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Retail Rate Impacts of Renewable Electricity: Some First Thoughts

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Retail Rate Impacts of Renewable Electricity

Some First Thoughts

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Objective

- Summarize select recent analyses of the retail rate impacts of renewable electricity
  - Review emphasizes—but is not exclusive to—research by National Labs
  - Includes work focused on historical and, to a lesser extent, future rate impacts
  - Does not address the additional cost of federal tax incentives to the US Treasury
  - Does not address other federal or state-level incentives whose costs would not impact retail electricity rates
- Introduce core limitations of available literature, as rate impacts remain only partly assessed
  - Further high-quality work in this space is warranted
- Highlight wide range of estimated historical and possible future rate impacts
  - Variations in part based on different assumptions and methods
  - Variations also driven by widely-varying policies and characteristics of different states
  - National average rate impacts are relevant, but state and utility-level impacts are arguably more relevant
- NOTE: This is a cursory and partial review of the literature; it is by no means comprehensive

Organization of Presentation

- Historical Retail Rate Trends
- Economic Purchases and Possible Rate Reductions
- Retail Rate Impacts of State RPS Policies
- Retail Rate Impacts of State and Utility Financial Incentives
- Retail Rate Impacts of Net Metering
- Conclusion

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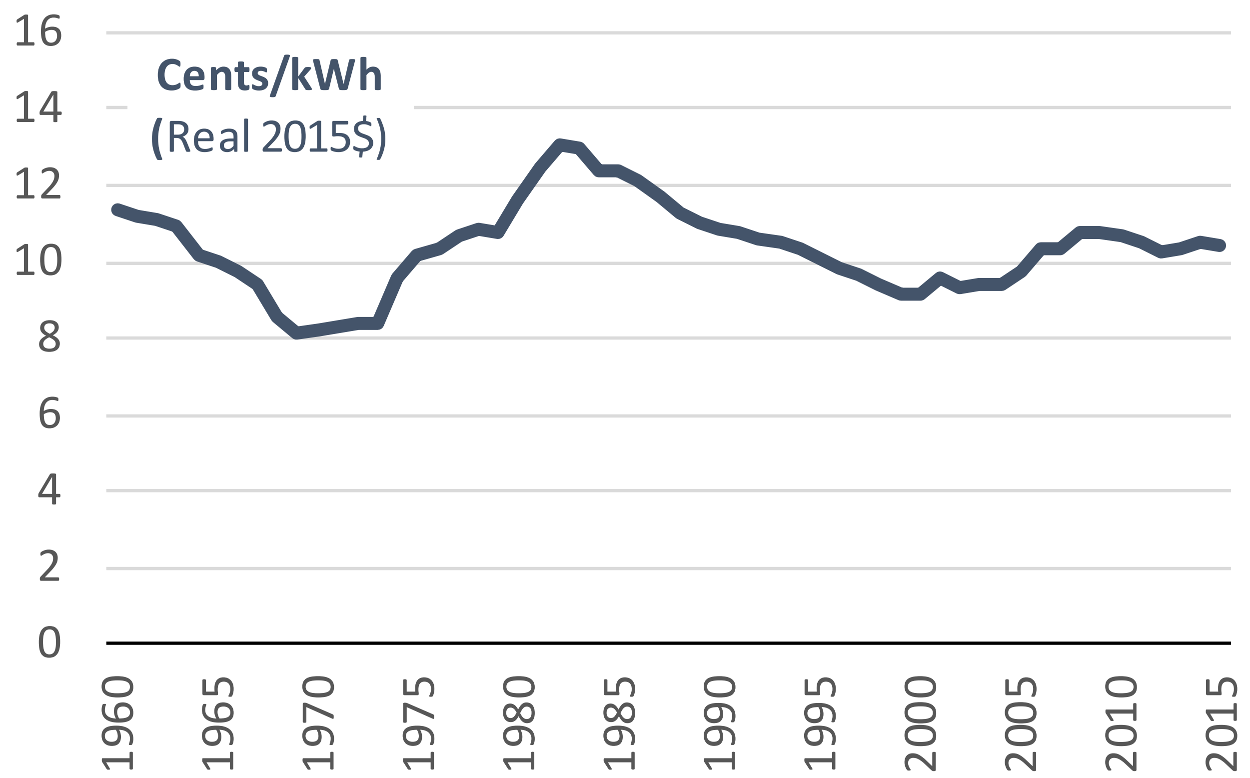
Historical Retail Rate Trends

U.S. average retail electricity prices have been relatively stable over the past decade, in real $ terms

U.S. average retail electricity prices

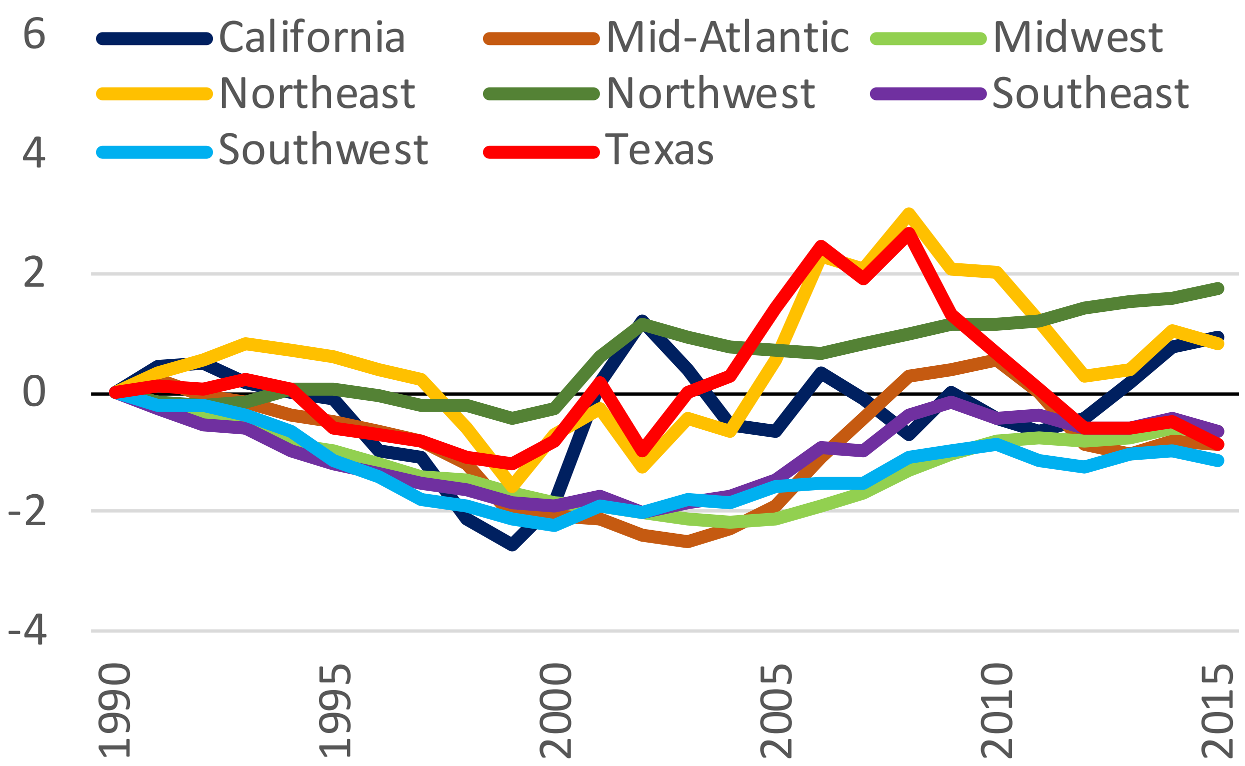


Notes: Represents U.S. average retail electricity prices across all customer segments and utilities, as reported by the U.S Energy Information Administration. Converted to real dollars based on GDP price deflator published by the U.S. Department of Commerce.

