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2010 APR 21 P 1:

AZ CORP COMMISSION
DOCKET CONTROL

ORIGINAL

April 21, 2010

Docket Control
Arizona Corporation Commission
1200 West Washington Street
Phoenix, Arizona 85007

RE: In the Matter of the Application of Arizona Public Service Company For Approval of a Residential Demand Response Pilot Program
Docket No. E-01345A-10-0075

Arizona Public Service Company ("APS") is providing a copy of the presentation given at APS's Home Energy Pilot Program Information Stakeholder Meeting held on April 20, 2010, in the above-referenced matter.

If you have any questions regarding this information, please contact Erinn Andreasen at (602) 250-3276.

Sincerely,

Leland R. Snook

Arizona Corporation Commission
DOCKETED
APR 21 2010
DOCKETED BY

LS/sl
Attachment

cc: Steve Olea
Janice Alward
Lyn Farmer
Barbara Keene
Bill Musgrove
Terri Ford
Jodi Jerich

Smart Grid Overview & Home Energy Information Pilot Stakeholder Meeting

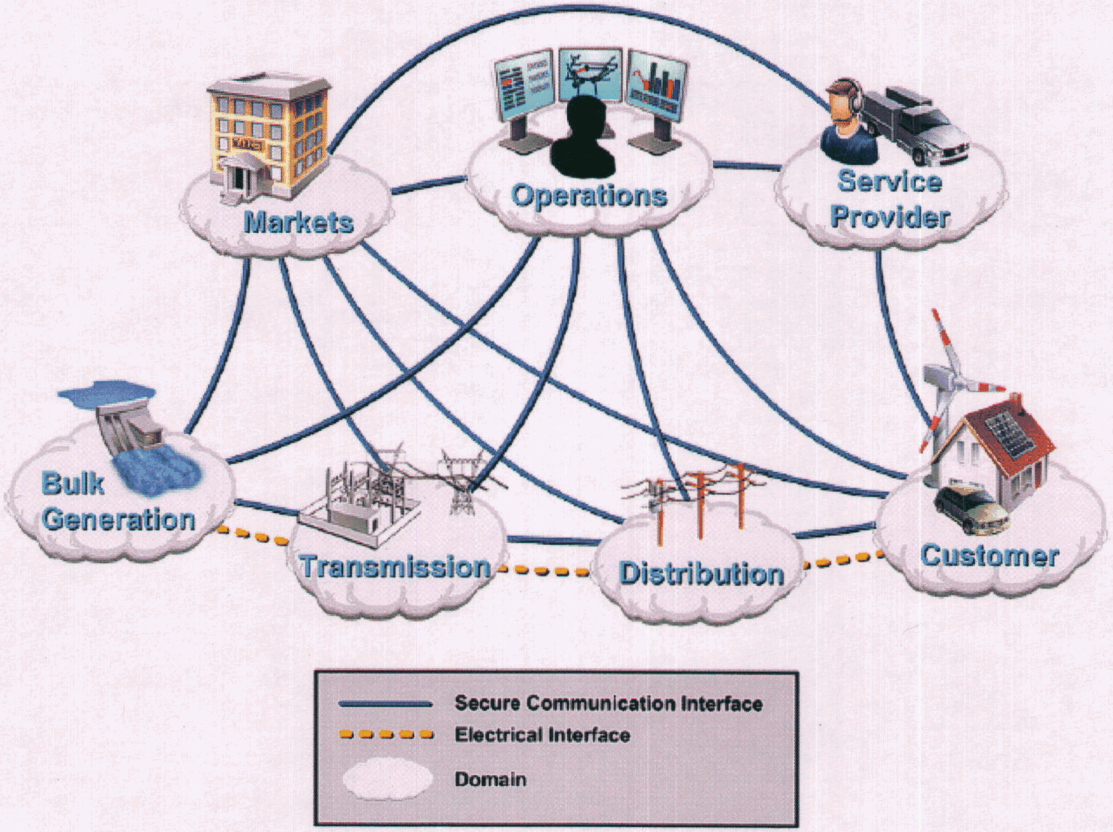
APRIL 20, 2010

APS

Agenda

- APS Smart Grid Activities
- Time-of-Use Rate Options
- aps.com Bill Prism
- Demand Response Activities and Valuation
- HEI Pilot Overview
- Pre-Pay Energy Service
- Timeline and Next Steps

Smart Grid Overview



The Smart Grid is a conceptual advancement of the national electric infrastructure from a static and reactive series of interconnected territories to a dynamic and proactive nationwide system of transmission, distribution, generation, and customer assets.

Smart Grid Objectives

An advanced delivery system, from generator to consumer, that provides enhanced operational capabilities

- Ensure EFFICIENT use of the electric grid
- Enhance RELIABILITY of the grid through early detection and automated "self-healing" technologies
- Provide CUSTOMERS with the information and tools to respond to electric grid conditions
- Improved CUSTOMER SATISFACTION
- Provide opportunities for NEW PRODUCTS AND SERVICES

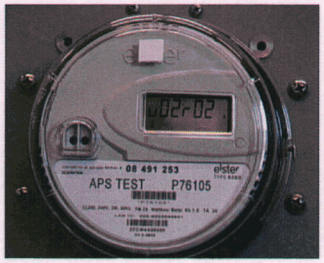
Edison vs. Graham Bell:
The case for revitalization

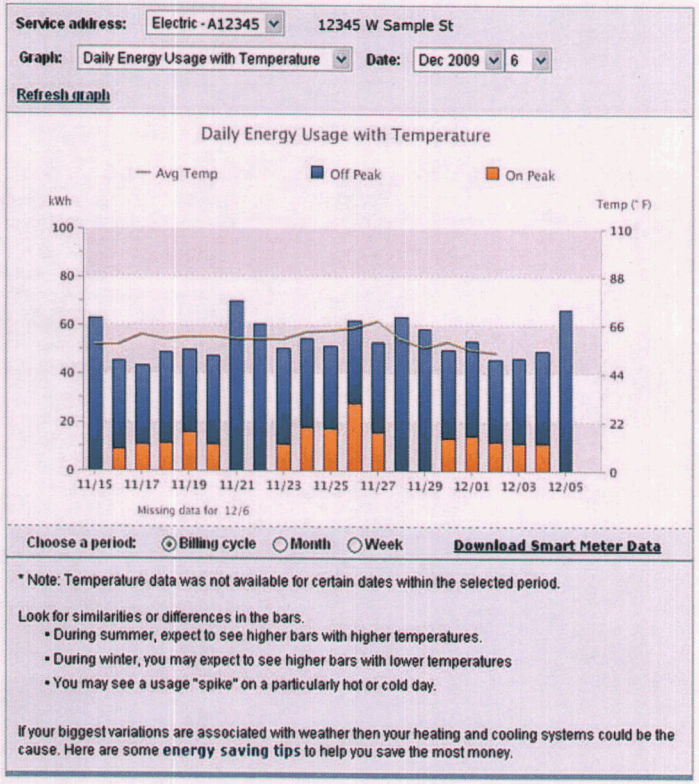
5 Things to Know About Smart Grid

1. There's not a single "smart grid" – it's a portfolio of technologies
2. It will be a long-term transformation: 10-20+ years
3. Success requires clear and consistent policy and regulatory support
4. There is significant opportunity to improve system reliability and efficiency
5. New customer products and services will change our business

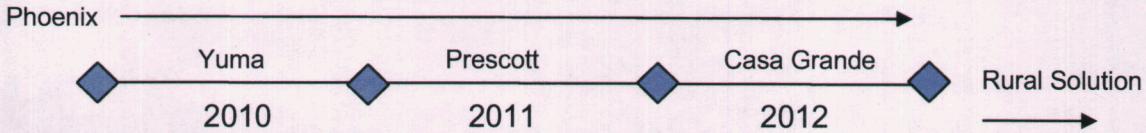
Setting the Stage – AMI

- Deployment of 1,000,000 "Smart Meters" by 2012
- Over 375,000 deployed to date in metro Phoenix and Flagstaff
- Remote meter reading, connect/disconnect, and rate change
- Greater customer information and flexibility
- Enabling technology-related programs
- Greater customer information through aps.com & Bill Prism
- Enables innovative rate design



