

Current Practices in Networked Plug Loads & Energy Efficiency Opportunities

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DSM Strategic Planning

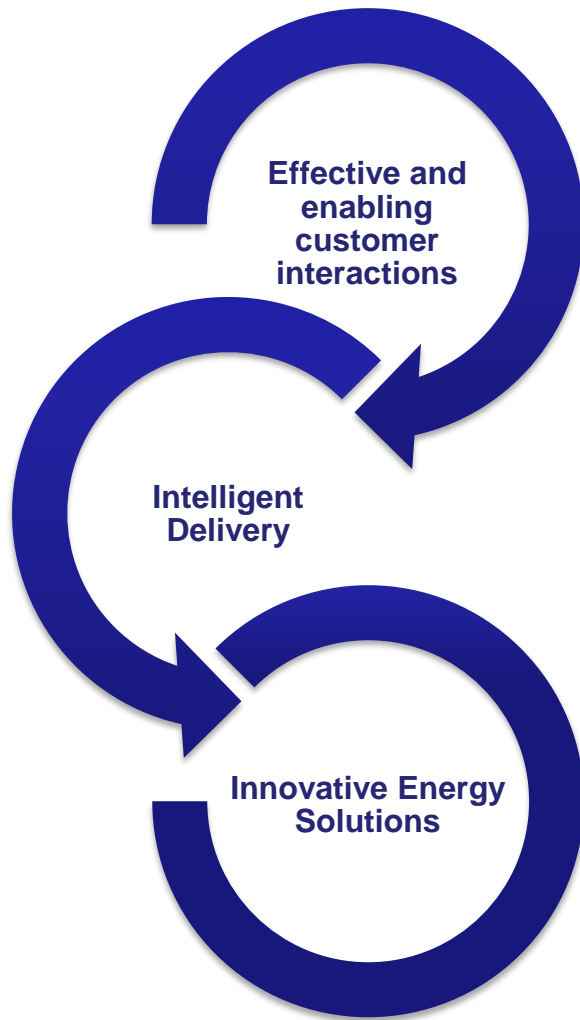
- SCE Background
- Energy Efficiency & Market Trends
- Plug Load Strategy Considerations
- Home Energy Management Opportunities
- Behavior Program Opportunities
- Next Steps

SCE Background



- One of the nation's largest electric utilities
- Nearly 14 million residents in service territory
- Approximately 5 million customer accounts
- 50,000 square-mile service area
- Over 103,000 miles of distribution and transmission lines
- Over 125 years of experience

Evolving DSM Strategy



- SCE is evolving toward a technology-enabled customer delivery service model
- This shift enables SCE to:
 - Meet customer expectations in a timely and agile manner as needs and expectations evolve
 - Address California's aggressive energy policies and goals while serving the specific needs of our customers
 - Leverage the benefits of our smart grid through more engaged customer program participation and behaviors

Evolving Energy Efficiency Trends

Early Years

Energy Savings Tips

Energy Audits

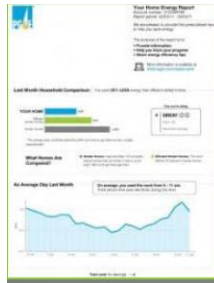


Standard Rebates



Today

Robust Data Tools and Home Energy Reports



Partnerships



Market Interventions: Retail, Distribution, Wholesale



Deeper Savings



Forward Trends

Zero Net Energy



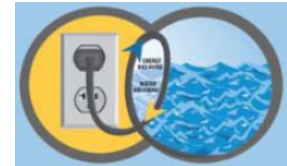
Whole Building



Big Data



Water-Energy Nexus



Financing Options

Project Cost	\$100,000
Rebates and/or Incentives	\$25,000
Loan Amount	\$75,000
Estimated Monthly Savings from Retrofit	\$3,000
Loan Term (months)	60
Monthly Loan Installment on your PG&E Bill	\$1,250
Monthly Savings	\$1,750

DSM Organizational Evolution

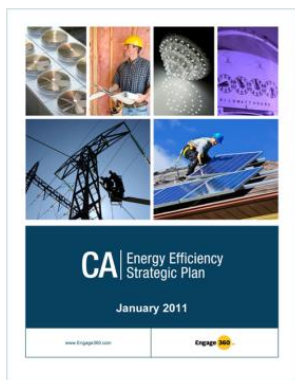


- EE, DR, DG, Low Income, Renewables
- CLTEESP
 - Zero Net Energy
- Water-Energy Nexus

