

Renewables and Electricity Affordability: Untangling Correlation from Causation

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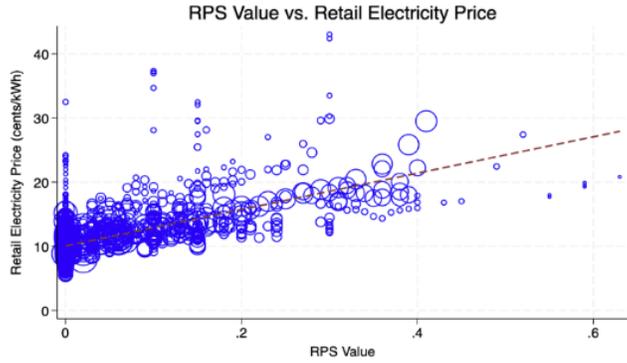


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Center for Energy and
Environmental Policy Research

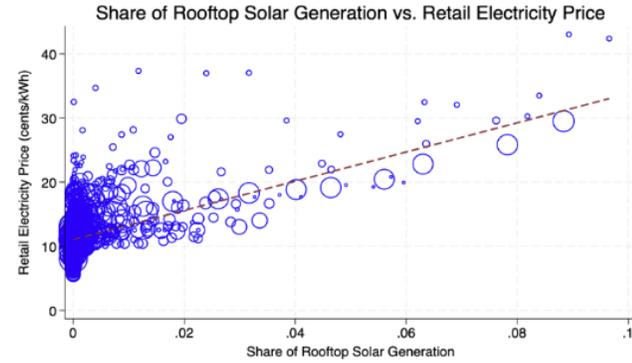
Raw correlational plots seem to confirm the worries of green policy skeptics

RPS Requirement	0.6363
% Wind Generation	0.2856
% Utility-Scale Generation	0.4278
% Residential Solar	0.6189

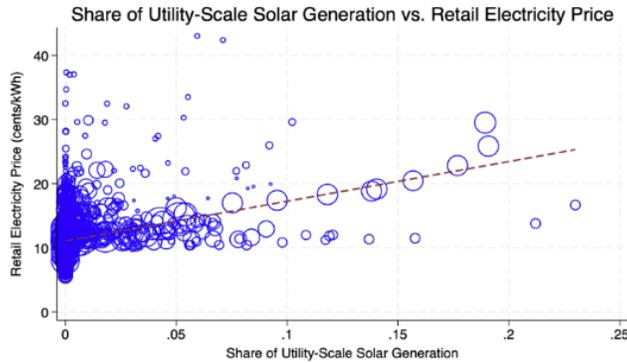
A recent study by Wiser et al (2025) finds a similar result and reports that RPSs have risen prices.



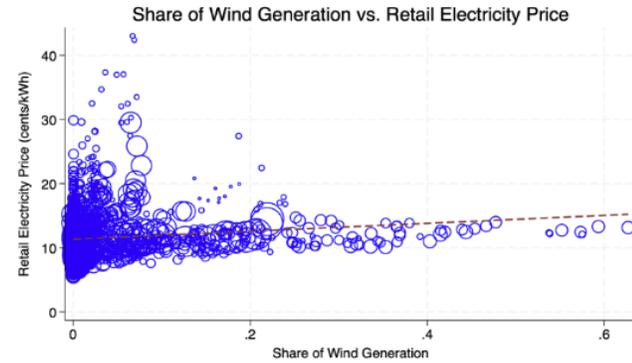
(a) RPS Value vs. Retail Electricity Price



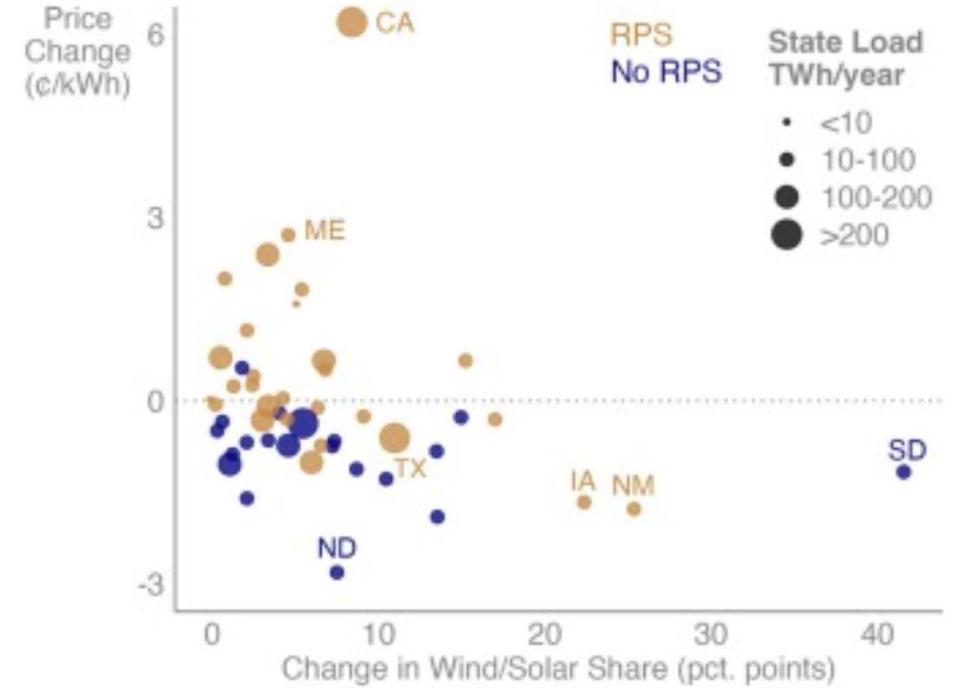
(b) Share of Rooftop Solar Generation vs. Retail Electricity Price



