

Net-to-Gross Methods for CFL Programs

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Summary of NTG Methods for CFL Program

- CFL purchaser self-report methods
- CFL upstream self-report methods
- Net effects/baseline approach
- Econometric approaches

Methods

- CFL purchaser self-report methods

- Most common NTG data collection methods are:
 - Shopper intercepts (CPUC, SMUD, PNM)
 - Telephone surveys (CPUC, SMUD, PNM, Wisconsin).
- Shopper intercepts: Trying to capture CFL shopper's decision-making immediately after purchase. Information collected:
 - *Pre-shopping intentions*: Did shopper enter store intending to buy light bulbs (If so, which types?)?
 - *Purchases & choices*: What did they purchase (program CFL, non-program CFL, incandescent)? What were alternatives? Why not alternatives?
 - *What influenced choices?*: (Price? Saving money/energy? In-store signage/displays? Mass advertising? Environmental reasons? Family/friend recommendations? CFLs superior to incandescents? Prior experience?)
 - *Price effects*: How many CFLs purchased if price was twice as much? Half as much?
 - *Multi-pack effects*: If CFLs sold individually but at same per bulb price, would have bought more, same, or less?
 - *Post-shopping actions*: When and where planning to install? Residential vs. nonresidential fixture?

Methods

- CFL purchaser self-report methods
 - Revealed vs. stated preferences
 - Store information (types of lighting products and their proximity, product placement, signage, pricing info, lighting displays, etc.)
 - Telephone/web surveys of recent CFL purchasers
 - For programs with mail-in/POS CFL rebates, purchasers can be actual participants.
 - For upstream lighting programs purchasers can be:
 - Actual participants with respondents obtained via a “bounceback” survey.
 - Recent CFL purchasers – survey then uses questions to try to determine which of these purchasers actually purchased a program-discounted CFL.
 - Focus groups – can supplement intercepts
 - Allow fuller exploration of NTG issues such as influence of various factors on decision-making (e.g., pricing, placement, packaging, prior use/awareness,
 - Allow exploration of NTG issues for other types of program-discounted CFLs and fixtures (e.g., specialty lamps, high-wattage lamps, ceiling fans, etc.).

Methods

- CFL upstream self-report methods
 - Surveys of lighting manufacturers, resellers, retailers selling program-discounted CFLs.
 - Since manufacturers/resellers/retailers must decide how many program-discounted CFLs they can handle – method tries to leverage these sales estimation practices.
 - Designed to capture market information that can't be gathered by consumer self reports (e.g., fact that 99 cent stores wouldn't be able to even sell Energy Star CFLs w/o discounts).
 - Methodology being used by CPUC, PNM, ComEd, NJ evaluations.

Methods

- CFL upstream self-report methods
 - Market actors are asked to estimate how much their CFL sales would change absent the program.
 - Free ridership estimates are sought for different retail channels (e.g., large home improvement, grocery, drug, etc.) and different CFL products (non-specialty, specialty, fixtures)
 - Spillover effects (how sales of program-discounted CFLs affect sales of non-program-discounted CFLs).
 - How mix of products or packaging would change absent the program.
 - Surveying both manufacturers and retailers hopes to offset possible biases.
 - *Gaming/golden goose bias*: Manufacturers might underestimate FR to keep rebates coming.
 - *Green retailer bias*: Retailers might overestimate FR by giving too much credit to their green promotional campaigns for CFL sales

Methods

- Net effects/baseline approach
 - Compares CFL sales data for evaluated program with baseline sales data.
 - Baseline sales = sales that would have occurred in absence of the program (typically estimated on a per household basis for a similar state or region that does not have a program)
 - A number of possible baselines
 - National baseline approach (MA, NYSERDA)
 - Regional baseline approach (VT)
 - State baseline approach (Wisconsin, MA)
 - Same retailer in different states
 - Often use demographic information (income, education level) to find appropriate baselines. Can also use relative presence of large CFL retailer (e.g., Wal-Mart).

Methods

- Net effects/baseline approach
 - Net-of-free rider ship (NTFR) – a.k.a. “narrow net” only counts free riders.
 - = 1 – free rider ship (FR)
 - States with CFL programs:
 - $FR = \text{baseline CFL sales per HH} / \text{program-attributable sales per HH}$
 - States without CFL programs:
 - $FR = \text{total CFL sales per HH}$ because program-attributable are zero.
 - Net-to-gross (NTG) – a.k.a. “expansive net” counts both free riders and market effects
 - = $(\text{total CFL sales per HH} - \text{baseline CFL sales per HH}) / \text{program-attributable CFL sales per HH}$.

