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**Improving Home Energy Upgrades with Insights from Households and the
Construction Industry**

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Reuven Sussman

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American Council for an Energy-Efficient Economy (ACEEE)

November 2-5, 2025
Hyatt Regency
Sacramento, CA

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Coming up: September 2025 Communicating Climate Change on Social Media



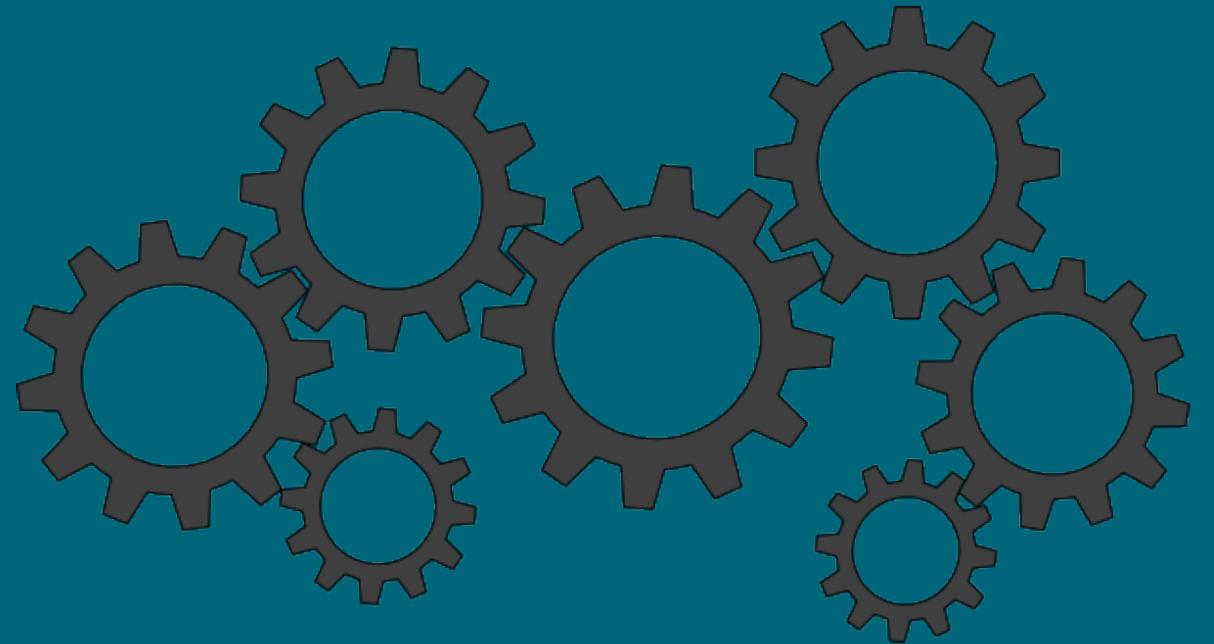
Jacob Simon
Independent video creator
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Moderated by: Beth Karlin
See Change Institute

Protocol

- Use the **chat** for questions and discussion throughout the webinar
- We will have time for questions **at the end**
- Recording will be available on the BECC website



Improving Home Energy Upgrades with Insights from Households and the Construction Industry

July 29, 2025





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Q&A



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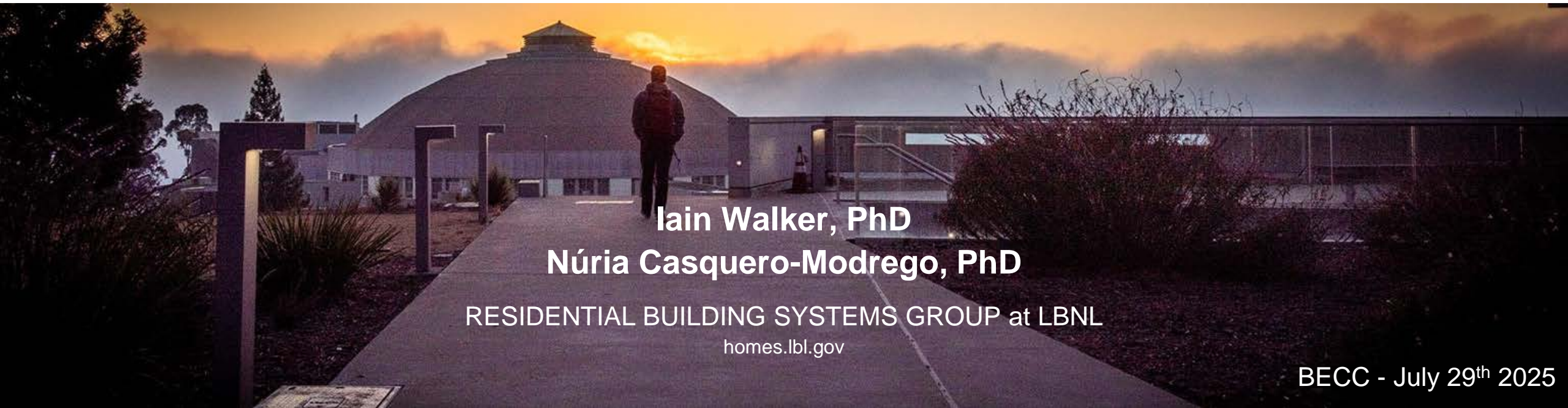
Pacific Northwest
NATIONAL LABORATORY



U.S. DEPARTMENT OF
ENERGY

Improving Home Energy Upgrades

(Insights from Households and the Construction Industry)



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BECC - July 29th 2025

HOW TO GET **AFFORDABLE** SOLUTIONS?