- IDSM offerings
- Emerging products
 - PCTs, IHDs,
 - HANs, HEMs
- Pilots and solution development

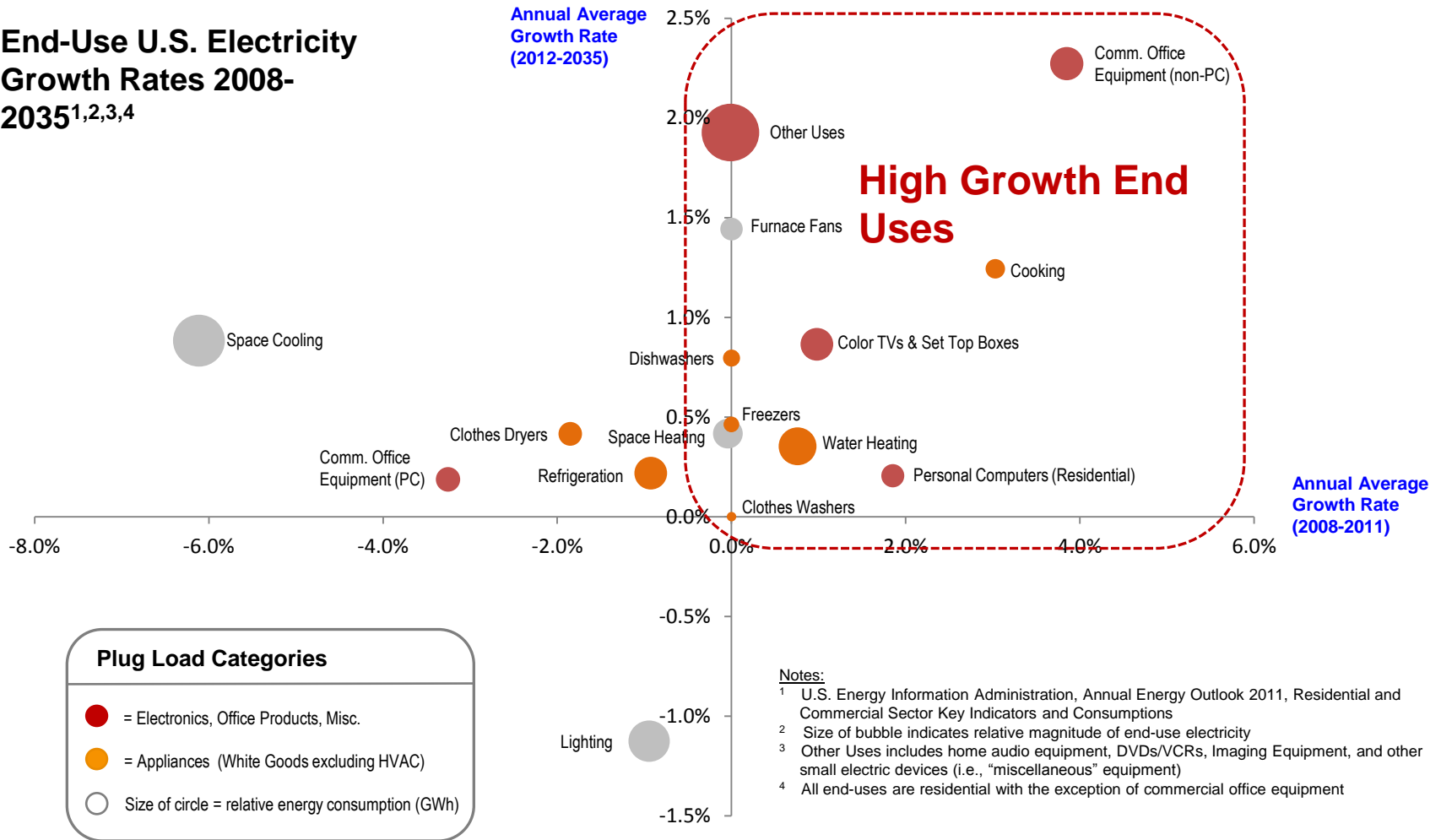
- EE, DR, DG, ESA, PEV programs
- Behavior programs
- Market transformation programs

- Offer Management
 - Lifestyle Plans
 - Rate Choices
 - TOU Rates & Dynamic Pricing
 - Load Management Incentives & Rebates (SDP)
- Self-Service Offerings



