



Better Buildings Residential Network Peer Exchange Call Series: *Effecting Behavior Change: Energy Report Data Usage*

March 23, 2017

Call Slides and Discussion Summary

Agenda

- Agenda Review and Ground Rules
- Opening Polls
- Brief Residential Network Overview and Upcoming Call Schedule
- Featured Speakers
 - **Olivia Patterson**, Data Science Director, Opinion Dynamics
 - **Guillaume Calas**, Strategic Analyst, Pacific Gas & Electric (PG&E)
 - **Brian Arthur Smith**, Principal Strategic Analyst, PG&E
- Discussion
 - Has your program used energy report data to inform homeowners about their home energy use?
 - What challenges have you encountered in using data from energy reports to change behavior?
 - How can programs improve or supplement home energy reports to get even more energy savings?
 - Other questions/issues related to home energy reports and behavior change?
- Closing Poll

Better Buildings Residential Network

Better Buildings Residential Network: Connects energy efficiency programs and partners to share best practices and learn from one another to increase the number of homes that are energy efficient.

Membership: Open to organizations committed to accelerating the pace of home energy upgrades.

Benefits:

- Peer Exchange Calls 4x/month
- Tools, templates, & resources
- Recognition in media, materials
- Speaking opportunities
- Updates on latest trends
- Voluntary member initiatives
- Residential Program Solution Center guided tours

Commitment: Provide DOE with annual number of residential upgrades, and information about associated benefits.

For more information or to join, email bbresidentialnetwork@ee.doe.gov, or go to energy.gov/eere/bbrn and click Join

Peer Exchange Call Series

We hold one Peer Exchange call the first four Thursdays of each month from 1:00-2:30 pm ET

Calls cover a range of topics, including financing & revenue, data & evaluation, business partners, multifamily housing, and marketing & outreach for all stages of program development and implementation

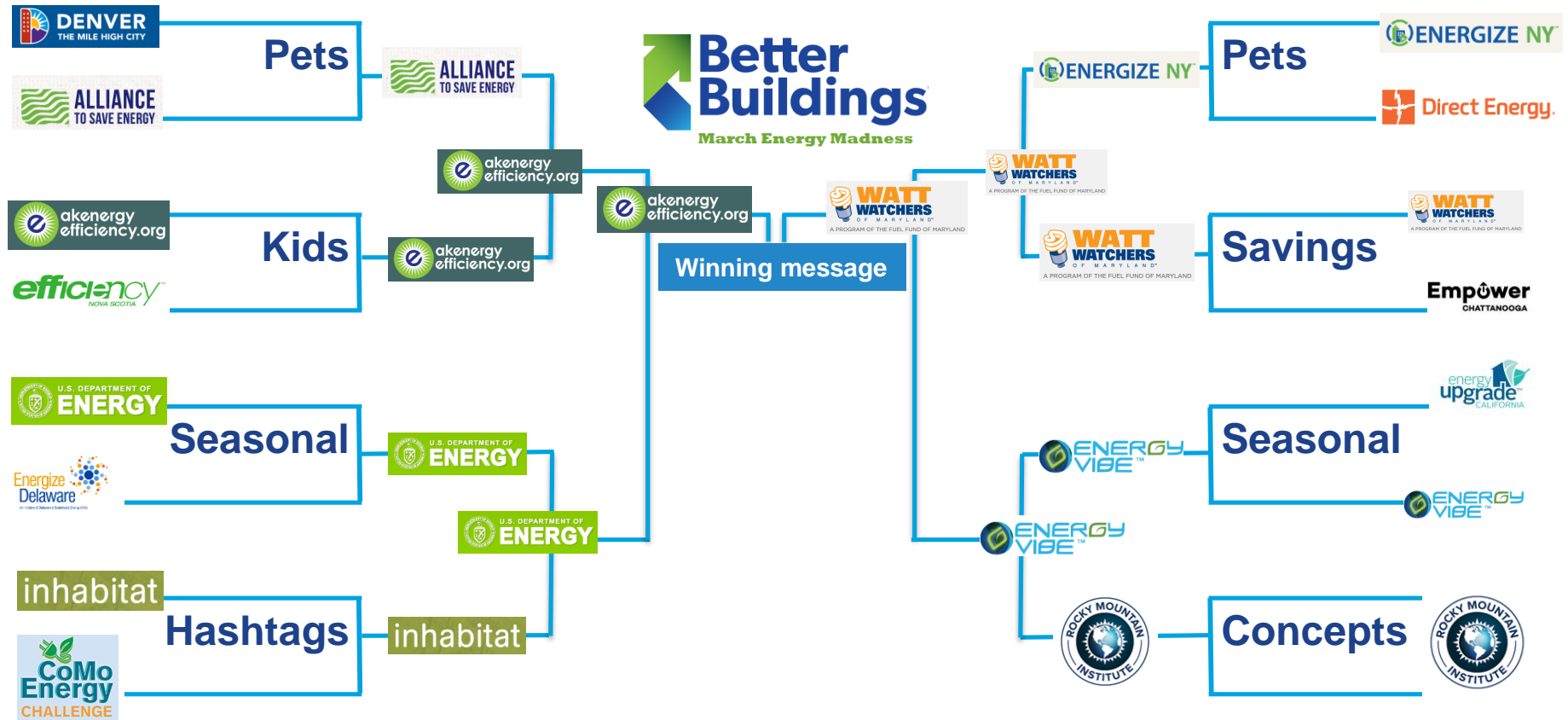
Upcoming calls:

- April 6: [Master Key: Unlocking Innovative Approaches to Program Design](#)
- April 13: [Ultimate Retrofit: Zero Energy Ready Homes](#)
- April 20: [Two Is More Than One: Leveraging Strategic Partners](#)
- April 27: [Just What the Doctor Ordered: Integrating Health Benefits into Energy-Efficiency Programs](#)

Send call topic ideas to peerexchange@rossstrategic.com

See the Better Buildings Residential Network Program [website](#) to register

March Energy Madness: Final Championship



March Energy Madness: Final Championship

Alaska Energy Efficiency



Fuel Fund of Maryland* The Watt Watchers Program



March Energy Madness: Final Championship



Final Round!



Fuel Fund of Maryland – Watt Watchers (*Network Member*)



Best Practices: Opinion Dynamics



HOME ENERGY REPORTS: FOCUS ON THE HIGH SAVERS

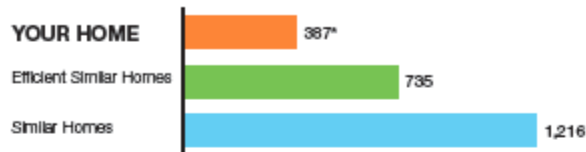
Identifying High, Medium and Negative Savers
and the Implications for Programs

Olivia Patterson
Director, Data Science

Example of a Home Energy Report

Last Month Household Comparison

You used **47% less** energy than efficient similar homes.



* This energy index combines electricity (kWh) and natural gas (therms) into a single measurement.

How you're doing:



What Homes Are Compared?

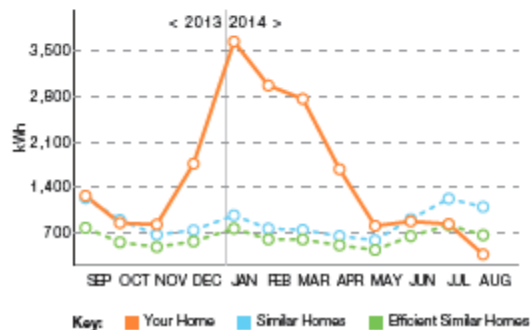
■ **Similar Homes:** Approximately 100 occupied nearby homes that are similar in size to yours (avg 1,083 sq ft) and have gas heat

■ **Efficient Similar Homes:** The most efficient 20 percent of similar homes

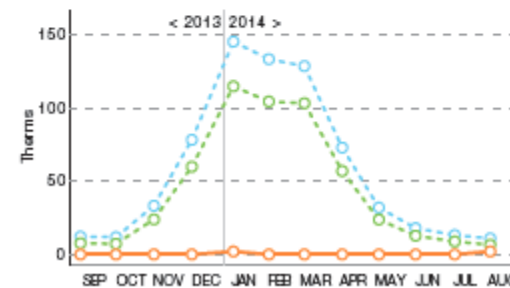
Last 12 Months Household Comparison

You used **42% more** energy than efficient similar homes.
This costs you about **\$225 extra** per year.

