TRIO Roundtable:

Energy Management in Demand Side Programs at the California Utilities

August 19, 2013

PG&E Pacific Energy Center

Pacific Gas and Electric Company

SOUTHERN CALIFORNIA EDISON
An EDISON INTERNATIONAL Company

SDGE
A Sempra Energy utility

Southern California Gas Company
A Sempra Energy utility

SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
The Power To Do More.

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Today's Objectives

1. Educate TRIO participants on the energy management (EM) and information technology (IT) related end-use CA utility programs
2. Identify key utility gaps, needs, opportunities, and priorities within the EM and IT arenas
3. Inform TRIO participants of the organizational structures and key processes within the represented utilities

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Agenda

Discussions by Experts On:

- Utility Energy Management Organizations
- Energy Efficiency and Behavior
- Demand Response, Home Area Networks and Data Management
- Pricing and Rates
- Evaluation, Measurement and Validation
- Networking with Utility Managers

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Welcome and Big Picture

Speaker:

Aaron Panzer: Principal, Emerging Technologies | PG&E

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Safety Message

In Case of Emergency

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Discussion

1. PG&E Background
2. Energy Efficiency’s Role
3. Emerging Technologies' Mission
4. Engage with ET

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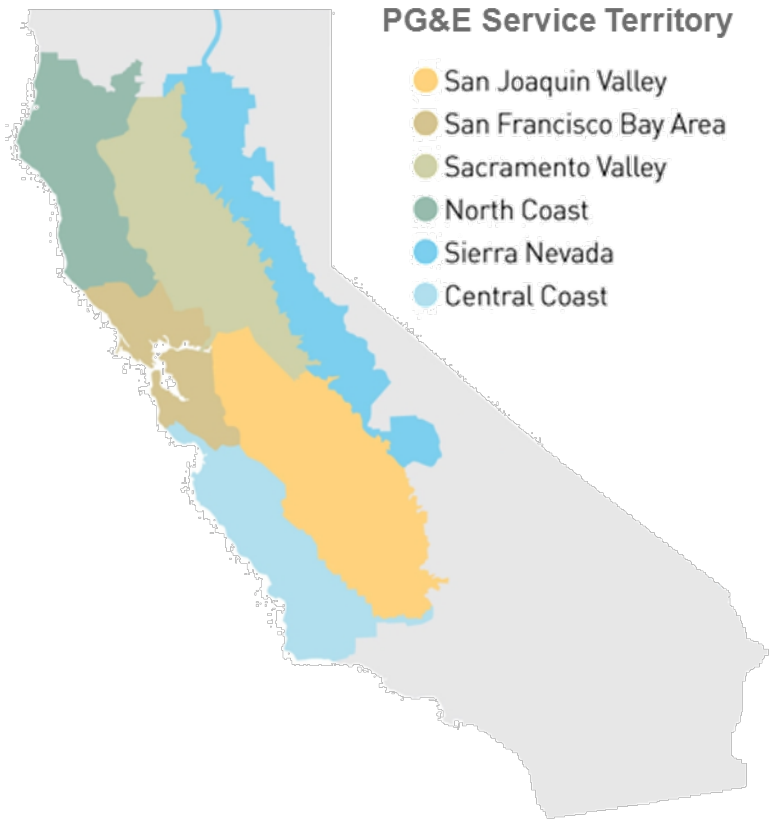
Pacific Gas and Electric Company (PG&E)



Company Facts

- Fortune 200 company located in San Francisco, CA
- $15B in operating revenues in 2011
- 20,000 employees

Energy Supply

- Services to 15M people:
  - 5.2M Electric accounts
  - 4.3M Natural Gas accounts
- Peak electricity demand: 20,000 MW
- Over 50% of PG&E's electric supply comes from non-greenhouse gas emitting facilities

Service Territory

- 70,000 sq. miles with diverse topography
- 160,000 circuit miles of electric transmission and distribution lines
- 49,000 miles of natural gas transmission and distribution pipelines

We Are Involved in All Parts of the Utility Value Chain

6,870 MW

Transmission:

- 18,616 miles electric lines
- 6,438 miles gas pipelines

Distribution:

- 141,215 miles electric lines
- 42,141 miles gas pipelines

15 million customers:

- 5.1 million electric accounts
- 4.3 million natural gas accounts

A Highly Diverse Customer Base

5.3 million residential customers, speaking 88 languages, living in two distinct environments:

Coastal communities / Bay Area:

- Urban and suburban, compact housing
- Temperate coastal summer climate
- Higher incomes and cost of living

Inland communities:

- Suburban and Rural, larger homes
- Hot inland summer climate
- Lower incomes and cost of living

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Highly Diverse Energy Needs




- Agriculture & Food Processing
- Government
- Hospitality
- Health Care
- Biotech
- High Tech
- Industrial
- Wholesale Warehouses
- Office Buildings
- Retail
- Schools & Colleges
- Builders

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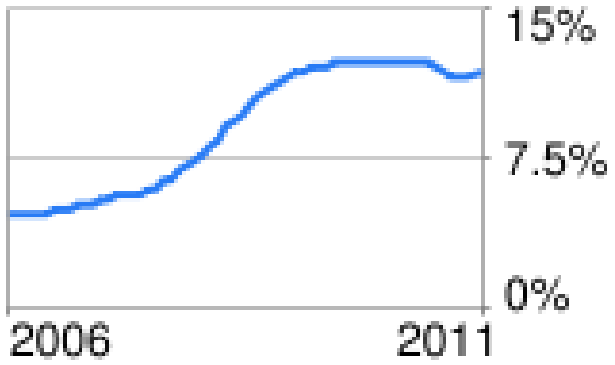
A Challenging Economy

The West recorded the highest regional unemployment rate in August 2011

CA Unemployment Rate



- Nevada continued to report the highest unemployment rate among the states, 13.4%

  California posted the next highest rate, 12.1%[1]

- 22 of the 25 California counties with highest unemployment rates are in PG&E's service territory[2]

- 18 of the 25 California counties hardest hit by foreclosures are in PG&E's service territory[2]

1 Bureau of Labor Statistics http://www.bls.gov/news.release/laus.nr0.htm September 2011
2. www.realtytrac.com (June 2010)
3. 2/18/10 USA Today article "Recession sometimes takes uneven toll"

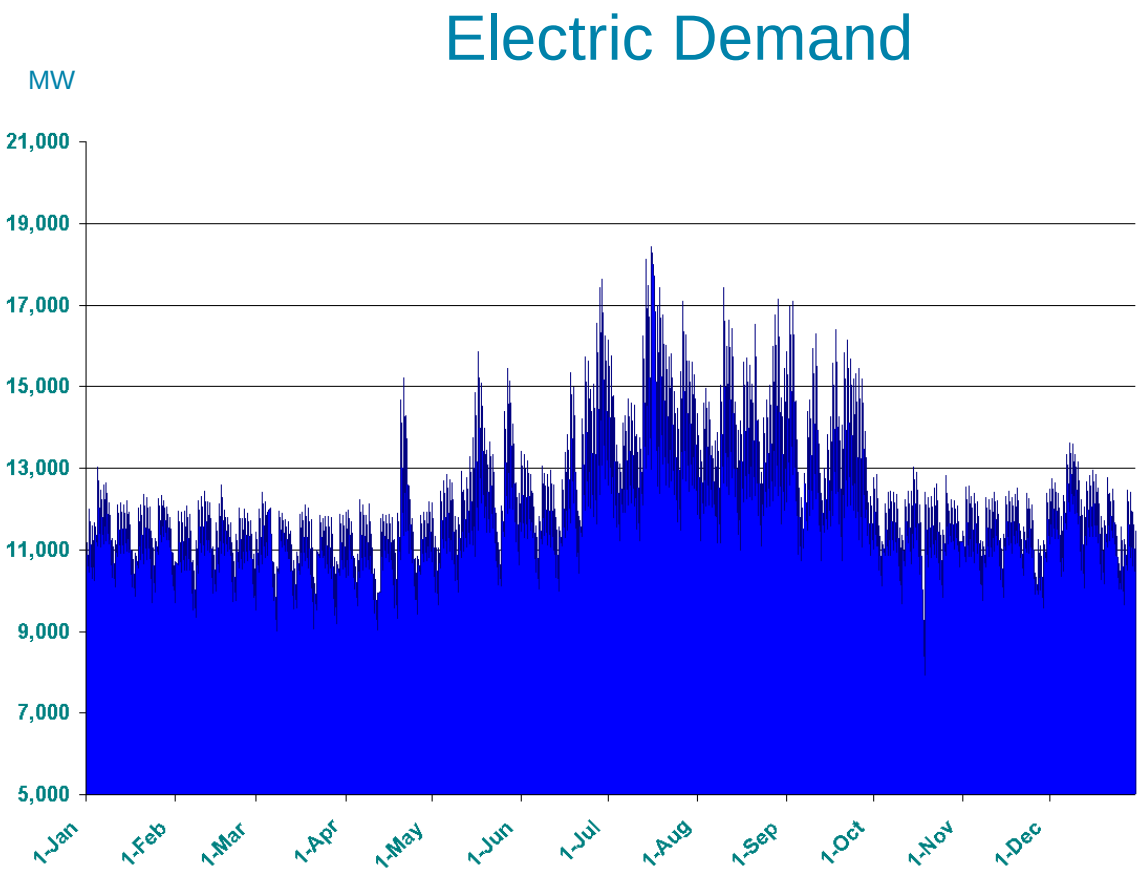
PG&E's Electric System:
Peaky Demand = Frequently Idle Capacity

Temperate climate with summer extremes

Summer demand can spike to ~2X normal demand

Significant capacity sits idle most of of the time:

- 5% of CA capacity used only 50 hours per year
- 25% of CA capacity used only 10% of the time



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Forward Thinking Energy Policies

35+ years of energy efficiency programs facilitated by “decoupling”

Renewable Portfolio Standard:

20% by 2010

33% by 2020

Preferred loading order:

1. Demand reductions: energy efficiency, demand response
2. New renewable and distributed generation
3. Clean gas-fired power plants

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Balancing Competing Priorities

Environmental Sustainability

Reliable Service

Reasonable Cost

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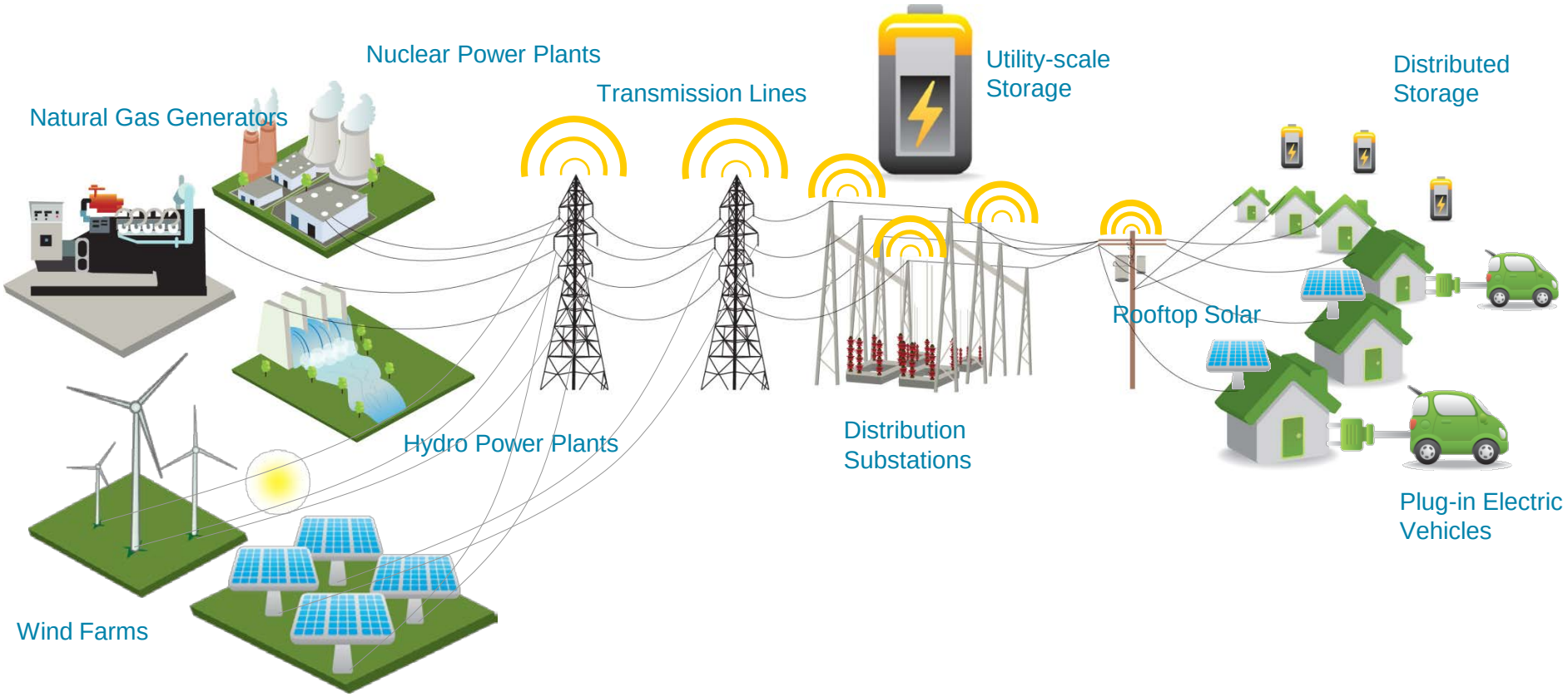
Building A Sustainable Electric System

Power Plants

Electric Grid

Customers



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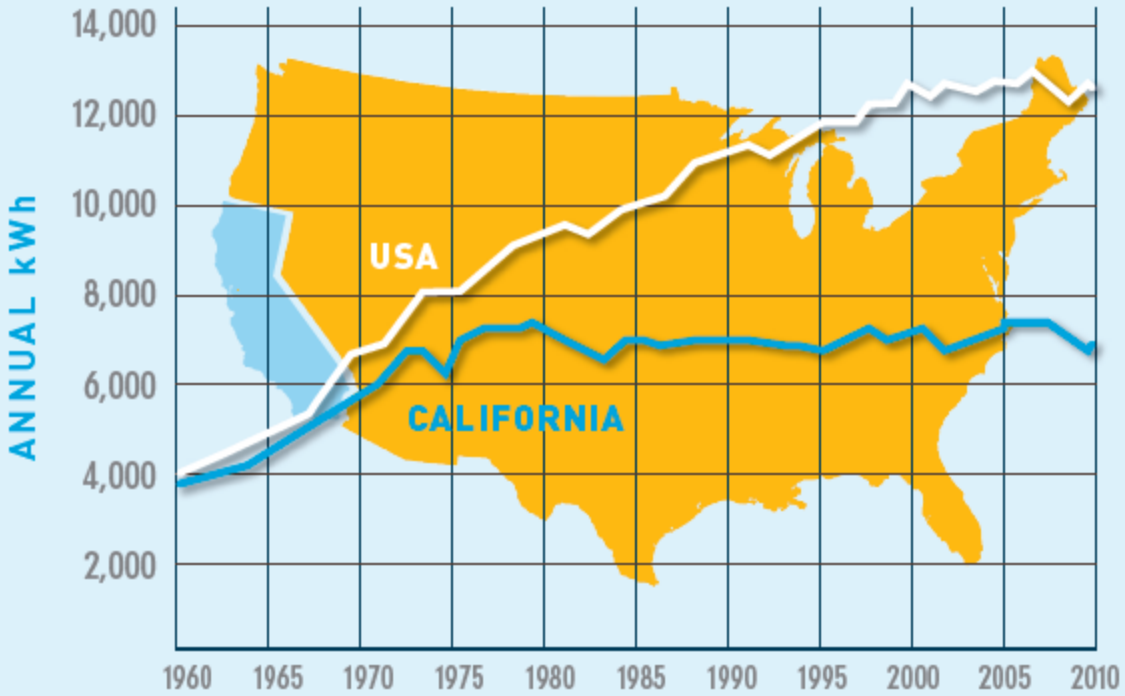
Energy Efficiency's Role

Per capita electricity consumption in California has remained nearly flat since the 1970s



PER CAPITA ELECTRICITY CONSUMPTION:

UNITED STATES vs. CALIFORNIA

(source: U.S. Energy Information Administration)

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Energy Efficiency Evolution

Early Years

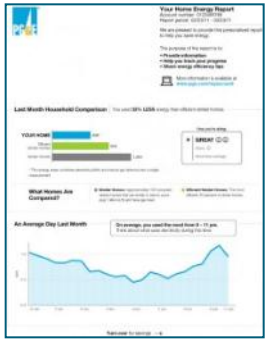
Energy Audits

Energy Saving Tips

Standard Rebates

Today

Robust data tools and Home Energy Reports



Partnerships

Market interventions: retail, distribution, wholesale

Deeper savings

Forward Trends

Zero net energy

Big Data

Whole Building

Water-Energy Nexus

Financing solutions

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

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PG&E's EE Portfolio

2 year budget = ~$800M

- **Incentives and services**
- **Emerging technology demos**
- **Workforce education**
- **Codes and standards advocacy**
- **Local energy plans**

Channels

- **Direct Sales**
- **Trade Professionals**
- **Retailers**
- **Manufacturers**
- **Government Partnerships**

Technology families

- Lighting
- Refrigeration
- HVAC
- Building shell
- Appliances/Electronics
- Food Service Equipment
- Energy Management Systems
- Industrial systems

- Rebates and incentives
- Services
- Information
- Surveys /Audits

Customer Segments

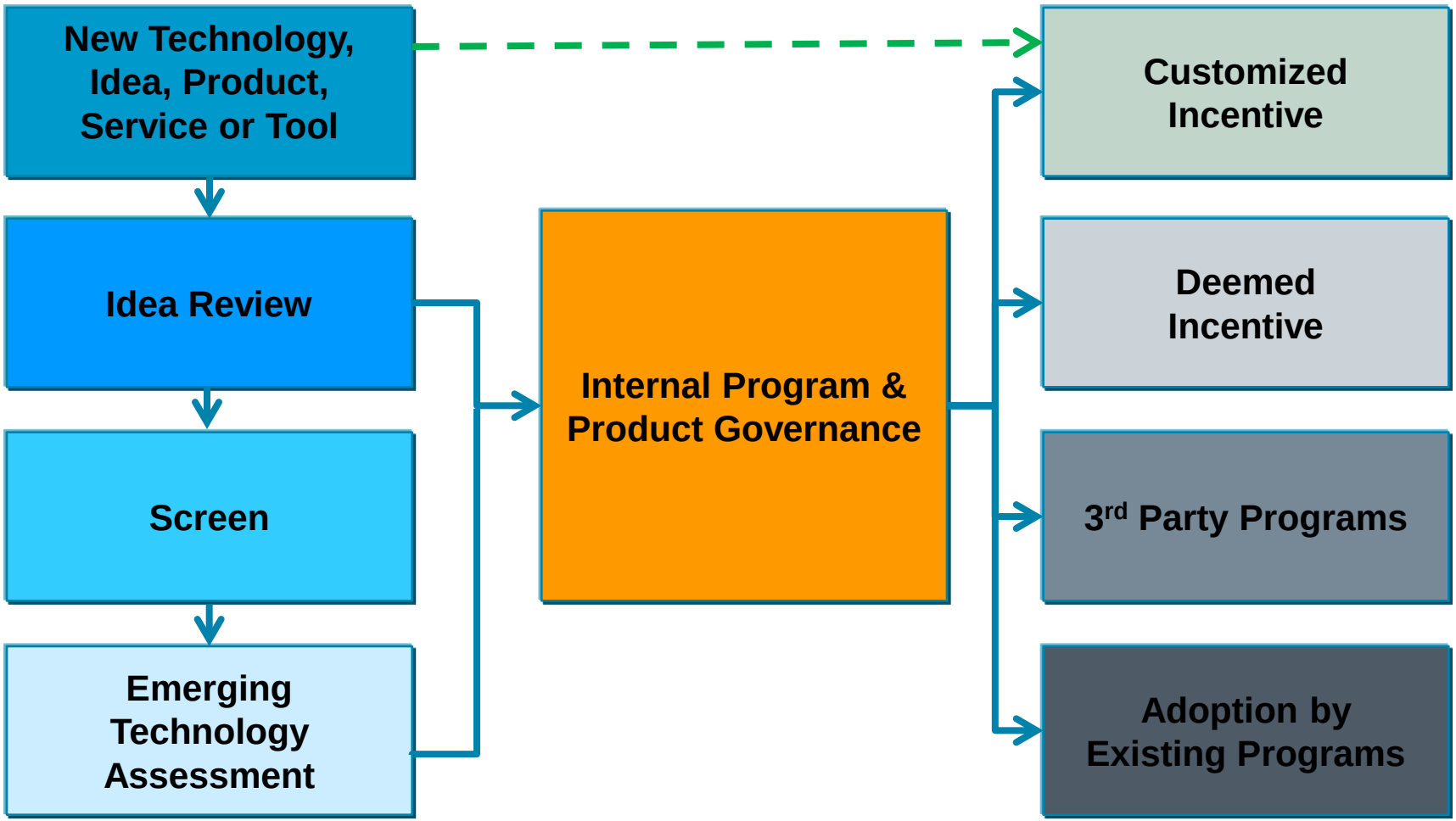
- Residential
- Commercial
- Industrial
- Agricultural

Sub-segments by:

size (large, medium, small)

type (e.g. retail, hospitality, high tech, etc.)

