EPRI ELECTRIC POWER RESEARCH INSTITUTE

U.S. DEPARTMENT OF ENERGY

Studying the Smarter Consumer

Rebecca Leiter – FirstEnergy Corporation

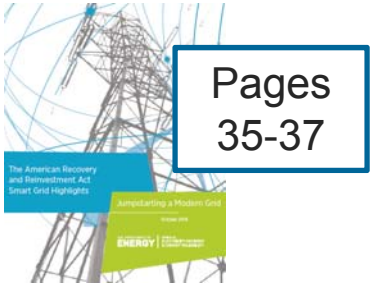
Jennifer Potter – Sacramento Municipal Utility District

Jim Eber – Commonwealth Edison

Moderators: Peter Cappers (LBNL) & Bernie Neenan (EPRI)

Rebecca Leiter

- Program Manager for the Consumer Behavior Study conducted by FirstEnergy under the Smart Grid Investment Grant funding
- Member of FirstEnergy Rates and Regulatory Affairs Department. Have also served in the Risk Management, Financial Settlement and Business Strategy departments at FirstEnergy.
- Prior to joining FirstEnergy served in Sales, Marketing and Actuarial Departments in the Insurance Industry
- The project team is key to success. Along with the Smart Grid Technology Team, we have received support from Communications, Call Center, IT, Customer Service, Metering Services and many others as well as received invaluable advice and support from EPRI, DOE technical advisory team and PUCO staff



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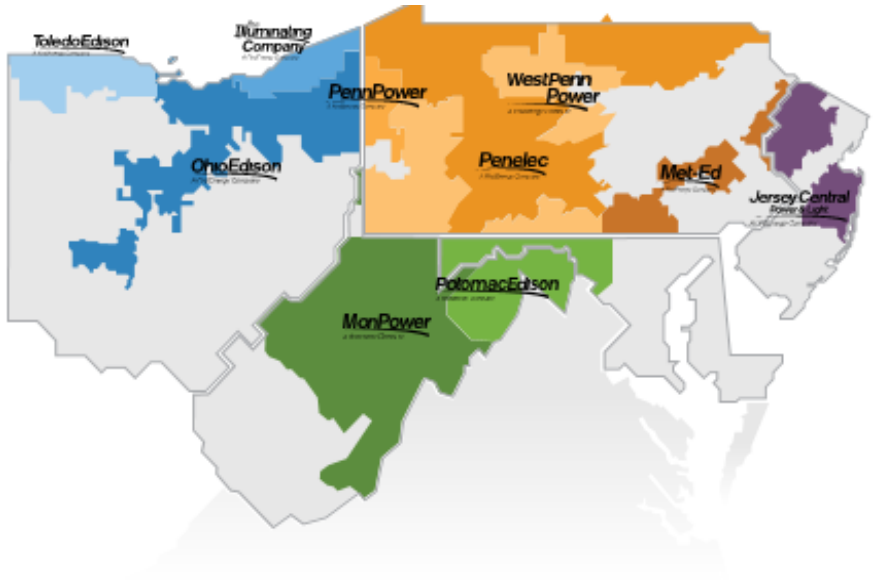
FirstEnergy Overview

- All states but West Virginia are de-regulated markets
- Department of Energy grant included customers in Ohio, Pennsylvania & New Jersey
  - Only Ohio included automated meters
  - DA/VVC in Ohio and Pennsylvania
  - Direct Load Control projects in New Jersey and Pennsylvania
- Roll-out of AMI to all customers in Pennsylvania in progress



State	2013 Customers (in thousands)	2013 Distribution Sales (MWH in thousands)
Ohio	2,087	53,492
Pennsylvania	2,023	52,224
New Jersey	1,098	20,893
West Virginia	525	14,292
Maryland	256	6,987
New York	4	–
Total	5,993	147,888

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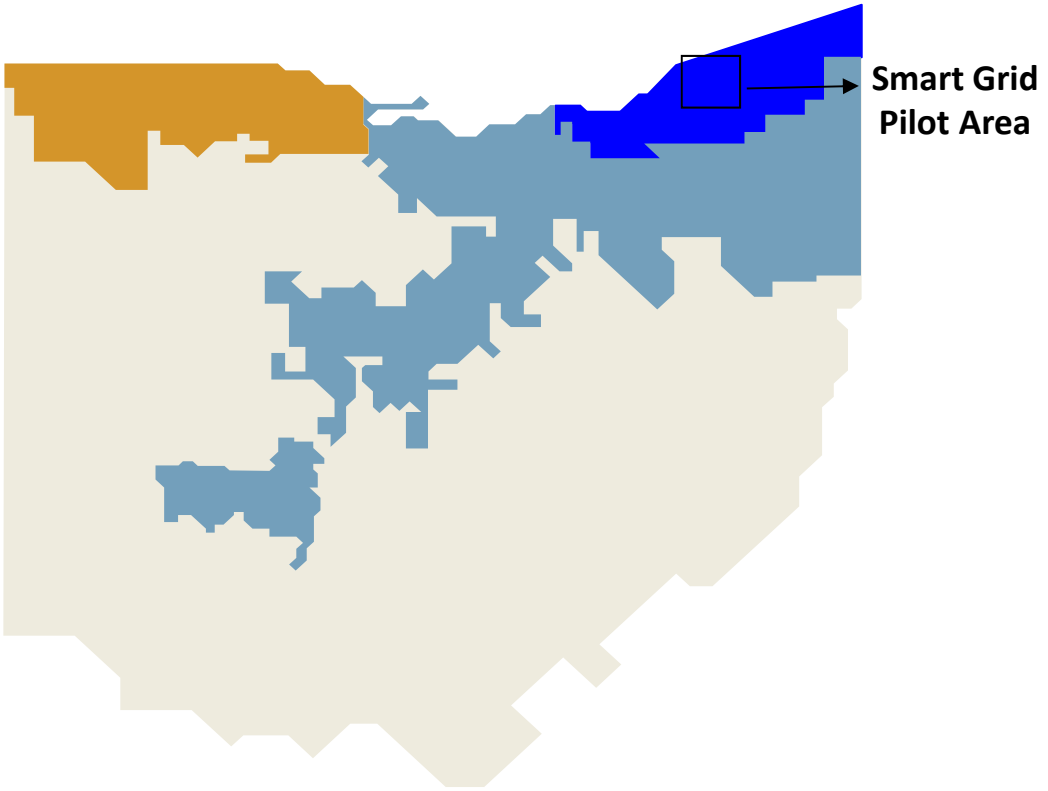
Consumer Behavior Study Overview

- Located in Cleveland Electric Illuminating Company in area that is east of the City of Cleveland
- Includes both rural and urban areas (some topographical challenges for communication network)
- Initial meter roll-out was 5,000 residential customers followed by a Phase II with approximate 29,000 additional residential and small commercial customers



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Study Goals & Objectives

- ✓Energy Savings
- ✓Peak Demand Reductions
- ✓Knowledge Gain For Future Cost Effective Implementation
- ✓Help Customers Save Energy & Money

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Study Overview Phase I

Study population	Res
Sample Frame	Subpopulation
Enrollment Approach	Opt-in
Experimental Design	RED
Treatments- Pricing (#)	PTR, Std Rate
Treatments- Technology (#)	PCT, IHD
Treatments – Information (#)	IHD, Web, Other
Recruitment Method	Mail, Phone, Email
Event Duration	4 Hour, 6 Hour

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Other Study Features

- Customers given the ability to opt out of the meter first
- Phase I study included a pre-treatment survey to identify if customers had central air, electric hot water heating, etc.
  - Customer were then made an offer for which they were qualified
  - PCT customers were also given the option of Direct Load Control by the Company or controlling the thermostat themselves in the events
- Critical peak days called during the months of June through August
  - Up to 15 days called per summer
  - Rebate of $.40/kwh given for curtailing load against their baseline usage
- Customers given day ahead notification of events through voicemail, e-mail, text messages


Good News

From The Illuminating Company

You have been selected to receive a new, digital smart meter as part of a pilot program in the Cleveland area. Replacement of your existing meter will take place within the next few weeks.

Smart meters and related technologies are part of our efforts to provide you with more information that can help you better manage your electricity costs. By participating in this program, you're also helping us improve future reliability and reduce overall electricity use, which is good for the environment.

At the time of installation, an Illuminating Company employee will knock on your door to let you know the meter is being replaced, and there will be a momentary interruption of your power. A second door hanger following installation will notify you when your meter has been replaced. All workers will be identified as working for The Illuminating Company, as will their vehicles, uniforms and identification cards.