⚡ Electricity | 152% more electricity than efficient similar homes

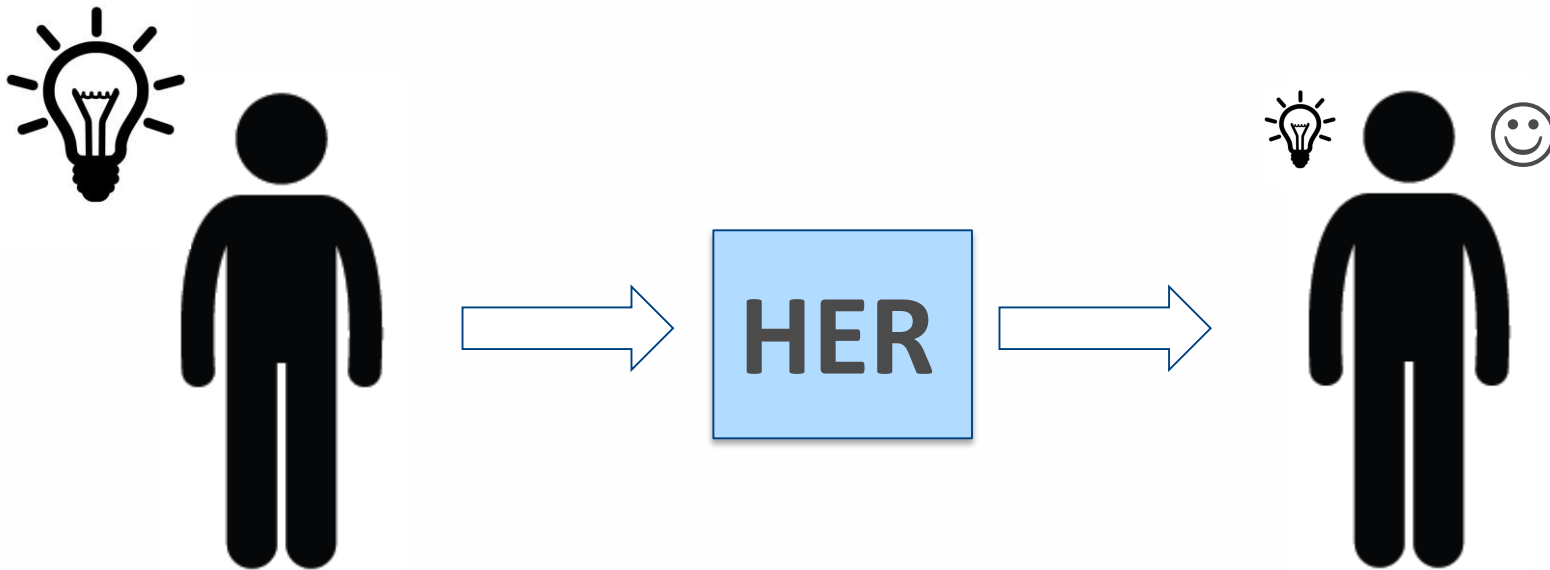


🔥 Natural Gas | 99% less natural gas than efficient similar homes



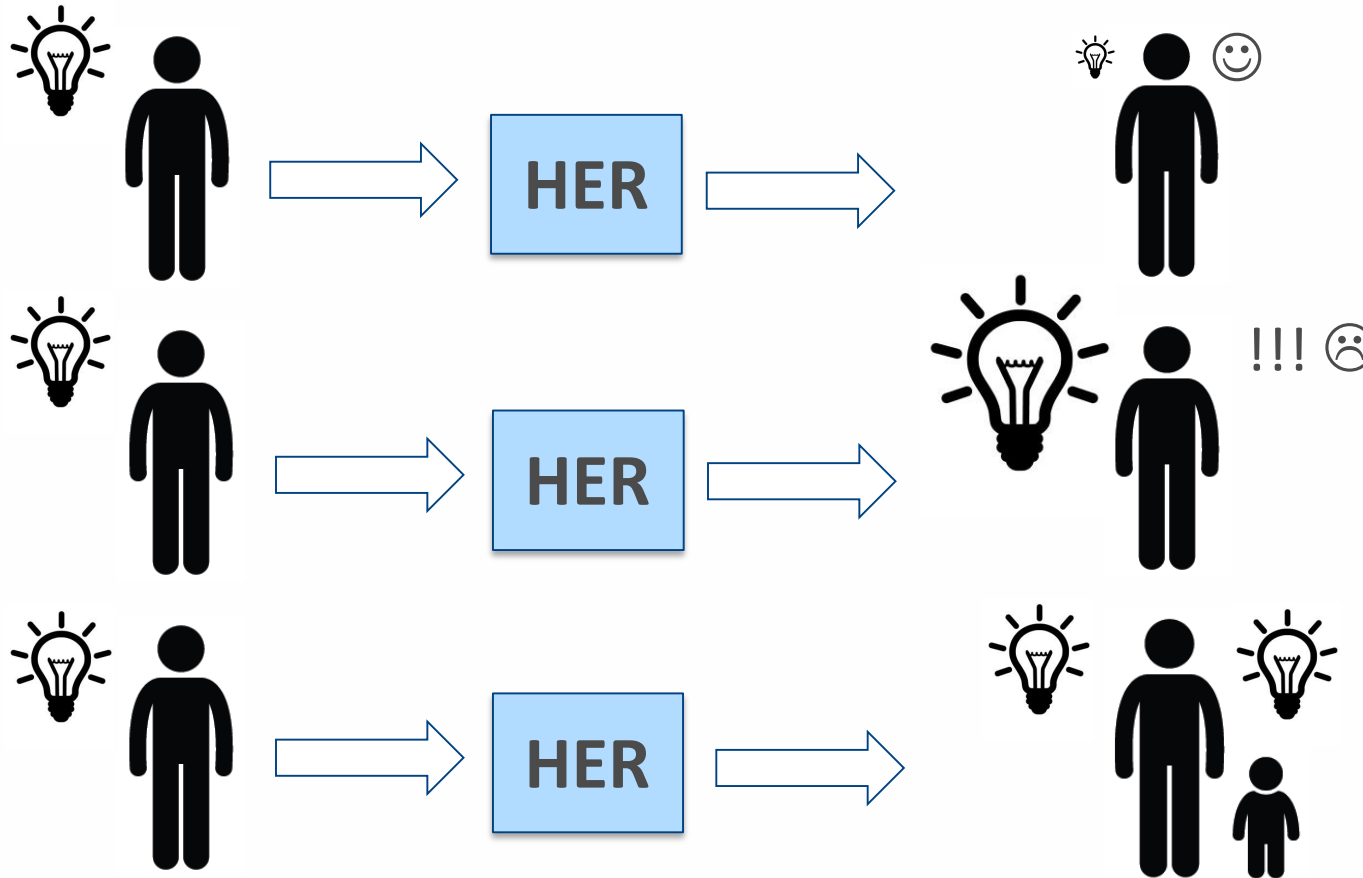
HER reports in theory

- Reduce energy consumption by changing customer behaviors and choices...



HER reports in practice...

