Low-Income Energy Affordability in an Era of U.S Energy Abundance*

Presented by:
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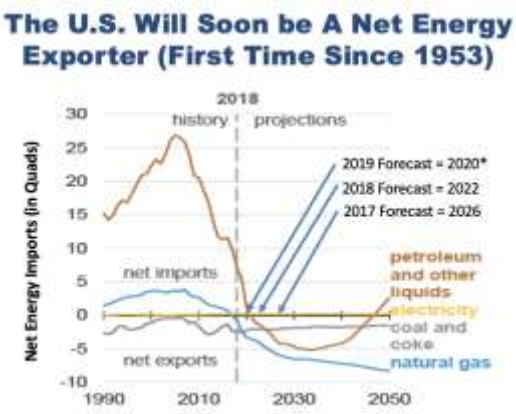
*Brown, M.A., A. Soni, M.V. Lapsa, K.A. Southworth, and M. Cox. (2019). "Low-Income Energy Affordability in an Era of Energy Abundance," *Progress in Energy,* forthcoming.

The Dilemma

- Low-income (LI) households spend a higher share of their income on electricity and natural gas than any other income cohorts.

- LI energy burdens are particularly high in geographies such as the South, rural America, and minority communities.

- And LI energy burdens are not declining despite decades of targeted public programs.
- Yet energy in the U.S. today is abundant and inexpensive, and promising opportunities exist to address low-income energy affordability.



To Understand this Dilemma:

We use the Web of Science to curate a bibliography of 171 recent U.S. publications covering the nexus of three topics:

low-income households in the U.S.

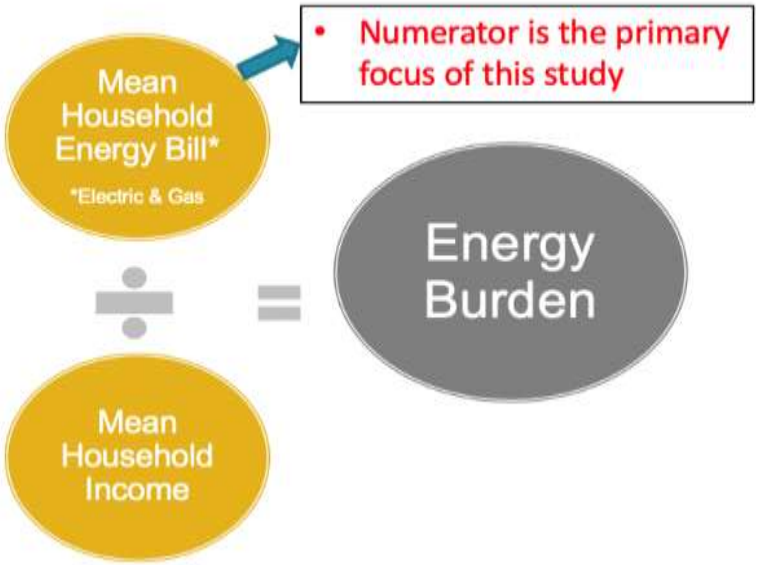
energy efficiency and/or solar energy technologies, policies, or programs