If you have any questions about your smart meter – or choose not to have your meter replaced at this time – please contact us at 1-877-862-7041.

Thank you for your cooperation. We appreciate the opportunity to serve you better.

The Illuminating Company
A FirstEnergy Company

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Web Portal

- Hourly usage data – can download to excel file
- Historical information back to June – August of previous year
- Estimates of peak time rebates as they occur
- Part of Home Energy Analyzer which includes tips for saving energy

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Recruitment

RULE
THE ROOST
A SMARTER WAY TO CONTROL YOUR HOME'S ENERGY

✓Conducted pre-marketing focus groups & survey to test what messages resonate with customers. Key learnings:

- Customers want to control usage
- They are intimidated by some of the in-home technology

✓Marketing campaign conducted in phases to maximize hit ratio

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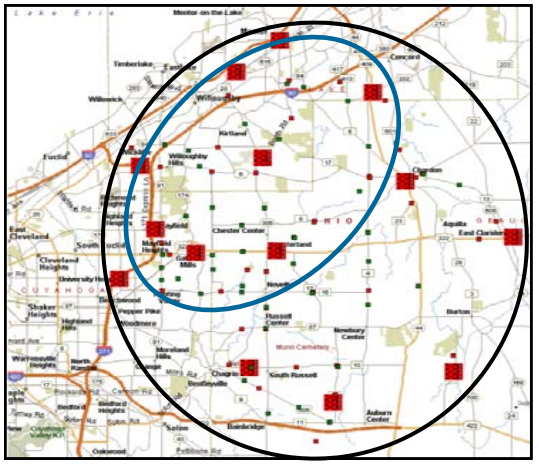
Phase II



- Phase II added an additional 29,000 Residential and Small Customers
- Treatment groups included PTR only, Education only and PTR + choice of technology
- Joint Motion with Public Utilities Commission of Ohio filed in the case for the Companies to implement an experimental TOU/CPP tariff in addition to the Peak Time Rebate program.
  - Only non-shopping Phase II residential participants with advanced meters would be eligible (Approximately 3,000 customers available).
  - Customers on this experimental tariff would pay this rider in lieu of the Generation Service Rider (Rider GEN) and not eligible for the Peak Time Rebate (Rider PTR)
  - Marketing resulted in six customers participating

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Questions / Discussion

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Jennifer Potter

- Jennifer Potter is a Principal Market Analyst in the Pricing and Resource Planning department at Sacramento Municipal Utility District.
- Jennifer spent the last 3 years as the Project Manager for the Department of Energy ARRA grant funded Consumer Behavior Study, currently known as SmartPricing Options pricing pilot.
- While at SMUD, she has worked as the program planner for residential and small commercial efficiency and incentive programs.
- Prior to her time at SMUD, Jennifer worked at City of Roseville, Roseville Electric, as the principal load and revenue forecaster, load researcher, and business analyst for the utility.
- Jennifer holds a B.A. in International Studies and Economics from Southern Oregon University and a M.S. in Public Policy and Management from Carnegie Mellon University.

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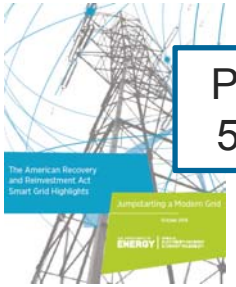

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Utility Overview- Sacramento Municipal Utility District (SMUD)

- 1.4 million population
- 900 mi^2, 2331 km^2
- Elected Board of Directors
- Not-for-Profit Utility
- 2nd largest municipal in California, 6th largest in the US
- 3299 MW peak load
- 2034 employees
- AMI meters fully deployed

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Study Overview

Study population	Res
Sample Frame	Subpopulation of customers with AMI meters
Enrollment Approach	Opt-in; Opt-out
Experimental Design	RCT; RED
Treatments- Pricing (#)	TOU; CPP
Treatments- Technology (#)	
Treatments – Information (#)	IHD
Recruitment Method	Mail; Phone; Email; Other

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SmartPricing Options Study Objectives

The pilot includes a two-year application of experimental rate options on a sample population of SMUD customers with the intent of determining:

1. Electricity impacts of each of the treatments
2. Customer characteristics associated with behavior changes
3. The roles of enabling technology in customers' daily electricity management
4. Program impacts on customer satisfaction
5. Rate and enabling technology program value to utility
6. Expected market penetration for rate and enabling technology programs
7. Effective educational and marketing strategies for customers

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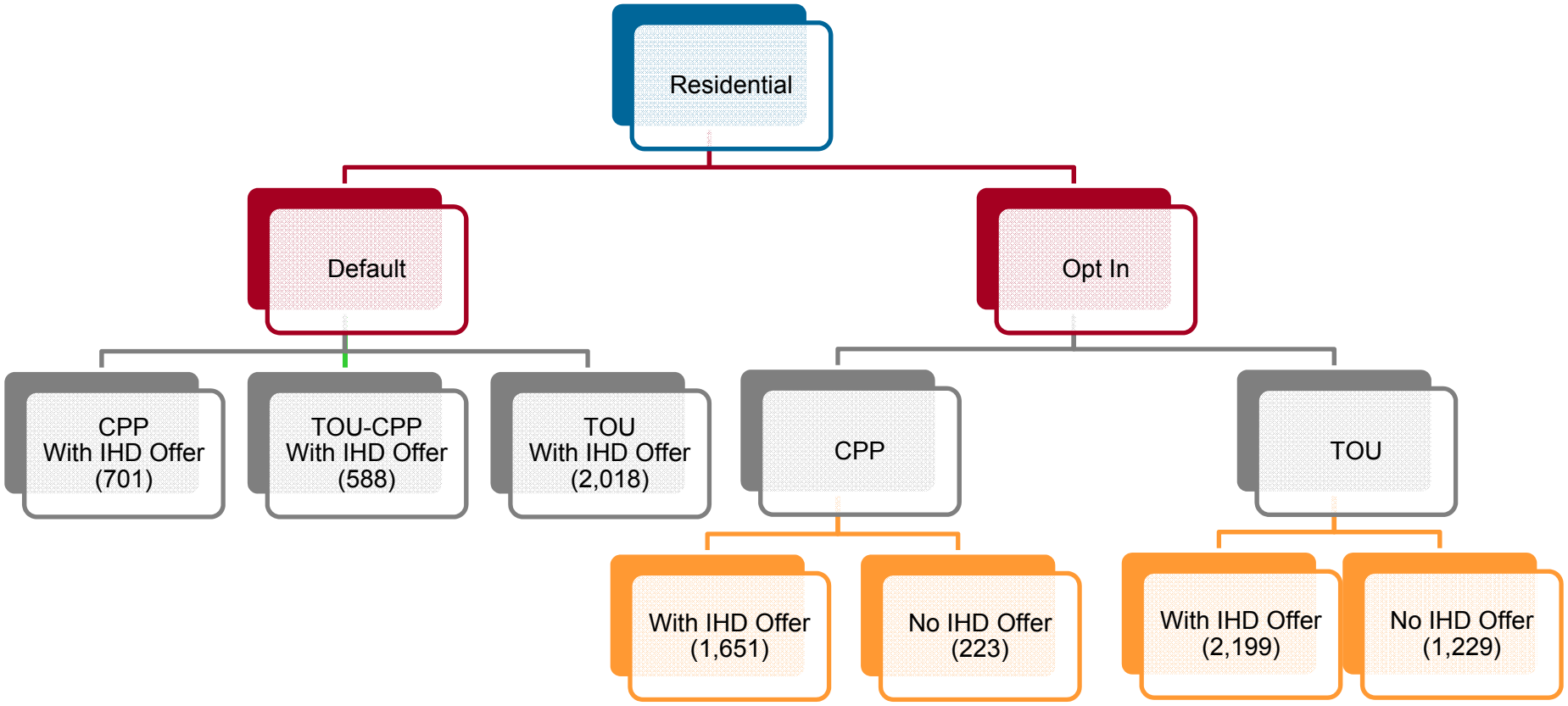
Key features of SPO pilot & enrollment



Total enrollment including deferred groups = 12,027; Total # of customers receiving offers (including deferred groups) = 53,798;
Total # of customers in SPO including controls = 99,661