Roadmap to incentive programs



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Product Lifecycle Management

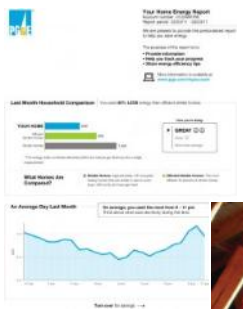
Emerging Technologies → Programs → Codes and Standards

Zero Net Energy

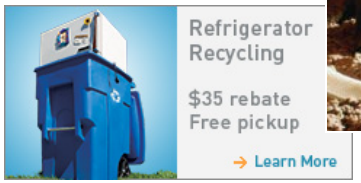
LED Lighting

HVAC

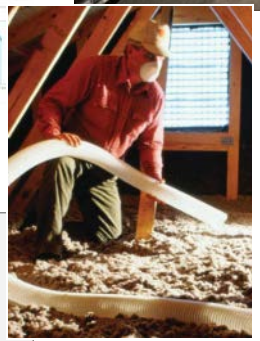
Home Energy Report



EE Rebates



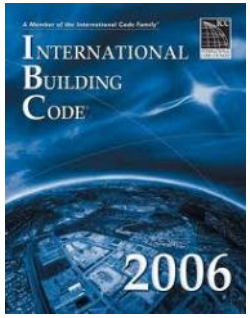
Retail and Manufacturer Strategy



Contractor Training and outreach

Appliance Standards

Building Codes



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Emerging Technologies Coordinating Council

The Emerging Technologies Coordinating Council (ETCC) provides a means to coordinate its members energy efficiency work to facilitate the assessment of promising energy efficient emerging technologies that will benefit California customers.

Members include:

Pacific Gas and Electric Company

Southern California Edison — An Edison International Company

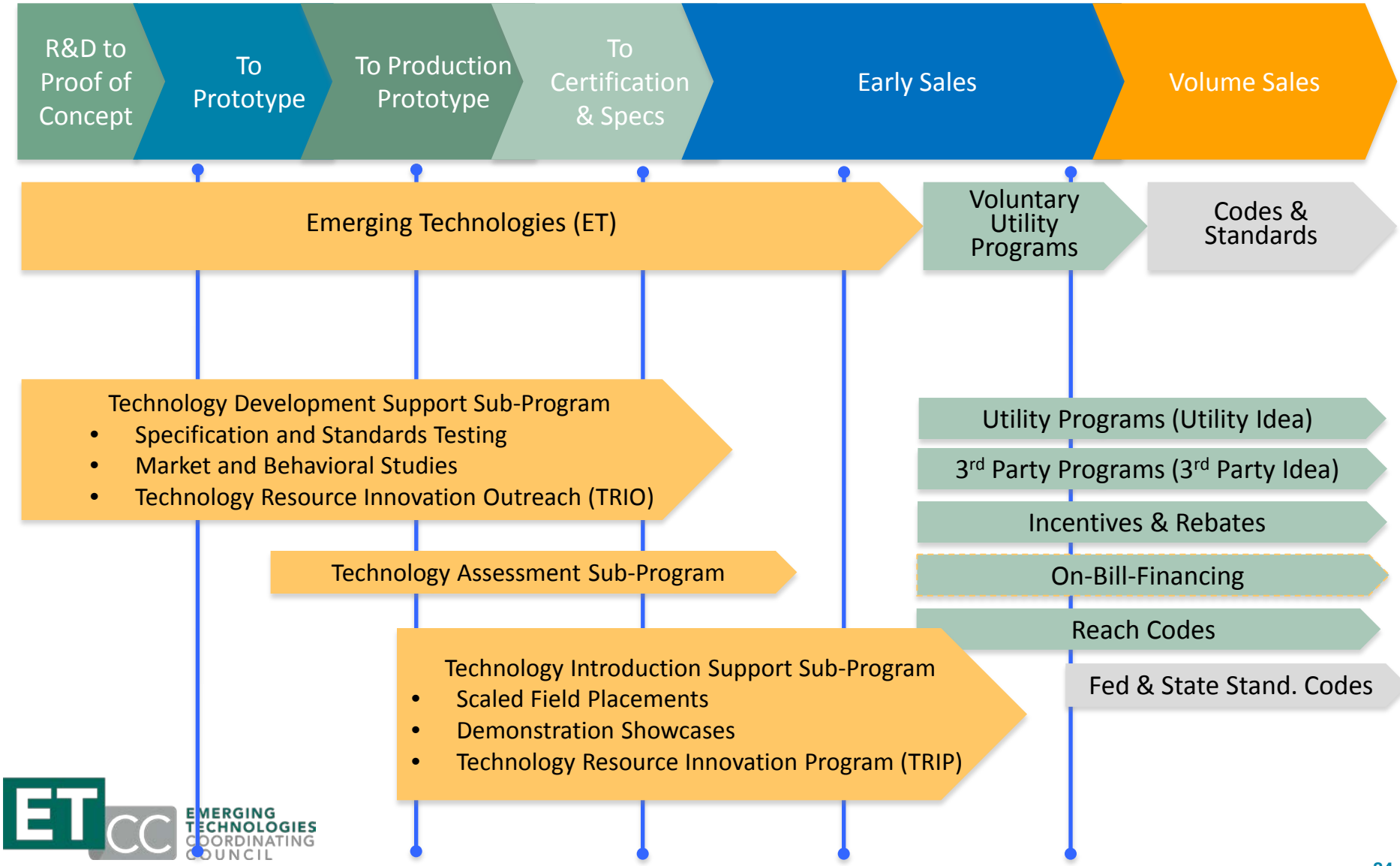
SMUD — Sacramento Municipal Utility District — The Power To Do More.

SDGE — A Sempra Energy utility

Southern California Gas Company — A Sempra Energy utility

ETCC — Emerging Technologies Coordinating Council

ET Place in the Value Chain



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Technology Stages / Actions

Stage 1: Unverified / Unavailable

Concept, Alpha or Beta Product.

Stage 2: Unverified / Available

May be sales, but not part of existing CA utility programs.

Stage 3: Verified / Available

Similar products on market already being sold in the market.

Upstream ET Program

TRIO workshops

Technical review

Lab testing

Identify specifications

ET Program

TRIO workshops

Idea Card

ET Assessment (Field/Lab)

Open Forum

Certifications

Existing Programs or 3rd Party Implementers

TRIO Workshops

ET Assessment

3rd Party Programs

Incentives

Customized Program

Solution Codes

Future Codes & Standards

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Screening Criteria

- It Saves Energy!
- Has a DSM Program Portfolio Fit
- Meets EE and DR Programs Requirements
- Commercially Available
- Market Barriers Addressed
- Current Market Readiness
- Need for IOU Involvement
- EM&V (achievable/defendable)
- Aligns with the California Long Term Strategic Plan

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Emerging Technology Focus Areas

Advanced lighting (LEDs) and controls

Whole buildings approach for "deep savings"

•Building = system of systems (lighting, HVAC, building shell)

Integration: energy efficiency + demand response + distributed generation

Behavior-based approaches

•Energy information (e.g. in-home displays)

Automation

•Smart meters

•Customer automation of energy management

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Engage with ET

Technology Resource Innovation Outreach (TRIO)

- Education opportunity to learn about CA utility DSM programs
- Arena to meet and network with key CA utility stakeholders

ETCC Open Forums

- Present technologies/solutions to ETCC members and other key CA utility stakeholders

ETCC Website

- Access final reports for previous Emerging Technologies projects
- Submit ideas to ETCC members

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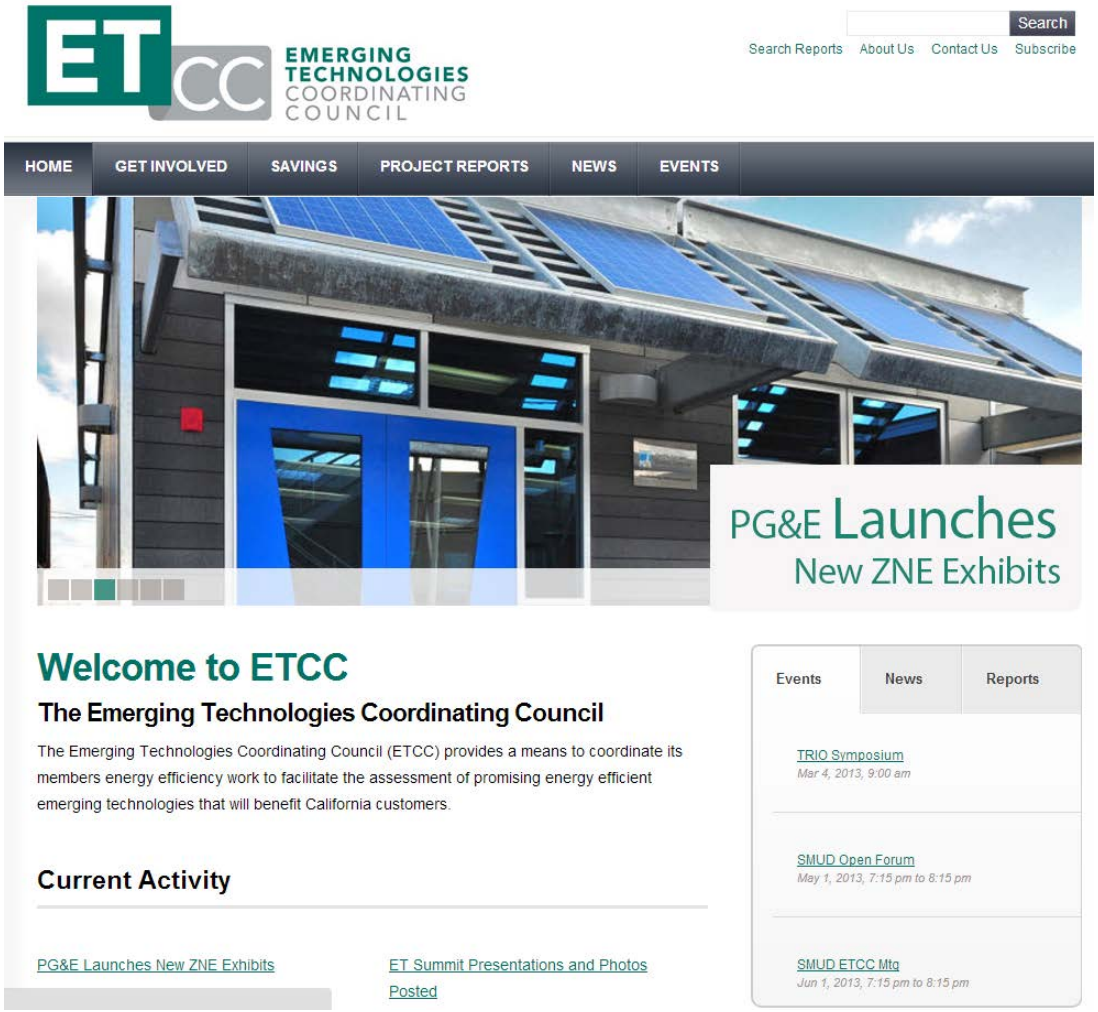
Online Resources



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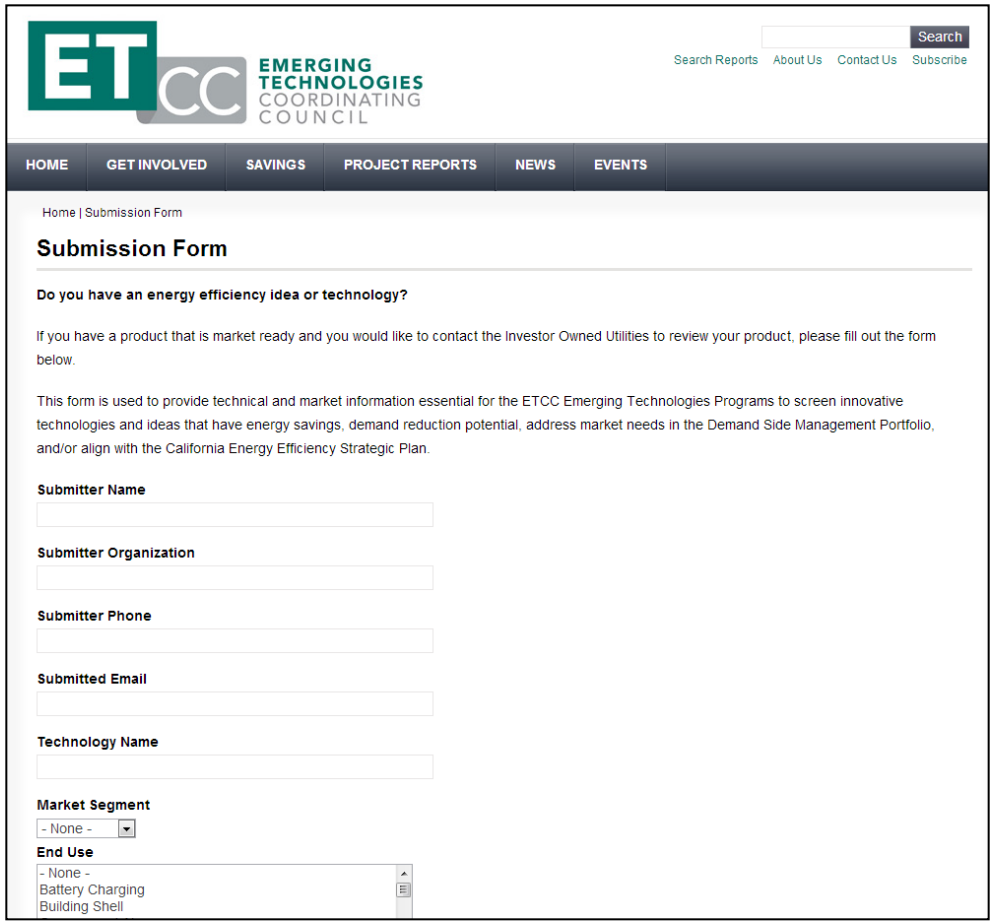
http://www.etcc-ca.com/

Idea Proposal Form

- Submit inquiries to: www.ETCC-CA.com, “Get Involved” tab
- Internal and external parties may submit ideas by completing required fields of idea proposal form
- Initiates idea review, selection, prioritization, and feedback
- Website administrator submits received ideas to ETCC members for consideration
- PG&E to respond within 2 weeks of receipt



Thank You!

Thank you all for taking time from your busy schedules to attend this event!

Please feel free to ask questions and be sure to take advantage of this wonderful networking opportunity.

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Energy Management Programs at CA Utilities

Moderator:

Mananya Chansanchai: Senior Product Manager, Emerging Technologies | PG&E

Panelists:

Rachel Radell: Project Manager, Energy Research and Development | SMUD

Edwin Hornquist: Manager, Emerging Technologies Program | SCE

Nathan Taylor: Project Manager, Emerging Technologies | SDG&E

Abdullah Ahmed: Manager, Emerging Technologies Program | SoCal Gas

Panel Agenda

- Introductions
- Organizational and energy management structure at PG&E
- Organizational structures at CA IOUs and SMUD
- High-level overview of energy management and information technology landscape in California
- Q&A

PG&E Customer Energy Solutions

Organizational Overview

Key Takeaways

- **Insight into PG&E's Customer Energy Solutions team**
- **Overview of energy management at PG&E**

California Utilities: Similar Goals, Different Structures

Investor Owned Utilities

- Pacific Gas & Electric
- Southern California Edison
- San Diego Gas & Electric
- Southern California Gas Company

Regulated by the California Public Utilities Commission (CPUC)

Municipal Utilities

- Sacramento Municipal Utility District

Managed by SMUD Board

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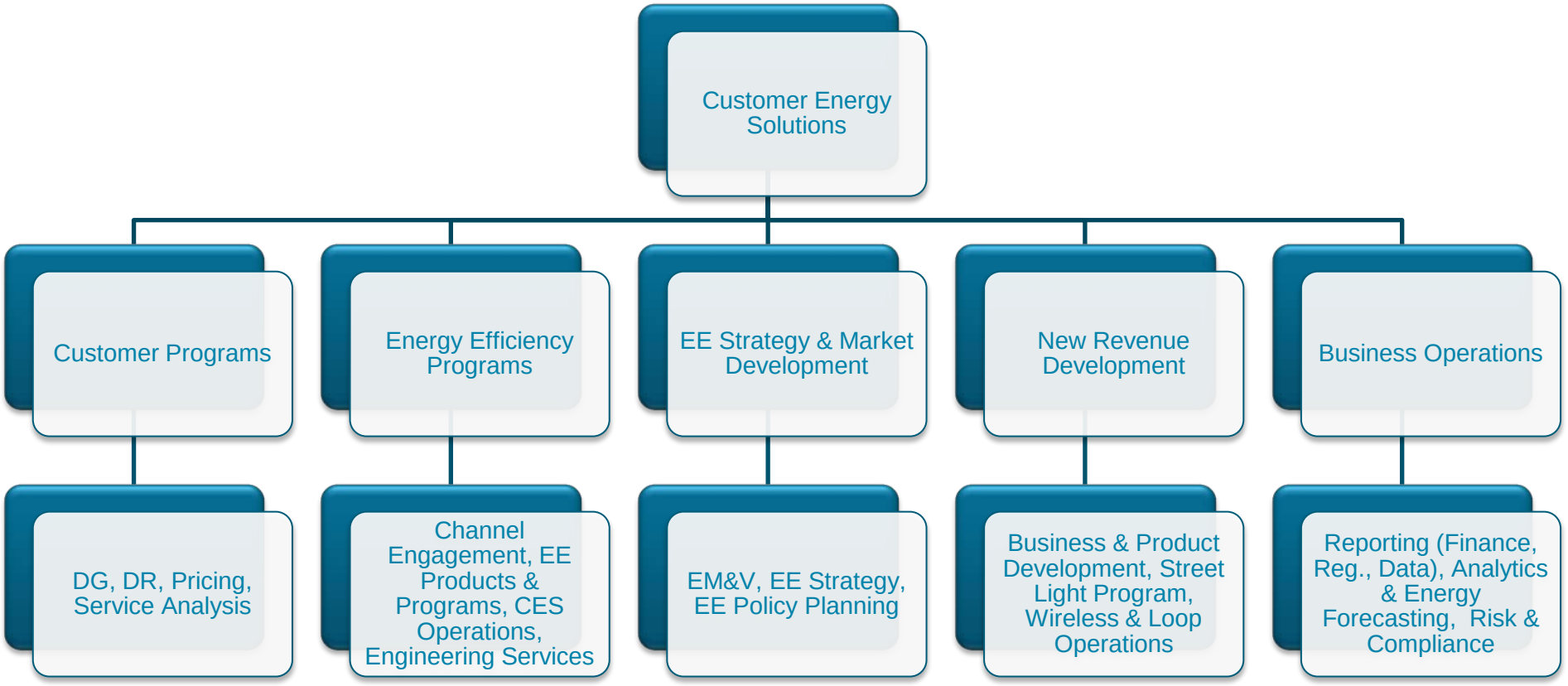
PG&E Customer Energy Solutions



We make energy personal for our customers.

We do this by providing products and services that are easy, efficient, and add value to our customers.