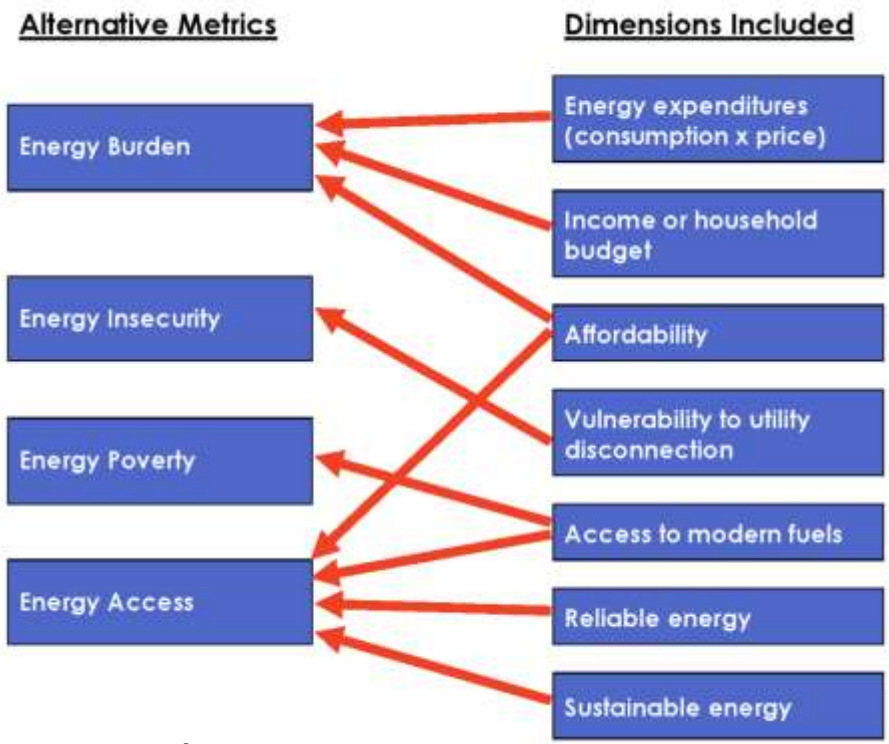
evaluation or data analysis.

Each finding is supported by at least 2 (and typically more) publications.

