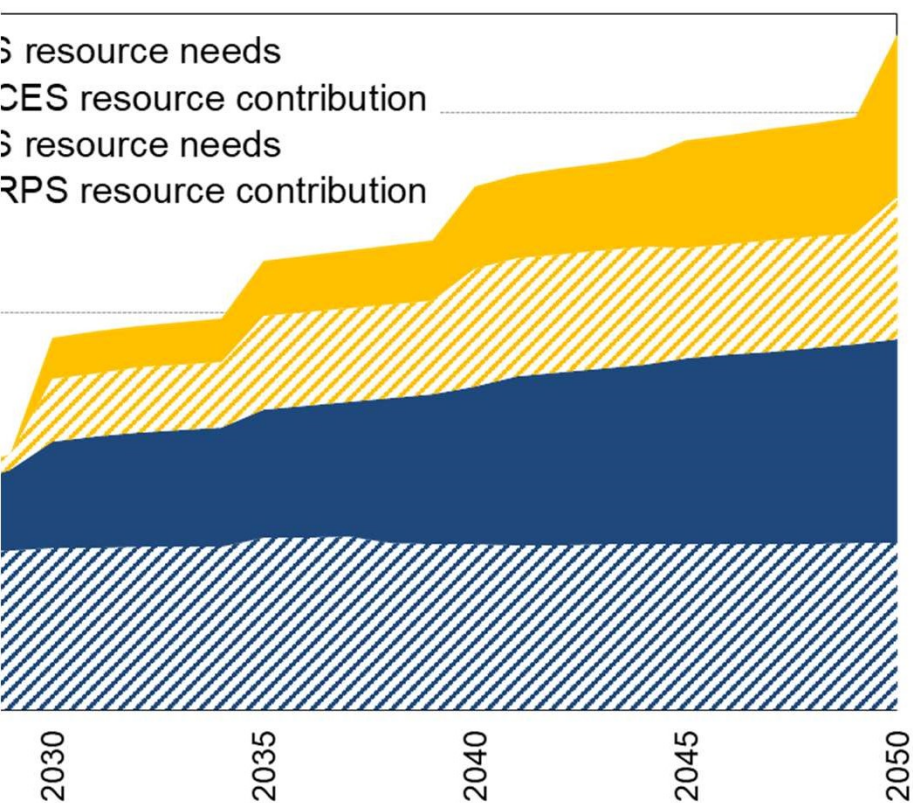
- Aggregate RPS demand more than doubles from 450 TWh in 2024 to 930 TWh in 2050
- RPS demand growth slows after 2030 as states pass their maximum percent targets
- CES targets pick up that slack, adding 180 TWh of additional clean electricity demand
 - ▣ Lumpy growth, reflecting staggered targets; corresponding supply growth likely smoother
 - ▣ CES targets may not always be binding in the same manner as RPS policies
- Increase in clean electricity demand directly equate to required increase in

