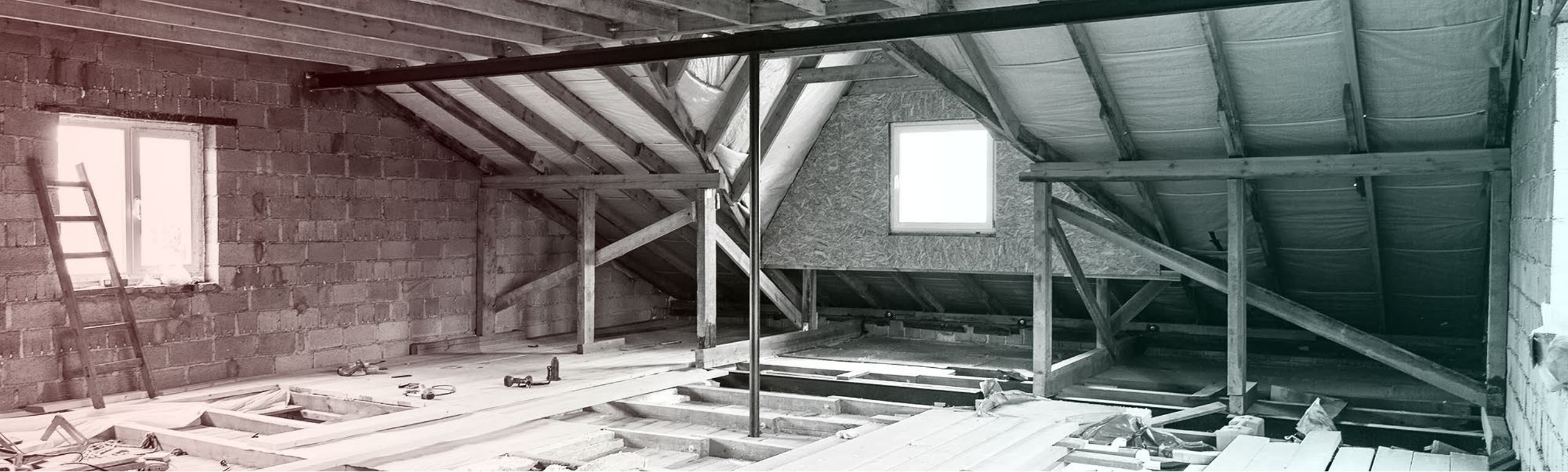


ILLUME



Pacific Northwest National Laboratory

Advancing Energy Efficiency Behaviors Findings
Webinar

ILLUME Advising
January 26, 2023

Agenda

RESEARCH OVERVIEW

DECISION-MAKING FACTORS

KEY FINDINGS AND RECOMMENDATIONS



Research Overview

Research Focus and Goal

Our research focused on **motivations** and **decision points** for home occupants (owners, renters) as they approached all home projects, including both **energy and non-energy upgrades**, ranging from small maintenance fixes through larger remodeling projects. Our goal is to provide insights that will help industry stakeholders frame **outreach** and **interaction** with home occupants on the topic of **electrification**. Specifically, our research aimed to answer the following questions:

PRIMARY RESEARCH QUESTIONS

How do home occupants make purchasing and renovation decisions that may or may not impact the carbon impact/energy efficiency of their homes? How do these decisions differ across various community and demographic groups?

What are the purchasing decisions and usage patterns for water heaters, HVAC systems, smart thermostats, smart control panels, and smart home energy management systems (SHEMS) writ large?

How can human-centered research inform program design and interventions that will equip communities, companies, and individuals to catalyze deeper energy transitions in the residential sector?

Research Summary

In Spring 2022, the ILLUME team, sponsored by PNNL and DOE, conducted 121 online in-depth interviews with homeowners and renters across four states – Arizona, Georgia, Illinois, and Massachusetts.

