



Socio-Behavioral Research and Sustainability:

Ensuring Relevance & Broadening the Scope

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We need YOU!

- Energy crises are great to attract attention to how we use energy!
- Up to early 80's had a flurry of social science research around energy and homes
- Then it disappeared. Why?
- We forgot who's running programs... they're your audience!
- Engineers/MBAs have trouble understanding humans
 - Mores, needs & wants, behavior
 - how do they equate?
- Humans have trouble understanding engineers/MBAs
 - kW = kWh? Is the "h" a typo?
 - Peak load = is that related to how much laundry I have to do?
 - IRR, NPV, Elasticity of Demand – Do I use these when I go to the store to buy bread or a CFL?

My education on all things social...

- B.Sc. & M.Sc. In Engineering – isn't it just about technology?
- Ph.D. at Energy & Resources Group, UC Berkeley
 - look at the world beyond your discipline!
- Multicultural background
 - welcome and seek to understand diversity in all you do
- NRC 1984 “Energy Use The Human Dimension”
- ACEEE’s Human Dimensions panel in Summer Study
- Loren Lutzenhiser’s 1996 ARE&Env paper on social sciences and energy
- BECC – Social scientists can finally publish and not perish!

Relevance & Communication Are Crucial

- Ensure research is actionable!
- Communicate as develop, implement and present findings in a way that your audience can relate to.
 - Not interested in past literature reviews
 - Methodological discussions... for peer reviews!
 - Want to know insights/key changes that lead to more success
 - What will get people to act differently
 - How can you track and enhance your success?

Expand Your Scope

- It is not just about customers... yes, humans are interesting, but...
- They work in institutions, who have behaviors of their own!
- Study institutional arrangements and behaviors, as these are crucial to make your results actionable!
- Many times individuals are constrained by the institutions they work in
- Institutions behave at times in ways that are as baffling as people; formulate your results to ensure it is heard and acted upon

Examples of What Social Scientists Can Help With

- Psychologists – what are the mental maps and triggers
- Sociologists – What are social mores and how to enhance them?
- Anthropologists – Power issues, who decides, how influence these?
- Ethnographers – show what really do, not what report
- Economists – do people even care about prices? How do we internalize externalities? What is their real value
- Public Policy – What policy most effective
- Political Scientists – Getting effective legislation, policies in place
- Educators – How to communicate effectively
- Marketing – Its all about spin, right?
- Others (dentists – the ultimate communicators to non-respondents)

The “real” cause of global warming?



Photo courtesy of Dr. Stephen Schneider, Stanford University

We WELCOME You BACK!

- Feel free to contact me
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Extra slides

PG&E Service Territory



- 70,000 square miles
- 15 million people
 - about 1 in every 20 Americans
- 6 million customers
 - 87% residential
 - 13% non-residential
- Summer Peak (2006): 20,568 MW
- 2006 Electricity Sales: 84,300 GWH

Definitions

- **Energy Conservation**
 - Using less energy; may involve reduced comfort or functionality
- **Energy Efficiency**
 - Permanent reduction of energy usage while maintaining the same comfort levels
- **Demand Response**
 - When requested, altering your routine to reduce peak demands during a few critical hours of the year and be rewarded for your reduction
- **Time of Use (TOU) Management**
 - Permanent shift of energy usage to non-peak times to take advantage of differential in time-of-use rate