Methods

- Net effects/baseline approach
 - Results usually do not separate free ridership from spillover.
 - Method highly dependent on reliable CFL sales estimates.
 - Does method penalize earlier CFL programs?
 - If earlier CFL programs encouraged CFL adoption in comparison states indirectly (e.g., by contributing to increases in production capacity ---> broad reduction in avg. production costs), then earlier programs might be penalized because it means a higher baseline.
 - Latecomer programs likely have more untapped CFL potential so they may have temporarily high CFL sales/household that make CFL sales of mature programs look worse by comparison.

Methods

- Econometric approaches
 - Third leg of triangle in CPUC study.
 - Not just price elasticity study because program also has non-price effects (packaging, product placement, etc.).
 - Combines information from both supplier and end-user surveys.
 - *Supply-side model*: What suppliers said product mixes, prices, packaging, marketing would have been in absence of the program.
 - *Demand-side model*: What consumers said they would have purchased given different availability, pricing, packing, and promotions – from shopper intercept surveys.
 - Based on both revealed and stated preference surveys from shopper intercepts for both participating and nonparticipating retailers.
 - Shelf surveys and CFL sales data can provide additional information on CFL prices, product placement, and promotions.
 - May also use contingent valuation (CV) methods to construct consumer CFL demand curves (i.e., would you have purchased if the price was \$/per bulb?).
 - But tradeoffs between sophistication of CV methods (e.g., double-bounded) and respondent fatigue of consumers.

Net Savings Results for CFL Programs

- NTG results not consistently reported:
 - Some evaluations focus on fraction of **program participant population** that would have purchased in absence of program
 - Others focus on fraction of **entire population** that would have purchased CFLs in absence of all programs= naturally occurring sales of CFL
 - Most evaluations take snapshot of current year effects, some implicitly include spillover from previous year program effects

How you choose to measure Net Savings depends on your policy goal

- If focus is on measuring energy savings that occurred in entire market- use broad definition of NTG and collect market sales data
- If focus is on estimating what savings are strictly attributable to program- use narrow definition that uses self report methods to identify free riders.
- Sometimes method's choice is a function of available evaluation resources, upstream self report methods generally cheaper.
- Market sales data method is more reliable in my view but other evaluation experts prefer self report.

Range of NTG results for CFL programs using customer self-report methods

Study #	Utility	Study Name	Program Year	Delivery Method	NTFR Ratio	Evaluation Method	Evaluator
1	PG&E	Compact Fluorescent Lighting Study ID 14	1992	Rebate	0.75	Self-report	HBRS
2	SDG&E	CFL Giveaways ID 150	1991	Giveaway	0.65	Self-report	SDG&E
3	SCE and SDG&E	Residential Appliance Efficiency Incentives First Year Statewide Load Impacts Study	1994	Upstream rebates	0.90	Self-report of sales and comparison of sales/HH	Xenergy
4	SDG&E	Net Impact Evaluation of the 1993 Retail Sales Program	1993	customer rebates	0.87	Self-report	SDG&E
5	Oregon	Evaluation of the 2004 Oregon Home Energy Survey Program	2004	Direct install after audit	0.85	Self-report	Itron
		Residential Average			0.80		

NTG Results from Supplier Self Report Methods Upstream Programs – (with some give aways)

State	Utility	Program Year	NTG narrow	NTG broad	Sales Channel range
CA	SMUD	2005	0.78	0.97	NA
CA	PGE, SCE, SDGE	2004-2005	0.62	0.7	.25-.97
CT	United Illuminating	2006	0.85	1.09	NA

Discussion of CFL Sales Data Comparison Method

- Caveats about Market comparison results
- Method- Compare treatment vs control area CFL sales with adjustments for demographics and differences in sales channel mix between areas
- Uncertainty in accuracy of sales data because of manufacturer self report as source
- Method captures cumulative effects but may be hard to isolate spillover from neighboring regions in or from CA outward
- Dynamic markets without control for quality of bulbs?
- International market may have copious leakage across state borders