Several Methodological Challenges

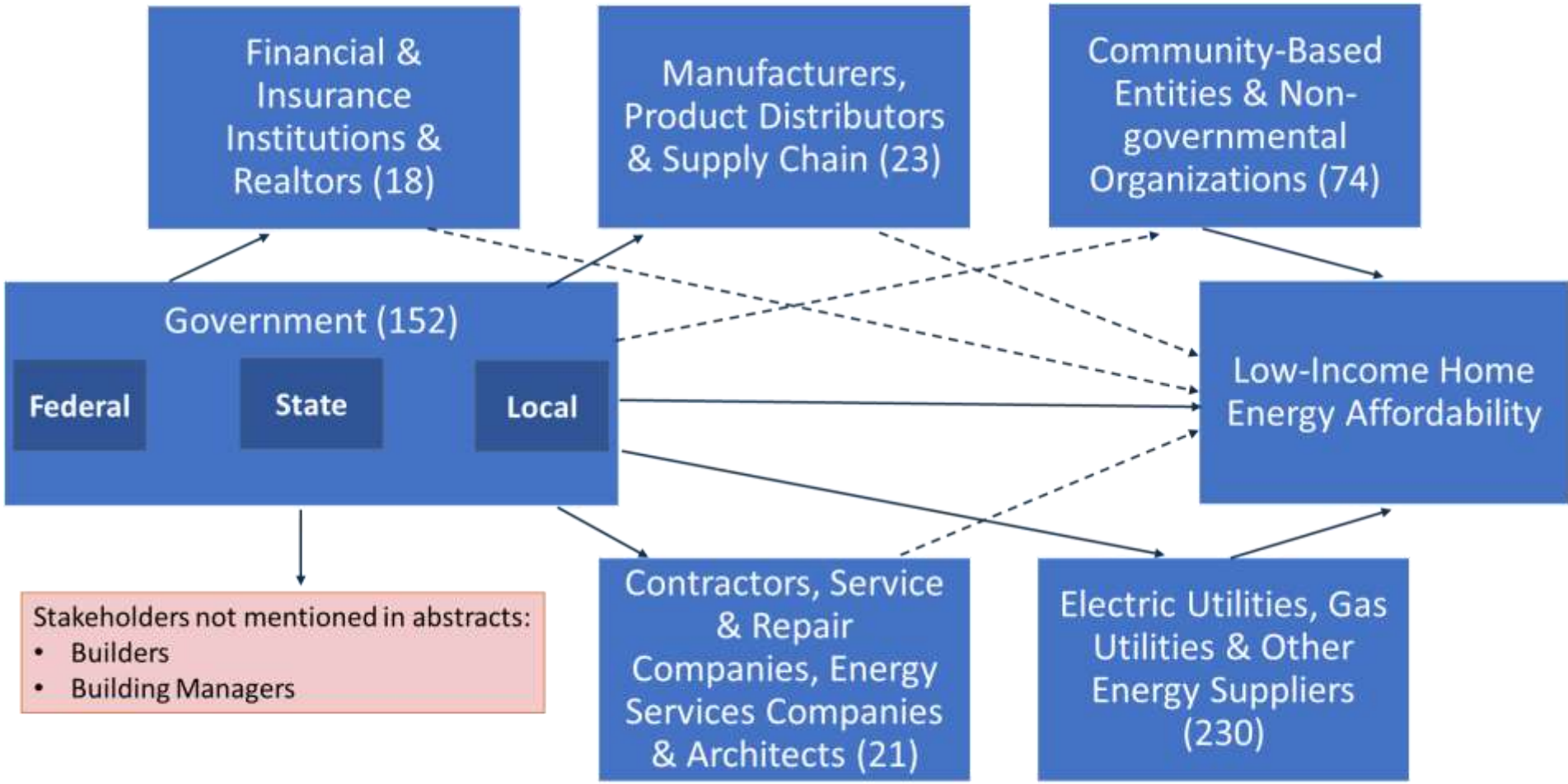
- The extent, nature, and impacts of energy burden depend on the metrics used, & there are many.