HOW TO **SCALE** ENERGY RETROFITS?

To **SCALE** energy retrofits, we need **motivated** building industry and **motivated** households

We used SURVEYS of households and industry professionals to assess and understand these motivations

Household Perspectives and Priorities in Energy Retrofits

Survey 1 – Households

Study led by Chrissi Antonopoulos at PNNL

There's No Place Like HOME

- Human behavior is at the center of interactions between people and the homes they live in.... and the technology they interact with.
- Residential building stakeholders grapple with complex sociotechnical dynamics when researching/diffusing technology in residential buildings.
- Many factors make this dynamic more complex:
 - Building stock characteristics
 - Region and community density
 - Income
 - Race, cultural background, ethnicity
 - Education, including technology background
 - Age, life-stage
 - Preference



U.S. Department of Energy (DOE) Building Technology Office (BTO) is funding research to investigate how residents make home energy decisions and to explore whether those decisions help improve their homes.

Survey of 10,000 households

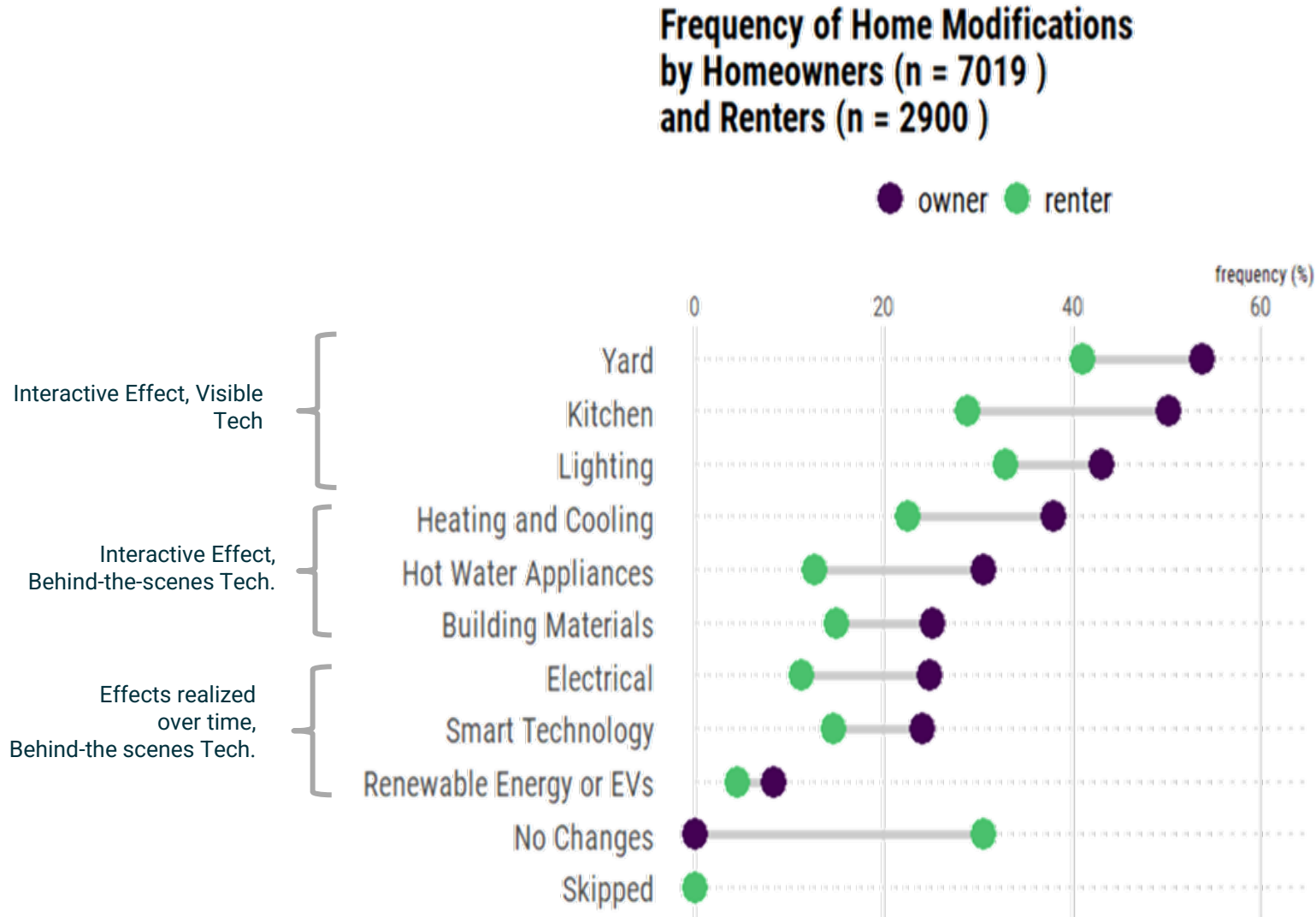
Interviews with 120 households

Research Questions for homeowners:

- What are the motivations and key decision points for energy-related home renovations and upgrades?
- How do different residential stakeholders decide to buy and use key technologies relevant for residential energy retrofits?

