Customer Targeting to Enhance Energy Efficiency Savings at the Meter

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Convergence Data Analytics

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Customer Targeting – A Primer

Energy Efficiency Funding

California: $1 Billion

Insights from Previous Research

Consistent patterns from recent billing analysis studies on residential EE programs:

1. Impacts observed at the meter vary widely among program participants.
2. A small fraction of participants accounts for a high fraction of the total metered savings.
3. A significant number of participants display near neutral or *negative* savings when assessed at the meter.

[1]See for example, *AMI Billing Regression Study (Phase I).* Evergreen Economics, 2016. CALMAC ID: SCE0383.01 and *PG&E Whole House Program: Marketing and Targeting Analysis*. Opinion Dynamics Corporation, 2014. CALMAC ID: PGE0302.05

Study Objectives: Can We Predict Who Will Save?

Questions:

1. Can we predictively identify customers with high propensity to save?
2. If yes, what are the most effective targeting schemes and why?
3. What is the overall impact of targeting?
4. What other implications/insights arise?

Covered in This Talk

The Dataset:

- Minimum 1-year of pre- and post-intervention hourly interval electric usage data for participating customers

PG&E's whole home retrofit (Advanced Home Upgrade) program. These data also used for development of CalTRACK methods.[2]

- Central Valley (Climate Zones 11 – 13) only

- Several other programs and regions have been studied

[2]http://www.caltrack.org/

Methods

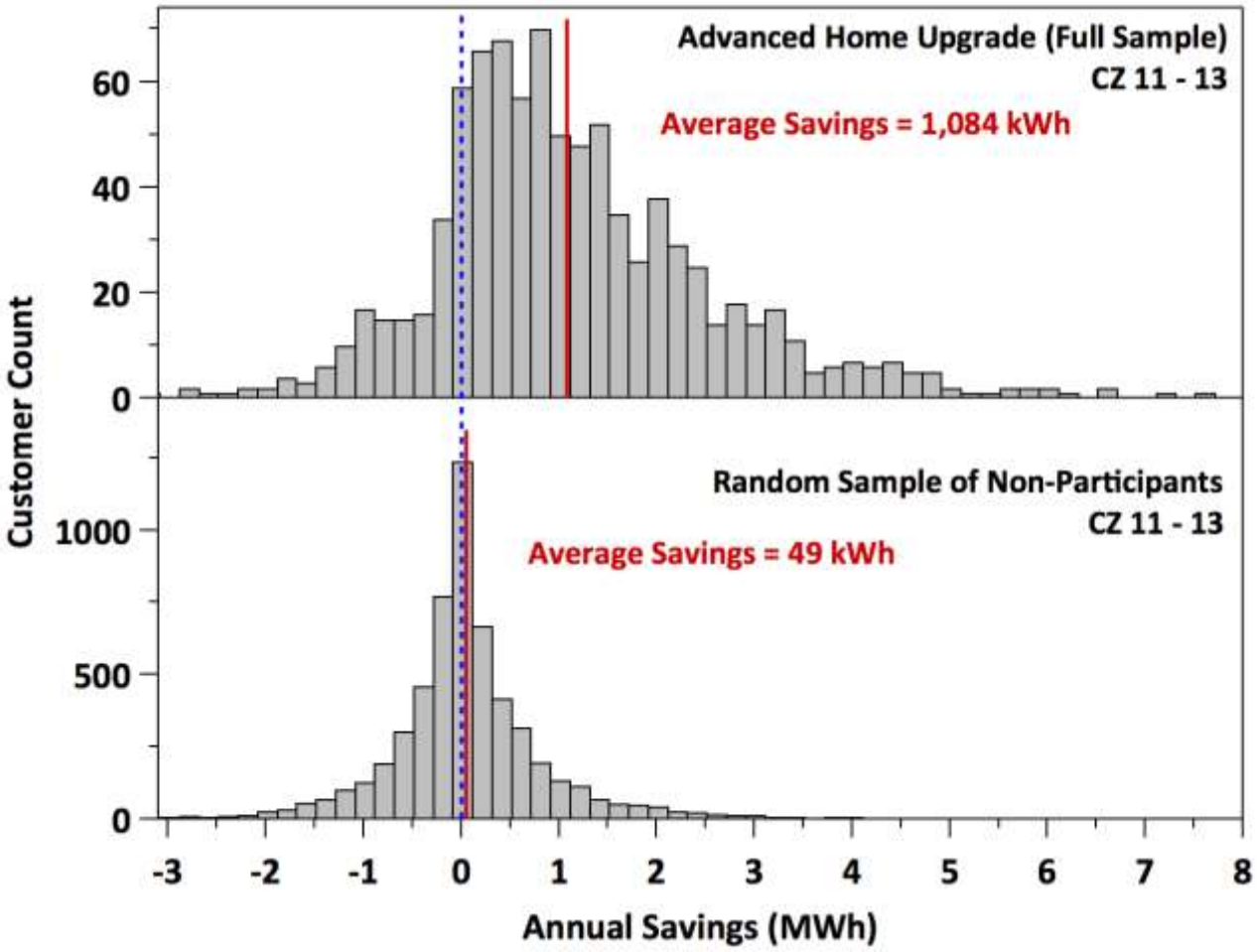
Approach:

1. Conduct pre/post billing analysis for each customer
2. Compute features for each customer based on pre-program AMI data
3. Rank-order and filter customers based on usage features
4. Compare savings of resulting subsets with the full sample