- ...but customers may not respond the same way

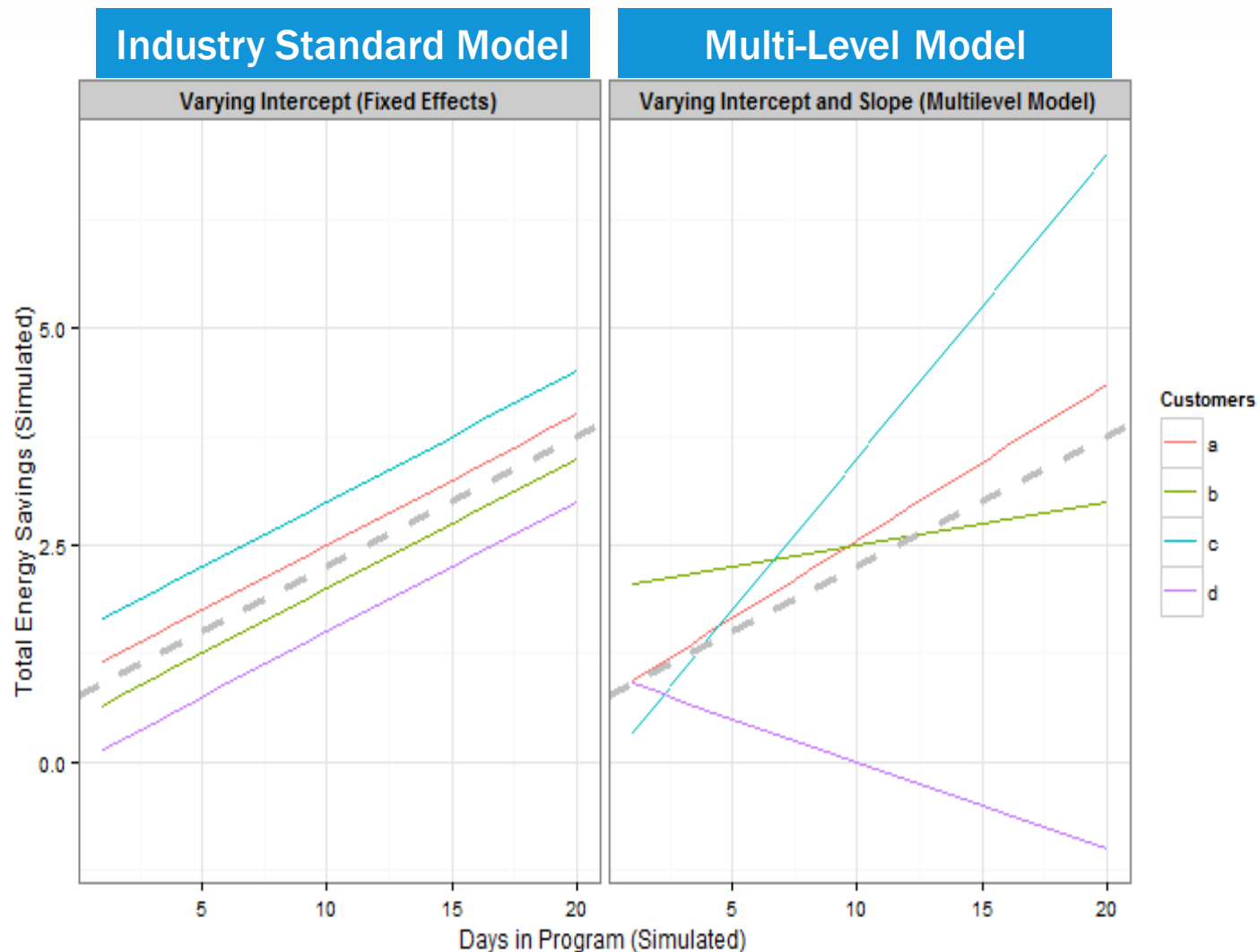


Conduct multilevel modeling to garner customer insights

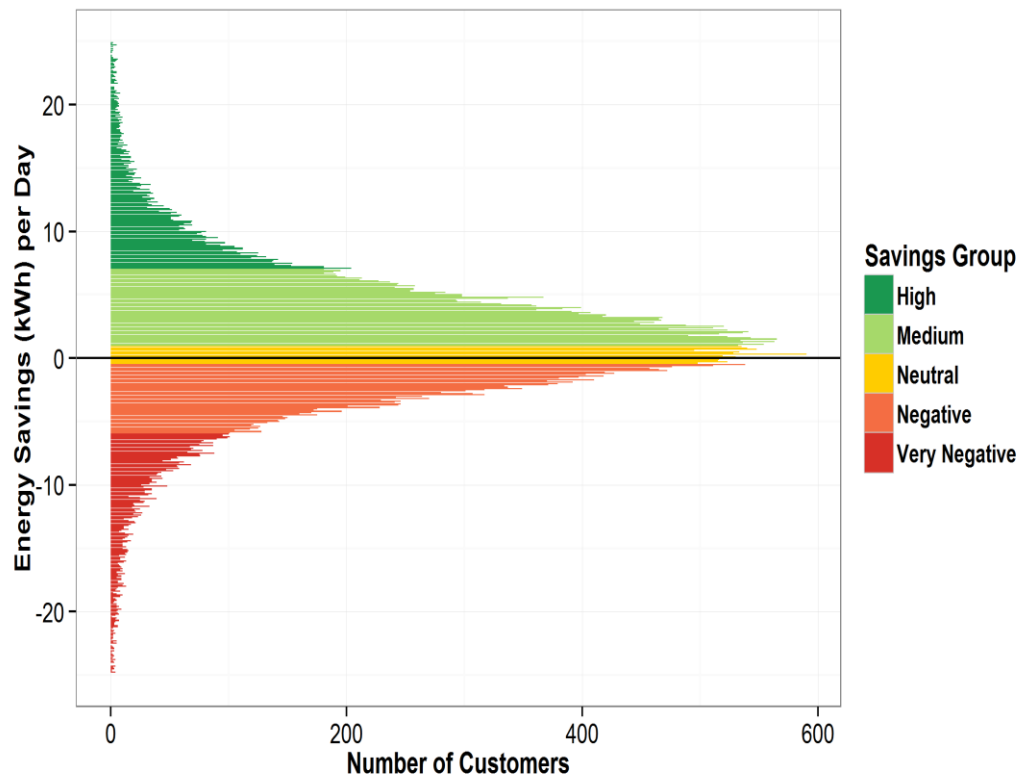
- Evaluated long-running HER program with ~250k customers
- Identified five savings segments using a multi-level billing analysis
- Developed model to understand the responses of different types of customers to the HERs in addition to calculating total savings attributable to the program



