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?

BBEE programs focus on energy savings resulting from changes in individual or organizational behavior and decision-making.
• 2% of the residential sector load
• Relatively easy and cheap to implement
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)
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
Energy Efficiency Mergering Technologies

Avista (IOU) — Web portal with AMI
Participants: 13,000, opt.
Vendor: multiple
Expected Savings: 2%

Puget Sound Energy (IOU) - OPower

Seattle City Light - OPower

Snohomish PUD – Energy Challenge
Snohomish PUD - Starbucks Commercial Pilot

Pacific Power (IOU) - OPower

Cowlitz PUD – OPower with Advanced Digital Pilot

Clark Public Utilities – OPower with Social Energy Pilot

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

Energy Trust of Oregon (IOU) - OPower

Pacific Power (IOU) - OPower

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
Starbucks employees will reduce energy consumption when provided usage data and tips for saving, in the context of a competition.
Phase I - Program Design

Gather real time energy data
- meter upgrades
- data communication

Store partners implement energy saving behaviors
- design and manage energy saving competition
- reward top performers

Provide store partners access to real time energy information
- create metrics
- provide access to information portal
- Integrated communications

Provide guidance on energy saving behaviors
- analyze saving opportunities
- prepare and deliver engaging educational materials

E3T Energy Efficiency Emerging Technologies

Starbucks Green Store Challenge
- COMPETITIONS
- meter upgrades
- data communication

Welcome | Electricity | Natural gas | Water | Take Action | Competition | Green ideas | Got Ideas?

Building dashboard

Spokane County
PUBLIC UTILITY DISTRICT NO. 1
WASHINGTON STATE UNIVERSITY
EXTENSION ENERGY PROGRAM
EnergyServices Western Area Power Administration
Phase I - Results

- 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
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 customers 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?
### Behavioral Based Energy Efficiency - Home Energy Reports

<table>
<thead>
<tr>
<th></th>
<th>20,00 Households</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year 1</td>
</tr>
<tr>
<td>MWh</td>
<td>7,124</td>
</tr>
<tr>
<td>kWh/HH</td>
<td>356</td>
</tr>
<tr>
<td>TRC</td>
<td>1.17</td>
</tr>
</tbody>
</table>
CPU’s Savings Results

% Savings per Month

- Last 3 Month
- 12 Months Prior Value
- Program Max
- 95% CI
- Orig Forecast
- Adj Forecast

Program start

Oct 2012 to Jul 2013

2.1% to 2.3% to 2.4%
Cumulative Program Savings

- Cumulative program savings (MWh)
- Percent savings

Percentage savings are as follows:
- September 2012: 0.1%
- October 2012: 0.9%
- November 2012: 1.6%
- December 2012: 1.7%
- January 2013: 1.9%
- February 2013: 2.1%
- March 2013: 2.3%
- April 2013: 2.3%
- May 2013: 2.2%
- June 2013: 2.5%
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
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

E3T
Energy Efficiency
Emerging Technologies
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

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

<table>
<thead>
<tr>
<th>Treatment Groups</th>
<th>HER Measured Savings (Per Household)</th>
<th>Joint Savings (Per Household)</th>
<th>Credited Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Per Household</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>All Households</td>
</tr>
<tr>
<td><strong>Electric (kWh)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current</td>
<td>306.0 (+/- 47.9)</td>
<td>5.7</td>
<td>300.3</td>
</tr>
<tr>
<td>Suspended</td>
<td>196.0 (+/- 63.3)</td>
<td>11.8</td>
<td>184.2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>6,959,625</td>
</tr>
<tr>
<td><strong>Gas (therms)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current</td>
<td>12.7 (+/- 2.9)</td>
<td>1.4</td>
<td>11.4</td>
</tr>
<tr>
<td>Suspended</td>
<td>8.7 (+/- 3.7)</td>
<td>0.7</td>
<td>8.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>272,243</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>HER Treatment Group</th>
<th>Electric</th>
<th>Gas</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Consumption kWh</td>
<td>Percent</td>
</tr>
<tr>
<td>Continued Reports</td>
<td>10,596</td>
<td>276.4</td>
</tr>
<tr>
<td>Suspended Reports</td>
<td>164.3</td>
<td>1.6%</td>
</tr>
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</table>

## 2012

<table>
<thead>
<tr>
<th>HER Treatment Group</th>
<th>Electric</th>
<th>Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Consumption kWh</td>
<td>Percent</td>
</tr>
<tr>
<td>Current Reports</td>
<td>10,591.18</td>
<td>300.34</td>
</tr>
<tr>
<td>Suspended Reports</td>
<td>184.25</td>
<td>1.7%</td>
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</table>
Average Savings per Participant

Program Year

<table>
<thead>
<tr>
<th>Program Year</th>
<th>Suspended kWh</th>
<th>Continued kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>170</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>235</td>
</tr>
<tr>
<td>3</td>
<td>164</td>
<td>274</td>
</tr>
<tr>
<td>4</td>
<td>184</td>
<td>300</td>
</tr>
</tbody>
</table>
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
... 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 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:

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Conduit: www.ConduitNW.org