Common Energy Retrofits

- More homeowners and renters changed **visible, interactive technologies** compared to "behind-the-scenes" technologies.
- Overall, homeowners more likely to make changes than renters.
- 50% of homeowners and 29% of renters have made changes in the **kitchen**.
- Fewer changes to **HVAC** for both groups (38% owners, 23% renters).



Envelopes and Heat Pumps

What factors motivate households to upgrade envelopes, adopt heat pumps:

- Most correlations occur between **tech and combo projects**, especially electrical upgrades.
- Household economics, programs and ability to finance plays a role.
- Many **non-energy factors** also are important

Influencing Factors for Upgrades

We asked what **general preferences** residents have for their home:

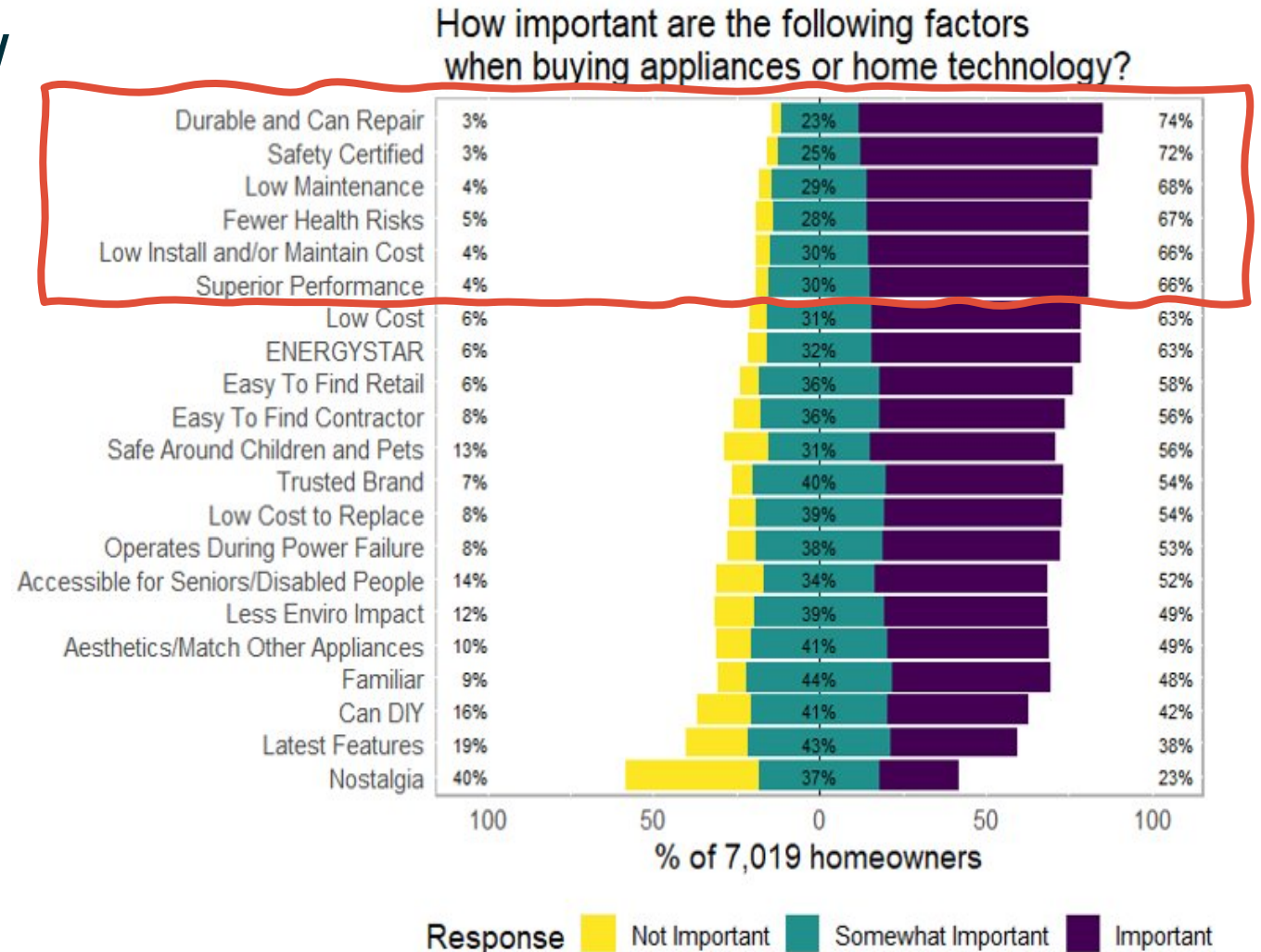
- **Most important:** A place to relax and a home/yard that is easy to care for (74%, 71%).
- **Important:** A family kitchen (69%).
- **Important:** Homeowners highly value the look of their home (60%).
- **Noted:** Safety and access to outdoor space were noted by about 50% of respondents.