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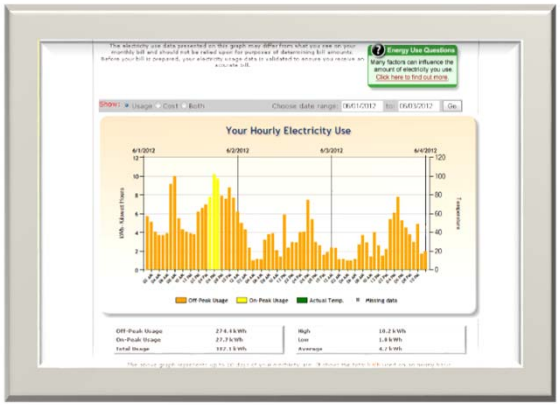
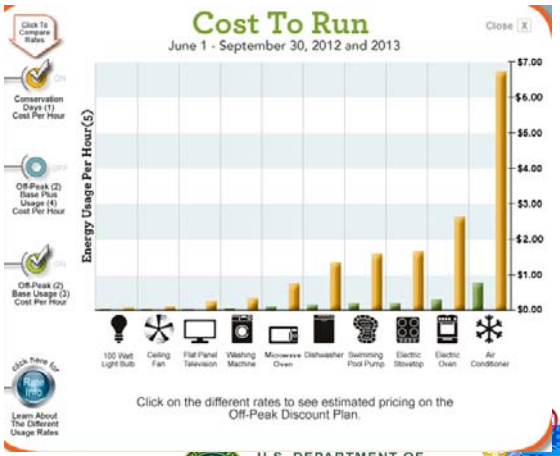
Study Overview

- Summer season only (June-Sep)
- Three rate plans available
  - Time-of-Use / Weekday Value Plan
  - Critical Peak Pricing / Off-Peak Discount Plan
  - TOU-CPP / Optimum Off-Peak Plan
- Effective in 2012 and 2013
- In Home Displays- shipped approximately 5,000 pre-provisioned devices to pilot participants
- Web portal with hourly energy use
- Dedicated Microsites for each pricing plan





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Questions / Discussion

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Engaging the Smarter Consumer

Karen Lefkowicz – PEPCO

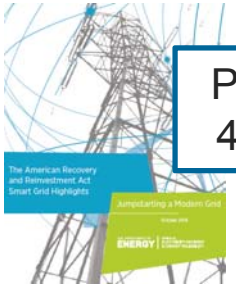
Gail Allen – KCP&L

Dennis Sumner – City of Fort Collins Utility

Moderators: Peter Cappers (LBNL) & Bernie Neenan (EPRI)

Speaker Bio

- Ms. Karen Lefkowitz is the Vice President of Business Transformation and the Chief Information Security Officer for Pepco Holdings, Inc. (PHI)
- She is responsible for leading PHI's enterprise-wide initiatives to implement business processes and advanced technologies, including Smart Grid
- She also leads the Security Steering Committee at PHI
- Ms. Lefkowitz is an industry veteran with more than 30 years experience
- She currently sits on the Boards of the GridWise Alliance, Woolly Mammoth Theater, and Strathmore Foundation for the Arts



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About Pepco Holdings, Inc.

- Approximately 2 million customers in Delaware, the District of Columbia, Maryland and New Jersey
  - Atlantic City Electric, Delmarva Power and Pepco provide regulated electricity service
    - Delmarva Power also provides natural gas service
- AMI is fully deployed among Pepco and Delmarva Power residential and commercial customers
- PHI has successfully rolled out a critical rebate program in Pepco Maryland and Delmarva Power Delaware, called the Peak Energy Savings Credit

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Project Overview

Residential customers in Montgomery County and Prince George's County, MD	Residential
490,000 customers	Residential Customers
Enrollment Approach	Opt-out (Customers did not have to participate. No penalty.)
Treatments- Pricing (#)	Critical Peak Rebate (CPR)
Treatments- Technology (#)	AMI Network, Programmable Thermostat (DR Component)
Treatments- Information (#)	Web (Baseline) Phone Notifications
Recruitment Method	Mail, Phone, Email, Advertising

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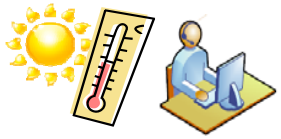
The Peak Energy Savings Credit Program

Introduces a new rate structure with a credit option designed to incent customers to reduce consumption during Peak Energy Periods

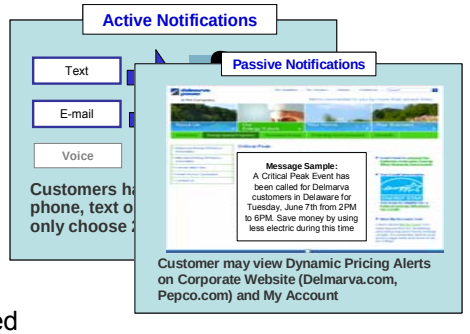
1 Peak Energy Savings Credit Enrollment

- PHI defaults a customer to the Peak Energy Savings Credit (PESC) rate
- Customer sets notification preferences or opts-out of the Dynamic Pricing rate (through My Account or a CSR)

2 Initiate Peak Energy Period / Notify Customers



- PHI Power Procurement initiates a Peak Energy Period for the next business day
- Customer receives notifications based on his preferences



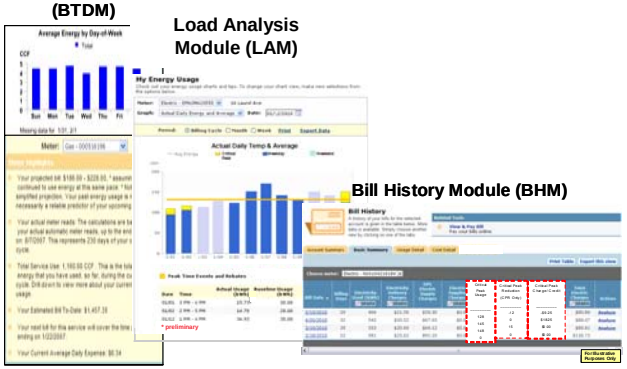
3 Customer Views Peak Energy Period Results

- Event results are visible to the customer on the Aclara modules, accessed through My Account

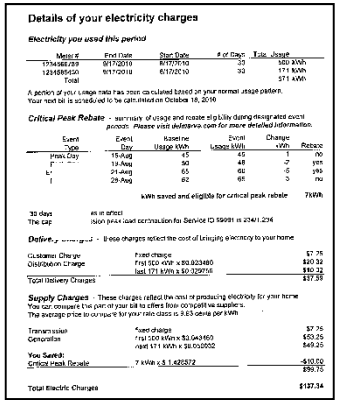
Bill to Date Module (BTDM)

Load Analysis Module (LAM)

Bill History Module (BHM)



4 Customer Receives Dynamic Pricing Bill



- A Dynamic Pricing customer will see interval information in the meter section, a Peak Energy Savings Credit table with event information and Peak Energy Savings Credit savings information

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About the Peak Energy Savings Credit

- Pepco Maryland customers had already been educated about energy management tools on My Account and saving energy as part of AMI education
- First rolled out Peak Time Rebate (PTR) pilot in 2012 to 5,000 customers
- Summer of 2013 did a mass rollout to 533,000 residential customers
  - Introduced the Peak Energy Savings Credit (PESC) to all customers
- Summer of 2014 continued program with residential customers
  - focused on engagement as well as continuing education
  - used 2013 success stories and results to talk about
- **Key Lessons Learned:** How does everything work together? How do you leverage existing education investments, building a platform for long-term education throughout AMI and dynamic pricing?

Weather plays an important role if you are trying to roll out a PTR program.

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Building Upon Our AMI Customer Education

- Rolled out Smart Meters in 2011 with wide scale education effort that focused on customers “taking control” of their energy use using hourly energy data
- The Peak Energy Savings Credit leveraged this existing messaging
- Offering incentives to reduce energy use was a natural evolution and was well received by customers, who were focused on saving money
- New education focused on why customers should reduce energy use on high demand days and the benefits

Evolving your message is critical. Build a platform from which you can build upon.

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Program Design

- The Peak Energy Savings Credit offers credits when customers reduce their energy use below their baseline on Peak Savings Days.
  - Customer baselines were calculated by taking the average of the three highest energy use days during the prior 30-day period, excluding the day prior to a Peak Savings Day, previous Peak Savings Days, weekends and holidays
  - Customers received $1.25 for every kWh reduced below the baseline
  - Customers saw their credit on My Account and on their next bill

We promoted our demand response program, Energy Wise Rewards™, with PESC to encourage further participation and automatic reductions

- By helping customers understand how these programs worked together, we increased likelihood for participation and reduced potential confusion as both programs reward for energy reductions during Peak Demand Periods, called Peak Savings Days

Combining education efforts around related programs can help reduce customer confusion.