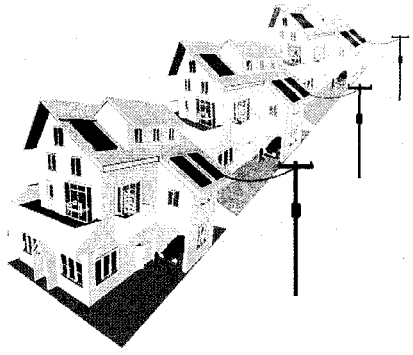


Deployment Strategy



Flagstaff Smart Grid Pilot – Key Facts

- 95% of Flagstaff plus portions of Coconino County
- 35,000 AMI meters installed by August 31, 2009
- Automating feeder mid-points and tie-points
  - 15 distribution feeders out of 4 Flagstaff substations
- Sensoring technologies
  - Power outages
  - Fault indications
- Adopting "self-healing" technologies on 4 feeders
- "Large Pipe" fiber communications
- Design, test IS back office systems and protocols



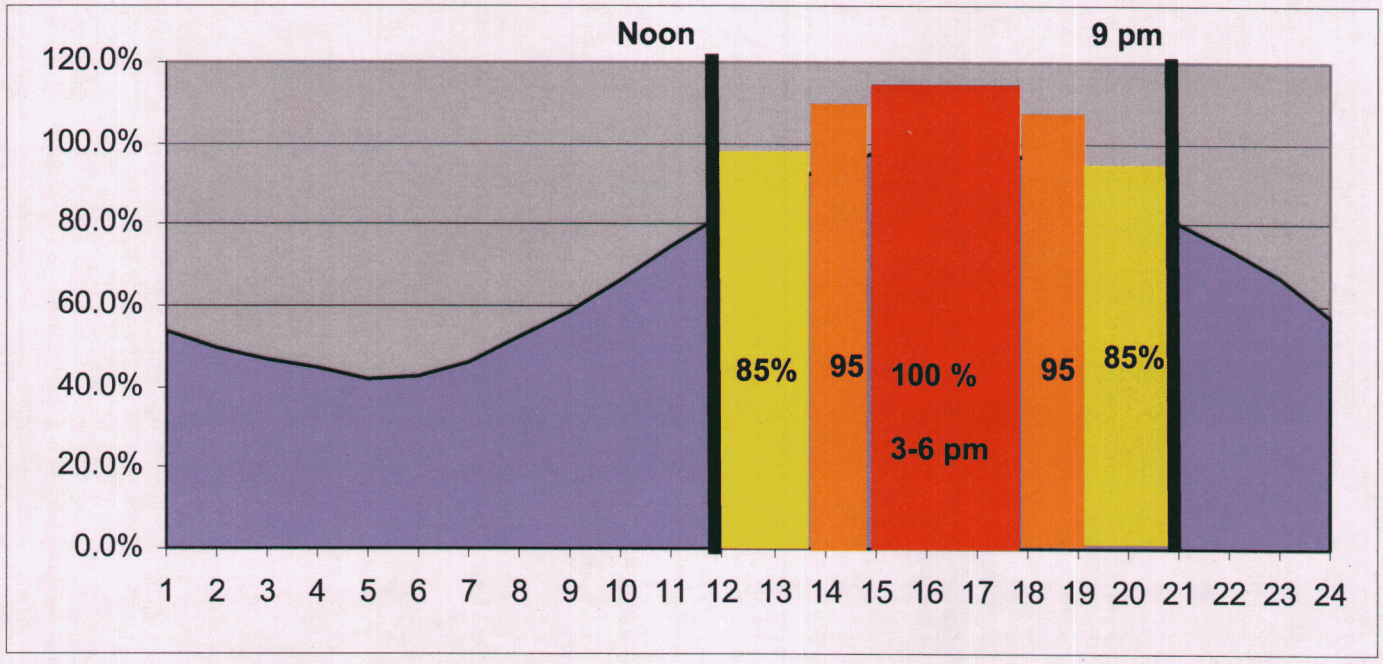
- Community Power Project
  - Located on one distribution feeder
  - Opportunity to study a concentrated deployment of solar energy
  - Incorporates 200 – 300 solar systems on eligible customer homes and businesses
  - Participants will be billed on the Community Power rate, which is fixed for 20 years
  - Total of 1.5 – 2MW of distributed solar energy
  - Includes 1MW of central storage – likely batteries
  - Also testing Solar Water Heaters and Distributed Wind generation

Electric Vehicles

- History of involvement with EVs (GM EV1)
- Electric Vehicle (V2G) study completed in March 2010
- April 1, 2010 ACC filing of study and program
- Nissan LEAF / eTec deployment in Arizona
  - One of five states / 11 major markets
  - ~ 500 - 700 cars in Phoenix area by EOY
- Internal effort to define EV business model for APS (system impacts, rates, meters, 3rd party, ownership, incentives, etc.)
- Target APS EV Program filing Q3, 2010