(c) Share of Utility-Scale Solar Generation vs. Retail Electricity Price



(d) Share of Wind Generation vs. Retail Electricity Price



The contribution of RPSs to residential electricity prices is eliminated by controlling for interstate and interannual confounders.

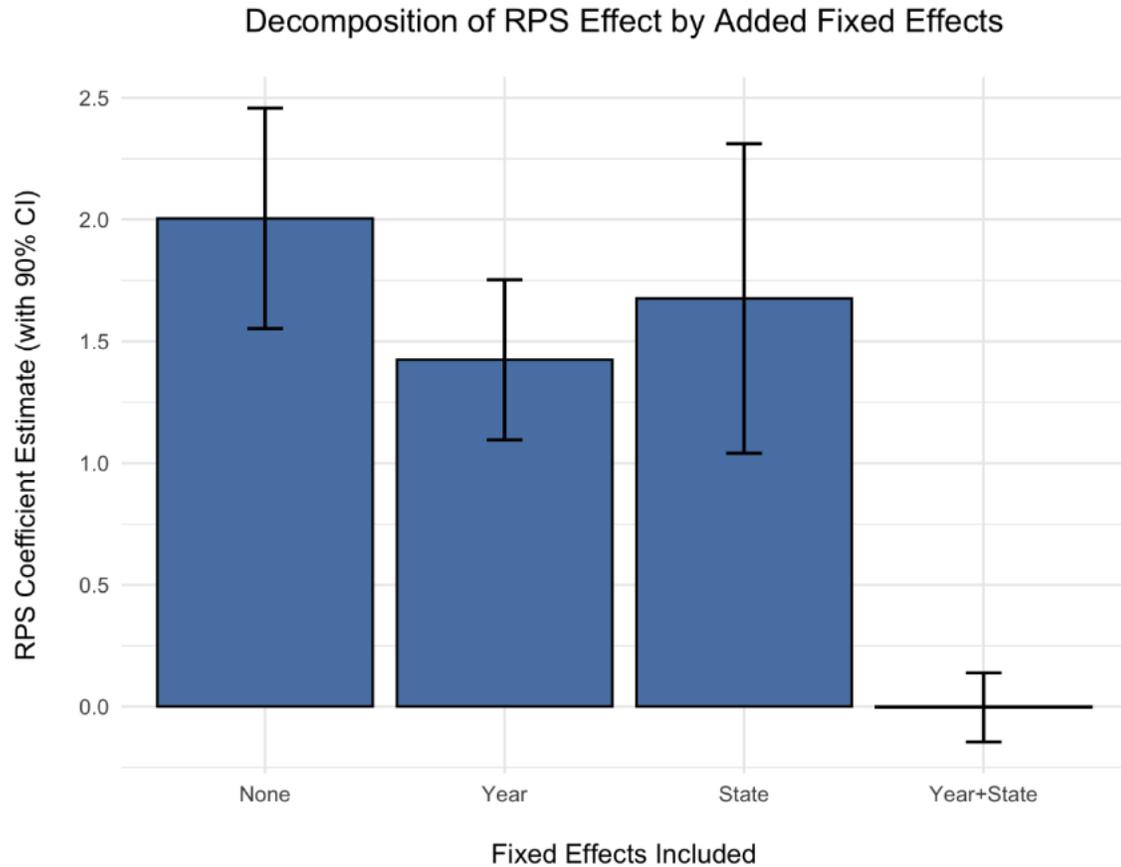


Table A1: Impact of RPS on CONUS Residential Electricity Price (1998-2023), in nominal \$

	(1)	(2)	(3)	(4)	(5)
RPS	2.0053*** (0.2750)	1.4246*** (0.1997)	1.6764*** (0.3865)	-0.0029 (0.0862)	0.0598 (0.0709)
R2 Adj.	0.408	0.604	0.631	0.943	0.969
Num.Obs.	1248	1248	1248	1248	1248
R2	0.408	0.612	0.645	0.946	0.973
Year FE		Yes		Yes	Yes
State FE			Yes	Yes	Yes
Year:State FE					Yes
Year ² :State FE					Yes

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Dependent Variable: Log residential electricity price [¢/kwh], in nominal USD. State clustered standard errors. RPS refers to the share of applicable retail electricity sales that should be served by renewable sources.