NTG Results from Comparisons of CFL Sales Data

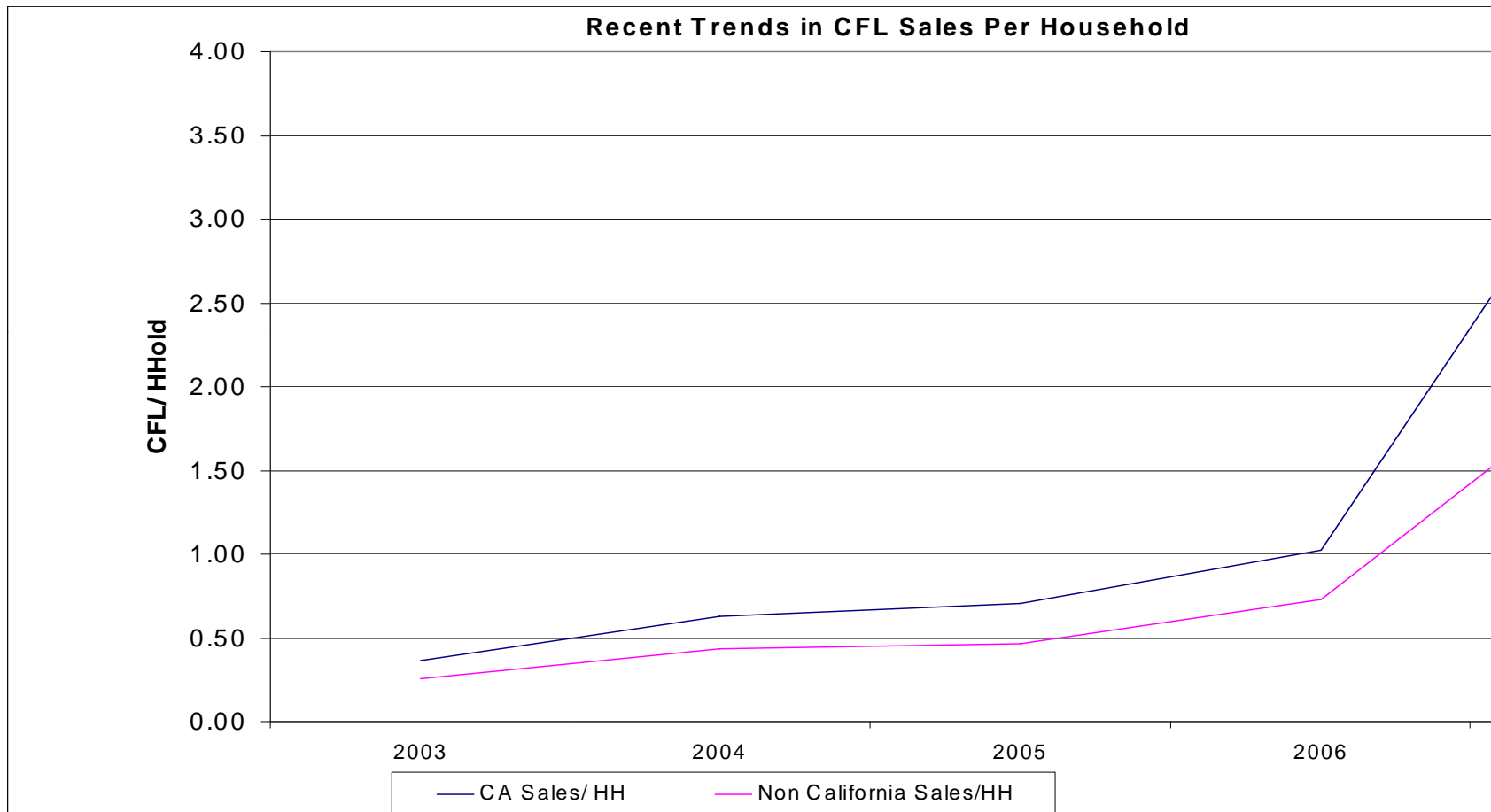
State	Utility	Program Year	NTG narrow	NTG broad	NTG by Sales Channel (range)
WI	Focus on Energy	2005	NA	1.24 (1)	NA
WI	Focus on Energy	2006	NA	0.81(1)	0.61-1.18
CA	PGE, SCE, SDGE	2006-07	0.62 (2)	0.70(3)	0.42-.94

Sources: (1) Rick Winch, *Comprehensive CFL Market Effects Study*, (Glacier Consulting, 2007) (2), KEMA/Itron, *2004-05 Evaluation of Single Family EE rebate programs* (2007) & (3) Energy Division DEER team, *Discussion of Evaluation methods to Estimate load impacts from CFL programs* (July 2008)