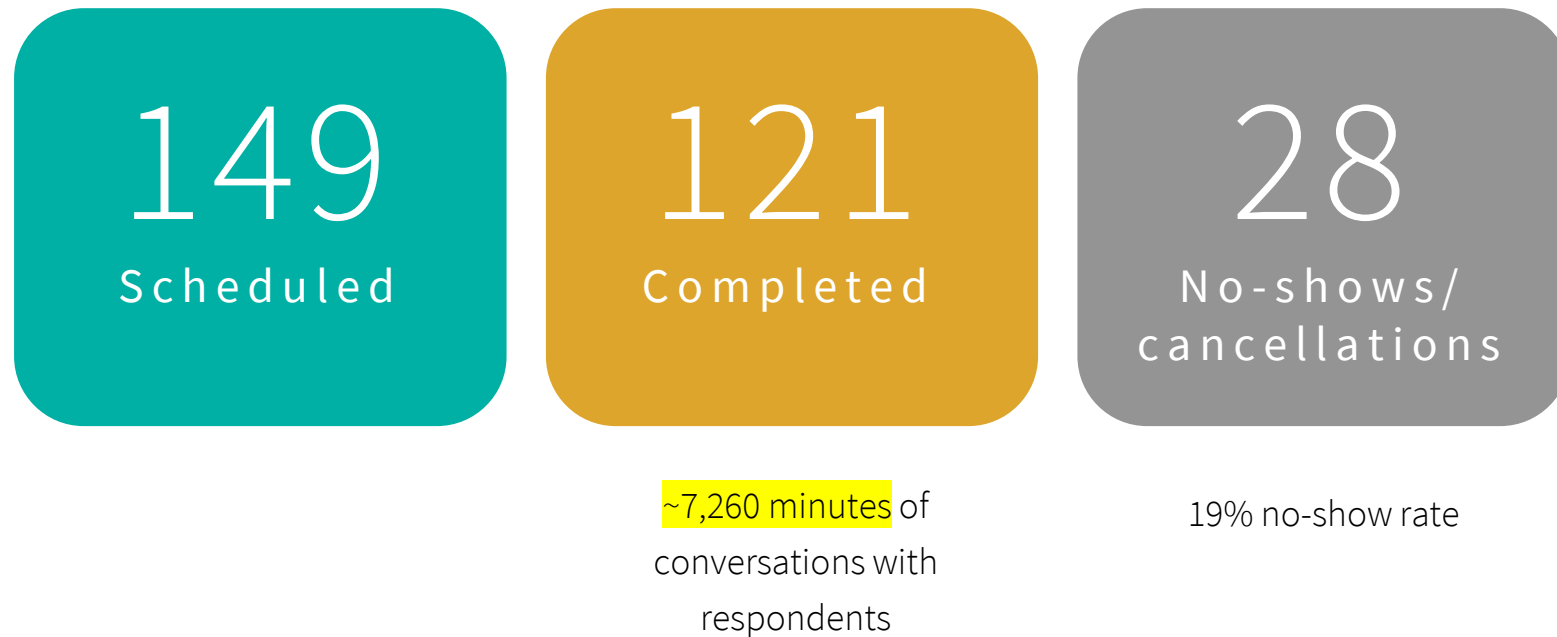
These hour-long interviews explored topics including:

- Home attitudes and preferences
- Approach to home maintenance and finances
- Decisions about energy and non-energy related home projects
- Attitudes towards energy systems and energy bills
- Familiarity and attitudes towards concepts including electrification, decarbonization, and sustainability



Interviews Completed

Overall, the team spoke with 30 people in AZ, 31 in GA, 30 in IL, and 30 in MA.



Respondent Demographics

Total = 121



Home Ownership

Own	84
Rent	37



Race/ Ethnicity

Asian, Native Hawaiian, or Pacific Islander	9
Black or African American	35
Hispanic, Latino, or Spanish	28
Native American, American Indian, or Alaskan Native	7
Non-Hispanic White or Euro-American	55



Age

18 – 24	2
25 – 39	43
40 – 64	60
65+	16



Education

Some high school, HS diploma, or GED	30
Associate Degree	23
Bachelor's degree	39
Graduate or professional degree	29