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Our Education Approach

- We work collaboratively with a Commission appointed Maryland AMI Working Group which represents multiple stakeholders in the community
- Targeted research and ongoing tracking of customers as well as a segmentation study helped us understand our customers and their preferred channels
  - Conducted qualitative customer testing for the program name, process, and customer educational materials
  - Used different channels communications to reach all segments of the population (e.g., those without a computer and low income)
  - Focused on incentive-based messaging as well as some combined messaging with the demand response program

Base your messaging on good research.

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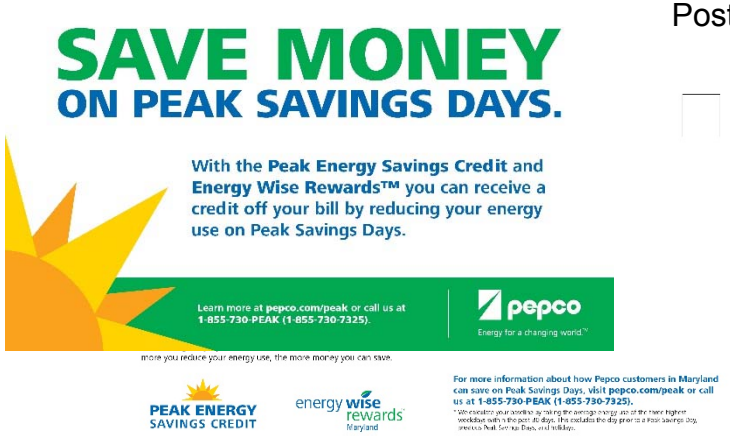
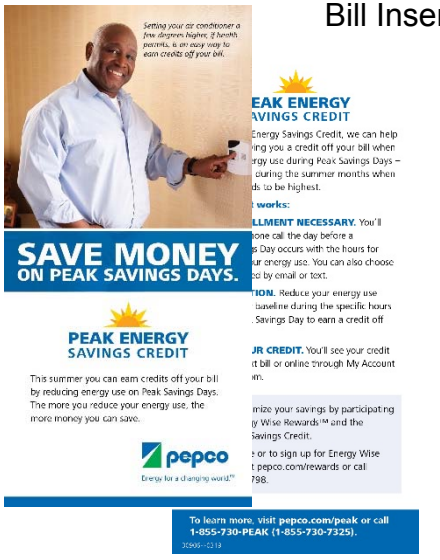
“Look and Feel”

Postcard

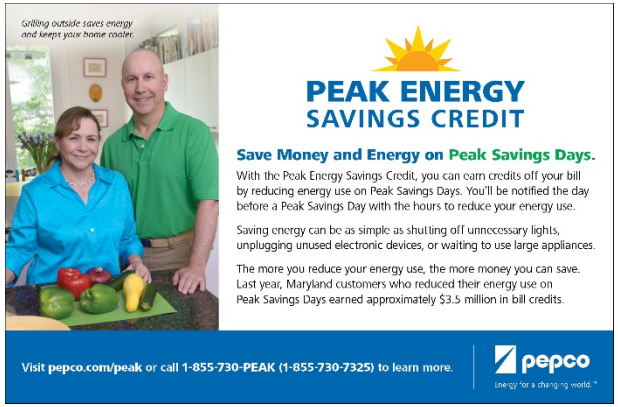


Print Advertising

Bill Insert



Print Advertising



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Results

- Participants:
  - Over 350,000 customers participated in the 2013 season
- Bill Credits:
  - $3.4 million in bill credits were received in 2013
  - $4 million in bill credits were received in 2014
- kWh Saved:
  - 2.3 million kWh were saved in 2013
  - 2 million kWh were saved in 2014

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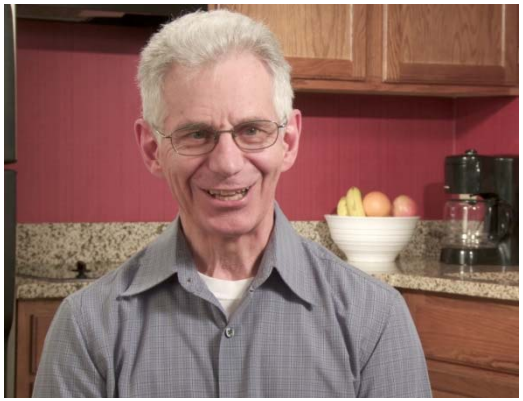
What Our Customers Had to Say

"There are people like me that are on a limited budget and really need to save money."

- Stephanie J.



"I went online the next day to see what my Peak Energy Savings Credit was, and I was quite pleased."

- Richard K.

"During the months of summer when your bills tend to be the highest, there is nothing better than getting a discount off of those peak bills. Anytime that I can reduce those bills in the middle of summer is a huge benefit to me."

- Edward G.

"I will grill in the summer months as opposed to using the stove inside."

- Jacqueline H.

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Questions / Discussion

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Gail Allen, Kansas City Power & Light
Sr. Manager, Customer Intelligence

- She started in the IT department (15+ years applications and operations) and spent several years working on Six Sigma process improvement for Aquila. She directed a team that launched Aquila's first energy efficiency programs in 2005. When she transitioned to KCP&L she led the Energy Consultants who were responsible for the utility's key accounts.
- She shifted full-time to the Smart Grid project in 2010 where she managed a team who launched several smart grid tools for customers for the DOE Smart Grid Demonstration pilot in KCP&L's urban core.
- Today she leads the Customer Insights team. They perform traditional customer market research (JD Powers), online customer panels and makes recommendations on target customer marketing campaigns. They are launching Oracle's Business Intelligence customer data warehouse repository. Oh yes, in her spare time she serves on the core team that is implementing Oracle's CC&B customer billing system.
- Gail has an MBA and is a Six Sigma Certified Master Black Belt. She has been in the utility industry for over 29 years (although she swears she doesn't look it).

Gail Allen

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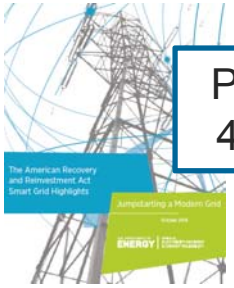

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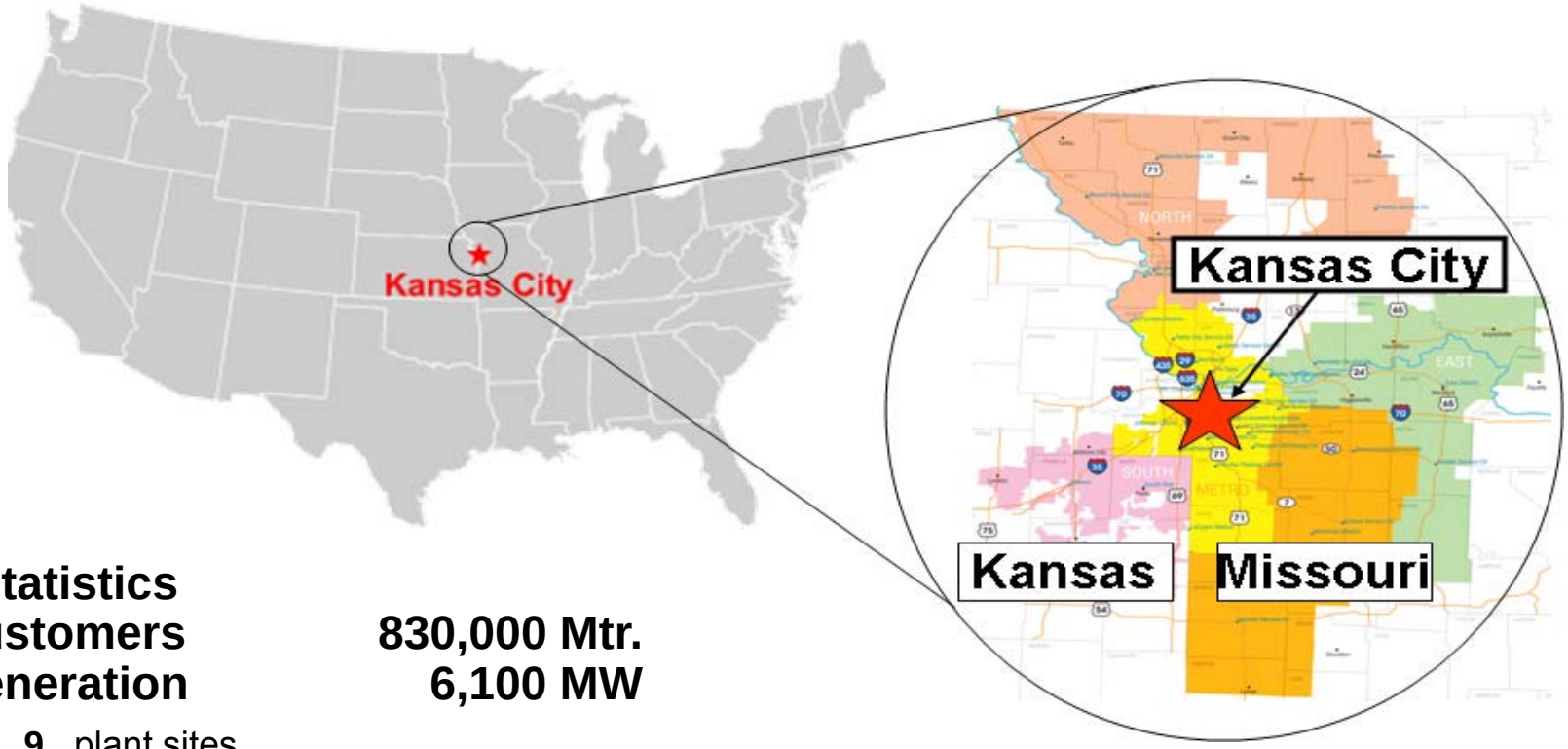
Utility Overview



