

Behavior-Based Energy Efficiency Programs

Presenters: Summer Goodwin – Bonneville Power Administration
Laura McCrae – Snohomish County PUD
Matthew Babbitts – Clark Public Utilities
Joel Smith – Puget Sound Energy

Welcome. Today's webinar is being recorded and will be posted at:

- www.E3Tnw.org
- www.ConduitNW.org

You may submit questions at any time during the webinar. We'll answer them during the Question & Answer session after the presentation.



Behavior-Based Energy Efficiency (BBEE)

Summer Goodwin

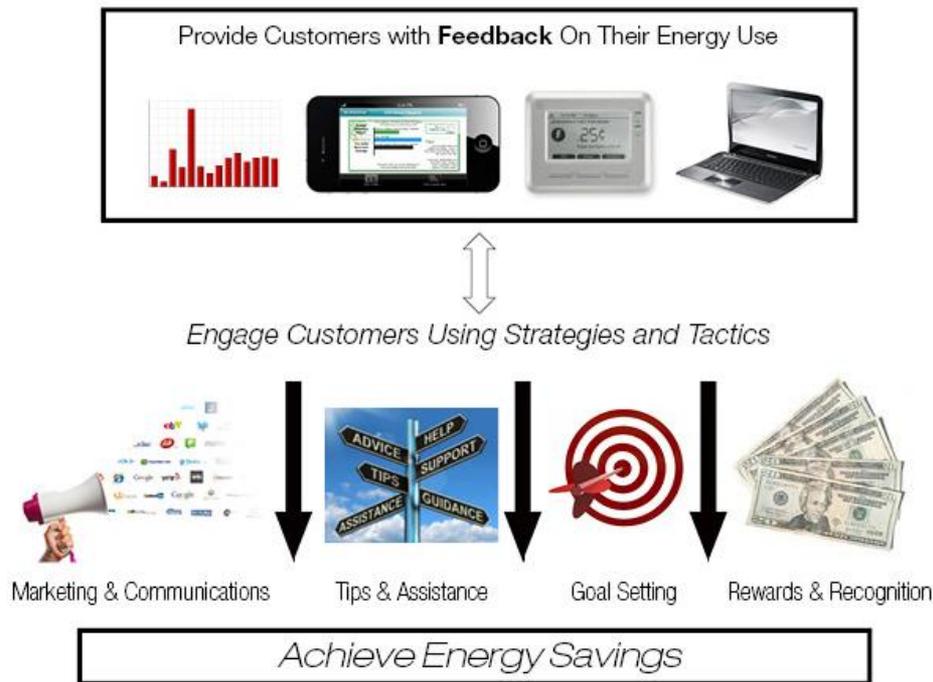
BBEE Project Manager

Bonneville Power Administration



What are behavior-based energy efficiency programs?

BSEE programs focus on energy savings resulting from changes in individual or organizational behavior and decision-making.



What is the potential?

- 2% of the residential sector load
- Relatively easy and cheap to implement

What are the risks?

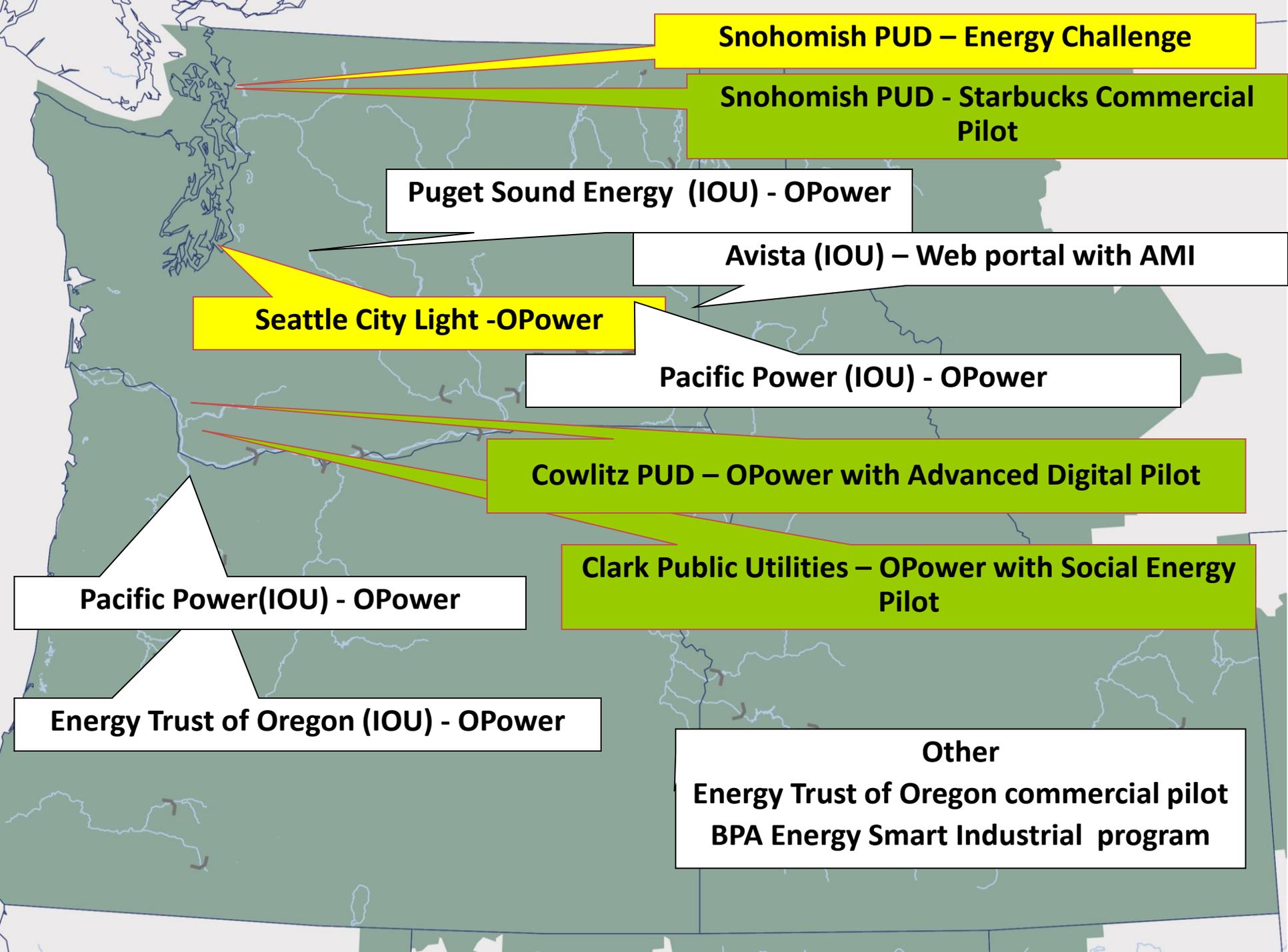
As Energy Efficiency becomes increasingly larger portion of resource portfolios, savings need to be valid and reliable