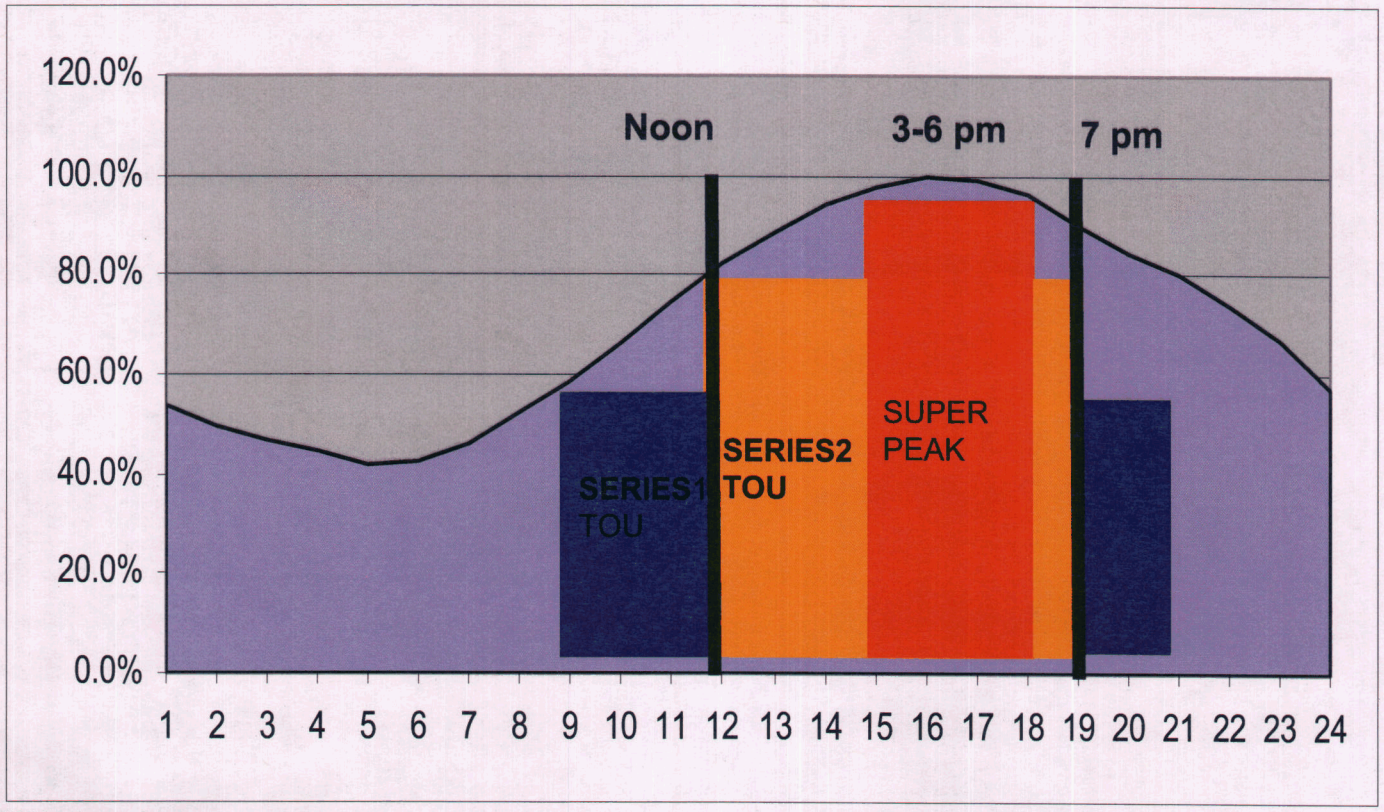
Residential Peak Day Load Shape

Top 10 Core Summer Peak Days
Percent of Maximum kW by Hour of Day



Residential TOU Rates

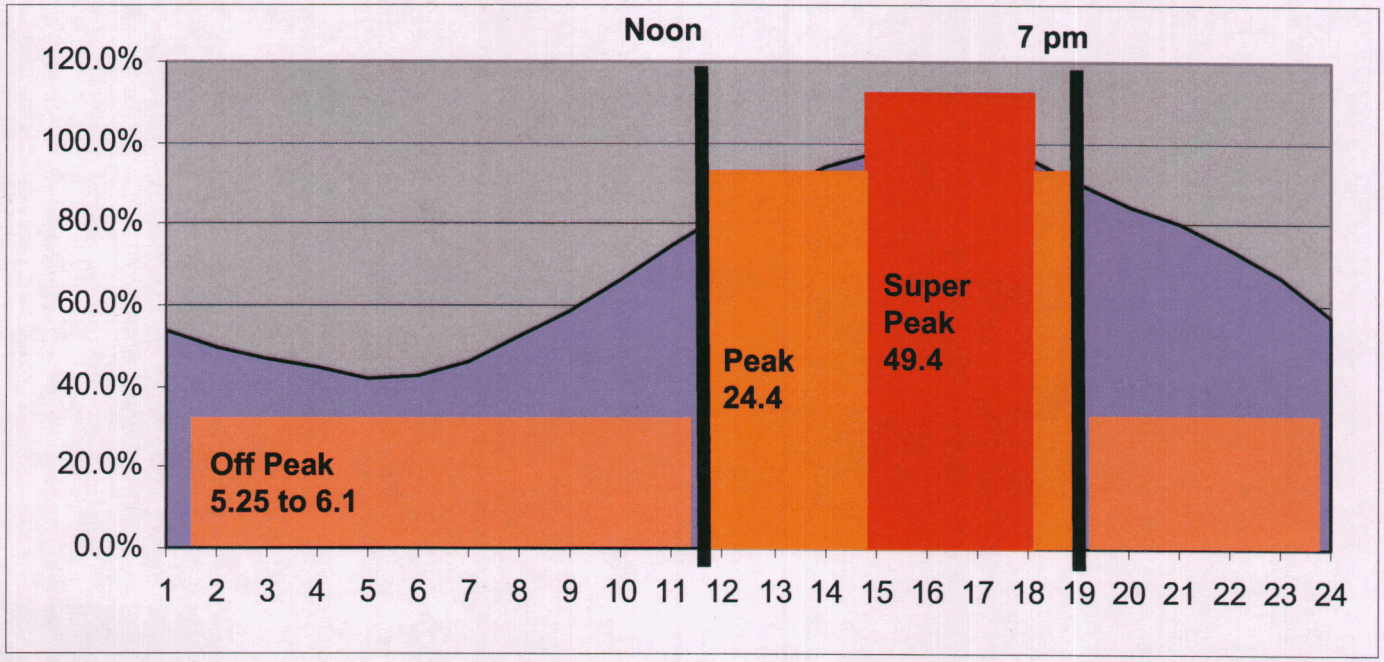
TOU Peak Hours vs Summer Peak Day Load Shape



Series 1 TOU closed to new customers

Residential TOU Rates

Summer Prices - Cents per kWh



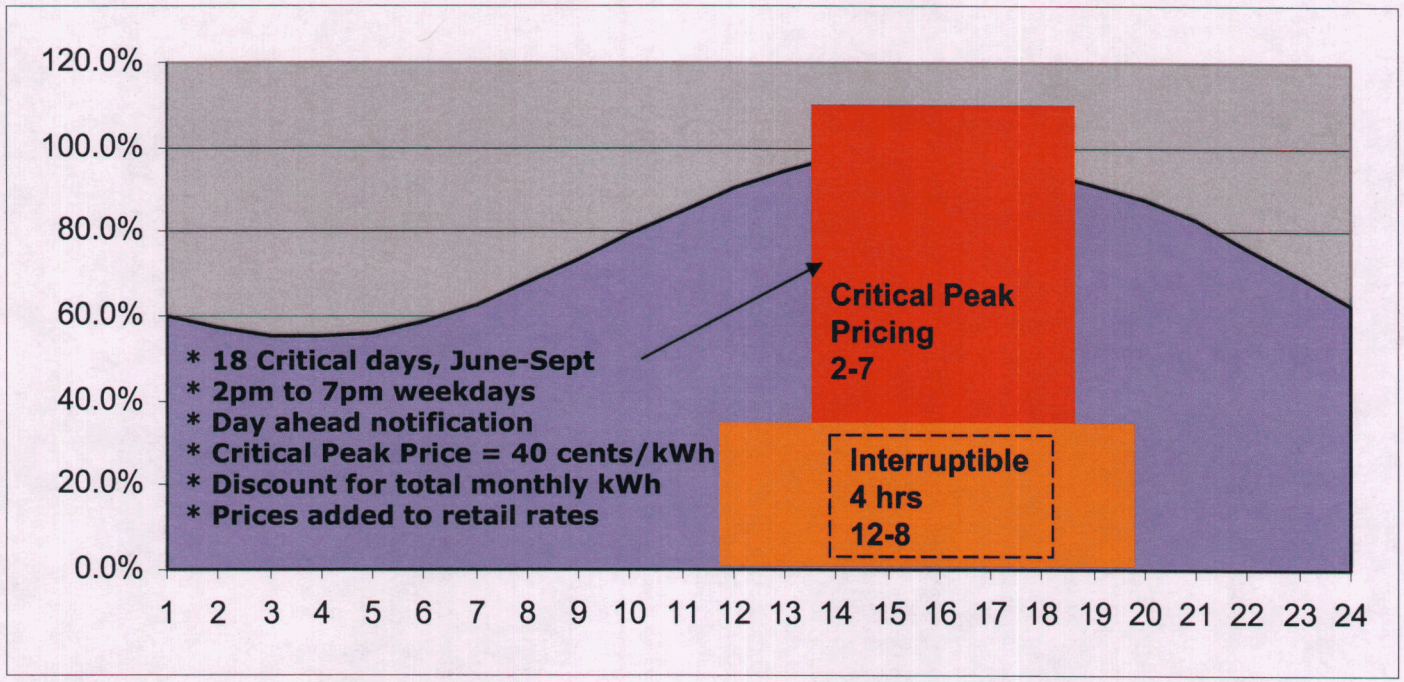
Residential TOU Participation

February 2010

Standard (non-TOU)	493,533	49.6%
Time Advantage 9-9	319,120	32.1%
Combined Advantage 9-9	50,978	5.1%
Time Advantage 7 pm to Noon	96,313	9.7%
Combined Advantage 7 pm to Noon	35,074	3.5%
Time Advantage Super Peak	46	0.0%
Total Residential	995,064	100.0%
Residential Time-of-use	*501,531*	*50.4%*

Dispatchable Rates

Prices only apply to critical days



* Interruptible info is preliminary

Home Energy Information Project Pricing Initiatives

Test CPP customers with remote thermostat control
Compare to CPP customers without control

Test Standard and TOU customers with in-home device. Compare to customers without device