Market Factors that Make NTG Estimation Difficult for Future CFL Programs

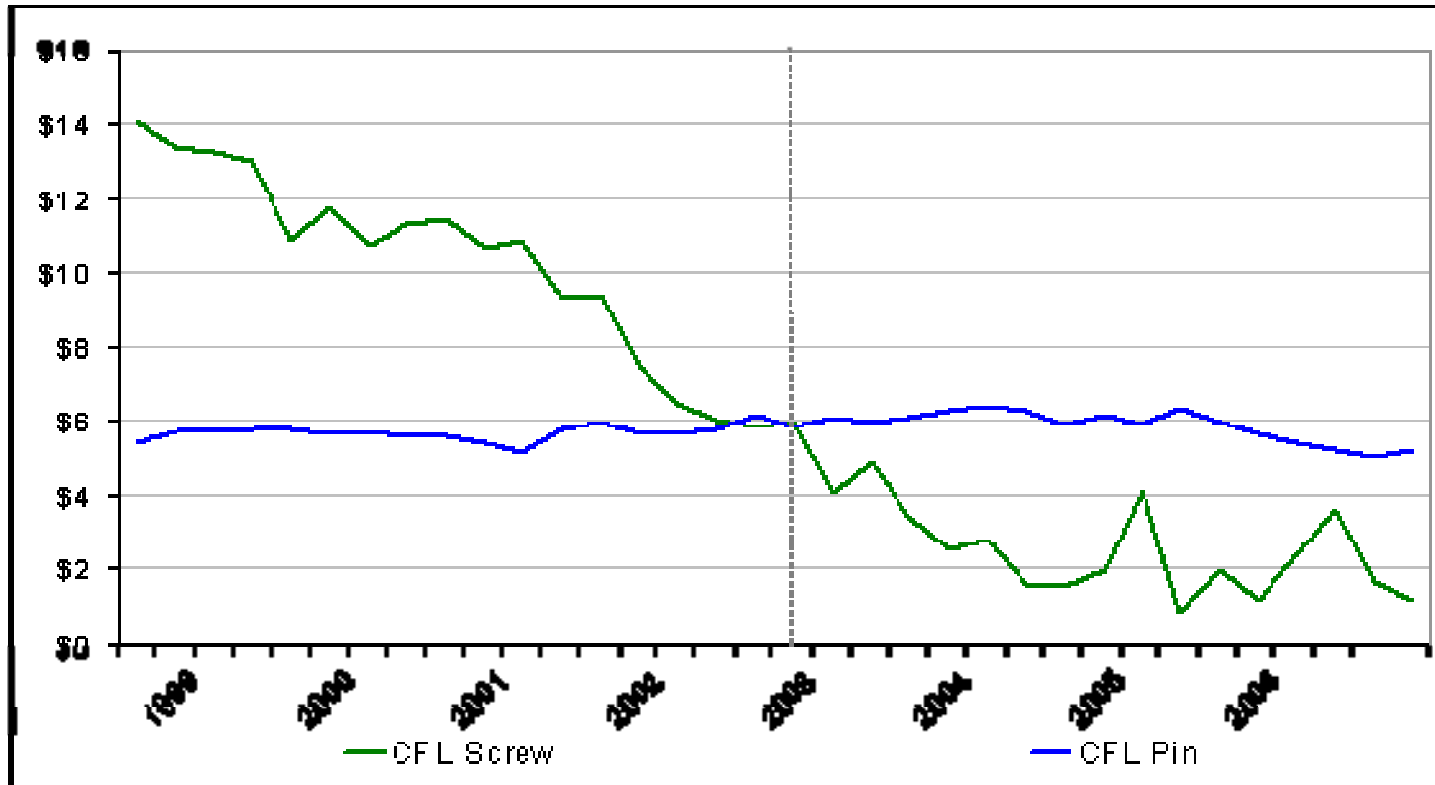
- 2007 surge in nationwide and global CFL sales
- Large drop in CFL prices over last ten years
- Variations in quality of bulbs worldwide
- Spillover effects between program and non program states
- Saturation effect- Will sales drop as CFL saturation per household rates approach 10 per home or 15 per home out of 42 sockets per home on average?

Recent Trends in CFL Sales/ HH



Source: Itron, *Discussion of Evaluation Methods to Estimate Load impacts from CFL programs in California* (Prepared for the Energy Division of the California Public Utility Commission, May 2008)

Price Trends for CFL's



* After 2003, the data no longer include home improvement stores.