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Customer Programs

Responsible for all non-EE customer facing programs

- Demand Response
- Distribution Generation
- Pricing and Rates
- Home Area Network
- Green Button Connect

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EE Programs

Responsible for developing and delivering energy efficiency products and programs

EE Products & Programs	Engineering Services	Channel Engagement	CES Operations
• Programs (Residential, Commercial, Industrial/Ag) • Core Products (HVAC, Lighting, Food Service, Codes & Standards) • Information Products • Emerging Technologies	• Work Papers • Field Engineers • Technical application services	• Third Party Programs • Government & Community Partnerships • Retail, Distributor and Trade Alliances • Salesforce Automation	• Project Office • Processing • Fulfillment

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Two approaches to motivating energy efficient choices

Rebates

- Large volume
- Standard systems
- Similar performance

Incentives

- Small volume
- Custom systems
- Unique performance

Deemed

Standard energy savings attributed when measure deployed

Calculated

Manual calculation of energy savings when measure deployed

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EE Strategy and Market Development

Responsible for helping PG&E grow its portfolio by focusing on ways to continue to play an active role in the CA energy landscape

- EM&V
- Regulatory
- Policy Planning

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Enabling Energy Management at PG&E

- SmartMeter™ provides the platform for the evolution to integrated customer energy management
- Enables tools that allow customers the ability to see how they're using energy and make informed decisions that help reduce energy use
- Automation and Behavioral Savings are the next frontier

PG&E is using SmartMeter™ data to offer customers innovative and useful new services

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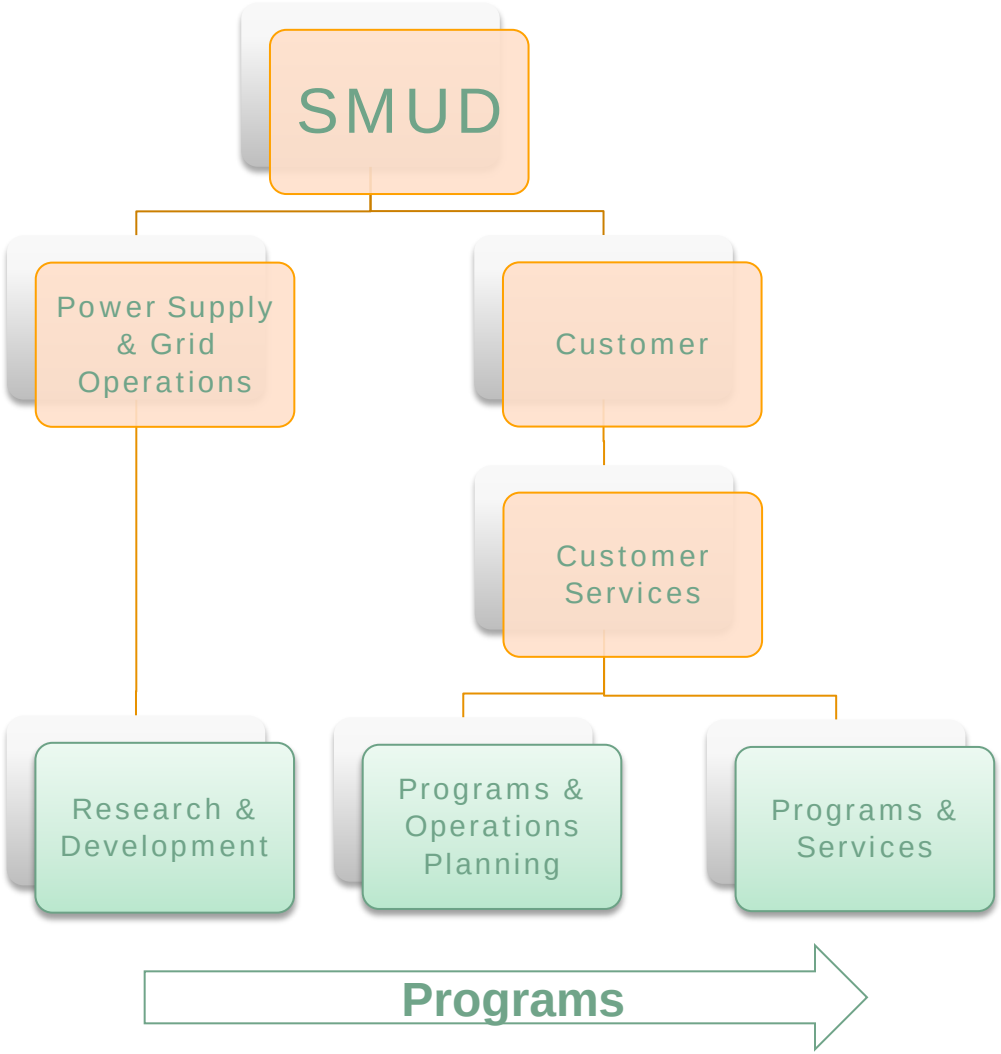
Organizational Structures

Energy Management at the CA Utilities

Sacramento Municipal Utility District

Rachel Radell

SMUD Customer Programs



Programs

Customer Direct

- •Weatherization
- •Energy Advisor
- •Home Electricity Reports
- •AC Load Management
- •PV, EV, Green Energy

Mid & Upstream

- •Appliances, Lighting , Electronics, Solar Smart (EE/PV), Retail Partnerships
- •Equip. Efficiency, Whole Home, Multi Family Retrofits, Shade Trees
- •Customer Loans (EE/PV)
- •Residential and Commercial PV, Virtual Net Metering, Community Solar

Commercial & Industrial

- •Custom EE, Prescriptive Incentives, Distributor Incentives
- •DR, AutoDR
- •Savings by Design

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Southern California Edison

Edwin Hornquist

Customer Centric Offerings Evolution

Policies

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

Products

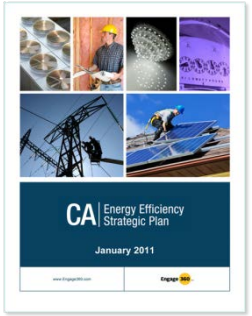
- IDSM Offerings
- Emerging Products
  - PCTs, IHDs,
  - HANs, HEMs
- Pilots and Solution development

Programs

- EE, DR, DG, ESA, PEV Programs
- Behavior Programs
- Market Transformation Programs

Promotion

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



Demand Side Management Programs & Tools

Program	Focus
Summer Discount Plan	• Acquisition Marketing Campaign (South of Lugo) ➢ Residential – launched 3/28, enrollment goal 25 MW ➢ Commercial – launching 6/3, enrollment goal 1 MW • Transition to Economic Event Trigger – launched 5/6 ➢ Commercial customers only
Save Power Day	• Targeted marketing efforts to enroll customers on Save Power Day Incentive Alerts – launching June • Customer education to encourage program participation when events are called – launching June
Demand Response Pilots/Studies	Home Area Network Pool Pump, Off-Peak Pool Pump Education, 3rd Party Programmable Controllable Thermostats
Automated Demand Response (AutoDR) Technology Incentives	Additional technology incentives
Energy Efficiency	Direct Install, Express/Customized Solutions, Appliance Recycling, Home Energy Efficiency Rebates
Flex Alert	• Leveraging partnerships with community-based organizations for community outreach • Coordination with Flex Alert statewide media plan
Energy Management Tools	MyAccount, Budget Assistant, Online Billing, Energy Manager

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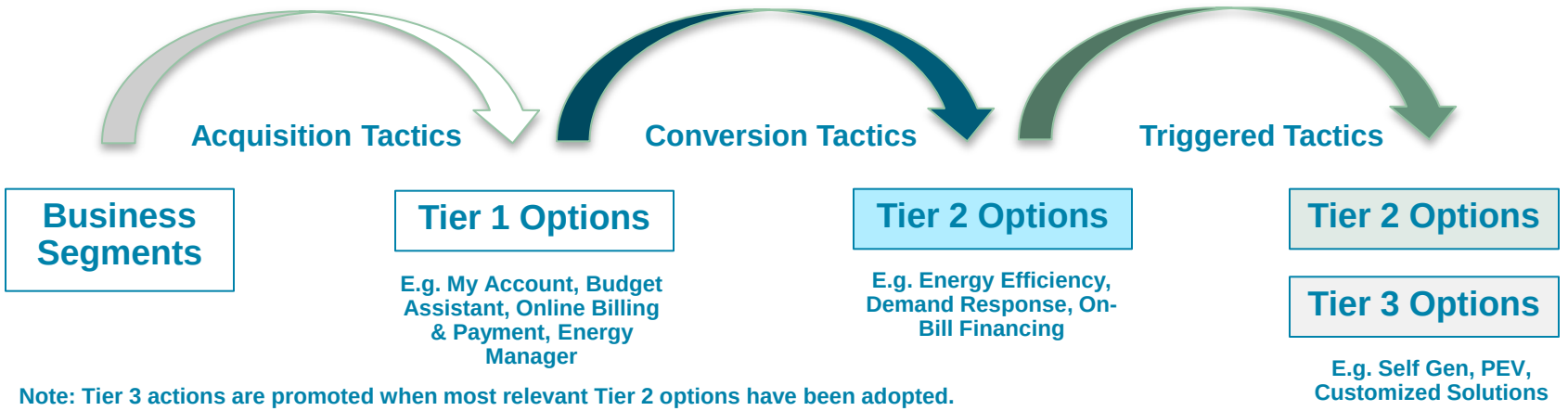
Go-To-Market Approach

The Go-to-Market approach consists of Acquisition, Conversion and Triggered tactics:



Note: Tier 3 actions are promoted when most relevant Tier 2 options have been adopted.

First step is to engage business customers in Self Service options (Acquisition). Next is promote Energy Efficiency (Conversion) followed by promoting subsequent solutions of the Energy Improvement Process (Triggered).

Examples tiered actions:

- **Tier 1: My Account, Budget Assistant, Business Energy Advisor**
- **Tier 2: Lighting, HVAC, Demand Bidding**
- **Tier 3: Savings By Design, Retrocommissioning**

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Customized Solutions Available Incentives

Measure Classification	Incentive ($/kWh)	Incentive ($/kW)	Examples
Lighting - Targeted	$0.08	$100	Controls, LED
All Other Lighting	$0.03	$100	Fluorescent, induction, CFL
Non-Lighting Targeted	$0.15	$100	Chillers, oversized condensers/ evaporators
All Other Non-Lighting	$0.08	$100	VFDs, compressed air, fans

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Comprehensive Project Bonus

20% incentive bonus, not to exceed $25,000

Applications must have at least 3 of the below technologies :

- Controls
- HVAC
- Lighting
- Process
- Refrigeration
- Retrocommissioning
- Auto-DR

Each technology must be at least 10% of the project's total estimated incentive

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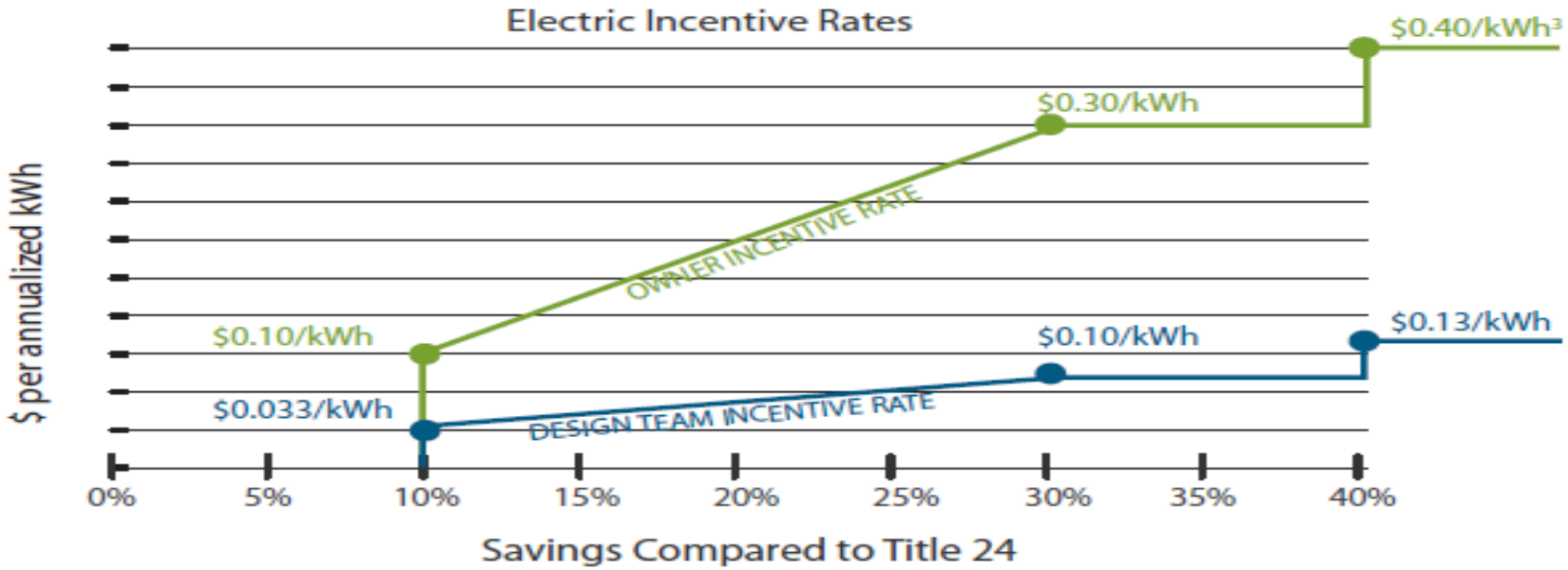
Savings By Design (EE)

Whole Building Incentives

Owner Whole Building Incentives - up to $150,000
- 20% Bonus for end use monitoring
- 10% Bonus for enhanced commissioning

Design Team Whole Building Incentives - up to $50,000[1]



Peak Demand Incentive Rates:	$100/kW Owner	$33/kW Design Team[1]
[2]Therm Incentive Rate:	$1.00/therm Owner	$0.33/therm Design Team[1]

[1]Design Team Assistance to be offered in lieu of Design Team Incentives in SDG&E service territory.
[2]SCE therms incentive, offered in partnership with SCGC.
[3]Not available in PG&E service territory

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San Diego Gas & Electric
Southern California Gas

Nate Taylor

ET Program Structure at Sempra Utilities

Jeff Reed – Director of Business Strategy Development

- Kate Zeng – Technology Planning and Analysis Manager
  - Nate Taylor – Energy Efficiency ET Lead
  - Open – Demand Response ET Lead
- A.Y. Ahmed – ET Manager SCG
  - Joe Shiau – ET Program Advisor
  - Aline Dew – ET Project Manager

EE/DR Program Structure at SDG&E

Non-Residential

- EEBI
- EEBR
- Savings By Design (New Construction)
  - EMS is code, presents challenges
- TA/TI and DR Programs

Residential

- Midstream
- Upstream
- Appliance Rebates
- Multi-Family
- Energy Upgrade CA

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Other Programs at SDG&E

IDEEA365 and Other 3PP

Strategy Group

- Green Button Data
- Customer Information
- Behavioral Programs
- HAN Team

Understanding utility capabilities

What can be expected from the CA Utility EE Programs?

Can:

- Develop and invest in rebate and incentive programs for customers
- Provide education and awareness programs to customers on energy management opportunities

Cannot:

- Invest in companies or technologies*
- Provide customers to external parties for business development purposes

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*SDG&E's Equity Investment Program is an exception

Southern California Gas

A. Ahmed

C&I Programs at SoCalGas

Efficiency Rebates for Businesses (EERB)

Energy Efficiency Calculated Incentive Program (EECIP)

Energy Advisor Program.

Benchmarking

Third Party Programs

Partnerships

RetroCommissioning (RCx)

Continuous Energy Improvement (CEI)

On Bill Financing

Residential Programs at SoCalGas

Instant Rebates

Rebates for Property Managers and Owners

Energy Upgrade California™

Ways to Save - Personalized Energy Savings Tools

Solar Water Heating

Builder Services

New Construction Design Reviews

…. Emerging Technologies Program Joint/Pilot Projects

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Energy Management Landscape

Emerging Technologies Program Perspective

Energy Management via ET Programs

- Demand Response Opportunities
- Energy Efficiency and Optimization Opportunities
- Policy Considerations
- Emerging Technology Program Projects and Initiatives

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Demand Response and ET

Completing Field Assessments and Demonstrations

- Perform M&V to understand the potential demand reduction for strategies and technologies
- Assessing the customer impact of various strategies
- Determining ability of technology to respond to DR signals as well as communicate statuses in accordance with protocols (OpenADR, etc.)

EE and Optimization Opportunities

ET's Role for New and underutilized Strategies

- Field Assessment at a customer site for new
- Demonstration/Showcases for underutilized

EEBI

- Deploy proven strategies through existing custom incentive programs.
- Incentives are paid based on annual, time dependent (demand reduction), kWh savings and vary depending on technology from $.01-.14/kWh

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Policy and Implementation Consideration

- **Behavioral "Gray Area"**
- **Consistency and "Modelabilty"/Predictability**
  - Options to standardize M&V and shorten test periods
- **Persistence**
  - Retro-commissioning availability. Potential ~10% Incentive Kicker for New Construction Projects.
- **IDSM**
  - EE vs. DR
  - Shift from DR to EE (DR events could "pilot" facility comfort level for permanent modification for certain measures)

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Current ETP Projects and Initiatives

Project	Utility
HVAC Optimization BMS Overlay (EE/DR)	SDG&E
Integrated BMS for Lighting, HVAC, EV, Storage, Renewables (EE/DR/Ancillary Services)	SDG&E
Business Energy Reports	PG&E
EMIS Baseline Performance Criteria & Testing Protocols	PG&E
Small Commercial EMS	PG&E
Sunverge & Energate Smart Community Demonstration	SMUD
3rd Party Programmable Controllable Thermostats	SCE

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ETP Projects and Initiatives (cont'd)

Advanced Lighting Controls Systems

- Statewide Initiative to Co-develop Best Practices for M&V
- Goal of Standardizing findings and rigor of methodology
- Hope to inform a future model for these installations
  - Simplify EEBI > Move to EEBR

Contact Information

PG&E Energy Management Program / Product Managers

- EnergyManagement@pge.com

Mananya Chansanchai, PG&E

- M7CE@pge.com

Rachel Radell, SMUD

- Rachel.Radell@smud.org

Edwin Hornquist, SCE

- Edwin.Hornquist@sce.com

Nate Taylor, SDG&E

- NTaylor@semprautilities.com

Abdullah Ahmed

- AAhmed1@semprautilities.com

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Q&A and Panel Discussion

Networking Break

Energy Efficiency and Behavior Management Technology

Moderator:

Daniel Ohlendorf: Expert Product Manager, Information Products | PG&E

Panelists:

Derek Okada: Senior Project Manager, DSM Strategy Planning | PG&E

Leo Carrillo: Principal Product Manager, Information Products | PG&E

Ray Manion: Homeowner

Energy Efficiency and Behavior Management Technology

Technology Resource Innovation Outreach (TRIO) Roundtable

August 19, 2013

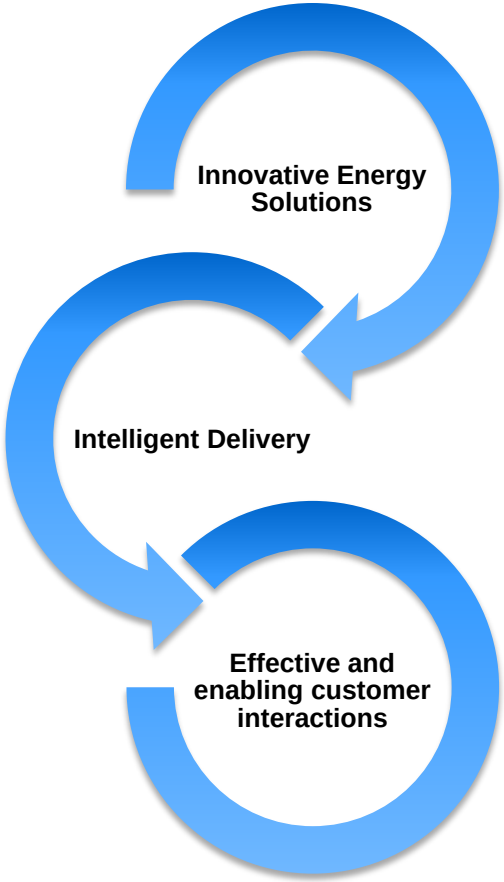
Derek M. Okada
Senior Project Manager, DSM Strategic Planning
Southern California Edison