Key Statistics

Customers	**830,000 Mtr.**
Generation	**6,100 MW**

- **9** plant sites
- **26** generating units
- **10** peaking facilities

Dist. Subs	**315**
Dist. Circuits	**1600**
AMI Meters	**150,000**

KCP&L SmartGrid the future of energy

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Project Overview

Study population	Res	Small C&I received treatments	Large C&I received meters
Sample Frame	Pilot 10,000 urban core customers	Green Impact Zone (subset)	
Enrollment Approach	Opt-in		
Experimental Design	Control group outside pilot		
Treatments- Pricing (#)	TOU	Std Rate	
Treatments- Technology (#)	PCT	HAN	
Treatments – Information (#)	IHD	Web	
Recruitment Method	Mail	Email	Grassroots event enrollments
Training	Dedicated CSR)	Local Ambassador office and in-home	

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KCP&L

SmartGrid

the future of energy

for illustration only

The SmartGrid demonstration improvements will enhance service for the entire Midtown area through improved service reliability, reduced energy delivery costs, more efficient energy consumption, an improved carbon footprint and better information flow.

Smart Generation

1 Residential Rooftop Demonstrations

Demonstrates potential of solar power as an auxiliary energy source for homes.

2 Commercial and School Rooftop Solar Demonstrations

Demonstrates potential for solar power use in commercial or school settings.

3 Utility-Scale Battery Storage

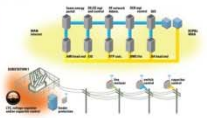
Demonstrates energy storage benefits integrated with intermittent distributed energy sources such as solar.

Smart Distribution

4 Enhanced Substation

Improves reliability and efficiency, and enables integration of renewables, demand response and advanced communication with other parts of the electric grid.

5 Distribution Grid Improvements and Switches



Allows for advanced communications.

Smart Consumption

6 Hyper-Efficient Heat Pump Systems

In partnership with EPRI, demonstration will include installation in a limited number of homes.

7 Energy Management System (EMS)

Selected homes and businesses will be eligible for an EMS, or information hub device, to monitor and manage energy usage.

9 Products and Services

Each customer will be eligible for KCP&L's full portfolio of energy-efficiency products and services, including rebates for high-efficiency air conditioners, incentives for energy-efficient lighting, home energy audits and commercial rebates for improvements in lighting and efficiency.

8 Programmable Thermostat

Can automatically set temperatures based on the season, resulting in up to 20 percent savings in heating and cooling bills.

9 Advanced meters that deliver two-way communication

Advanced meter to access real-time usage information and price signals will be installed in each home and business.

10 Web Portal

Helps customers understand the impact of their electricity use and encourages them to make decisions that conserve energy, help the environment and save money.

11 In-home Display

Provides real-time information that increases awareness of electricity use and identifies opportunities to reduce consumption and save money.

12 Electric Vehicle Charging Station

Allows introduction of new transportation options.

This material is based upon work supported by the Department of Energy under Award Number DE-OE0000221.

204-10-1310 (09/10)

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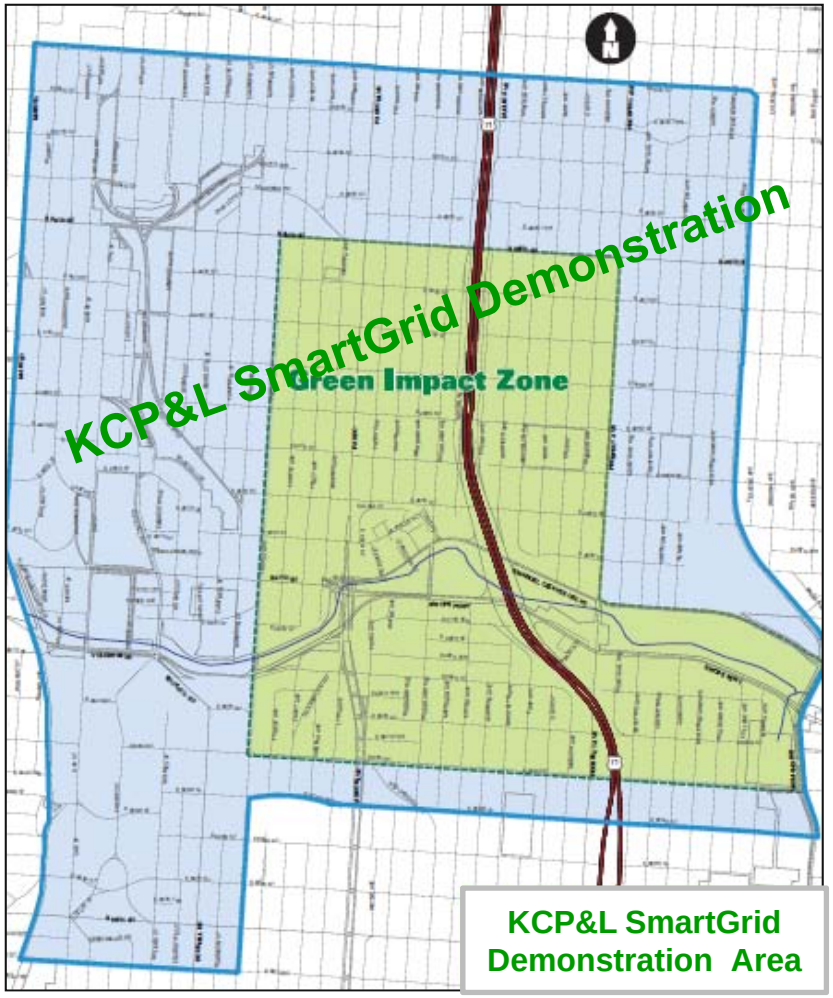
Project Co-located with the Green Impact Zone

Green Impact Zone

- **150-square block area (39th to 51st between Troost and Prospect).**
- **Comprehensive set of programs using grant funds and other resources for:**
  - Economic development
  - Community policing & service centers
  - Training and employment
  - Energy and water conservation
  - Grant funds (over $100M) include
    - Transportation Investments Generating Economic Recovery (TIGER) grant
    - Energy Efficiency Conservation Block Grant (KC MO, MARC)
    - MDNR Innovative Weatherization Grant
    - KCP&L SmartGrid Pilot Project
    - Brownfields Grant — (Pending)
- **Involves over 25 stakeholder groups including neighborhood groups, Congressman Cleaver, MARC, MEC, KCP&L, MGE, KCMO water & UMKC**