The Nature of Metered Savings

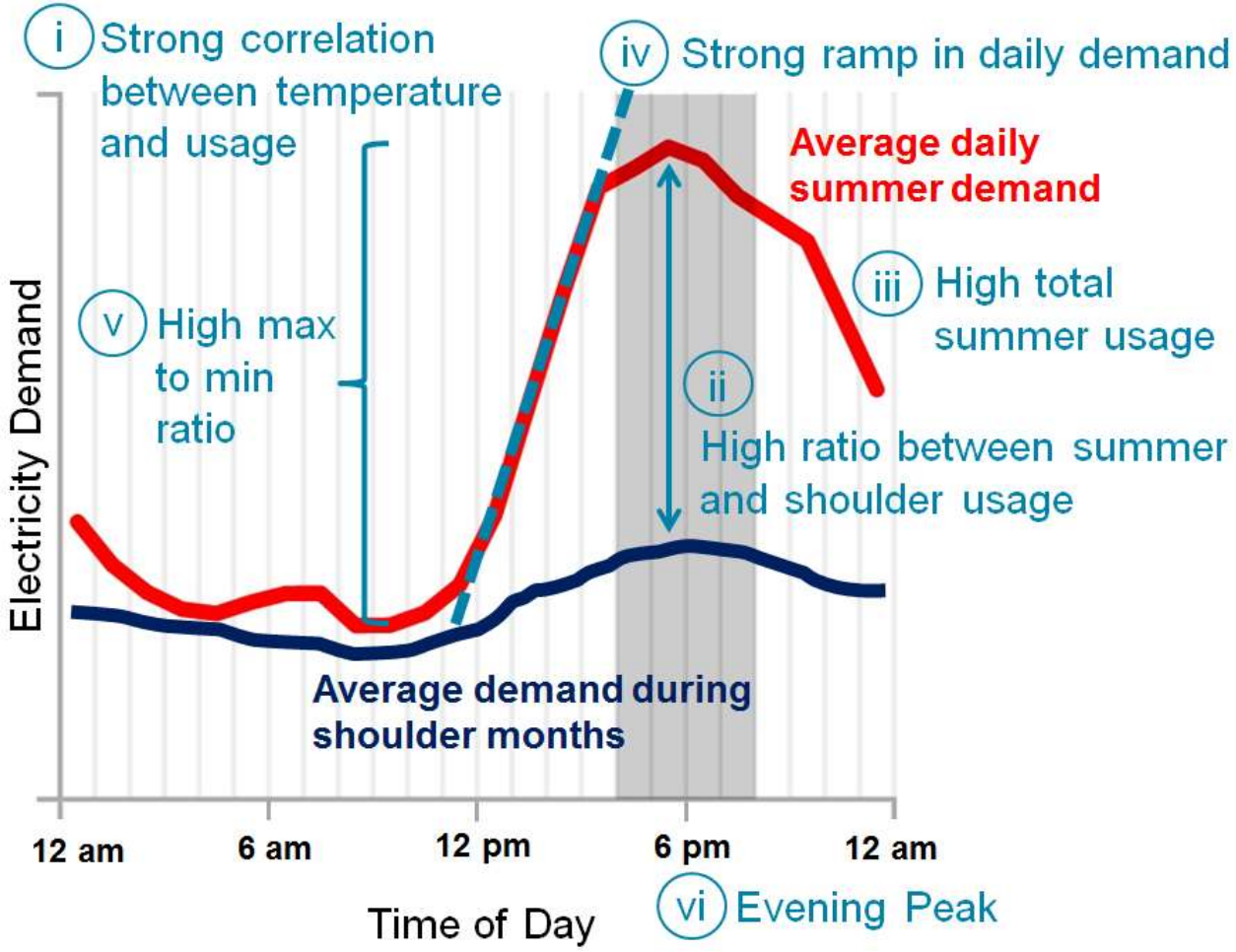
- EE program intervention shifts and broadens the distribution of pre – post usage.

- Many near-neutral and negative savers remain



Defining Features and Targeting Scheme

Based on participating customers pre-program usage data, features are defined and tested as targeting criteria.



Two impactful features:

1. **Total Summer kWh Usage**
2. **Ratio of Summer to Shoulder-period kWh ratio**

The Targeting Scheme

Targeted customers meet threshold values for both average daily summer kWh usage and the ratio of summer-to-shoulder month kWh usage ratio

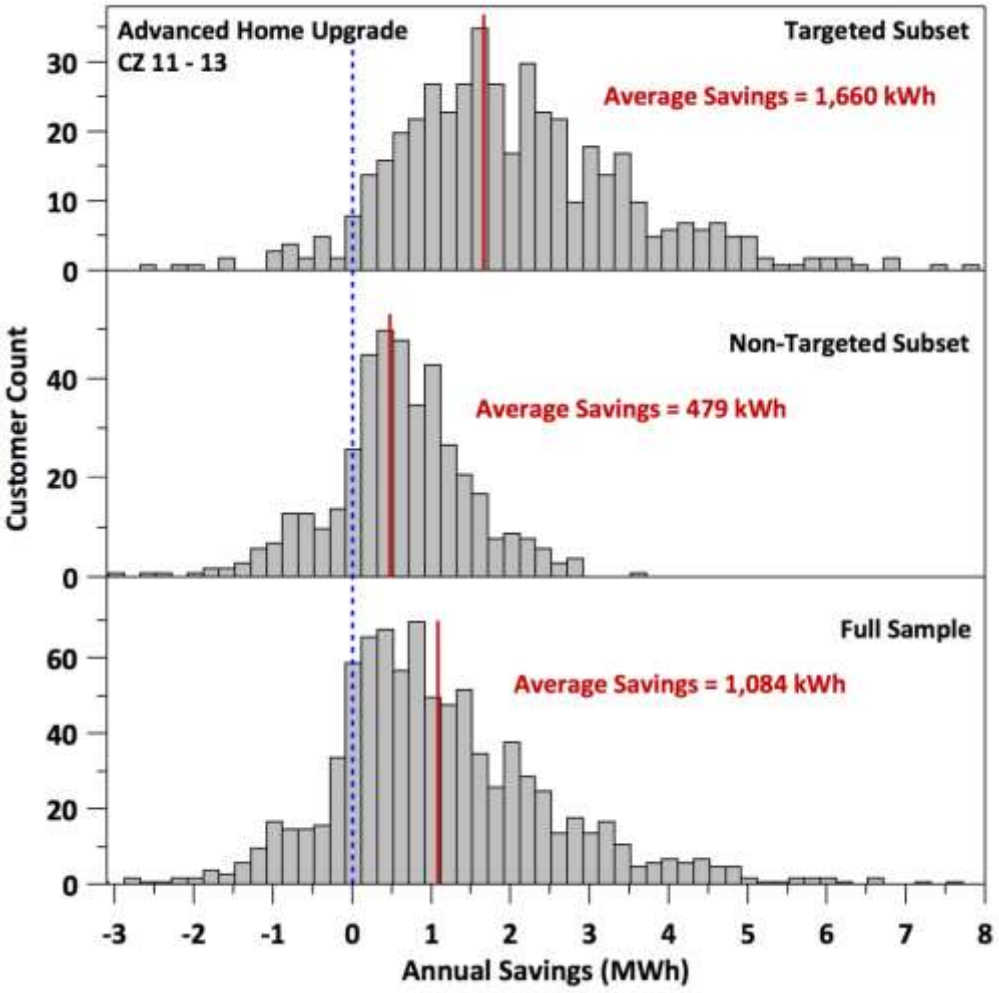
Table 1: AHU Central Valley Targeting Scheme; Threshold Filter Values