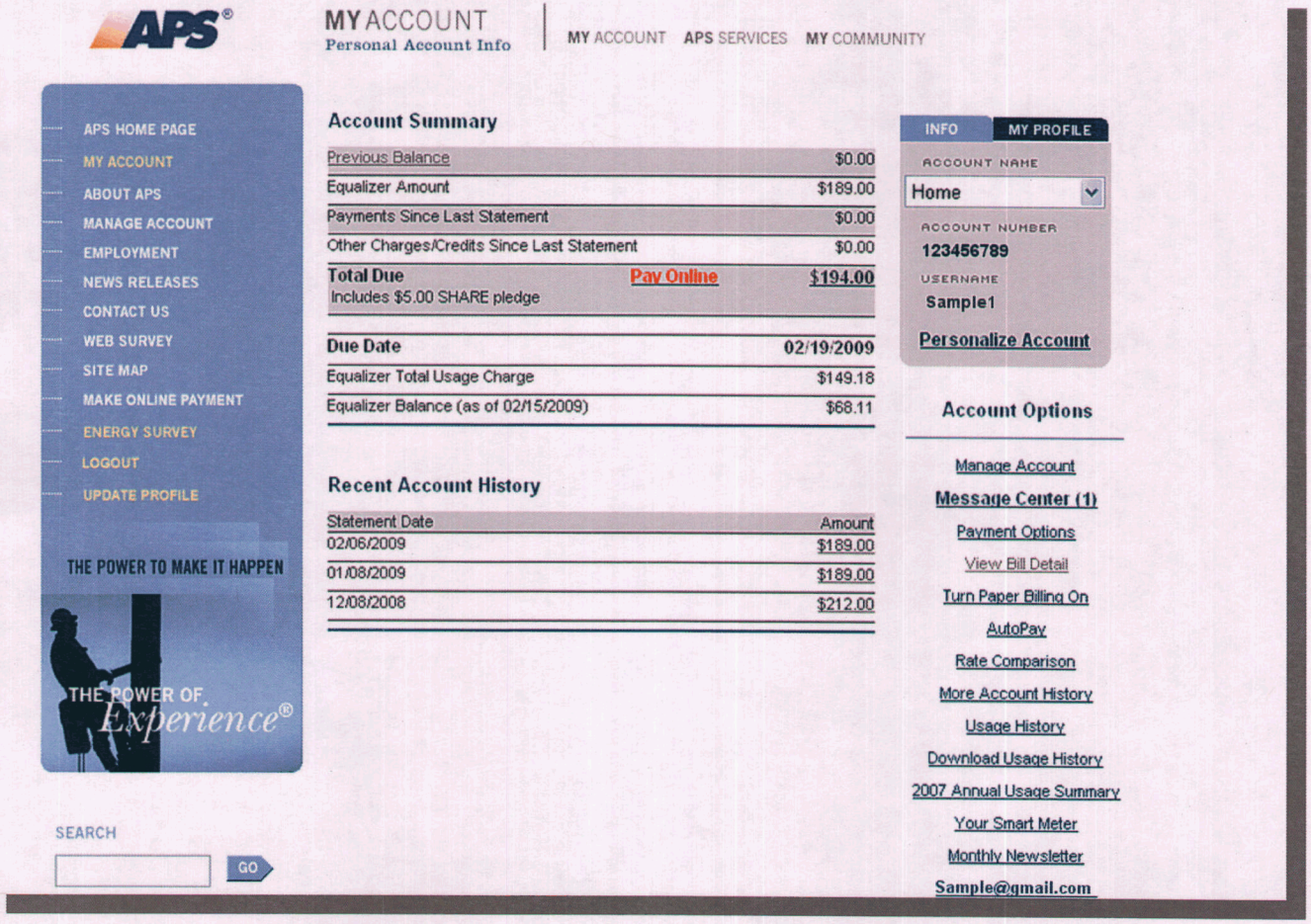
Test Standard and TOU customers with mobile information.
Compare to customers without information

Test conservation impact for pre-pay energy

aps.com overview

- Nearly 425,000 active users
- Over 40% of APS customer base
- 16% receive only electronic billing
- Over 85 million page views
- Over 2.2 million payments processed
- Transaction-based self-service site
- Educational resource for customers, assist in exploring ways to save money and change energy behaviors

Previous My Account



New My Account

Account Summary

- An at-a-glance overview of the bill
- How much do I owe?
- When did I make my last payment?
- Link to "Payment history"
- Links to "View bill" and "Pay bill"

Account Summary

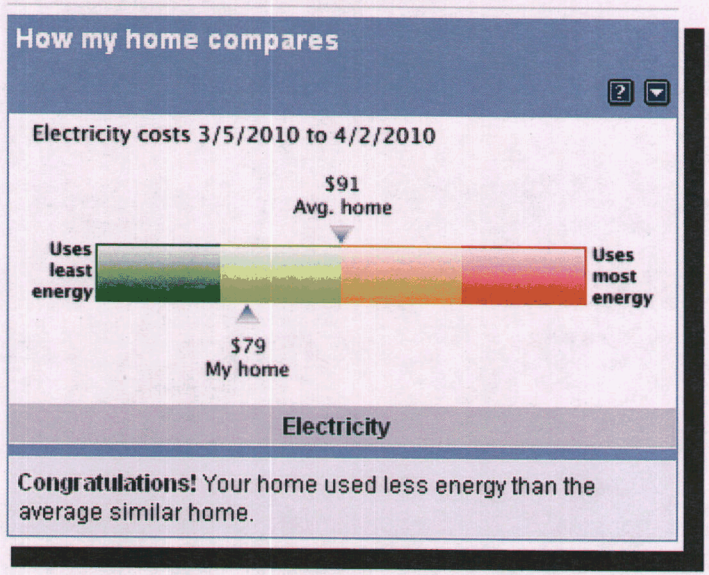
Bill date 4/7/2010	$135.52	View bill
Payment summary		Payment history
Last payment made on 3/22/2010	$146.52	
Amount due 4/20/2010	$135.52	Pay bill

Account Summary

Bill date 4/7/2010	$135.52	View bill
Bill Summary		
Previous balance	$0.00	
Equalizer amount due	$136.00	
Other charges & credits	($0.48)	
Total amount due	$135.52	
Payment summary		Payment history
Last payment made on 3/22/2010	$146.52	
Amount due 4/20/2010	$135.52	Pay bill

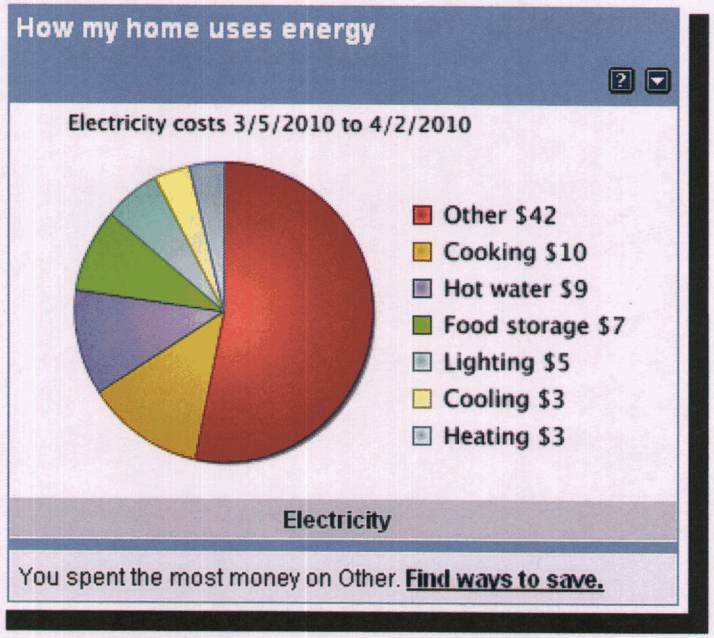
How my home compares

- How do I compare to others?
- Do I use more or less energy compared to homes my size?



