



Environmental Energy Technologies Division Lawrence Berkeley National Laboratory

U.S. Renewables Portfolio Standards: *Past their prime, or primed for progress?*

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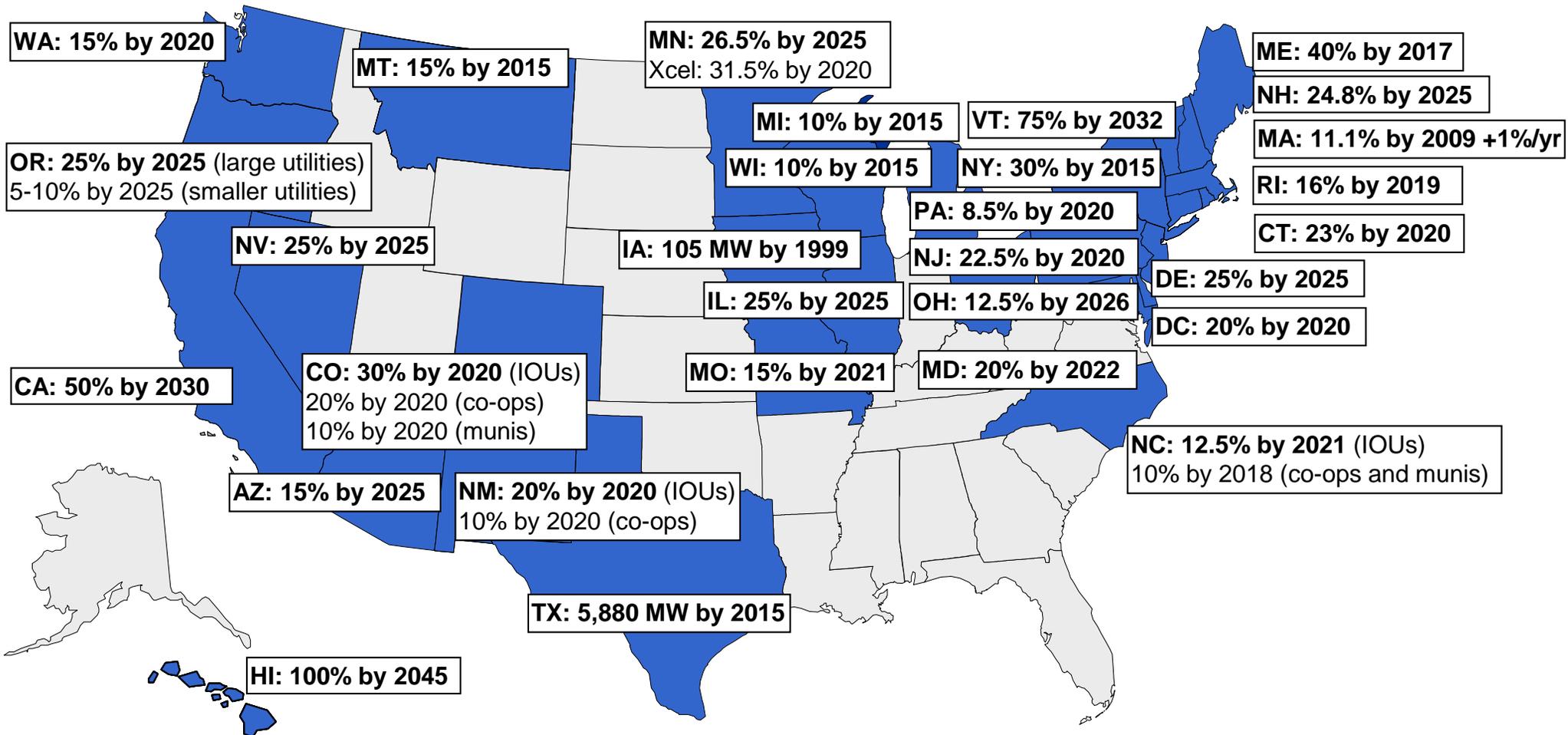
Renewable Energy Markets 2015

Washington, D.C.