Multilevel modeling estimates individual customer savings

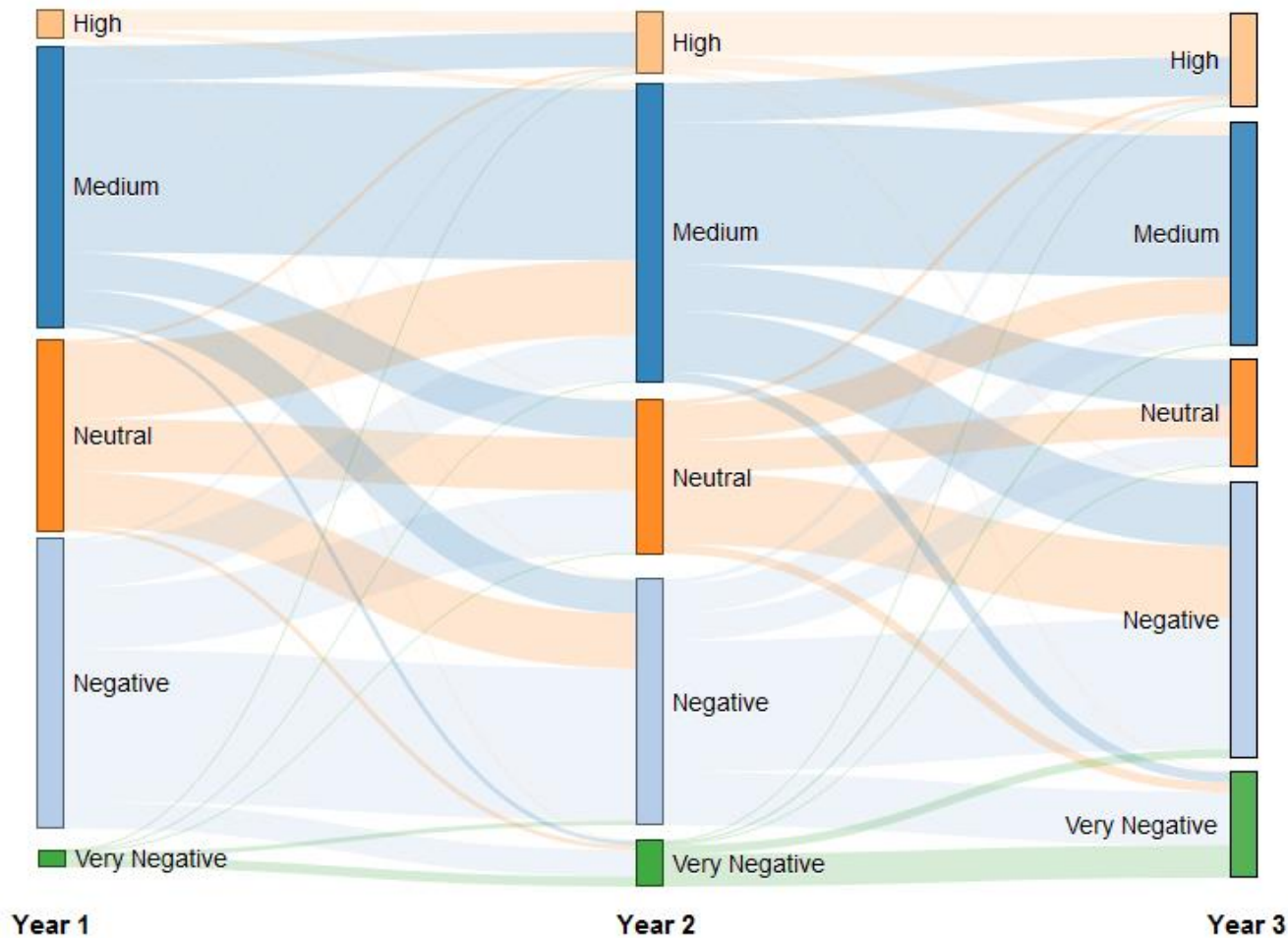


On average, customers have positive energy impacts, but 40% of customers are increasing their energy usage



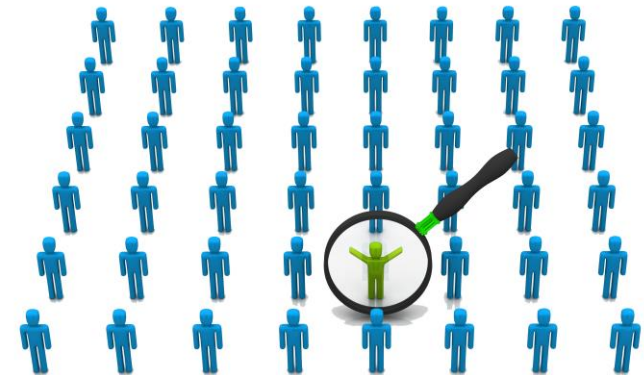
Group	Percent of Population	kWh Savings / Day
High	Top 10%	> 7 kWh
Medium	Next 30%	> 1 & ≤ 7 kWh
Neutral	Middle 20%	> - 0.5 & ≤ 1 kWh
Negative	Next 30%	> -6 & ≤ -0.5 kWh
Very Negative	Bottom 10%	≤ -6 kWh

Not much mobility between segmented groups over time



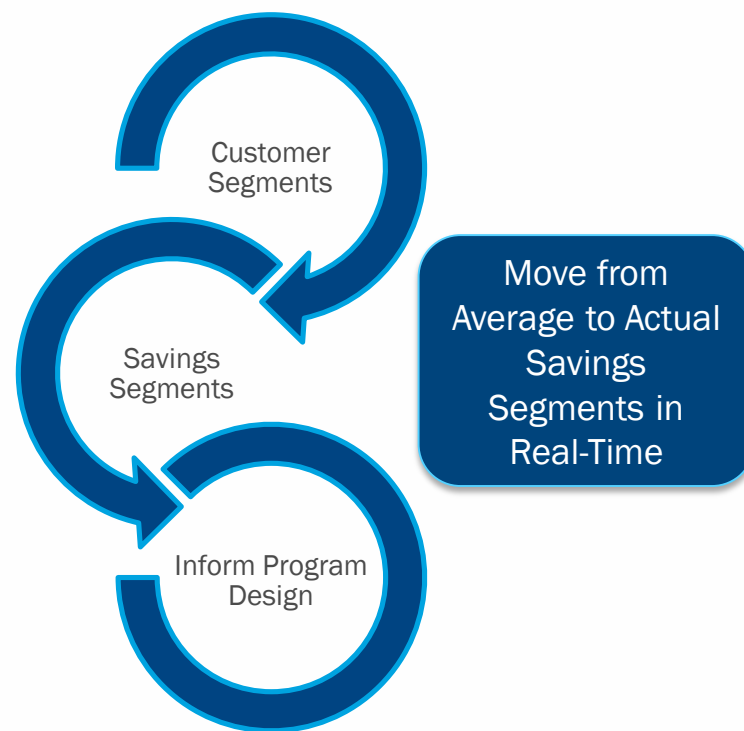
Recommendations for HER Programs

- Based on research findings, HER programs may want to:
 - **Stop or modify reports** for participants in the **very negative savings group** to increase overall program savings
 - **Heavily promote** utility sponsored programs to **very high savings group**
 - Use report as an engagement tool with **middle of the pack savings groups** (or for other online platforms)
 - Remove customers predicted to be negative savers from future cohorts based on propensity scores based on demographic characteristics of current savings cohorts



Applications to EE Programs: Moving from Averages to Actuals

- Behavioral evaluations show that there is variation in actual savings across customers, which is likely true of other EE programs (but difficult to measure)
- Current EE program design relies on customer segments, but rarely do they incorporate specific prior participant actual savings estimates to optimize program design
- EE programs can benefit by incorporating specific actual savings information as one key input to maximize future savings



Opinion Dynamics: Program Experience

Are Home Energy Reports effective? Programs that implement Home Energy Reports (HERs) experience small but consistent savings, but not all customers respond similarly to comparative messaging.

- **Average vs. Actual:** For its study, Opinion Dynamics segmented customers into 5 distinct categories based on energy savings. Although most homeowners saved energy with HERs, **40% actually increased energy use** after receiving a HER.
 - There is **not much mobility between categories**. In the study, 40% of people stayed in the same category after 3 years of receiving HERs.
 - **Negative savers** may be elderly, have children, or spend more time in their home than other participants.
 - **High savers** may be engaging in a broad spectrum of energy efficiency actions from conservation practices to purchasing efficient appliances.
 - The study was **unable to pinpoint predictive customer and household demographics** for high vs. negative savers, although age of home was predictive for gas customers.

Opinion Dynamics: Lessons Learned

- **Herding Cats!** Households that have children or more people in their home may have more difficulty getting everyone in the home on board with efficiency changes.
- **Tailored Messaging:** The study demonstrated the importance of customer segmentation, and future programs should consider tailoring their messages to appeal to specific demographics.
 - **Reinforce the Positive:** Negative savers may not have a positive response to the comparative model and could be motivated by more encouraging messaging.
 - **Focus on What Is Cost-Effective:** In the future, programs may want to consider discontinuing HERs for negative savers and explore different methods for motivating those customers.
 - **Dig Deeper into Behaviors:** The research didn't examine which energy-efficiency behaviors customers implemented, though programs may be able to further improve their programs with this type of data.