How my home uses energy

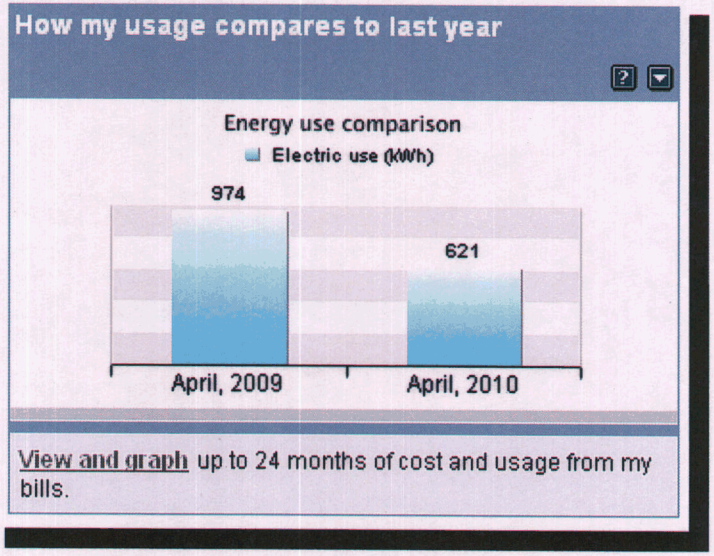
- A chart showing a breakdown of the current bill
- Shows how major appliances impact energy use
- How did I use energy this month?
- How much of my bill is from cooling costs?



Note – appliance usage is estimated based on customer profile and energy modeling

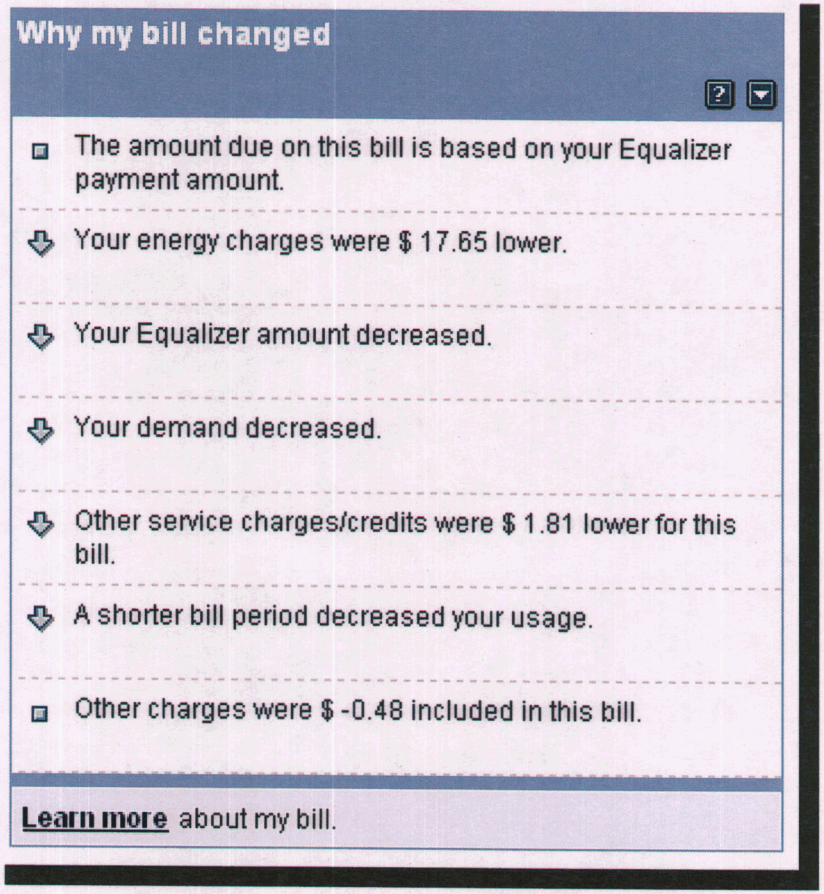
How my usage compares to last year

- Quick visual breakdown of a year-over-year usage
- Did I use more or less?
- Link to create customized usage and payment graphs



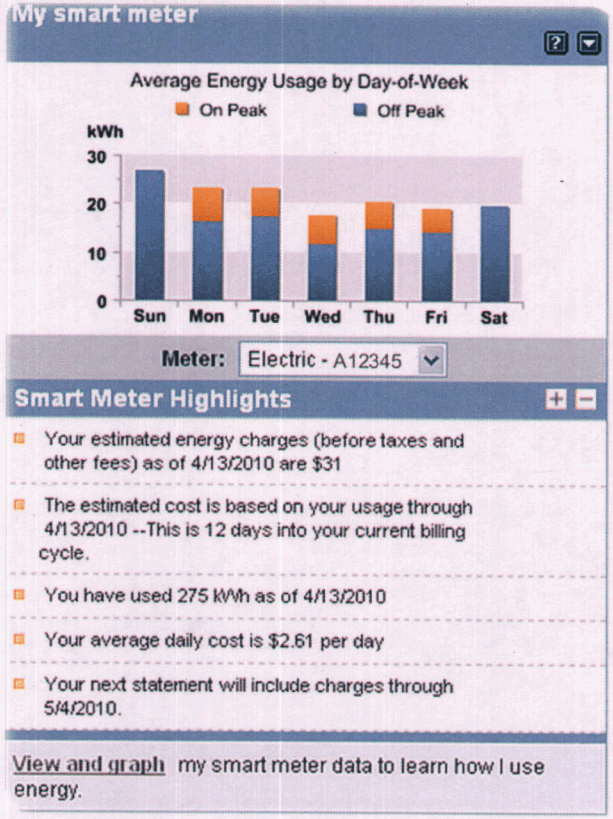
Why my bill changed

- Shows all the factors that affect the bill
- How much of an impact each factor has on the amount due
- Why is my bill different from last month?
- Why is my bill so high?
- Link for more detailed comparison



My smart meter

- Detailed look at energy usage
- "Bill-to-date" highlights
- How do I use energy?
- What hour do I use the most energy?



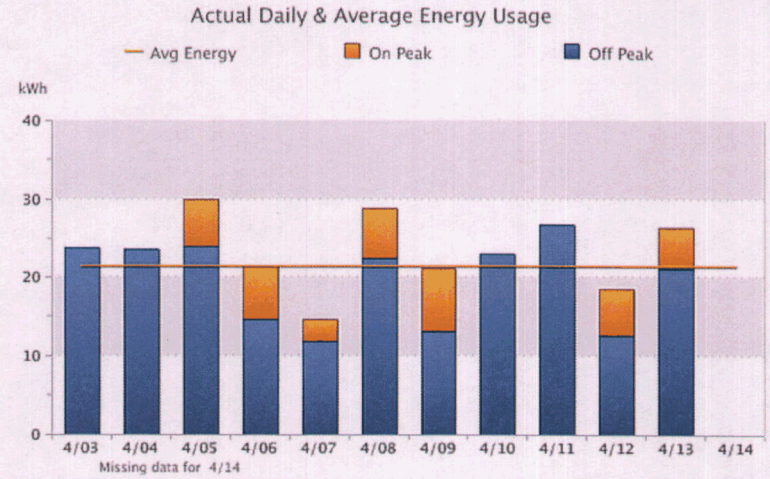
Actual Daily & Average Energy

My Smart Meter

Service address: Electric - A12345 1234 W. Sample St.

Graph: Actual Daily & Average Energy Usage **Date:** 04/14/2010

Period: ⦿ Billing Cycle ○ Month ○ Week **Download Smart Meter Data**



Look for similarities or differences in the daily usage bars.

- If a bar is lower than the others, was there a good energy practiced followed on that day that you can apply to others?
- If a bar is higher than the others, was there an energy practice that can be avoided to reduce your energy usage?

View the Day-of-Week chart for a closer look. You might also review the temperature chart to see how the weather is influencing your energy usage due to heating or cooling.

