Retail Rate Impacts of Distributed Solar

Focus on New England

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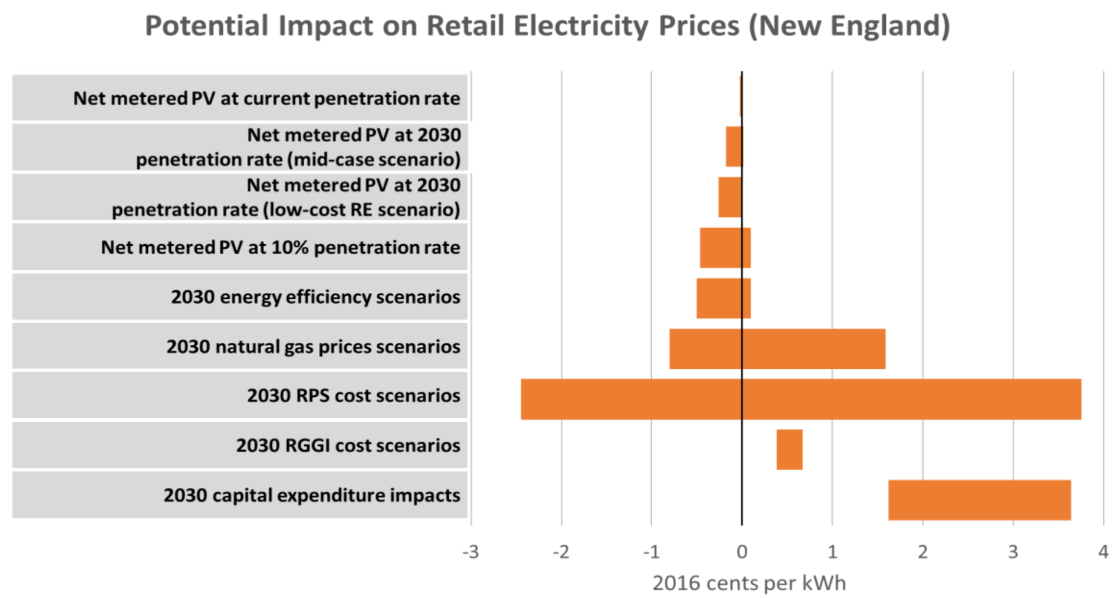
Overview

The Lawrence Berkeley National Laboratory (LBNL) recently issued a study entitled "*Putting the Potential Rate Impacts of Distributed Solar into Context*," authored by Galen Barbose. The LBNL study estimates the potential rate impact of distributed solar on national average retail electricity prices, and importantly, compares that impact to the potential impact of other rate drivers such as natural gas prices, renewable portfolio standards, and utility capital expenditures.[1]

This brief applies a similar style analysis as used by LBNL to regional and state level data to estimate more granular impacts for New England. We estimate rate impacts for various penetration rates of net metered distributed solar and compare them to the potential rate impacts of future natural gas prices, energy efficiency gains, RPS costs, RGGI costs, and utility capital expenditures. Like LBNL, we attempt to isolate the impact of these rate drivers as well as represent uncertainty around future policy choices, commodity costs, and technology costs.

Results

We find analytical results for New England that are similar to the national numbers. The potential rate impacts of net metered distributed solar are relatively minimal—even at penetration rates above current optimistic projections—compared to other potential rate drivers. The following graph presents our findings for New England; state-level findings are below:



[1] Barbose, G. (2017). Putting the Potential Rate Impacts of Distributed Solar into Context. Accessed at: https://emp.lbl.gov/publications/putting-potential-rate-impacts

Using distributed solar value estimates for the New England states developed by Acadia Center and the Maine Public Utilities Commission, we show that the potential rate impacts of full retail net metered solar at current and projected future penetration levels is negligible. Even at 10% penetration, the average potential rate *increase* caused by net metered solar is less than 0.10 cents per kilowatt-hour ($0.001/kWh). Even larger rate *decreases* are also possible.

The magnitude of possible rate impacts of the other rate drivers analyzed are much larger. Average rate impacts of projected state energy efficiency programs could be between -0.5 to 0.1 cents/kWh. Projected future natural prices represent large uncertainty for retail electricity prices in the New and could translate to between approximately -0.8 to 1.6 cents/kWh difference in baseline retail electricity prices. Incremental renewable portfolio standards compliance costs and other benefits/costs could equate to between -2.3 to 3.8 cents/kWh difference in retail prices. If the RGGI states choose to reduce the region-wide carbon cap through 2030, retail prices could increase between 0.4 to 0.7 cents/kWh. Finally, incremental increases in utility capital expenditures may impact future retail electricity rates between 1.5 and 3.5 cents/kWh.