Program Experience: Pacific Gas & Electric (PG&E)

Home Energy Reports - Reversing a Middle Age Crisis

Guillaume Calas & Brian A. Smith

March, 2017



Together, Building
a Better California

PG&E's HER Program Overview

Cohorts	Launch Date	Initial Study Population	
		Treatment	Control
Alpha	Q1 2011	2,000	
Beta	Jul. 2011	60,000	60,000
Gamma	Nov. 2011	75,000	75,000
	Nov. 2011	75,000	
	Nov. 2011	45,000	45,000
	Nov. 2011	15,000	15,000
Wave One	Feb. 2012	360,000	90,000
	Feb. 2012	40,000	10,000
Wave Two	Jan. 2013	320,000	50,000
	Jan. 2013	80,000	50,000
Wave Three	July 2013	225,000	75,000
Wave Four	Mar. 2014	200,000	75,000
Wave Five	Oct, 2014	210,000	50,000
Wave Six	Sept. 2015	310,000	50,000
Wave Seven	Mar. 2017	157,500	40,000

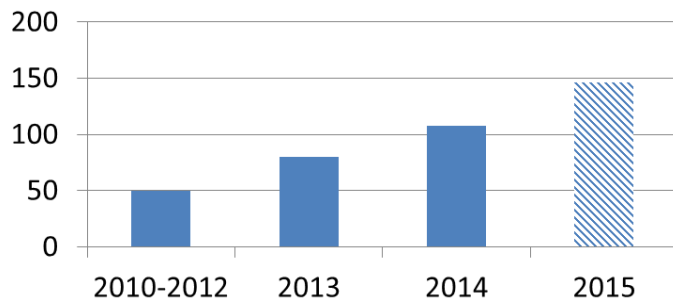
Program Highlights

- Started in 2011
- 9 active experiments
- Impacts 45% of residential customers today
 - Treatment: 1.5 M households
 - Control: 450,000 households

A Successful Program

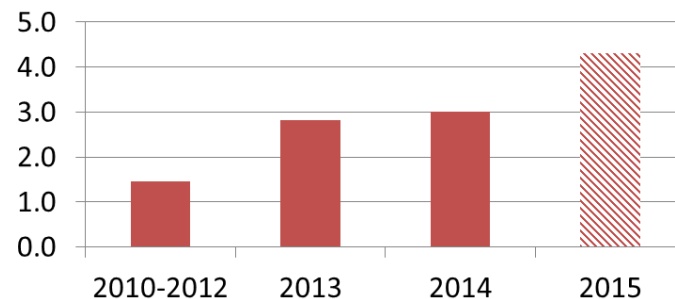
Electric Savings (GWh)

Ex-Post First Year



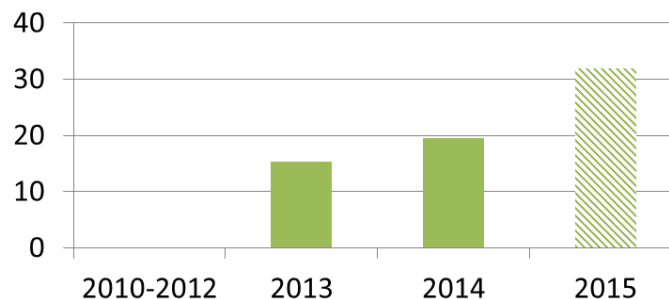
Gas Savings (Mtherms)

Ex-Post First Year



Demand Savings (MW)

Ex-Post First Year



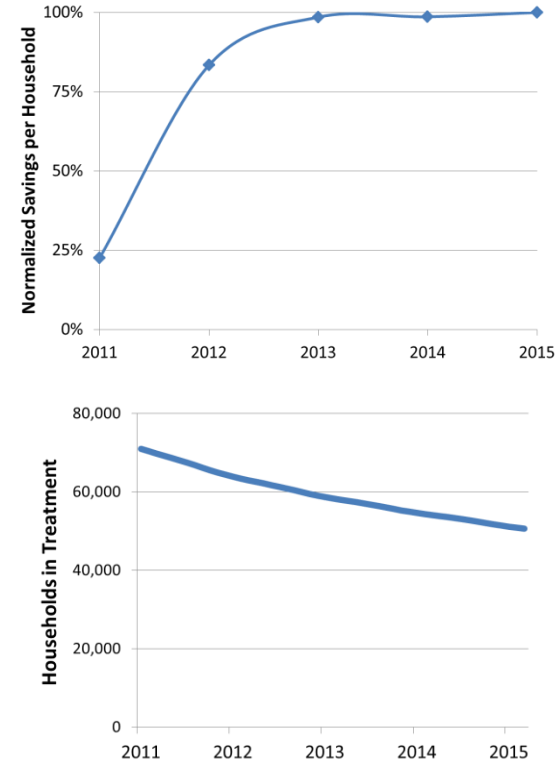
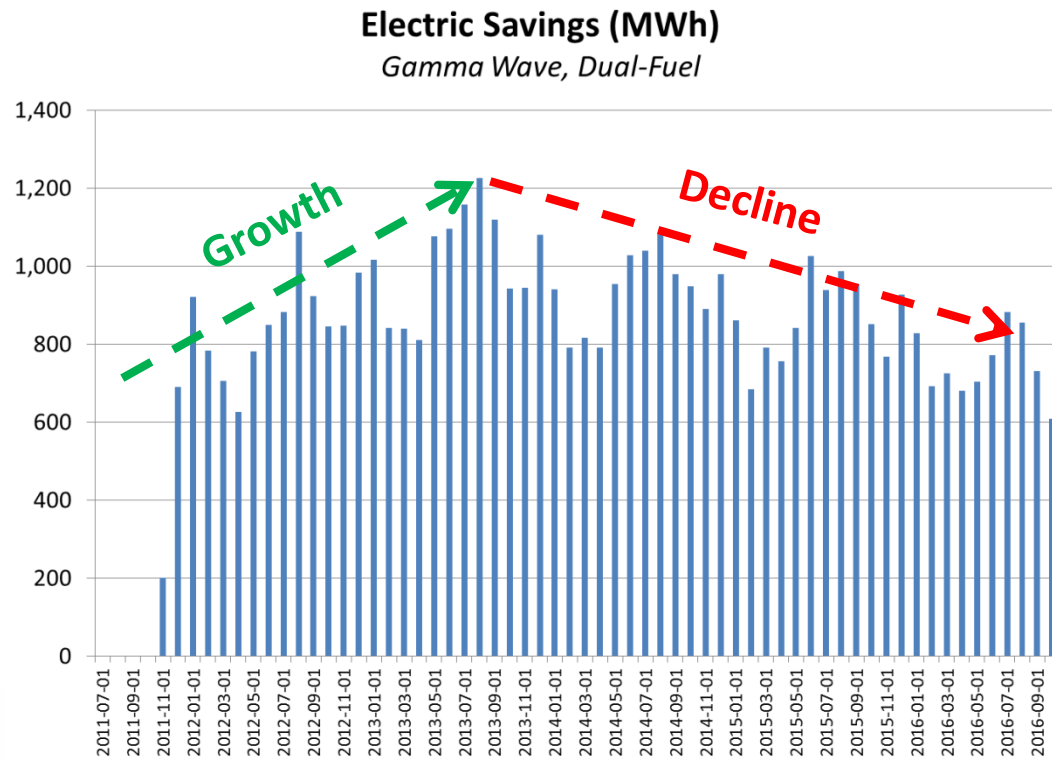
Substantial Savings at Program Level (2014)

- 25% of PG&E's Energy Efficiency portfolio savings (ex-post, first year)
- Average savings per household: 1.6%-2.3% (electric), 0.6-1.3% (gas)

