Welcome to the LIFE Webinar Series

We will begin the webinar momentarily
LIFE Webinar Series

Energy Justice –
Research at the Intersection of Energy and Equity

Tony G. Reames
University of Michigan School for Environment and Sustainability
Urban Energy Justice Lab

July 16, 2020
1:30 p.m. – 2:30 p.m. ET
Mission Statement

Working to help low-income New Yorkers address energy issues.

LIFE, the Low-Income Forum on Energy, is a unique statewide dialogue that brings together organizations and individuals committed to addressing the challenges and opportunities facing low-income New Yorkers as they seek safe, affordable and reliable energy.

Supported by the New York State Public Service Commission and the New York State Energy Research and Development Authority (NYSERDA), the LIFE dialogue encourages an interactive exchange of information and collaboration among the programs and resources that assist low-income energy consumers.
Webinar Series, Newsletter, Social Media

> Monthly webinars – Register at nyserda.ny.gov/LIFE-Webinar-Series
  • On hiatus until October 2020

> Monthly electronic newsletter
  • Sign up at nyserda.ny.gov/LIFE – “Join the email list”
  • Direct link – nyserda.ny.gov/LIFE-Mailing-List

> Social media
  • Twitter: @LIFEny
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  • nyserda.ny.gov/LIFE

> Join the mailing list for announcements and updates
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> Contact LIFE
  • Phone: 866-697-3732, ext. 3628
  • Email: LIFE@nyserda.ny.gov
LIFE 2020 Virtual Event – October 27-30, 2020

- Live-online panel presentations with Q&A opportunities
  Learn about the New York State energy, climate change, and equity policy environment

- Live-online interactive workshops
  Talk with others in the field who want to take a deeper dive into new energy frontiers

- On-demand pre-recorded presentations
  At-your-own-pace learning opportunities related to the evolving low-income energy landscape

- Continuing legal education training hosted by Public Utility Law Project of NY
  New York State Shared Meter Law and the New York State Public Service Commission Complaints and Appeals Process

- Resource repository
  Information about programs and services to assist communities and individuals

Details about the event: nyserda.ny.gov/LIFE-Mailing-List
Asking Questions During Today’s Webinar

> Click on the small arrow to the left of Q&A to open the text field.

> Type your question into the text field and click “send.”
Technical Difficulties or Contacting the Host

> Click on the “Chat icon on the bottom menu to activate the chat function.

> The chat function will appear in the middle right portion of your screen.
Residential Energy Efficiency Disparities Across Race, Class, and Place

Tony G. Reames, PhD, PE
University of Michigan
LIFE Webinar - July 15, 2020
“Where U.S. Energy Policy is concerned, African Americans are proverbial canaries in the mineshaft.”

Congressional Black Caucus Foundation Report, African Americans and Climate Change: An Unequal Burden, 2004
Outline

- Framing Energy Justice
- US National Energy Justice Trends
- Energy Justice Studies
  - Disparities in Heating Consumption Efficiency
  - Disparities in Technology Access
  - Energy Efficiency Financing Donut Hole (Coverage Gap)
  - Community-based approach to Energy Efficiency & Justice
Is energy a basic human right?
What is Energy Justice?

- Seeks to apply basic principles of justice... to the injustices evident among the **energy oppressed poor**; think developed vs. developing nations.
- Recognizes the importance of the ability of everyone to afford the energy they need for **health and well-being**; think developed nations.
- Like, *environmental justice*, energy justice allows us to frame energy disparities across **race** (demographics), **class** (socioeconomics), and **place** (geographies).
A Call for Energy Justice
(4 Basic Rights)

- Right to healthy, sustainable energy production
- Right to the best available energy infrastructure
- Right to affordable energy
- Right to uninterrupted energy service

What is Energy Justice? (cont.)

- **A Just Energy System**— an energy system that fairly disseminates both the benefits and costs of energy services, and one that has representative and impartial energy decision-making.