- Over the long-term, several large price swings
  - Rapid rise with oil price shocks in 1970’s
  - Followed by steady decline over 1980s-90s
  - Prices bottomed out around 2000, followed by slight rise
- U.S. average prices have been flat at ~10.5 cents/kWh since 2006
- Current U.S. average prices are roughly equal to their long-term historical average since 1960

Regional price trends vary to some degree, reflecting the diverse set of price-drivers over the past 10-20 years

Growth in regional retail electricity prices
(Real cents/kWh, change from 1990)



Notes: Values represent the change in price relative to 1990. Based on state-level average retail electricity prices, reported by the U.S Energy Information Administration and averaged (on load-weighted basis) across all states in each region. Converted to real dollars based on GDP price deflator published by the U.S. Department of Commerce.

- **Restructuring:** Some academic studies suggest lower prices as a result of restructuring, others find no effect (see Morey and Kirsch 2016 for a summary)
- **Natural gas prices:** Price increases in 2000s, until steep drop after 2008; effects most evident in restructured regions (Northeast, Texas) where gas plants set wholesale electricity prices
- **Slowing load growth:** Effectively zero growth in electricity sales since 2008 (or earlier) in most regions
- **Utility CapEx growth:** CapEx in the electric sector tripled from 2000-2015, mostly T&D (EEI 2015, ABB 2016); rate pressure amplified by slow load growth
- **State clean energy policies:** Includes RPS policies, net metering, rebate programs, state/regional cap-and-trade programs, and others; the subject of much of the remainder of this presentation

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Assessing the rate impacts of renewable electricity requires consideration of…

- **The diverse set of policy and economic drivers motivating renewable electricity procurement**
  - Federal tax incentives (PTC, ITC, accelerated depreciation)
  - State renewables portfolio standards
  - State or utility financial incentives often funded through systems benefit charges (SBC)
  - Net metering for distributed solar, and related rate design
  - Economic purchases by utilities (partly driven by tax incentives and other financial incentives)
  - Voluntary green power market (corporate procurement, green pricing programs)
- **Significant differences across states in policy, but also RE endowment and costs**
- **The cost of renewable energy relative to its electric system value**

No existing studies have, to our knowledge, credibly taken all of this into consideration to assess the aggregate impact of all renewable electricity generation on retail rates in each state

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Economic Purchases and Possible Rate Reductions

- Some states with abundant, low-cost wind and/or solar have likely witnessed rate decreases as a result of RE

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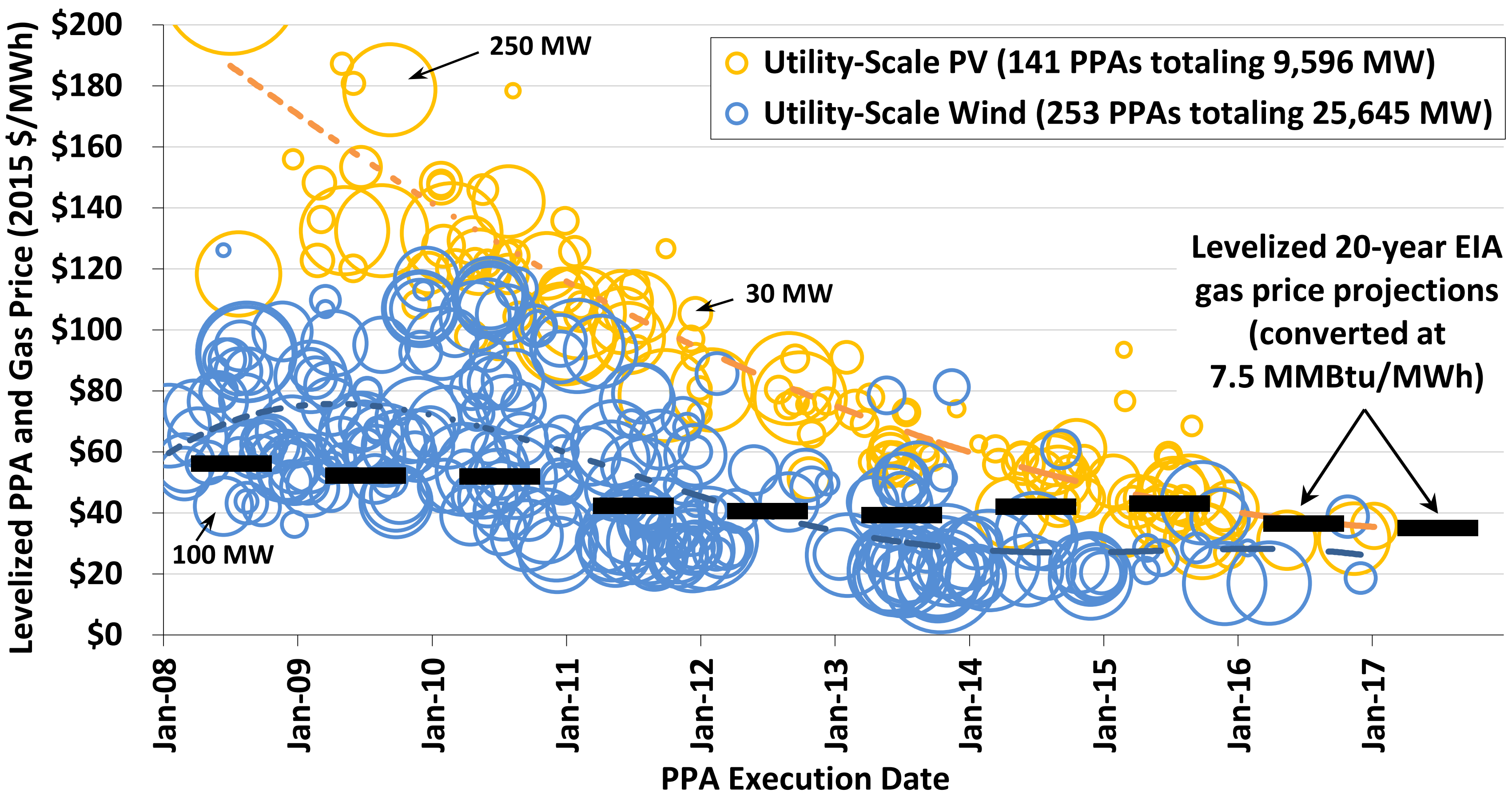
Wind and solar PPAs increasingly competitive with burning gas in a CCGT

Suggestive of potential retail rate reductions in some cases

Blue and gold bubbles represent wind and solar PPA prices (which reflect receipt of the PTC and ITC) levelized over the full contract terms at a real discount rate of 7%



- Black dashes represent the EIA's then-current delivered natural gas price projections over the coming 20 years, converted to $/MWh terms at a heat rate of 7.5 MMBtu/MWh and levelized at a real discount rate of 7%
- Compared on this narrow basis, and with the PTC and ITC, utility-scale wind and (increasingly) solar are competitive with the projected cost of merely burning fuel in a combined-cycle gas plant
- This simplistic comparison ignores many important differences between wind, solar, and gas-fired generation, including dispatchability, transmission requirements, integration issues, and capacity value; it also ignores CCGT CapEx and fixed and variable O&M, as well as consideration of any non-monetized social costs