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

Resources Needed to Meet RPS+CES Demand Growth

which will be met by resources already under development

5. New Resource Contributions to Meet RPS and CES Demand

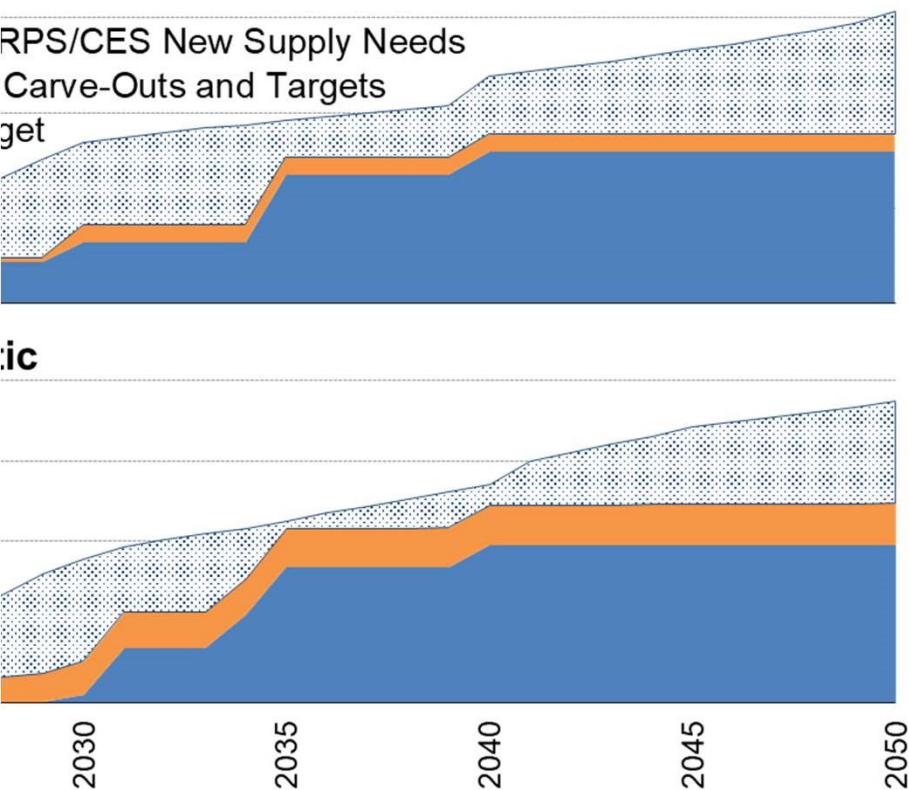


ES resources represent the potential contribution to future RPS and CES resources in operation as of year-end 2023, including banked capacity considering future retirements. New resource needs represent the additional RPS/CES demand and existing resources.

- RPS demand growth requires a nearly equivalent increase in clean electricity
- In contrast, roughly half of CES demand could be met with existing resources, including nuclear & large hydro (depends on retirements)
- Collectively, RPS and CES policies require roughly 350 TWh of new clean electricity by 2030 and 900 TWh by 2050 (roughly double the historical rate of RPS-buildout)
- Important factors not captured here:
 - ▣ New inter-regional transmission could reduce resource needs for both RPS and CES
 - ▣ Retirements of existing RPS and CES resources could increase new resource needs
 - ▣ The voluntary market may absorb a larger portion of current RPS-eligible supply than assumed

Targets and Solar Carve-Outs Comprise a Large Share of New Supply Needs in the Northeast and Mid-Atlantic

Target and Solar Carve-Out Contributions to New Supply Needs



Translated to TWh assuming 45% capacity factor.

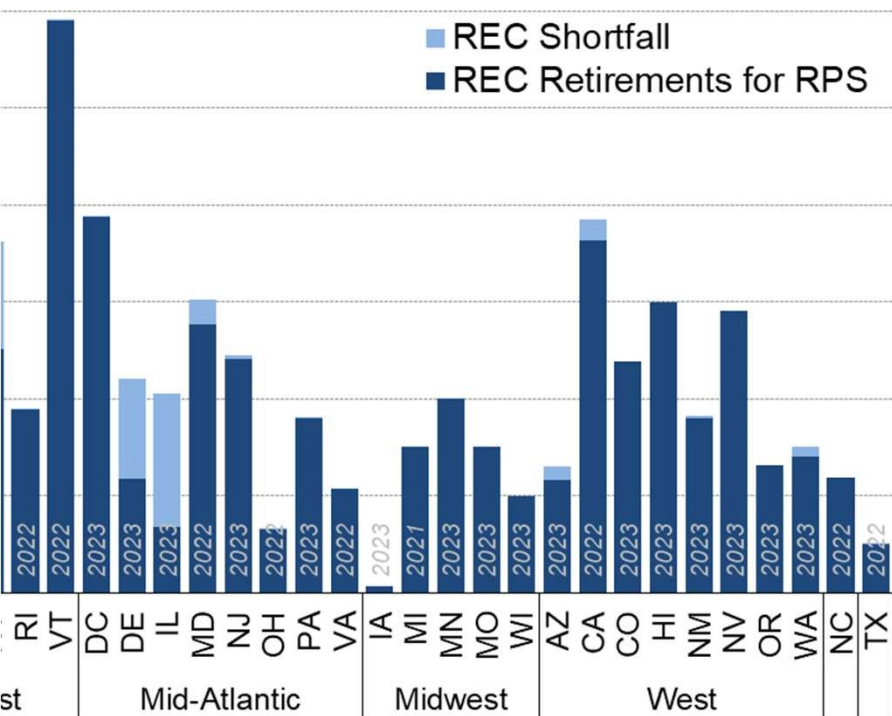
- Numerous states in the Northeast and Mid-Atlantic have established procurement targets for Offshore Wind (OSW)
- Many also have solar and/or DG carve-out procurement targets
- A sizeable share of RPS/CES new supply needs may be met by these OSW and solar/DG
- Residual new supply need in any given year is heavily dependent on the timing of when projects come online
 - ▣ A slow pace in OSW deployment could result in large near-term residual supply needs
 - ▣ Possibility of large periodic swings in residual supply, REC pricing volatility