- It involves the following key elements:
  - **Costs**, or how the hazards and externalities of the energy system are imposed on communities unequally, often the poor and marginalized;
  - **Benefits**, or how access to modern energy systems, technologies, and services are highly uneven;
  - **Procedures**, or how many energy projects proceed with exclusionary forms of decision-making that lack due process and representation.

(Sovacool & Dworkin, 2014; Sovacool et al. 2017)
Interrelated Energy Justice Tenets

“The energy justice concept provides a more focused means to tackle injustices with environmental and climate knock-ons”

The State of US Energy Insecurity

One in three U.S. households faces a challenge in meeting energy needs.

### Distribution of Energy Insecurity (Census Region)

<table>
<thead>
<tr>
<th>Region</th>
<th>No. of Energy Insecure Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>37M</td>
</tr>
<tr>
<td>Northeast</td>
<td>6.2M</td>
</tr>
<tr>
<td>Midwest</td>
<td>7.4M</td>
</tr>
<tr>
<td>West</td>
<td>8.1M</td>
</tr>
<tr>
<td>South</td>
<td>15.4M</td>
</tr>
</tbody>
</table>

Source: EIA, Residential Energy Consumption Survey 2015
Energy and Race – Consumption vs Efficiency

Energy and Race – Cost vs Burden

A Hidden Environmental Injustice
Do heating consumption and efficiency differ across race, place and class?

Method
- Framework for energy end use and spatial modeling
- OLS regression, small-area estimation, correlation

Data
- DOE’s Energy Information Administration
  - 2009 Residential Energy Consumption Survey (RECS)
    - 12,083 U.S. households surveyed
    - Representative samples of 12 states
- U.S. Census
  - American Community Survey (ACS)
    - 5 Year (2005-2010) Block Group Level data
    - Smallest spatial resolution that matches variables in RECS
The intersection of energy and justice: Modeling the spatial, racial/ethnic and socioeconomic patterns of urban residential heating consumption and efficiency in Detroit, Michigan

Dominic J. Bednar, Tony Gerard Reames, Gregory A. Keoleian

Energy and Buildings, 143, pp.25-34.

1. Introduction

Residential energy costs place a disproportionate burden on low-income households. Following the Great Recession, roughly 34 million households (11% of all households) had utility bills that amounted to 3.2% of annual income or more (H. D. Schipper & F. X. Reilly 2009). Low-income households are the most vulnerable to rising energy costs because their budgets are already stretched thin. To help low-income households meet their energy needs, the U.S. Department of Energy has developed the following goals: protect the health and welfare of citizens, improve energy efficiency, reduce greenhouse gas emissions, and increase energy security (Energy Policy as an Infrastructure, 2011).

This study aims to contribute to the growing field of energy justice by exploring the spatial, racial/ethnic, and socioeconomic disparities in urban residential heating energy consumption and efficiency in Detroit, Michigan. Using data from the U.S. Energy Information Administration's (EIA) Residential Energy Consumption Survey (RECS), this study examines the energy consumption patterns of low-income households in Detroit. The study also assesses the extent to which these patterns are influenced by racial/ethnic and socioeconomic factors.

2. Methodology

The study uses a combination of qualitative and quantitative methods, including the RECS data and secondary data from the U.S. Census Bureau.

3. Results

The results of the study show that low-income households in Detroit have higher heating energy consumption rates compared to higher-income households. This disparity is exacerbated by racial/ethnic and socioeconomic factors. The study also finds that low-income households in Detroit have lower energy efficiency compared to higher-income households, indicating a need for targeted interventions to improve energy efficiency in these communities.

4. Conclusion

This study contributes to the ongoing discourse on energy justice and highlights the need for targeted interventions to improve energy efficiency and reduce energy costs for low-income households in Detroit. The findings suggest that policymakers and energy planners should prioritize low-income communities in their efforts to address energy disparities.

References

Energy and Buildings, 143, pp.25-34.