- We don't know how long these savings last
- We aren't sure if all of the savings are from behavior change or something else (light bulbs or other measures)

BPA BBEE Strategy

Enable, validate and increase the amount and persistence of energy savings achieved through behavior based energy efficiency programs in the Northwest.

- Monitor and assess national and regional BBEE programs and identify and promote use of best practices
- Create policies that help our customers operate BBEE programs
- Collaborate with our customers and market partners to implement and evaluate



Snohomish PUD – Energy Challenge

Snohomish PUD - Starbucks Commercial Pilot

Puget Sound Energy (IOU) - OPower

Avista (IOU) – Web portal with AMI

Seattle City Light -OPower

Pacific Power (IOU) - OPower

Cowlitz PUD – OPower with Advanced Digital Pilot

Pacific Power(IOU) - OPower

Clark Public Utilities – OPower with Social Energy Pilot

Energy Trust of Oregon (IOU) - OPower

Other

**Energy Trust of Oregon commercial pilot
BPA Energy Smart Industrial program**

BPA Policy on BBEE Programs

- Customer utilities use Custom Program path
- Requires third party verification of savings
- Utility pays all costs up front
- BPA reimburses at \$0.025/kWh

What we expect to learn from the Pilots

- Snohomish PUD
 - Does competition between similar stores work?
 - Does competition between different businesses work?
- Cowlitz PUD
 - Do home energy reports deliver expected savings?
 - Does daily energy use data (AMI) increase savings?
 - Can digital media increase savings?
- Clark Public Utilities
 - Do home energy reports deliver expected savings?
 - Can social media increase savings?
- General
 - What does it take to get these programs up and running?
 - What do these savings cost?
 - Do savings persist?

Piloting Behavior Driven Energy Savings in the Small Commercial Sector

Laura McCrae

**Principal Utility Analyst –
Planning & Evaluation
Customer Strategy & Analytics
Snohomish County PUD**



Phase I Pilot Program Overview

- 5 project team members:



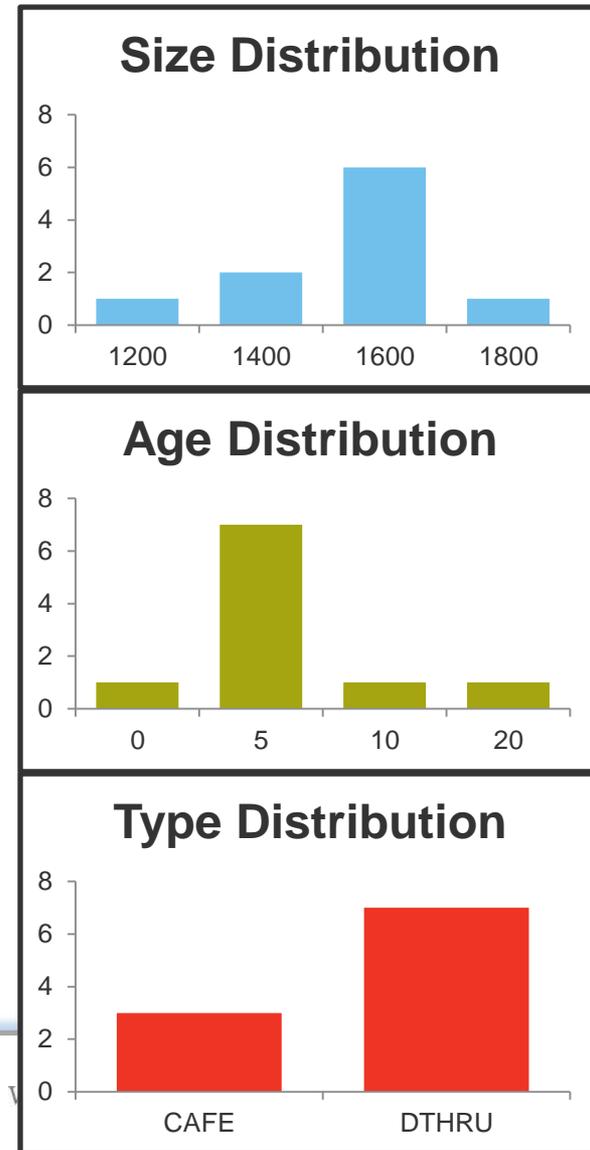
- Bonneville Power Administration funded a significant portion of the direct costs
- Pilot schedule ran March 2012 – March 2013

Pilot Program Goals

1. Demonstrate employee behavior change driven energy savings in the small commercial environment
2. Identify key program components and drivers for persistence
3. Develop a replicable, scalable program design
4. Pilot M&V approach for behavior based efficiency in small commercial buildings

Phase I Pilot - Hypothesis

Starbucks employees will reduce energy consumption when provided usage data and tips for saving, in the context of a competition



Phase I - Program Design

- design and manage energy saving competition
- reward top performers

Store partners implement energy saving behaviors

- analyze saving opportunities
- prepare and deliver engaging educational materials

Gather real time energy data

- meter upgrades
- data communication



Provide store partners access to real time energy information

- create metrics
- provide access to information portal
- Integrated communications

Provide guidance on energy saving behaviors

Phase I - Results

Electric Energy Savings



Communication



- Pooled Electric Savings: 4% (-1.8 – 9.0%)
 - 2.1% as compared to control stores
- Strong communication with winner and other high performing stores