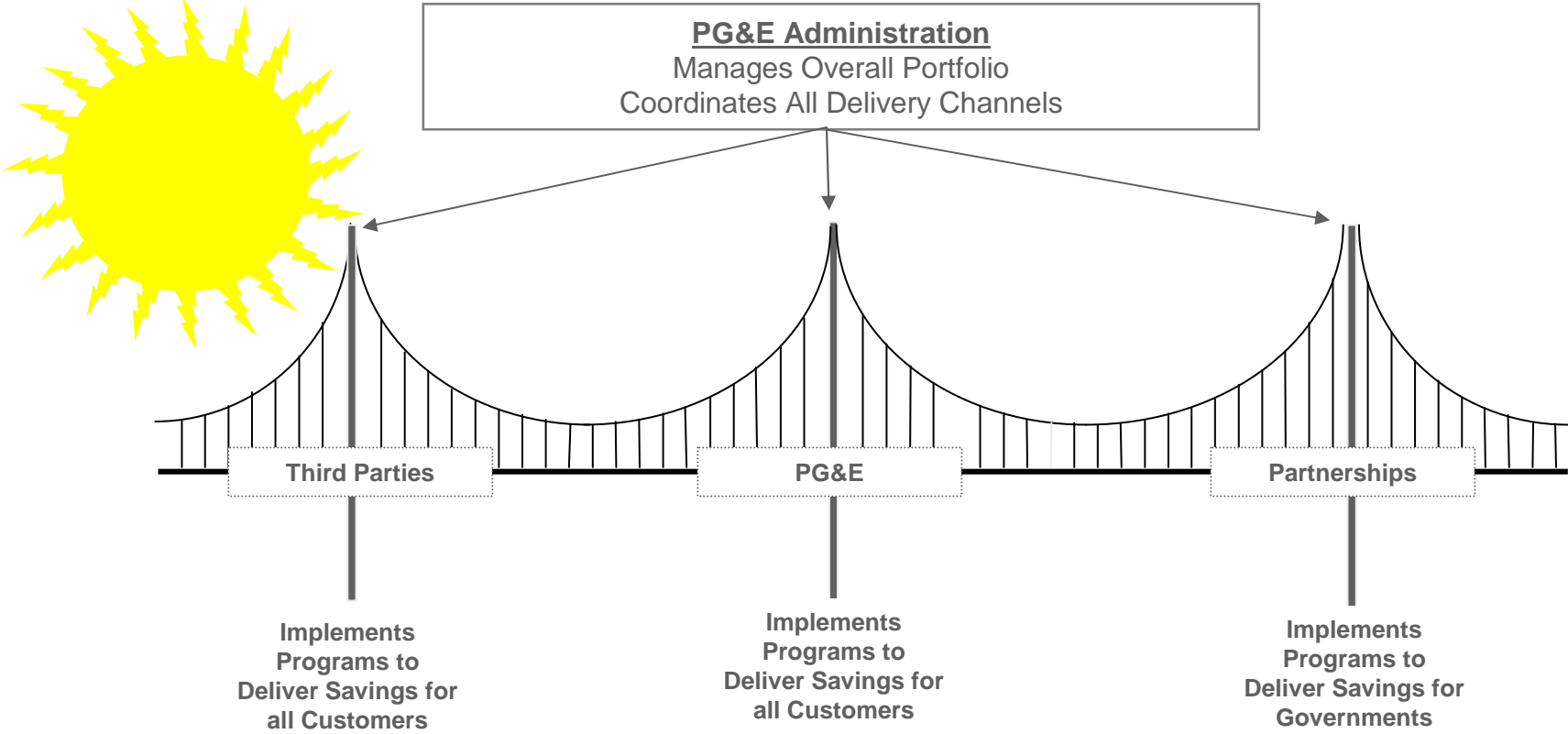
Demand Side Management As Procurement Resource

- Consider DSM resources just as you would a power plant
- California Energy Action Plan establishes a loading order which requires utilities to prioritize resource procurement
 - Energy efficiency and demand response
 - Renewable energy
 - Clean fossil-fuel generation