Discussion

- Evolving Utility Customer Strategies
- Behavioral Frameworks
- Overview of Energy Advisor Programs
- Program and Services Offerings
- Behavioral Program Considerations

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

DSM Strategy Evolution – Focus on Innovative Customer Solutions



- The IOUs are evolving toward a technology-enabled customer delivery service model
- This shift enables utilities 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

Organizational Evolution – Develop Customer Centric Offerings

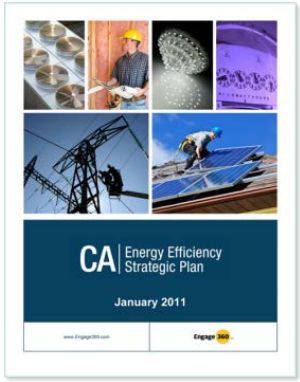
Policies → **Products** → **Programs** → **Promotion**

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

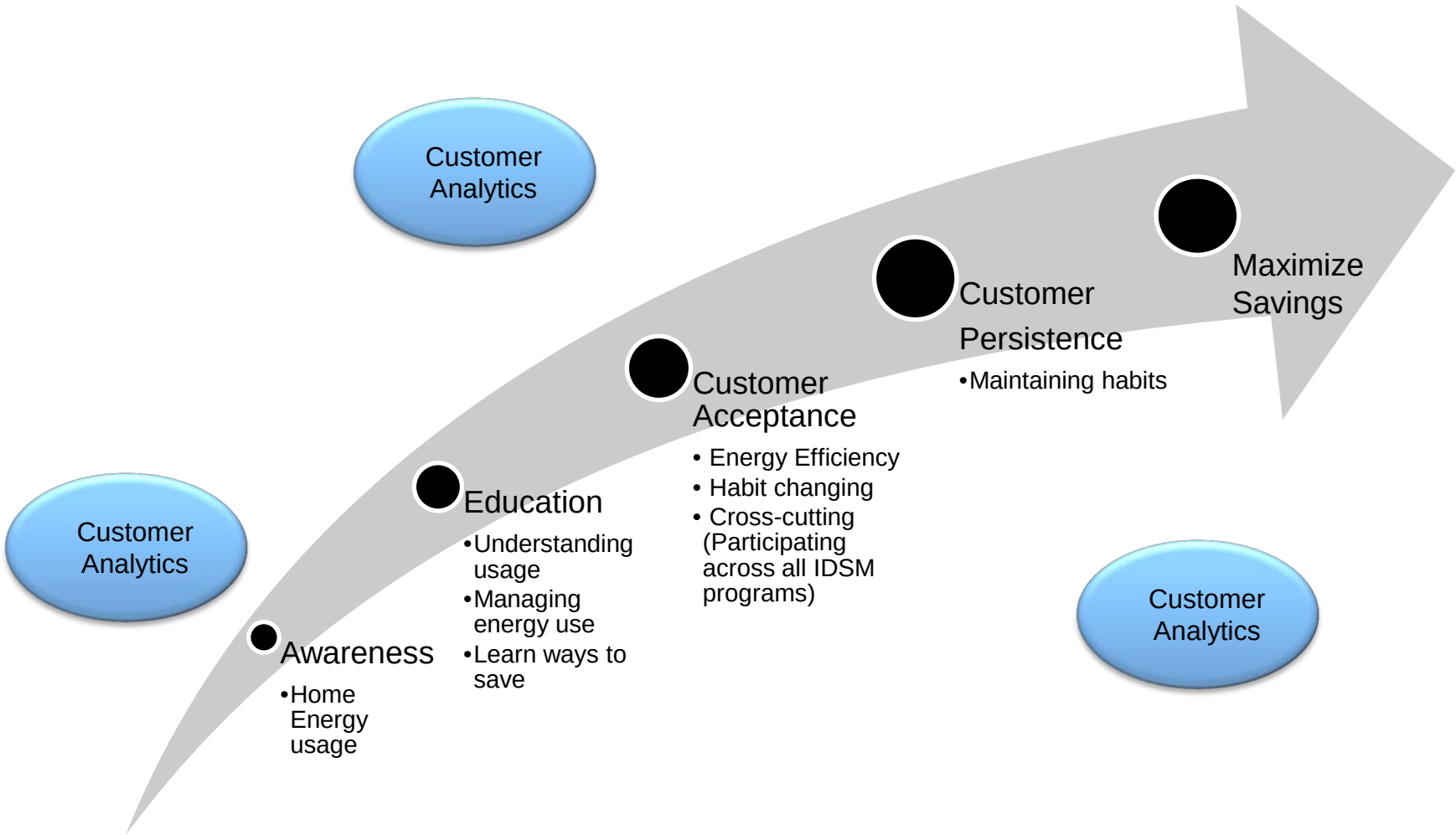
- IDSM offerings
- Emerging products
  - PCTs, IHDs,
  - HANs, HEMs
- Pilots and solution development

- 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



Behavioral Intervention Progression



Overview of Energy Advisor Programs

- **Residential Energy Advisor (EA) Program**
  - Utilizes interactive tools designed to engage customers and encourage participation in innovative initiatives.
  - Designed to help and empower customers to manage their energy use guide them towards advancing whole-house energy solutions.

- **Commercial EA Program**
  - Brings together all audit services offered to support customer education and participation in EE, DR and DG opportunities and benefits as well as awareness of GHG and water conservation activities.
  - Includes Benchmarking, Online Energy Audit Tool, Nonresidential Audits, Pump Efficiency Services, Retrocommissioning (RCx) and coordination with Continuous Energy Improvement (CEI).

- **Industrial EA Program**
  - Brings together all audit services offered to support the customer's education, participation in EE, DR and DG opportunities and benefits, and awareness of GHG and water conservation activities.
  - Includes Benchmarking, CEI, Nonresidential Audits, Pump Efficiency Services, and RCx.

- **Agriculture EA Program**
  - Provides online and onsite audits, including benchmarking (offices and other "commercial" building areas), focused and integrated comprehensive energy audits, pump tests, RCx and may include CEI audits/services across the agricultural segment depending on the IOU's market segment potentials and available resources.
  - Provides an inventory of technical project opportunities and financial analysis information for a customer's short- or long-term energy plan, and overcomes both informational and technical customer barriers.

Program Offerings

Previous

Dedicated Programs:

- Home Energy Efficiency Surveys (HEES)
- Non-Res Audits (NRA)

Offerings:

- Long Online Energy Questionnaires (Surveys)
- Paper Energy Surveys
- Energy Audit Services
- Benchmarking

Features:

- Monthly Data
- Measure Recommendations
- Some behavior recommendations

Current

Dedicated Programs:

- Res Energy Advisor
- C / I / A Energy Advisor

Offerings:

- Home Energy Reports
- Universal Audit Tool
- Online Buying Guides
- Rate & Usage Analysis
- Smart Home (HAN)
- Energy Alerts
- Benchmarking
- Energy Audit Services
- Goal Setting

Features:

- Interval Data
- Engagement Focus
- IDSM Integration
- Many behavioral recs

Future Proposed

Programs:

- Energy Advisor as a behavior program
- Behavior integrated with all applicable programs

New Offerings:

- SMB Energy Reports
- Social Gaming
- Smart Thermostats
- Others TBD…

New Features:

- Whole Building Approaches
- Near Real-time Data
- Advanced use of disaggregation technology
- Continuous Customer Engagement
- Active Participation / Energy Conscious

Integrated Customer Offerings

BEHAVIOR PROGRAM

- Targets a wider customer scope and population
- Fills the gap through multiple touch points
- Integrates IDSM, AMI-enabled, and evolving technology
- Mass market Energy Advisor supported

MARKETING

- Behavioral messaging would be incorporated in collateral and campaigns.
- My Account
- Social media
- Energy alerts
- Rewards

OTHER PROGRAMS

- PLA
- Energy Upgrade
- Multifamily
- Influence both buying & usage behavior

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

Anticipated Evaluation Approach for 2015 & Beyond

- For interventions with claimable energy savings, IOUs are likely to be asked to do the following:
  - Link proposed intervention strategy to acceptable social science theories,
  - Support “under-utilized” intervention behavior strategies as defined by the behavior whitepaper,
  - Ensure that the intervention strategy is verifiable, evaluable and measurable (e.g., Randomized Control Trial, Quasi-Experimental Design and other accepted M&E protocols),
  - Utilize ex-post and ex-ante energy savings reporting/

Q&A

Derek Okada
Southern California Edison
(626) 302-0790
Derek.Okada@sce.com

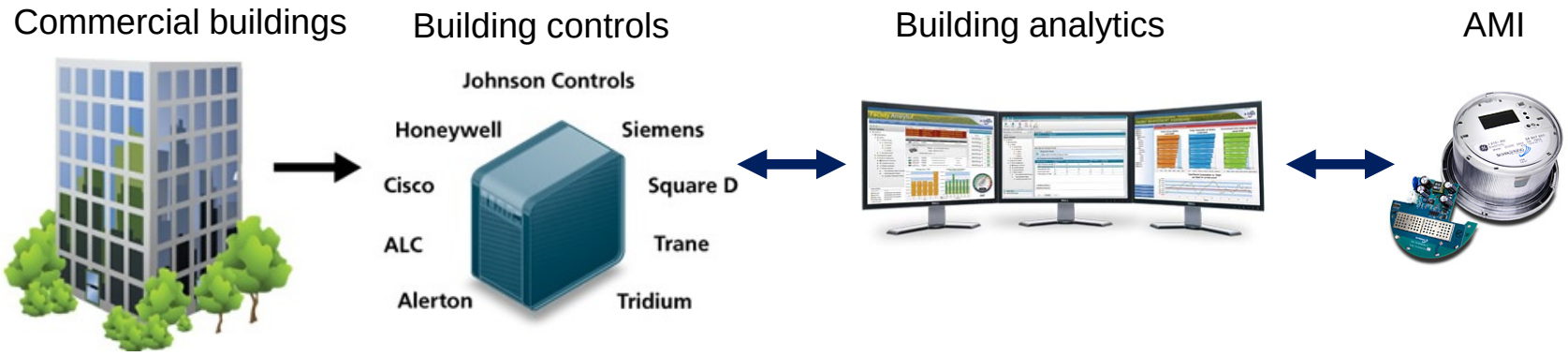
Energy Management Technology & Products

Technology Resource Innovation Outreach (TRIO) Roundtable

August 19, 2013

Leo Carrillo
Principal Product Manager, Energy Management Systems and Information Products
Pacific Gas & Electric Co.

Technology Focus



- Home & Building Automation
  - Under the right conditions, building automation can reliably deliver operational savings
  - Building digitization and wireless technology has driven advancements in building controls and driven down prices

- Analytics Software
  - Analytics can enable behavioral and operational savings through information products and services
  - BACnet standardization and AMI deployment has driven innovation in building energy analytics offerings

How to offer meaningful incentives to induce customers to purchase, install and fully utilize energy management software and control systems?

The Evolving Data Landscape

The data landscape is rapidly changing, but the focus of utilities is squarely on customer (and vendor) privacy and confidentiality

Meters

- Utility meter data (Whole building energy consumption)
- Building submeter data (energy consumption of individual building systems or physical spaces)

Sensors

- Sensor and data loggers may capture and record key environmental and usage parameters such as occupancy, ambient temperature and humidity (exterior and interior), and daylight supply (via photo sensors)

Other Sources

- Infrared imaging data
- Spatial imaging data
- Personal locational data

Technology Sophistication and Savings Potential

Thermostats

Sensors & Controls

Building Automation Systems

BAS Optimization Solutions

A New Generation of Thermostat

Thermostats have yet to prove their efficiency value, but a new generation of programmable, communicating thermostat has the potential to deliver a discernible level of operational and/or behavioral savings

Smart Thermostat Features and Functions

Automation/ programmability

- Automatically adjusts set points according to programs

Advanced energy efficiency features

- Examples in include set point enforcement, adjustable dead band and override adjustment limits

Sensing and machine learning

- Uses on-board or networked sensors to automatically adjust dead bands, set backs and set points based on occupancy and other patterns

Remote control capability

- May be accessed through the web or mobile technology

Utility program compatibility and price signal responsiveness

- Demand response; real time price signal responsiveness

Communicates with other devices

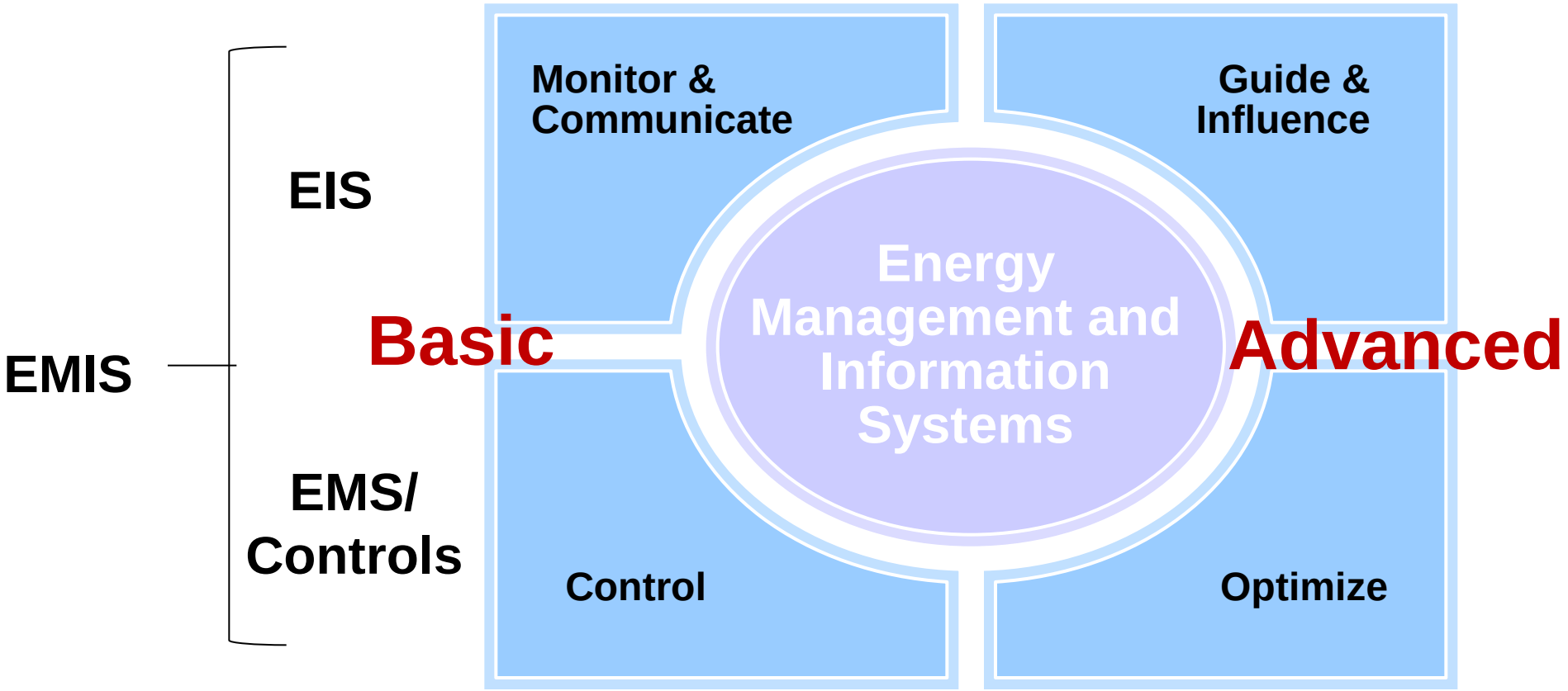
- Interoperable with other smart devices

Behavioral messaging

- Signals occupants and users when set points are optimized

Basic v. Advanced EMIS Technology

- Smart thermostats are a type of building control or automation system
- Building controls and analytics are important technologies capturing operational and behavioral savings



Current PG&E Incentives

- PG&E provides incentives for both basic and advanced building controls technology, but it has yet to provide incentives for analytics software

Controls Measures: Custom and Deemed

Custom	Deemed
DDC	Time clocks
EMS	Occupancy sensors and photocells*
Lighting EMS	Programmable thermostat**
HVAC controls	Humidistat controller
Refrigeration controls	Vending machine controller
Compressed air controls	Demand ventilation control system

* Exterior photocells only
** For HVAC-QM customers only

Controls Products

Energy management systems
- Calculated incentives only

Basic HVAC, refrigeration and lighting controls
- Deemed incentives

Software and Information Products

Advanced EIS
- No offerings

Information products
- Free residential customer offerings

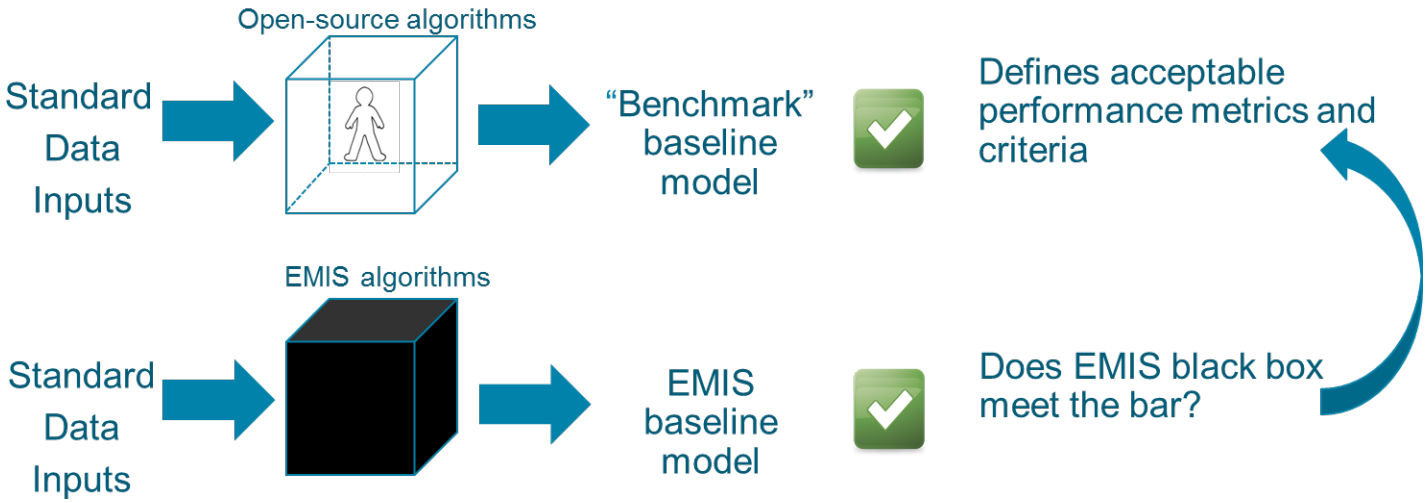
- Deemed measures are limited to only basic controls and sensors, while advanced building controls and EMS measures have always been Custom
- Measuring and validating the savings from both type of technologies is inherently challenging and often cost-prohibitive

Baselining Software Functionality

Energy Management and Information System (EMIS) Software

Software Functionality Types

Presentment	Remote audit
Performance tracking and benchmarking	Savings estimation

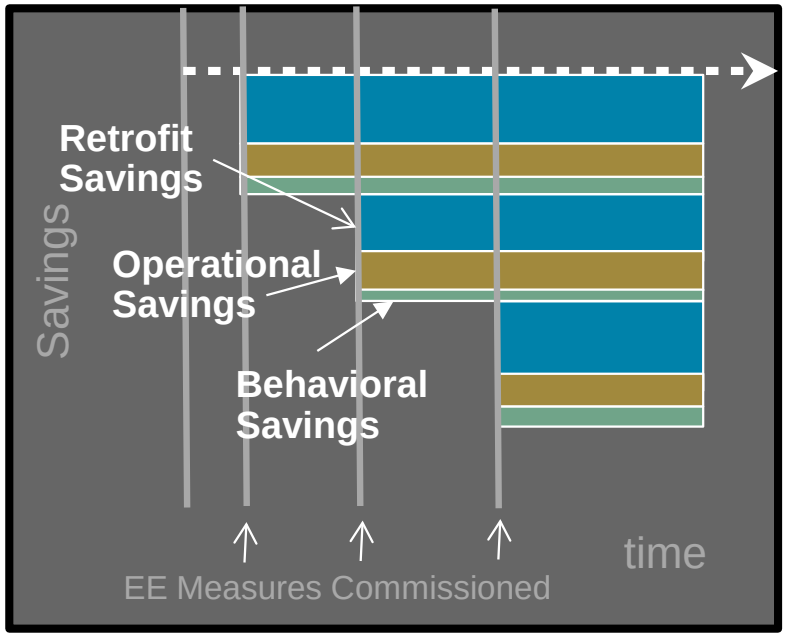


A specific functionality of EMIS software may be key to quantifying energy savings for EMIS technology in general

Whole Building Demonstration

A demonstration involving several dozen commercial buildings of a comprehensive approach to unlock deep energy savings measured at the building meter over time

Energy Savings Over Time



Savings Types

Retrofit | Operational | Behavioral

Potential benefits:

- A simplified, integrated offering with expedited application processing
- Flexibility to pursue a wide range of measures with multiple treatments over time
- ROI substantiated by energy and bill savings determined using interval meter data
- An opportunity to earn a significant performance incentive to maximize and maintain savings

Project Schedule	
Q1	Customer Research and Program Design
Q2	Sourcing and Operations Planning
Q3	Recruitment and Demonstration Launch

Target segments may include Office, Retail, Grocery, Government, Schools and Lodging

Questions?