Phase II-A : Starbucks Reports

- Test a less costly, lower touch approach
- Utilize existing utility and Starbucks infrastructure
- Leverage knowledge and materials from Phase I
- Deliver monthly utility reports with normative comparisons
- 110 Starbucks stores in BPA's service territory
- Pilot implementation Apr 2013 – Feb 2014



Phase IIB : Energy Challenge

- Test a modified Phase I design with 10-20 independent customers in a single business district competing on 2 teams
- Provide real-time electricity data, tips, two-way communication, and community engagement
- Extend the competition period
- Target of 10% savings
- Pilot implementation May 2013 – September 2014



Home Energy Reports, Web Portal and Social Media

Matthew Babbitts

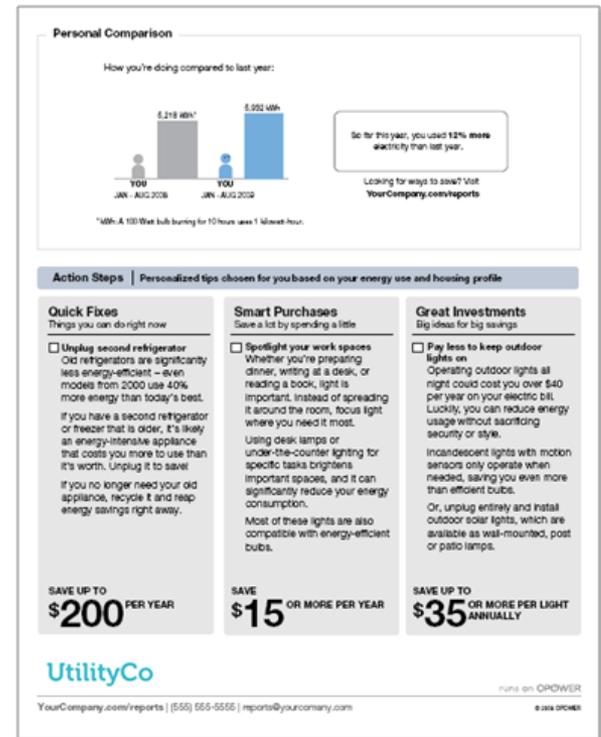
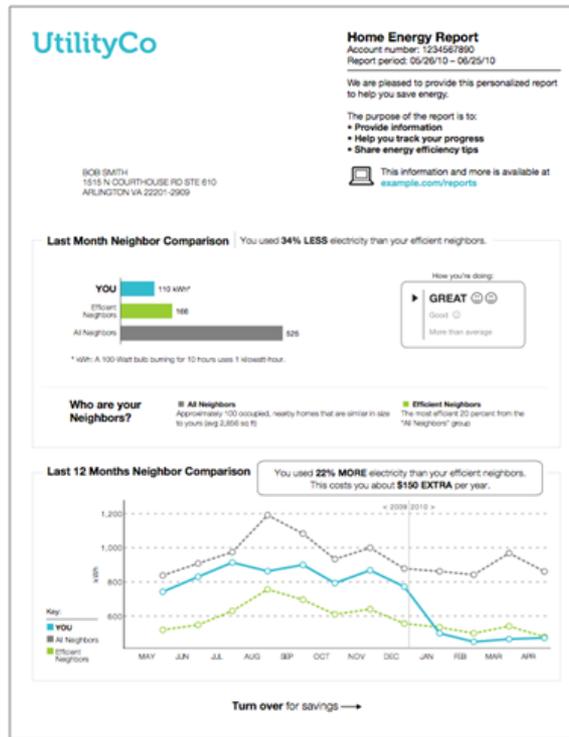
Residential Program Manager
Clark Public Utilities –
Energy Services



Home Energy Reports

Opower is probably best known for pioneering the Home Energy Report. One way to think of it is as a more interesting presentation of the customer's electric bill. More than 7.5 million homes receive Opower reports today, and they're on track to save hundreds of millions of dollars on their energy bills.

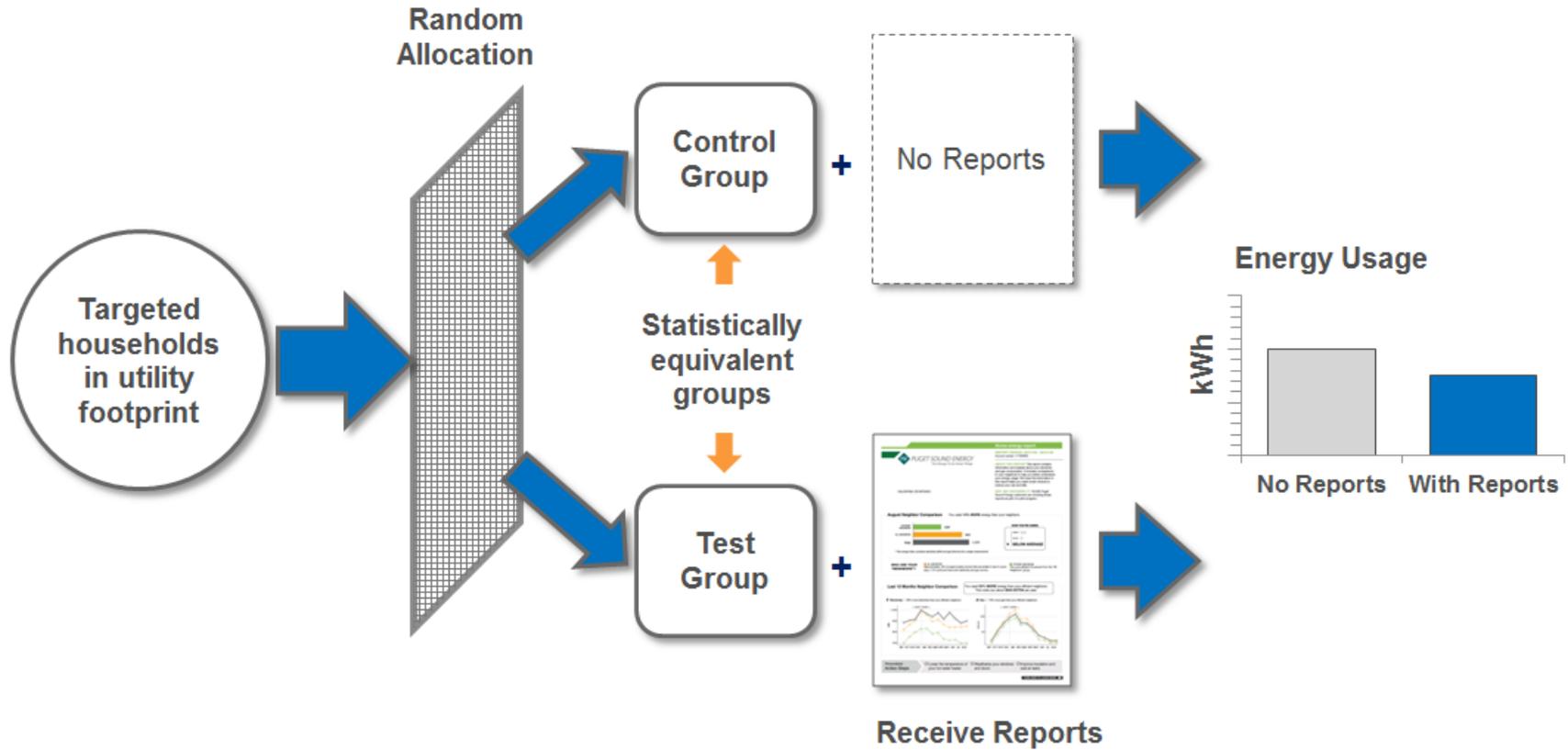
* 20,000 Clark Customers will receive home energy reports bimonthly... seven the first year...option to participate in years 2 & 3.