RPS Target Achievement To-Date

RPS Target Achievement

es are on track with their overall RPS targets

Retirements and Shortfalls (recent compliance year data)



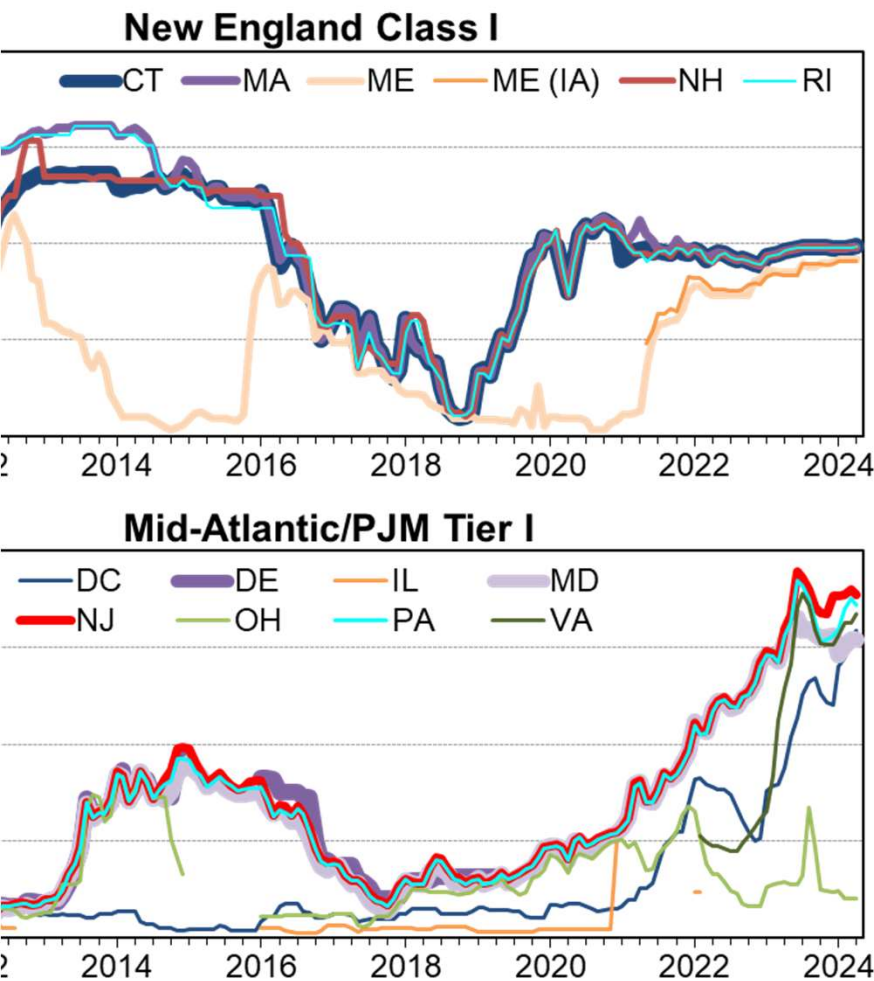
year shown for each state is indicated in grey. The height of represents the annual RPS compliance obligation, inclusive of all that allow the use of ACPs, REC shortfalls represent the portion of RPS. NY target is interpolated based on 2021 and 2030 targets.