Not All Decisions are Based on Cost

Households care more about the benefits associated with new appliances/retrofits than about the cost



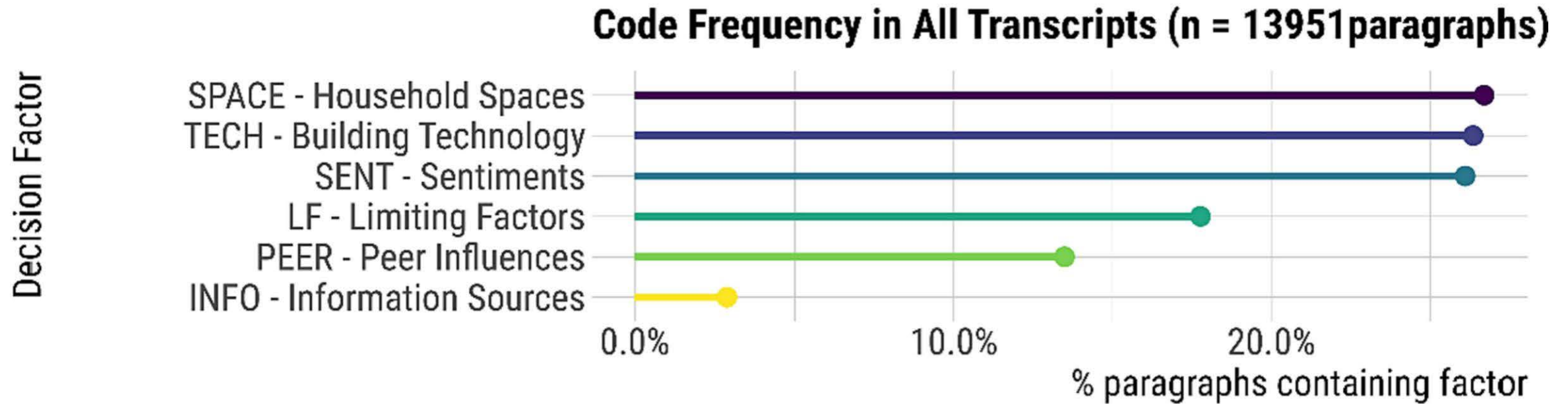
We need to better understand these “Non-Energy Impacts”



Households Prioritize Many Non-Energy Factors

- **Comfort/safety for pets/children** is the most important decision-making factor for home modifications.
- **Repairing/replacing something broken** is second for both homeowners and renters.
- **Improving appearance and reducing energy bills** are also important.

Households Prioritize Comfort not Cost Savings



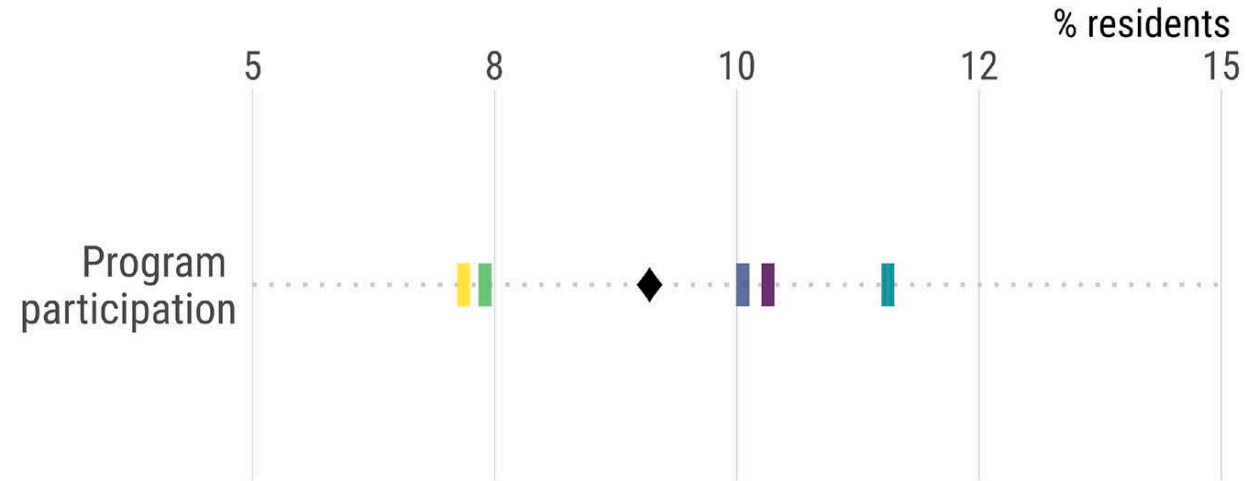
Households' primary decision factors for making upgrades include:

- Create better household spaces
- Integrate new building technologies
- As reactions to personal sentiments, judgements and/or perceptions

Contractors Play an Important Role

- Only 9% of households are participating in programs → Contractors are a key source of information
- 30% of households note they can't find contractors to do the work they need done.
- **Decisions (motivations)** are influenced by many factors, but upfront cost is still a **barrier**

A) Program participation



B) Barriers to Modifications



What do Industry Professionals Think?