Income

Less than \$50,000	36
\$50,000 - \$99,999	54
\$100,000 or more	31



Decision-making Factors

Home Upgrade Decision Making Framework

Attitudes Towards Home

- Why did respondents choose their home
- Favorite and least favorite parts of their home
- Rooms or features they focus on

Orientation Towards Home Maintenance

- Regular maintenance vs. emergency maintenance
- Respondent feelings of empowerment/disempowerment
- Prior experience with home cleaning/maintenance
- Life stage

Change-making Resources

- Knowledge (available tech, how to make upgrades, how to use post-installation)
- Access to experts (contractors, online resources, friends/family)
- Agency over their space (e.g. rent vs. own)
- Access to technologies/materials
- Financial
- Time



Home Decision Making

Building/Room Characteristics

- Existing equipment/infrastructure
- Equipment requirements
- Space

Influence of Others

- Influence of others in household
- Influence of experts
- Influence of broader social networks

Type of Upgrade

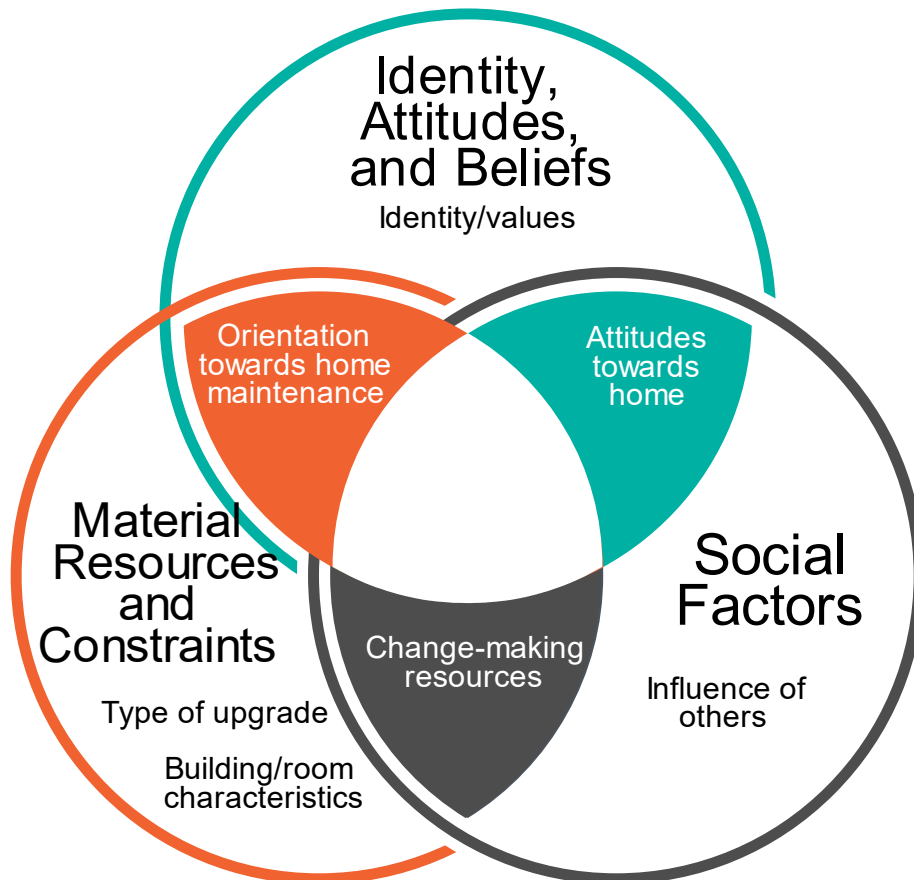
- Contractor vs. DIY
- Level of technicality
- How visible/invisible

Identity/Values

- Respondent self-perception in relation to home/technologies
- Respondent values and priorities

Interactions between these factors

Different decision-making factors are often deeply interconnected and interact to influence home occupant's decision-making.



Identity, attitudes, and beliefs include elements of decision-making related to values and personal identity, which may shape attitudes towards the home and different equipment and features of the home

Social factors include the influence of others and signal the important impact of other people, including family, friends, neighbors, and the broader community, on an individual or household's decision-making.