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Targeting energy justice: Exploring spatial, racial/ethnic and socioeconomic disparities in urban residential heating energy efficiency


Targeting energy justice: Exploring spatial, racial/ethnic and socioeconomic disparities in urban residential heating energy efficiency

Tony Gerard Reames

School of Natural Resources & Environment, University of Michigan, 467 Church St., Ann Arbor, MI 48109-1065, USA

HIGHLIGHTS

Developmental model to predict block group (BG) residential heating energy use intensity (HEUI), an energy efficiency proxy.

Spatial and multivariate analysis explore associations and socioeconomic environments in heating BGs.

HEUI with more variation among lower-heating BGs than higher-heating BGs.

PEG with lower socioeconomic had higher-heating BGs.

Mapping heating BGs can locate effective energy efficiency intervention targeting.

ARTICLE INFO

Keywords: Energy justice; Targeting; Spatial; Racial/ethnic; Socioeconomic disparity

Abstract

Recent research into the connections between high energy consumption and low income suggests the need to target interventions to reduce energy costs for low-income households. This paper develops a model to predict residential household energy use intensity (HEUI) in block group (BG) space to target interventions to reduce energy costs. The model is developed using data from the U.S. Energy Information Administration’s (EIA) Residential Energy Consumption Survey (RECS). The model is validated using data from the U.S. Census Bureau’s American Community Survey (ACS). The model is validated using data from the U.S. Census Bureau’s American Community Survey (ACS).

1. Introduction

Energy efficiency interventions target consumer behavior at the household level. The target is a consumer—whether an individual or institutional—who has the ability to alter energy use behavior. This approach assumes that energy consumption is an individual choice. However, the evidence suggests that household energy consumption is influenced by both individual and household characteristics, as well as contextual factors such as neighborhood and community characteristics. This evidence suggests that energy consumption is not purely individualistic, but rather a collective phenomenon influenced by social, economic, and political factors. The evidence also suggests that energy consumption is influenced by social, economic, and political factors.

2. Methodology

The methodology involves the development and validation of a model to predict HEUI in block group space. The model is developed using data from the U.S. Energy Information Administration’s (EIA) Residential Energy Consumption Survey (RECS). The model is validated using data from the U.S. Census Bureau’s American Community Survey (ACS).

3. Results

The results of the model show that low-income households have higher HEUI compared to higher-income households. This disparity is exacerbated by racial/ethnic and socioeconomic factors. The results also show that the HEUI of low-income households in block groups with higher socioeconomic status is lower than the HEUI of low-income households in block groups with lower socioeconomic status.

4. Conclusion

This study contributes to the ongoing discourse on energy justice by exploring the spatial, racial/ethnic, and socioeconomic disparities in urban residential heating energy consumption and efficiency in Detroit, Michigan. The findings suggest that policymakers and energy planners should prioritize low-income communities in their efforts to address energy disparities. The evidence also suggests that energy consumption is influenced by social, economic, and political factors. The evidence also suggests that energy consumption is influenced by social, economic, and political factors.

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Kansas City & Detroit Energy Dynamics

MISSOURI
- Space heating: 41%
- Appliances, electronics & lighting: 35%
- Water heating: 18%
- AC: 6%

MICHIGAN
- Space heating: 55%
- Appliances, electronics & lighting: 27%
- Water heating: 17%
- AC: 1%

KC 11th highest energy burden for low-income households in the nation

Detroit 9th highest energy burden for low-income households in the nation

Residential Segregation, KCMO

Income

Race/Ethnicity

HHINC
- $6,020.89 - $36,043.59
- $36,043.60 - $56,494.46
- $56,494.47 - $80,607.15
- $80,607.16 - $123,996.01
- $123,996.02 - $245,958.44

Race/Ethnicity
- White
- Black
- Hispanic

1 Dot = 1

Kansas City boundary

NORTH

Miles
## Heating Energy Use Intensity (Efficiency)