Policy Upshot

Any analysis that tries to isolate the impacts of a single policy mechanism in the real world carries a risk of imprecision. Still, the relative magnitude and direction of rate impacts revealed in this analysis is indicative and intuitively logical. Net metering has received a lot of attention in trade and popular media; solar is perhaps the most interesting energy generation resource to appear on the utility scene in many years. This analysis does not detract from the importance of addressing the issues raised by increased penetration of net metered distributed generation. Rather, it provides important high-level perspective on where regulatory engagement time and effort could yield results of greatest financial significance for utilities and customers.

Policy options do not operate in isolation. Well-targeted utility investments in infrastructure and information systems can be designed to facilitate greater deployment of distributed generation and distributed energy resources of all kinds. A strategic perspective for grid modernization efforts underway in many states, including in New England, can help ensure that the rate reduction opportunities of all policies are maximized and captured.

Thanks

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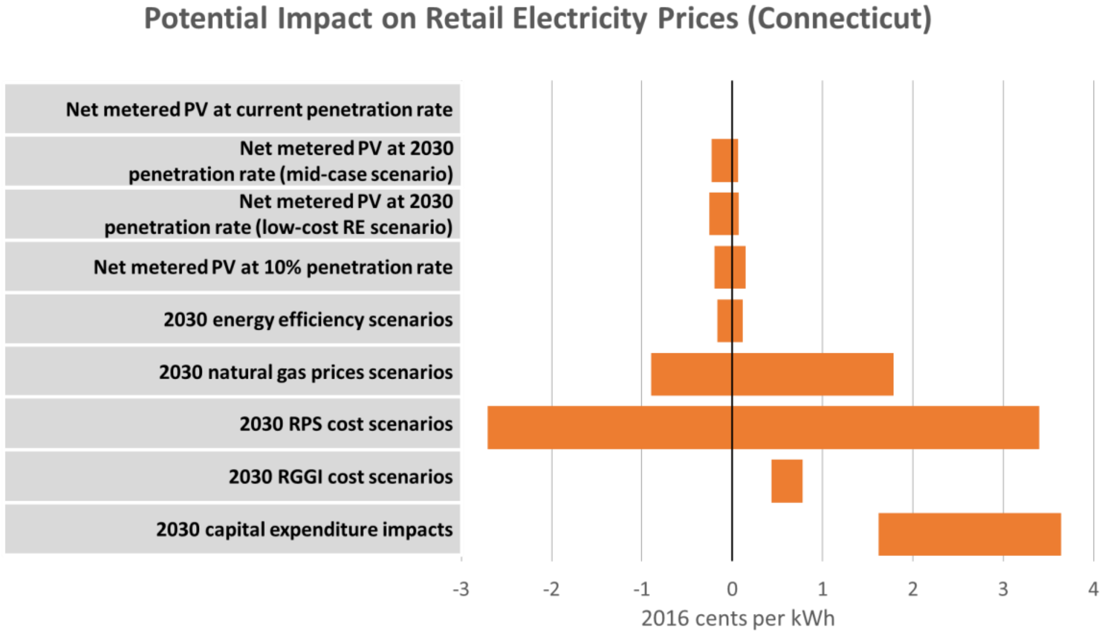
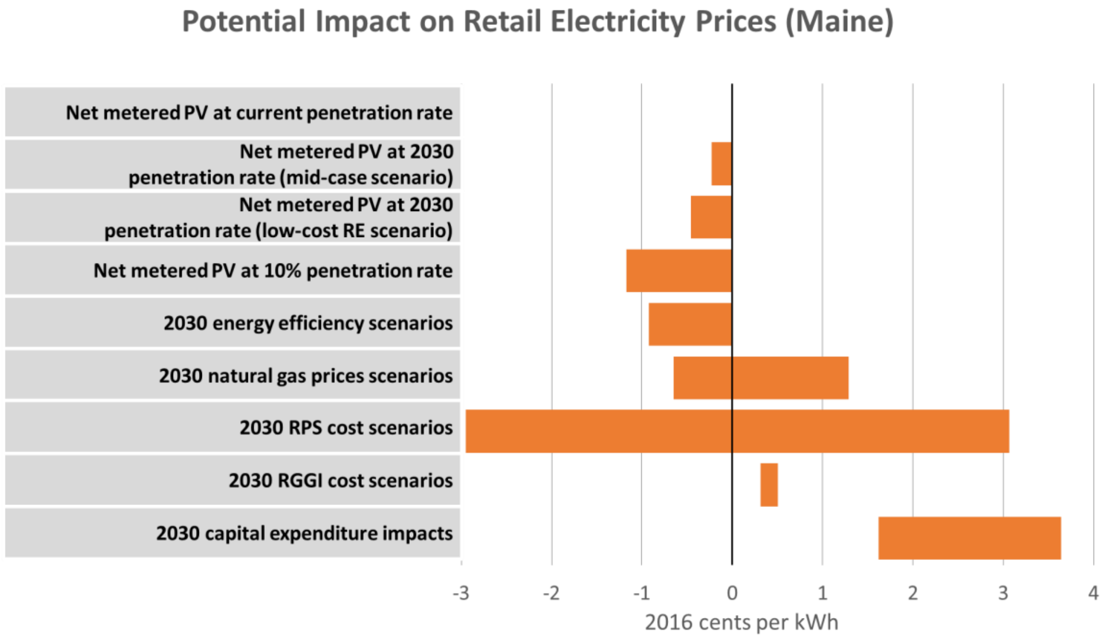
State Level Results