Home Energy Reports deliver customized & personalized information about energy usage and offer easy-to-follow tips to save energy

- **Neighbor Comparison:** Compares your household's monthly energy usage to that of 100 occupied, similarly sized homes that are nearby
- **Cooling Comparison:** Shows how much energy you use to cool your house compared to your neighbors, along with personalized tips for saving more
- **Heating Comparison:** Shows how much energy you used to heat your house last winter compared to your neighbors, along with personalized tips for saving more
- **Last 12 Months Neighbor Comparison:** Compares your household's monthly energy usage to that of 100 occupied, similarly sized homes nearby
- **Home Audit/ Utility Programs Promo:** Presents three questions for customers to complete as part of an evolving, on-going home energy audit/ Utility Programs
- **Neighbor Rank:** Shows changes in your household's efficiency rank over the past six months in comparison to 100 occupied, similarly sized homes that are nearby

How are the energy savings calculated?

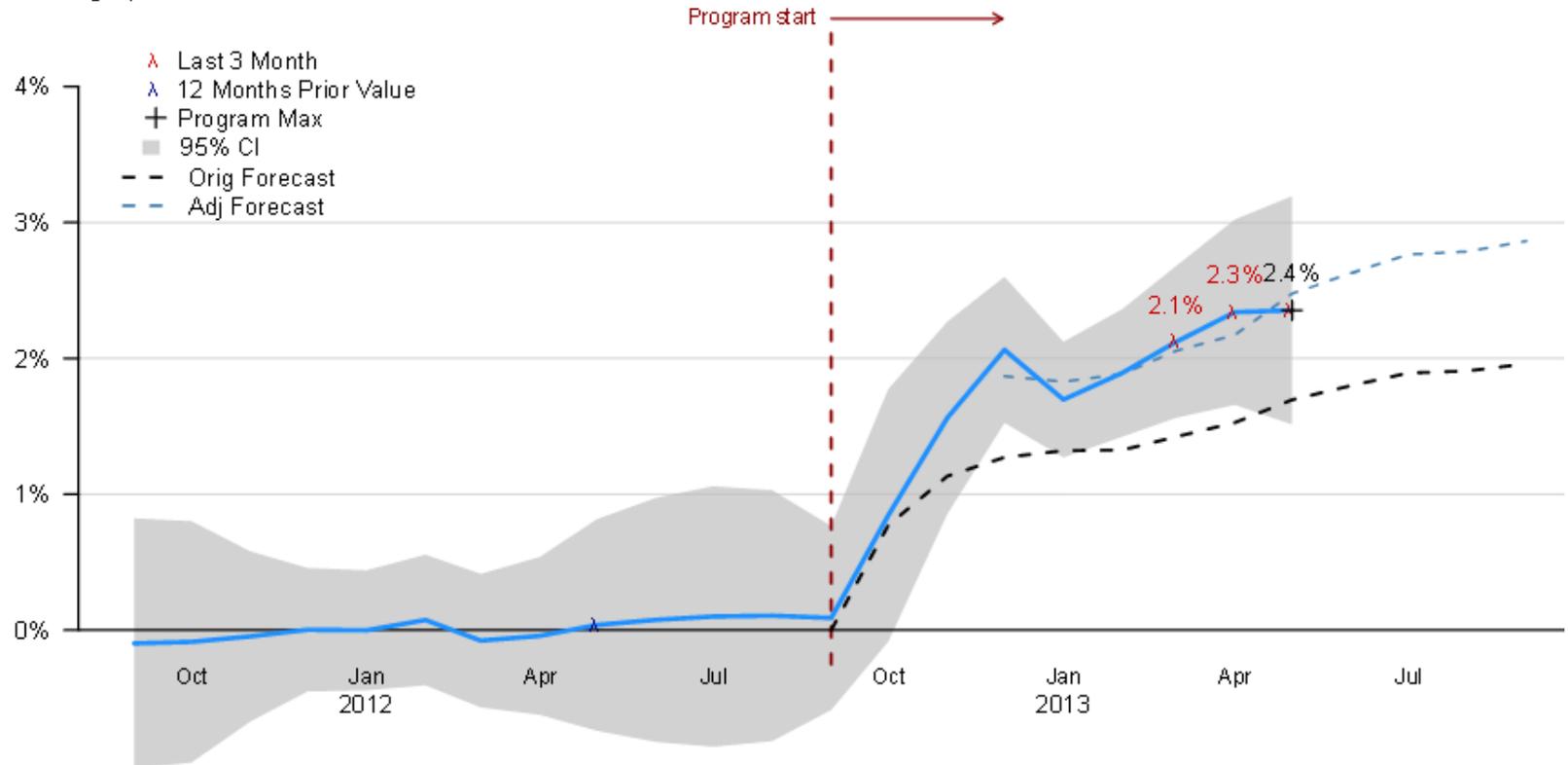


Home Energy Reports (HERS) is a Cost Effective Energy Resource

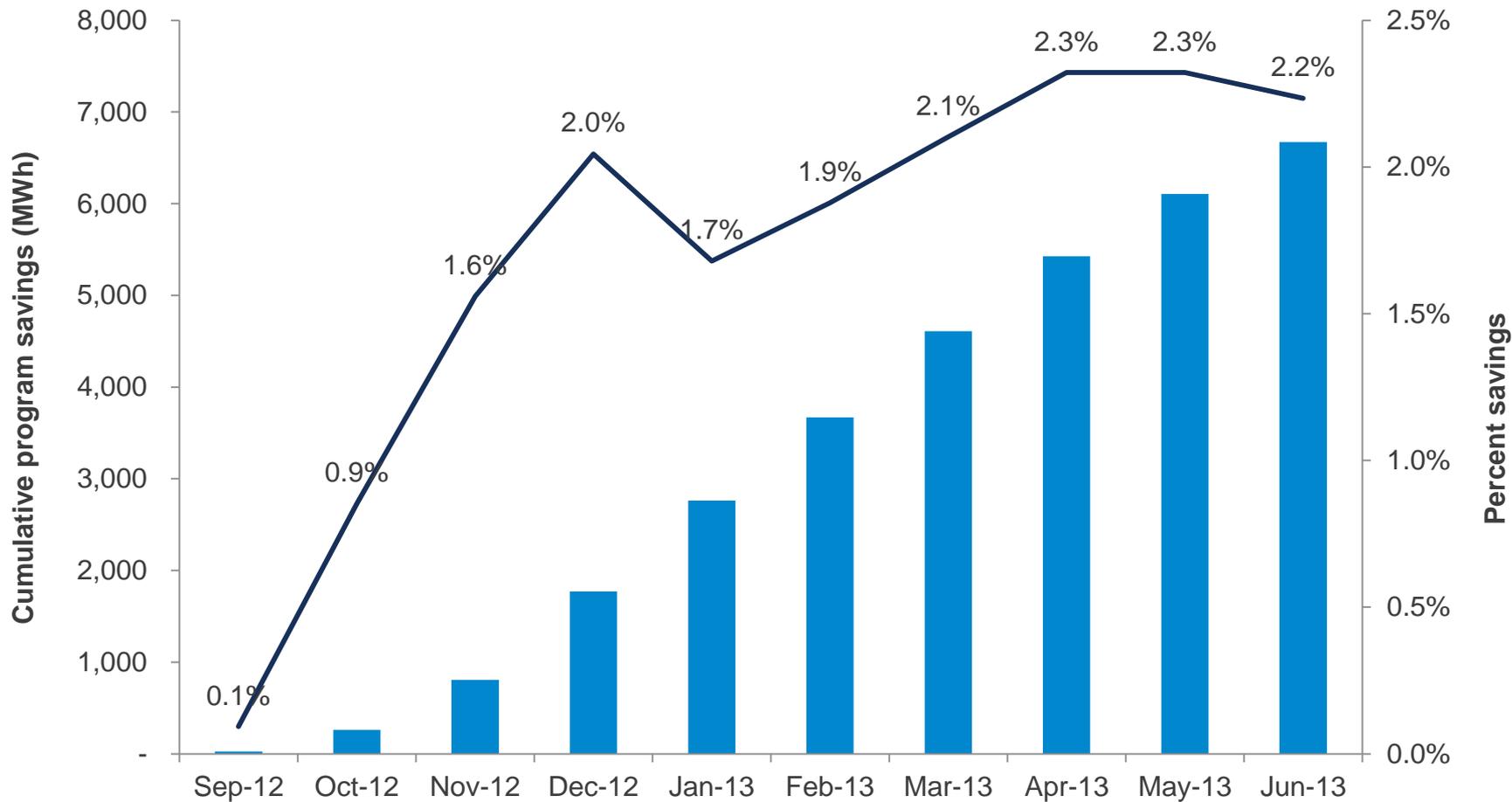
Behavioral Based Energy Efficiency - Home Energy Reports				
	20,00 Households			Total
	Year 1	Year 2	Year 3	
MWh	7,124	9,040	9,169	25,333
kWh/HH	356	452	458	
TRC	1.17	2.03	2.06	1.67

CPU's Savings Results

% Savings per Month



Cumulative Program Savings



Challenges To-Date

- O-Power platform is mostly non-customizable:
 - Language edits/changes that may appear minor are actually complicated programming changes and usually not possible
 - Once a decision is made and programmed into O-Power's software it is permanent



Say hello to your first Home Energy Report.

Learn about your home's energy use, see how you compare to your neighbors, and learn ways to save money.



Say hello to your first Home Energy Report.

Learn about your home's energy use, see how you compare to your neighbors, and learn ways to reduce energy waste and lower your bill.