Survey 2 - Construction Industry

Market Survey

- ▶ Qualtrics survey platform
- ▶ 20-minute online survey to gather information from building energy professionals on their experiences and opinions
 - What motivates and deters energy retrofit projects in today's market?
 - Promising strategies and technologies
 - Non-cost aspects of retrofit measures
- ▶ ~250 survey participants

Survey Questions Organized By Main Sections Of Topic:

- ▶ Background information about past experiences of the respondent
- ▶ Consumer perspective on energy retrofit projects
- ▶ Home performance contractor perspective on challenges
- ▶ Promising technologies and approaches
- ▶ Work scope and approaches from past experiences
- ▶ Project costs



Survey: Customer Perspective

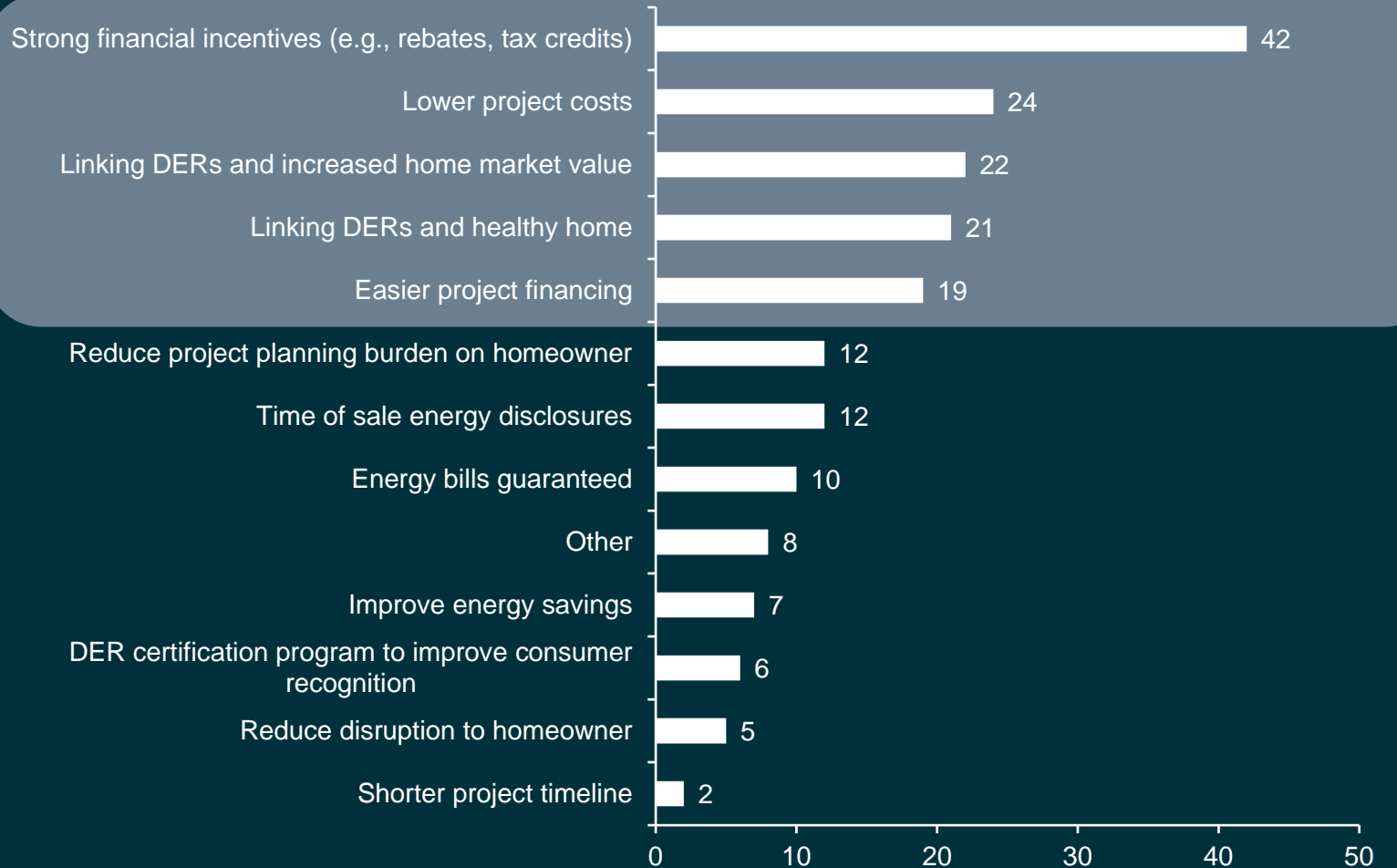
What are the main motivations of homeowners / building owners?