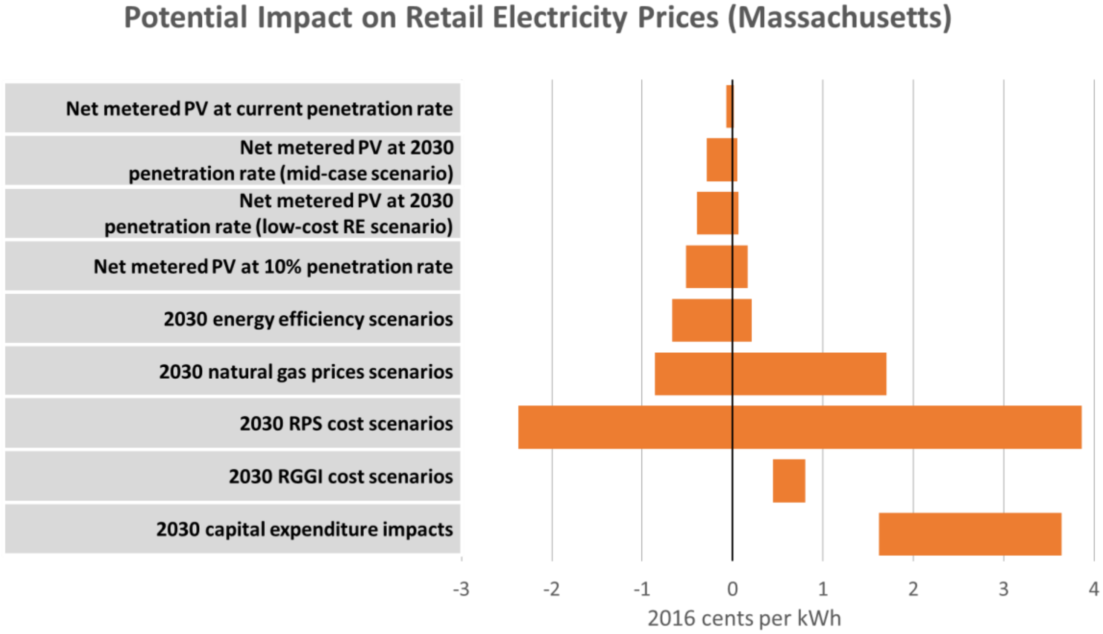
Connecticut



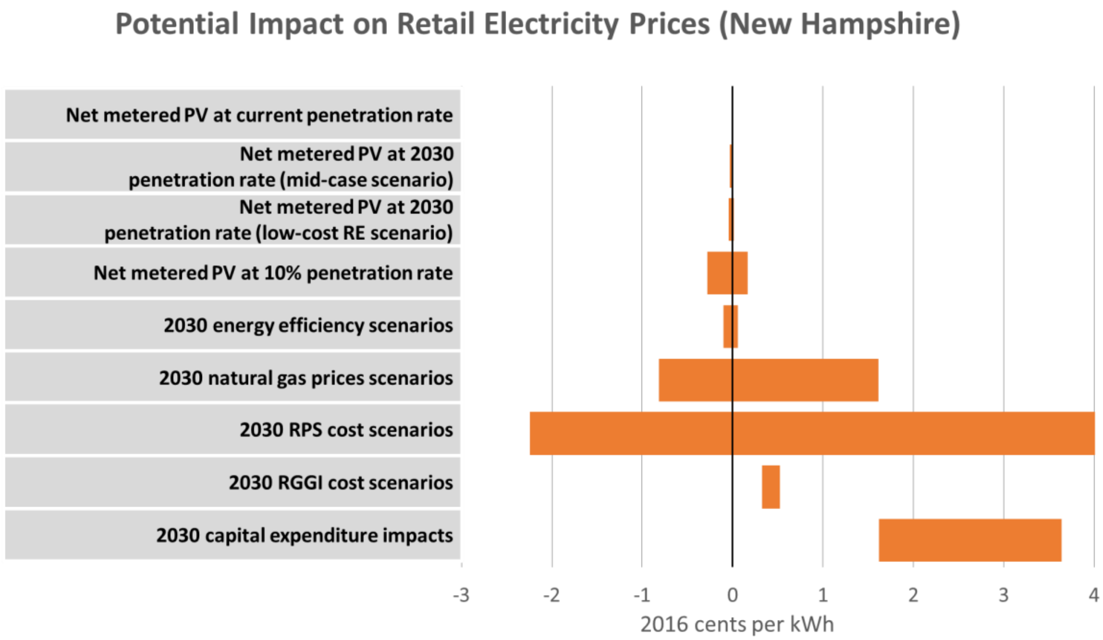
Maine



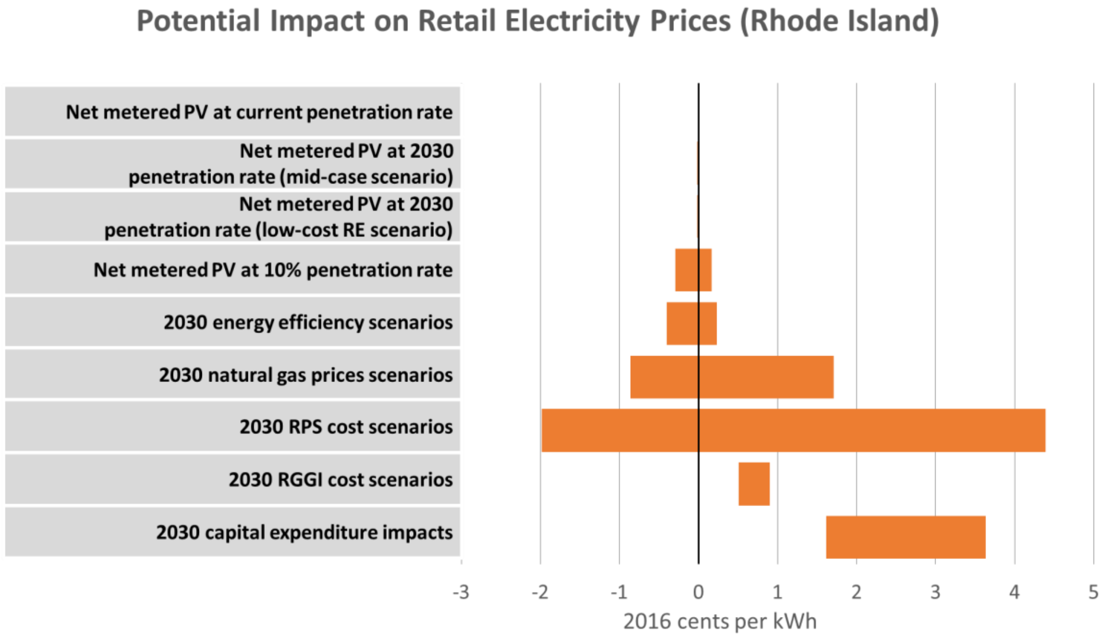
Massachusetts



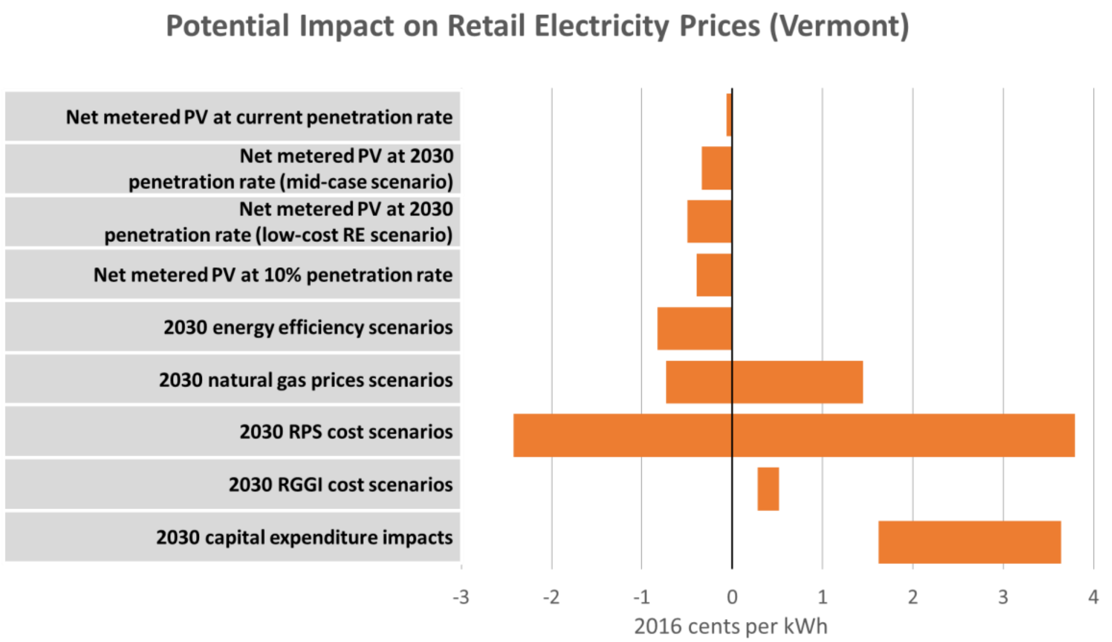
New Hampshire



Rhode Island



Vermont



Methodology

We use a similar approach as LBNL except we provide state specific estimates as opposed to national averages. To accomplish this, we utilize different data sets and references with state and region specific information.

The Impact of Distributed Solar

We estimate the rate impact of distributed solar at various penetration levels and with a range of grid values. LBNL estimates the rate impact of distributed solar using the following formula:

$$\begin{matrix}\text{Percent Change in} \\ \text{Retail Electricity Price}\end{matrix} = \begin{matrix}\text{Solar} \\ \text{Penetration}\end{matrix} \; x \left[\frac{\begin{matrix}\text{Solar Compensation} \\ \text{Rate}\end{matrix}}{\text{Cost of Service}} - \frac{\text{Value of Solar}}{\text{Cost of Service}}\right]$$