Leo Carrillo
Principal Product Manager
Energy Management Systems and
Information Products
Pacific Gas & Electric Co.
lmcz@pge.com

Networking Lunch

Demand Response, Home Area Networks and Data Management

Moderator:

Jonathan Burrows: Senior Product Manager, DR Emerging Technologies | PG&E

Panelists:

Amy Kight Costadone: Principal Product Manager, Demand Response – 3rd Party Data Platforms | PG&E

Mark Martinez: Senior Manager, DSM Strategy and Policy | SCE

Prateek Chakravarty: VP, Business Development and Marketing | Bidgely

Albert Chiu: Expert Product Manager, Customer Energy Solutions | PG&E

Pacific Gas & Electric

Amy Kight Costadone: Principal Product Manager, Demand Response – 3rd Party Data Platforms

Agenda

1) Framework
2) What are the platforms?
3) What are the benefits?
4) How can vendors get involved?

What's driving this market?

Demand-Side Management

- Steadily growing number of requests from customers (and authorized third-parties) for access to their electricity usage data
- Standardized, automated process for distributing customer meter data also expected to reduce cost and lead-time of supporting such requests
- Streamlined access to customer data could fuel innovation and growth in the third-party services market, providing customers with more options to manage their energy usage

"Internet of things"

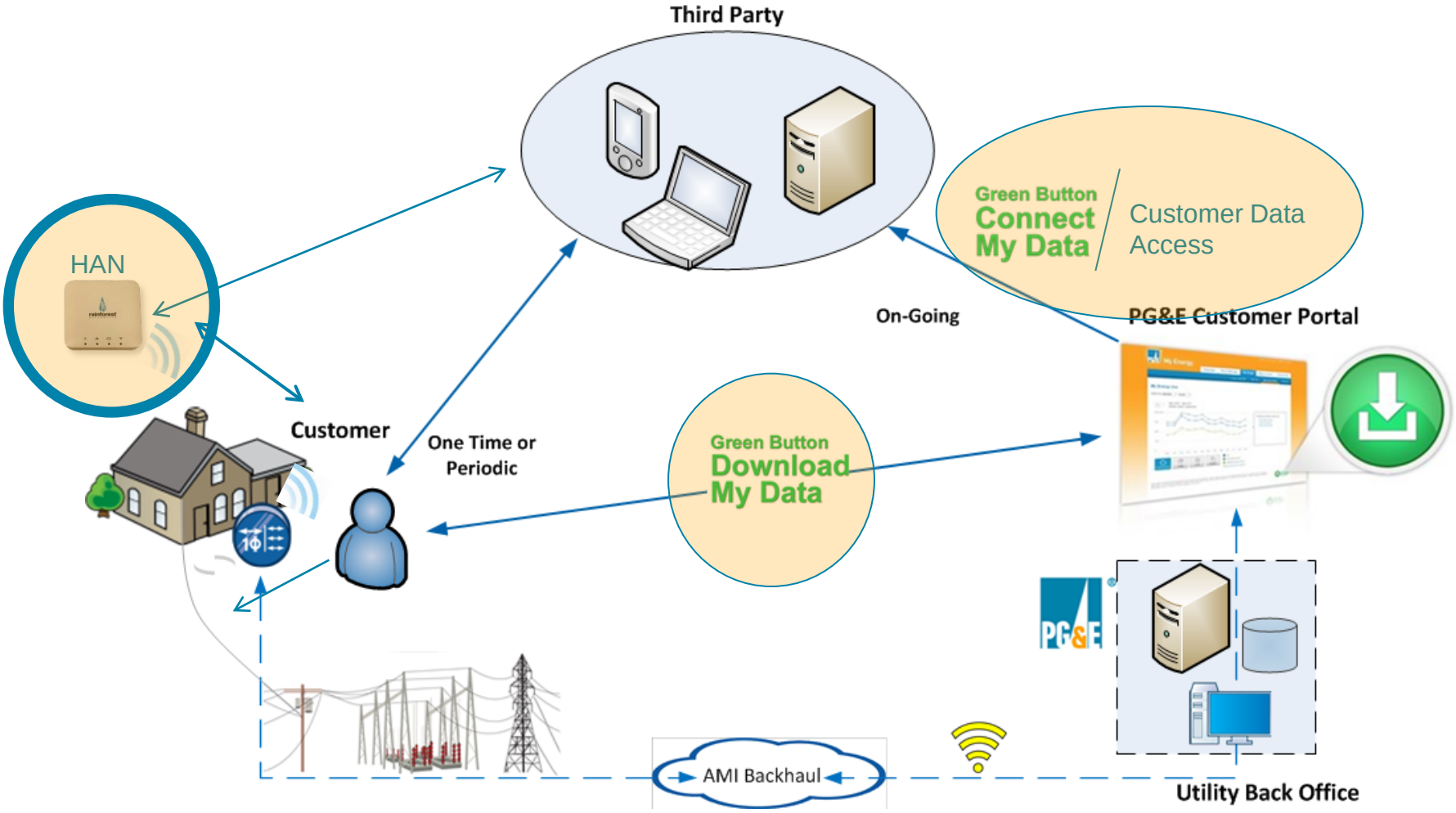
- Growing 3rd party retail market for energy management products and services
- Home controls and energy management is a key driver in this market

Call to Action

- White House "Call to Action" – enable consumers to download their detailed energy usage with the simple click of a "Green Button."

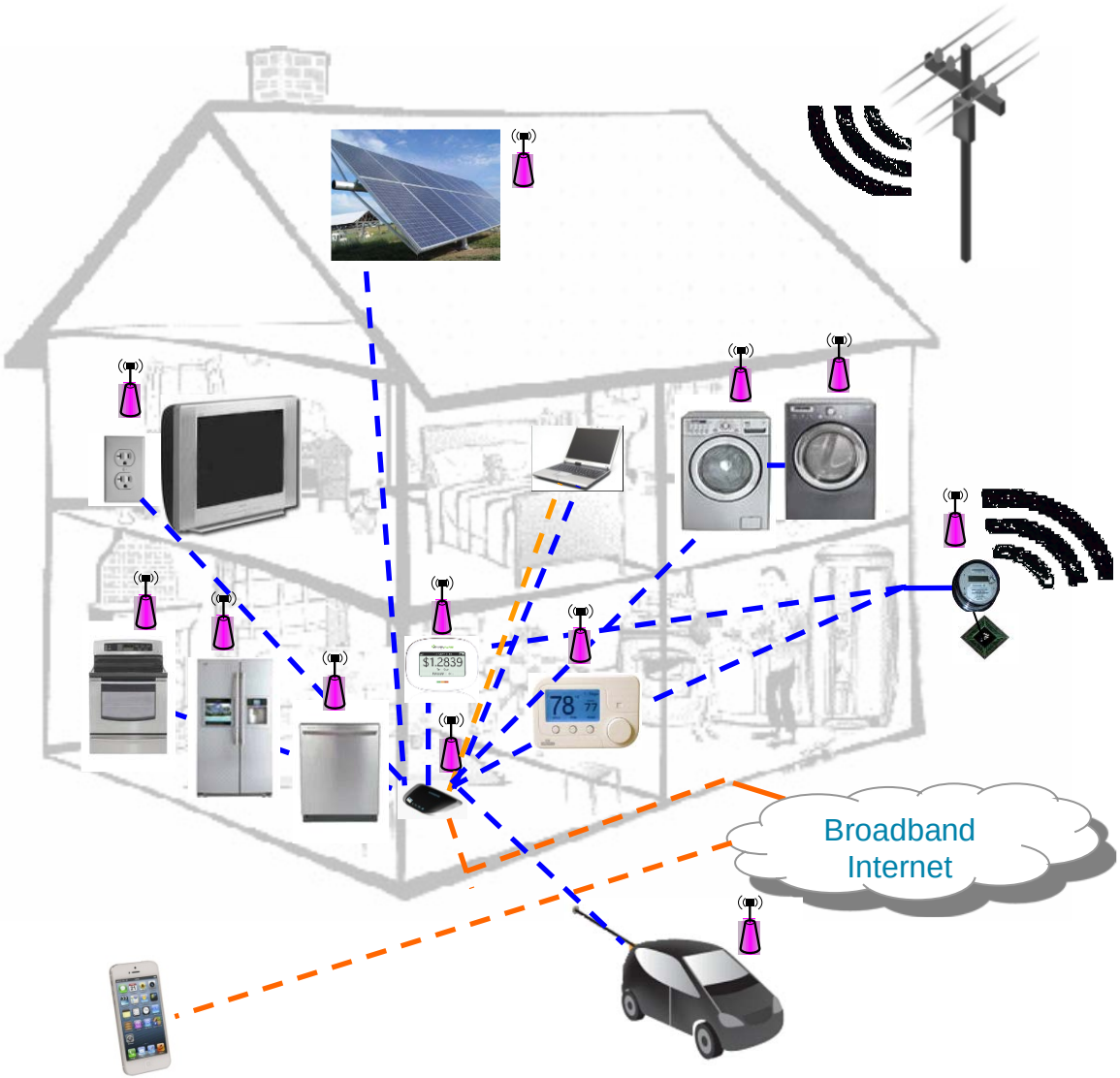
Systematic Access to Customer Data

With Customer Consent



WHAT ARE THESE PLATFORMS?

Possible Home and Business Area Network



From meter to the home:

- Energy consumption information (now)
- Timely price signals (est 2014)
- DR event signals (est 2014)

From meter to utility:

- Customer electric use (now)
- Response to event signals (est 2014)

HAN network communication

SmartMeter communication

PG&E's HAN Implementation Phases

2012	2013	2014
Phase 1 (2012-2013)	**Phase 2** (2012-2013)	**Phase 3** (2013-2014)
Initial Rollout •*Gather data to prepare to accommodate next phase* •500 PG&E provided and installed IHDs to a mix of employee and customer single family homes on inclining block rates •Near real-time usage (kW and kWh) and current price data ($/kWh and $/hr) •Updated ~15 sec intervals •Device memory provides historical consumption – daily, weekly, monthly	Early Adaptors •*Move from pilot to a platform* •Initially provide a list of five PG&E validated 1.x HAN devices (that will be customer purchased) •Provide ability for customers to self register / activate their devices •Metering information only	DR Integration •*Help customers manage their response to time varying rates* •Create and communicate DR signals, such as price and DR event notifications, in order to expand DR opportunities to Residential and SMB customers •Pilot with up to 2,000 existing SmartRate and PDP customers (Summer 2014) •Expand to all eligible customers after successful pilot
Complete	**Self Registration End of 2013**	**Project In Progress; Completing Plan/Analyze Phase**
Initial Rollout: up to 500		
Platform enabled, start device rollout (March)		
	Asynchronous online registration platform available	
		Mass Market : up to 200,000 customers
		Synchronous online registration
		Pilot DR event notifications to SMB and Residential customers

Green Button and GBC

Easy, secure way to get & share customer authorized data

Green Button Download My Data

- Download historical personal energy usage data
- Developers and third parties can receive energy usage data from customers in machine-readable form (when a customer sends the downloaded data to third parties)
- Launched in Dec 2011

Green Button Connect My Data

Software interface (API) that allows customers to easily share & provide ongoing access to their electrical data with other service providers.

- Customer sets up a PIN code for each of the electrical service agreements they wish to share and provides this PIN / Service ID combination to the companies that they want to share their data with.
- If they wish to stop the vendor's access to their data at any time, then they can simply change or delete their PIN
- Beta Release -- PG&E initially partnered with three companies and has recently added 7 more requestors
- About 15,000 customer have set up a GBC PIN (through July 2013)

Customer Data Access (CDA)

Expecting Final Decision in September 2013

Platform that will provide authorized and secure CDA to customer-authorized third parties .

Main functions of the CDA service:

1)Registration (by third parties) –

- through the third-party portal
- initiate the registration request ,provide the appropriate level of information to determine that the third party is a responsible provider of energy-related services, including a current active eligibility registration at the Commission

2) Authorization –

- Only be initiated by the customer
- Require acknowledgement of the relevant Privacy Policies to ensure that the customer is informed of the risks of sharing data

3) Access (Data Exchange) –

- PG&E will push data to the secured data access site for customer or third-party retrieval
- Site access will only be allowed for those registrations active and in good standing

4) Management (registrations and authorizations)–

- Registrations manage a third parties' ability to "pull" authorized customer data
- Authorizations control the access terms of types of customer data, time period of access, and associated account relationships between customers and third parties

CDA Implementation

Phase 1
Up to 18 mo after Decision

- Development of the infrastructure/systems required to share customer electric meter interval data
- File structure and API will synch with the OpenADE ESPI [Energy Service Provider Interface] Release 1.0 format

Phase 2
9 mo after Ph 1

- Increase the types of customer data that will be supported by the CDA platform to synch with OpenADE ESPI Release 1.5:
  - Critical Peak Pricing Program & Event Data
  - Pricing Data
  - Directed Messages
  - Public Messages

WHY ARE THEY IMPORTANT?

Benefits

Customers

•Ability to see and optimize usage

•Potential for lower energy spending from conservation or demand shifting

•Customer Satisfaction - Increased knowledge, choice, and ability to take action, including doing their part for the environment

- Allows customers to choose vendors and applications that support their education and understanding of energy
- Authorization mechanisms protect customer privacy

Utilities

•Energy Conservation

•Customer Satisfaction

•More reliable and measureable demand response load shed

•Increased operational efficiencies

•PG&E is a partner in energy awareness

- Industry standard format allows for consistent description of data, faster integration, and lower cost of solutions development

HOW CAN VENDORS GET INVOLVED?

How can vendors get involved?

HAN

- Participate in Industry Standards Bodies
- Third Party HAN device Testing Launching YE 2013
- Interested vendors, please email hanvalidation@pge.com to get added to the waitlist and the mailing list to find out about updates to the testing process.

GBC

- Participate in Industry Standards Bodies
- Unlikely we'll be able to take on new GBC applicants going forward (beta pilot has received a large number of applications)

Customer Data Access

- Participate in Industry Standards Bodies
- Participate in regulatory process

Thank you

hanprogram@pge.com

http://www.pge.com/han

http://www.pge.com/greenbutton

Southern California Edison

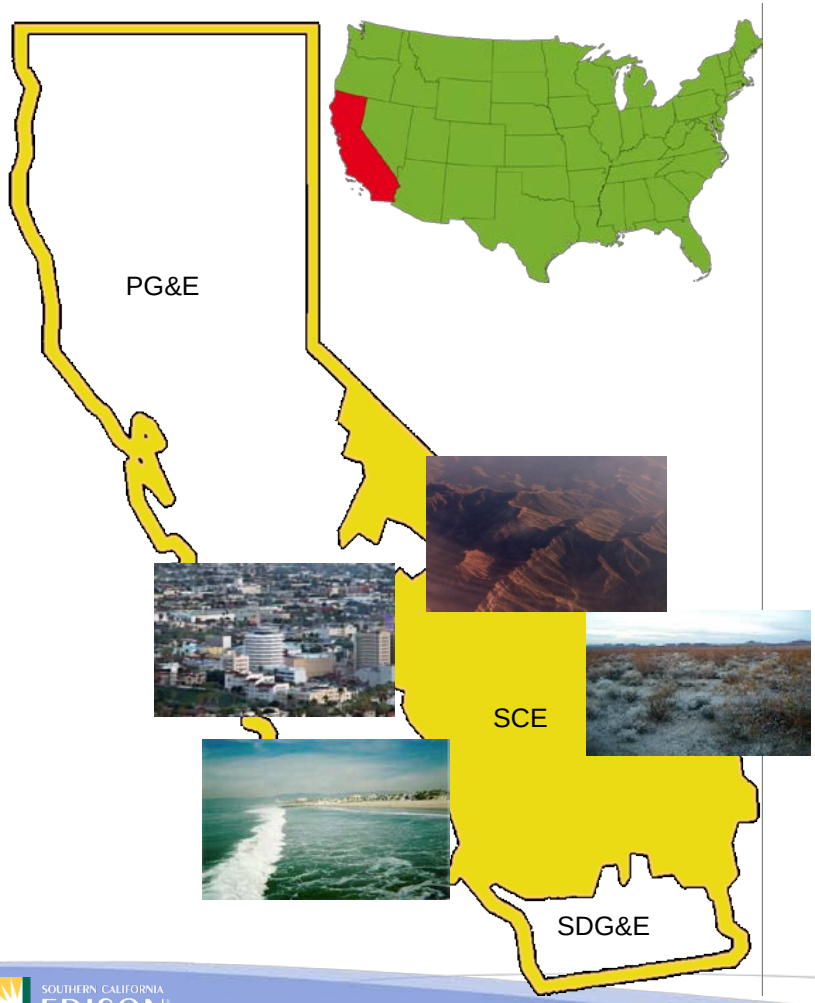
Mark Martinez: Senior Manager, DSM Strategy and Policy