Source: Itron, California Residential Energy Efficiency
 Market Tracking:2006 Lamp Report: Prepared for Southern
 California Edison May, 2008

Closing Thoughts, Lessons Learned

- Difficult to tell when CFL market is self sustaining in this area; e.g. programs no longer needed.
 - Current economic downturn increased price sensitivity?
 - Have cheap CFLs changed consumer perceptions of what a reasonable CFL price point should be?
- Have to be careful in choosing time periods for comparisons as part of net effects/baseline approaches.
 - E.g., CA CFL sales have been affected by other trends besides growing saturation – 2006 lawsuit, 2007 great volume of multi-pack sales → pantry loading.
 - Advantage of combining upstream self-report method with net effects/baseline methods is that manufacturers/retailers can help provide context for CFL sales trends.

Closing Thoughts, Lessons Learned

- Granularity of results
 - Useful for program design and planning. Some retail channels have more price sensitivity than others. Equity issues: Are CFLs reaching discount, ethnic grocery stores?
 - Some methods have been better than others at providing this granularity.
- Since all methods benefit from better CFL sales data, should program managers make sharing data a prerequisite of receiving rebate \$?
 - Some are already doing this – NEEA, etc.
- Should programs begin to phase out to another more efficient lighting source at 10 CFLs per household (25% saturation) or 20/HH (50%) or theoretical limit for screw ins of 67%? (due to can's and variable dimming)
- Northwest is the experimental ground, programs have been slowed or terminated recently, what will CFL sales be in absence of program?

Questions and Comments?

- Triangulation Methods Expert



CFL Net-to-Gross (NTG) and Market Effects: A Policy Perspective

Edward Vine

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AESP Brown Bag on CFL Net-to-Gross

October 30, 2008

Why Do We Care about NTG? #1

- Regulatory objectives & concerns
 - Are we giving away money wisely? (Efficiency argument)
 - Are we giving away money to people who do not need it? (Equity argument)
- In CA: focus is on resource acquisition (RA) programs
 - Not on market transformation (MT) programs
 - Not on market (program-centric)
- In CA: focus is on free riders
 - Not on spillover (participant and non-participant)
 - Not on market effects

Why Do We Care about NTG? #2

- Focus varies by:
 - Regional objectives (RA vs MT)
 - Program maturity (new versus old programs)
 - Concern over reducing greenhouse gases
 - Gross reductions
 - Net reductions (cap and trade; emissions trading) - Additionality
- Policy issue:
 - Does current use of NTG inhibit new, market transforming energy efficiency interventions?
 - Time to look at market effects?

California's Market Effects Studies

CIEE and CPUC are working together on market effects:

- CFL market effects study
- Residential New Construction market effects study
- High-Bay Lighting market effects study

- Market Effects Review study

Market Effects of California CFL Programs

- Project started: April 2008

- Preliminary Scoping Study Results and Work Plan
 - Presented on July 11, 2008 at public workshop

- Key people:
 - CPUC Energy Division: Tim Drew and Mikhail Haramati
 - CIEE: Ed Vine and Ralph Prah (consultant to CIEE)
 - CADMUS Group: Scott Dimetrosky and Ellen Rubinstein
 - Similar group is conducting Upstream Lighting Impact Evaluation for CPUC

Reason for Doing this Study

- Requested in Decision 07-10-032 (October 18, 2007)
OP35:
 - Report findings on the ability of current protocols to measure “non-participant spillover” savings and propose possible revisions to the protocols, savings goals, and incentive mechanism.
- This study is a pilot test of the market effects protocols conducted on the 2006-2008 CFL market/programs in California