Lessons Learned

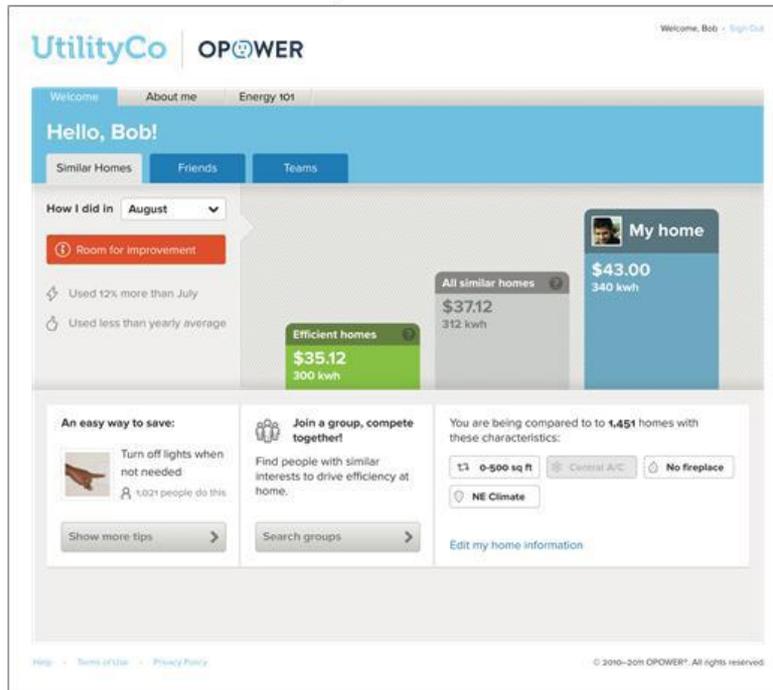
- Identify and negotiate any customization your utility may require before signing a contract with O-Power
- The more lines of communication (email, Facebook ID) you have with your customers the more potential success you can have with the O-Power product
- Be prepared to have the utility IT and marketing teams invest significant time in the early phases of the project
- Customer service reps will need training on FAQ's around the home energy reports. Supervisors should plan on in-depth training



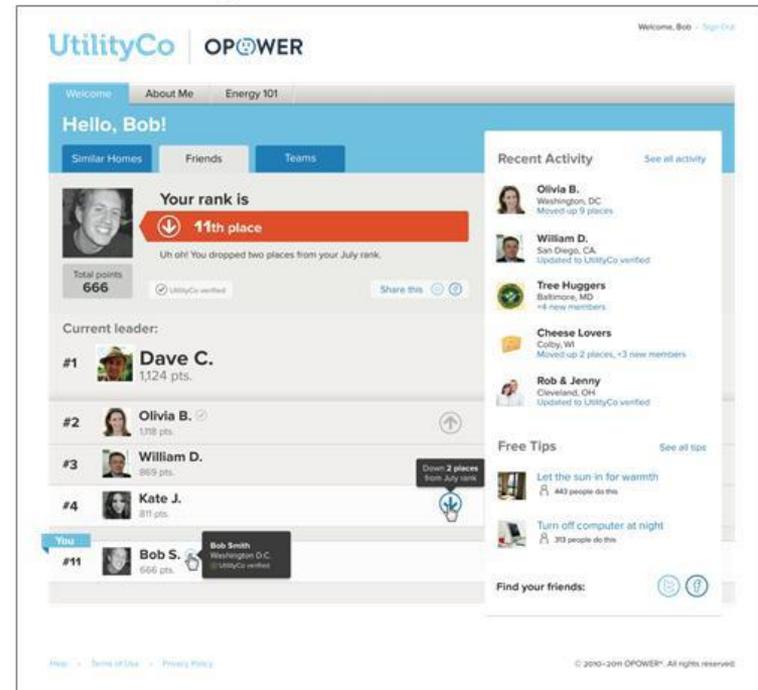
BPA Pilot Home Energy Reporting Program + Social Energy (Energy Efficiency Social Networking)

Compare their energy use to a group of their choosing—either friends or a national average of similar homes—helping customers benchmark their usage against friends, communities, peers and fostering a healthy competition

Similar Home Comparison

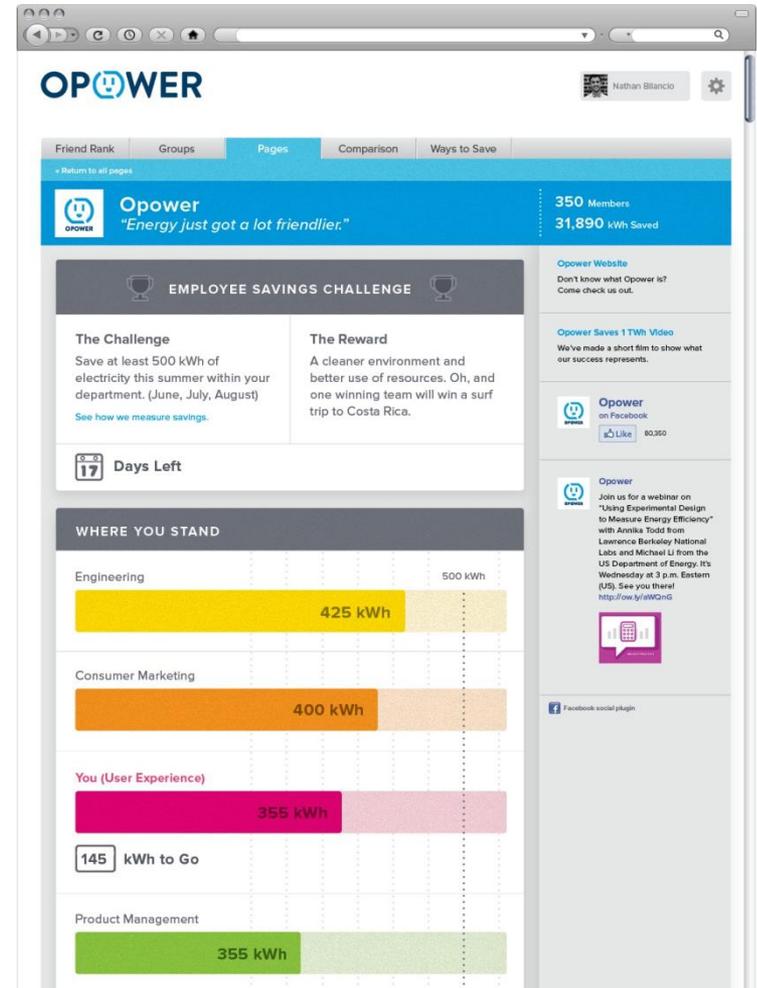


Friend Comparison



Social Energy Platform

- Platform is in Beta form and currently live with more than a dozen utility participants
- Clark will go live with social energy in September
- All interested customers will be able to participate and participation is 100 percent opt-in
- Social activities within the app fall into three categories:
 - Social – compare energy use with friends
 - Personal Engagement – users view energy use over time and are rewarded for reducing use
 - Community – users participate in contests, individual or team, and win prizes for reducing energy use