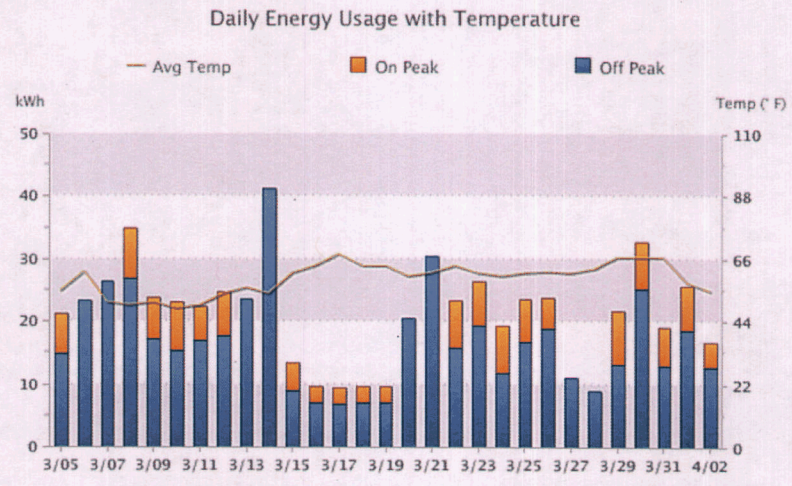
Daily Energy Usage with Temperature

My Smart Meter

Service address: Electric - A12345 1234 W. Sample St.

Graph: Daily Energy Usage with Temperature **Date:** 03/10/2010

Period: ◉ Billing Cycle ○ Month ○ Week **Download Smart Meter Data**



Look for similarities or differences in the bars.

- During summer, expect to see higher bars with higher temperatures.
- During winter, you may expect to see higher bars with lower temperatures
- You may see a usage "spike" on a particularly hot or cold day.

If your biggest variations are associated with weather then your heating and cooling systems could be the cause. Here are some **energy saving tips** to help you save the most money.

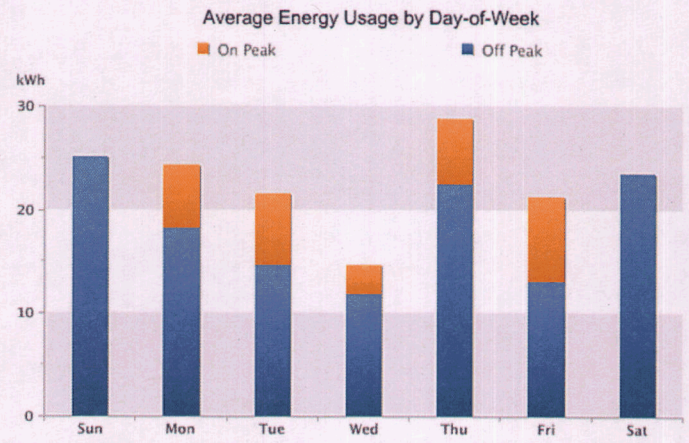
Average Energy Usage by Day of Week

My Smart Meter

Service address: Electric - A12345 1234 W. Sample St.

Graph: Average Energy Usage by Day-of-Week **Date:** 04/12/2010

Period: Billing Cycle Month Week **Download Smart Meter Data**



Look for similarities or differences in the days of the week.

- Is your usage even on weekdays or does a day of the week stand out as higher or lower than the others?
- How is your weekend usage compared to weekdays?
- If you are home more often, you can expect a proportional increase in your energy usage.

Change the chart interval from monthly to weekly or select another week.

- Are your results consistent from week to week?
- Can you spot a bar that is particularly low? Was there some particularly good energy practice on that day that can be applied to others?

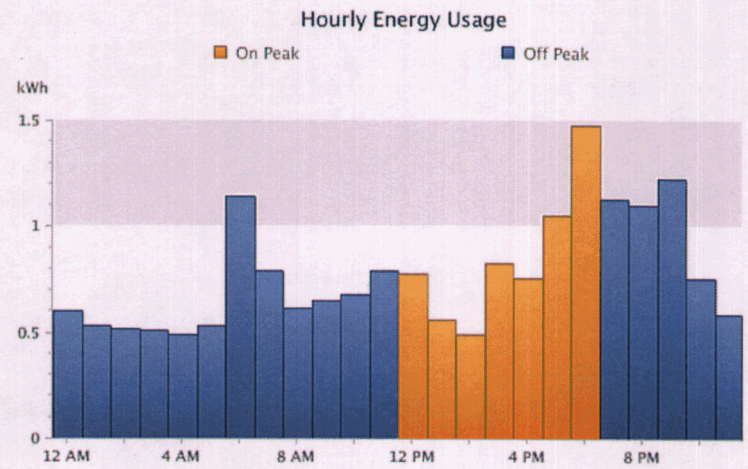
Hourly Energy Usage

My Smart Meter

Service address: Electric - A12345 1234 W. Sample St.

Graph: Hourly Energy Usage **Date:** 04/12/2010

Period: ○ Week ◉ Day **Download Smart Meter Data**



Look for similarities or differences in the hourly demand (kW).

- What are the top three hours of energy demand?
- Do these hours vary from day to day?
- What are the main activities that are happening during the top three hours?

Consider if there are any ways to reduce energy-consuming processes during these hours to reduce your overall energy usage. Here are some **energy saving tips** to help you save the most money.

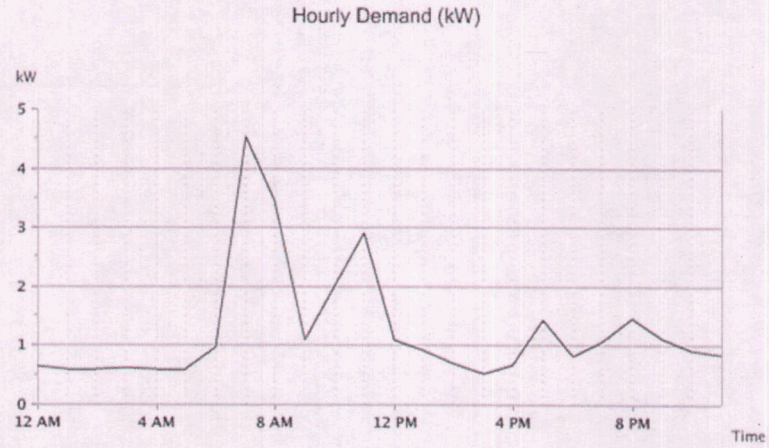
Hourly Demand

My Smart Meter

Service address: Electric - A12345 1234 W. Sample St.

Graph: Hourly Demand (kW) **Date:** 04/05/2010

Period: ○ Week ◉ Day **Download Smart Meter Data**



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APS DR Study

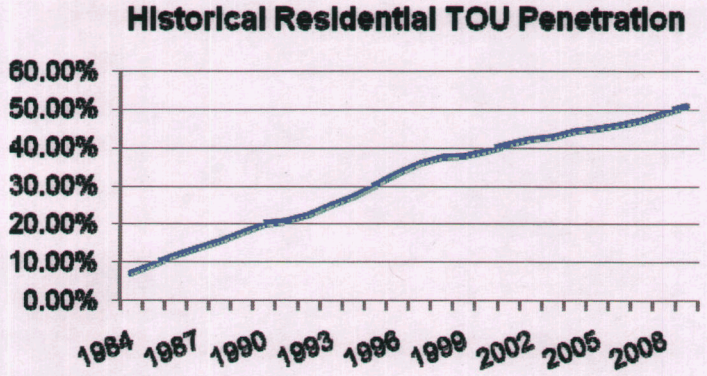
- Filed June 28, 2008
- Review of DR programs that could be implemented and the costs/benefits to APS and its customers

Direct Load Control	Customer Load Response
Residential A/C Cycling	Curtailable & Interruptible Rates
Residential Misc. Load Control	Demand Bidding/Buyback
C&I Load Control	Standby Generation
	Plug-in Vehicles
Scheduled Load Management	**Time-Differentiated Rates**
Thermal Energy Storage	Time-of-Use Rates
Scheduled Water Pumping	Critical Peak Pricing
Battery Storage	Real-Time Pricing

DR in Progress Today

Time-Of-Use

- Initial experimental TOU rate implemented in 1976
- First widely available Residential TOU rates in 1982
- Over 500,000 Residential customers now on a TOU rate plan
  - Leads nation in both number and percentage of Residential customers
- New Super Peak and Critical Peak rates available in January 2010