Utility-scale renewables correlate with lower prices; Rooftop solar is linked with higher prices

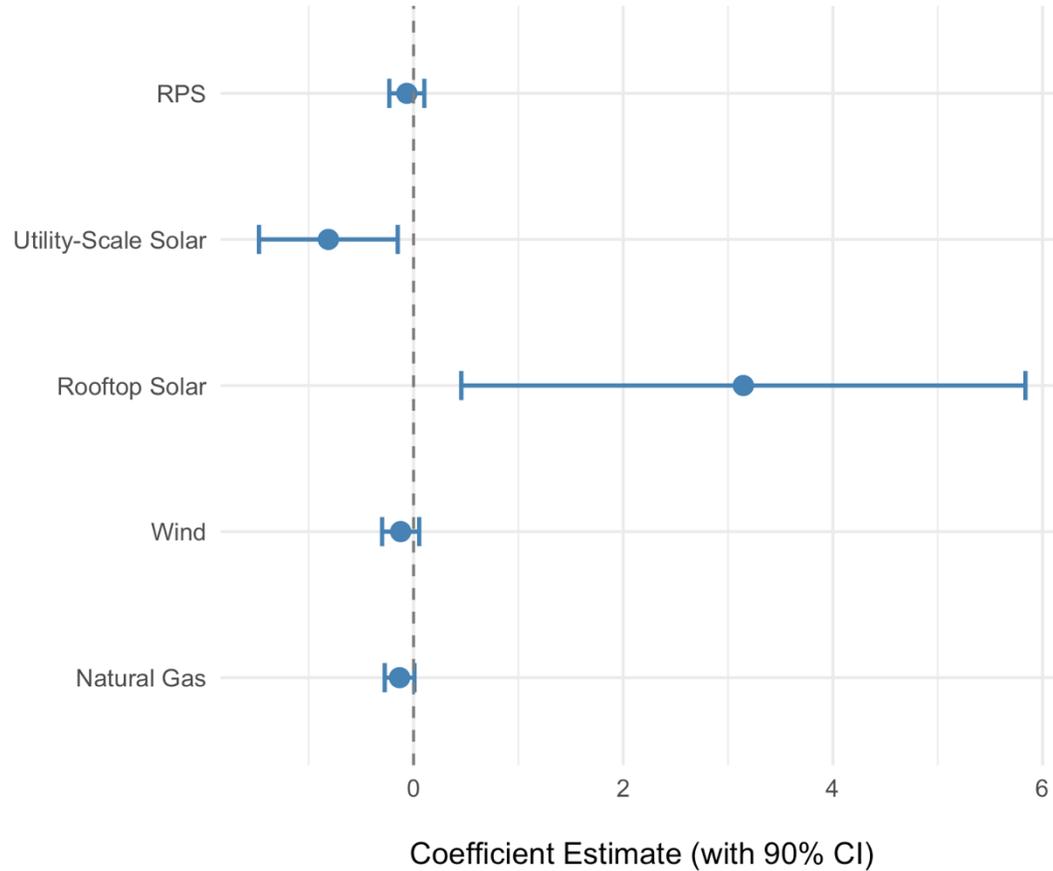


Table A2: Impact of RPS and Source Generation Shares on CONUS Residential Electricity Price (1998-2023), in nominal \$

