

Break-out Discussion I: Modeling Consumer Behavior *Residential Scale*



SunShot
U.S. Department of Energy

Why Are We Here?

- Are we asking the right questions?
- What is a question we could ask about *modeling consumer behavior* that might lead to deeper insights into how to spur innovation?

Opower: visual comparison

The logo for OPOWER, featuring the word "OPOWER" in white capital letters on a blue rectangular background. The letter "O" is stylized with a white smiley face inside it.

We use a well-defined, scientific approach to measurement and verification.

Opower's methodology and results have been independently verified by leading industry analysts and non-profit organizations, including the American Council for an Energy-Efficient Economy (ACEEE), The Brattle Group, Navigant Consulting, Power Systems Engineering, KEMA, Environmental Defense Fund (EDF), as well as by established academics from several leading institutions. Our measurement protocols follow guidelines specified by Public Utility Commissions across the country, and in particular the protocols laid out in the California Public Utility Commission's Measurement & Verification Guidelines and the EPA's National Action Plan for Energy Efficiency (NAPEE) guidelines.

> Time Comparison

We use baseline data to identify test and control groups with statistically equivalent usage patterns and histories.

> Group Comparison

We measure program impact against a group of non-participating homes to control for external factors that may affect energy use.

> Replication

We measure energy use across thousands of households, over different spans of time, to increase the statistical precision of our results.

UtilityCo

John Doe

Last Month Neighbor Comparison | You used 34% less than your efficient neighbors.

How You're Doing:
▶ GREAT 😊😊
 Good
 More Than Average

WHO ARE YOUR "NEIGHBORS"?

- ALL NEIGHBORS**
 All approximately 60 occupied nearby houses that are similar in size to yours (avg. 2,750 sq ft)
- EFFICIENT NEIGHBORS**
 The most efficient 20 percent from the "All Neighbors" group

Spotlight on Cooling

Your cooling usage compared to your neighbors:

You used **36% LESS** energy on cooling than your neighbors.

Summer Reminder
 Adjust your thermostat every time you leave the house. Even one degree can make a difference in savings.

Your estimated cooling usage is based on last summer's energy use and temperature.



Energy Saving Tips for the Hot Summer

Overall, move your thermostat up 2°.
 You won't feel the temperature difference, and you could save up to 10% on your electricity bill.

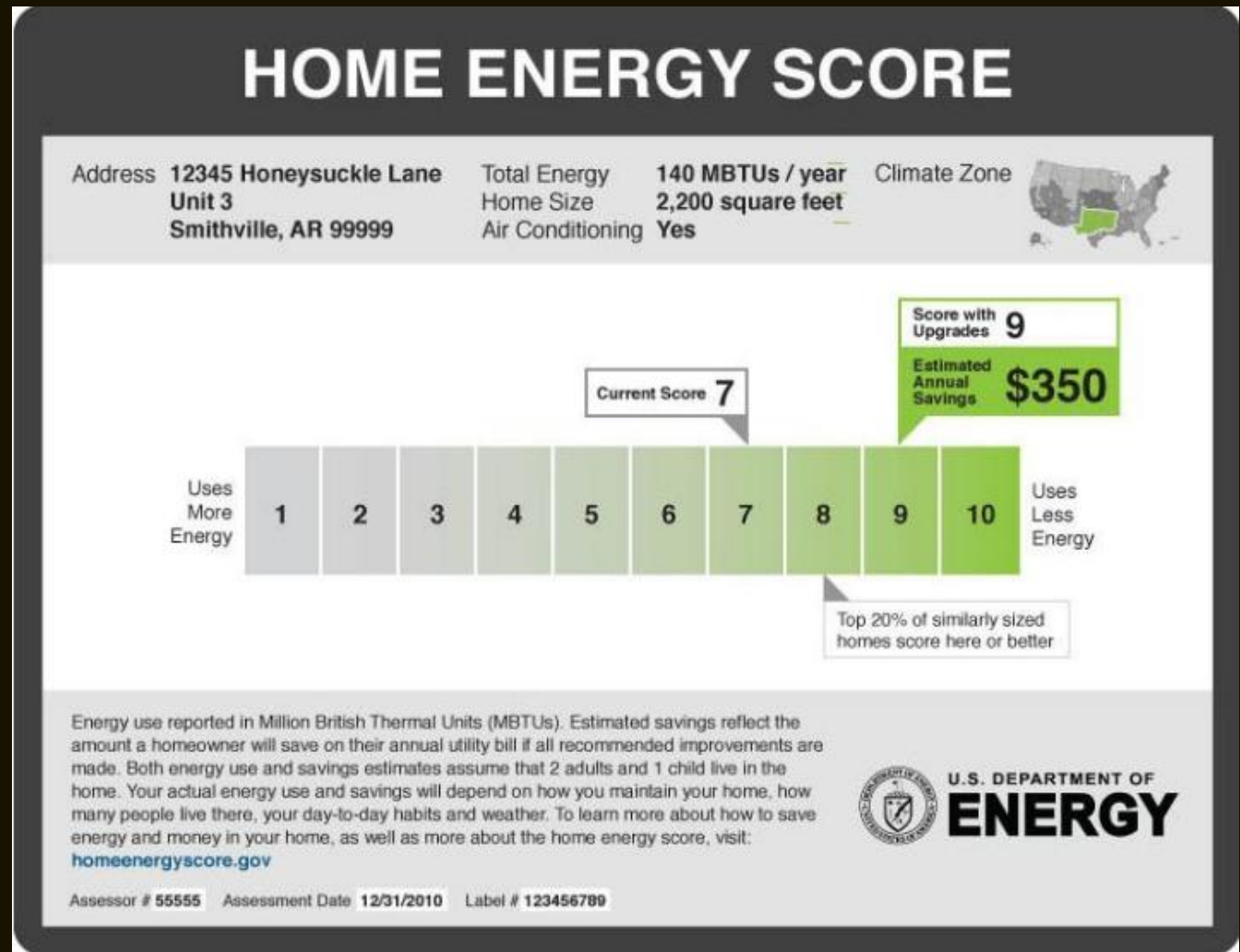
When you're away, set it higher.
 When you leave home or go to bed, turn your thermostat up 10°.