Growing Plug Loads through 2035

End-Use U.S. Electricity Growth Rates 2008-2035^{1,2,3,4}



Plug Load Strategy Framework

$$PL = f(UEEC \times OH \times Q) + ET$$

Description	<ul style="list-style-type: none"> Unit Electricity Consumption 	<ul style="list-style-type: none"> Operating Hours by mode 	<ul style="list-style-type: none"> Quantity of devices plugged in 	<ul style="list-style-type: none"> Enabling Technologies
Examples	<ul style="list-style-type: none"> Watts 	<ul style="list-style-type: none"> On-Power Standby-Power Off 	<ul style="list-style-type: none"> # of active devices # of inactive devices 	<ul style="list-style-type: none"> PCTs, IHDs, HEMs, HANs, Home Automation
Market Trends	<ul style="list-style-type: none"> ↑ (UHD TVs) ↓ (Game Consoles) ↔ (Refrigerators) 	<ul style="list-style-type: none"> ↑ (Smart TVs) ↓ (TV viewing) ↔ (Toasters) 	<ul style="list-style-type: none"> ↑ (Tablets, 2nd Refrig) ↓ (Desktop PCs) ↔ (TVs) 	<ul style="list-style-type: none"> ↑ Pay-TV Channel ↓ Barriers to Entry ↔ Value Proposition
Strategies	<ul style="list-style-type: none"> Replace inefficient equipment Enhance product efficiency Support code advocacy 	<ul style="list-style-type: none"> Reduce idle use Increase auto power down Address consumer behaviors 	<ul style="list-style-type: none"> Remove inefficient, unnecessary equipment Integrate/consolidate equipment 	<ul style="list-style-type: none"> Increase customer awareness/adoption Enable EE benefits from automation Tap into behavioral benefits (smart phone)

Application of Plug Load Market Strategies

Change Behaviors

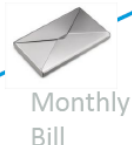
Educate customers about their energy use

Influence Attitudes

Identify new and impactful areas for policy and advocacy



Utility



Monthly Bill

Meter

Consumer

Behavior change

Equipment upgrade

Energy use

Diversify Offerings

Pursue all cost-effective DSM opportunities to target energy savings without impacting user experience

TOPICS

- Televisions
- Computers
- Monitors/Displays
- Set-top Boxes
- Power Strips
- Game Consoles
- Imaging Equipment
- Audio/Video Equipment
- Other Products
- Recycling
- Low Power Modes/Standby