Confronting HER Challenges

- **Long-term viability of savings**
 - Declining savings (experiment-level)
 - Savings potential of eligible participants
- **Customer engagement and satisfaction**
 - Report fatigue
 - Minimal personalization
- **Addressing cost effectiveness**
 - Savings by time-of-use (“load shapes”)
 - Persistence and Effective Useful Life

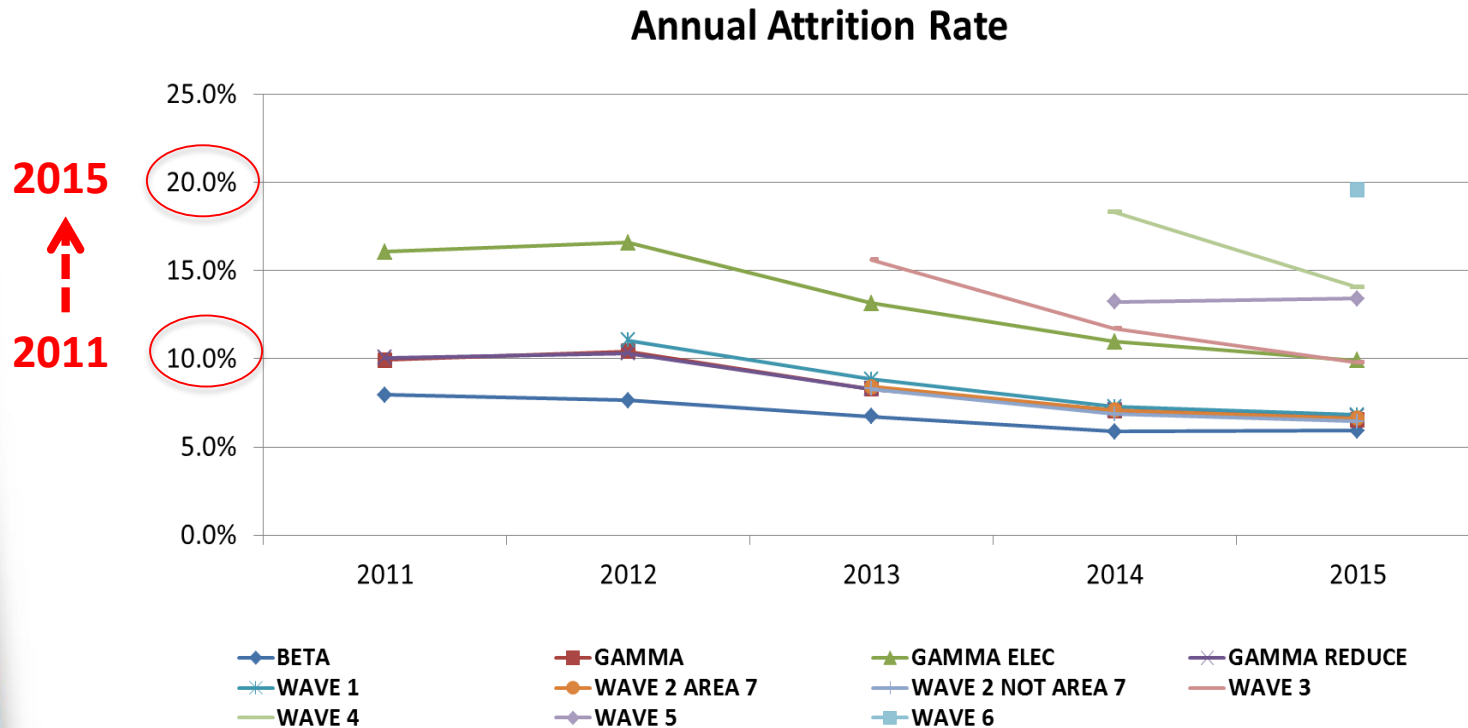
Declining Savings (Wave Level)



Consequences

- Need to launch new waves regularly
- Potential long-term sample frame problem (lower savings potential)
 - Past preference for higher energy users
 - Increased proportion of previously-treated households

Increasing Attrition



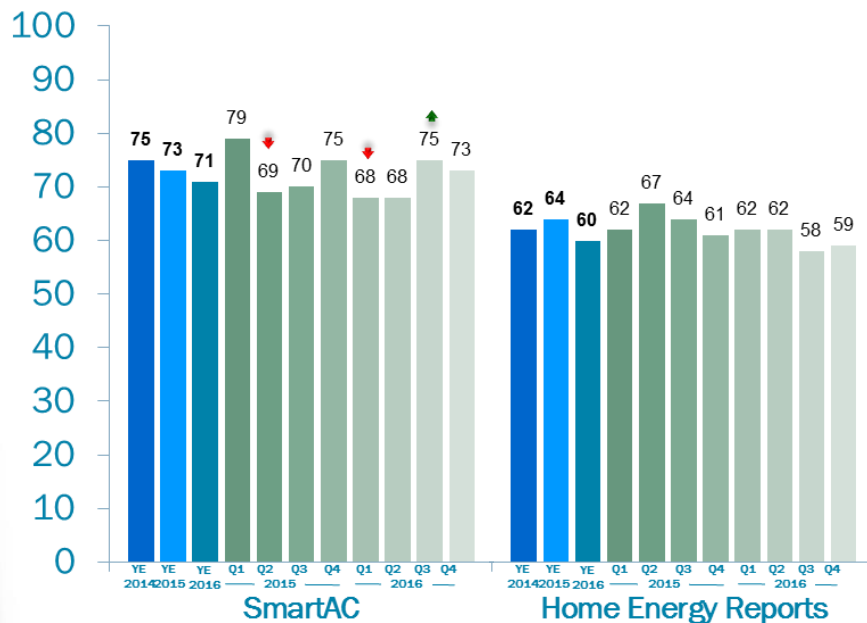
➤ Unclear explanation

- Program specific?
- Macro trends?

➤ Investment with lower return

- Impossible to claim credit on attrited participants

Lack of Customer Engagement



Quick Fix

Something you can do right now

☐ Turn off your computer at night

It may be convenient to leave your computer on at night, but turning it off could save you one-third of the computer's energy costs depending on your use and power management settings.

The U.S. Department of Energy assures that switching a computer on and off multiple times does not negatively affect its lifetime. Also, machines that run constantly are more likely to wear out their fans.

Remember to turn off your monitor, too.

SAVE UP TO
\$105 PER YEAR

➤ Low satisfaction

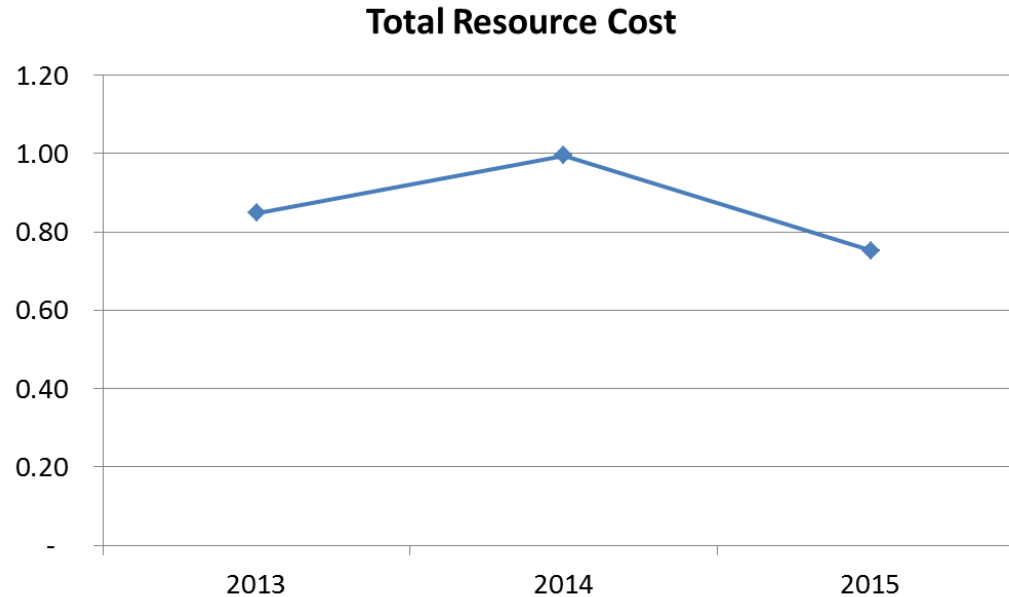
- Opt-out design
- Neighbor comparison

➤ Lack of engagement, poor cross-participation

- Disconnect between message (saving energy) and messenger (utility)
- General and repetitive tips