% Customers Filtered Out	Average Daily Summer kWh	Summer-to-Shoulder[a] Usage Ratio
10	12.93	0.827
24	19.60	0.827
49	26.98	1.138
73	39.58	1.498
89	42.14	1.805

[a]Summer = June, July, August; Shoulder = November, February, March

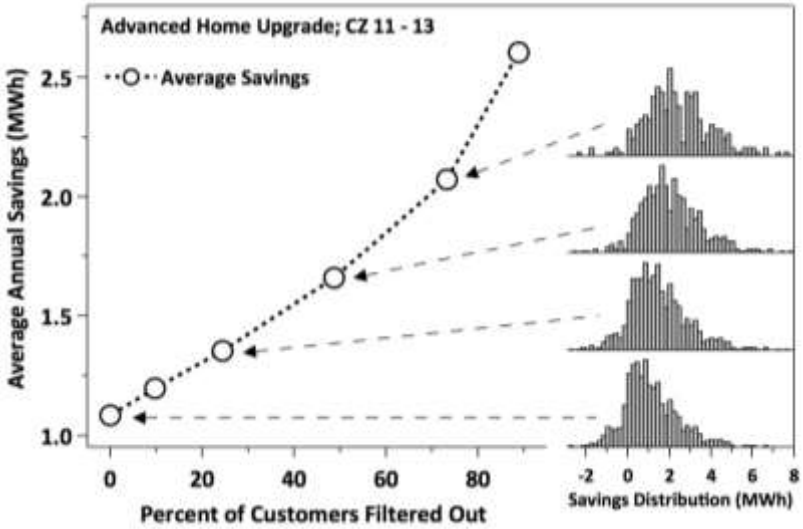
These filters can be tuned to increase the rigor of the targeting scheme and select a smaller number of customers.