	(1)	(2)	(3)	(4)	(5)
RPS	1.2889*** (0.2359)	0.9302*** (0.2362)	0.6577** (0.2027)	-0.0603 (0.1015)	-0.0832 (0.0784)
Utility PV & Thermal Generation	-0.8507 (0.7851)	-1.6156* (0.7424)	0.3946 (0.8605)	-0.8123* (0.4024)	1.1148 (0.9691)
Residential PV Generation	5.9385* (2.2673)	6.6609** (2.2293)	3.5418 (2.7259)	3.1459+ (1.6357)	8.0167* (3.0075)
Wind Generation	0.9773*** (0.1102)	0.4015** (0.1230)	1.1943*** (0.1545)	-0.1229 (0.1076)	-0.1092 (0.2036)
Hydro Generation	-0.1560* (0.0653)	-0.1535* (0.0722)	-0.1691 (0.2820)	-0.2030* (0.0932)	-0.1674 (0.1609)
Pumped Storage Generation	0.2379 (4.9398)	0.4623 (5.1908)	1.8098 (4.8057)	-5.3118+ (2.8813)	-3.9884* (1.8330)
Natural Gas Generation	0.5189*** (0.0693)	0.3479*** (0.0975)	0.7992*** (0.1492)	-0.1332 (0.0863)	-0.1912* (0.0789)
Nuclear Generation	0.6014*** (0.1059)	0.5181*** (0.1042)	0.6284** (0.1901)	0.0664 (0.0956)	-0.0976 (0.1281)
Petroleum Generation	0.1784 (0.3140)	1.0160** (0.3276)	-0.1458 (0.2919)	-0.1166 (0.2721)	-0.3977 (0.2960)
Other Generation	0.3375 (0.4323)	0.7116 (0.4688)	1.1197+ (0.6614)	-0.0363 (0.4704)	-0.7372+ (0.4333)
R2 Adj.	0.676	0.792	0.804	0.946	0.971
Num.Obs.	1248	1248	1248	1248	1248
R2	0.678	0.798	0.813	0.950	0.976
Year FE		Yes		Yes	Yes
State FE			Yes	Yes	Yes
Year:State FE					Yes
Year ² :State FE					Yes

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Dependent Variable: Log residential electricity price [¢/kwh], in nominal USD. State clustered standard errors. The omitted comparison group is the share of coal generation. Generation is expressed in MWh as a share of the total generation for each state in a particular year.

Why might rooftop solar increase costs?

Over 57% of the energy bill isn't even for the electricity!



Account Number:
Statement Day:
Service Provided To:

Rate R1-Residential Non-Heating Cycle 20
Service from 08/28/25 - 09/26/25 30 Days
Next read date on or about: Oct 30, 2025

Meter Number	Current Read	Previous Read	Current Usage	Reading Type
7119486	80617	79352	1265	Actual

Sep	Oct	Nov	Dec	Jan	Feb	Mar
1071	1087	988	1252	1170	973	931
Apr	May	Jun	Jul	Aug	Sep	
931	931	1195	2082	1654	1265	

Contact Information
Emergency: 800-592-2000
www.eversource.com
Pay by Phone: 888-783-8618
Customer Service: 800-592-2000

Payment will be sent to bank for processing on 10/15/25 **\$434.44**

Electric Account Summary

Amount Due On 09/23/25	\$547.80
Last Payment Received On 09/15/25	-\$547.80
Balance Forward	\$0.00
Current Charges/Credits	
Electric Supply Services	\$186.37
Delivery Services	\$248.07
Total Current Charges	\$434.44
Total Amount Due	\$434.44

Total Charges for Electricity

Supplier (FIRST POINT POWER - LEXINGTON CCA)
Meter 7119486

Generation Service Charge	1265 kWh X .14733	\$186.37
Subtotal Supplier Services		\$186.37

Delivery
R1-Residential Non-Heating
Meter 7119486

Customer Charge		\$10.00
Distribution Charge	168 kWh X .09405	\$15.80
Distribution Charge	1097 kWh X .09655	\$105.92
Transition Charge	1265 kWh X -.00095	-\$1.20
Transmission Charge	1265 kWh X .04545	\$57.49
Net Meter Recovery Surcharge	1265 kWh X .01622	\$20.52
Revenue Decoupling Charge	1265 kWh X -0.00085	-\$1.08
Distributed Solar Charge	1265 kWh X .00431	\$5.45
Renewable Energy Charge	1265 kWh X .00050	\$0.63
Energy Efficiency Charge	1265 kWh X .02506	\$31.70
Electric Vehicle Program	168 kWh X .00138	\$0.23
Electric Vehicle Program	1097 kWh X .00238	\$2.61
Subtotal Delivery Services		\$248.07
Total Cost of Electricity		\$434.44

Supply Charges = \$186.37

Delivery Charges = \$248.07

\$10 Customer Charge

\$25 Rooftop Solar Recovery

Eversource is required to comply with Department of Public Utilities' billing and termination regulations. If you have a dispute please see the bill insert for more information.

For an electronic version of this insert, residential customers go to Eversource.com/about-residential-bill and business customers go to Eversource.com/about-business-bill. Then select "Monthly Bill Inserts" from the page. Budget Billing is also available to pay a more consistent bill each month. Please see the Customer Rights Supplement for more information.