Wind and solar PPAs increasingly competitive with wholesale power prices

Suggestive of potential retail rate reductions in some cases

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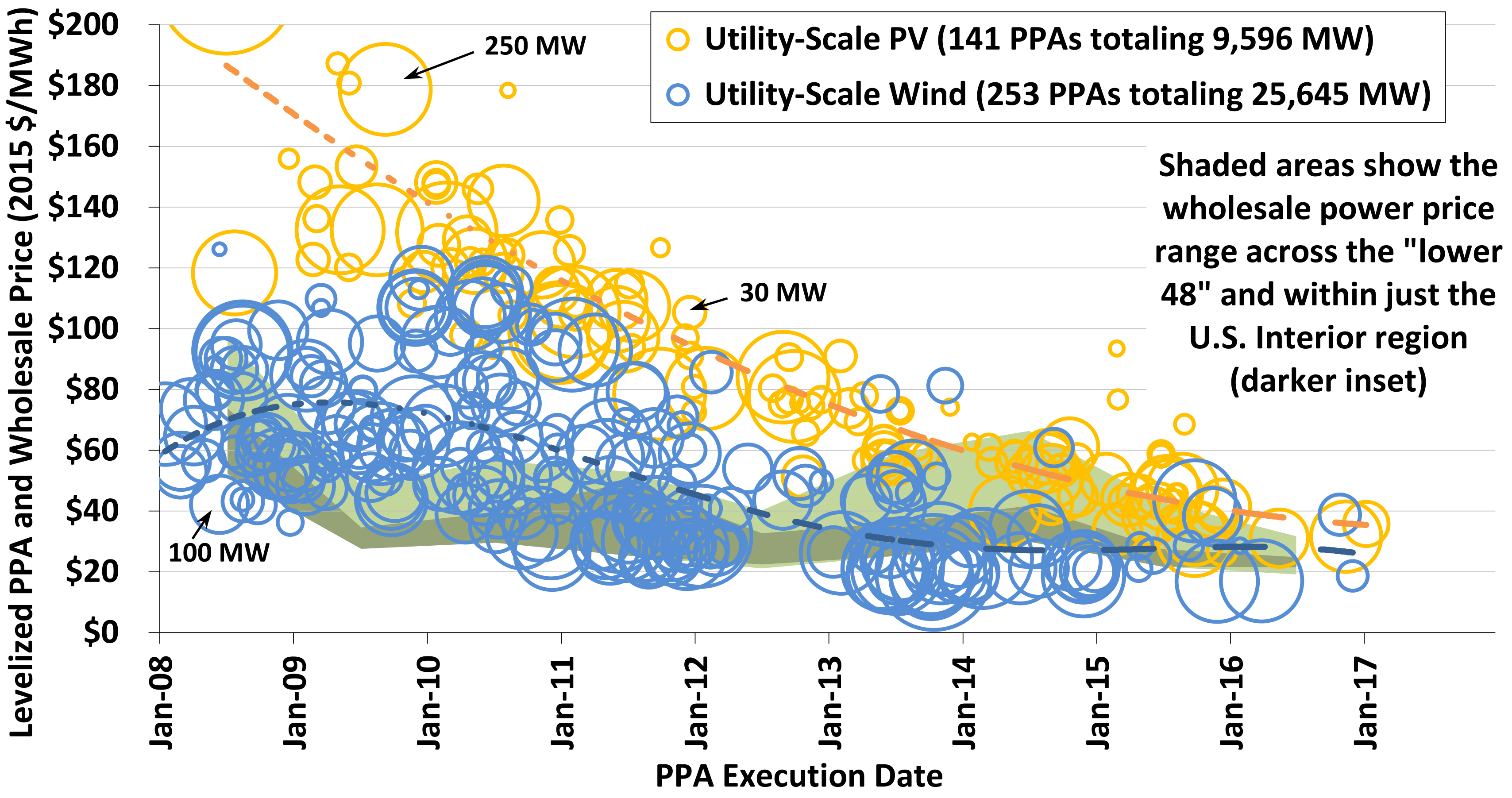

- Green-shaded areas represent the range of historical wholesale power prices across the “lower 48” (lighter green) as well as within the 13-state “interior” region (darker green), focusing on a flat block of power
- Compared on this narrow basis, and with the PTC and ITC, utility-scale wind and (increasingly) solar are sometimes competitive with wholesale power prices
- This simplistic comparison ignores many important differences between long-term wind and solar PPAs and flat-block short-term wholesale power prices
- Nonetheless, the comparison suggests that rate savings from RE purchases are possible in some conditions

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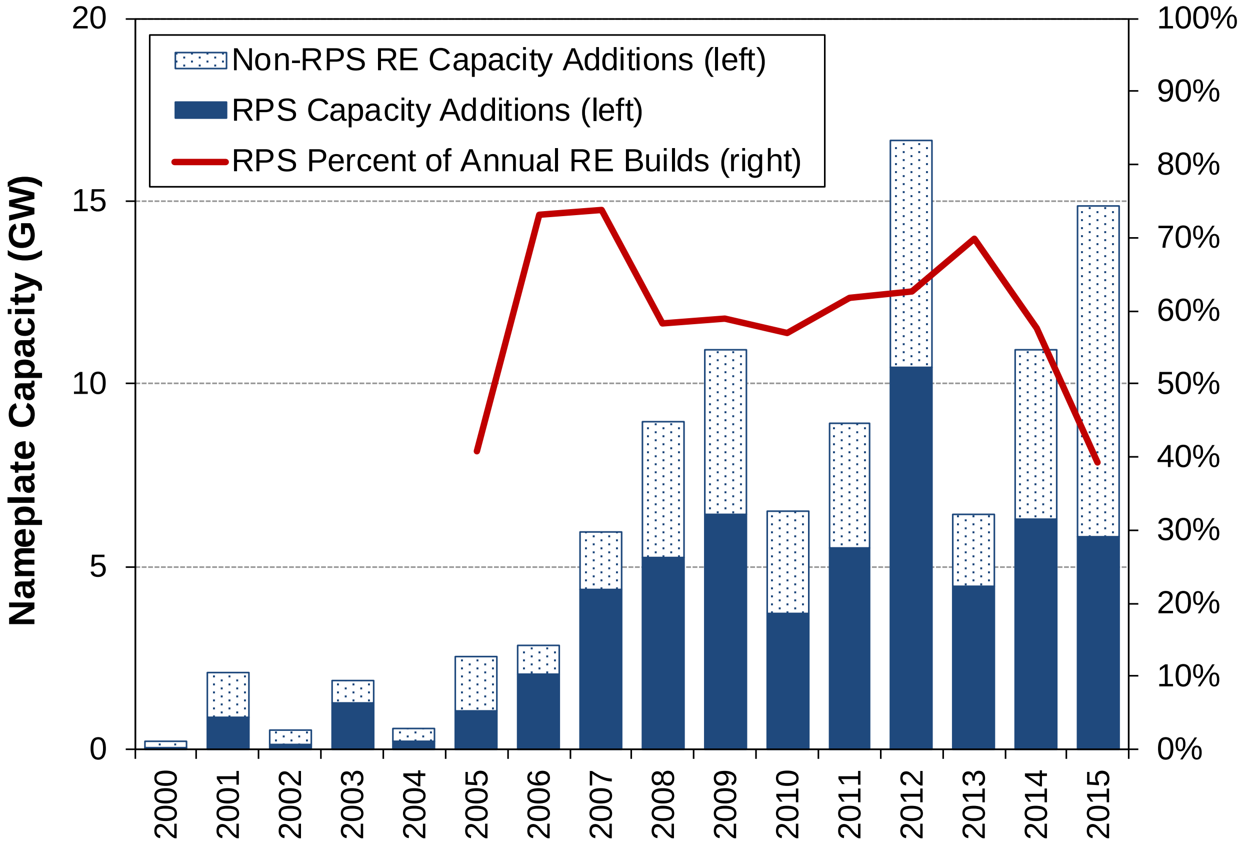
RPS requirements are a large, but shrinking, share of new RE builds

Significant amount of new RE development is serving utility/corporate markets

Annual Renewable Capacity Additions



Notes: RPS Capacity Additions consists of RE capacity contracted to entities with active and remaining RPS obligations or sold on a merchant basis into regional RPS markets. Source: Lawrence Berkeley National Laboratory, U.S. Renewables Portfolio Standards: 2016 Annual Status Report, April 2016. http://rps.lbl.gov

The figure shows what portion of RE capacity additions each year are contracted to entities with RPS obligations (and thus at least partially attributable to the RPS)

- Cumulatively since 2000, 58% of all RE capacity additions consist of projects contracted to RPS-obligated electricity providers
- Over the past few years, the RPS-portion of new RE builds has declined (see red line in figure)
  - Mostly due to rebounding wind growth in Texas and Midwest, serving voluntary utility and corporate demand
  - Also associated with utility-scale PV in non-RPS markets (Texas, Georgia, Florida, Utah) and net-metered PV in CA (not eligible for the state’s RPS)