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic Status</td>
<td>Median HH Income</td>
<td><em>↓</em></td>
</tr>
<tr>
<td></td>
<td>% HHs below poverty</td>
<td><em>↑</em></td>
</tr>
<tr>
<td>Education</td>
<td>% Less HS diploma</td>
<td><em>↑</em></td>
</tr>
<tr>
<td>Age</td>
<td>% HH 65+</td>
<td><em>↑</em></td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td>% White HHs</td>
<td><em>↓</em></td>
</tr>
<tr>
<td></td>
<td>% African American HHs</td>
<td><em>↑</em></td>
</tr>
<tr>
<td></td>
<td>% Hispanic HHs</td>
<td><em>↑</em></td>
</tr>
<tr>
<td>Housing Tenure</td>
<td>% Renter-occupied</td>
<td><em>↑</em></td>
</tr>
</tbody>
</table>

HHs = Households
As percent black and Hispanics increase, so does heating inefficiency

- Racial/ethnic pattern mediated by SES but remains significant
- Greater racial/ethnic isolation (segregation) related to higher inefficiency

Table 3. Relationship between estimated heating EUI and block group race and ethnicity, segregation and socioeconomic characteristics

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th></th>
<th>Model 2</th>
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<th>Model 3</th>
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<th>Model 4</th>
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<td>b</td>
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<td>b</td>
<td>S.E.</td>
<td>b</td>
<td>S.E.</td>
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<tr>
<td>Percent black householders</td>
<td>0.75</td>
<td>***</td>
<td>0.07</td>
<td></td>
<td>0.19</td>
<td>*</td>
<td>0.09</td>
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<tr>
<td>Percent Hispanic householders</td>
<td>2.58</td>
<td>***</td>
<td>0.29</td>
<td></td>
<td>0.71</td>
<td>*</td>
<td>0.32</td>
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<tr>
<td>Percent households below poverty level</td>
<td>1.24</td>
<td>***</td>
<td>0.20</td>
<td></td>
<td>1.47</td>
<td>***</td>
<td>0.28</td>
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<tr>
<td>Percent population with less than high school diploma</td>
<td>1.47</td>
<td>***</td>
<td>0.28</td>
<td></td>
<td>0.75</td>
<td>***</td>
<td>0.17</td>
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<tr>
<td>Black isolation</td>
<td>90.93</td>
<td>***</td>
<td>7.19</td>
<td></td>
<td>37.09</td>
<td>***</td>
<td>9.19</td>
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<tr>
<td>Hispanic isolation</td>
<td>238.68</td>
<td>***</td>
<td>22.03</td>
<td></td>
<td>94.27</td>
<td>**</td>
<td>29.92</td>
<td></td>
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<tr>
<td>Proportion households below poverty level</td>
<td>98.37</td>
<td>***</td>
<td>22.87</td>
<td></td>
<td>146.14</td>
<td>***</td>
<td>29.97</td>
<td></td>
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<tr>
<td>Proportion population with less than high school diploma</td>
<td>146.14</td>
<td>***</td>
<td>29.97</td>
<td></td>
<td>64.32</td>
<td>***</td>
<td>16.89</td>
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<tr>
<td>Proportion households with householder aged 65+</td>
<td>64.32</td>
<td>***</td>
<td>16.89</td>
<td></td>
<td>210.09</td>
<td>***</td>
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<td>3.29</td>
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<td></td>
<td>0.23</td>
<td></td>
<td>0.33</td>
<td></td>
</tr>
</tbody>
</table>

*Significance p < 0.05
**Significance p < 0.01
***Significance p < 0.001
Residential Segregation, Detroit

Wayne County, Michigan

Income

Race/Ethnicity

Data Source: U.S. Census, American Community Survey (2006-2010 Est.)
## Consumption v. Inefficiency across covariates (Detroit)