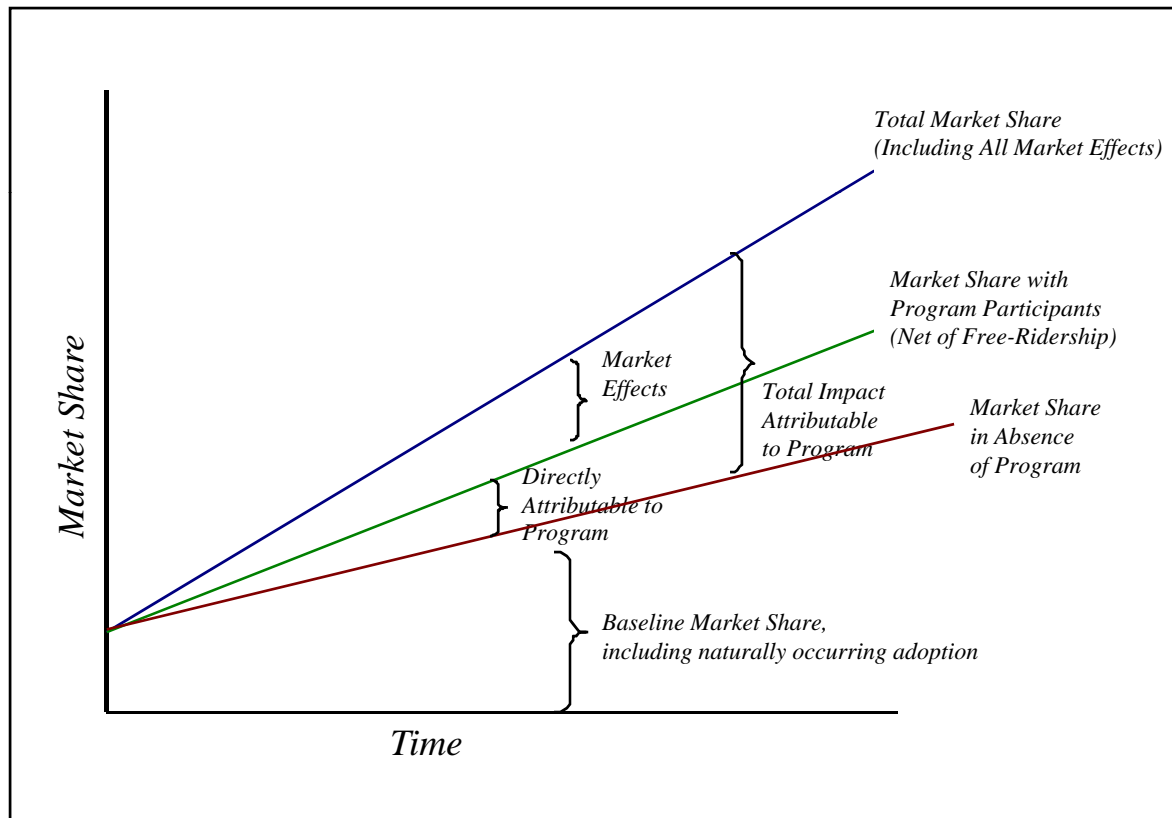
What Are Market Effects?

- According to the California Evaluation Protocols, market effects are:
 - “A change in the structure of a market or the behavior of participants in a market that is reflective of an increase in the adoption of energy-efficient products, services, or practices and is causally related to market interventions...”

Market Effects Protocols

- Current CPUC policy does not allow attribution and credit for savings from non-participant spillover
- CPUC recognized importance of market effects and commissioned study
 - CIEE prepared CFL Market Effects Study Plan

Calculation of Market Effects on CFL Sales



Overall Study Goals

- Understand cumulative effects of California's energy-efficiency programs on the CFL market
- Quantify the 2006-08 kWh and kW savings caused by market effects, yet not claimed as direct or participant spillover savings
- Investigate whether savings from market effects can be quantified with sufficient reliability to be treated as resources

Research Questions

- What can be attributed to the CA IOU CFL programs beyond the programs' direct and participant spillover savings?
 - Changes in non-program sales
 - Changes in retail prices
 - Changes in awareness, attitudes, and behaviors, and product offerings
 - Energy and demand savings (non-participant spillover)
- What are the cumulative effects of the CA IOU programs on the CFL market—in CA, the rest of the US, and the world?
- What is the likelihood and magnitude of sustained market effects in the absence or reduction of public intervention?

Scoping Study Goals

- Characterize current CA CFL programs
- Describe evolution of CFL programs in CA and elsewhere
- Develop integrated market and program theories
 - Develop market and program logic models
 - Detail market indicators to be studied
- Review CFL market effects studies from other states
 - Gather insights and approaches for this study
- Define and document the final study approach

Work Plan Approach

- Analysis of baseline retail sales patterns
- Estimation of total CFL sales - triangulation of many data sources:
 - Sales data, consumer surveys, shelf stocking survey, customer intercept surveys, interviews with upstream market actors
 - Secondary approach: regression analysis (CFL sales as dependent variable)
- Cumulative effects on historic retail sales
- Pricing analysis (regression analysis)
- Analysis of changes in other market effects
- Attribution analysis (preponderance of evidence approach)
- Energy and demand savings estimation (deemed savings from DEER)
- Sustainability assessment

Timeline

- First Report to CPUC: Dec. 2008 (available for public review: Jan. 2009)
 - Analysis of point of sale (POS) and EPA data
 - Random digit dialing (RDD) surveys and in-home audits
 - Finalized scoping study
 - Regression model
 - First round of manufacturer/retailer surveys
- Second Report to CPUC: August 2009
 - Full comparison state analysis
 - RDD, shelf stocking, retailer interviews
 - Attribution analysis
 - Net savings
 - Sustainability assessment

Time for Questions



PG&E's Upstream Programs

Marcela Fox

Manager, Upstream and Midstream Programs



***Pacific Gas and
Electric Company™***

The Numbers Talk...