Results: Targeting the Top Half

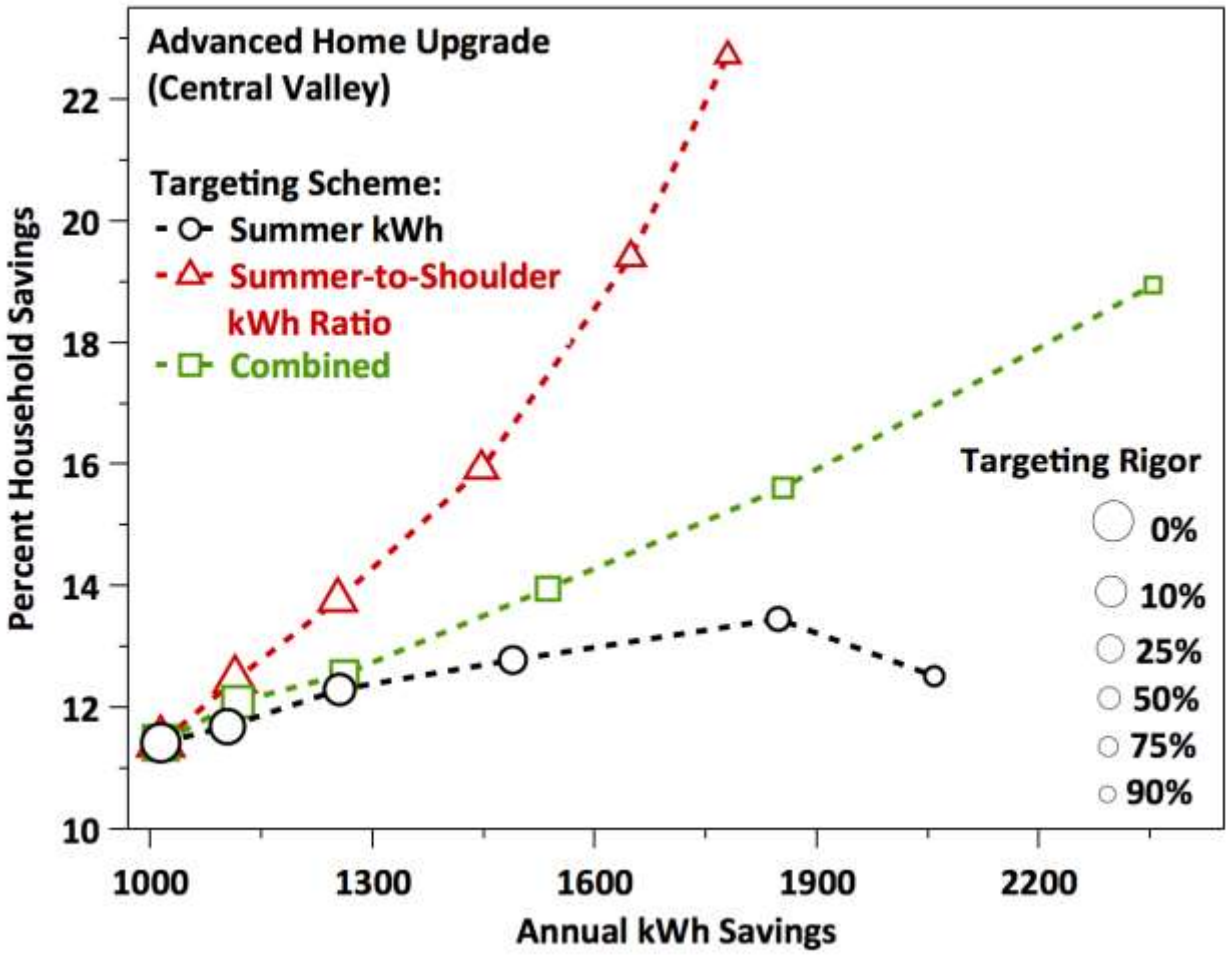


Average targeted customer savings are 53% greater than the full sample and 3.5x greater than non-targeted customers.

Tuning targeting rigor:



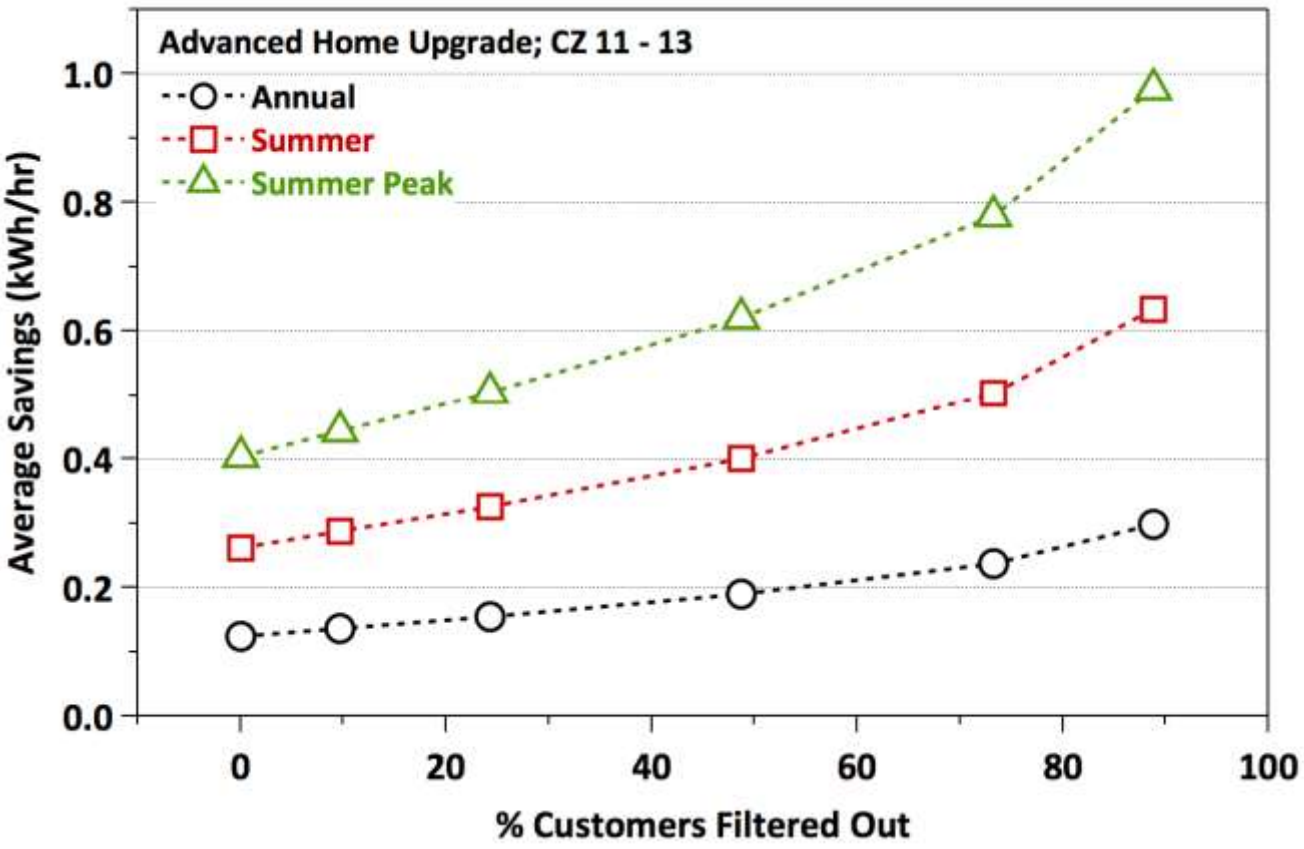
Targeting for Depth of Savings



Targeting based only on total usage is effective at increasing average savings, but not depth of savings.

Targeting based on usage and efficiency criteria can be more effective.

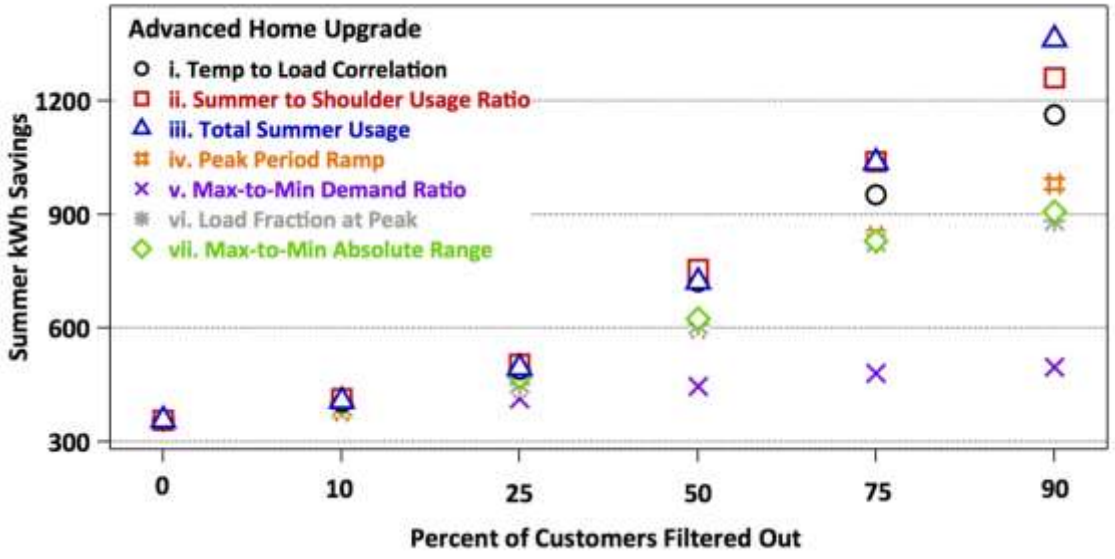
Targeting to Enhance Peak Period Savings