October 20, 2015

RPS Policies Exist in 29 States and DC

Apply to 54% of Total U.S. Retail Electricity Sales



Source: Berkeley Lab

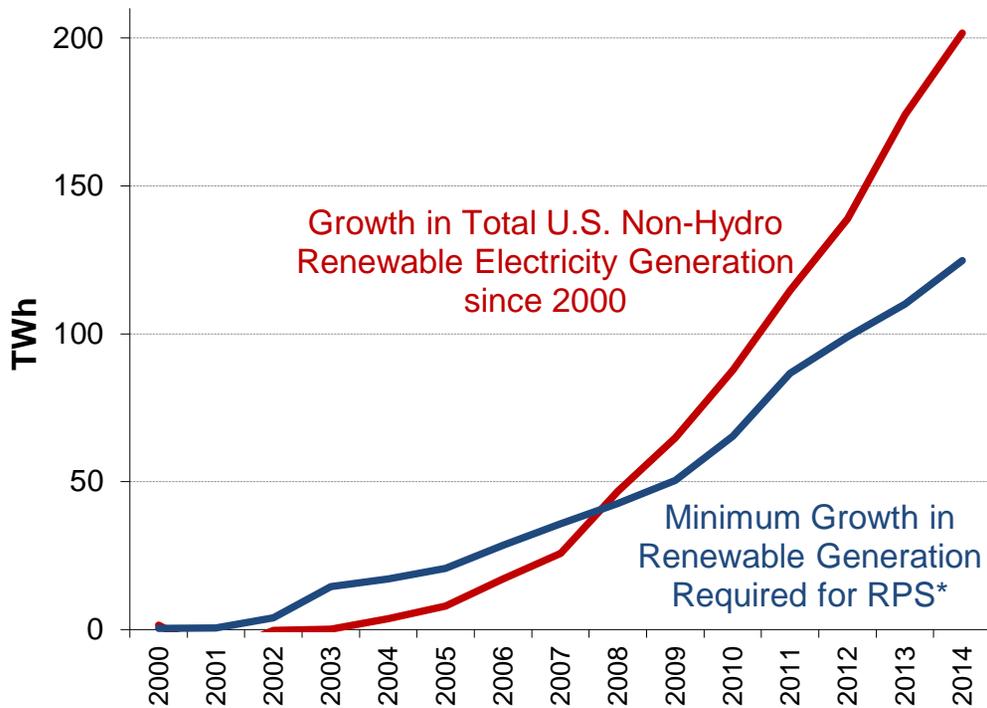
Notes: Compliance years are designated by the calendar year in which they begin. Mandatory standards or non-binding goals also exist in US territories (American Samoa, Guam, Puerto Rico, US Virgin Islands)

Legislative Activity on RPS Policies Continues

- Of the **159** RPS-related bills introduced in 2015 (*Source: EQ Research*):
 - Evenly split between strengthen (**50**), weaken (**56**), or neutral (**53**)
 - **16** enacted as of August 31 (and at least one more since)
- Major legislative revisions in 2015:
 - **CA**: Increased RPS to 50% by 2030
 - **HI**: Increased RPS to 100% by 2045
 - **VT**: Replaced voluntary RE goal with new mandatory RPS (75% by 2032) including a DG set-aside (10% by 2032)
 - **KS**: Repealed RPS and replaced with voluntary RE goal
- One more coming down the pike?
 - **OH**: RPS set to un-freeze in 2017, but legislative committee recently recommended indefinite freeze on RPS and EE targets until “100% certainty the CPP becomes effective”