Material resources and constraints include those elements of decision-making that are constrained or shaped by the specifics of the building and room, the material and time resources of the decision-maker, as well as the specifics of the potential upgrade.



Key Findings and Recommendations

Ability to choose impacts emotion around home choices

Finding:

Home occupants tended to **prioritize more visible and more frequently used spaces** and equipment for upgrades and associated these upgrades with **feelings of joy and empowerment**.

By contrast, respondents tended to associate feelings of **stress, disempowerment, and frustration** with replacing less visible upgrades as these were typically only maintained or replaced when **something broke** or when there was a significant **health, safety, comfort, or functionality issue**.

Recommendation:

More visible or more used equipment, such as stoves, electric vehicles, or electric lawn equipment **may be a means to raise awareness of some of the energy and non-energy benefits of electrification**, as respondents are more likely to prioritize these upgrades and associate these types of equipment with positive feelings of joy and empowerment.





Diamond

- **Homeowner**
- **Central Georgia**
- **Late-30s**

Diamond has a long list of upgrades she would like to make. However, six months ago, a large storm flooded her basement, which triggered her severe mold allergy. Her home insurance denied her claim and she had to save to make repairs, putting other projects on hold.

Diamond wants energy efficient windows, both to increase the potential resale value of the home, and to bring her energy costs down. She says, *“I just want them to be efficient for weathering so that the light bill will go down... I just want to keep my house up to par. So when I pay it off or sell it, we have no problem with it because we maintained everything and anything that is an issue with inspection or anything it's minute.”*

Decision Making Factors for Diamond

Attitudes toward the home: Diamond has a large home to accommodate the indoor and outdoor lifestyle that her family of 8 desires.

Orientation toward home maintenance: Regular maintenance is a priority for Diamond. But, she has experienced a setback in this due to an unexpected flood in the basement.

Change-making resources: Diamond is budget conscious.

Building/room characteristics: Diamond has a long list of functional and aesthetic upgrades that she would like to do, including the installation of energy efficient windows.

Influence of others: She looks to Pinterest for project ideas, and she consults with trusted contacts, including her uncle, on appliances.

Type of upgrade: Her primary focus is repairing a flooded basement, and repairing malfunctioning appliances.

Identity and values: Diamond spends nearly all of her time at home. Her approaches to energy efficiency are shaped by her experiences as a mother to a non-verbal autistic child.

Attitudes about home maintenance vary

Finding:

Attitudes towards home maintenance are shaped both by **identity, attitudes, and values, as well as material and resource constraints** and will impact the degree to which respondents are interested in information about things like electrification, efficiency, and smart devices.

“We’re a Latino family who always have to be together. You dine together at a certain time, and believe it or not, that is where everyone hangs out. Even if they have a room, even if they have their own desk area, they want to be together. They want to talk to you about how their day went. And ideally, it’s the main area where everybody hangs out. So, the bigger the space of the first floor is, the better. That’s I think what we’re working on as far as a family. We like to be together.”

–Respondent No. 6, Illinois

Recommendation:

The differing priorities, attitudes, and approaches that home occupants take to their home maintenance highlights the importance of **promoting electrification technologies through both customer- and contractor-facing channels.**

Additionally, it is important to design informational resources both for those customers who want minimal information, as well as for those who would like to do a deeper dive.

Renter Disempowerment impacts opportunity

Finding:

Many renters expressed **concerns about asking for too much from their landlord** or maintenance person, citing concerns about **rent increases**, being perceived as too high **maintenance**, and the time and hassle required for them to get their landlord's attention.

Recommendation:

Tools such as **building codes and incentives targeted at building owners** may be more effective means of promoting electrification in the small multifamily sector. Implementation of these tools should consider how to **protect tenants, so renters are not priced out of their homes** as a result of implementation of these upgrades.

"I guess I'm scared that if I ask the landlord for money for [work I did in the apartment], he might raise the rent on us knowing that the unit is now more valuable.[...] I don't think they're going to mind, but I also don't want them to know that we're improving the place and then [increase the rent]."