Consider a programmable thermostat.
 You can automatically increase and decrease the temperature of your home according to the time of day. Programmable thermostats cost less than \$50 and are easy to install.


Find more ways to save online www.acmpower.com/reports

EERE Home Energy Score

- Similar comparison model
- Adds climate context
- Simple, visual



Beyond comparisons...

- **Data:**
 - How much
 - What type

needed to validate behavioral patterns in the context of new technology adoption?
- **Data:**
 - What is actionable today?
 - What is bodacious, over-the-top ambitious that we could shoot for?
 - What would excite you, as a scientist, to jump out of bed and figure out how to cover all the rooftops in the U.S. with solar panels?

Fundamental Questions

- Three Dimensions to Customer Decision Making related to SunShot Goals
 - Deployment = efficiencies/comfort
 - Direct cost reductions
 - Customer Acquisition
- Can we take the same approach with different demographics and what variables are important to examine?
 - Smash stereotypes with data
- Examine decision-making from “household” perspective, rather than “customer” perspective

Key Ideas & Questions

- Naming & Shaming
 - Are there data-driven pathways for normative change?
 - How do past examples inform future approaches to policy?
 - Gainesville example
- Change from energy **user** to **producer**?
 - How do people behave differently? Do they take other actions?
 - Rebound effects? Mindset changes? Ripple effects?
 - Altruism as motivation? How do we quantify this effect?
- How to approach those who aren't thinking about energy / don't want to think about it (i.e., majority of consumers)?
 - Lack of smart meters, integration into everyday life prevents engagement?
 - What's the point of conversion to energy consciousness?
 - What data tells this story?
- What are the key data points that energy consumers take into consideration when making energy decisions?

Key Ideas & Questions

- How does confusion/ambiguity repel consumers?
 - Even when economic/social barriers overcome, confusion remains
 - No storefronts, far-removed from typical purchases.
 - Even for online purchases, who is trusted for the information?
 - What types of confusions
- Different consumers, different buildings, different adoption patterns
 - Renters, condo owners, multi-family buildings
 - Community solar programs, group buys, solar gardens
- How does adoption take place on the grassroots level and what are the most effective types of diffusion?
 - HOA's / Neighborhood Associations
 - Door-to-door sales
 - Viral/Social
- What can we learn from builders & construction companies' decisions to incorporate solar into new home construction?
 - How does that drive consumer behavior?

Key Ideas and Questions

- Normative vs. Analytical Approach? Tied together.
 - Focus on analytical frameworks to inform policy.
- Lessons to learn from approaching solar adoption as political campaign?
 - House parties?
 - Individual identity and the involvement in something bigger?
 - Leaving behind an energy/policy legacy?
- Education and legacy
 - Motivation to influence the future?
- How does policy interact with behavior?
 - If government has a top-down fix (e.g., cap and trade), does that remove incentive to act on a personal level?

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Utility Innovation: Discussion Questions

Regulatory Incentives

- What questions can we ask about the structure and dynamics of the current U.S. electricity system and its history that might help shape technology adoption by utilities?
 - IOUs
 - Munis
 - Coops, other power delivery networks

Human-technology interface

- How can we better understand/conceptualize the connection between different stakeholders in the complex energy generation and supply structure –
 - What incentives work in parallel?
 - What incentives are contradictory to technology adoption goals?

Targeting intervention

- What conceptual/analytical models for how a technology evolves **exist**
- or ***Need to be developed?***

Other

- Other questions?

Group I – Utility Brainstorm

- Most regulators balk at experimentation related to behavioral science/econ
 - Exceptions:
 - California PUC and utilities
 - NERUC, other industry groups
 - Empower other utilities and regulators to take CA's example?
- State policies drive adoption
 - Solar carve-outs
 - Drive activities of utilities
 - However, when solar is cheaper in the future, are these state policies as important?
- Utilities have a big role to play in behavior change
 - However, role varies greatly by state, and will vary by time
 - Could be responding to RPS, etc., against their will
 - Once explicit incentives disappear, they may not need to push
- Two levers – mandates & incentives
- Consumer attitude & behavior can also drive utility adoption
 - Some may be willing to pay more, push utilities to provide solar programs
- Utilities can incentivize communities by creating competitions
 - Which community can install the most solar, bragging rights, financial
- What incentivizes the utilities to do this?
 - Wealthiest consumers, who pay more for electricity (top tier), are likelier to buy solar, which then removes these ratepayers from the utilities' base.