Engaging Our Customers Through Enabling Technology

TRIO – August 2013

Southern California Edison

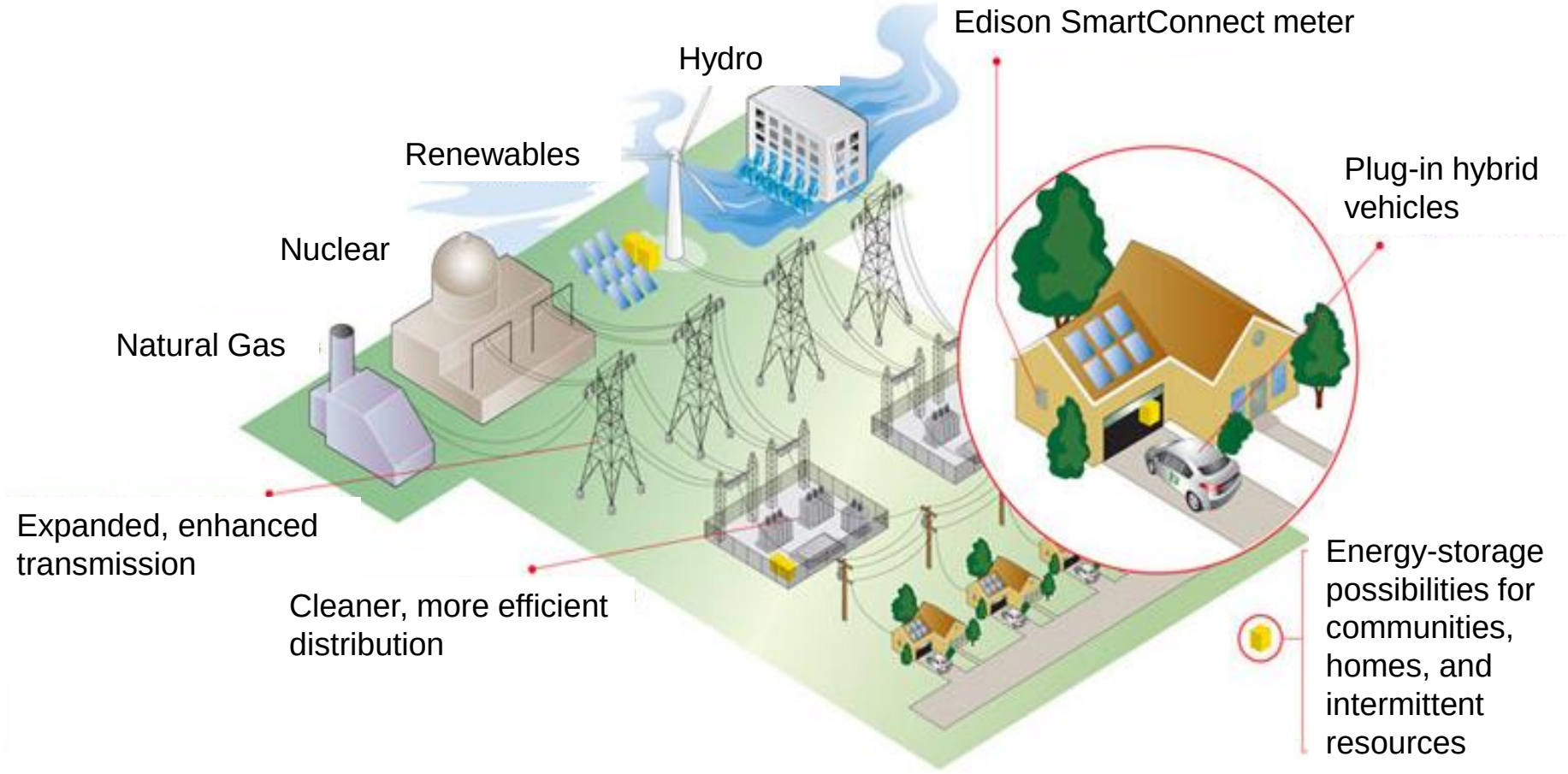
An Edison International Company



- **Southern California Edison (SCE), headquartered in Rosemead, California, employs approximately 14,000 people**
- **Serves a population of more than 14 million people in a 50,000 square mile area of Central, Coastal, and Southern California**
- **Service territory includes more than 180 cities and communities with a dozen different languages**
- **Award-winning integrated demand side management (EE, DR, DG, ST) customer programs**
- **Industry leader in procuring renewable energy, enabling electric transportation, deploying the Smart Grid and smart metering**
- **Serving customers for 125 years (initially as the Electric Light Works in 1886)**

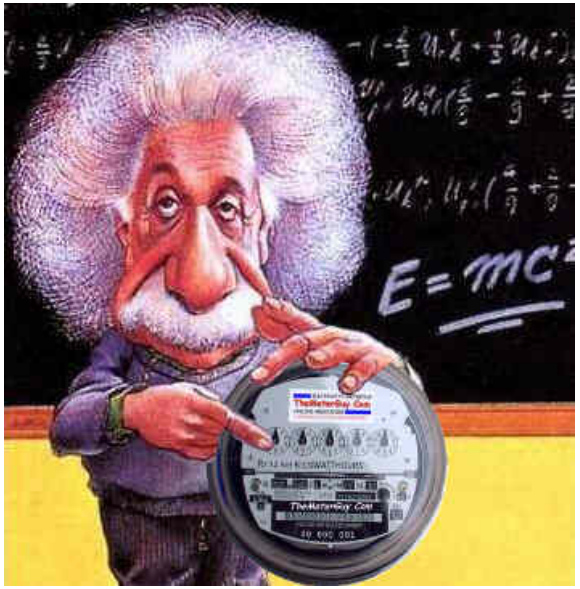
SCE Smart Grid Vision

A cleaner, more diverse generation supply. A smarter and more reliable electricity grid. Serving customers who are using electricity more wisely, and in more ways, than ever before.



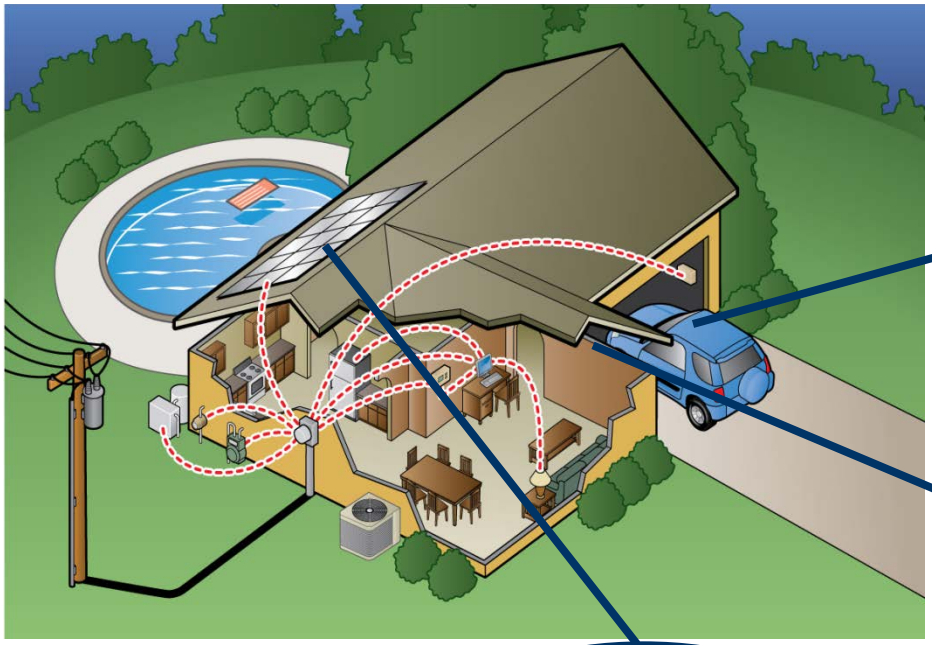
Making it "Smart"

Southern California Edison (SCE) has installed nearly five million Edison SmartConnect meters. These will provide daily cost and billing info through the home and business area network



The Connected Home

Enable Distributed Energy Resources

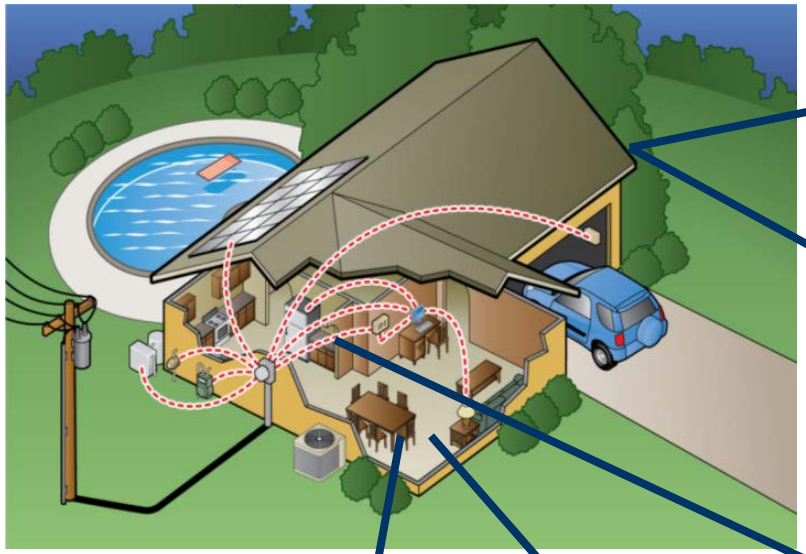


Long-term opportunities through plug-in electric vehicles

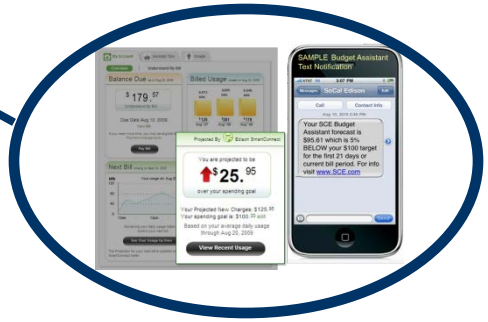
Enable net metering, discrete metering and integrated energy management with solar panel

Home energy storage creates opportunities for increased renewables

SCE's New Customer Experience Will be Tailored to Customer Preferences



Customer-friendly "Lifestyle" Plans



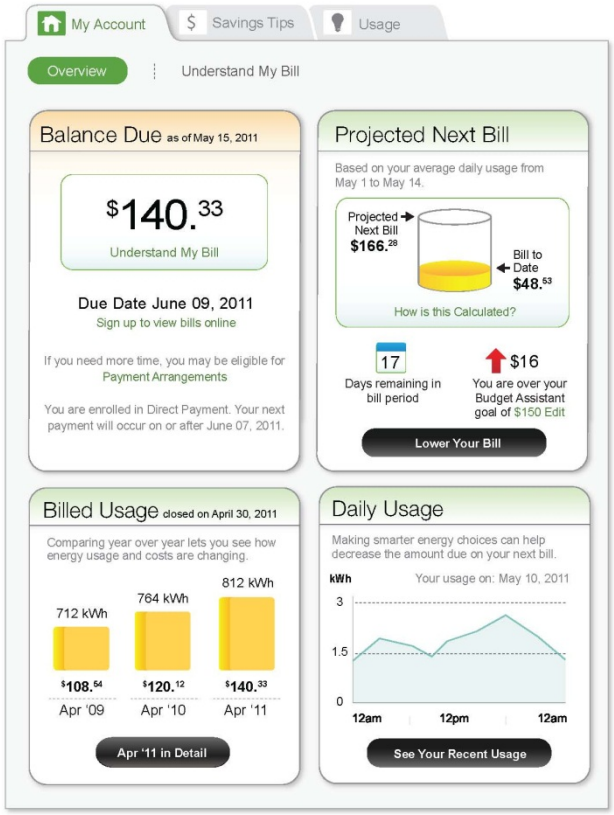
Web & Mobile Tools

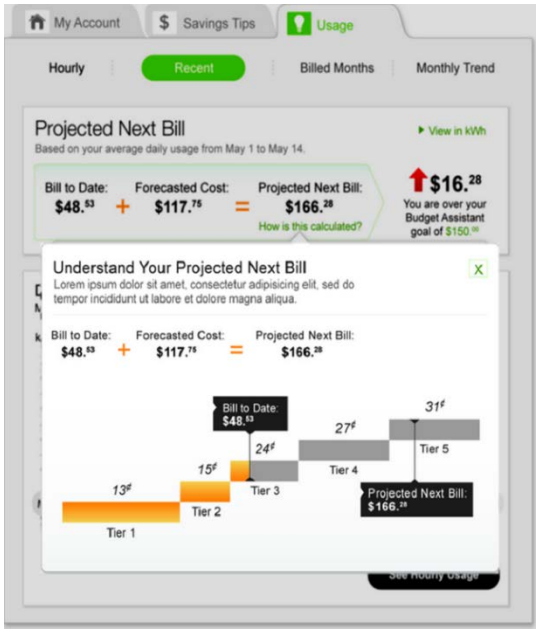
Improved load management through Edison SmartConnect technologies

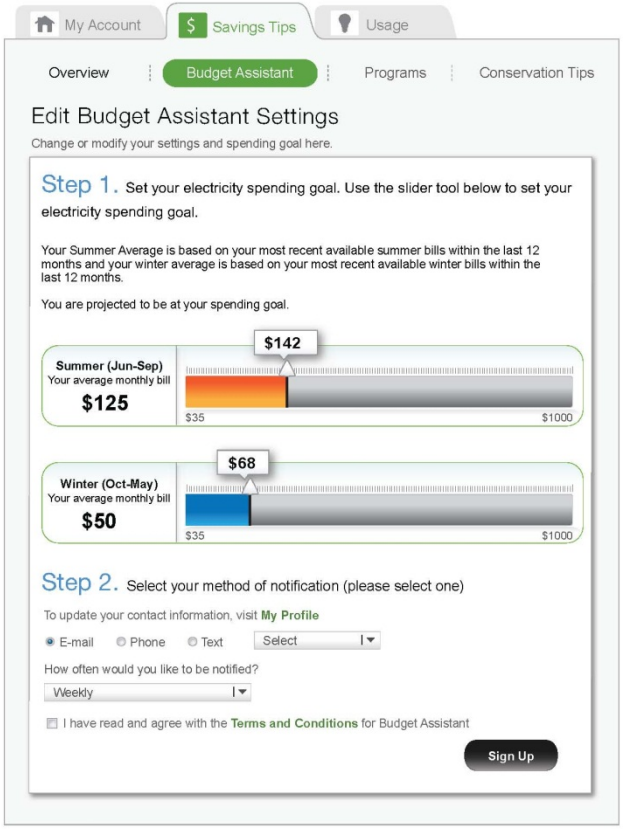
Energy information drives energy conservation and GHG reductions

Customer enabled automated response through Smart Energy appliances

Providing Customers Helpful Online Tools





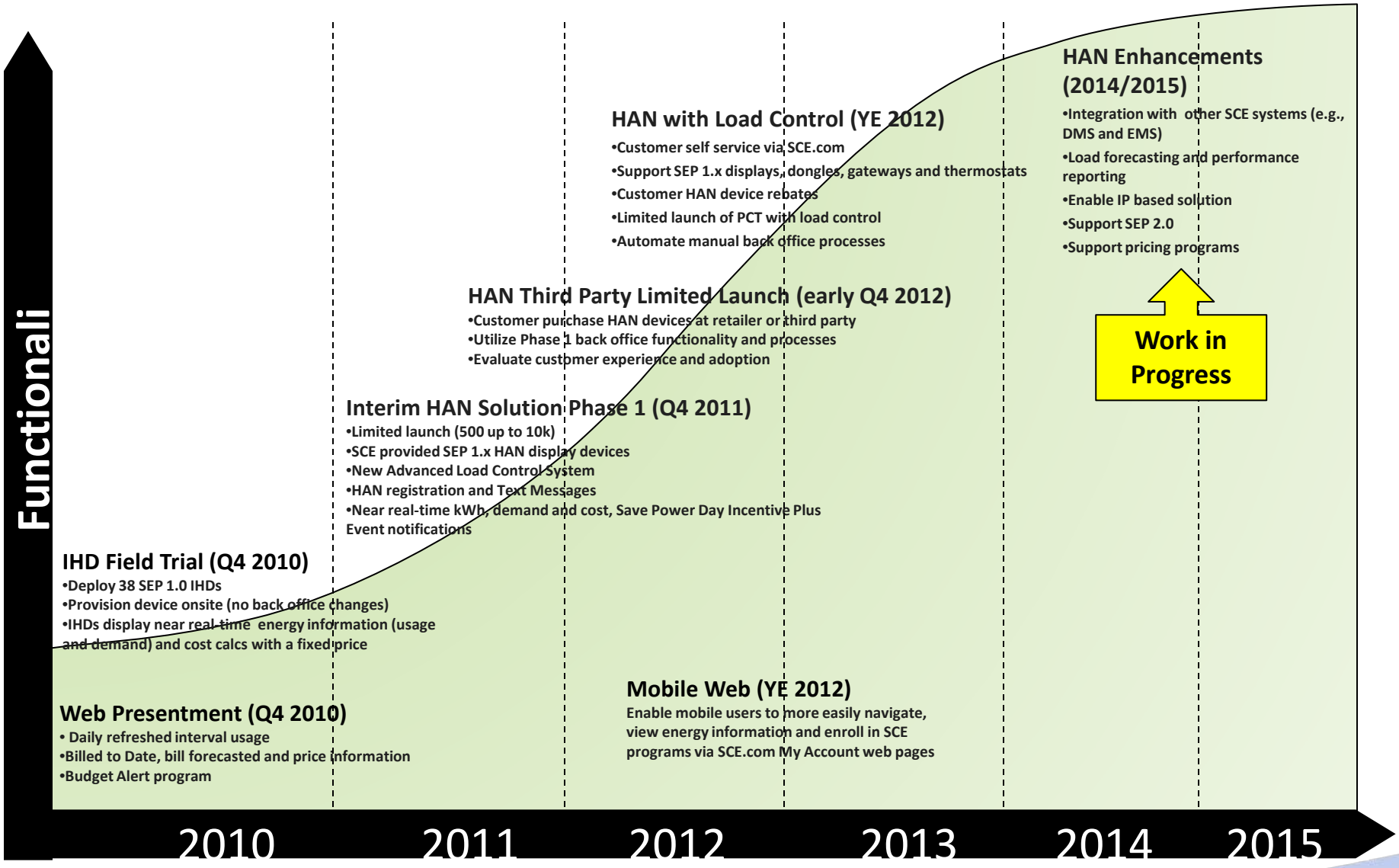


The Home Area Network (HAN) is the Key to Customer Engagement

The HAN allows SCE's Edison SmartConnect meters to communicate wirelessly with customers' smart devices and appliances, empowering them with information to make better energy choices.

- Choice to manage costs and peak demand
  - Time of use and tiered rates
  - Critical Peak Pricing (CPP)
  - Peak Time Rebate (PTR)
- Reliable electric grid
  - Reduce peak load by 1,000 MWs
- Energy information drives conservation
  - Reduce residential energy consumption by 1% (minimum)
  - Reduce GHG by 365,000 tons/yr

Customer Enablement Roadmap



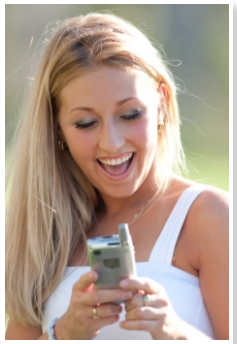
What Our Customers are Saying

"Budget Assistant is a great idea. It shows me how and when to save money and energy!"

"Extremely helpful when budgeting monthly, retirement income and knowing where we are using the most electricity, so we can change our living habits."

"It's a hassle free way of letting me know I need to cut back on our electricity usage to save money or stay within my budget."

"It has almost become a personal goal for me to see how much I can get below my budget each month. I enjoy the challenge."



"I liked that Edison could alert you via email, phone or text when you were getting near to your set limit of spending."

What's in Scope for 2013/2014?

Areas of interest include…

- Additional process automation
- Enhanced HAN registration status communications
- New load control applications
  - New devices/Multiple devices
- SEP 2.0
- Business customers
- Pricing programs
- Load forecasting

Guiding Principles

- **Customer First:** Think about how your customers will accept the processes, and how it will scale
- **Collaborate:** Bring your business leaders, technology teams, and vendors to the table when designing your implementation
- **Look Forward:** Balance your design between existing capabilities and where you want to be in the future (don't get trapped by traditional processes)
- **Partnership:** Choose vendors engaged in standard's groups. While they are moving targets, make sure you are not locked into obsolete technology

Giving Our Customers the Power to Invest in What Matters Most to Them: Their Families and Businesses

Get to Know More About the Utility's Rate Programs

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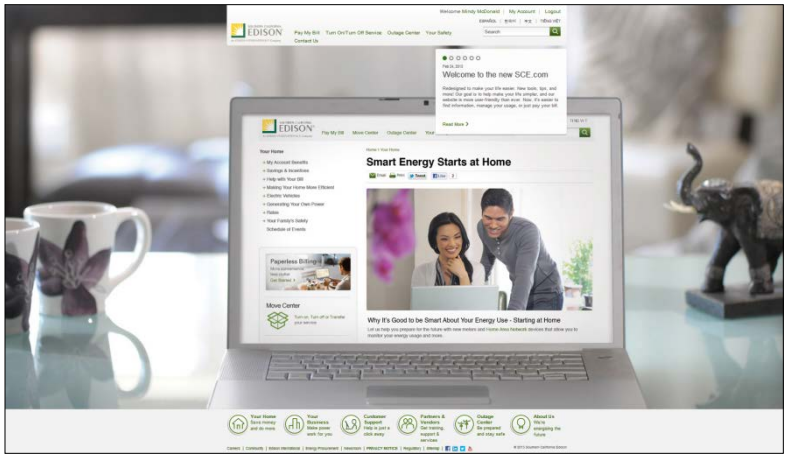

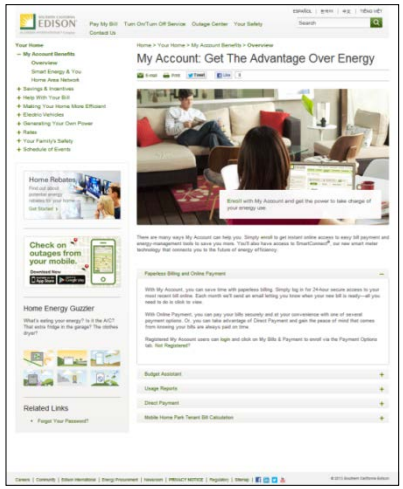

Green Button
Connect
My Data

TO LEARN MORE

Like Us on Facebook!