A separate bill from a cabin in NH with rooftop solar reduces export charges

Much Higher Customer Charge (\$34 > \$10)

nhec.com | 1-800-698-2007

Account Number: | Type of Service: Residential | Next Scheduled Read Date: 11/01/2025

Rate	Meter #	Service Period	Start Reading	End Reading	Meter Multiplier	kWh Usage	Demand	Comment
N01A	901887	09/01/2025 - 10/01/2025	1419	1524	1	105		
N02A	901887	09/01/2025 - 10/01/2025	3924	4647	1	723		
PVN	901562	09/01/2025 - 10/01/2025	4733	5559	1	826	5.78	

NHEC Electric Charges

Member Service Charge		\$34.66
Delivery Charge	105 kWh x 0.04689	\$4.92
Delivery Charge Export	723 kWh x -0.02482	-\$17.94
System Benefit Charge	105 kWh x 0.00756	\$0.80
System Benefit Export	723 kWh x -0.00756	-\$5.46
Regional Access Charge	105 kWh x 0.03894	\$4.09
Regional Access Export	723 kWh x -0.00582	-\$4.21
Co-op Power Charge	105 kWh x 0.11464	\$12.04
Co-op Power Charge	723 kWh x -0.09253	-\$66.90
Current NHEC Electric Charges		-\$38.00

Summary of Charges

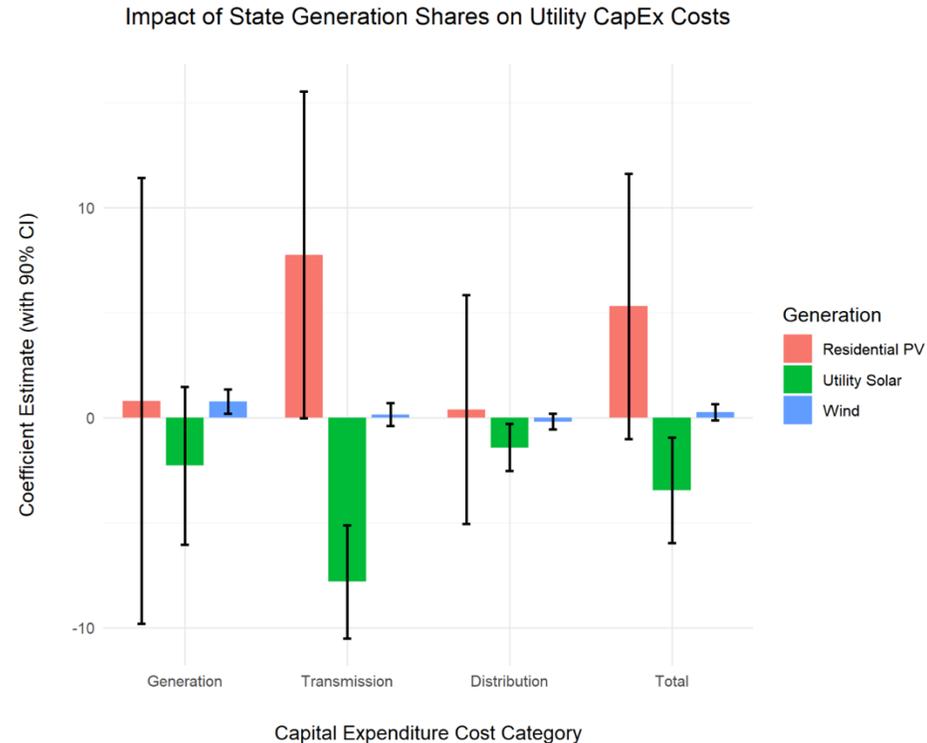
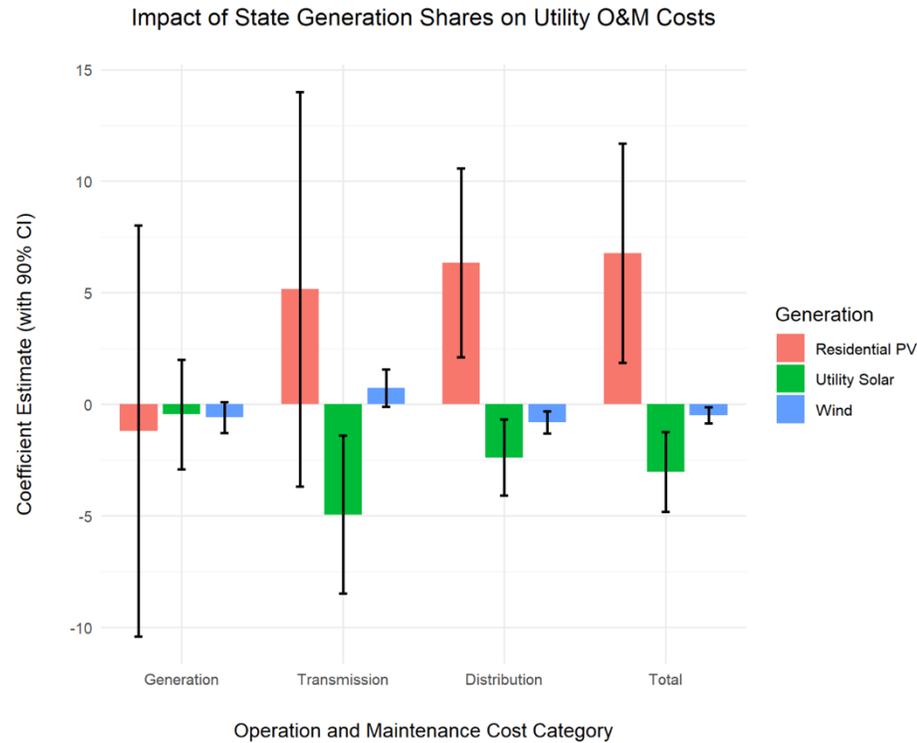
Other Charges/Credits		
Monitor Pv	\$3.00	
Subtotal		\$3.00
Current NHEC Electric Charges	-\$38.00	
Subtotal		-\$38.00
Balance Forward		-\$92.32
Total Balance Due		-\$127.32