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Customer Focused Goals

- Provide **sustainable energy savings** for our customers as we increase customer satisfaction by:
  - Educating customers in the demonstration area about how smart grid investments will ultimately impact and benefit them
  - Engaging customers and influence behavior/participation in energy usage management
  - Informing the remainder of KCP&L's customer base about how smart grid investments will ultimately impact and benefit them
- Understand new smart grid technologies and interoperability
- Improve **community relations** with our stakeholders
- Create jobs and focus on economic development
- Streamline processes
- Share information with the broader utility industry on the progress and outcome of the project

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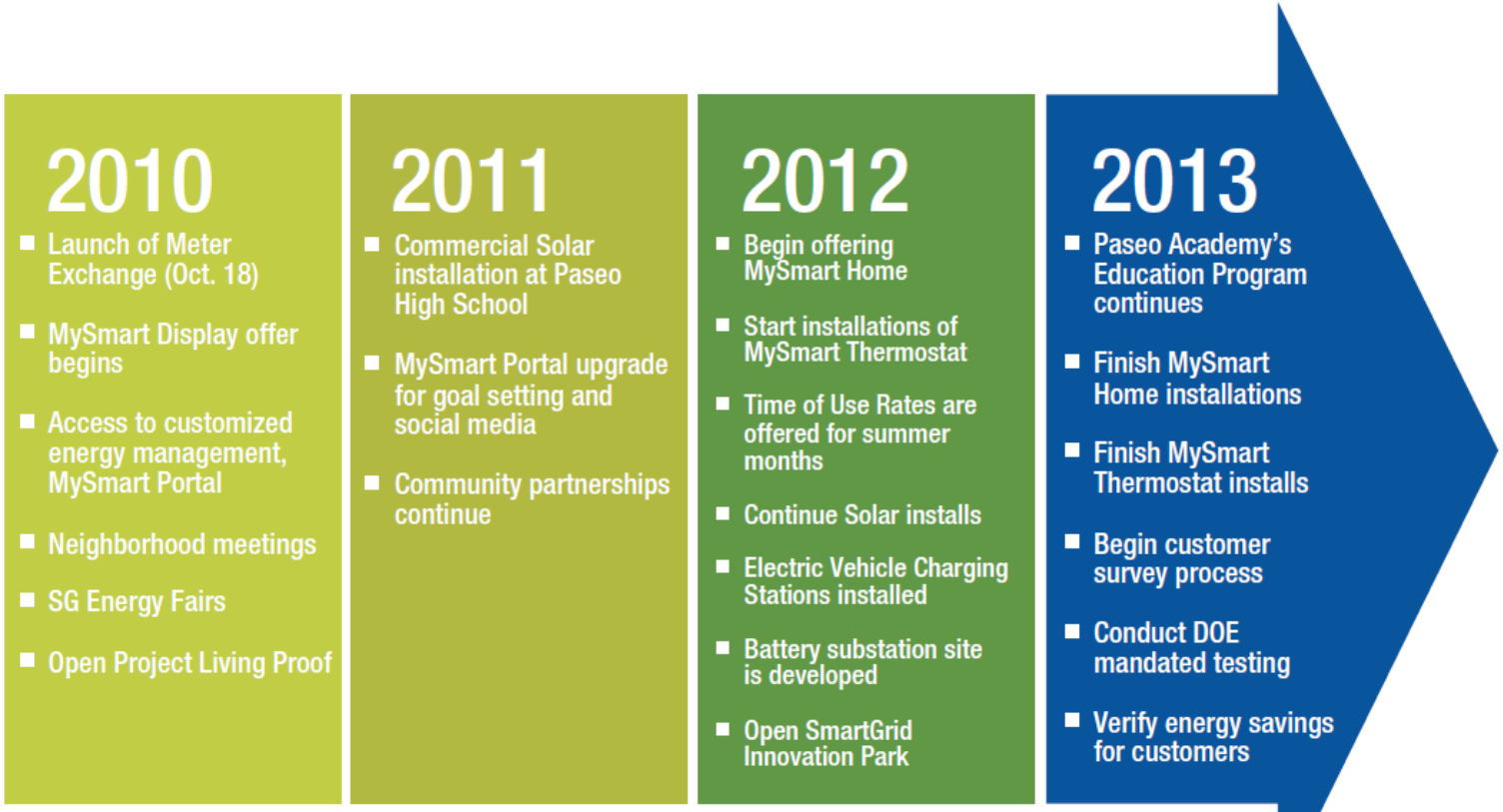
Project Timeline



KCP&L SmartGrid the future of energy

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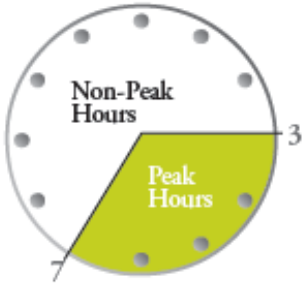
Product Offerings

MySmart Portal *Tendril's Energize*	
Project Goal	2,660
To Date	2,066

MySmart Display *Tendril's Insite*	
Project Goal	1,600
To Date	1,100

MySmart Thermostat *Tendril's SetPoint*	
Project Goal	1,600
To Date	128

Time of Use Rates	
Project Goal	264
To Date	156



MySmart Home *Tendril's HAN*	
Project Goal	400
To Date	64

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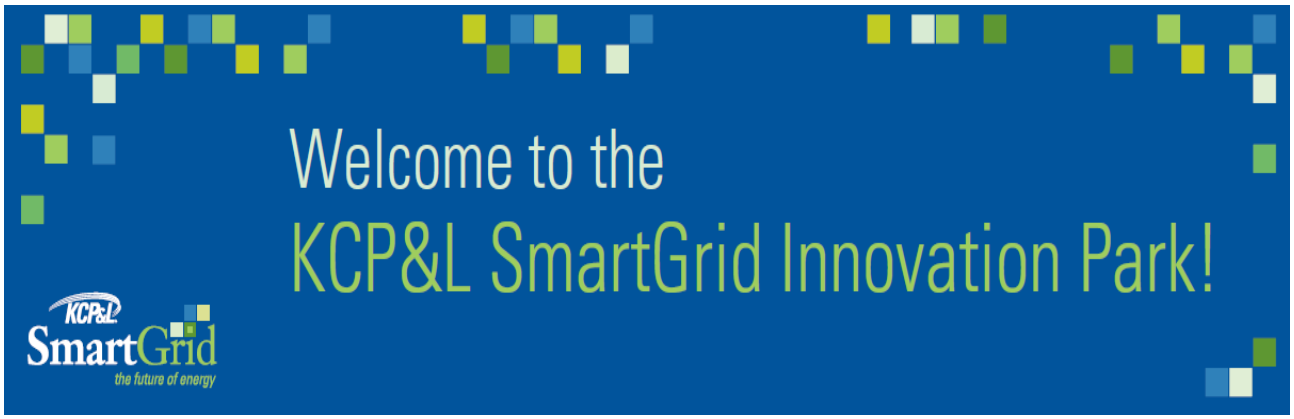
Community Engagement



Project Living Proof

180 kWh solar at 8 locations
(including local High School)

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Key Lessons Learned

Key Decision	Lessons Learned
Hire local labor	• Ambassadors lacked product knowledge; customer training weak • Training curve for local labor; additional processes and handoffs
Partnerships and Grassroots outreach	• Multi-purpose events held jointly with partners are more successful than utility-only events; strong neighborhood associations will help
Customer product adoption	• Customer adoption did not always equal customer engagement • Testing if tools will fit wide range of customer preferences • Only 1 product per customers; restrictive for display users • Product participation requirements will limit thermostat enrollment
Customer tools at the time of meter install	• Technology constraints with meter network stabilization • 95% adoption (for customers who were home); 50% usage
Dedicated smart grid support staff	• Non-traditional support tasks include marketing and outreach • Segment from normal customer service operations
Customer Segmentation	• Unable to fully implement true enrollment segmentation model due to EM&V and a non-bias approach for non-proven SG tools • Will utilize segment model to evaluate customer enrollment and participation groups during evaluation phase and future marketing • Limited segmentation (on usage) will guide equipment purchase

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Questions / Discussion

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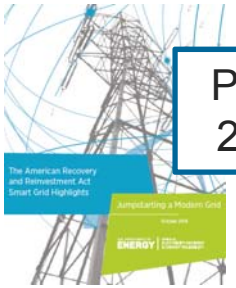
Speaker Bio

Dennis Sumner

- City of Fort Collins Colorado
- BS/EE University of Colorado
- 42 years power industry experience
- Project Manager Fort Collins Smart Grid Projects:
  - Smart Grid Investment Grant
  - Renewable & Distributed System Integration Cooperative Study



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Utility Overview

Disclaimer:

The City of Fort Collins does not endorse or recommend any commercial product, process, service, or manufacturer. Mention of any specific trade name, trademark, or manufacturer in the following materials are provided for informational purposes only and do not indicate favored status by the City of Fort Collins. Such statements shall not be used for advertising or endorsement purposes and do not represent the views, position, or practices of the City of Fort Collins.