*-Respondent No. 1,
Massachusetts*



Angela

- **Renter**
- **Tucson**
- **Late-30s**

Angela has lived in her townhome in Tucson for 3 years. She has a difficult relationship with her landlord who previously refused to replace a broken dryer, telling Angela to dry her clothes in the Arizona sun. Angela now would like to fix a broken shower and address other plumbing issues, but no longer trusts her landlord to address these issues.

She says, *“We need a licensed plumber to come and get that fixed. And that's just a money issue. This, the outside really is just a time issue. And we know we have to get it done soon because during the summer, we're not going to do it. It's just way too hot out there to get anything done.”*

Decision Making Factors for Angela

Attitudes toward the home: Angela rents a townhome and dislikes her landlord who she feels is negligent and intrusive.

Orientation toward home maintenance: Angela prioritizes emergency maintenance, and regular cleaning.

Change-making resources: Angela is on a limited budget, and with two kids and a work-from-home job, finds she has little time to do the work she would like to do. She and her husband need to complete essential repairs themselves because their landlord doesn't always complete requested repairs.

Building/room characteristics: The home is old and needs repairs, but she dislikes and distrusts her landlord.

Influence of others: She talks with her husband, and has her husband talk with the landlord.

Type of upgrade: Angela needs structural and functional upgrades, and also has an eye towards beautifying the outdoor space.

Identity and values: A full-time mom and a full-time worker, Angela feels pressed for time. The gender and class-privilege of her landlord affects her relationship with him.

Home occupants are more likely to research simple, more visible projects

Finding:

Respondents were more likely to want to **do their own research** when pursuing upgrades that were **simpler and more visible** and for projects with longer timelines.

Recommendation:

Visible or highly used upgrades, such as stoves or even electric vehicles, may be a means **to familiarize respondents with electrification technologies** and the concept of electrification. Respondents' **reliance on social networks** emphasizes the importance of promoting electrification technologies **frequently and through multiple channels** (including non-utility and non-manufacturer channels) to become part of the public consciousness.

It's like sunny 360 days of the year. Why doesn't everybody have solar energy? And so, like I've entertained that a couple of times [...] And it's just like, you know what? Until the value proposition really is motivating to make that shift, forget it. And then I think there's a little bit of ... we have family here we have my parents, [my wife]'s parents, cousins, friends, et cetera. I don't think any of them have solar panels because they've each kind of gone through this very same process that I have. And they've said, you know what? This is not worth it. They're ugly and this is not worth it. And so, I think there's a little bit of that influence as well

-Respondent No. 32, Arizona



Jen

- **Homeowner**
- **Chicago**
- **Late-30s**

This is the first home that Jen has owned, and she has been remodeling it to suit her and her family's needs. Jen says aesthetics are her top priority, and she is also laser-focused on energy efficiency.

Jen says that *“after I got in here and now the newness has worn off of it, now it's like, okay, it's time to make this look more presentable and nicer. I just want it to look nicer so that it's something that I'm not ashamed of. Just look like what other people's houses look like. And then too, energy wise, the furnace was not working properly.”*

Decision Making Factors for Jen

Attitudes toward the home: Jen prioritizes work that creates a safe, expansive, and comfortable space for her and her children.

Orientation toward home maintenance: Jen has been doing emergency maintenance but is building towards a situation where she can also do preventative maintenance.

Change-making resources: Time and money are major constraints, but she is discerning and knowledgeable about her project resources.

Building/room characteristics: The home is old and lacks adequate heating.

Influence of others: Jen spends a lot of time researching online, and she uses online community groups, conversations with professionals to determine her projects.

Type of upgrade: Jen would like to focus on the visible, but the condition of her home has meant that she needs to focus on the structural. She uses contractors for this.

Identity and values: As a domestic violence survivor, safety, comfort, and family networks shape her approach to her home.



Eric

- **Homeowner**
- **Chicago**
- **Early-40s**

Eric wants to upgrade the kitchen and the bathrooms. He would like to remodel the kitchen first, but supply-chain issues and problems with contractors has made him refocus his energies into the bathrooms. He has had many problems with contractors, and so he now plans to do some of the work himself.