In their own words: wind and solar (with the PTC & ITC) can sometimes deliver cost savings for utility ratepayers and corporate off-takers

Electric Utilities

- "These contracts [three wind power contracts totaling ~600 MW] were based on extraordinary pricing opportunities that will provide substantial savings for our customers." – *Public Service Company of Oklahoma, 2014*
- "Wind prices are extremely competitive right now, offering lower costs than other possible resources, like natural gas plants" – *Northern States Power, 2013*
- "The expansion [1,050 MW of new wind capacity] is planned to be built at no net cost to the company's customers and will help stabilize electric rates over the long term by providing a rate reduction totaling $10 million per year by 2017, commencing with a $3.3 million reduction in 2015." – *MidAmerican Energy, 2013*
- "The delivered price of energy from the wind facility is expected to be below the Company's projected avoided costs…with the resulting energy savings flowing directly to the Company's customers." – *Alabama Public Service Commission describing Alabama Power's wind power purchase, 2011*
- "The contract will save ratepayers $100 million on a net-present-value basis over its 25-year term under a base-case natural gas price scenario." – *Colorado Public Utilities Commission describing Xcel Energy's wind power purchase, 2011*
- "[Wind energy power purchase agreements] decrease our exposure to natural gas, provide a hedge against any future global warming legislation, and help us give our customers lower, more stable prices." – *Empire District Electric Company, 2008*

Corporate Offtakers

- "Investing in large-scale renewable power…helps Lockheed Martin hedge against the volatility of the electricity market and lower our energy costs…." – *Lockheed Martin, 2016*
- "Cost savings are the main driver, but price stability is a close second." – *General Motors, 2013*

Retail Rate Impacts of State RPS Policies

- RPS policies in many states have increased retail rates, but with widely varying estimated magnitudes
- *Note: utilities in some states have gone beyond RPS obligations to purchase additional RE on economic grounds; the focus on just the RPS in the slides that follow may overstate the rate impacts of RE in such situations, as the analysis ignores possible rate savings from voluntary procurement*

Simple descriptive analyses of electricity price trends have come to divergent conclusions about RPS rate impacts

- Organizations on both “sides” of the issue have performed simple descriptive analyses that attempt to *correlate* RPS policies (or renewable generation, more generally) with state-level electricity price trends
- These analyses often include no or limited control variables, and in general are not analytically sophisticated enough to support *causal* attribution—but are often featured in the press; select examples include:

Study	Approach	Key Findings
Manhattan Institute 2012	Compared average retail electricity prices and growth rates between RPS and non-RPS states, including comparisons focusing only on coal-dependent RPS and non-RPS states	Average electricity prices in 2010 were ~30% higher in RPS states than in non-RPS states (38% higher if comparing only coal-dependent states). The percentage increase in state-average prices over the 2001-2010 was greater in coal-dependent RPS-states (54%) than in coal-dependent non-RPS states (24%).
Center for American Progress 2012	For each RPS state, compared the rate of increase in electricity prices relative to non-RPS states in the periods before and after the RPS went into effect	For 12 of 22 RPS states, electricity price growth (relative to non-RPS states) was lower after the RPS went into effect than before the RPS. For the other 10 RPS states, the opposite occurred.
DBL Investors 2015	Compared average retail electricity prices and growth rates between RPS and non-RPS states, and also between top-10 and bottom-10 states with respect to percent renewable generation	Average electricity prices in RPS states increased by 3.02% per year, on average, over the 2001-2013 period, compared to 3.52% per year for non-RPS states. Average electricity prices in 2013 were lower in the 10 states with the highest percentages of renewable generation (9.8 cents/kWh) than in the 10 states with lowest renewable percentages (10.3 cents/kWh).

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A variety of other, more-sophisticated methods have been used to estimate the effects of RPS policies on retail electricity rates

- **Econometric analysis:** Use statistical techniques (multi-variate regressions) to isolate the effect of RPS policies, controlling for other confounding factors
- **Electric sector modeling:** Use capacity expansion and/or production cost models to compare system costs under scenarios with and without RPS policies; typically used for prospective rather than historical analysis
- **Bottom up estimates:** Use data (often public and reported to state public utility commissions) to calculate the incremental or "above-market" costs associated with meeting RPS obligations; different approaches for restructured states, which rely chiefly on renewable energy certificates, versus regulated states, which rely chiefly on power purchase agreements

Each of these methods has its strengths and weaknesses; can be useful to triangulate among all three

Econometric analyses of RPS rate impacts have estimated 1-8% higher rates due to the presence of an RPS

- A relatively small number of econometric studies have attempted to estimate the retail rate impacts of RPS policies
- Upper end of econometric estimates (7.5% average impact among RPS states) is higher than what bottom-up analyses have suggested on average, as shown on the following slides, though not out of line with a number of individual higher-cost states

Study	Timeframe	Unit of Observation	Estimated Effect of RPS Policies on Retail Electricity Prices
Morey & Kirsch 2013	1990-2011	State-level annual average prices by customer class	Found a statistically significant effect for residential rates, with an increase of 0.45 cents/kWh (and an additional 0.27 cents/kWh in retail choice states). Results for commercial and industrial rates were smaller and less statistically significant. For commercial: 0.18 (+0.26 in retail choice). For industrial: 0.09 (+0.32 in retail choice). Based on US average retail prices in 2011, these correspond to the following percentage effects: residential (3.8%/6.2%), commercial (1.8%/4.3%), industrial (1.3%/6.0%).
Tra 2016	2001-2012	Utility-level annual average prices by customer class	Found roughly a 3% increase in both residential and commercial rates, but found no effects from increasing the stringency of the RPS. Based on US average retail prices in 2012, this corresponds to 0.3-0.4 cents/kWh.
Wang 2014	1990-2011	State-level annual average prices	Depending on model specification and variable definition, found statistically significant increases ranging from 5-7.5%. Based on US average retail prices in 2011, this corresponds to 0.5-0.75 cents/kWh.

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Bottom-up analyses of historical RPS compliance cost data suggest ***average*** rate impacts in the range of 1-2%

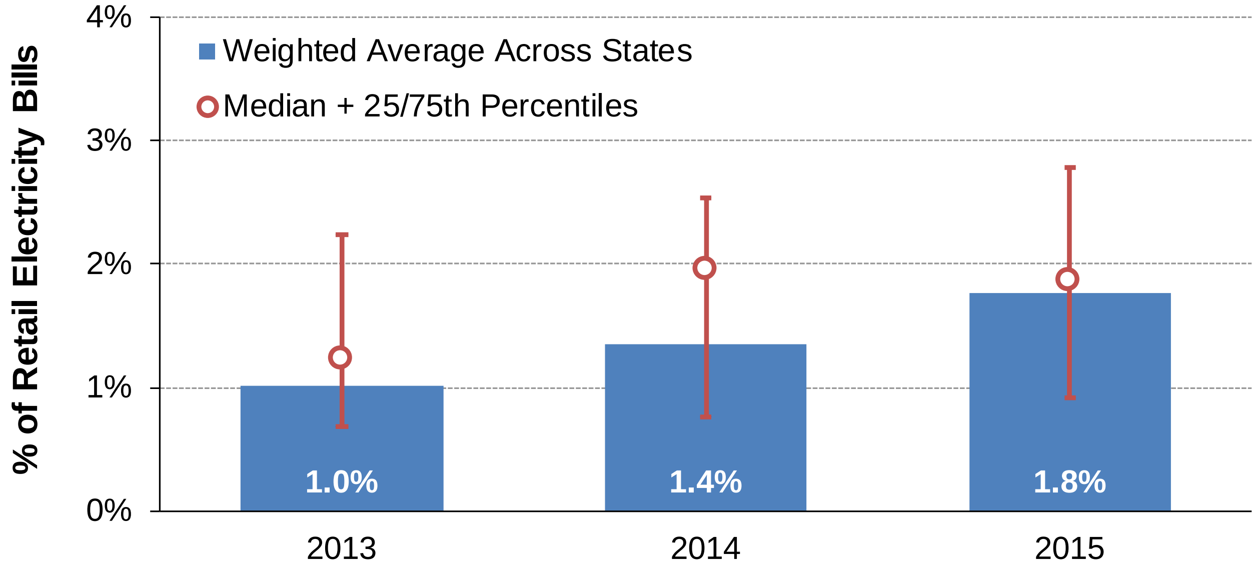
Approach: Rate impacts based on REC+ACP* expenditures for restructured states and on utility/PUC-reported estimates for regulated states