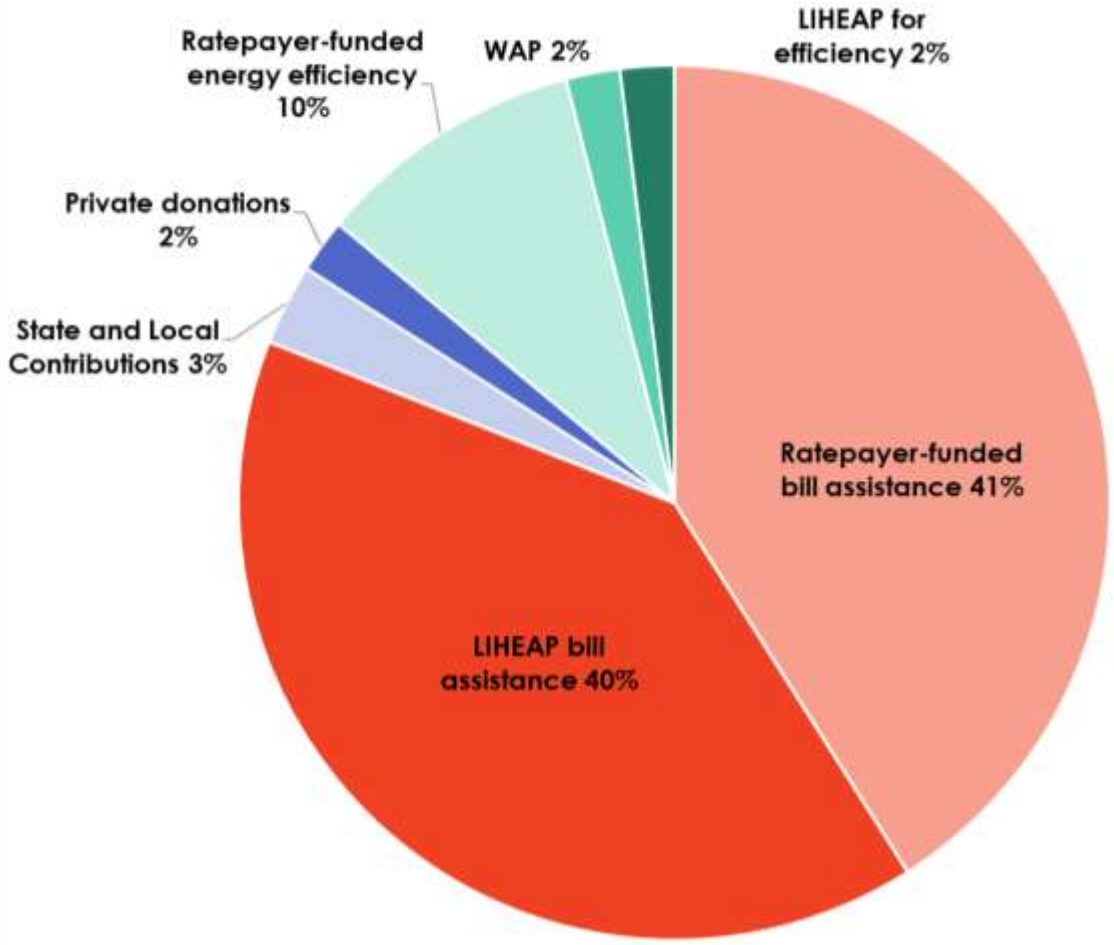
- There is limited publicly available data on low-income energy consumption at high spatial and temporal resolution, which limits the ability of data analytics to fine-tune program targeting and design.