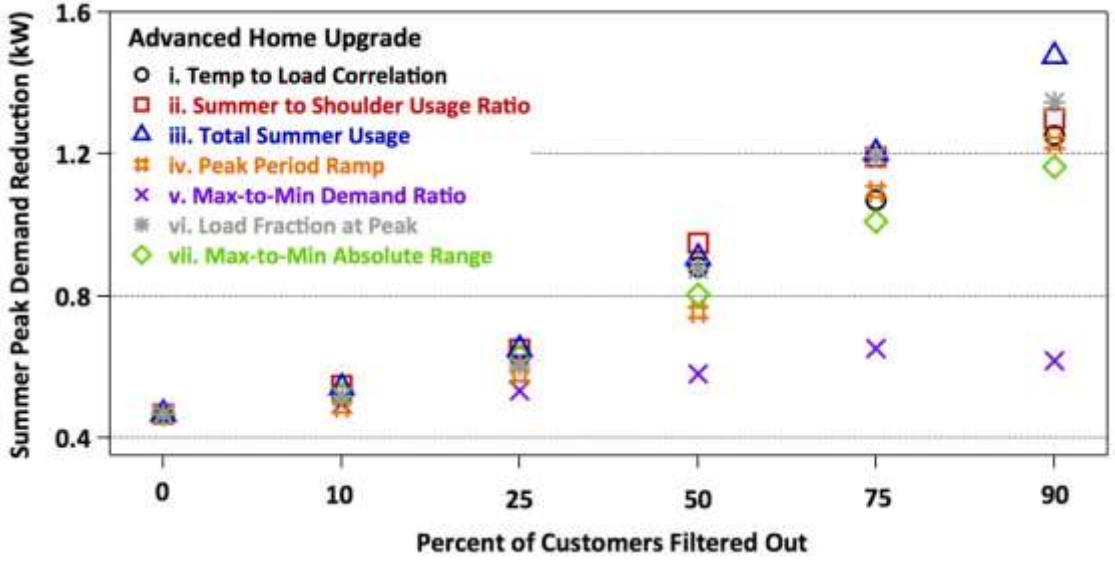


A high percentage of AHUP savings originates from the summer and summer peak periods

Targeting can substantially enhance summer peak periods savings.

Investigating Performance of Individual Criteria





- Individual filter performance is highly varied
- Summer kWh (iii) and Summer-to-Shoulder period usage ratio (ii) perform well for both kWh savings and peak demand reduction.
- Average daily Max-to-Min demand ratio (v) underperforms as an individual filter.

Customer Targeting and Pay for Performance

PG&E's Residential P4P program launched late 2017

Savings at the Meter = Incentives

Build It Green®

HEA

Both P4P programs are targeting customers

Implications

Pay for Performance

- Customer targeting within Pay-for-Performance (P4P) program designs can help ensure savings materialize at the meter.
- Within deemed programs the value proposition of customer targeting is not as strong

EE as a Grid Resource

- Along with other DERs, EE is being called upon to meet a variety of grid needs (peak demand reduction for load constrained areas, mitigation of high procurement costs, etc.)
- Customer targeting can make EE more competitive and reliable as a distributed energy resource

Study Objectives: Can We Predict Who Will Save?

Questions:

1. Can we predictively identify customers with high propensity to save? **Yes!**
2. If yes, what are the most effective targeting schemes and why? **Combining Total usage and Temp-to-Load Correlation criteria is particularly effective at identifying threshold ability to save and inefficiency.**
3. What is the quantitative effect? **When eliminating half of customers per capita savings are observed to increase by 50 – 250%**
4. What other implications/insights arise? **Many.**

Full Whitepaper Available

Draft Whitepaper: *Customer Targeting for Residential Energy Efficiency Programs: Enhancing Electricity Savings at the Meter*

- Posted to the Public Documents Area: http://www.energydataweb.com/cpuc/home.aspx
- Search 'Targeting'