** REC = renewable energy certificate; ACP=alternative compliance payment*

- Compliance costs equal to 1.8% of rates in 2015 (weighted average across 30 RPS states)
- Key temporal dynamics
  - Rising RPS targets
  - REC price movements: a function of supply-demand balance (high if REC shortage; low if REC surplus)
  - Falling RE technology costs
  - Falling natural gas prices

The figure shows historical RPS compliance costs among the 30 states with RPS policies

Denotes compliance costs as a percentage of retail electricity bills in each state: a proxy for rate impact

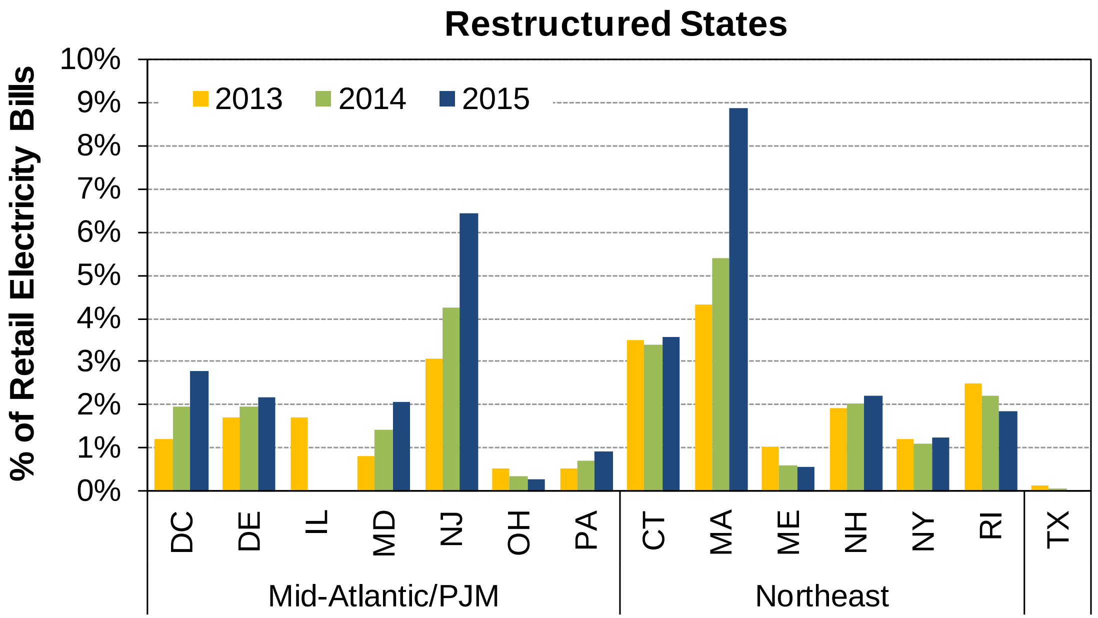


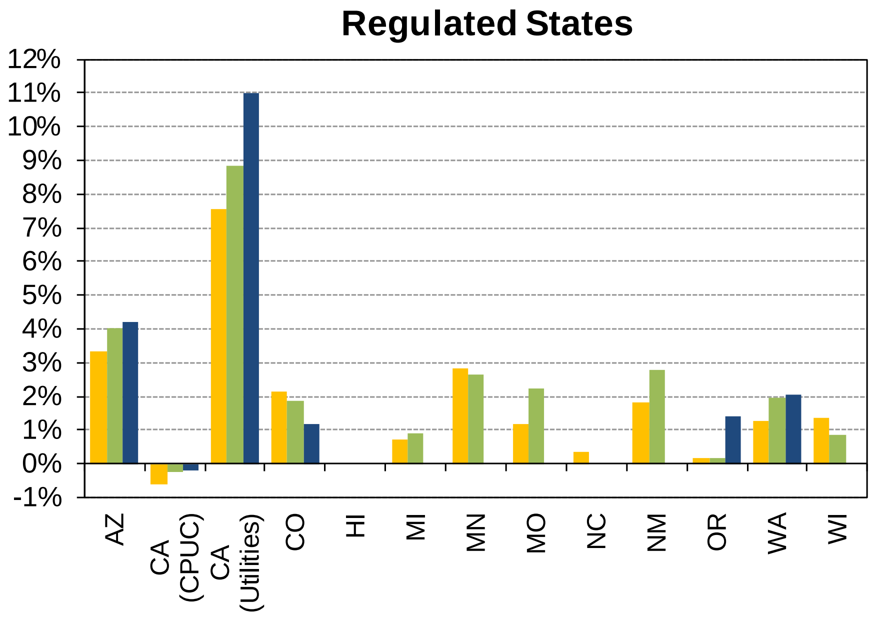
Source: Lawrence Berkeley National Laboratory, U.S. Renewables Portfolio Standards: 2016 Annual Status Report, April 2016. http://rps.lbl.gov

But compliance costs and associated rate impacts vary significantly across states

Total RPS Compliance Costs

The figures show the state-level details underlying the summary statistics on the previous slide; separate restructured from regulated states due to the different estimation approach





Source: Lawrence Berkeley National Laboratory, U.S. Renewables Portfolio Standards: 2016 Annual Status Report, April 2016. http://rps.lbl.gov.

Note: The two sets of values for CA reflect two alternate avoided cost estimates; the CPUC relies on their "market price referent", which is based on the long-run, all-in cost of a CCGT, while the utilities rely on wholesale electricity market prices. The striking difference between the two illustrates how sensitive results are to the underlying methods and assumptions used, and the value of standardization.

State-level RPS compliance costs in 2015 ranged from 0% to 11% of retail electricity bills

Cross-state cost variation reflects differences in:

- RPS target levels
- Resource tiers/mix
- REC prices
- Wholesale electricity prices
- Reliance on pre-existing resources
- State-specific cost calculation methods

Compliance cost data must be interpreted with some caution

Restructured states: Rate impacts are estimated based on REC and ACP expenditures, ignoring several other contributors (that work in opposing directions)

- Renewable integration and transmission costs: Some portion of incremental integration and transmission costs may be socialized by the network operator and therefore not reflected in REC prices
- Merit-order effect: At least within the short-run, low marginal-cost resources (like wind and solar) put downward pressure on wholesale prices, and in turn retail prices; can offset some portion of REC and ACP costs, though represents a transfer of wealth between generators and consumers and not a net welfare gain