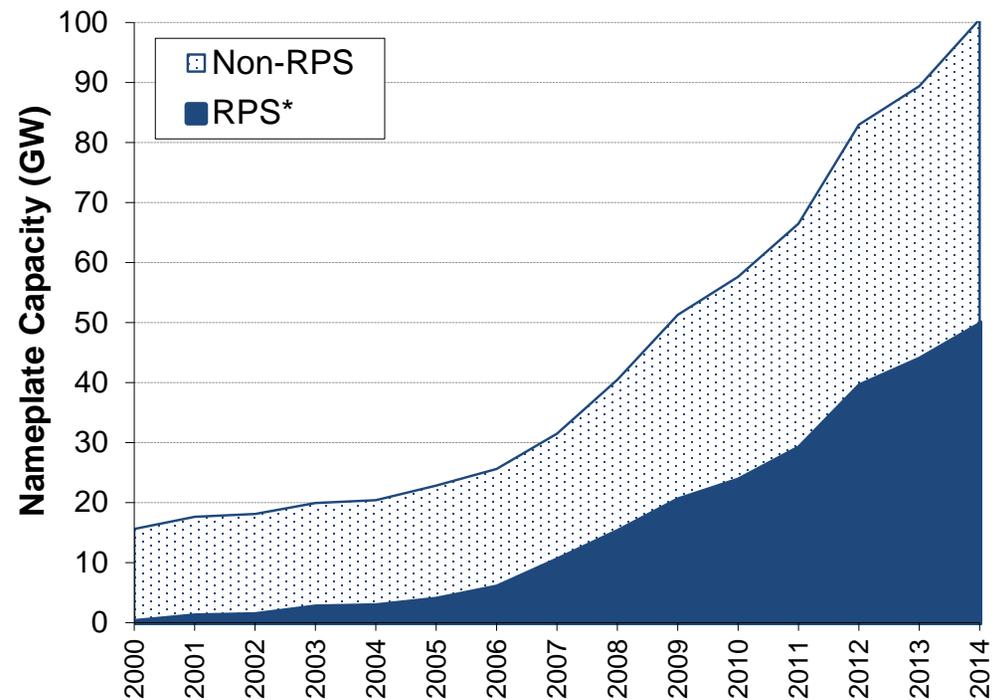
RPS Demand a Key Driver for RE Growth: 62% of Increased Generation, 58% of New Capacity

Growth in U.S. Renewable Electricity Generation (TWh)



* Min. Growth Required for RPS accounts for the use of pre-2000 vintage facilities in meeting RPS obligations, where it occurs

Total U.S. Renewable Generation Capacity (GW)

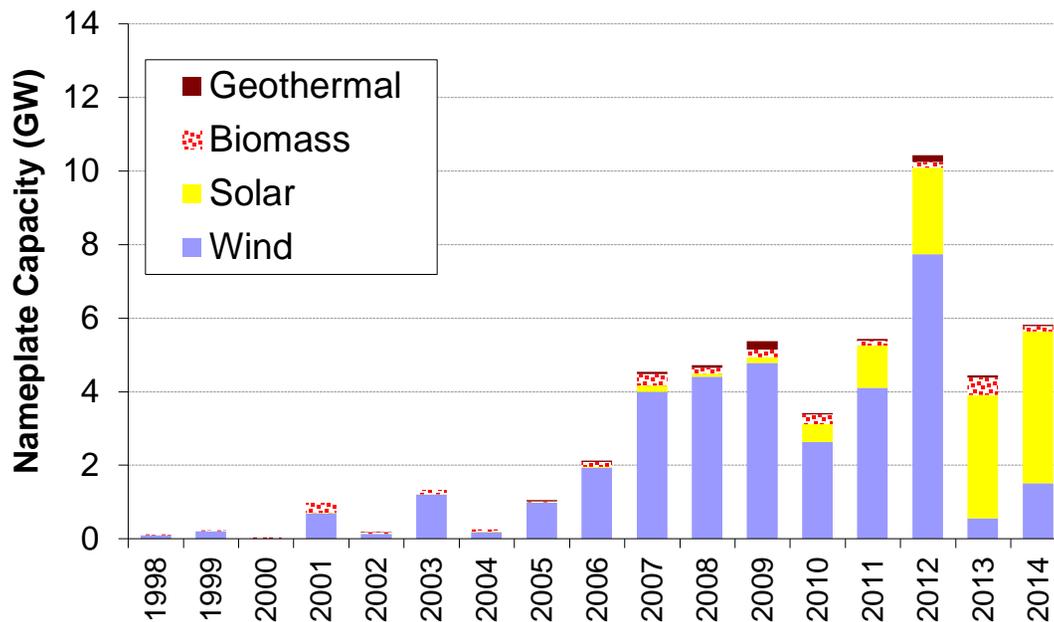


* RPS capacity: The entity purchasing RECs is subject to an RPS, and the project commenced operation after enactment of the RPS