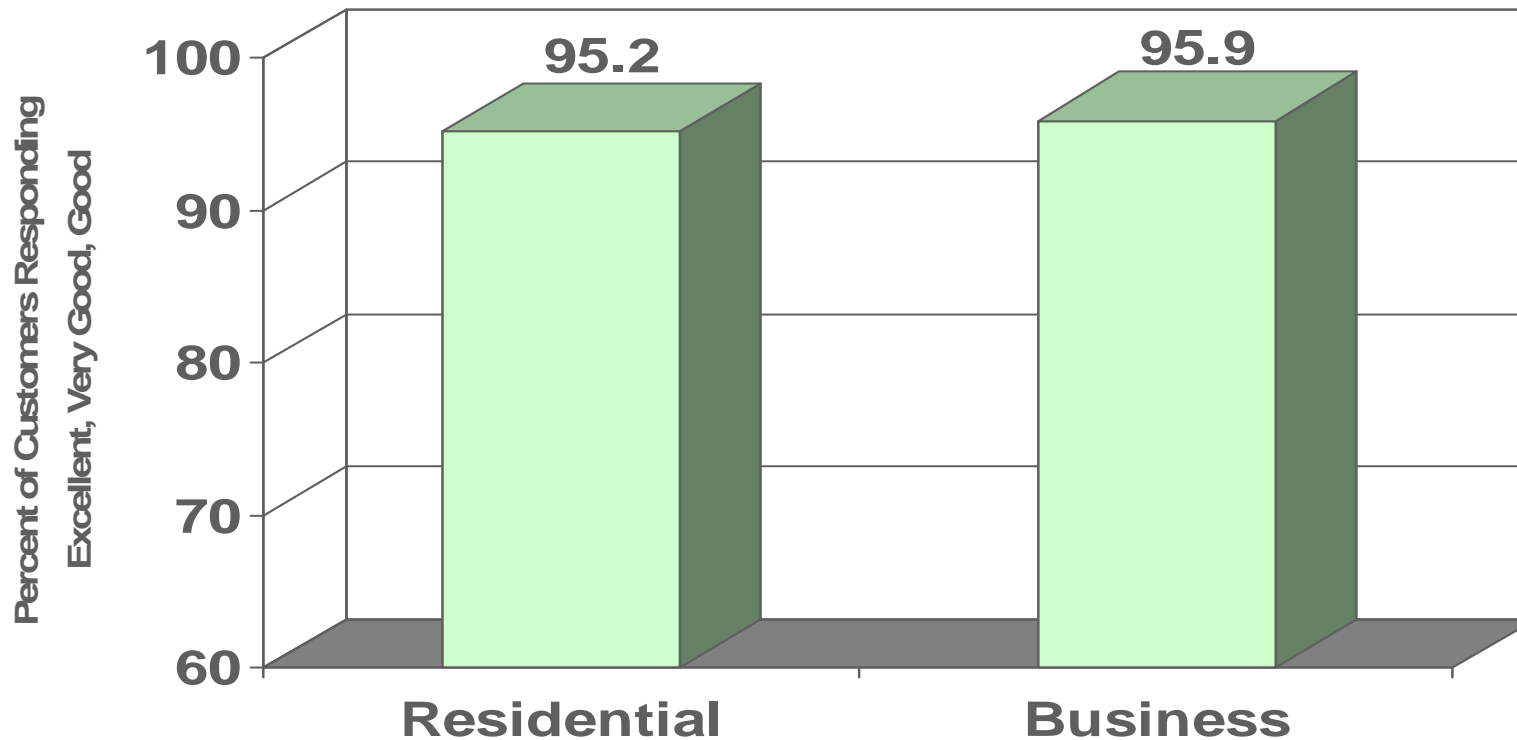
2006 - 2008 Energy Efficiency Portfolio: Focus on the Customer

- Portfolio includes: financial incentives and rebates, training, education, energy audits, emerging technology projects, energy codes and standards support, marketing and outreach, and evaluation activities
- Multiple delivery channel opportunities: utility programs, government partnerships and third party programs
- Mass Market: single family, multifamily and small business customers
- Targeted Markets:
 - Agriculture & Food Processing
 - Biotech
 - Hospitality & Lodging
 - Health Care
 - High Tech
 - Large Commercial & Institutional
 - Manufacturing & Heavy Industry
 - Residential New Construction
 - Retail
 - Schools, Colleges & Universities

Tying it all Together



Customers Love our Energy Efficiency Programs



2007 PG&E Customer Satisfaction Survey

Mass Market Energy Efficiency Programs

- Designed for single family residential, multifamily residential, and small business customers
 - Approach energy efficiency in the same way
 - Have similar purchasing patterns
 - Use the same vendors/purchasing channels
- Work with market actors through multiple delivery channels
 - Upstream: Incentives to manufacturers, distributors, and retailers
 - Midstream: Incentives to vendors who sell energy-efficient products to customers (i.e. contractors, installers, etc.)
 - Downstream: Incentives to end-use customers who purchase energy-efficient equipment
- Market programs through mass market media and general PG&E communications

Target Market Energy Efficiency Programs

- Target specific customer segments and industries
- Provide customized energy efficiency services that address the specific needs of that market segment
- Focus on larger customers and/or large-scale operations that can deliver significant energy savings
- Targeted marketing to each industry through PG&E communications, industry associations, and trade events