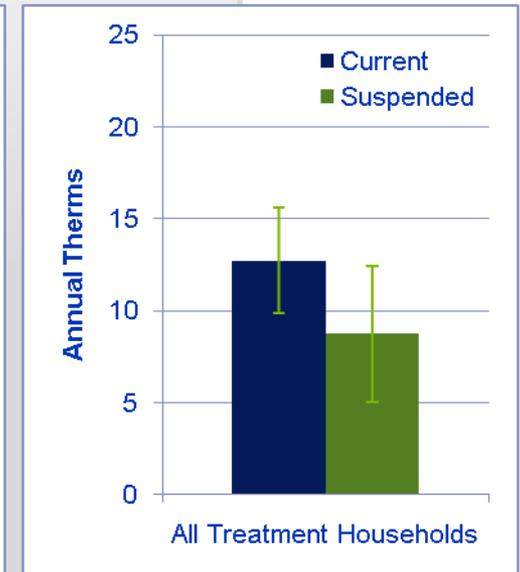
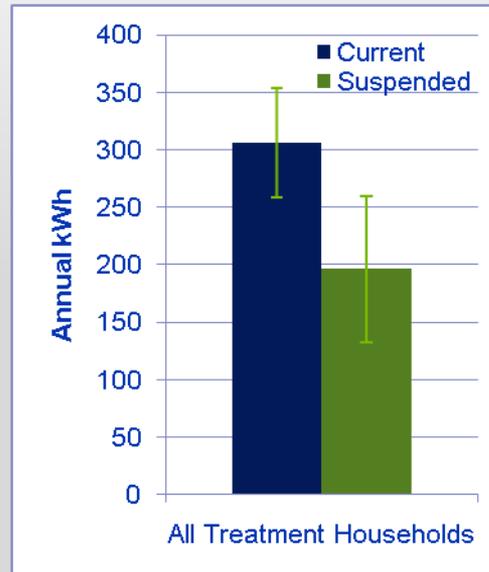
Next Steps...

- Currently negotiating “Year 2” details
- Looking at replacing “Social Energy” pilot with a new pilot in Year 2
- Third party evaluation of year one results to take place in early fall 2013

Puget Sound Energy HER Program Persistence

Joel Smith

**Puget Sound Energy
Program Manager,
Customer Solutions**



PSE Home Energy Reports

- Personalized peer-to-peer comparison reports
 - Annual usage tracking
 - Efficient tips
 - Mailed hardcopy report – monthly and quarterly
 - Employs behavior sciences and data analytics



Home Energy Report

Account number: [REDACTED]
Report period: 12/01/11-12/31/11

We are pleased to provide this personalized report to you as part of an energy savings program.

The purpose of this report is to:

- Provide information
- Track your progress
- Share energy efficiency tips

This information and more available at www.psereports.com

Last Month Neighbor Comparison

You used 7% MORE energy than your neighbors.



How you're doing:

You used more than average

Turn over for ways to save

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

■ All Neighbors: Approximately 100 occupied nearby homes that are similar in size to yours (avg 1,741 sq ft) and have gas heat

■ Efficient Neighbors: The most efficient 20 percent from the 'All Neighbors' group

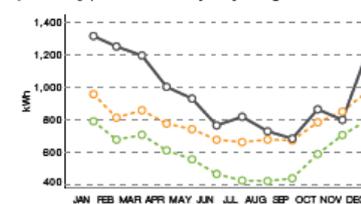
Are we comparing you correctly?

Tell us more about your home: www.psereports.com

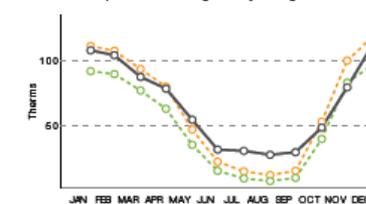
Last 12 Months Neighbor Comparison

You used 12% MORE energy than your neighbors.
This costs you about \$224 EXTRA per year.

Electricity | 22% more electricity than your neighbors



Natural Gas | 2% more natural gas than your neighbors



Track your progress and find ways to save at www.psereports.com

PSE Home Energy Reports Recap

- Started with 40,000 test participants in 2008
 - One to One control group
 - Experimental Design
- Removed 10,000 in 2011 to measure persistence
- Savings methodology validated by LBNL
- Started claiming savings in 2011
 - Annual Ex Post evaluation
- Current continuing test group is less than 17,750

Experimental Design

- Dual Fuel (home uses both natural gas and electricity, which are both provided to the service address by Puget Sound Energy)
- Single family residential home
- Uses more than 80 MBtu of energy per year
- Home does not utilize a Solar PV system
- Address must be available with parcel data from the county assessor
- Has a bill history that starts on or before January 1, 2007
- Home must have 100 similar sized homes (neighbors) within a two mile radius
- Home must have automatic daily meter reads

Billing Data Disposition

Population	Control	Treatment	Total
Original population	44,124	39,757	83,881
Not in customer/billing data	35	42	
Not randomly assigned		4,864	
PSE sample population	44,089	34,854	78,943
Other Opower program	111		
Inconsistent zip codes	72	70	
Other data issues	599	507	
Move-outs	9,765	7,816	
Final Sample for 2012	33,693	26,590	60,283
Monthly - Current		12,703	
Monthly - Suspended		6,348	
Quarterly - Current		5,046	
Quarterly - Suspended		2,493	

Summary of Annual Savings

Treatment Groups	HER Measured Savings (Per Household)	Joint Savings (Per Household)	Credited Savings	
			Per Household	All Households
Electric (kWh)				
Current	306.0 (+/- 47.9)	5.7	300.3	5,330,705
Suspended	196.0 (+/- 63.3)	11.8	184.2	1,628,920
Total				6,959,625
Gas (therms)				
Current	12.7 (+/- 2.9)	1.4	11.4	201,670
Suspended	8.7 (+/- 3.7)	0.7	8.0	70,573
Total				272,243

Continued vs Suspended Reports

- 10,000 households randomly removed in 2011
 - 8,841 currently remaining
- Savings for both report groups are significantly different than zero, using a 95 percent one-tail test.