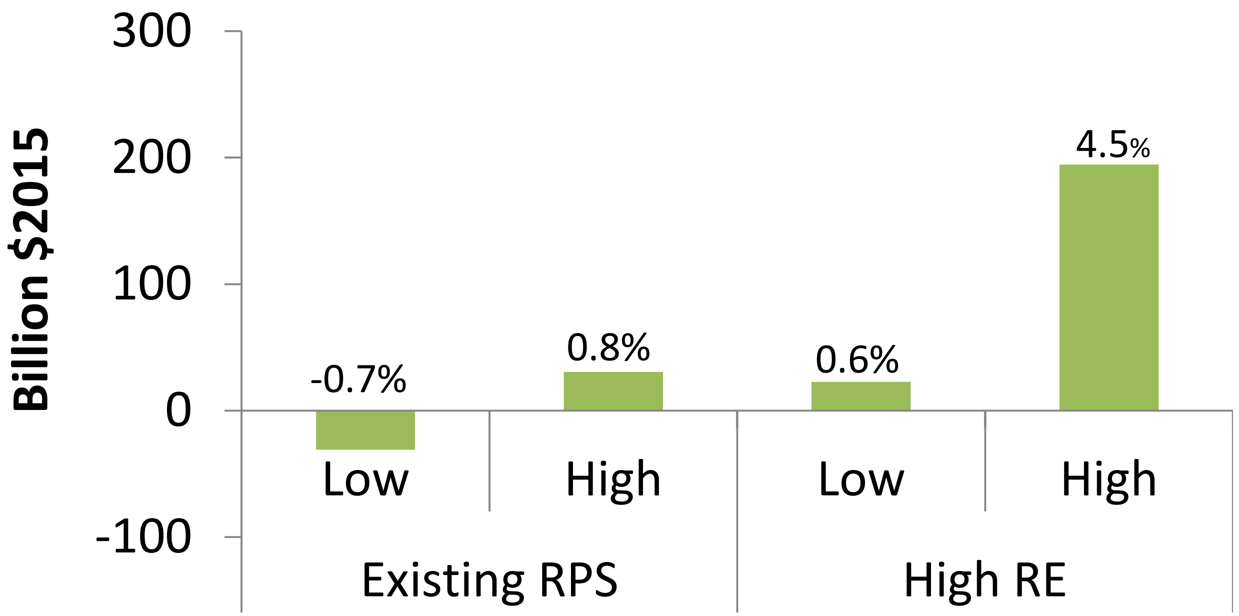
Regulated states: Compliance costs must be estimated by comparing the gross cost of RPS procurement to the counterfactual cost of displaced non-RPS resources; utilities and states report compliance costs using widely varying methods, making comparison and aggregation challenging; the results from California on the previous slide illustrate this issue

All states: Compliance costs may not be fully or immediately passed through to ratepayers, for example, due to regulatory lag or to rules requiring that ACP revenues are refunded to ratepayers

Recent modeling estimates the net cost of incremental RPS growth through 2030 at less than ±1% of total U.S. electric system costs

Net present-value cost of RPS additions from 2015-2030, under both existing RPS policies and under hypothetical higher targets

Low and High values reflect range of assumptions about RE technology costs and natural gas prices

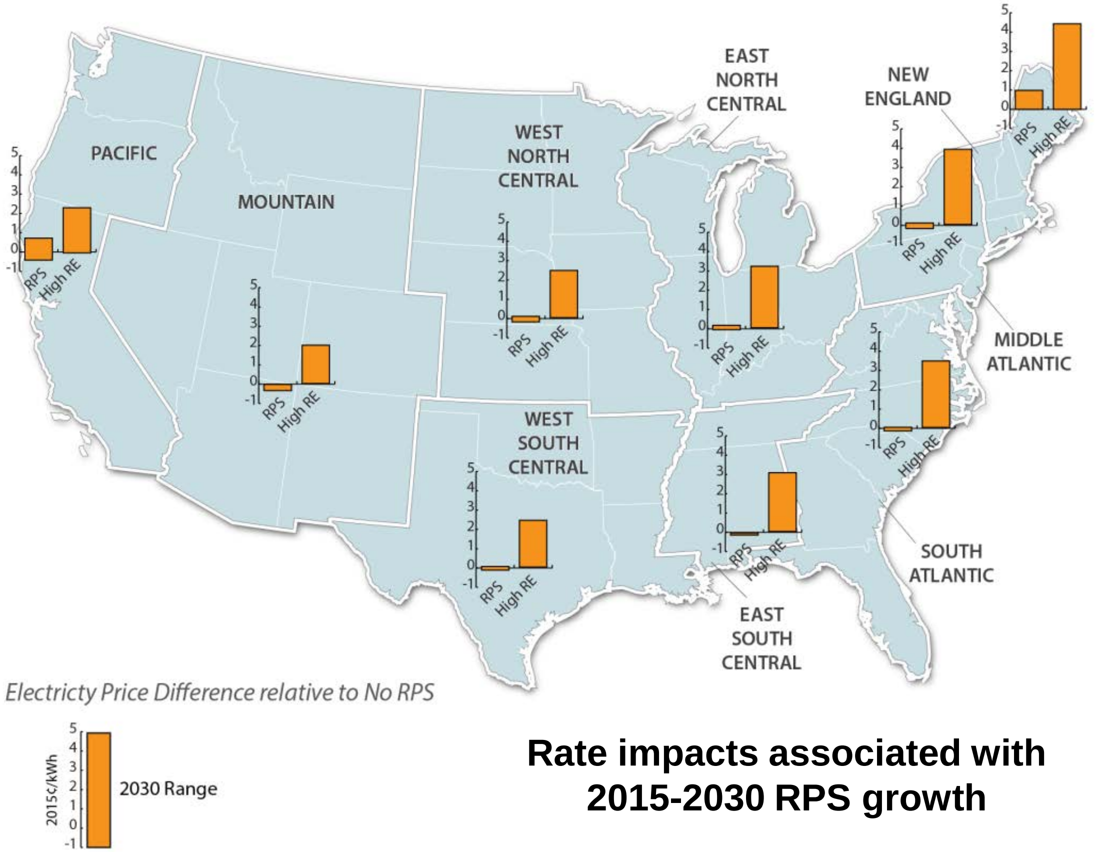


Source: Lawrence Berkeley National Laboratory and the National Renewable Energy Laboratory, Prospective Costs, Benefits, and Impacts of U.S. Renewable Portfolio Standards, December 2016. https://emp.lbl.gov/publications/prospective-analysis-costs-benefits

- Study used NREL's ReEDS capacity expansion model to estimate total electric system costs (capacity, fuel, and O&M for generation, storage, integration, transmission) under multiple scenarios and sensitivity cases
- Existing RPS scenario is found to have an impact of less than ±1% (±$31 billion) on system costs across gas-price and RE technology cost sensitivities
  - This is the net cost associated with reaching 26% renewable electricity generation by 2030, per existing state policies, compared to 21% in a "No RPS" scenario
- High RE scenario (total U.S. renewable electricity reaches 35% of total by 2030) results in larger incremental costs ranging from 0.6% ($23 billion) to 4.5% ($194 billion) across the sensitivities→ note this is a purely hypothetical case, and is not linked to existing RPS policies; as such, it is not particularly relevant in the context of this presentation

Modeled rate impacts associated with RPS growth through 2030 range from a -2% to 1% nationally; larger increases in some regions

Average rate impact by Census region in 2030



Rate impacts associated with 2015-2030 RPS growth

Source: Lawrence Berkeley National Laboratory and the National Renewable Energy Laboratory, Prospective Costs, Benefits, and Impacts of U.S. Renewable Portfolio Standards, December 2016. https://emp.lbl.gov/publications/prospective-analysis-costs-benefits