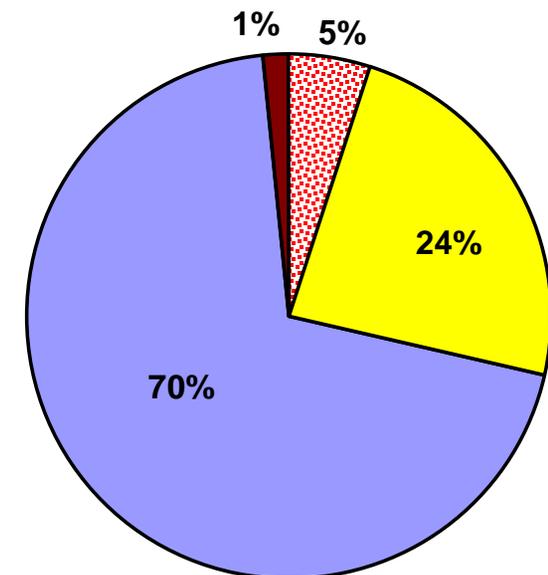
Wind Was Historically the Dominant New-Build for RPS, but Solar Has Recently Taken Over

RPS Capacity Additions from 1998-2014, by Technology Type

Annual RPS Capacity Additions



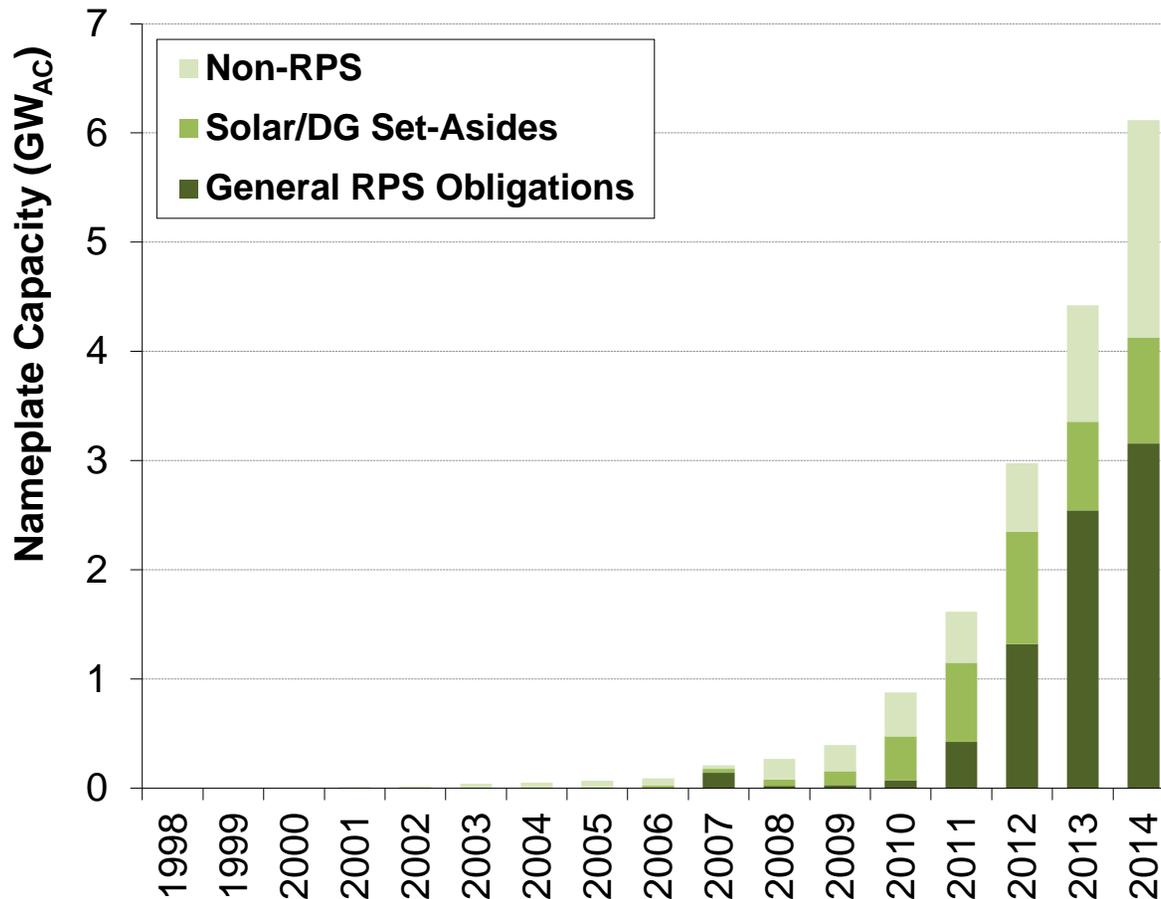
Cumulative RPS Capacity Additions



Notes: Renewable additions are counted as “RPS-related” if and only if the entity receiving RECs from the project is subject to RPS obligations, and the project commenced operation after enactment of the RPS. On an energy (as opposed to capacity) basis, wind energy represents