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Utility Overview

- **City of Fort Collins Light & Power**
- Northern Colorado – Front Range
- Population 151,000
- Municipal
- Retail only
- Urban
- 100% AMI penetration
- Policy context , But no CBS

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Utility Overview – Policy Context & Community Values

FCL&P Energy Policy

- 1.5% energy savings
- Reduce system peak by 5% by 2015 / 10% by 2020
- Renewable resources to meet Colorado Renewable Energy Standard
- Provide Highly reliable electric service – 12 months ending June 2014
  - Average System Availability Index 99.9981%
  - Customer Average Interruption 39 minutes
  - System Average Interruption Frequency Index 0.260

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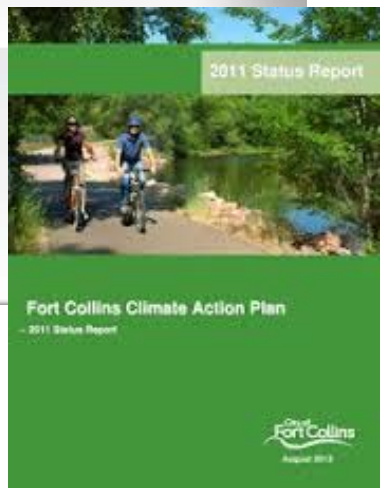
Utility Overview – Policy Context & Community Values

- Climate Action Plan
  - 20% GHG reduction below 2005 levels by 2020, 80% by 2050
- Energy Efficiency
- FortZED: Zero Energy District / Demonstration
- Stormwater Management
- Water Conservation Plan
- Water Quality

City of Fort Collins Utilities

PROTECT
MANAGE
SUPPLY
CONSERVE
Water

green BUILDING FORT COLLINS



FORT ZED

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Project Overview

Study population	No Study, Offered to all Except large C&I
Sample Frame	Available to all
Enrollment Approach	Available to all
Experimental Design	N/A
Treatments- Pricing (#)	Standard Rates: Residential Tiered, Commercial Energy and Demand
Treatments- Technology (#)	Demand Response: Wi Fi Thermostats
Treatments – Information (#)	N/A
Recruitment Method	Promotions: Media ads, electronic, social media, word of mouth
Deployment	Phased: Friends and Family, Expanded Friends and Family
Other	? ? ?

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Programs that Support Goals

1. Customer Web Portal
   - ‘Manage My Use’
2. Demand Response
   - Peak Partners/’Reduce Our Peak’

Programs are designed to align with City & Utilities strategic direction.

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Web Portal

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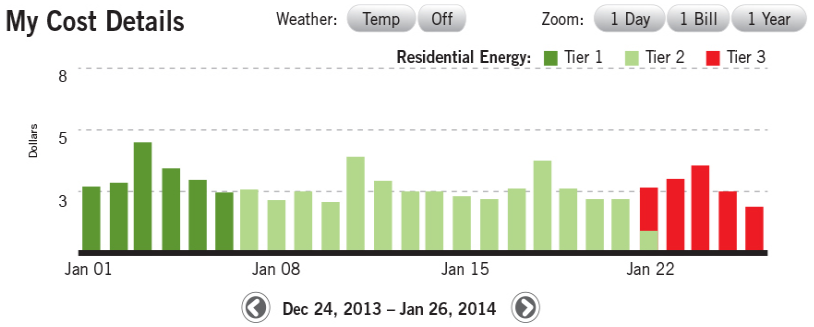
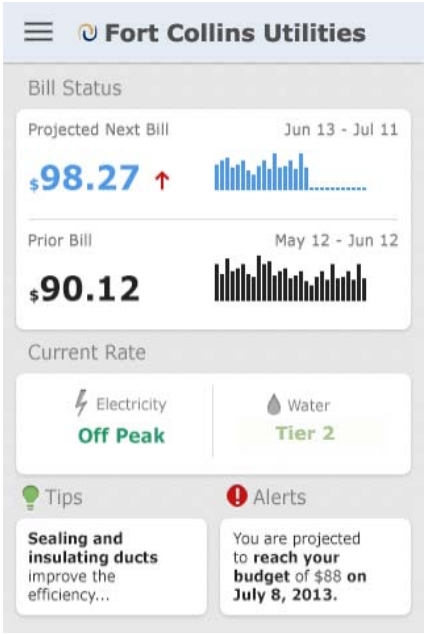
Web Portal: Fact Sheet



- Enrollment
  - Online tool made available to all residential and small commercial customers
- Marketing Approach
  - Limited followed by mass launch
  - Multi-channel campaign
- Results & Metrics
  - Google Analytics
- Monitor Results & Refocus Marketing Based on Analytics



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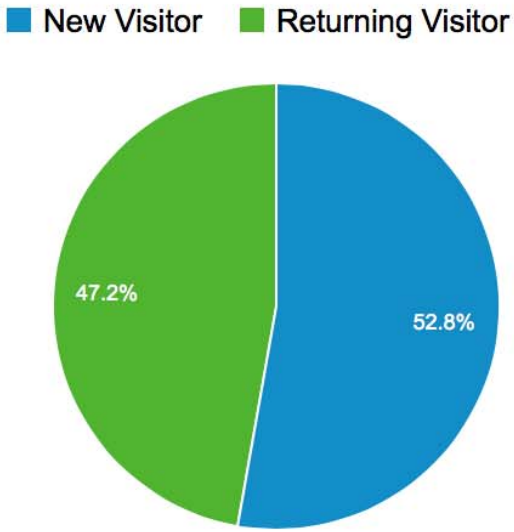
Web Portal Analytics Drive Marketing

Sessions
4,093

Users
2,215

Pageviews
16,376



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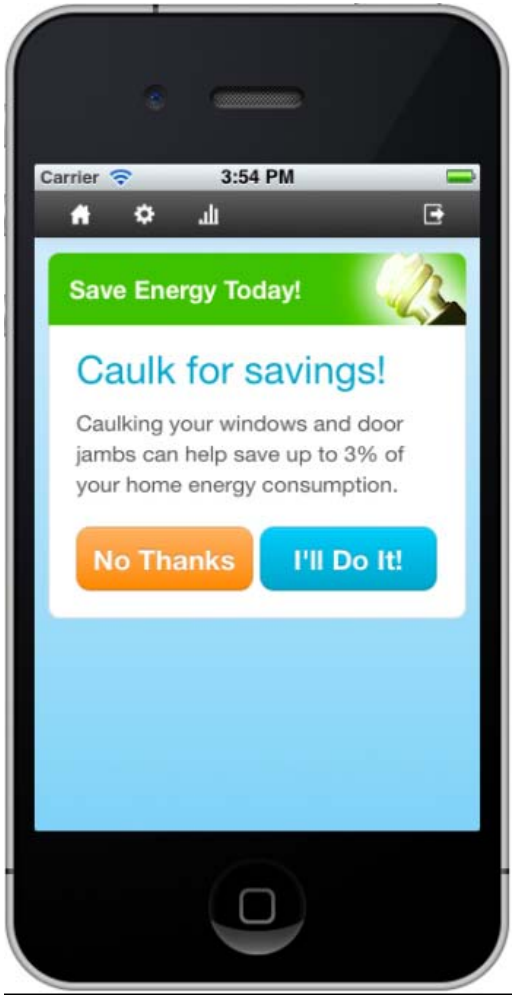
Demand Response



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Demand Response: Fact Sheet

- Phase 1: Replaces existing AC load control program
  - Offered to ‘Friends & Family’ during test phase
  - Offered to legacy program customers
  - Offered to all customers
- Option to decline participation
  - Two conservation events per season
- Incentive
  - Free Wi-Fi programmable thermostat installed at no charge to customers