Edison's Smart Meter web site:
www.sce.com/smartconnect

Learn More About SCE's Home Area Networks
www.sce.com/han

Bidgely

Prateek Chakravarty: VP, Business Development and Marketing

GB and HAN Experience

PG&E TRIO Forum

Aug 2013

What we have learnt from the market

Novelty

- Consumers want more information, but only if its simple and novel.

What we have learnt from the market

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bidgely

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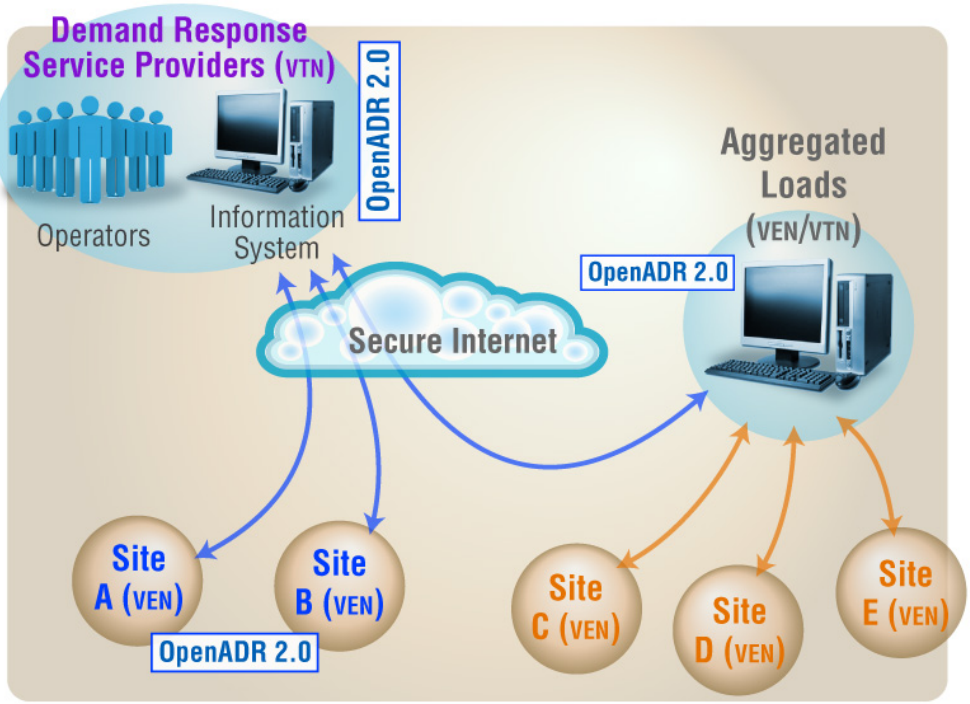
Pacific Gas & Electric

Albert Chiu: Expert Product Manager, Customer Energy Solutions

Understanding OpenADR

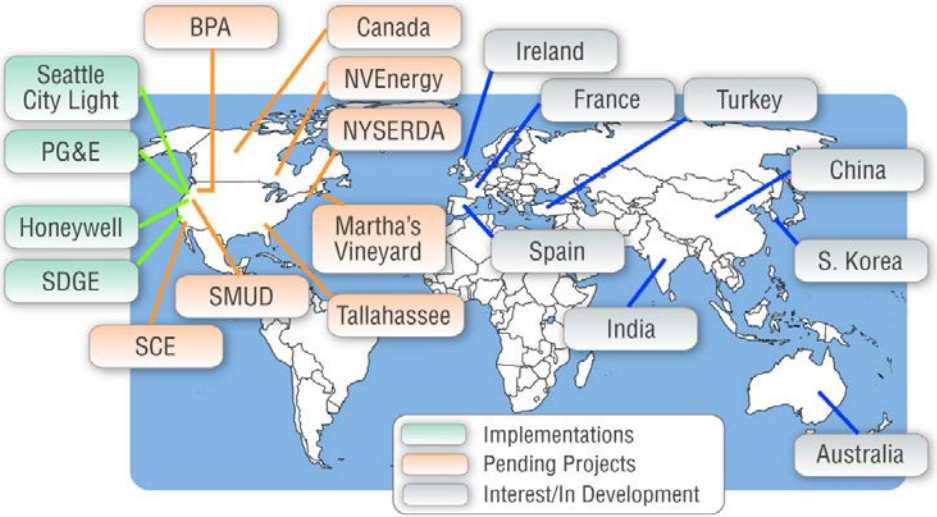
Open Automated Demand Response (OpenADR) provides a non-proprietary, open standardized DR interface that allows electricity providers to communicate DR signals directly to existing customers using a common language and existing communications such as the Internet.

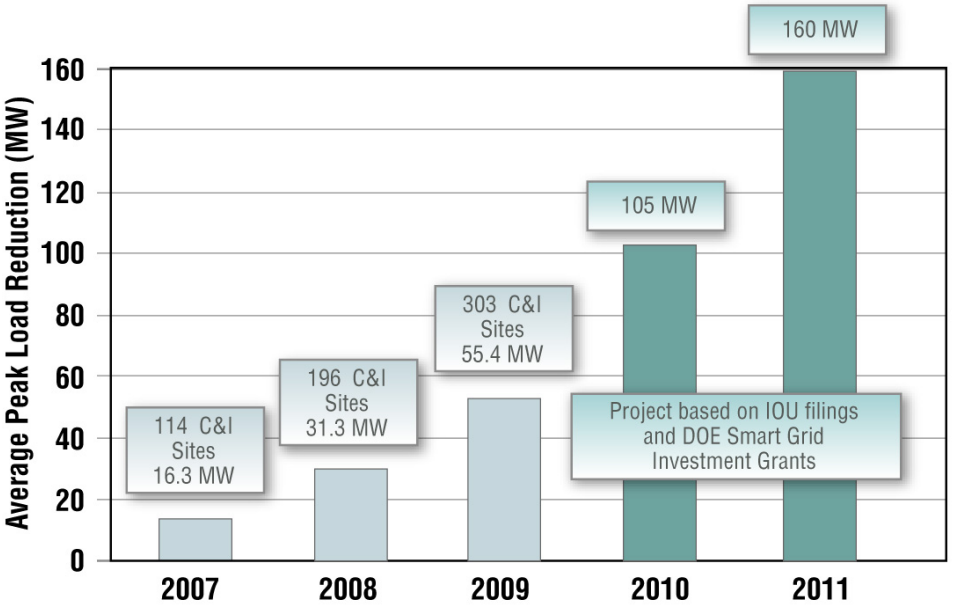


Source: LBNL

OpenADR Deployments

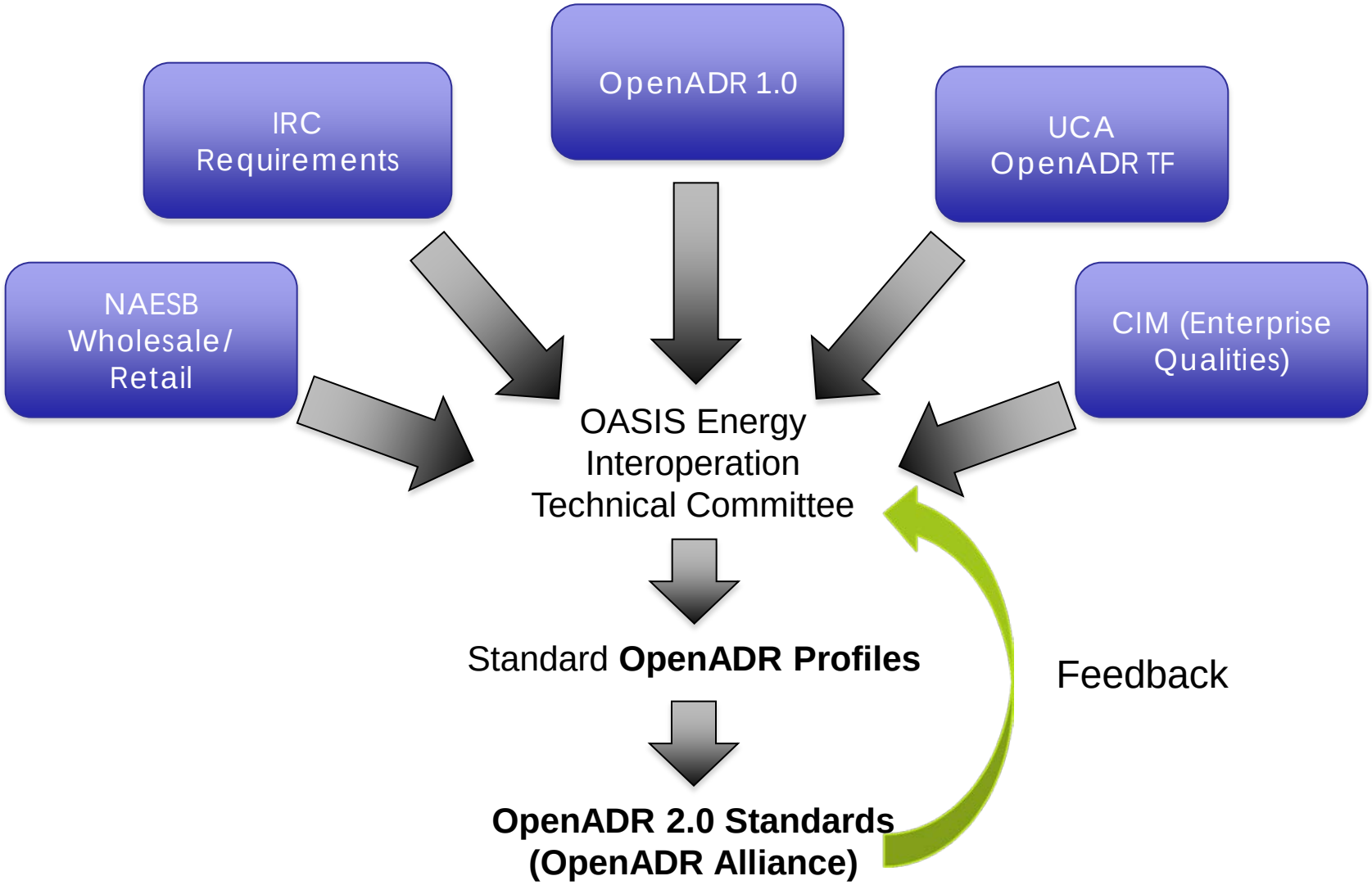
OpenADR Deployments around the World





OpenADR Commercial Deployment MW (CA: current enrollment ~260 MW)

OpenADR 2.0


OpenADR 1.0
IRC Requirements
UCA OpenADR TF
NAESB Wholesale/ Retail
CIM (Enterprise Qualities)
OASIS Energy Interoperation Technical Committee
Standard **OpenADR Profiles**
OpenADR 2.0 Standards (OpenADR Alliance)
Feedback

Conclusion

- **Standardize** the interface between electricity markets and customers

- **Automate** the customer resource to fluctuating energy prices and grid instability

- **Simplify** your energy future and maximize the value of your DR capacity

openADR ALLIANCE

Networking Break

Pricing and Rates

Speaker:

Andrew Au: Product Manager for Commercial Time Varying Pricing | PG&E

Pricing Products Objectives

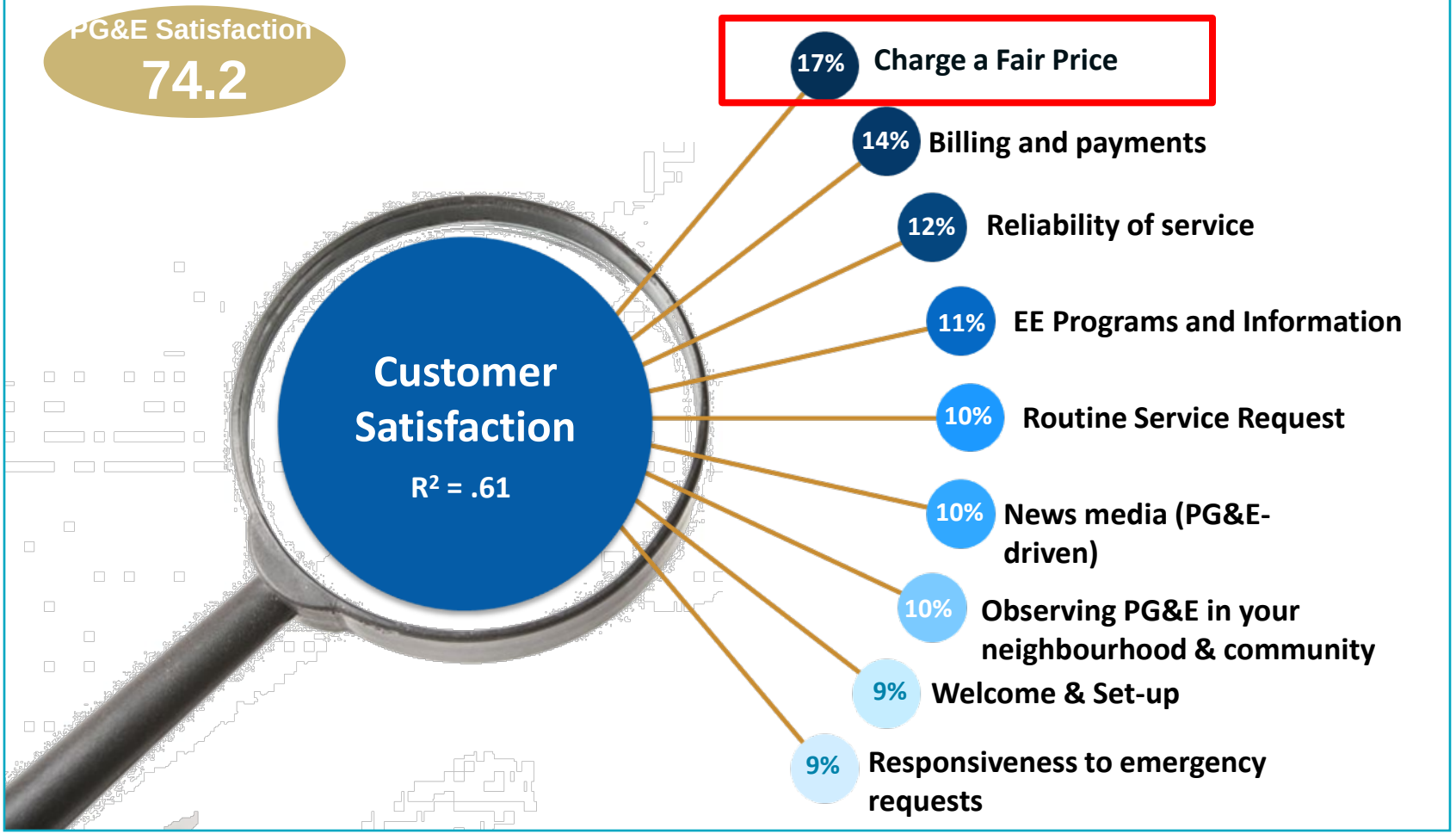
Pricing Options - Rate plan options that balance customer needs, company goals and policy objectives while driving migration of the right customers to the right optional rates.

Dynamic Rates - Reduce energy usage in peak time periods through pricing signals

Analytics and Tools - Align with enabling technologically and tools to engage customers on time varying rates

Rate Options

Driver Analysis



SOURCE: Customer Experience Process Survey (July – August 2012); Separately, Q2 CSS avg. PG&E satisfaction = 74.2

Rate Options

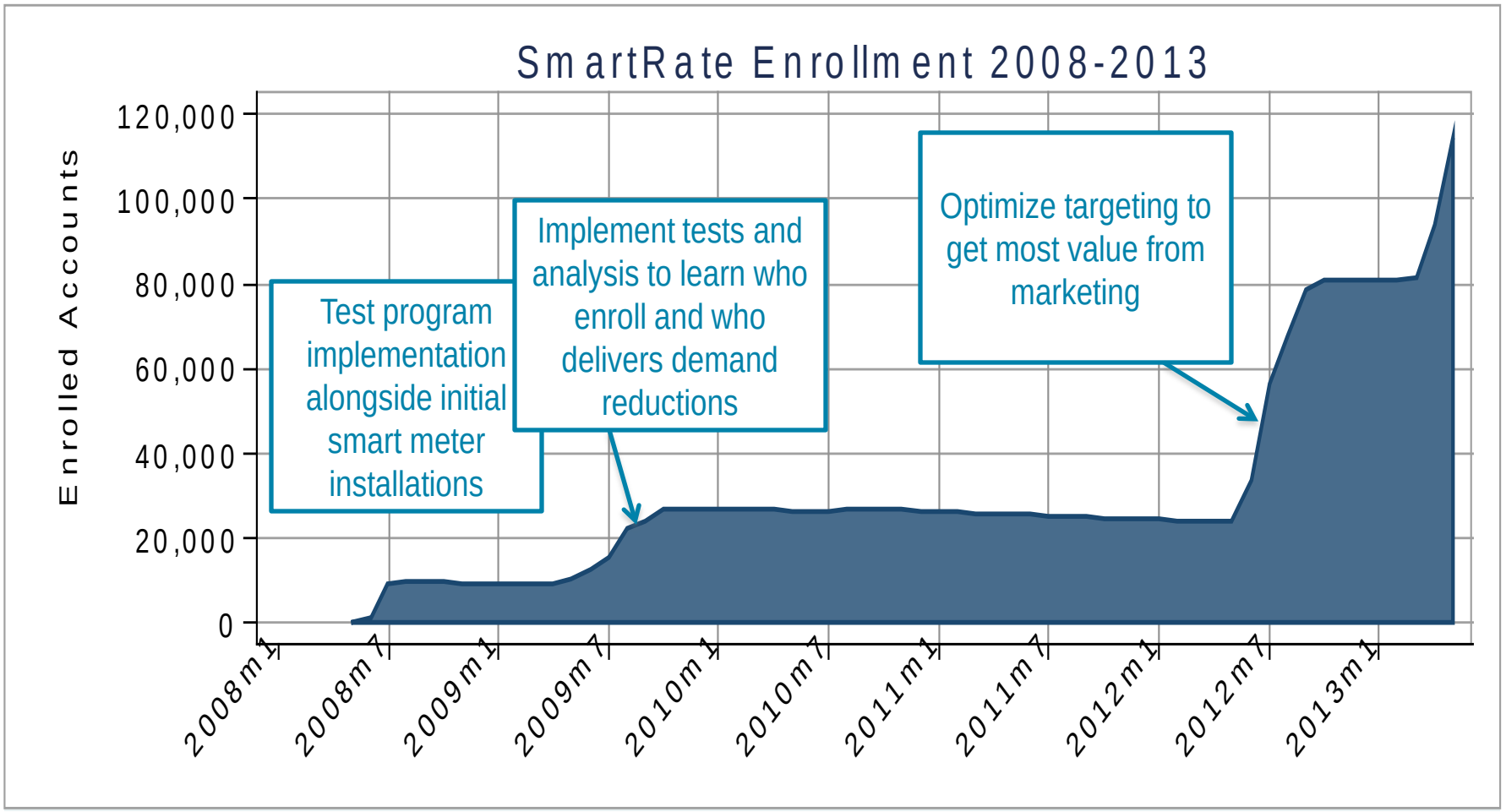
Residential Rates Survey (May 2013) shows:

- 90% residential customers are open to switching to a new rate
- Majority of customers practice time-shifting: 74% customers have tried to save money on their bill by shifting **(even though 22% believe they're on a TOU rate, and less than 1% actually are).**

"Choice is good. We don't have a choice of electric company, but giving us a choice of rates is a good thing."