The System of Stakeholders Exhibits a Range of Connectivity



>80% of Low-Income Energy Program Spending is Bill Assistance

- Short-term fixes rather than long-term solutions.
- Peak of funding with ARRA.
- Post-ARRA, return to modest increase in DOE weatherization program.
- More substantial increases in LI solar programs.



Federal Programs and Policies

DOE Weatherization Assistance

- The purpose and scope of this Program is to increase the energy efficiency of dwellings owned or occupied by low-income persons, reduce their total residential energy expenditures, and improve their health and safety.
- WAP provides grants to U.S. states, which then provide grants to local weatherization agencies to weatherize income-eligible low-income homes.

LIHEAP Bill Assistance

- LIHEAP bill assistance directly compensates some of the cost of energy burden for qualifying households. It is the primary source of bill assistance to low-income high-energy burden areas.
- The assistance is meant to cover those with the lowest of incomes and relatively highest energy bills.
- Weatherization funding is also available from LIHEAP.

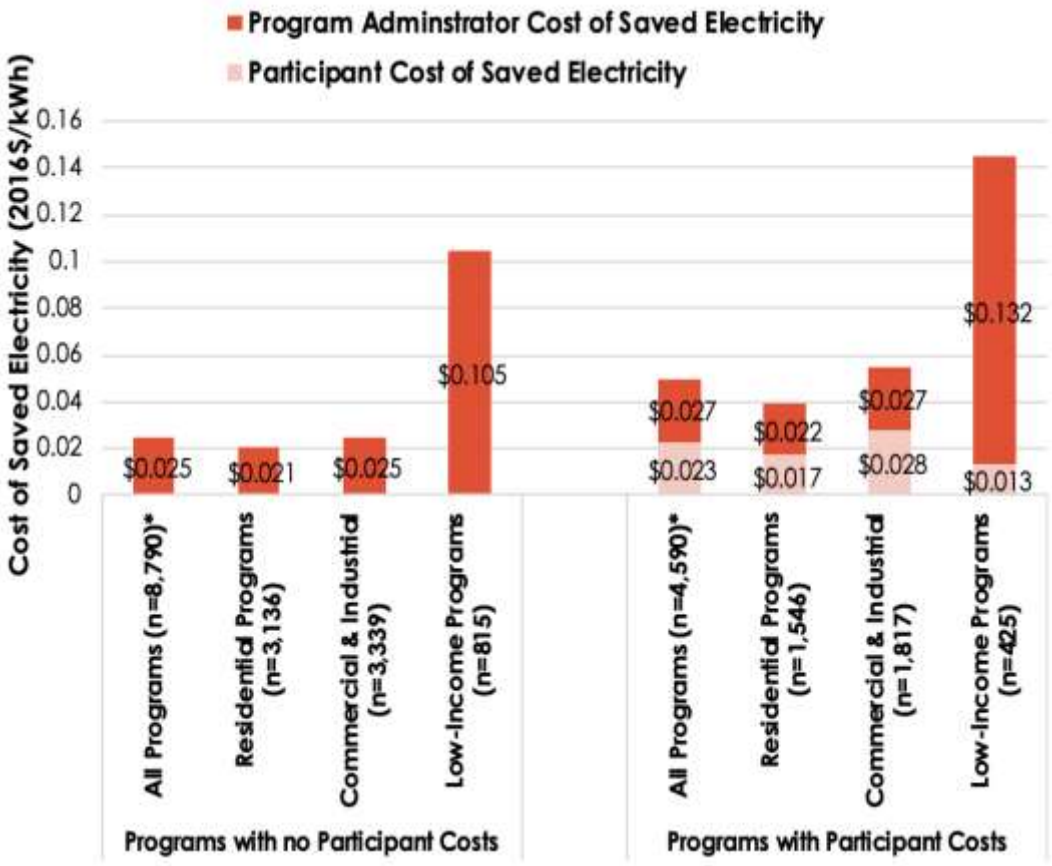
LIHEAP
Low-Income Home Energy Assistance Program