Example of a Tip (old version)

Low Cost-Effectiveness



- **Inefficient way to capture all program benefits**
 - Conservative refrigeration load shape (flat)
 - Demand savings
- **One-year EUL**
 - Under-value lifecycle savings and over-value first year savings
 - Contradicts persistence studies

Tactics to be Tested

➤ Increase savings

- Widen the sample frame (control group cannibalization, reduce exclusion criteria...)
- Tailor treatment (instead of “one-size-fits-all”)

➤ Increase customer engagement

- Engage customers with eHER to bring online participation
- Create personalized experiences with encouragement and positive feedback

➤ Increase cost effectiveness

- Adjust EUL to exploit savings persistence
- Identify negative savers and develop strategies (updated exclusion criteria, tailored treatment, additional treatment...)

PG&E: Program Experience

- **Looking Ahead:** PG&E identified a number of hurdles to an accurate evaluation of their HERs program impact and to increasing energy savings in the future, including:
 - **Here today, gone tomorrow:** PG&E counts all energy a customer saves towards program totals, but if a high saver moves, even within program territory, those savings can't be counted towards the program since savings are counted against baseline data.
 - **Renters:** Programs that invest in renters make them better savers, but it's difficult to capture the full spectrum of their savings.
 - **Cross-Participation:** Oftentimes, HERs households also participate in other programs (e.g., rebates, etc.). PG&E avoids double-counting by identifying customers participating in multiple programs and accounting for the savings from other programs.

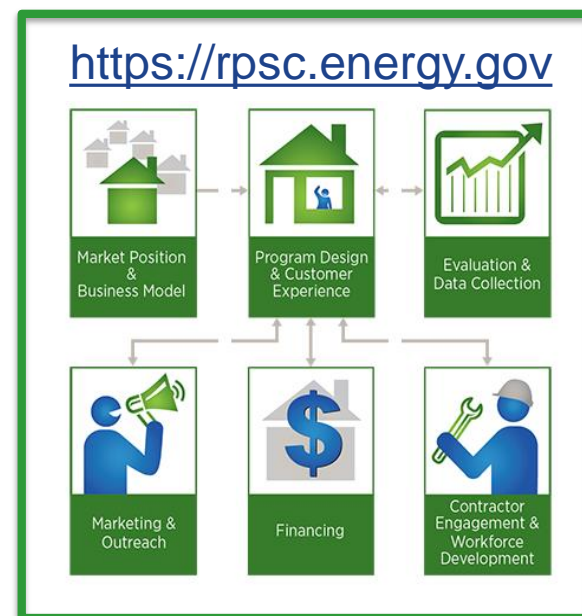
PG&E: Lessons Learned

- **You don't know me!** With HERs reports, customers may feel that their unique situation has not been considered or that the comparison to neighbors is unfair.
 - **Bringing People Online:** By sending email messages similar to paper reports with added features (hyperlinks, images), PG&E tries to attract customers to its online portal where it provides more in-depth, personalized energy information (rates, audit info, rebates, etc.).
- **Why This Messenger?** Many homeowners do not understand why a utility would want to reduce energy use when they *sell* energy.
 - PG&E is trying to create positive interactions with customers to build trust and clarify how they can make more money when people use less.
 - Other HER programs use third-party implementers or use an opt-in rather than an opt-out design for the HERs.

Related Resources in the Residential Program Solution Center

Explore resources related to behavioral change and energy report data usage:

- Learn how energy efficiency programs have used social norms via home energy reports to drive behavioral change in this [paper](#).
- See how insights from environmental psychological research can be applied by programs to encourage behavior change, in this [Pacific Institute for Climate Solutions report](#).
- Explore the long-term savings and cost-effectiveness implications of four home energy report programs in this [Cadmus report](#).



- Check out the latest [Proven Practices](#) post on [Leveraging Broad Program Benefits](#).
- The Solution Center is continually updated to support residential energy efficiency programs—[member ideas are wanted!](#)

2017 Better Buildings Summit

Registration is now open!



Be sure to [register today](#) for the 2017 [Better Buildings Summit!](#)



Spread the word:

[#BBSummit17](#) registration is right around the corner. Get ready to learn about expert [#EnergyEfficiency](#) enhancements <http://bit.ly/2iZCMsB>

GET SOCIAL WITH US



Stay engaged and connected with the Better Buildings Residential Network and our partners from the residential and multifamily sectors!

Follow us to plug into the latest Better Buildings news and updates!

Share with us your top stories on how your organization is accelerating energy savings through efficiency upgrades, strategies, and investment!



[Better Buildings Twitter](#) with [#BBResNet](#)