Energy Efficiency Education & Training Programs

- Energy efficiency classes and trainings
 - Offered free throughout PG&E service area
- Tool Lending Library
 - Loans building measurement equipment for energy analysis
- Private Consultations
 - Advise building professionals on energy-efficient design
- Have trained more than 500,000 people since 1979



*Analysis of an architectural model using the **heliodon**, which simulates sunlight penetration and shading at different times of day and during different seasons*

PG&E Supports Stronger Codes & Standards

- PG&E actively supported and participated in the California Energy Commission's (CEC) 2001 and 2005 code upgrade cycles
 - Produced 37 Codes and Standards Enhancement (CASE) Studies
 - 18 Title 20 Appliance Efficiency Standards
 - 19 Title 24 Building Efficiency Standards
 - Approximately 70 specific standards adopted by CEC
 - 26 Title 20 Appliance Efficiency Standards
 - 20 Title 24 Building Efficiency Standards
- PG&E is currently supporting and participating in the CEC's 2008 code upgrade (cycle is expected to continue through 2010)
 - CEC adopting 16 changes to building codes (Title 24) proposed by PG&E
 - PG&E developing over 25 appliance standards (Title 20) proposals for residential and nonresidential customers

Demand Response (DR) Overview

- DR programs help manage demand on electric grid during peak times
- Offer financial incentives to customers who reduce electric demand during peak times and/or permanently shift electric load
- Goal = 5% of our system peak load will be enrolled in demand response programs and be available for load shedding

Demand Response Programs

Reliability Programs

- Customers agree to reduce their load to some contractually determined level in exchange for an incentive, often a commodity price discount
- 5 programs with 340.2 MW of load *

Price Responsive Programs

- Customers choose how much load reduction they can provide based on either the electricity price or a per- kW/KWh load reduction incentive
- 6 programs with 696.1 MW of load *

“Cafeteria-style menu” (customer option)

- Customers choose from a menu of DR options, based on reduction amount, commitment level, event duration, notification lead time, number of events, and other information

California Solar Initiative (CSI)

- Help develop a self-sustaining solar photovoltaic industry over a ten year period
- Provides incentives for the installation and operation of solar photovoltaic projects for residential retrofit, non-residential retrofit, new construction, and low-income solar projects
- Formally launched January 1, 2007
- In 2007, 1,665 PG&E customers installed 8.3 MW of solar generation and earned over \$20 million in incentives

Developing a Demand Side Program

- **Plan:** Without planning, you will not be efficient
- **Prioritize:** A comprehensive program takes years to develop
- Select some areas for **quick "wins"**
- Bring in **experts** to accelerate your results
- **Continuous training** of staff is important

Prioritizing Energy Efficiency Opportunities

- Start with the customer
- Go for the highest loads first, where the customers will get the largest savings
- Do not pursue individual mass market transactions in the early stages - they are generally not cost-effective
- For mass markets, focus upstream on manufacturers and distributors. Make them compete for incentives!

Maximizing Customer Energy Efficiency Results

- Focus on the most critical market segments first
- Assign staff to each critical market segment
 - Program staff must be knowledgeable about specific market segments
- Develop contracts with engineering firms that provide in-depth, integrated audits
 - Contracted firms specialize in only one or a two key industries
- Focus on new technologies/processes to reduce targeted customer energy use

Integrated Programs Produce the Best Results

- Consider both energy and demand reduction
- Maximize energy efficiency first - it increases the cost effectiveness of the other options
- Determine if customer is interested in distributed generation
- Technologies and controls that reduce energy can often be used to reduce demand (with no customer impacts)
- Control technologies may improve customer operations, energy efficiency is often a side benefit

Use Cost-Effective Upstream/Midstream Channels for Mass Markets

- Identify technologies that offer the best opportunity for savings (turnover, size of improvement)
- Focus efforts on top 3 to 5 technologies/opportunities
- Partner with other utilities to maximize the opportunity
- Assess market potential
- Consider Request for Proposals (RFP) to obtain most cost effective pricing and results
- Require enhanced marketing for incentives

Codes and Standards Lock in Savings at the Lowest Cost

- Identify top opportunities
- Work with regulatory agency to align interests
- Develop technology/market research to support change in codes
- Education and enforcement necessary for maximum code benefit