Demonstrate Innovation

Support development of customer facing energy management solutions

- Build upon Edison SmartConnect™ capabilities



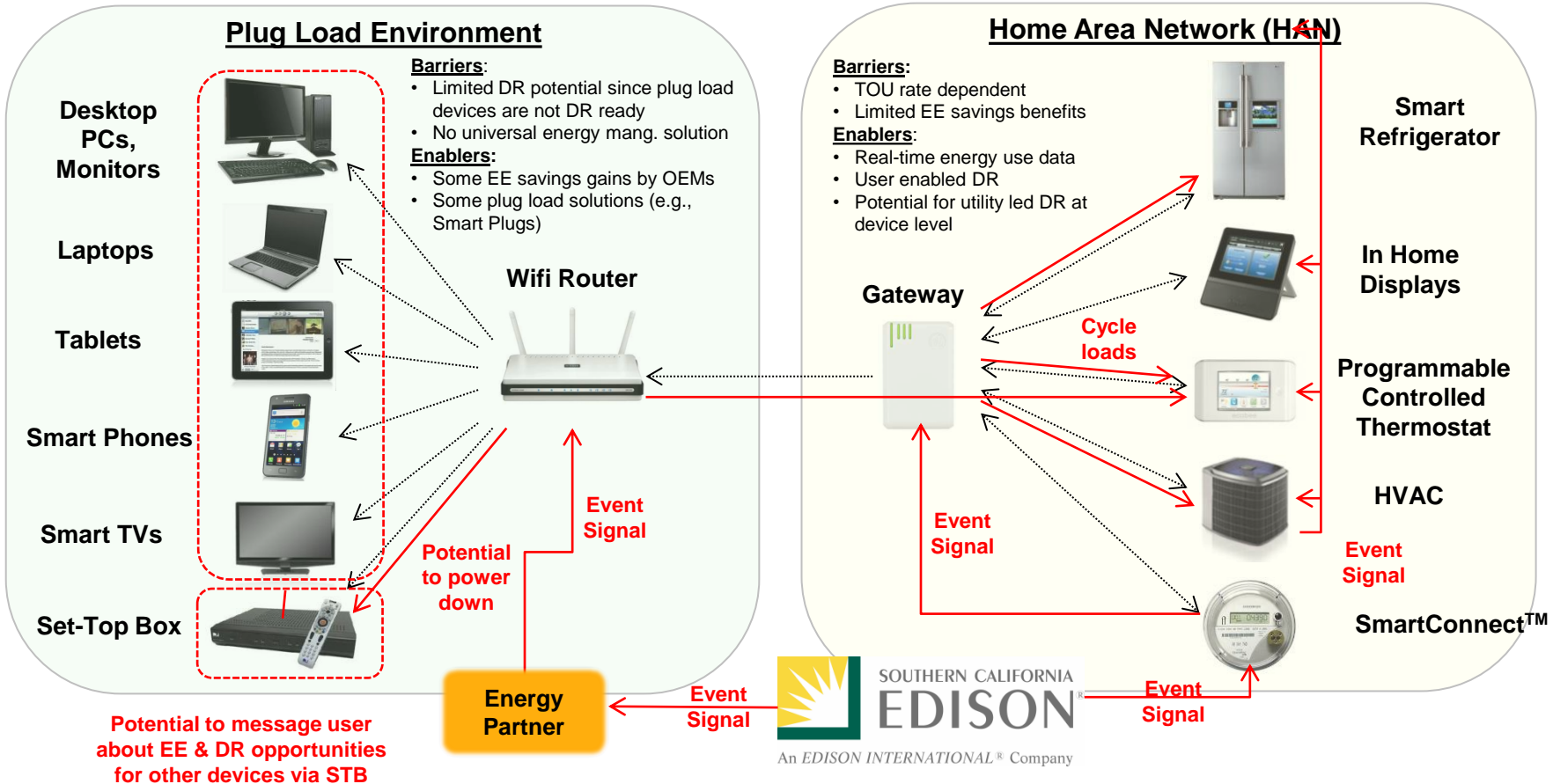
The Present and Future "Connected" Home

Present Home

Future Home

Plug Load Environment

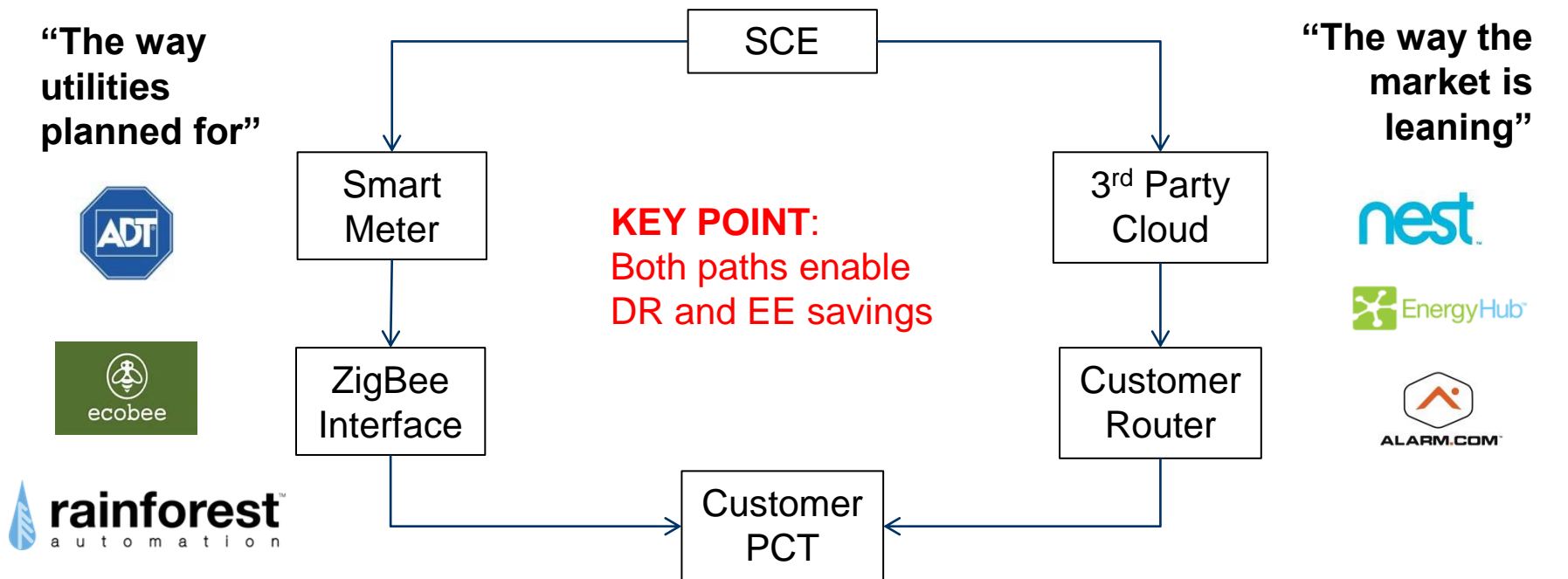
Home Area Network (HAN)