DOE Weatherization: Importance of Health & Safety Benefits

	2008	2010
Total Homes Weatherized	97,965	340,158
Average Cost per Weatherized Home	Total Cost: $4,695 DOE Inv. $2,301	Total Cost: $6,812 DOE Inv.: $5,926
Average Energy Measure Costs	$2,899	$3,545
Energy Savings Per Household (Present Value)	$4,243	$3,190
Total Energy Savings (PV)	$340 million	$1.2 billion
Savings-to-Investment Ratio	1.4	0.98
Total Benefits per Household Including Health & Safety (PV)	$13,550	$13,167
Carbon Reduction	2.25 $MMTCO_2$	7.38 $MMTCO_2$

The Average Cost of Saving Electricity in Utility LI Energy Efficiency Programs is High

- The average cost of saving electricity is higher for low-income programs than for residential, commercial, and industrial programs.
- Low-income participants contribute about 1.3 cents per kWh saved, which is less than in other programs, consistent with their limited access to financial resources.



Utilities Spend <Per Customer Share on LI Energy Efficiency

- Per low-income electricity customer, $22.4 was spent on energy efficiency.
- Per low-income natural gas customer $22.6 was spent on energy efficiency.

1.2% low-income customers participated in electricity efficiency programs

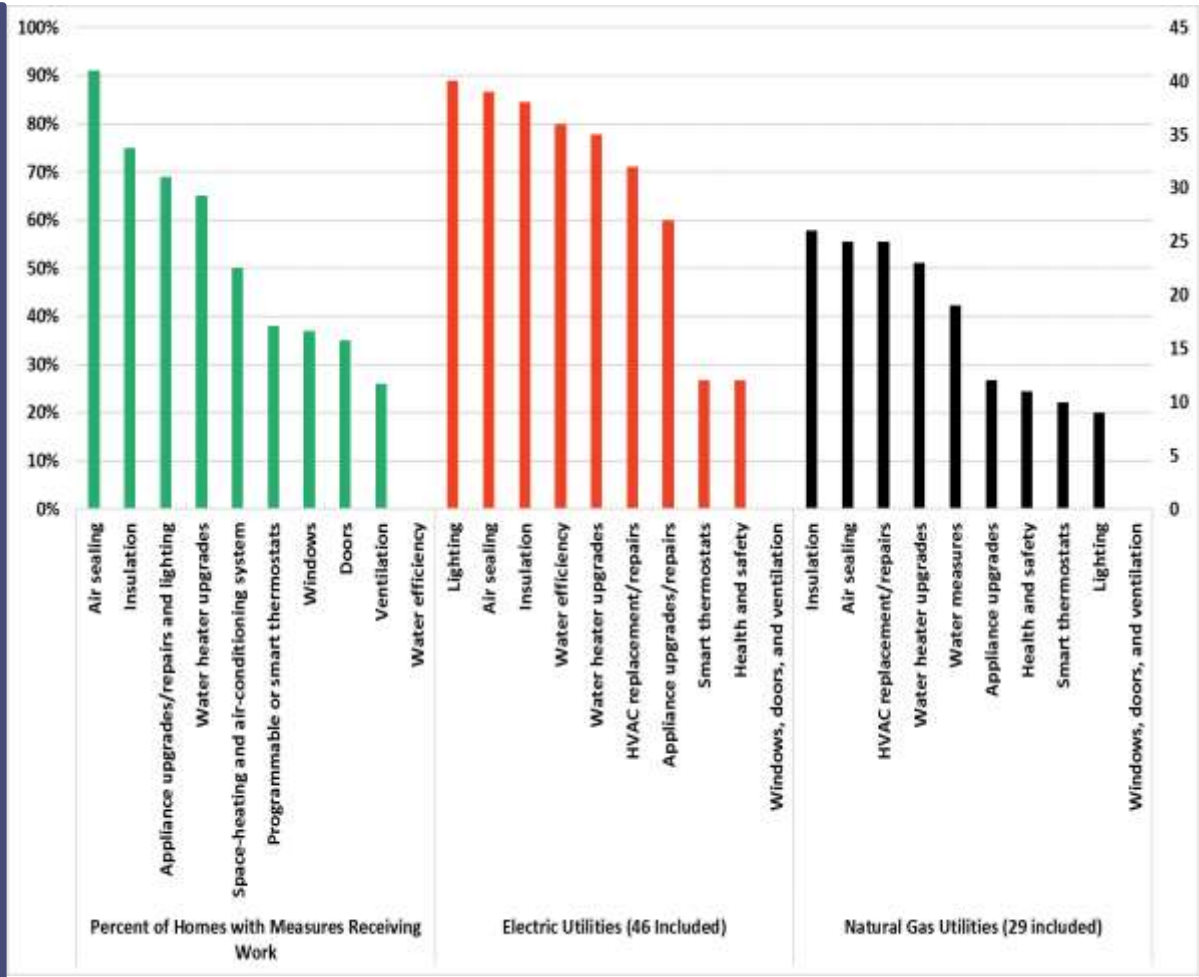
1.5% participated in natural gas efficiency programs

This is despite the fact that:

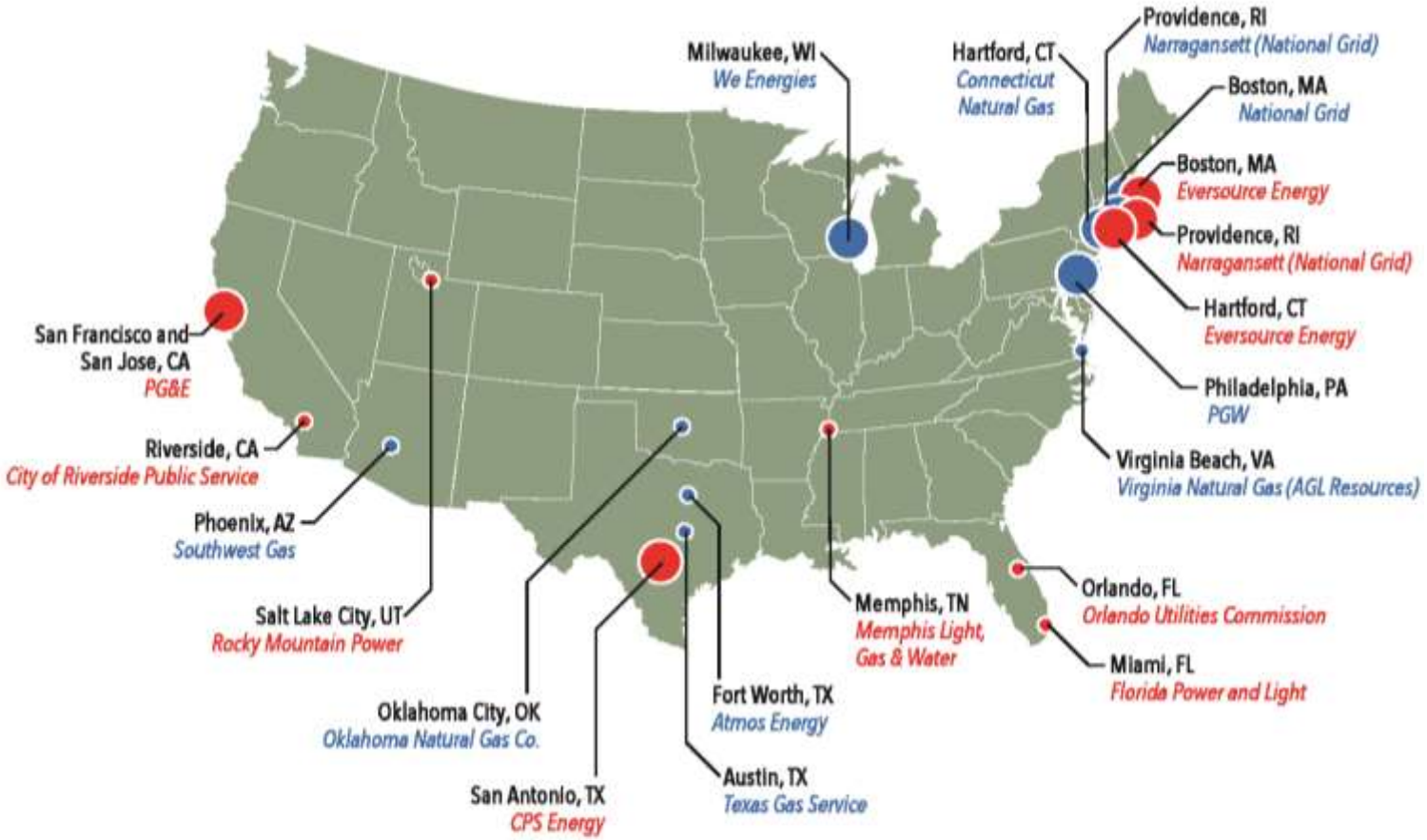
- many states use less demanding cost-effective metrics for LI EE programs;
- half have spending requirements;
- 2 have savings requirements

Leveraging DOE & Utility EE Programs: Value of Complementarity

- WAP installs energy-efficiency and safety/health related measures at no financial cost to the homeowner. Air sealing and insulation are the two most common measures.
- Utilities also use contractors. Their most common measures are lighting, air sealing, insulation, and water heater upgrades, also typically at no financial cost to the household.



About Half of Utility Programs Serving the Largest Metro Areas Coordinate with WAP