We use the following data and assumptions for each term within the equation to determine impact on retail electricity prices:

Term	Description		CT	ME	MA	NH	RI	VT	Source
Distributed Solar Penetration	Current penetration rate		0.47%	0.11%	1.21%	0.21%	0.09%	1.27%	EIA-861 forms, PVWatts
	Projected 2030 penetration rate	Reference case	8.24%	1.73%	4.80%	0.95%	0.35%	6.38%	2016 Standard Scenarios Report: A U.S. Electricity Sector Outlook. NREL.
		Low renewable cost case	9.21%	3.48%	6.54%	1.24%	0.39%	9.47%	
	10% penetration rate		10%	10%	10%	10%	10%	10%	N/A
Solar Compensation Rate	Assumed to be retail electricity rate (cents / kWh)		17.77	12.78	16.9	16.02	17.01	14.41	State Electricity Profiles. EIA.
Cost of Service (CoS)	Assumed to be retail electricity rate (cents / kWh)		17.77	12.78	16.9	16.02	17.01	14.41	State Electricity Profiles. EIA.

For each state's value of solar (VoS), we use values estimated in recent reports by the Maine Public Utilities Commission (for Maine) and Acadia Center (for the other states). Like the LBNL study, we use two values: *VoS* which considers only avoided energy, generation capacity, transmission capacity, and distribution capacity costs, and *VoS+* which considers all avoided costs in VoS plus energy and capacity cost price suppression effects.

State	VoS (cents/kWh)	VoS+ (cents/kWh)	Source
CT	17	20.4	Acadia Center. (2015). Value of Distributed Generation – Solar PV in Connecticut.
ME	13.8	24.3	Maine Public Utilities Commission. (2015). Maine Distributed Solar Valuation Study.
MA	15.9	22.6	Acadia Center. (2015). Value of Distributed Generation – Solar PV in Massachusetts.
NH	15	19.4	Acadia Center. (2015). Value of Distributed Generation – Solar PV in New Hampshire.
RI	16	20.5	Acadia Center. (2015). Value of Distributed Generation – Solar PV in Rhode Island.
VT	15	18.8	Acadia Center. (2015). Value of Distributed Generation – Solar PV in Vermont.