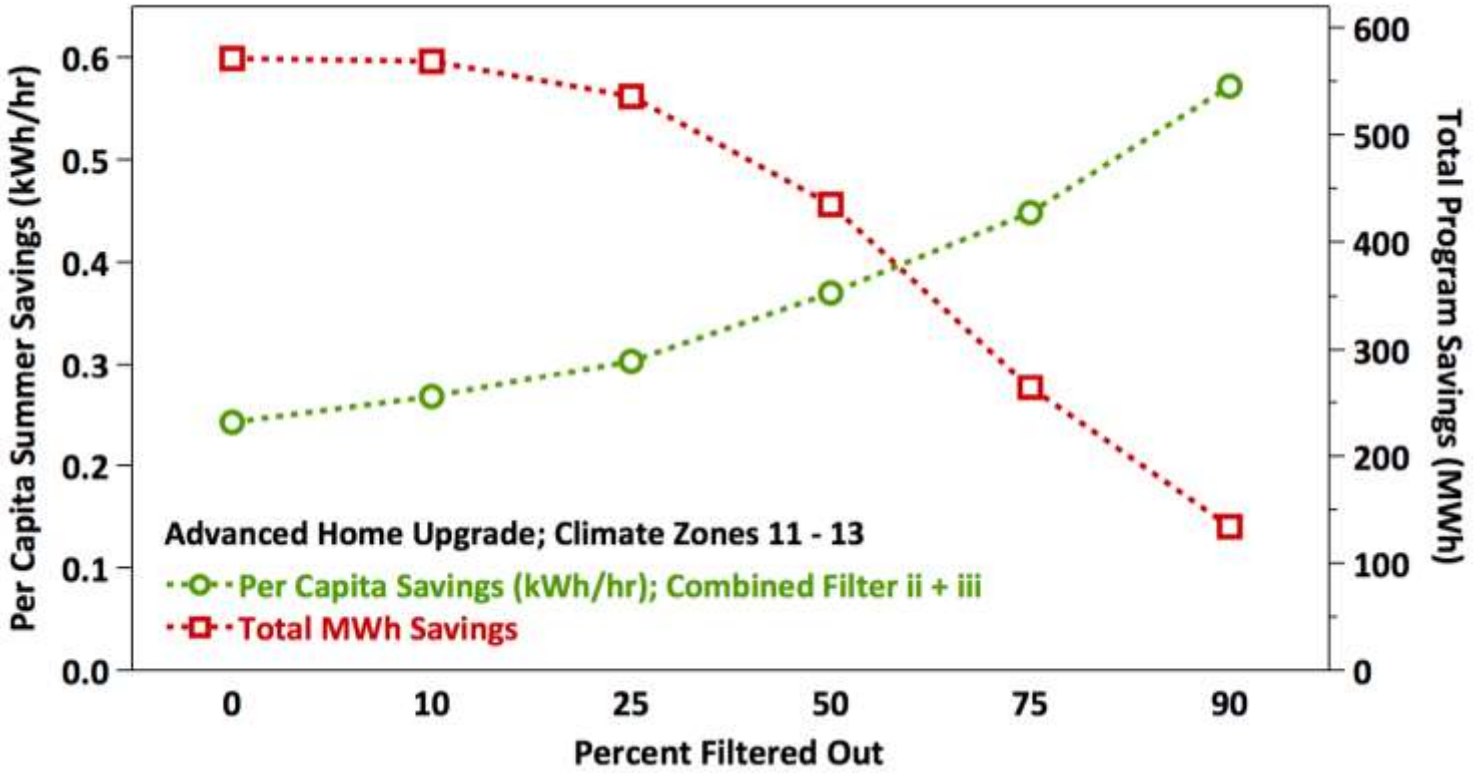
Next Steps

- PG&E and Convergence Data Analytics are currently studying customer targeting for the Small and Medium Business Sector and for gas savings within the residential sector
- PG&E is incorporating customer targeting within the Residential Pay for Performance Program
- Look for a summary paper at ACEEE Summer Study

Appendix

Convergence
Data Analytics

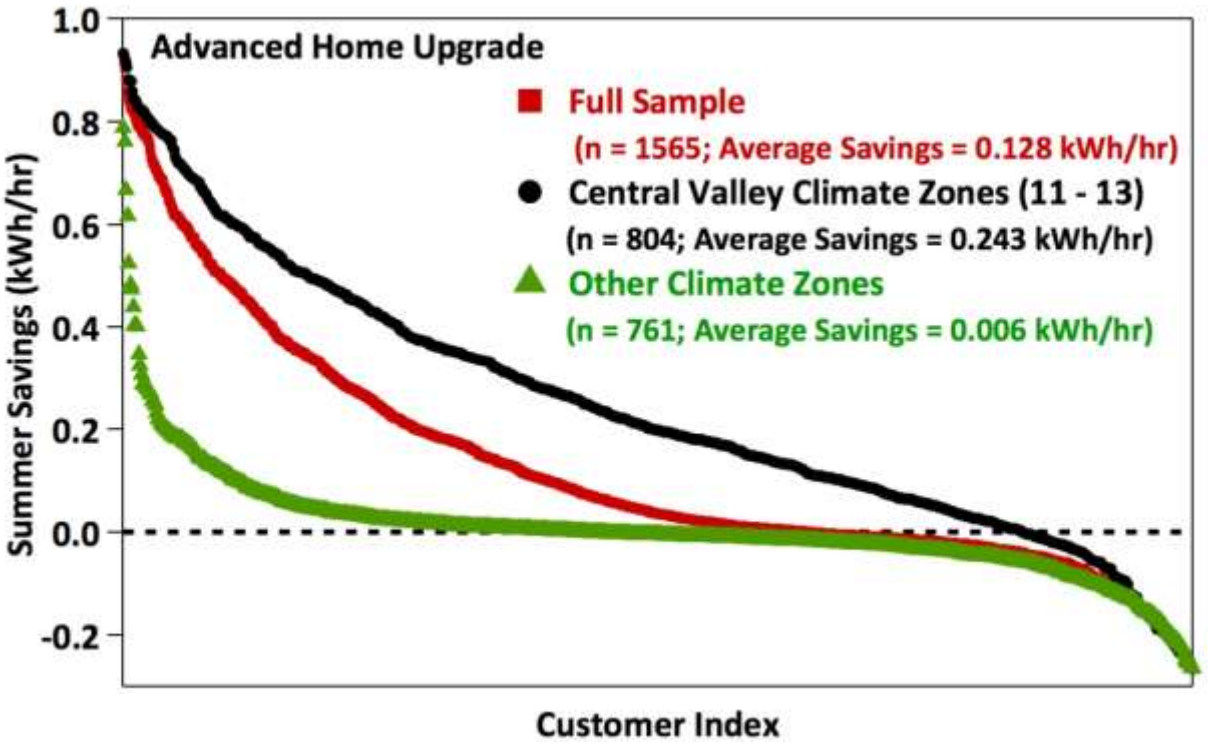
Finding the Right Balance (Central Valley Subset)



- 94% of savings persist after targeting removes one quarter of the sample.
- 76% of savings persist after targeting removes half of the sample.