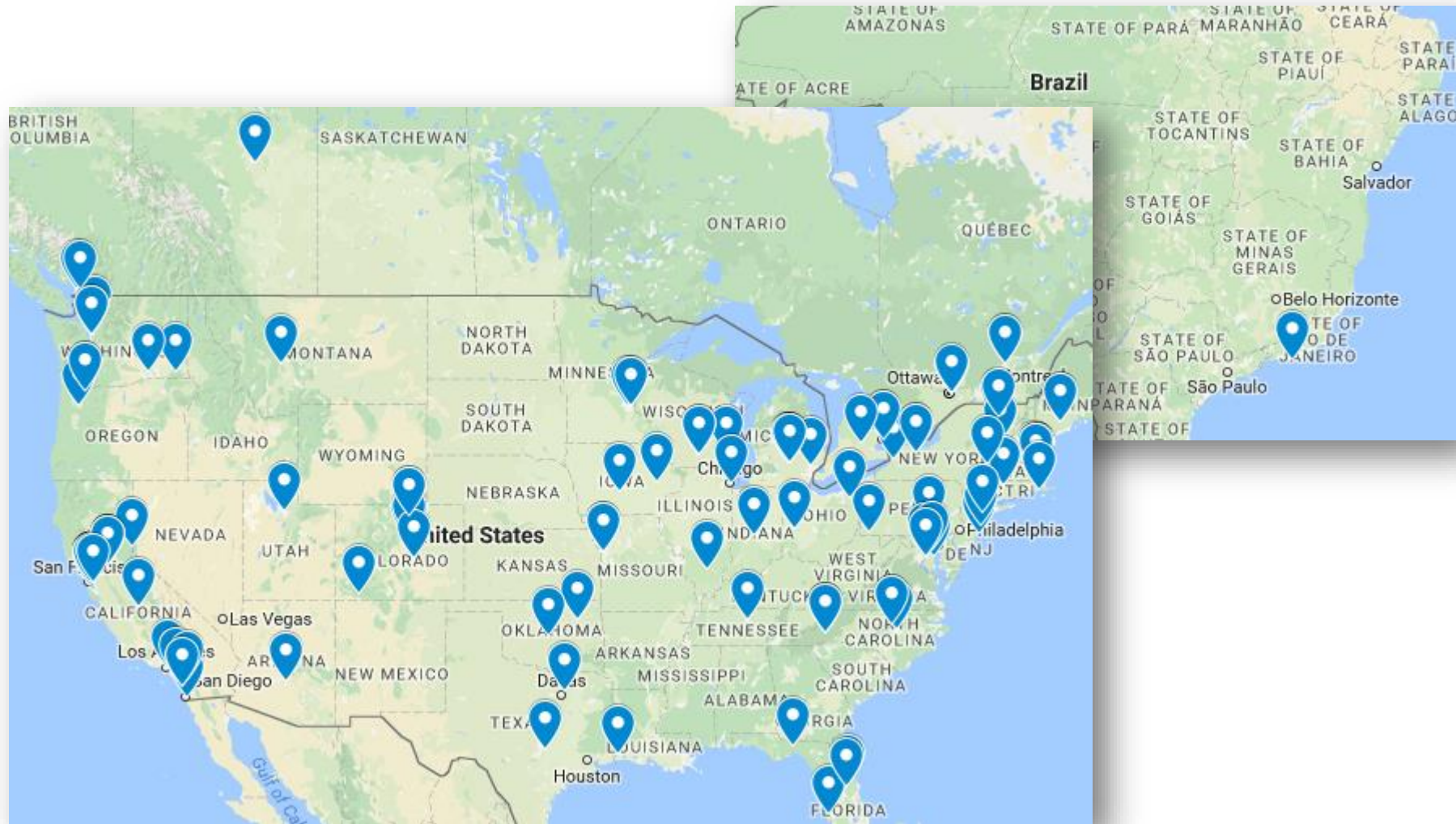


[Better Buildings LinkedIn](#)

We can't wait to hear from you!

Addenda: Attendee Information and Poll Results

Call Attendee Locations



Call Attendees: Network Members (1 of 2)

- Austin Energy
- Build It Green
- Building Performance Institute (BPI)
- Center for Energy and Environment (CEE)
- Center for Sustainable Energy
- City of Berkeley
- City of Cambridge
- City of Fort Collins
- City of Kansas City
- City of Plano
- CLEAResult
- County of San Luis Obispo
- Davis Energy Group
- Efficiency Maine
- Elevate Energy
- Energy Efficiency Specialists
- Energy Smart Home Performance
- EnergySavvy
- Enhabit
- Group14 Engineering Inc.
- High Country Conservation Center
- Homesol Building Solutions, Inc.
- Housing Authority of the City of San Buenaventura
- Institute for Market Transformation (IMT)

Call Attendees: Network Members (2 of 2)

- International Center for Appropriate and Sustainable Technology (ICAST)
- La Plata Electric Association
- Montgomery County Department of Environmental Protection
- NeighborWorks of Western Vermont
- New York State Energy Research & Development Authority (NYSERDA)
- Northeast Energy Efficiency Partnerships (NEEP)
- ResiSpeak
- Resynergy Systems
- Rocky Mountain Institute (RMI)
- Rural Ulster Preservation Company (RUPCO)
- Seventhwave
- Stewards of Affordable Housing for the Future
- The Insulation Man, LLC
- TRC Energy Services
- Vermont Energy Investment Corporation (VEIC)
- WattzOn
- Wisconsin Energy Conservation Corporation (WECC)

Call Attendees: Non-Members (1 of 5)

- 1000 Home Challenge
- 2rw Consultants
- A New Energy Solution Today
- Action Research
- American Electric Power Company Inc.
- Alaska Housing Finance Corporation (AHFC)
- Akin & Associates
- ASC Energy Services
- Association for Energy Affordability (AEA)
- AtSite
- BA Consult
- Ballarat Consulting
- Bank of Montreal
- British Columbia Institute of Technology
- BKi
- Blue Ridge EMC
- BPA
- Buildings Performance Institute Europe
- Brand Cool
- Building Envelope Materials
- C40
- CA Energy Commission
- Cascade Natural Gas
- Canadian Home Builders' Association
- City of Asheville

Call Attendees: Non-Members (2 of 5)

- City of Atlanta, Mayor's Office of Sustainability
- City of Mesa, AZ
- City of Milwaukee, MI
- City of Mt. Vernon, Va
- City of Orlando, FL
- City of Santa Cruz, CA
- Codman SQ NDC
- County of San Diego
- California Public Utilities Commission
- Craft3
- Connecticut Green Bank
- D+R International
- Delaware Division of Energy and Climate
- Dimension Energetique
- Donna Arthur Landscaping
- Duke University
- Energy Information Administration
- Emerson
- Energy Maintenance Technologies
- Enbridge Gas Distribution Inc.
- Energy Analytics
- Energy Design Update
- Energy Innovation Task Force
- Energy Management Services
- Energy Resource Center
- Energy Smart Colorado at Walking Mountains Science Center
- Energy Wise Solutions
- Environment and Climate Change Canada

Call Attendees: Non-Members (3 of 5)

- Environmental Finance Center at UNC
- Florida Department of Agriculture and Consumer Services Office of Energy
- Fox Energy Specialists
- Franklin Energy Services, LLC
- Fraunhofer USA CSE
- FS Energy
- Glumac
- GoodCents
- Greater Minnesota Housing Fund
- Green Compass Sustainability
- Greenbanc
- Groundswell
- Hawaii Energy
- HILCO Electric Cooperative Inc.
- ICF International
- Idaho Division of Building Safety
- Insightful Healthy Homes Inc.
- Institut de Recherche d'Hydro-Québec
- Johnson Home Performance
- Kansas City Board of Public Utilities
- Landmark Group
- Lawrence Berkeley National Laboratory
- LGC
- Low Energy Edge Node Analytic Laboratories
- Maryland State Highway Administration

Call Attendees: Non-Members (4 of 5)

- Mayberry Energy Inspections
- Menlo Spark
- Michigan Dept. of Health & Human Services
- MKThink
- Montana Department of Environmental Quality
- Minnesota Pollution Control Agency
- Montana Department of Public Health & Human Services
- National Fuel
- Natural Resources Canada
- New Bedford Housing Authority
- New Jersey Natural Gas
- North Carolina Sustainable Energy Association
- Northeastern University
- National Renewable Energy Laboratory (NREL)
- Oakland Livingston Human Service Agency
- Off The Grid Renovations, LLC
- Oregon Institute of Technology
- Okaloosa Gas
- Oregon Dept. of Energy
- Pennsylvania Public Utility Commission
- Pacific Northwest National Laboratory
- Passive House
- Pacific Gas & Electric (PG&E)
- Proctor Engineering Group
- Purdue University

Call Attendees: Non-Members (5 of 5)

- s2e Technologies
- Salcido Solutions LLC
- Salesforce
- Sanfilippo Solutions, Inc.
- Sarasota Co
- Seattle City Light
- Secvitel
- Socioeconomic Data and Applications Center
- See Change Institute
- Sierra Business Council
- San Joaquin Valley Clean Energy Organization
- Smaart House
- Sacramento Municipal Utility District
- Snohomish County PUD
- Solar Habitats, LLC
- Solar Home Builders
- Stone Energy Associates
- StopWaste
- sustainable design + behavior
- Southwest Energy Efficiency Project
- Tay River Homesmiths
- Texas Commission on Environmental Quality
- The Energy Coalition
- TownGreen 2025
- Center for Sustainable Building Research
- University of Maryland
- University of Minnesota
- University of North Carolina Charlotte
- U.S. Green Building Council
- Virginia Tech

Opening Poll

- Which of the following best describes your organization's experience with using data from home energy reports?
 - Very experienced/familiar – **28%**
 - Limited experience/familiarity – **27%**
 - Some experience/familiarity – **22%**
 - No experience/familiarity – **17%**
 - Not applicable – **6%**

Closing Poll

- After today's call, what will you do?
 - Seek out additional information on one or more of the ideas – **64%**
 - Make no changes to your current approach – **22%**
 - Consider implementing one or more of the ideas discussed – **11%**
 - Other (please explain) – **3%**