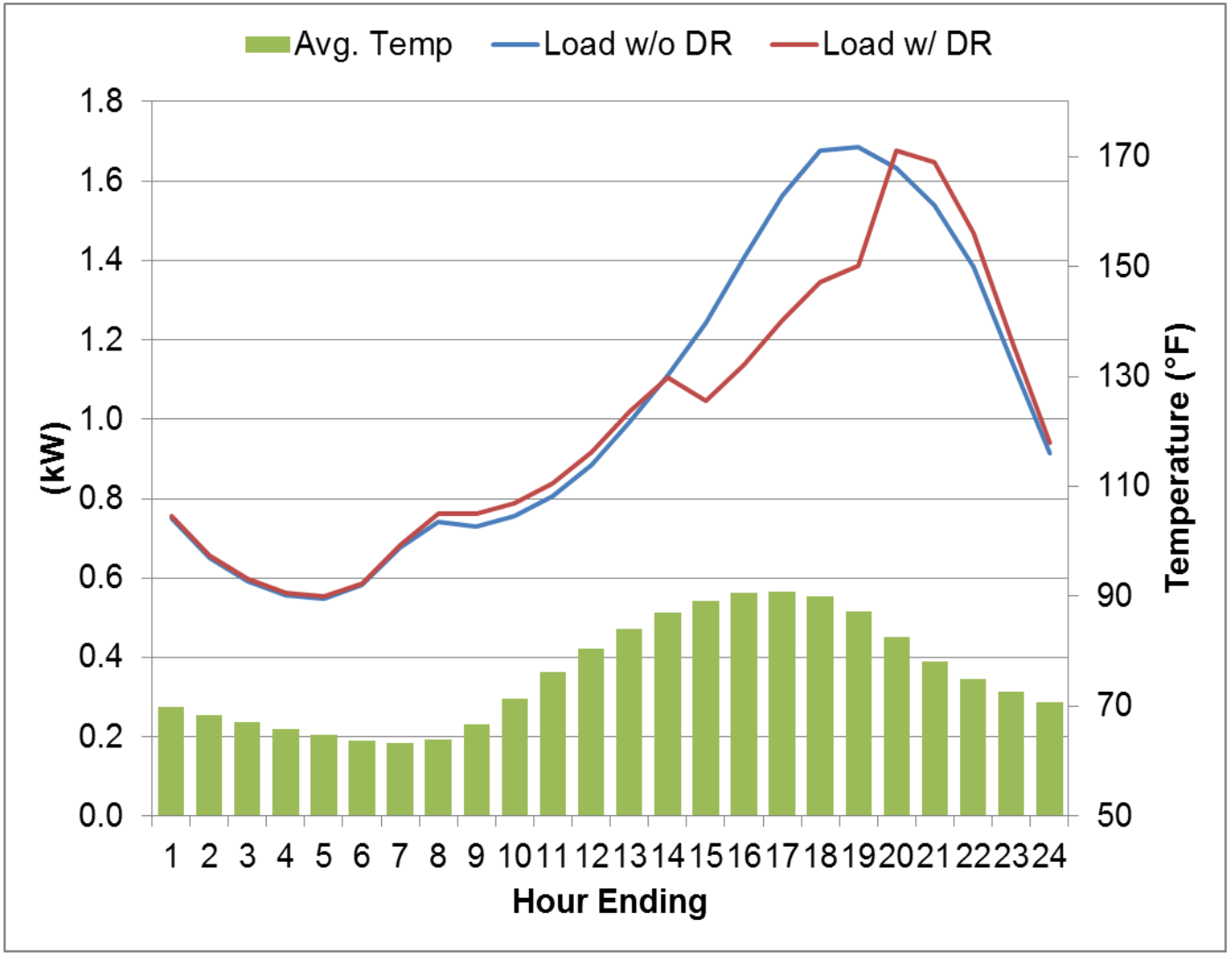
Sources: RROIR Rates Survey, Hiner & Partners, May 2013

Dynamic Pricing

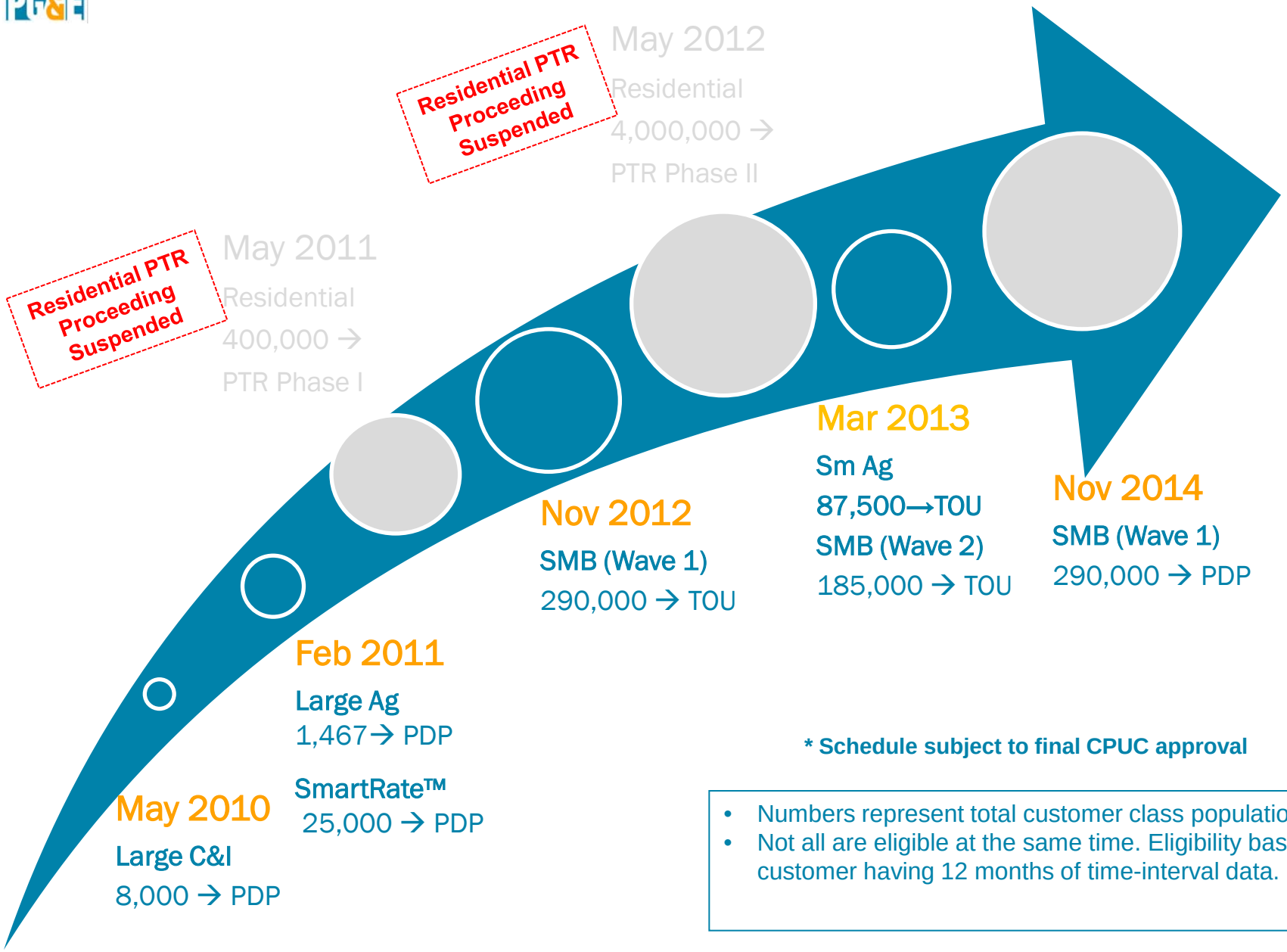


Dynamic Pricing

SmartRate Avg Customer Load Profile



Dynamic Pricing - Transition Timeline



*** Schedule subject to final CPUC approval**

- Numbers represent total customer class population.
- Not all are eligible at the same time. Eligibility based on a customer having 12 months of time-interval data.

Dynamic Pricing

PDP - July 1st event results

Select Event Date:
07/01/13

Average Load Reduction Between 2:00pm - 6:00pm

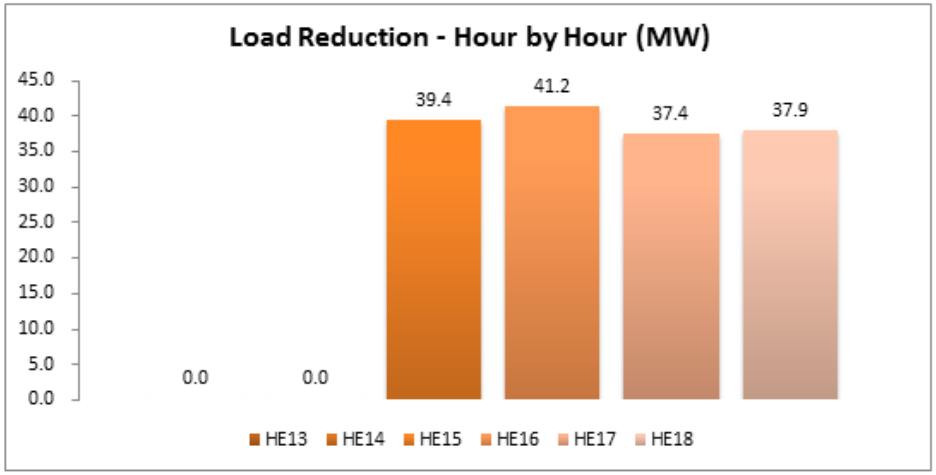
Peak Day Pricing Customers	Average Load Reduction/Customer
6,041	6.45 KW

Notification Failures	Failure Rate	Target	Status
28	1.48%	2.00%	

5 Station Average Temperature	Trigger Temperature	Average Load Reduction*
103.6°F	96°F	38.955 MW

Concord	Fresno	Red Bluff	Sacramento	San Jose
101°F	108°F	111°F	106°F	92°F

Description	# of Failures	Event Trending (%)
Invalid Email Address[1]	0	0.00%
Invalid Phone Number[1]	9	1.94%
Invalid Fax Number[1]	0	#N/A
Invalid SMS Number[1]	0	0.00%
Multiple Preferences[1]	1	0.09%
No Answer	13	2.80%
No Contact Information[2]	5	
Hang Up[3]	1	0.22%
Total	28	



Tools and Analytics

My Rates

Have questions? Download PDF Print my summary

We've estimated your costs for each rate option.
Why are these rates offered?

Improve these estimates
Tell us how you use energy

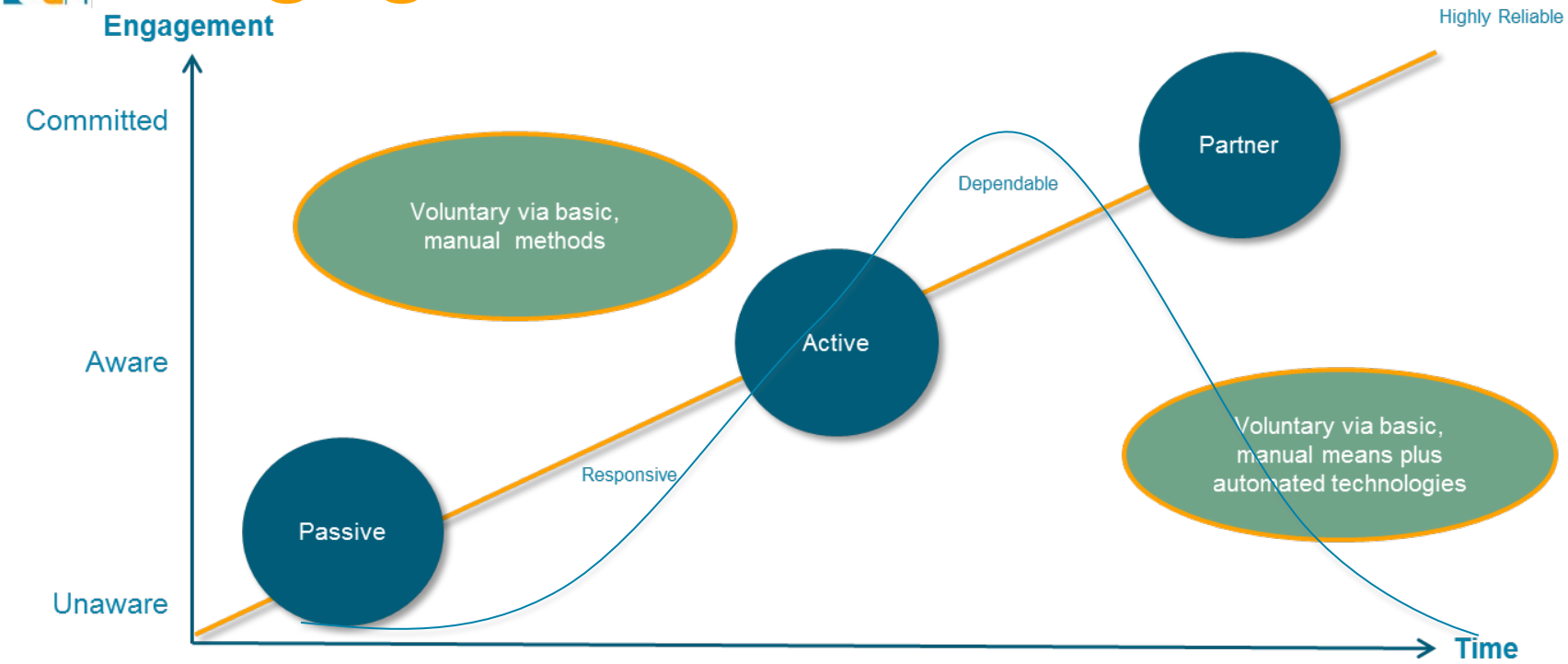
Your current rate A1 Time-of-Use	A1 Peak Day Pricing	A6 Time-of-Use	A6 Peak Day Pricing
Your estimated cost (details)	Your estimated cost (details)	Your estimated cost (details)	Your estimated cost (details)
$13275/yr	**$14665**/yr	**$21950**/yr	**$22200**/yr
Prices change by time of day.	Prices change by time of day. Prices are higher 9 - 15 days annually.	Prices change by time of day.	Prices change by time of day. Prices are higher 9 - 15 days annually.
	This rate has extra options		This rate has extra options
Learn more	Learn more	Learn more	Learn more

Tools and Analytics

Future of Tools

- An Integrated platform for EE, DR, DG and Rates
- Energy Analytics
- Aggregated account analysis
- Customized alerts and notifications
- Bill and usage comparisons
- Disaggregated Loads
- Industry specific control strategies
- Mobile
- What else?

Engagement over Time



Well-informed risk-takers willing to try an unproven rate option.	Educated , opinion leaders driven by positive response of innovators	Careful; avoids risk; relies on recom-mendations of others with experience or when participation is common	Avoid change and may never participate until traditional options are no longer available
Innovators (2.5% of customers)	**Early Adopters** (13.5% of customers)	**Early & Late Majority** (68% of customers)	**Laggards** (16% of customers)
Test, educate and support	Educate, target market, collect success stories, build community & support	Mass market, share success stories, increase community & support	Consider desired outcome

Pricing Products

Questions?

Andrew Au
Andrew.au@pge.com

Evaluation, Measurement and Validation

Speaker:

Brian Arthur Smith: Manager, EM&V | PG&E

Presentation Overview

- What is EM&V
- What EM&V does
- Our involvement with Emerging Technology projects
- Deliverables/typical time lines
- Q/A

What is EM&V?

- Evaluation, measurement and verification
- EM&V has three teams in PG&E
  - Energy Efficiency (“EE”) has most comprehensive research portfolio, with IOU ability to formulate a portion of research
  - Demand Response (“DR”) mostly regulatory driven, focused on confirming past demand reductions and predicting future ones
  - California Solar Initiative/Direct Generation (“CSI/DG”) mostly regulatory driven, also seeks to confirm past impacts and predict future ones

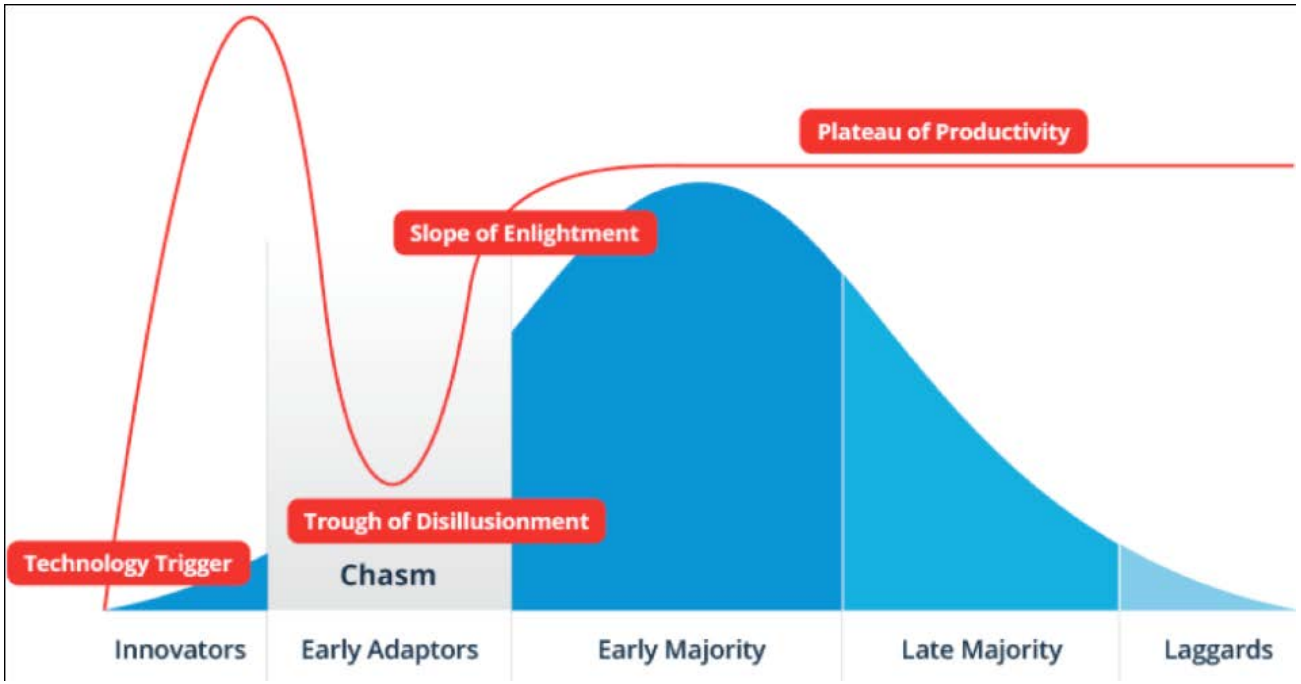
What Does EE EM&V Do?

- EE EM&V Evaluates Trial/Program Performance
- Evaluation does “Formative” research – how to improve the design and operation of PG&E’s trials/portfolio/programs. This includes:
  - Assessment of energy savings potential for potential and current products in the EE portfolio
  - Conduct process evaluations
  - Oversee market assessments/ characterizations
  - Do ad-hoc data mining
- Evaluation also:
  - Advocates for new evaluation methods, policies, protocols
  - Provides ad-hoc analyses to management
  - Responds to data requests
  - Reviews, comments and advocates for accuracy in CPUC-led impact evaluations

EE Evaluation Supporting ET Trials

We work with PG&E's Emerging Technology Staff to:

- Conduct background research on potential ET trials
- Develop research plans to evaluate ET trials
- Manage research to get timely results
- Develop strategies to maximize verified savings
- Document evaluation findings and recommendations



TRIO Questions that EM&V Seeks to Answer

- What are the unit energy savings (“UES”) from a new technology?
  - Hours of use
  - Delta Watts
- What’s the size of the potential market?
- What are the key issues that inform estimates of customer uptake?
  - Benefits and costs
  - Barriers

Market Assessments/Characterization Research

Pacific Gas and Electric Company

- Understand size of energy savings opportunities
- Understand market dynamics, business cycles, key players, barriers and opportunities
- Develop market baseline
- Investigate barriers to program participation and other obstacles to program implementation
- Recommend program interventions that can result in energy savings from untapped opportunities

Some Examples of Our Work

- All EM&V-funded research is in the public domain
- Final reports posted on CALMAC.org
- Reach out to EM&V if you have questions
  - Lucy Arnot is key contact: llaa@pge.com
  - Reach me at b2sg@pge.com

Wrap-Up

Speaker:

Aaron Panzer: Manager, Emerging Technologies Prgoram | PG&E

Please Complete Evaluation Forms

Networking with IOU Program Managers

Thank You

Please Complete Evaluation Forms

Pacific Gas and Electric Company

SOUTHERN CALIFORNIA EDISON
An EDISON INTERNATIONAL Company

SDGE
A Sempra Energy utility

Southern California Gas Company
A Sempra Energy utility

SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
The Power To Do More.