Power Supplied By: NHEC

Lower export credits (\$0.12 < \$0.22)

Net Billing enables rooftop solar owners to benefit from their exports while ensuring they still contribute towards additional utility costs.

Utility-scale renewables reduce total O&M and CapEx costs; Rooftop solar increases them



- **Rooftop solar** generally increases per-kWh costs by reducing sales volume, oversized net-metering compensation, and inducing power backflows while deferring distribution system investment.
- **Utility-scale renewables** (especially solar) reduce overall per-kWh costs by necessitating less delivery infrastructure as compared to centralized fossil fuels and requiring lower marginal generation costs.

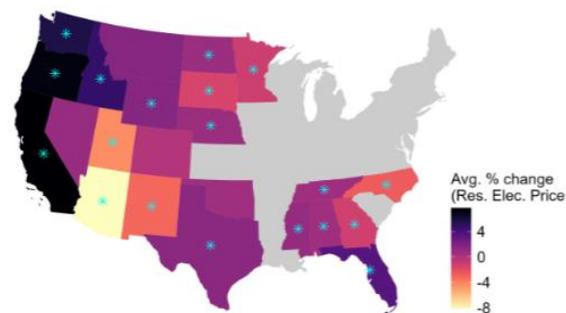
Conclusions

- **RPSs and utility-scale renewables are not to blame for higher residential electricity prices.** Rather, they are likely lowering prices nationally.
- **Rooftop solar generation is linked with higher prices,** likely because of present rate structures that compensate their exports beyond the value they provide to the grid.
- Other contributors such as climate enhanced **storms, wildfires, and heatwaves** along with **data centers** are **driving up utility costs** (Clausing et al, 2025).

Who bears the burden of climate inaction?

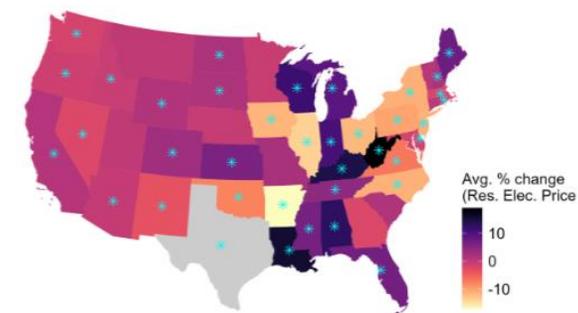
Kimberly A. Clausing, Christopher R. Knittel, and Catherine Wolfram
September 24, 2025

Wildfire Impact (long-run, 1990 - 2023)



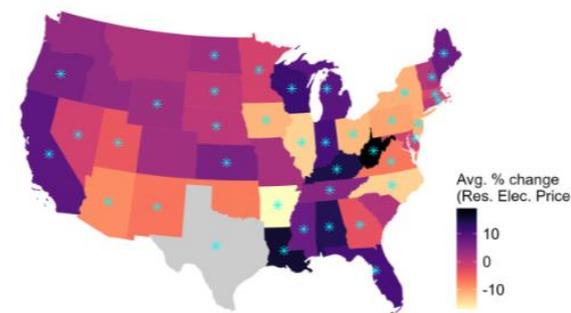
(a) Wildfire Impact

Storms Impact (long-run, 1990 - 2023)