Two Paths Into the Home

“The way utilities planned for”

“The way the market is leaning”



Utility-centric:

- Requires additional technology, \$
- Uniform control; connection issues
- Aligns with current utility programs

Interested 3rd parties:

ADT Security, some PCT manufacturers

Customer-focused:

- Uses home WiFi, variety of PCTs
- Personalized PCT management 24/7
- Aligns with market preference

Interested 3rd parties:

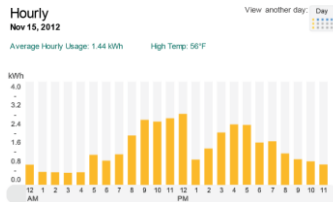
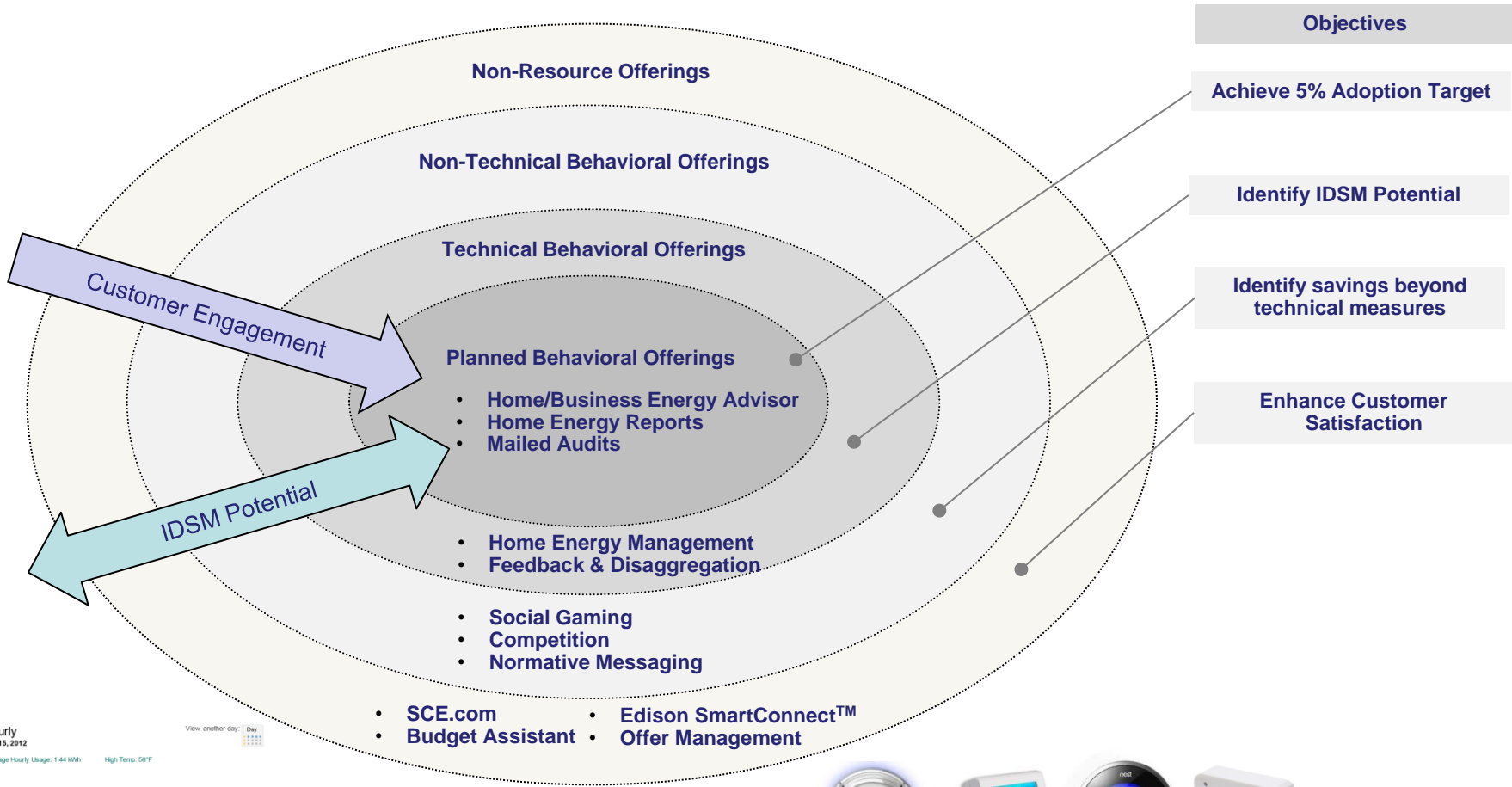
Cable, Telecom, HEM Platforms, Portals