He says *“since I'm doing it myself, I can just take my time, make sure I have all the supplies stocked in my house before I start the project, because that's the last thing I want to do is start it halfway and just pause there. But that means getting the tile, getting to grout, getting a vanity, having all that, maybe asking friends, well, one or two friends, if they're available to help out on a weekend as a weekend project.”*

Decision Making Factors for Eric

Attitudes toward the home: Eric sold his condo in the Chicago area and needed to a comfortable condo with an open concept, professional kitchen, and space to work from home.

Orientation toward home maintenance: Eric is comfortable with regular maintenance and upgrades but hesitates because of supply chain issues.

Change-making resources: Eric is comfortable with doing his own research, and previous experiences with contractors has made research a priority for him.

Building/room characteristics: He is happy with his place, but like would like to make updates to some “dated” features in the kitchen and bathrooms.

Influence of others: Eric has had negative experience with contractors, and that has led him to refocus his energies on the bathroom instead of the kitchen.

Type of upgrade: He wants to make aesthetic changes, but functionality and reliability are the top of his priority list.

Identity and values: Eric is frugal and does not like to waste.

Contractors are important in recommending equipment and in education

Finding:

For less visible and more complex upgrades, such as HVAC and water heater replacements, **contractors are vital not only in recommending equipment** to respondents and installing it, but also **educating respondents to use the new equipment installed** in their home.

Recommendation :

It is important not only **to train contractors to sell and properly install electrification technologies**, but also to **explain to respondents what equipment has been installed and how to optimally operate it**, especially in conjunction with an existing system.



Energy bills are often mysterious or seen as out of people's control

Finding:

Respondents are **unlikely to connect their purchases** to their **energy bill** unless they see a **sustained increase (or decrease)** in their bill **over a period of multiple months**.

Visible appliances may be more top-of-mind for people as they think about their energy usage, compared with HVAC or water heating.

"I absolutely don't [have control]. Absolutely don't Nope. I just... I don't know what's really going to change it drastically. You know what I mean? Like what's okay. If I come home and I don't turn that TV on, is it really going to make a difference on my bill?"

– Respondent No. 34, Illinois

Recommendation:

For those upgrades that will substantially impact the home occupants' bills, such as insulation, HVAC, and water heating upgrades, it is **important to clearly communicate the bill impacts of electrification to home occupants**.



David

- **Renter**
- **Boston**
- **Late-20s**

David and his wife have lived in their apartment about three years. The apartment, though old, is conveniently located and affordable. David and his wife are meticulous with their financial management and do what they can to keep their costs contained. They want to buy a home in the area but are nervous about whether they will be able to save enough.

He and his wife have focused on the aesthetics of the house. He says, *“we can actually [make surface-level changes], while changing the way the entire electricity, the circuitry or whatever it is, works in the whole house – it’s probably a much bigger, more unlikely job [to do] rather than putting some veneers on the cabinets.”*

Decision Making Factors for David

Attitudes toward the home: David and his wife decided to rent this place because of the price point and the location. Their landlord is non-responsive and so they do the work they want to do on it.

Orientation toward home maintenance: They feel they have autonomy to make renovation decisions, though they do so semi-secretly, often without the landlord’s knowledge.

Change-making resources: David and his wife coordinate work with a handyman who services the building.

Building/room characteristics: The building is old and neglected, and they do the work that they can control. They think they need new plumbing and wiring, but don’t think it will get done.

Influence of others: David and his wife do things semi-secretly, but with the help of the building’s handyman.

Type of upgrade: They do cosmetic, visible upgrades that they hope the landlord will not oppose.

Identity and values: As a young graduate student, David is extra cautious about expenses. He does not want to do anything that will raise his rent.

Questions?

WE'VE GOT ANSWERS

Contact



Mallika Jayaraman

Managing Consultant

mallika@illumeadvising.com

Liz Kelley

Director

liz@illumeadvising.com