Impact of Energy Efficiency

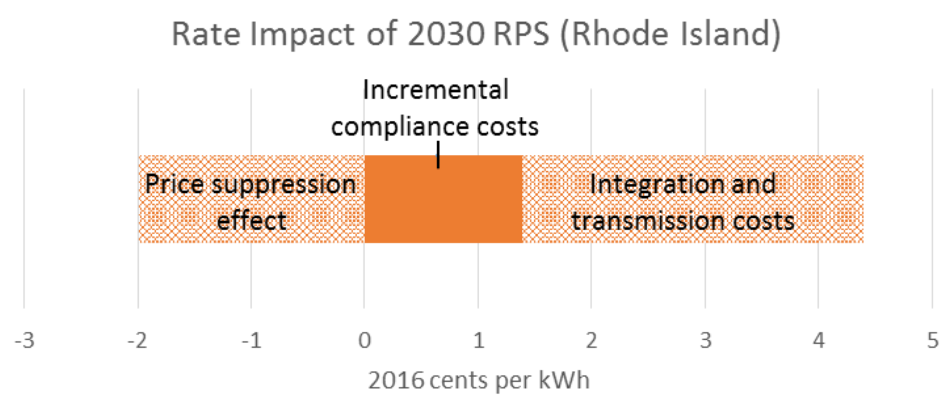
We estimate the rate impact of New England states' energy efficiency programs between 2020 and 2030. We use the ISO-NE energy efficiency forecast for each state between 2020 and 2025 and assume the same average annual savings between 2026 and 2030 (approximately 125GWh per year).[2] Additionally, we assume no annual net attrition in savings of previous years' energy efficiency measures. In 2030, we estimate energy efficiency savings gained between 2020 and 2030 represent approximately 14% of retail sales. Like LNBL, we use the value of solar estimates as a proxy for the value of energy efficiency.

Impact of Natural Gas Prices

We estimate the rate impact of uncertainty in projected 2030 natural gas prices. We use region specific projections of retail electricity prices in 2030 from EIA's 2017 Advanced Energy Outlook (AEO2017). To incorporate uncertainty in future natural gas price ranges, we scale 2030 retail price projections to the price impact of AEO2017's high and low gas/oil resource cases, which assume greater and less gas/oil supplies than anticipated, respectively.

Impact of Renewable Portfolio Standards (RPS)

We estimate the rate impact of each states' 2030 RPS incremental compliance costs (e.g. REC prices) coupled with rough estimates of potential price suppression effects and additional integration/transmission upgrade costs. We use a range of 2030 Tier 1 REC price projections as modeled in the on-going RGGI Program Review from the low and high emission cases assuming a 2.5% cap decline through 2030.[3] We use this REC price range to calculate the per kWh cost to supply additional RECs for the RPS obligation increase between 2016 and 2030 (10% to 31%). Additionally, to account for potential downward and upward pressure on rates resulting from price suppression effects and integration/transmission upgrade costs, we assume a +/- 3 cent adjustment based on assumptions made by LBNL. As an example, the following graph shows the breakdown of the assumed price suppression impact, incremental compliance costs, and integration/transmission costs for Rhode Island.



[2] ISO-NE. (2016). 2016 Energy-Efficiency Forecast 2020-2025. Accessed at https://www.iso-ne.com/static-assets/documents/2016/04/ISO_NE_2016_EE_Forecast_2020_2025_Final.pdf
[3] See Draft IPM Modeling Results under November 21, 2016 Meeting Materials at https://www.rggi.org/design/2016-program-review/rggi-meetings

Impact of Regional Greenhouse Gas Initiative (RGGI)

We estimate the rate impact of various RGGI cap level trajectories between 2020 and 2030. We use changes to projected 2030 firm power prices under 2.5% and 5.0% cap declines through 2030 scenarios compared to a reference case as modeled as part of the on-going RGGI program review.[4]

Impact of Utility Capital Expenditures

In lieu of state and utility specific capital expenditure rate impacts, we simply use the range derived by LBNL of 1.6 to 3.6 cents per kWh. This range represents LBNL's estimate of the national average increase in utility capital expenditures by 2030.

[4] See Draft IPM Modeling Results under June 17, 2016 Meeting Materials at https://www.rggi.org/design/2016-program-review/rggi-meetings