approximately 71%, biomass 13%, solar 12%, and geothermal 4% of cumulative RPS-related renewable energy additions, if estimated based on assumed capacity factors.

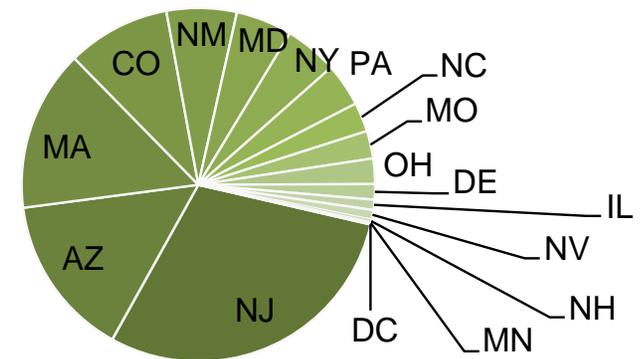
RPS Solar Additions Driven by Combination of General Obligations and Solar/DG Set-Asides

Annual Solar Capacity Additions

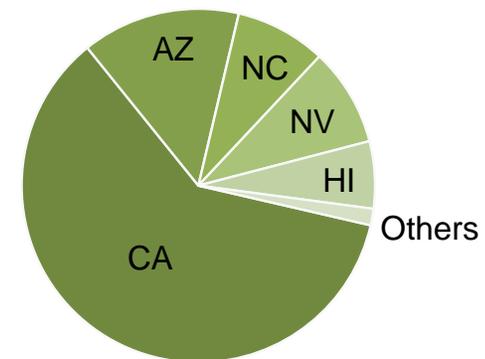


Cumulative RPS Solar Capacity Additions

Solar/DG Set-Asides (4.2 GW)



General RPS Obligations (7.7 GW)



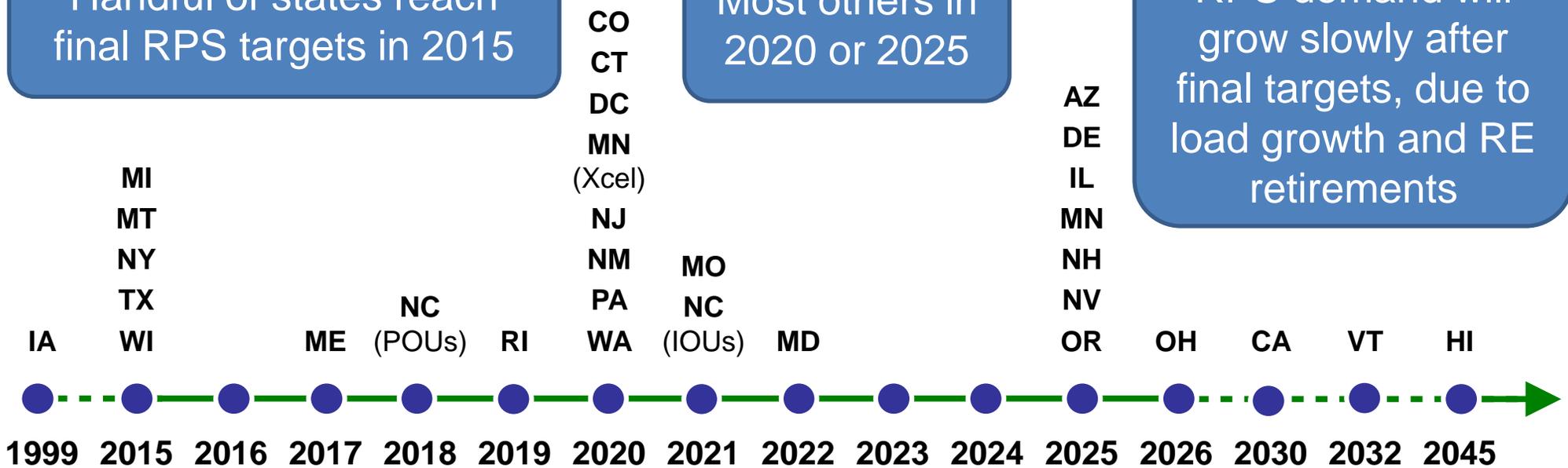
States Are Starting to Approach Final Targets