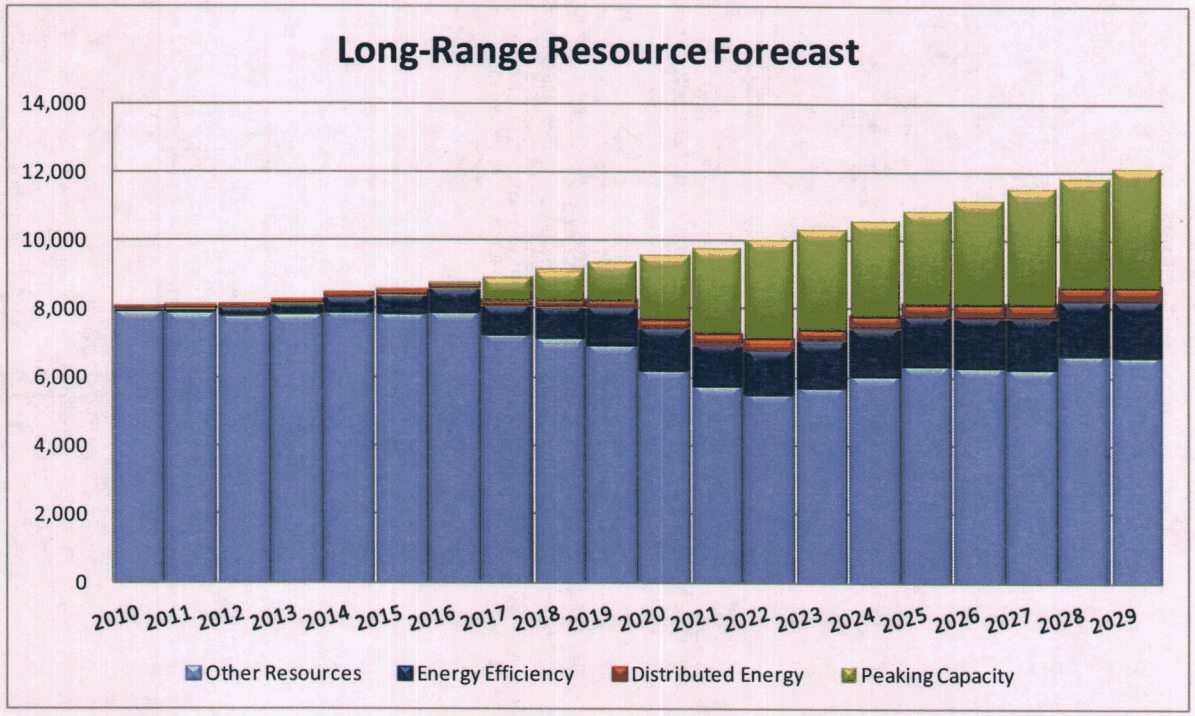


APS Peak Solutions

- Demand Response program for Commercial & Industrial customers
- Approved by Commission in 2009
- Objective is to reduce summer peak demand
- Customer agrees to reduce peak demand in exchange for incentive payment
- First impacts to be realized in summer 2010
- Current status: Customers being recruited; meters installed; control and billing infrastructure being put in place

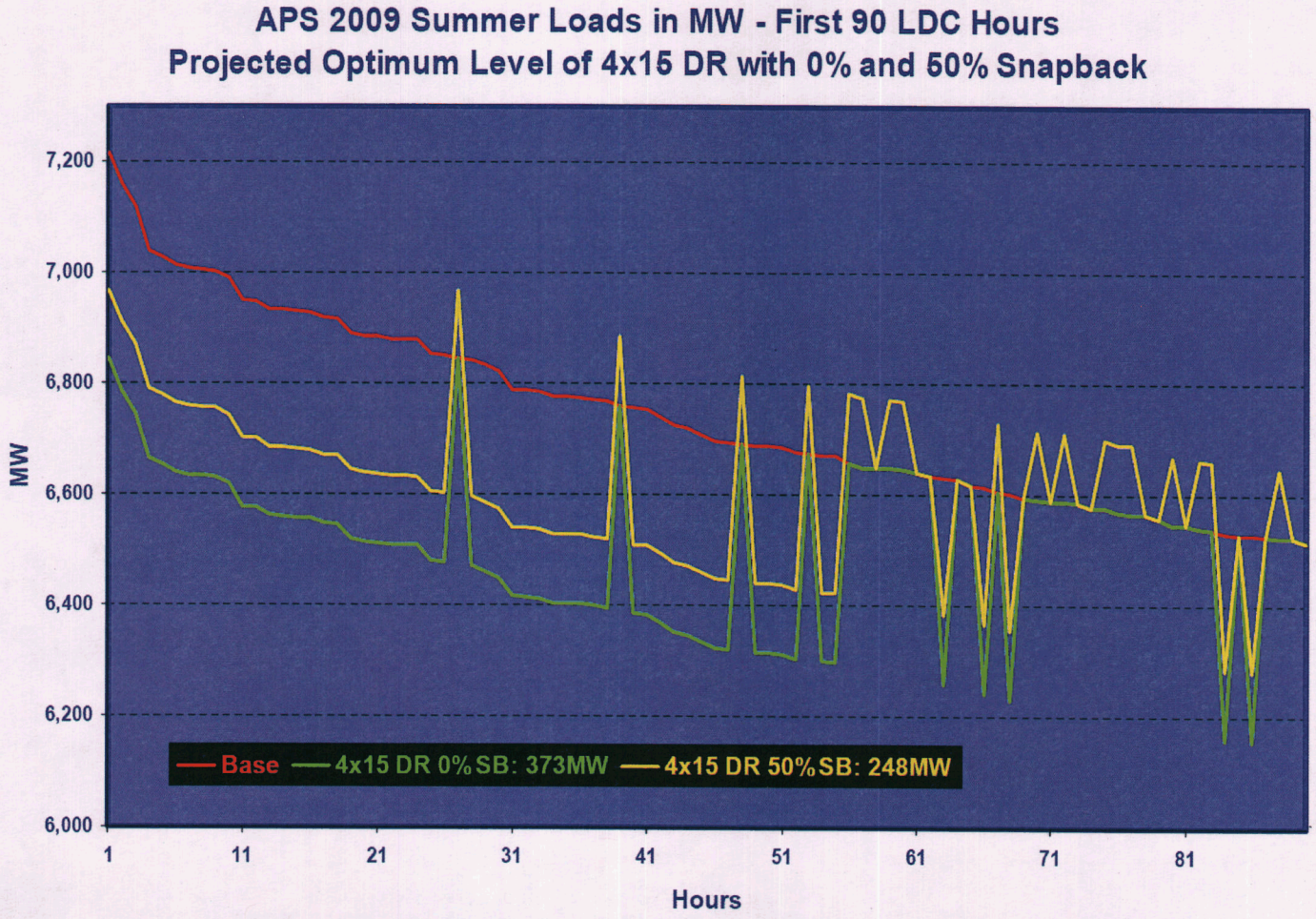
APS Resource Needs & DR Impact

- APS peaking needs are impacted by:
  1. Economic slowdown, impacting typically rapid customer growth
  2. Aggressive pursuit of renewable energy resources
  3. Energy Efficiency goals
- DR programs provide a demand-side solution to meeting the highest peak load hours
  - Similar in nature to a Combustion Turbine
- Must account for true impacts to the Load Duration Curve ("LDC") to understand how DR can be utilized as a resource
  - Certain dispatch restrictions for DR limit its ability to fully mimic a generation resource
    - Ability to only call a limited number of hours per day for a limited number of days per year
  - Many DR programs shift when energy is consumed rather than eliminate the consumption
    - "Snapback Effect"
- Long lead time for development for DR means APS is not waiting until 2017 – planning for resources to be fully developed in time for the resource need



DR Impacts to Utility Planning

* Represents impacts of a DR program that can be called on four hours per day on the fifteen highest peak days