(b) Storms Impact

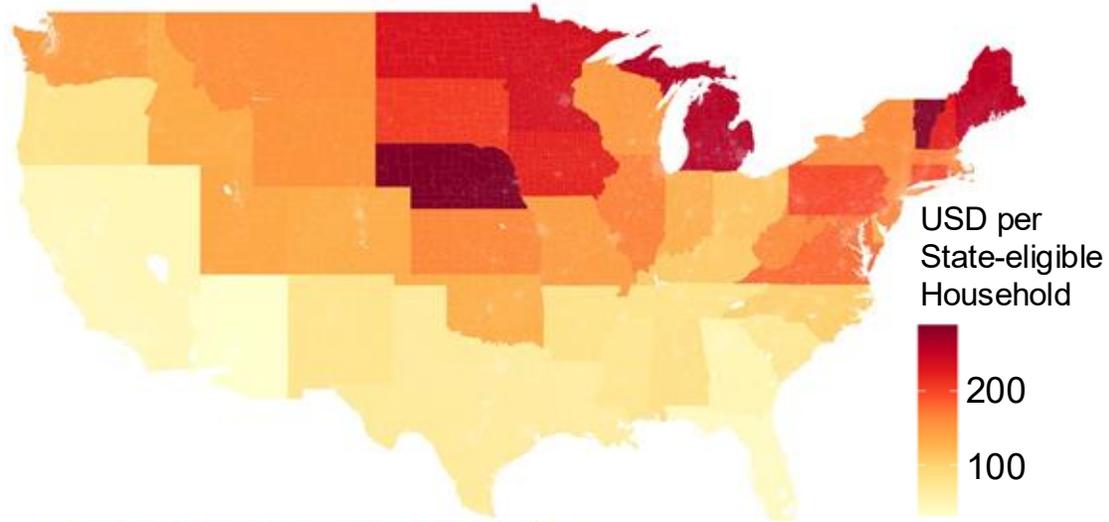
Cumulative Impact (Storms + Wildfire, 1990 - 2023)