But…More than half of savings is lost after removing 75% of sample.

Results by Climate Region

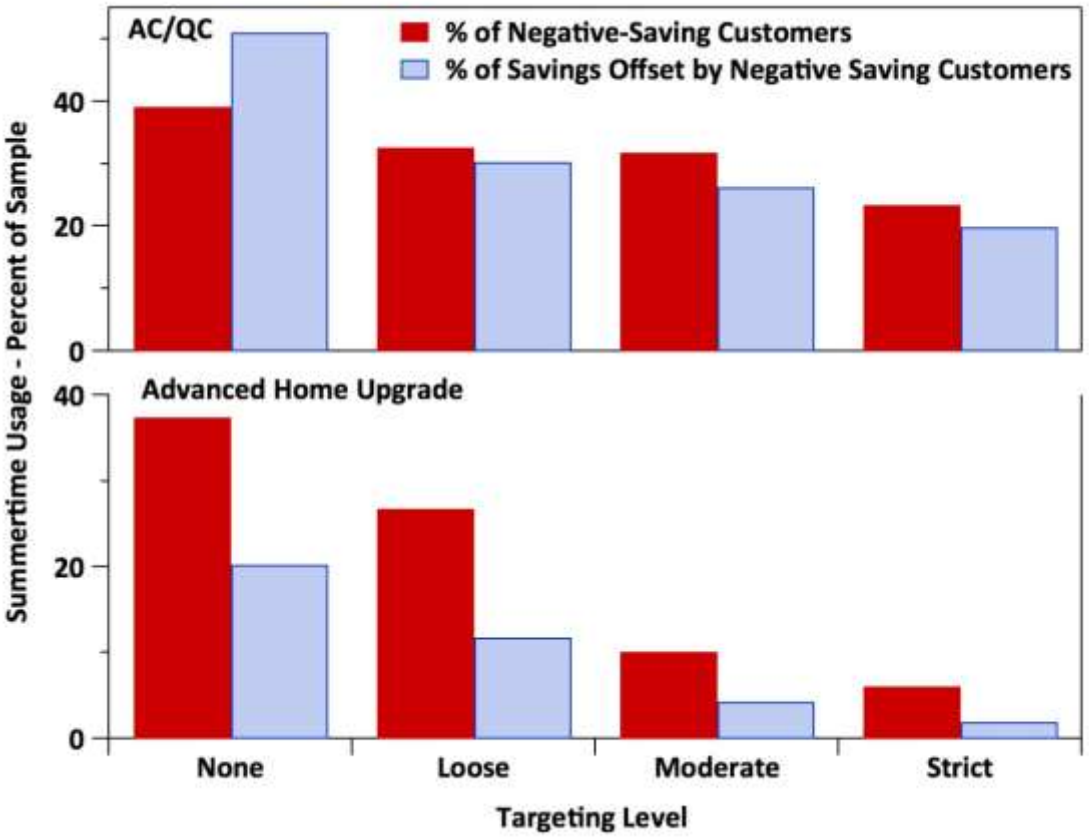


- Central Valley households yield much higher average electricity savings.
- A high percentage of customers removed by targeting are low-performing households in temperate regions.

Implications:

- On average, building shell and AC measures are not observed to yield substantial electricity savings in mild climate regions.
- Targeting schemes can be made more precise if developed for specific climate regions, etc.

Drivers Behind Increased Average Savings: Limiting Negative Savers



The targeting scheme is effective at limiting negative savers and negative savings.

- In both programs nearly 40% of customers are observed to consume more after program intervention.
- After moderate targeting in AHU, only 10% of participants are negative savers.

Targeting within the Central Valley

- Summer kWh (iii) and Summer-to-Shoulder usage ratio (ii) are high performing individual filters.
- ii and iii are combined (see whitepaper for more details)

Recommended Central Valley Targeting Scheme; Threshold Filter Values

% Customers Filtered Out	Average Daily Summer kWh (iii)	Summer to Shoulder[a] Usage Ratio (ii)
10	12.93	0.827
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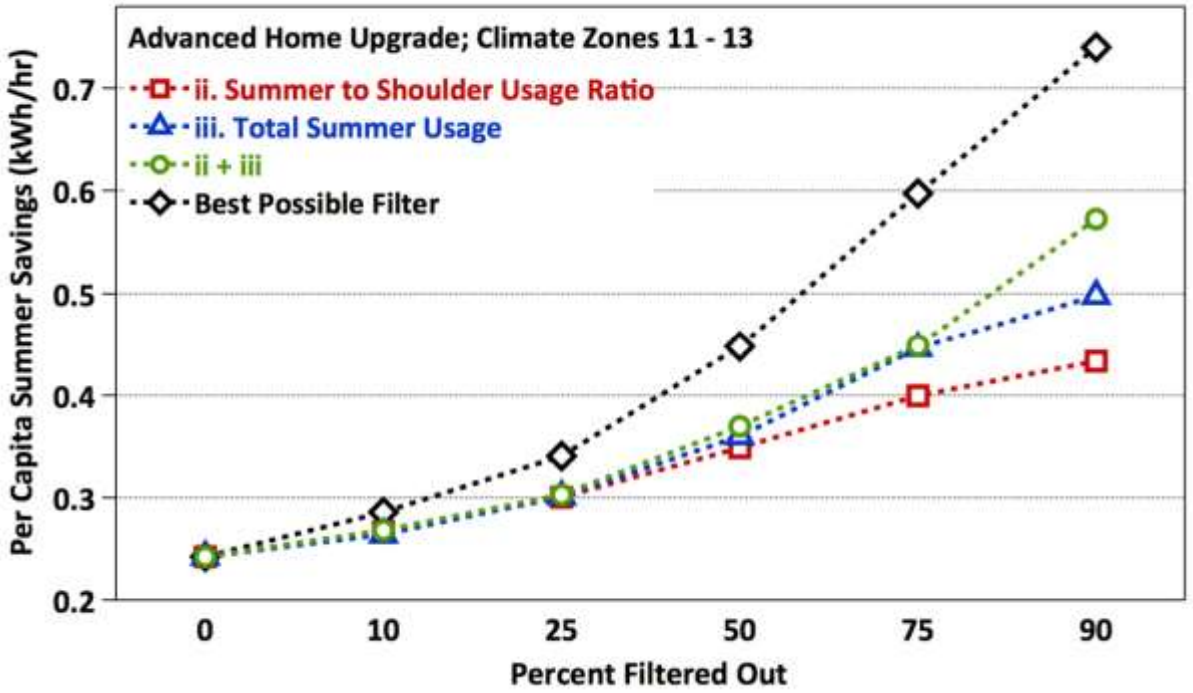
50	26.98	1.138
75	34.58	1.498
90	42.14	1.805