Residential <> Commercial

Profit is not the motive

ROI, payback and other traditional investment metrics are misleading and the wrong ones to use.

Affordability and financing are key.

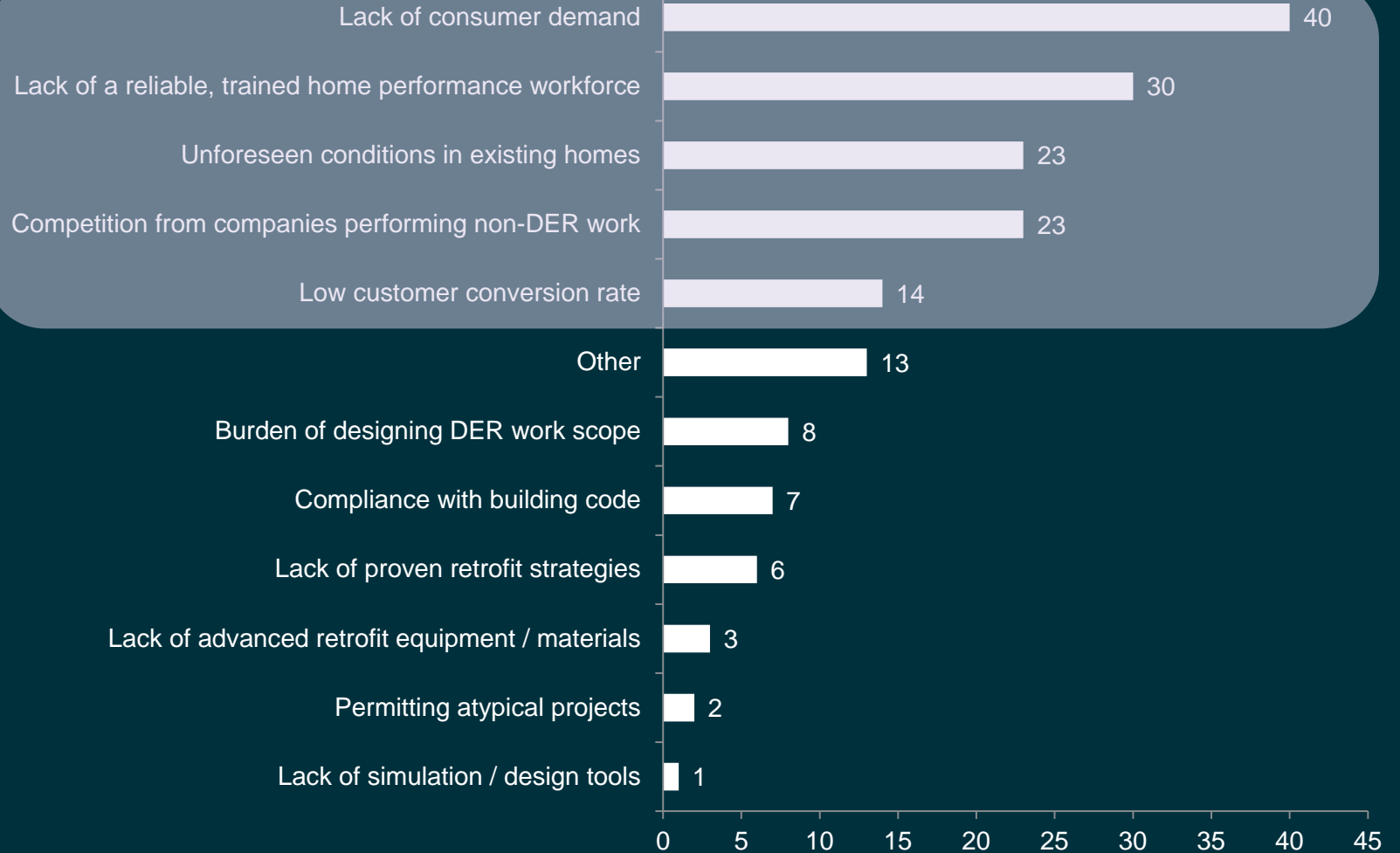


Survey: Industry Perspective

Aside from costs:

What are the biggest barriers?

- Lack of consumer demand
- Lack of workforce



Survey: Project Cost Estimates

Common causes of project cost increase.



A Comparative Analysis:

What are the **Perceptions** and **Behaviours**
of Households and Construction Professionals?