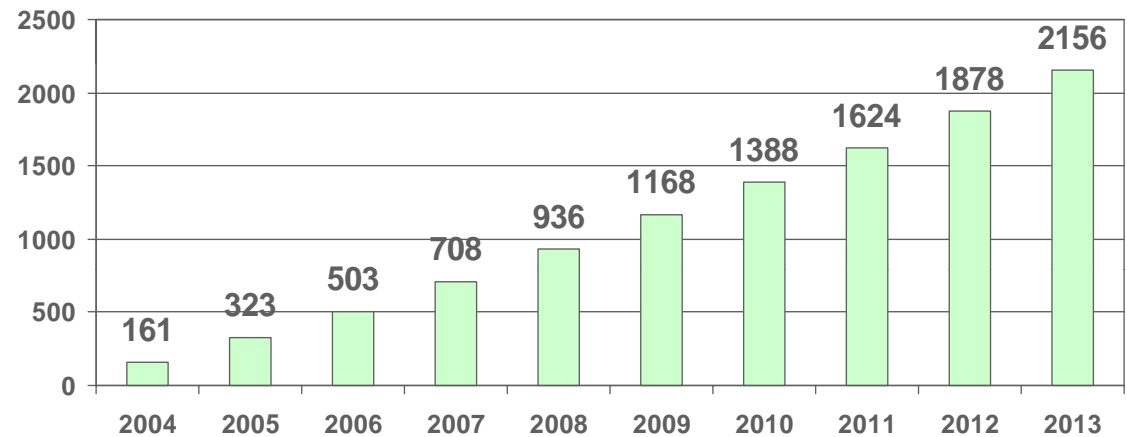
Since 1976 PG&E's energy efficiency programs have:

- Saved more than 118 million megawatt-hours and 10.7 billion therms from installed measures (cumulative lifecycle savings)
- Saved enough annual electricity to power over 18 million homes and enough annual natural gas to heat 15 million homes
- Helped California avoid building 24 large power plants
- Kept over 125 million tons of CO₂ out of the atmosphere, based on combined electric and natural gas savings

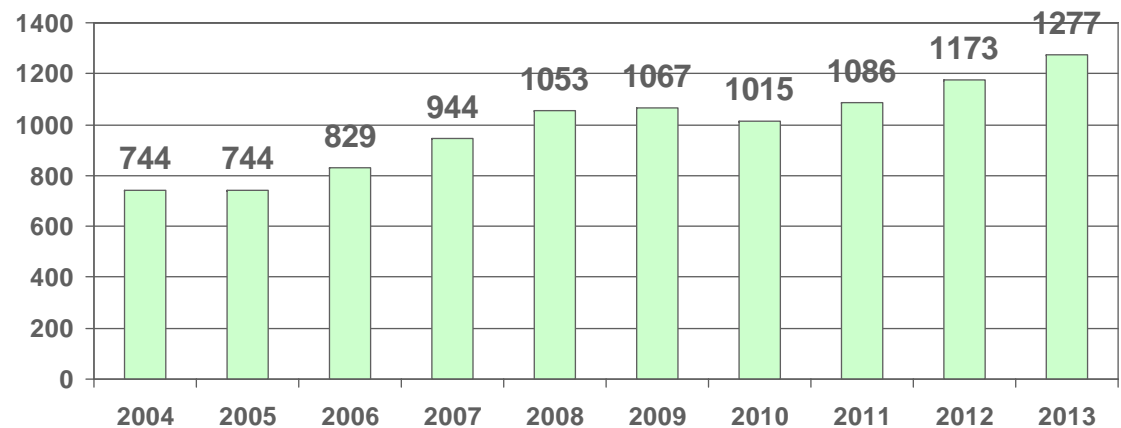
Energy Efficiency Goals Are Going Up

- *PG&E's energy efficiency goals are increasing significantly*
- *California expects to meet approximately half of demand growth with energy efficiency through 2013*
- *PG&E 2006-08 energy efficiency budget of ~\$1 billion*