- Current RPS targets in the range of 1 retail sales across most states
 - ▣ High targets in ME and VT reflect expected eligibility rules, including pre-existing I
- Most states are hitting their targets
 - ▣ Small shortfalls are common, often as with individual LSEs or specific resour
 - ▣ NY and IL: Shortfalls expected to close as contracted projects come online (e.g., additional ~18% of retail sales in NY)
 - ▣ DE: Large shortfall due to low ACP co other states in the region
- Many states/utilities are well ahead of while others have met interim targets on stockpiles of banked RECs from p

CC Pricing and RPS/CES Compliance Costs

Pricing Trends for Primary Tier RPS Obligations

2023 have remained at ACP in New England, continued rising in



values are the mid-point of monthly average bid and offer prices
at future compliance year traded in each month.

New England:

- Pricing relatively stable over the past, hovering just below the current MA/CT
- Maine prices were historically lower, due to broader biomass eligibility, but rose as Class IA tier (Class IA) ramped up

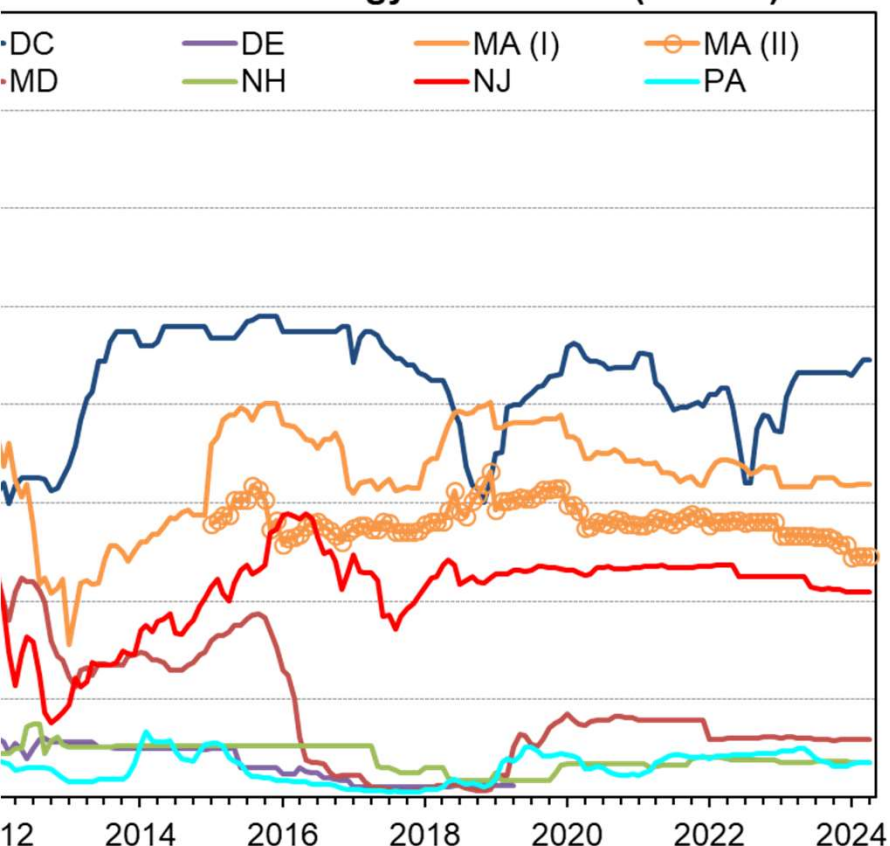
Mid-Atlantic/PJM:

- Prices rising steadily as regional RPS obligations grow faster than new supply
- Leading to shortfalls in states with low RPS rates (MD and DE), as REC sales shift to states with higher ACPs/REC prices

Pricing Trends for RPS Solar Carve-Outs

most states remained flat through 2023

Solar Renewable Energy Certificates (SRECs)



values are the mid-point of monthly average bid and offer prices
st future compliance year traded in each month.