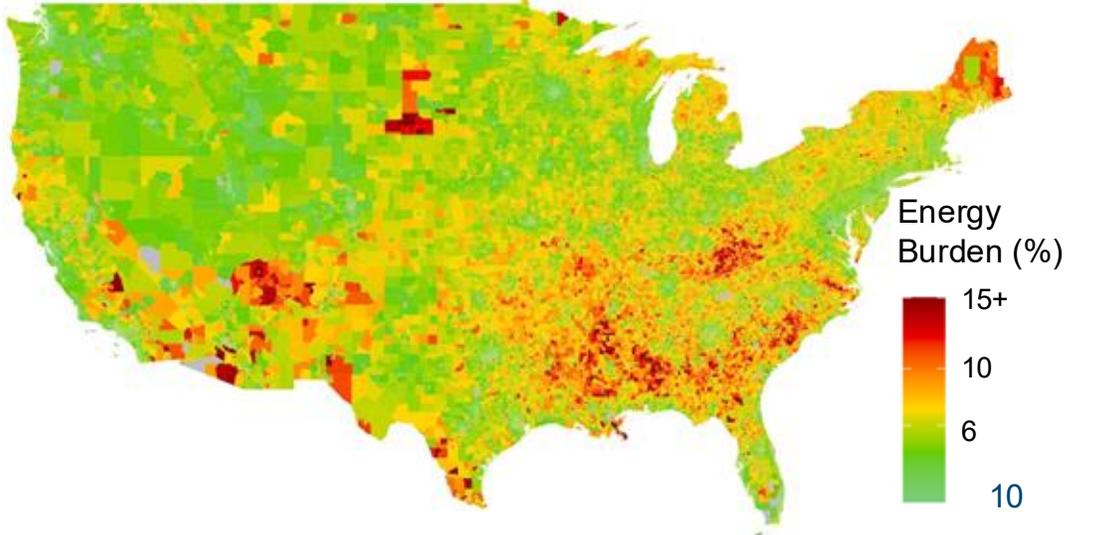
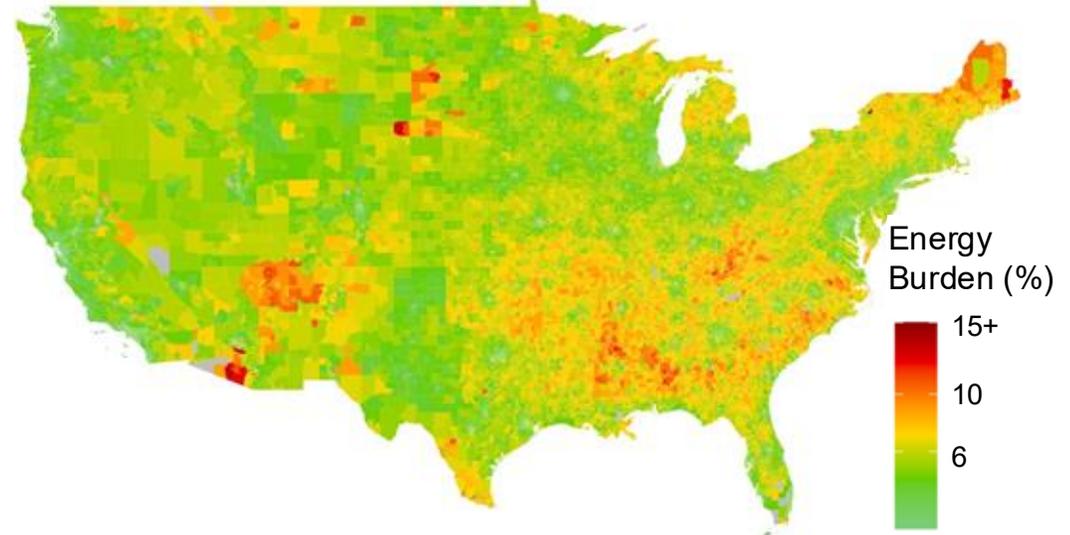
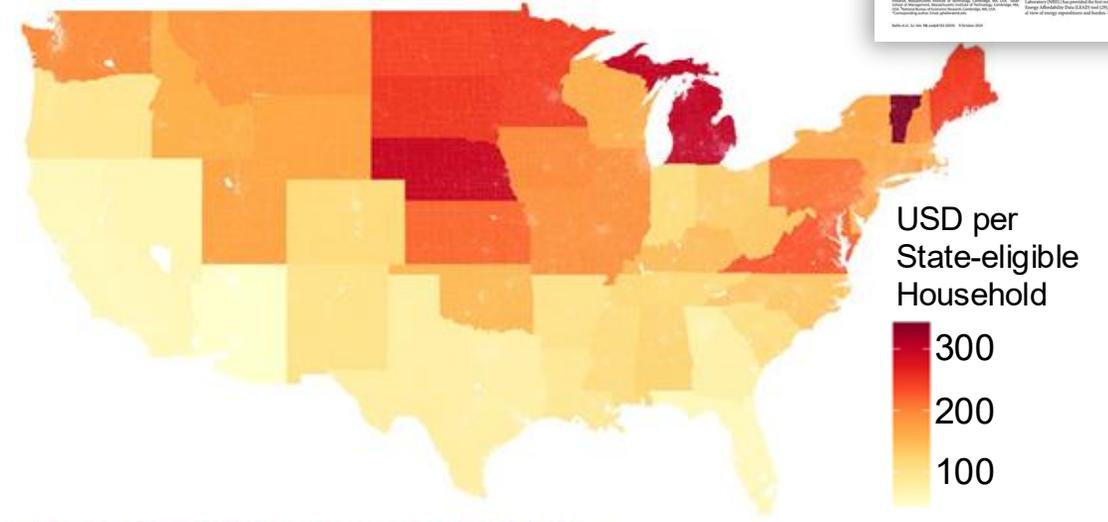
(c) Cumulative Effect

Current U.S. Federal Policy

2015 LIHEAP Funding



2020 LIHEAP Funding



SCIENCE ADVANCES | RESEARCH ARTICLE

US federal resource allocations are inconsistent with concentrations of energy poverty

Kevin Egan^{1,2*}, Peter Taylor^{3,4}, Christopher Hendon^{1,2,5}, and Nicholas Nassif^{1,2,6}

Abstract The US Energy Information Administration reports that energy costs in their households in the United States have been increasing steadily since 2010, with the distribution of energy costs becoming more skewed toward higher energy costs. We use a novel methodology to estimate the geographic distribution of energy poverty in the United States. We find that the geographic distribution of energy poverty is not consistent with the geographic distribution of LIHEAP funding. We find that the geographic distribution of energy poverty is not consistent with the geographic distribution of LIHEAP funding. We find that the geographic distribution of energy poverty is not consistent with the geographic distribution of LIHEAP funding.

INTRODUCTION The United States reports energy costs in their households in the United States have been increasing steadily since 2010, with the distribution of energy costs becoming more skewed toward higher energy costs. We use a novel methodology to estimate the geographic distribution of energy poverty in the United States. We find that the geographic distribution of energy poverty is not consistent with the geographic distribution of LIHEAP funding. We find that the geographic distribution of energy poverty is not consistent with the geographic distribution of LIHEAP funding.

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CONCLUSION We find that the geographic distribution of energy poverty is not consistent with the geographic distribution of LIHEAP funding. We find that the geographic distribution of energy poverty is not consistent with the geographic distribution of LIHEAP funding.