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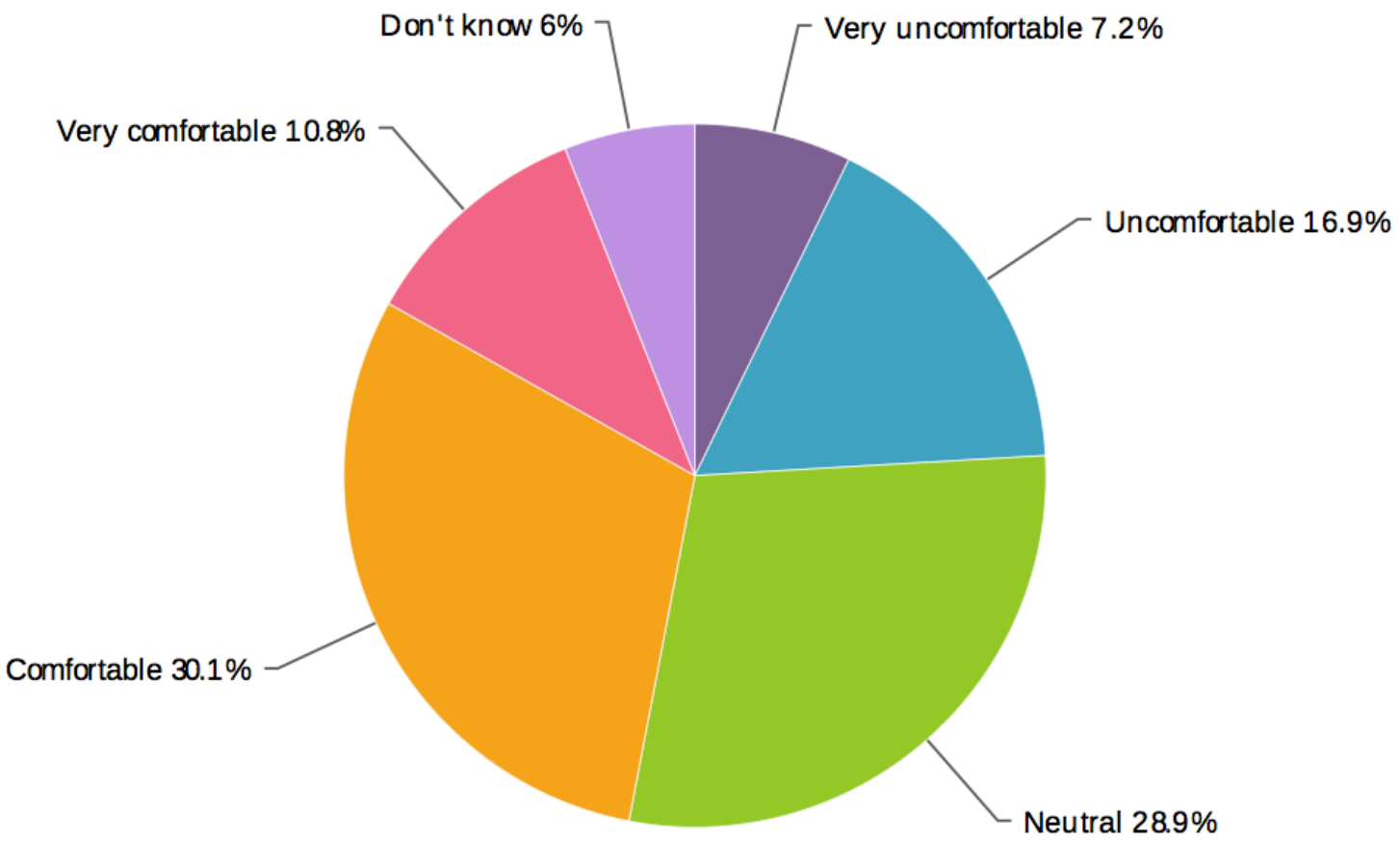
Customer Research Helps Tailor Program



Comfort Level During Conservation Events

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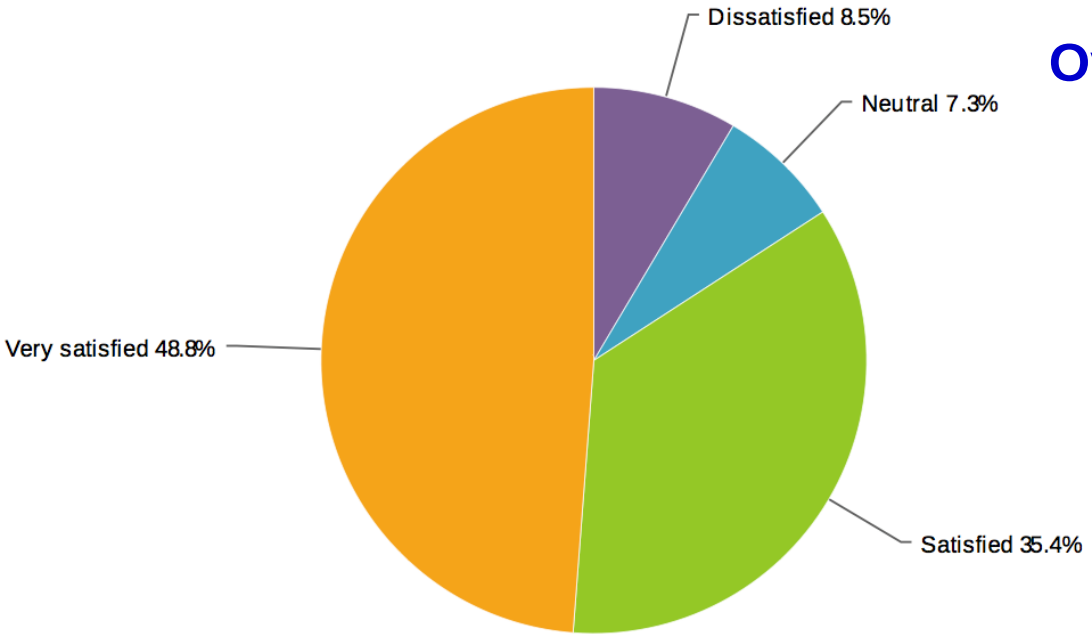
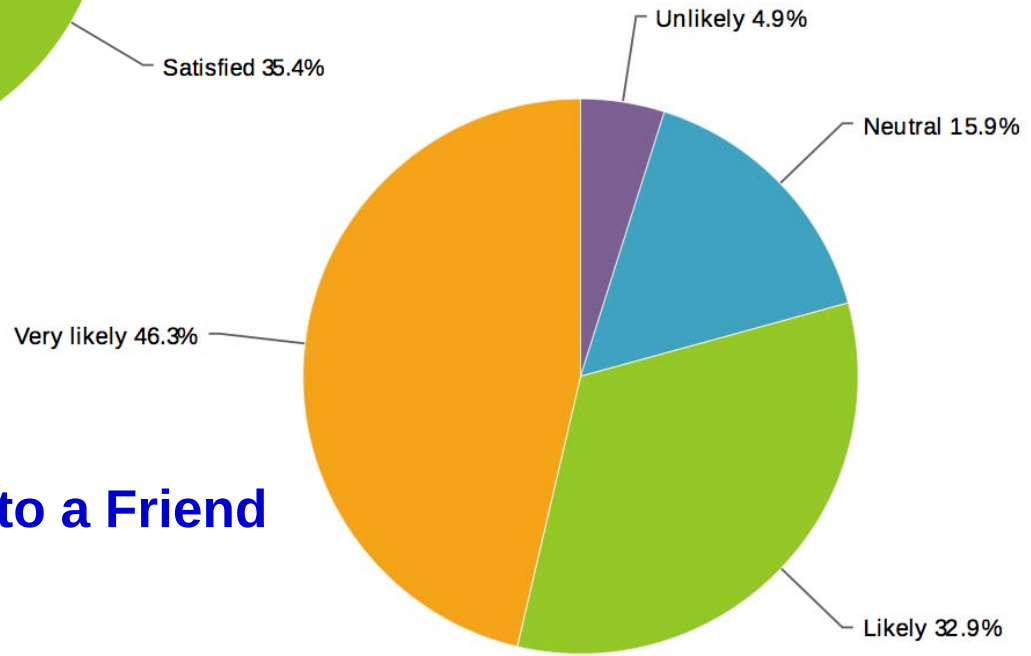
Customer Research Helps Tailor Program

Overall Satisfaction



Recommend to a Friend



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Marketing Communications

- Login Dashboard
  - Icons visible to all
  - Drive e-Bill customers to explore WP & DR
- Cross Marketing
  - Energy Reports
  - Water Reports
- All Channels
  - Electronic Media
  - Social Media
  - Traditional Media
- Segmented Approach

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Questions / Discussion

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