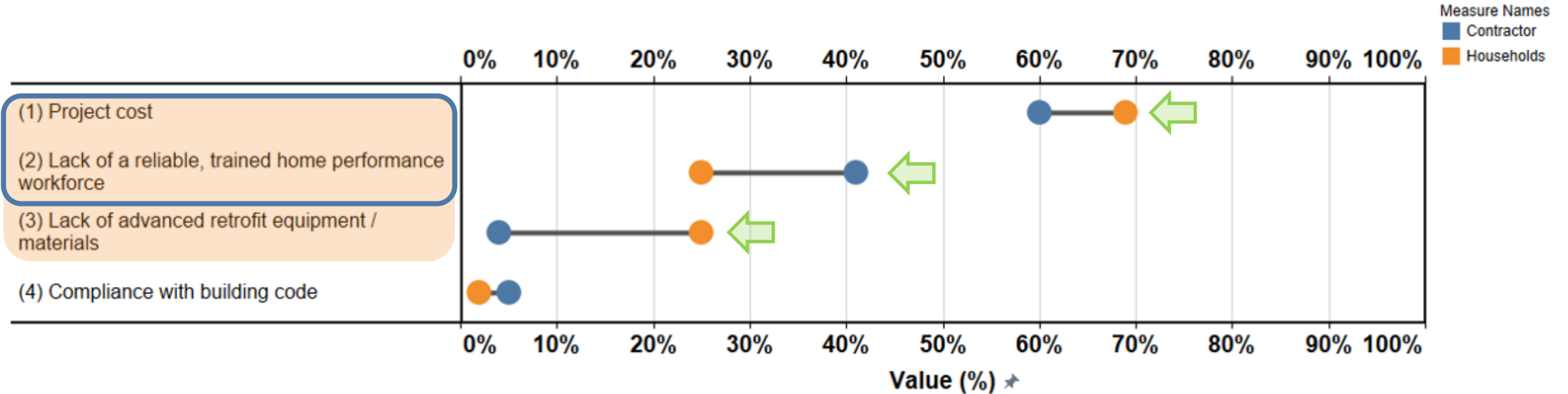
Addressing Gaps: A Comparative Analysis

Research Questions

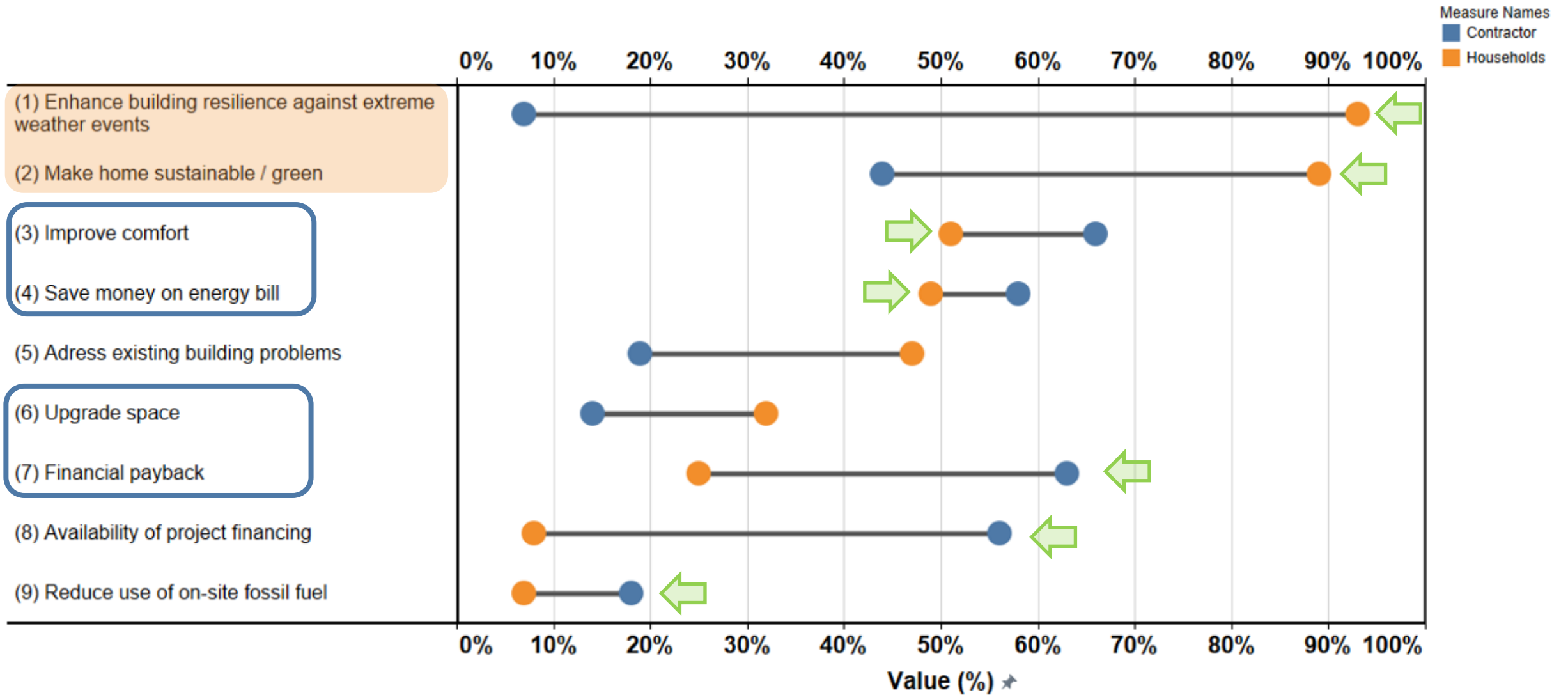
- a) What drives and hinders households and construction professionals in deciding to retrofit a home?
- b) How does the construction industry supports energy retrofits for households?
- c) What are the top strategies to scale energy retrofits for households and professionals?