- **DC:** Prices have remained high, due to fundamental challenges of meeting target in-district resources
- **MA** and **NJ:** Both states have transitioned from SREC markets, but SREC pricing in legacy carve-outs has remained relatively high
- **MD:** Prices capped by low solar ACP (\$60/MWh)
- **NH** and **PA:** modest carve-outs (0.7% and 0.5%, respectively) heavily oversupplied

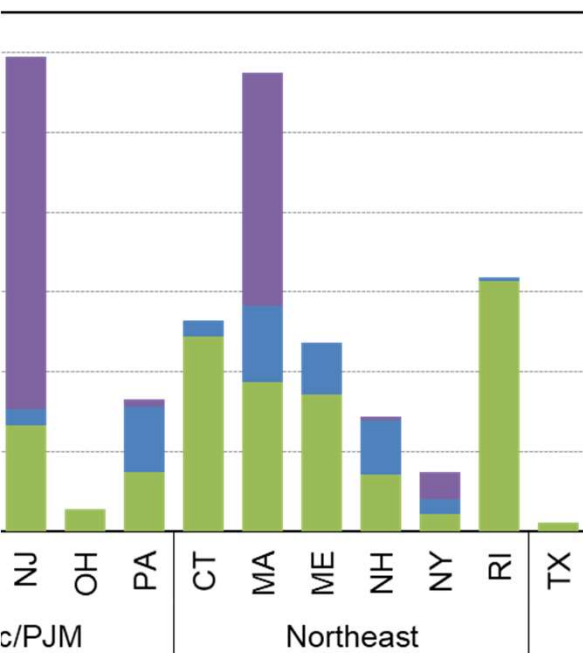
Compliance Costs by Resource Tier

Compliance costs average ~4% of customer electricity bills but vary widely

Compliance Costs for Most-Recent Available Year (Percentage of Average Retail Electricity Bill)

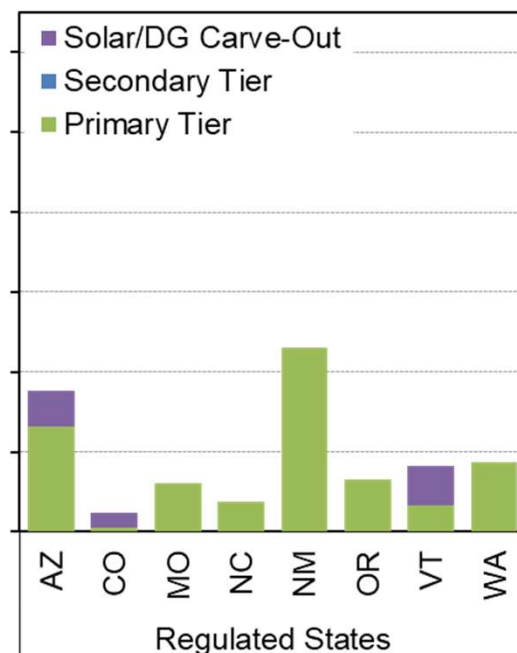
Retail Choice States

Based on REC+ACP Expenditures



Vertically Integrated States

Based on Utility or PUC Estimates



See Appendix A for general explanation of compliance cost estimates. Data for most states is for the 2022 or 2023 compliance year. For MA, the solar carve-out includes SREC I costs. The Primary Tier includes the residual Class I requirement, including SMART, plus the cost of the solar carve-out. Carve-out costs are included in the Primary Tier costs for IL, MO, NC, NM, and NY. We did not separately break those costs out.

- RPS compliance costs vary across states, reflecting differences in policy design, procurement structure, and RE economics
- Highest compliance costs are related to solar/dg carve-outs in states with high SREC prices (though for NJ and MA, these are legacy programs in the process of ramping down)
- Primary tier costs in retail choice states vary by differences in target level and RE economics
- Secondary-tier costs are generally a smaller contributor, due to low REC prices; in several states are seeing costs on the order of 1-2% of customer bills
- Compliance costs in vertically integrated states are generally lower than in retail choice states, reflecting greater reliance on bundled generation

Outlook

Future Role & Impact of State RPS and CES Programs V On...

er additional states decide to increase and extend RPS targets and/or
- CES

nds of implementation and enforcement mechanisms are ultimately
shed to meet longer-term CES targets

y of IRA, BIL, and other federal policy in stimulating new clean electric
s and transmission

plementary efforts to address RE integration, permitting, and interconne

t and REC price trajectories, and the attendant impacts on RPS comp

other RPS policy refinements (e.g., long-term contracting programs, A
REC banking rules, eligibility rules, etc.)

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Information

and publications from the Electricity Markets & Policy Group: <https://emp.lbl.gov/publication>

or our email list: <https://emp.lbl.gov/mailling-list>

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