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Correlation</th>
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</thead>
<tbody>
<tr>
<td>Economic Status</td>
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</tr>
<tr>
<td></td>
<td>% HHs below poverty</td>
<td>↓, ↑</td>
</tr>
<tr>
<td>Education</td>
<td>% Less HS diploma</td>
<td>↓, ↓</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td>% White HHs</td>
<td>↑</td>
</tr>
<tr>
<td></td>
<td>% African Americans HHs</td>
<td>↑</td>
</tr>
<tr>
<td></td>
<td>% Hispanic HHs</td>
<td>↑, ↓</td>
</tr>
<tr>
<td>Housing Tenure</td>
<td>% Owner-occupied</td>
<td>↑</td>
</tr>
</tbody>
</table>

HHs= Households
Estimating Heating Energy Efficiency (National)

- Mean: 19.1 kBTU/sf
- Higher income reduces EUI
- Ownership reduces EUI
- Midwest & Northeast positive influence on EUI
- Sig. (-) corr. w/ prop. Black households
An incandescent truth: Disparities in energy-efficient lighting availability and prices in an urban US county
Residential lighting is in a state of transition

Steady growth in the adoption of more energy-efficient bulbs
  - Only 29% of U.S. households use at least one LED bulb in their home (US EIA 2015)

Adoption is not equitably distributed across socioeconomic groups
  - Low-income households (<$50k) are less likely than higher income households to purchase LED bulbs (Sylvania 2016).

Elimination of incandescents overturned

Rollbacks of federal light bulb efficiency standards
**Research question:** Are there disparities in the access and affordability of LED light bulbs?

- Study employ similar approach to food justice access and cost studies
- "Food desert" studies reveal disparities in access to healthy foods
  - Distance to retailers
  - Types of food carried
  - Price of healthy foods
- **Mixed-methodology:** Spatial analysis (GIS), retailer sampling, qualitative observation, statistical analysis
- **Field study** in 130 Wayne County stores
Bulb Type Availability by Poverty Strata

- Nearly all sampled stores in each strata carried IHLs.
- The majority of samples stores carried CFLs.
  - Except in the lowest poverty strata, only 45% of sampled stores.
- There was a significant difference in the availability of LEDs.
  - 91% of stores in the two lowest poverty strata carried LEDs.
  - Only 57% of sampled stores in the highest poverty strata carried at least one LED option.
Energy Technology, Access and Affordability

- $2.67 difference in cost of LED bulbs between poorer and less poor areas
- Cost to upgrade from INC to LED was 2 times greater in poorer areas than in less poor areas ($6.25 v. $3.10)
Information asymmetry

Consumers’ **main source** of light bulb info is **at the retailer** (Sylvania, 2016)

**Big-box stores**: knowledgeable clerks; bright displays; easy to read signage

**Dollar stores**: Items difficult to find; lack of signage; products poorly labeled (different brands)

![Graph showing mean LED price across different store types](image-url)

Funded by: Alfred P. Sloan Foundation
1 in 8 Michigan households fall into an energy efficiency funding coverage gap.

Statewide, an estimated 12%, or nearly 460,000 households fall into the energy efficiency funding coverage gap.
Donut Hole Market Potential in Michigan
A community-based approach to low-income residential energy efficiency participation barriers

Case study exploring community-based approach to implementing the Weatherization Assistance Program

Research Questions

1. What barriers to energy efficiency participation continue to manifest in the absence of financial impediments?

2. Can a community-based approach effectively identify and overcome those barriers?

Data

21 walk-along and semi-structured interviews (and follow up) with neighborhood association leaders and other stakeholders
Community-based Energy Projects

- **Support** equity, justice and democracy; serves as a conduit for community empowerment and self-determination (Teron & Ekoh 2018)

- **Acknowledge** that complex decision-making processes guide energy choices and cannot be described using a simple rational-economic model (Wilk and Wilhite 1985; McKenzie-Mohr and Smith 2011; Anda and Temmen 2014)

- **Foster** social connectedness to transform the way people consume energy – relying on group interaction, peer support, and communal resolve to impact behavior (Wisconsin Energy Conservation Corp.)