Key Points – System Integration of DR

- Analyze similar to a peaking resource
  - Must account for potential snapback scenarios
  - Current plans forecast peaking need in 2017
- DR potential depends largely on the shape of the Load Duration Curve
  - Steeper curve equates to higher DR potential
  - Snapback greatly reduces the maximum DR potential
- The optimal potential for DR is between 4.5% – 6.8% of system peak
  - The longer the callable window (6 hours versus 4 hours), the higher the potential
  - With 50% Snapback, this is reduced to 3.2% - 5.7%
  - 6 hour event window is most attractive to the APS system (6.8% potential), but likely too long for a Residential program

DR Plan – Overview

- Required by Decision No. 71448
- Filed on March 1, 2010

APS Demand Response Plan

Residential DR	Commercial & Industrial DR	Research & Development DR
• Combination TOU and Demand Pricing	• TOU Pricing • APS Peak Solutions	
• Critical Peak Pricing • Super Peak Pricing	• Critical Peak Pricing	
• Home Energy Information Pilot/DR Study	• Thermal Energy Storage • Standby Generation • Interruptible Rate Rider	• Electric Vehicles • Battery Storage

= Current Programs

= Programs Implemented 1/1/10

= Additional Programs

= Demand Response Plan (~250 MW)

DR Plan – Potential Resource Mix

Targeted Customer Class	Demand Response Program	MW Reduction
Residential	Residential Direct Load Control	100 - 150 MW
	Residential Critical Peak Pricing	2 - 3 MW
	Residential Super Peak Pricing	1 - 2 MW
General Service	C&I Critical Peak Pricing	30 - 40 MW
	Interruptible Rate Rider	
	Thermal Energy Storage	2 - 15 MW
	Standby Generation	50 - 100 MW
	TOTAL MW REDUCTION	**185 – 310 MW**

APS

Future C&I Programs

Thermal Energy Storage

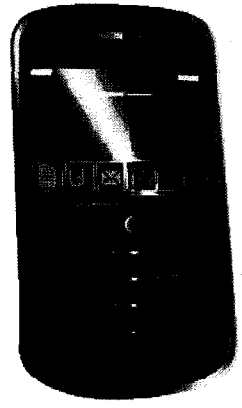
- Technology to make ice during the off-peak hours for building cooling during on-peak hours
- New rate to be filed with 2011 General Rate Case
  - Provide incentive for technology adoption ($/kW-reduced)
  - rate structure that encourages off-peak cooling (higher differential between on-peak and off-peak demand and energy rates)

Standby Generation

- Utilization of customer-owned emergency generation
  - Subject to current air permit restrictions
  - Potential for retrofitting with emissions control equipment or bio-diesel/natural gas

What Does Smart Grid Mean to Consumers?

- Make and receive phone calls



- Instant messaging
- Internet
- Pictures
- Phone calls
- Email
- Text messages

REACTIVE → **PROACTIVE**

- Monthly information on usage and cost information

- Near real-time usage and cost information
- Dynamic pricing capabilities
- Web-based controls and applications
- Disaggregation of usage by appliance

HEI Pilot Program – Overview

- Five Program Types being tested:
  A. Critical Peak Pricing with Enabling Technology
  B. In-Home Displays
  C. Direct Load Control
  D. Smart Phone & PC App
  E. Pre-Pay Energy Service
- Targeting 200 customers for each group
  – Up to 2,000 for Pre-Pay Energy Service
- Participants keep the in-home technology and receive a complimentary Home Energy Audit

HEI Pilot – Demand Response Offerings

Critical Peak Pricing w/ Enabling Technology

- Customer receives smart thermostat (or other in-home technology)
- Thermostat receives signal from APS when a CPP event has been called
- Thermostat executes pre-programmed response during CPP event
- Customer has discretion on pre-programmed response and has override capabilities

Direct Load Control

- Customer receives smart thermostat
- APS remotely modifies the thermostat during DLC events
  - Strategies include increasing the pre-programmed temperature or modifying the likely cycle times on the A/C unit
- APS has discretion on the thermostat control during DLC events; customer has override capabilities

HEI Pilot – Energy Efficiency Offerings

In-Home Displays

- Customer receives an IHD that is capable of displaying:
  - Near real-time consumption
  - Near real-time cost of consumption
  - Estimated consumption and cost by period (e.g., month)

Smart Phone & PC App

- Customer receives either:
  - an application for their smart phone that provides consumption and cost information

  OR
  - an advanced computer-based software that mimics the functionality of an IHD

Pre-Pay Energy Service

- Customer periodically pre-pays an amount (at their discretion) towards their electric service in lieu of standard monthly billing
- APS provides updated energy usage, cost, and account balance information as well as notice of their balance falling below a pre-determined threshold

Prepay Program

- Leverage AMI technology
- More flexibility than traditional prepay programs
  - No special meters or in-home equipment
  - More rate options
  - More payment options
  - Customer alerts
  - Multiple options for usage monitoring
- Fully integrated with CIS and AMI infrastructure

Customer Benefits

- No upfront deposit
- No monthly bill
- Smaller, more frequent payments
- Greater awareness and control of costs
- No late payments or disconnect charges
- Usage and balance information 24 hours a day
- Multiple payment options
- Friendly usage alerts and reminders

Utility Benefits

- Potential energy savings
- Reduced disconnects & reconnects
- Lower write-off expenses
- Improved cash flow
- Reduced high-bill complaints
- Increased customer satisfaction
- No costs for extra equipment or infrastructure
- Reduced credit and collections costs

HEI Pilot – Anticipated Takeaways

- Success of each individual program
  - Customer feedback
  - Energy/Demand savings
  - Technology functionality
- Determination of best DR offering
  - Direct Load Control versus enhanced Critical Peak Pricing
  - Strategies for load reductions
  - Optimal business model
- Determination of best Energy Efficiency offering
  - Value and sustainable impact of In-Home Displays compared to Smart Phone or PC application
- Analysis of varying communications platforms
  - AMI system and Broadband
  - Signal strength, success rate, and latency
- Identification of Back Office integration needs
  - Data privacy and security
  - Customer care requirements
- Customer impacts
  - Comfort impacts from DR events
  - Value/frequency of device usage
  - Persistence of Energy Efficiency gains
  - Likelihood to participate in future programs

HEI Pilot – Progress to Date

- APS issued a targeted Request for Information on March 11
  - Seeking interest in participating as a vendor in HEI Pilot
  - Over 20 market participants have expressed interest
- Request for Proposals to be issued in late April/early May 2010
  - Turnkey provider or partnership of providers to facilitate the HEI Pilot
  - Measurement/Evaluation/Research ("M/E/R") Consultant
  - Also pursuing an RFP for Pre-Pay Energy Service software development and integration work
- Targeting final selections by the end of Q3/2010
- Subject to timing of Commission approval, APS plans to have all customer installations complete by June 2011

HEI Pilot – RFP Details

- Turnkey Vendor Requirements
  - Integration of hardware/software with current AMI system and other networks
  - Ability to provide a secondary communications platform
  - Equipment acquisition, provisioning, and repair
  - Scheduling and installation of equipment in customer premises
  - Customer field & call center support
  - Software hosting
  - Communication services between APS/Respondent and installed devices
  - Training of APS personnel
  - Implementation of DR events
  - Project Management
  - Ongoing O&M/repair and diagnostic support

- M/E/R Consultant Requirements
  - Design of customer selection process
  - Assistance in customer recruitment efforts, including the development of potential screening tools
  - Creation of Direct Load Control dispatch strategies
  - Measurement & Verification of all energy and demand impacts compared to standard APS customers not participating
  - Qualitative and quantitative research on:
    - Value, benefits, and frequency of usage of in-home devices
    - Comfort impacts (if any) from DR events
    - Likelihood of continued participation after the HEI Pilot
    - Documented behavior changes and determination of persistence
    - Suggestions for improving future programs
  - Preliminary and final report preparation and presentation

Conclusions

- APS is actively pursuing multiple new customer offerings
  - New rate options
  - Demand Response programs
  - Optimal channels for communicating energy information
    - One size doesn't fit all
  - Pre-Pay Energy Service
- Focus is on value-added and cost-effective program development
- Moving ahead now to be prepared when regulatory approvals are received