Year of Final RPS Target

Handful of states reach final RPS targets in 2015

Most others in 2020 or 2025

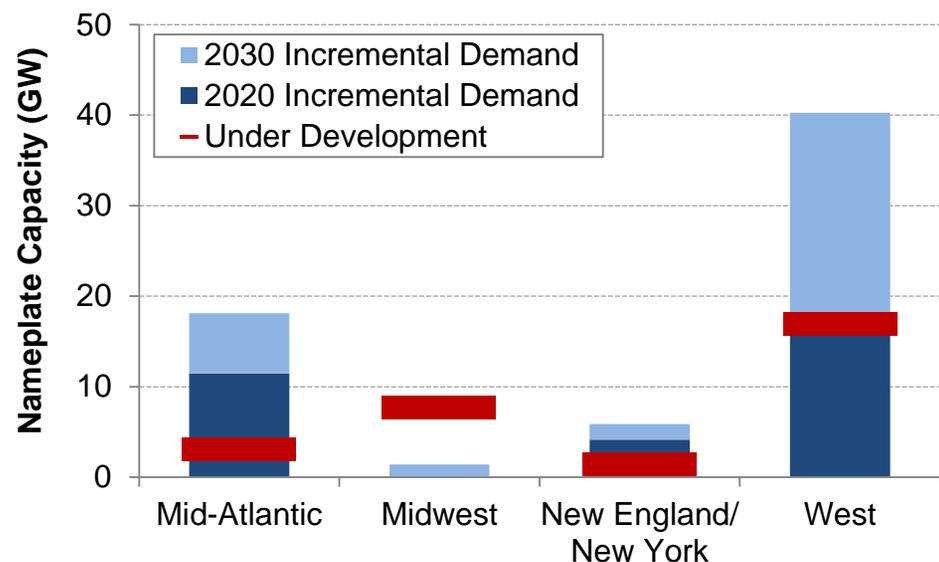
RPS demand will grow slowly after final targets, due to load growth and RE retirements



In addition, many states or utilities are ahead of schedule relative to current-year RPS requirements