[a]Summer = June, July, August; Shoulder = November, February, March

Results and comparison to 'best possible' scenario:



Customer Targeting: In Theory

Hypothesis: A well-rounded customer targeting scheme should at a minimum include both usage and efficiency criteria.

Hypothetical: Whom among the following three customers should be targeted for an AC/building shell EE program?

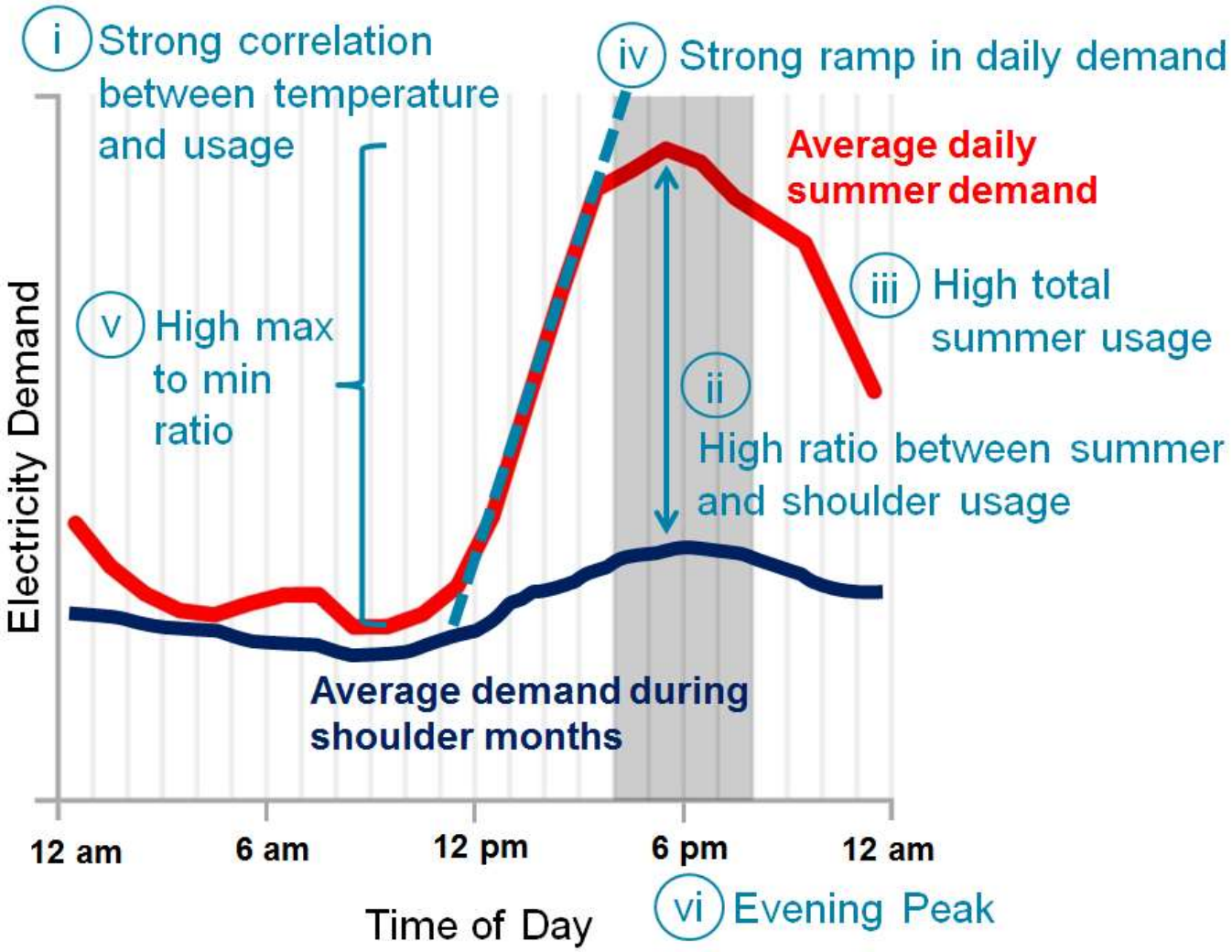
Outside High Temperature		Daily Electricity Usage		
		Customer A	Customer B	Customer C
Day 1:	70 °F	3 kWh	10 kWh	20 kWh
Day 2:	90 °F	6 kWh	17 kWh	22 kWh

Customer A: High Temp-to-Load correlation but low total usage

Customer B: Relatively high usage and Temp-to-Load correlation

Customer C: High usage but low Temp-to-Load correlation

The Ideal Customer for EE Intervention



These general features can be determined from AMI data

Customer Targeting and PG&E's EE Business Plan

Customer targeting is a key strategy within PG&E's Business Plan

"AMI data offers PG&E the ability to better understand site-specific customer energy usage and to tailor offerings that benefit customers most in need of specific energy efficiency offerings…PG&E plans to target customers who are expected to yield the greatest energy savings, energy bill reductions, and/or grid-value." p. 1-9

Residential Intervention Strategy 1 – Individual Customer Targeting via Interval Data Analysis

Source: Pacific Gas and Electric Company's Energy Efficiency Business Plan