- **Create** institutional capabilities to effectively deliver services, and recognize, and respond to fluid conditions (Berry 2010)
### Green Impact Zone vs. Kansas City

<table>
<thead>
<tr>
<th>Metric</th>
<th>Green Impact Zone</th>
<th>Kansas City</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>10,742</td>
<td>474,396</td>
</tr>
<tr>
<td>% Black</td>
<td>86.2%</td>
<td>28.1%</td>
</tr>
<tr>
<td>% White</td>
<td>9.5%</td>
<td>57.7%</td>
</tr>
<tr>
<td>Housing units</td>
<td>5,810</td>
<td>225,569</td>
</tr>
<tr>
<td>% Built before 1980</td>
<td>91.4%</td>
<td>48.3%</td>
</tr>
<tr>
<td>% Vacant</td>
<td>27.8%</td>
<td>13.3%</td>
</tr>
<tr>
<td>% Home ownership</td>
<td>49.1%</td>
<td>61.4%</td>
</tr>
<tr>
<td>Median HH Inc.</td>
<td>$24,125</td>
<td>$44,436</td>
</tr>
<tr>
<td>% Below poverty</td>
<td>35.2%</td>
<td>19.1%</td>
</tr>
<tr>
<td>Unemployment</td>
<td>16.3%</td>
<td>7.7%</td>
</tr>
</tbody>
</table>

- **$200M public-private, 150-block “green” urban renewal project**
- **September 2009-January 2014**
- **$4.5 million to weatherize 659 homes**
- **Completed 329 homes**
- [http://www.greenimpactzone.org](http://www.greenimpactzone.org)
Community-based Approach Barriers

**Social/Cultural**
- Public distrust
- Public priorities

**Market**
- Split incentive
- Lack of information

**Regulatory**
- Pre-weatherization
- Previous weatherization
Pursuing energy equity requires recognition of social characteristics that impede participation

- Distrust in government
  - Fear of “energy audit”
- Distrust in others
  - Fear of unknown individuals
- To overcome; used known, trusted messengers (e.g. community-based social marketing)
  - African American implementation staff
  - Neighbors (Neighborhood associations, block captains)

“Let’s be honest, I’m a blue-eyed, white woman... Now I’ve got a lot of cred with those neighborhood leaders, but they needed a strong African American presence and leadership...”

“... I am very happy... I can recommend it to anybody, everybody, they won’t have anything to worry about”.

Social barriers:
Public Distrust
Market barriers: Split-incentive

- GIZ magnified a major barrier to targeted, community-based implementation of WAP
- **51%** of houses in the GIZ were renter-occupied
- **82%** of WAP benefits owner-occupied units
- WAP may require landlords pay up to **50%** of costs
- **86%** of renters pay own energy costs, retrofitting is an unprofitable proposition for landlords (split incentive)
- To overcome barrier, GIZ requested reduction in landlords’ share to **5%** for dwellings with less than five units
Older homes often require repairs before weatherization improvements can be made

Older housing stock + low household incomes increased likelihood of deferred maintenance

Health and safety issues (i.e., mold, lead)

Lack of integration between programs limited participation

Community-based approach facilitated coordination with Kansas City’s minor home repair program

“Ok you’re not doing it because you’re afraid when they come in the house and see that you have a hole in the roof... the minor home [repair] program, you’re probably eligible for that.”
Conclusions

- Energy poverty is the result of a system of procedural, distributive, and recognition injustices

- Spatial, racial, and socioeconomic disparities exist in residential energy efficiency, affordability, technology access

- Less energy efficient areas are spatially clustered (*place is important*)

- Targeted, community-based approaches to energy efficiency support energy justice & may enable more effective implementation of assistance programs

- Community-based approaches recognize the unique characteristics and needs of target communities to overcome participation and technology access barriers
THANK YOU!

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> Live-online interactive workshops
   *Talk with others in the field who want to take a deeper dive into new energy frontiers*

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