There are Long-Standing Underserved LI Submarkets

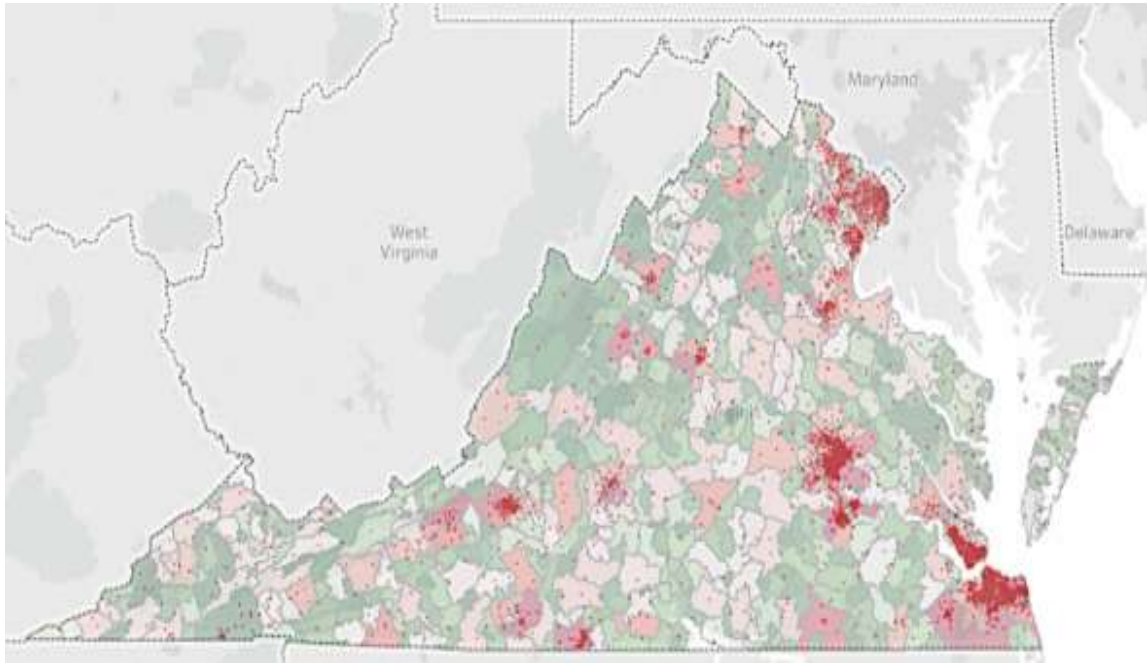
- The multi-family market has been difficult to reach due partly to misalignments of incentives.
- Mobile homes have received limited analysis and policy focus.
- Low-income households in rural communities often spend as much as a quarter of their income on energy due partly to their low-density geography.

Some Promising Opportunities to Tackle the Energy-Poverty Nexus

- Community-based strategies are showing great promise.
- Broadening the technology scope of low-income energy programs (e.g., energy efficiency, solar PV, smart meters) could help tackle the energy-poverty nexus.
- Monetizing the benefits of health and safety upgrades is helping to show the broader value of WX.
- information feedback offers more dimensions of influence today than ever before.

Data Analytics=Key to Improving Effectiveness

- The first step in making better data analytics possible will be collecting, analyzing, and visualizing more spatially and temporally high-resolution data to better inform low-income energy programs.
- With high-resolution data, investments in demand-side management can be designed to displace potentially more expensive generation and grid investments.



Energy Burden and Evictions in Virginia

The distribution of energy burden and evictions in Virginia: https://drive.google.com/file/d/1aDNah4c0JqNgIifhE1avOcI0bg0gIFVC/view

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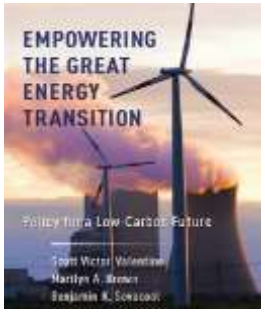
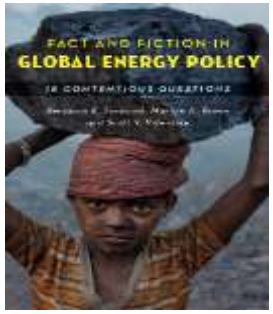
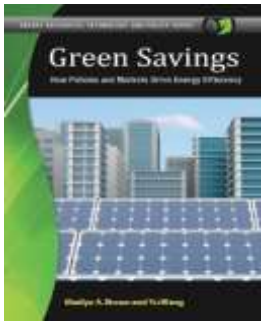


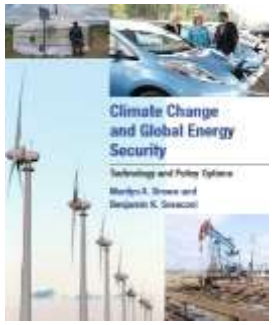
2019



2016



2015



2013