Significant Incremental RPS Demand Remains

Incremental RPS Demand Relative to 2014 RPS Supply

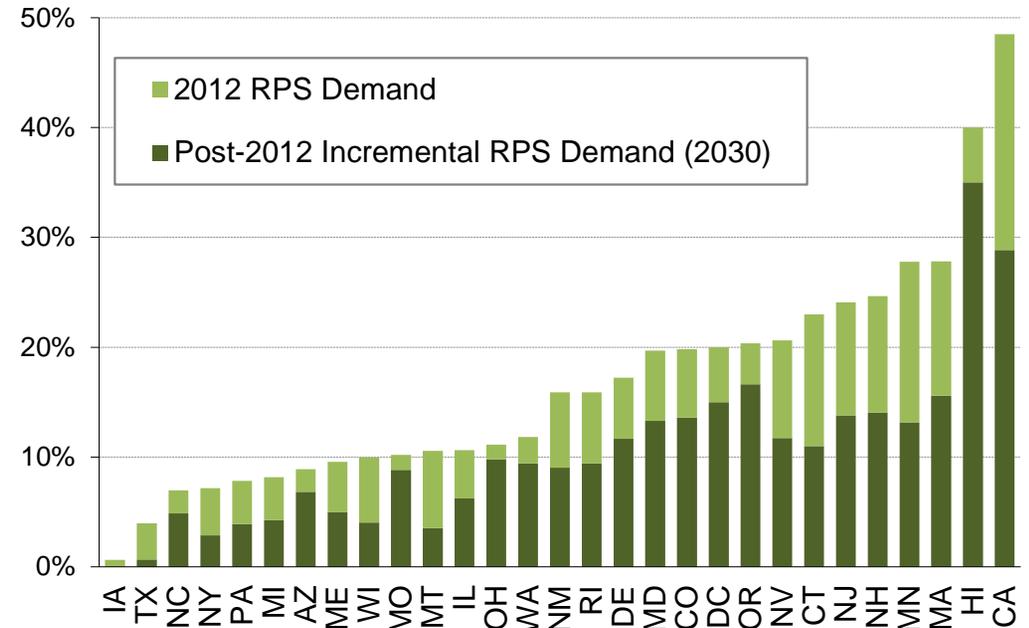
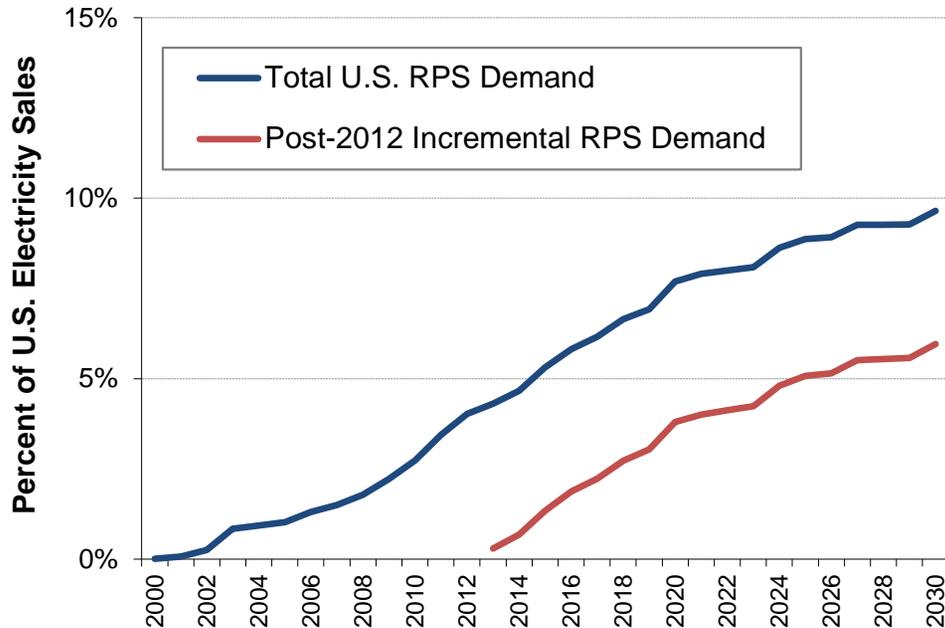


Notes: Incremental demand is measured relative to 2014 supply under contract to RPS-obligated entities only. Capacity under development includes plants permitted or under construction as of Sept. 2015 or completed in 2015 (Source: Ventyx/ABB Velocity Database).

- Meeting future RPS demand will require an add'l 32 GW of RE by 2020 and 67 GW by 2030
- By comparison:
 - RPS-builds to-date = 50 GW
 - Total U.S. RE in 2014 = 100 GW
- Equates to annual RPS build-rate of 5.4 GW/yr through 2020
 - Similar to avg. build rate since 2010
- Much of the incremental RPS demand through 2020 may be met with capacity already under development (esp. in West)
 - Though not all of that capacity will be built or available for RPS compliance

RPS Impacts on CPP Compliance Depend on Rate vs. Mass-Based Approach and Vary by State

RPS Demand as Percentage of Retail Electricity Sales



Under rate-based approach, only RE capacity built after 2012 is eligible for credit

- Nationally, CPP-eligible RPS demand represents 6-10% of U.S. electricity sales in 2030, depending on prevalence of mass- vs. rate-based approaches
- At state levels, RPS impacts will depend on target levels (relative to 2012, if rate-based), among potentially *many* other factors

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

Endogenous Factors

- ➔ Legislative and legal challenges to state RPS programs
- ➔ RPS compliance costs and ACPs/cost caps
- ➔ Whether/how RPS programs are expanded, re-tuned

Exogenous Factors

- ➔ EPA Clean Power Plan compliance strategies
- ➔ Federal ITC and PTC
- ➔ The many related issues affecting RE deployment (integration, siting, net metering, etc.)

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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