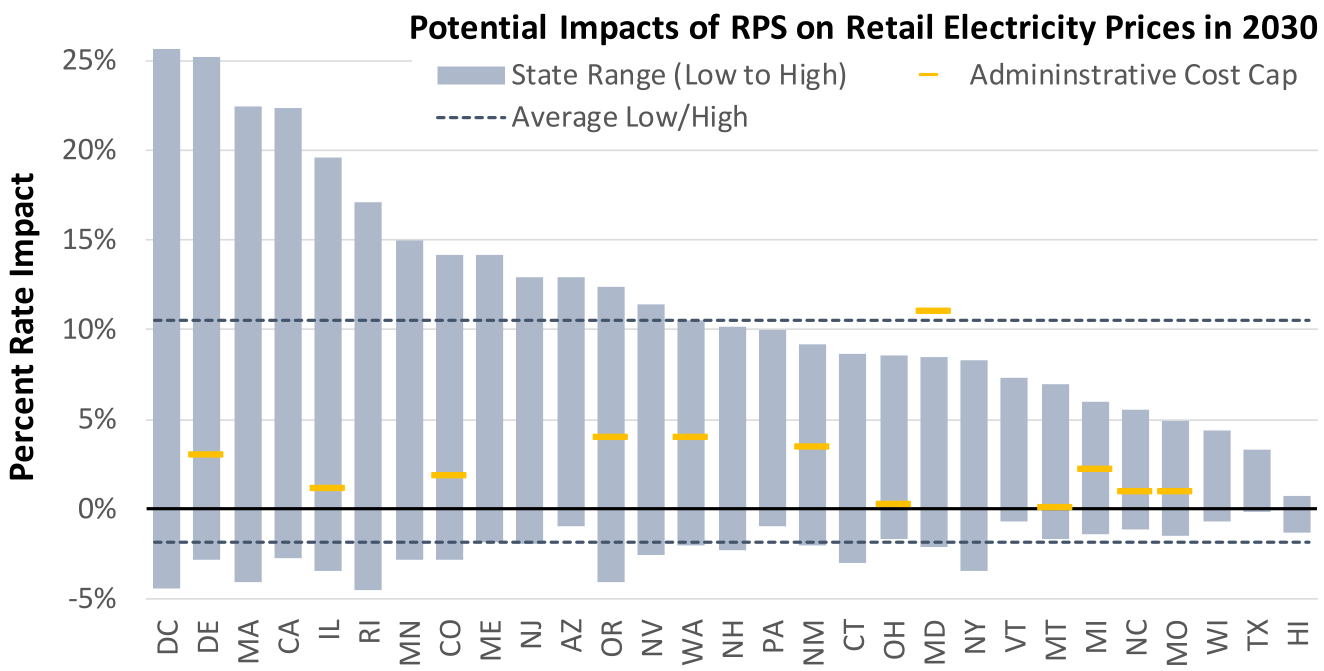
Existing RPS Scenario (left-hand bars)

- Across the set of modeled sensitivities, U.S. average rate impacts in 2030 range from a 0.14 cent/kWh (2%) decrease to a 0.07 cent/kWh (1%) increase
- The two regions with the most aggressive RPS policies could see substantially higher rate impacts under some sensitivity cases: up to a 0.7 cent/kWh (11%) increase for the Pacific region and 1 cent/kWh (13%) for the Northeast
- Rate impacts for all other regions fall within a range of a 4% decrease and a 2% increase

High RE scenario (right-hand bars; see previous slide for scenario definition): Rate impacts are higher, though this case is not particularly relevant for the purpose of this specific presentation as it simply illustrates the possible rate impacts of a more-aggressive RE growth scenario

Other analyses show that higher RPS rate impacts are ***possible*** under conditions of extreme REC shortages

Illustrative range in potential impacts of RPS policies on retail electricity prices in 2030



Source: Lawrence Berkeley National Laboratory, Putting the Rate Impacts of Distributed Solar into Context, January 2017. https://emp.lbl.gov/publications/putting-potential-rate-impacts

- LBNL estimated potential state-level RPS rate impacts in 2030 across broad set of assumptions
  - Upper bounds assume that REC prices are trading at their caps and that other administrative cost caps are not enforced
  - Such a scenario would occur only with persistent and pervasive shortages of REC supply
  - Smaller retail price effects are expected in practice, and even decreases are possible
- Rate impacts vary across states, depending on RPS stringency, DG carve-outs, and ACPs
- Average effect across all RPS states (dashed lines) ranges from a **2%** (0.3 cent/kWh) **decrease** to an **11%** (1.4 cents/kWh) **increase** in rates

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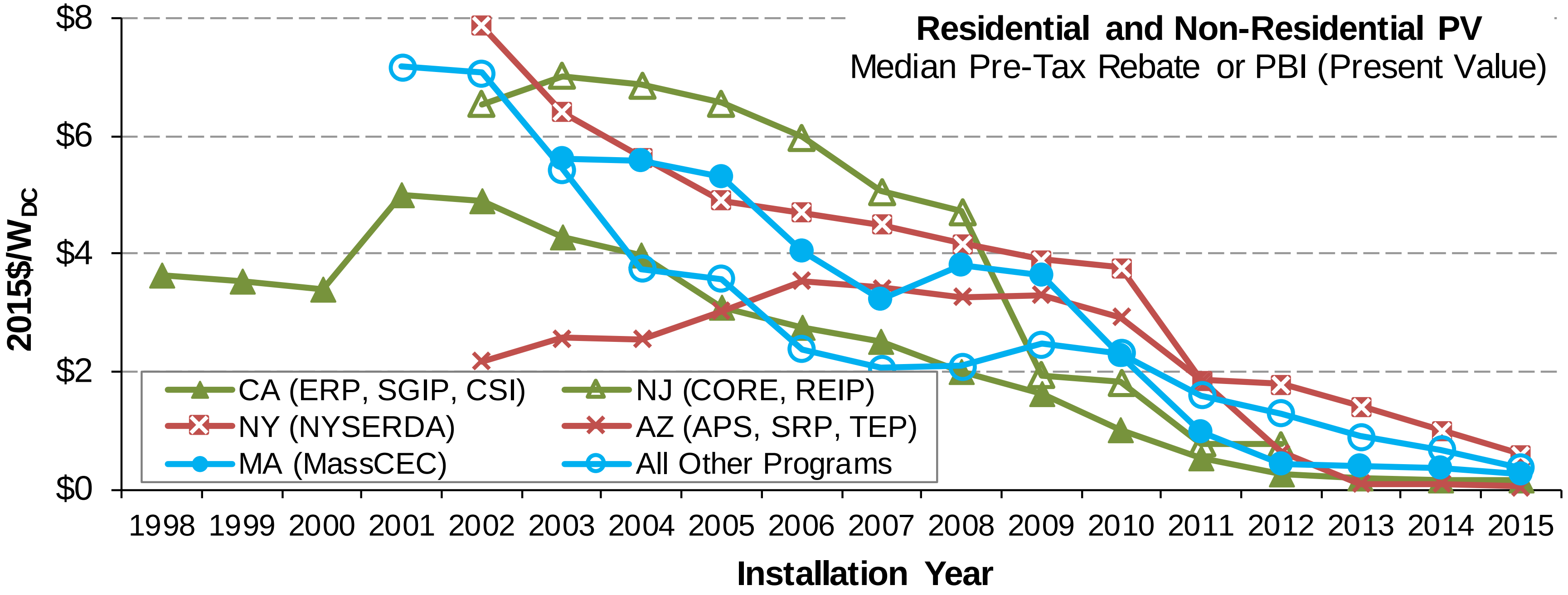
Retail Rate Impacts of State and Utility Financial Incentives

- State & utility financial incentives have generally increased retail prices by a smaller magnitude than RPS policies

State/utility financial incentives in the form of rebates, performance-based incentives, concessionary loans, etc. increase retail rates

- A number of states and utilities have created various types of financial incentives for renewable energy, either in addition to or instead of an RPS. The most wide-spread program type has been rebates for distributed PV (e.g., the California CSI).
- The magnitude of these incentives has generally declined over time, as the cost of renewable energy has dropped. The figure below is illustrative of this decline, in this instance focused on DG PV incentives over time across a number of states.
- Cost of these programs is commonly supported through a surcharge on consumption, sometimes referred to system benefits charge (SBC).
- Comprehensive data on size of surcharges not available; examples:
  - MA (0.3% rate impact), CA CSI (0.8%), CT (0.6%), and OR (0.5%)



- RE deployed based on these incentives may impose rate increases or decreased through other means as well, e.g., merit order effect may decrease retail rates, or net metering may further increase rate impact

Retail Rate Impacts of Net Metering

- Net metering can increase rates; magnitude (and direction) of impact depends on VoS, rate design, amount of DG PV