Home Energy Management Opportunities

Technology	Intervention Opportunities	Strategies	Barriers/Risks
PCT	<ul style="list-style-type: none"> Increase adoption of DR enabled PCTs Develop new “cloud” to “cloud” channels 	<ul style="list-style-type: none"> Engage Energy Information Service Providers on DR opportunities 	<ul style="list-style-type: none"> Business case for Residential OpenADR is developing
IHD/Mobile	<ul style="list-style-type: none"> Increase availability of IHD/Mobile customer offerings 	<ul style="list-style-type: none"> Pilot IHDs in homes Evaluate apps for EE/DR 	<ul style="list-style-type: none"> Short persistence for IHDs Limited app market for energy management
HAN/HEM	<ul style="list-style-type: none"> Educate consumers about market availability Test market for EE/DR savings potential Work with retailers on customer strategies 	<ul style="list-style-type: none"> Field test HANs via DR Pilots Support retailer HAN strategies Evaluate HEMs savings potential 	<ul style="list-style-type: none"> Emerging product class Savings benefit still TBD
Smart Appliances	<ul style="list-style-type: none"> Work with ENERGY STAR and CEE on “connected” device standards and strategies 	<ul style="list-style-type: none"> Field test Smart Appliance Evaluate EE/DR savings potential Test consumer behaviors 	<ul style="list-style-type: none"> Limited market availability Savings not yet verified Behavior strategy not yet defined
Smart Plugs	<ul style="list-style-type: none"> Test cost effective delivery channels Educate customers on plug controls 	<ul style="list-style-type: none"> Evaluate EE savings potential Pilot web channel opportunities Test consumer behaviors 	<ul style="list-style-type: none"> Low consumer awareness Long ROI No energy standards
Web Tools	<ul style="list-style-type: none"> Develop customer centric tools to better manage energy use 	<ul style="list-style-type: none"> Enhance customer facing tools <ul style="list-style-type: none"> Budget Assistant Universal Audit Tool Energy Disaggregation Pilot 	<ul style="list-style-type: none"> Customer engagement strategy not yet defined

Adopting customer's preferred way of communication and frame of reference is essential to changing behavior towards energy usage and increasing participation in energy programs

Behavioral Framework



Behavioral Program Qualifications (D. 10-04-029) - 2012

Comparative Energy Usage

- Residential unit usage compared to similar residences in the subscriber's geographic area
- Did not restrict definition to residential applications

Experimental Design

- Control vs. Treated Groups
- "Gold standard" and most rigorous research design
- Allows for isolation of program impact

Ex Post Measurement

- Measurement & Evaluation post program implementation

For more information on behavior intervention strategies, please refer to the behavior whitepaper, published in www.CALMAC.Org, "Paving the Way for a Richer Mix of Residential Behavior Program, Study ID SCE0334.01.

- **Continue to explore innovative energy management and networked plug load offerings**
 - Expand PCT, IHD, and other energy management solutions and partnerships
 - Explore upstream measure opportunities (STBs, PCTs, HEMs, etc.)
 - Explore interoperable network communication standards to manage plug loads
 - Continue ongoing stakeholder interactions
- **Expand the scope of behavioral measures**
 - Continue exploration within the behavioral community for measures meeting the 2013-2014 behavioral framework
 - Explore opportunities to expand the definition of behavioral programs in California



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