Program Results

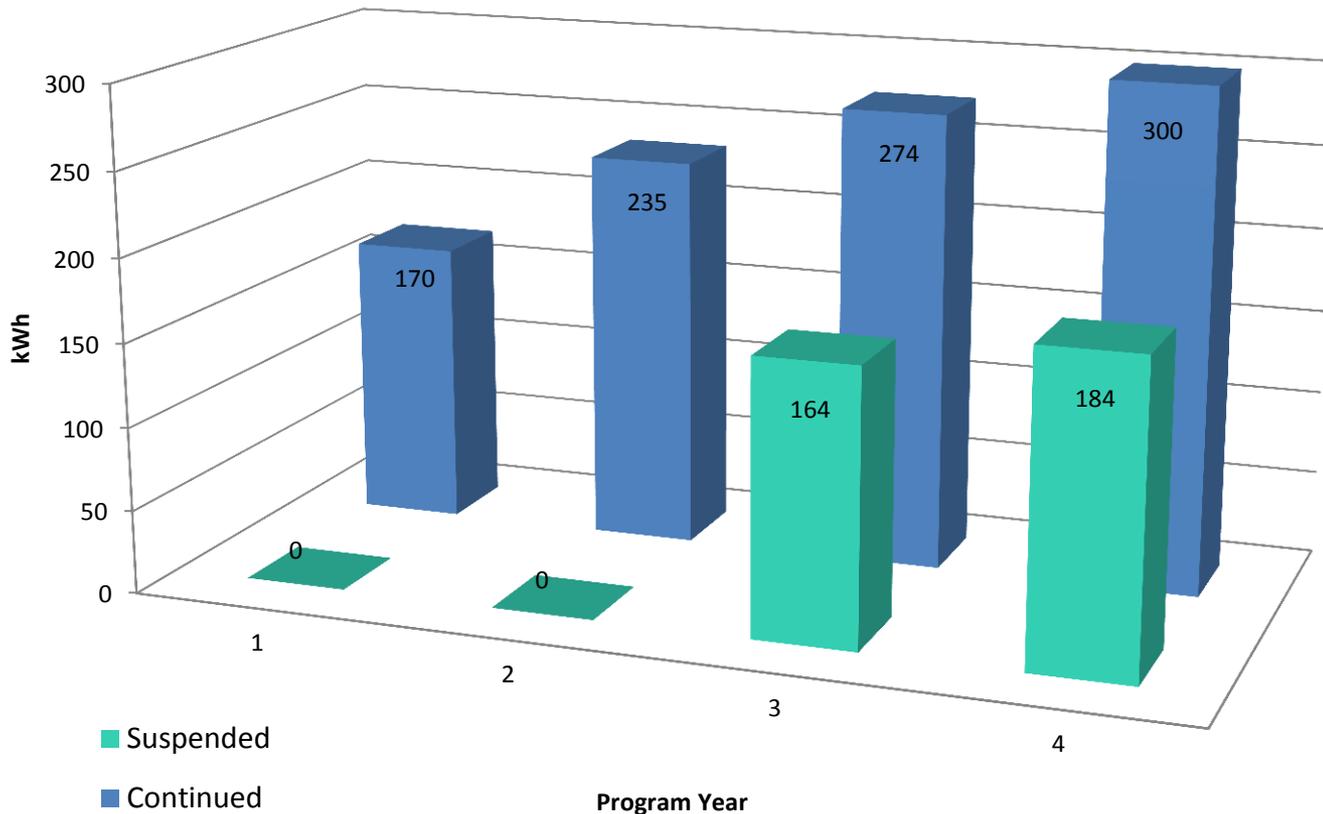
2011

HER Treatment Group	Electric			Gas		
	Consumption	kWh	Percent	Consumption	Therms	Percent
Continued Reports	10,596	276.4	2.6%	920	11.6	1.3%
Suspended Reports		164.3	1.6%		10.9	1.2%

2012

HER Treatment Group	Electric			Gas		
	Consumption	kWh	Percent	Consumption	Therms	Percent
Current Reports	10,591.18	300.34	2.8%	890.24	11.36	1.3%
Suspended Reports		184.25	1.7%		7.98	0.9%

Average Savings per Participant



Persistence

- Persistence is clearly demonstrated in the PSE program
 - Results may vary
- Still too early to conclude the next steps on how to incorporate into program design
 - 2012 year results only confuse the issue further
 - We don't know how long the persistence
 - Multi-year measure life is a game changer

Joint Savings Analysis

- Behavioral changes.
- Energy efficient installations and activities performed outside of PSE energy efficiency programs
- Energy efficient installations and activities rebated through PSE energy efficiency programs

Get it Right From the Start

... or get lucky

- Incorporating Evaluation into Program Design is fundamentally key to verifying success
 - Experimental design
 - Randomly assigned treatment and control groups
 - Size of participant group (treatment and control)
 - Variance of 1.5% to 3.0%
 - Set it and forget it
 - Ensure that there is no interference with treatment and control groups
- There is still much to learn...

Summary

- Experimental Design
- Proven Energy Savings
 - 300 kWh per household – continued reports
 - 184 kWh per household – persistence
- Evaluation is Ongoing

Resources

- [State and Local Energy Efficiency Action Network EM&V of Residential Behavior-Based Energy Efficiency Programs: Issues and Recommendations](#)
- [State and Local Energy Efficiency Action Network Customer Information and Behavior Working Group](#)
- [Behavior, Energy and Climate Change Conference](#) Nov 18-20, 2013 in Sacramento, CA
- CEE Evaluation and Behavior Committee
- E-Source Behavior Change Leaders Group
- Behavior Change group on www.Conduitnw.org
- [Regional Technical Forum protocol on evaluating BBEE programs](#)

For More Information

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Next Webinar

Wednesday, August 14, 2013 at noon PST

Non-Intrusive Load Monitoring

Register at www.e3tnw.org/webinars

More information about emerging technologies:

E3T database: www.e3tnw.org

E3T Program: www.bpa.gov/energy/n/emerging_technology/

Conduit: www.ConduitNW.org