Rooftop solar and net-metering

Potential rate impacts at three benchmark penetration levels

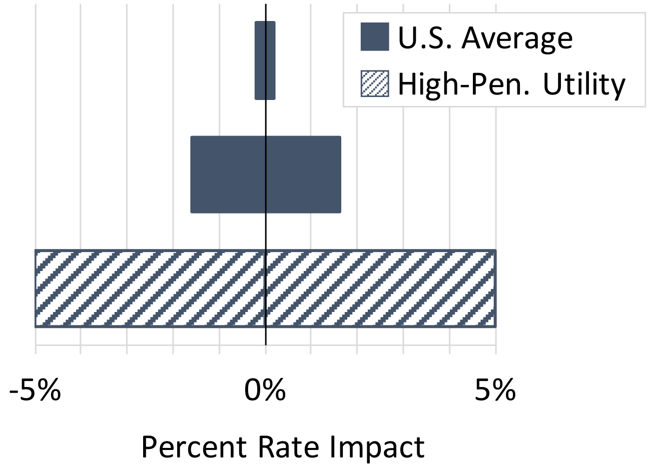
The rate impact of distributed solar is a function of its penetration, the level of compensation provided, the value-of-solar (VoS), and the utility's cost of service (CoS):

$$\%\ \textbf{\textit{Change in Retail Electricity Price}} = \textit{Penetration} \times \left[\frac{\textit{Solar Comp. Rate}}{\textit{CoS}} - \frac{\textit{VoS}}{\textit{CoS}}\right]$$

Net-Metered PV: Rate impact at *current national penetration levels*, across a range of VoS assumptions, with purely volumetric rates

Net-Metered PV: Rate impact at *projected national 2030 pen. level*, across a range of VoS assumptions, with purely volumetric rates

Net-Metered PV: Rate impact at *10% penetration*, across a range of VoS assumptions, with purely volumetric rates



Notes: Range in VoS assumptions is drawn from existing utility and state VoS studies. Source: Lawrence Berkeley National Laboratory, Putting the Rate Impacts of Distributed Solar into Context, January 2017. https://emp.lbl.gov/publications/putting-potential-rate-impacts

- At current penetration levels (0.4% of U.S. retail electricity sales): net metered PV could yield between a 0.2% decrease and 0.2% increase in U.S. average retail prices
- At projected penetration levels in 2030 (~3% of U.S. retail electricity sales), corresponding effect is ±1.6% impact on U.S. avg. prices
- Several utilities in Hawaii have reached 10% penetration and several states are projected to reach this level by 2030; corresponds to rate impact range of ±5% change in rates
- Demand charges, fixed charges, removal of net metering reduce estimated impacts

Utility- and state-specific analysis examples are consistent with preceding ranges

E3 California NEM Cost-Benefit Study (2013): Estimates net ratepayer cost as a percentage of revenue requirements (akin to rate impact) growing from **0.7%** in 2012 to **3.1%** once NEM is fully subscribed (which has since occurred). Note that the state has moved to flatten its tiered rate structure, which will reduce the rate impact of NEM.

E3 Nevada NEM Cost-Benefit Study (2016): Estimates net ratepayer cost from existing PV systems of $36 million per year (roughly 2/3rd from NEM and 1/3rd from rebates). Based on current NV Energy revenue requirements, equates to a **1.3%** rate impact for residential customers and a **1.0%** rate impact for non-residential customers.

Louisiana PSC NEM Cost Benefit Study (2015): Estimates net ratepayer cost from existing PV systems (as of July 2014) to be $6 million per year. Extrapolating to current PV penetration levels and based on current revenue requirements, equates to an average rate impact of **0.5%** for residential and non-residential customers, combined.

APS NEM Cost of Service Study (2015): Estimates a shortfall of $67/month per residential solar customer, in terms of the difference between the allocated cost to serve the customer and the revenues received. Based on the total number of residential solar installations and the utility's annual revenue requirements, equates to a **2.6%** rate impact.

Value-of-Solar Studies: Although study scopes vary widely, when comparing solely based on "traditional" utility cost categories, most studies estimate a value of solar ranging from 50% to 150% of the corresponding utility or state retail electricity price; percentages above 100% imply rate reductions over the long-run

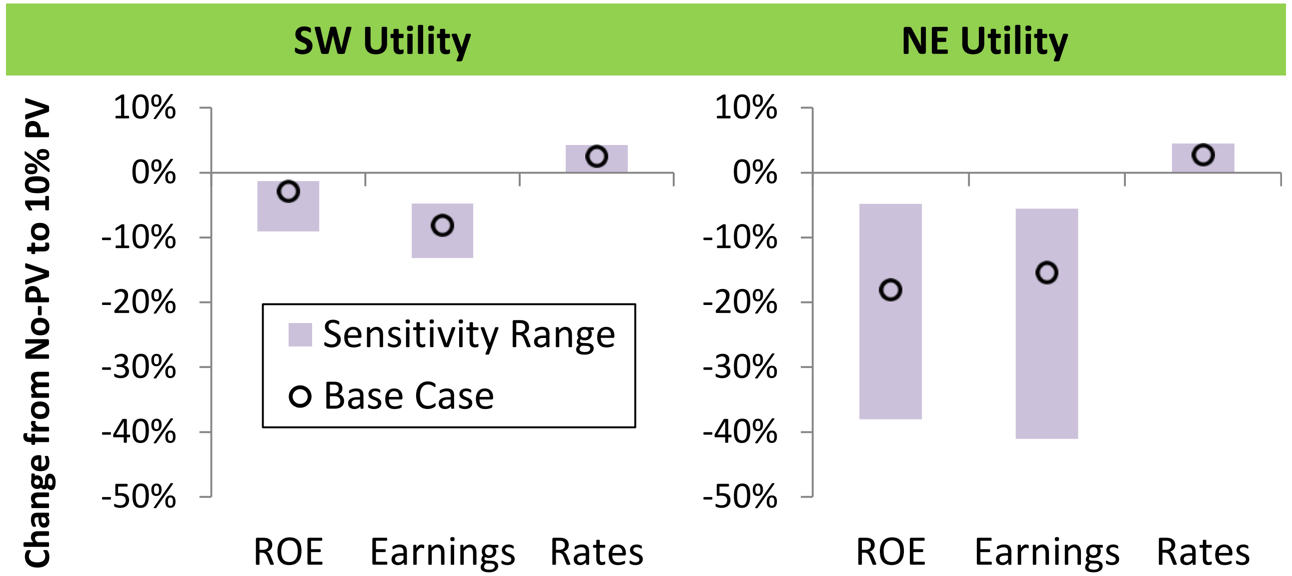
Rooftop solar and net-metering

Potential utility shareholder impacts

Pro-forma financial modeling of a prototypical vertically-integrated utility in the southwest and a wires-only utility in the northeast show:

- Ratepayer impacts ~5% or less at 10% DG PV penetration
- Utility shareholder impacts often greater than ratepayer impacts
  - Wires-only utility more sensitive due to smaller rate base
  - Impacts depend critically on specific market and regulatory conditions
  - Various regulatory mitigation options available (e.g., decoupling, rate design, utility ownership of distributed PV assets, etc.)

Change in utility shareholder ROE and earnings, and in average retail rates, with 10% penetration of NEM



Source: Lawrence Berkeley National Laboratory, Financial Impacts of Net-Metered PV on Utilities and Ratepayers: A Scoping Study of Two Prototypical U.S. Utilities, September 2014. https://emp.lbl.gov/publications/financial-impacts-net-metered-pv

Conclusions

Summary

Retail electricity rates have, on a national basis, been flat for roughly a decade

States endowed with high-quality wind and/or solar resources have, in some cases, likely witnessed rate decreases

State RPS policies have generally increased rates, but the estimated magnitude of historical and forecasted rate impacts span a wide range

State and utility financial incentives directly increase retail rates through retail rate surcharges; these surcharges tend to be relatively modest in size

Net metering for rooftop solar can increase retail rates, though magnitude and even direction of impact depends critically on VoS and rate design; impacts become more-significant at high levels of penetration of DG PV

Analysis has not considered RE incentives delivered through tax code or general government revenue sources, as the cost of these programs is not reflected in retail rates: in fact, these programs reduce retail electricity rates by making RE purchases less expensive

Analysis has not considered the claimed benefits of RE: human health, water usage, energy price risk, GHGs; nor has the analysis considered the claimed environmental impacts of RE on wildlife or local communities, or claimed positive or negative impacts on employment and economic development

The analyses and literature presented earlier do not always consider fully the relative balance between the full cost of delivering renewable energy and the value of that energy in terms of its ability to offset the cost of other generation sources