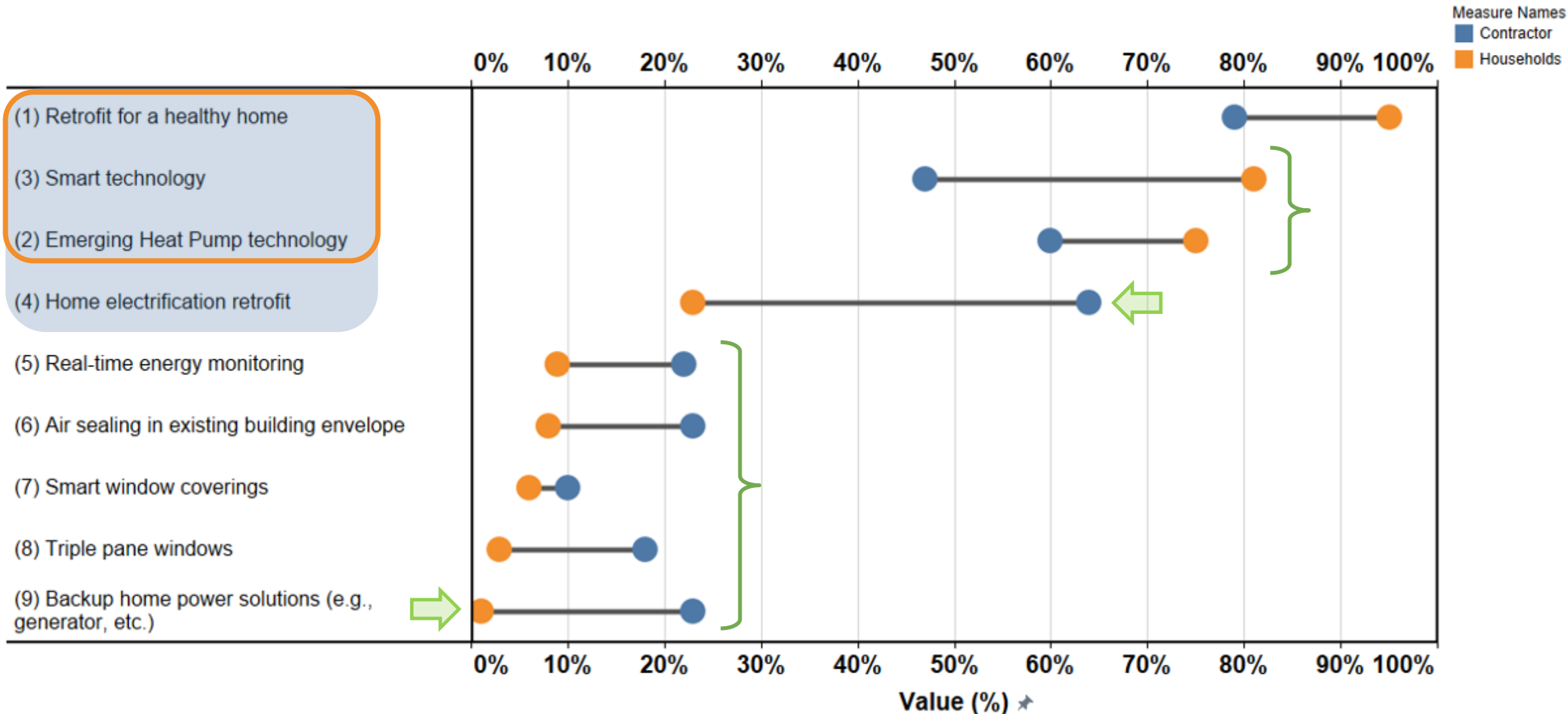
Key Barriers for the Building Industry and Households



Households Priorities and Motivations



Advanced Technology for Energy Retrofits



Summary

Misalignment between households and construction professionals:

- Households prioritize resilience to extreme weather, existing building problems, and green / sustainable homes.
- Industry professionals focus more on adding new electric loads, backup power, financing concerns, and payback timelines.

Shared priorities:

- Both groups value health, comfort, energy/bill savings, project costs, and availability of contractors/workforce.

Communication gap:

- Messaging needs to reflect household concerns (non-energy benefits), such health, and resilience to better engage homeowners.

Operational efficiency:

- Effective time management from design to construction is a key strategy for cost reduction.

Recommendations for the Industry:

- Align messaging with household values.
- Promote non-energy benefits of retrofits (e.g., health, thermal comfort, environmental impact).
- Address financial barriers through incentives, rebates, and integrated project financing.
- Develop and communicate resilient retrofit solutions.
- Invest in workforce development, particularly around emerging technologies.
- Prioritize products that are affordable, easy to install and maintain, and help reduce project timelines.

Current Work →

Quantification **Non-Energy Impacts**

Health related approach (Disability Adjusted Life Year DALY)



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**Thank You...
QUESTIONS ?**