PG&E Cumulative Peak Savings (MW) Goals *



PG&E Annual Electricity Saving (GWH) Goals *

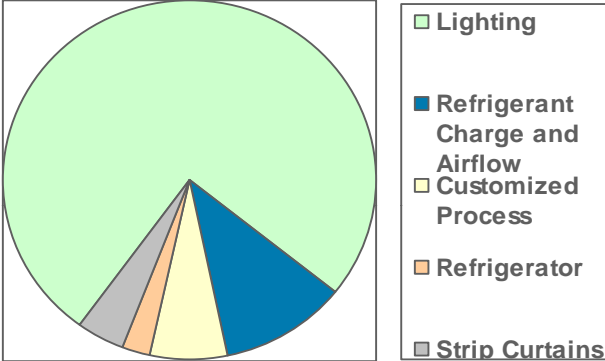


2006 - 2008 Energy Efficiency Portfolio: Focus on the Customer

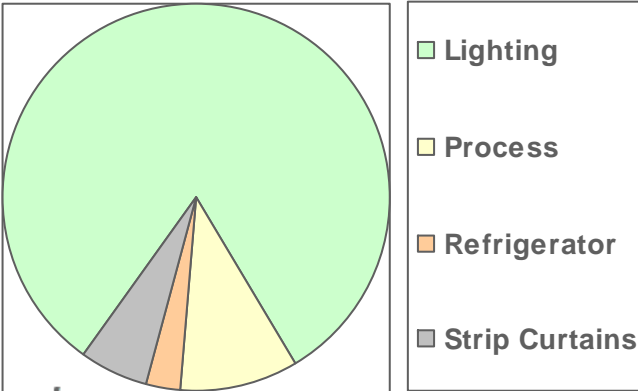
- Portfolio includes: financial incentives and rebates, training, education, energy audits, emerging technology projects, energy codes and standards support, marketing and outreach, and evaluation activities
- Multiple delivery channel opportunities: utility programs, government partnerships and third 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*

Top Selling CEE Measures

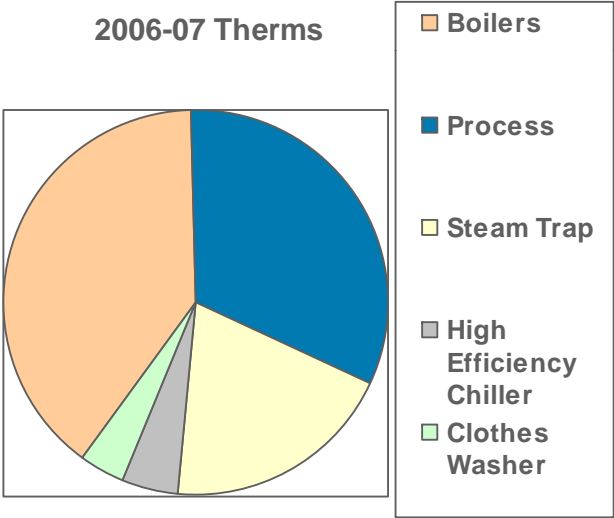
2006-07 KW



2006-07 KWh



2006-07 Therms



Mass Market Segmentation Strategy

- Pursue single family residential, multifamily residential, and small business customers
 - Approach energy efficiency in the same way
 - Have similar purchasing patterns
 - Use the same vendors



Mass Market Energy Efficiency Programs

- 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

Upstream CFL Program

- All three electric IOUs work with manufacturers and retailers to provide Energy Star qualified lighting products (CFL and fixtures) and other non-Energy Star products (LED) at a reduced price for mass market customers
- Program Components Include
 - Manufacturer buy down
 - Retail Point of Sale

Upstream Program Example

CFLs: Moving Towards Market Transformation

- Upstream incentive programs offering instant point-of-sale rebates have increased availability and market penetration of CFLs

PG&E Service Territory: Then and Now		
	2000	2008
CFLs Sold	0.2 million	28 million to date
Energy Savings	~ 57 GWH	~ 1165 GWH
Availability	Single packs, difficult to find, only available in limited locations, mail-in rebates only	Multi-packs sold in most major outlets and smaller stores, often receive prime shelf space, point-of-sale rebates

- PG&E's programs have sparked greater awareness of CFL benefits*
 - Federal legislation raises lighting efficiency standards*
 - Standards discussions pending in other states*
 - Seeking to advance new technologies: LEDs, "super" CFLs*

The 2006-08 CFL program has been a huge success

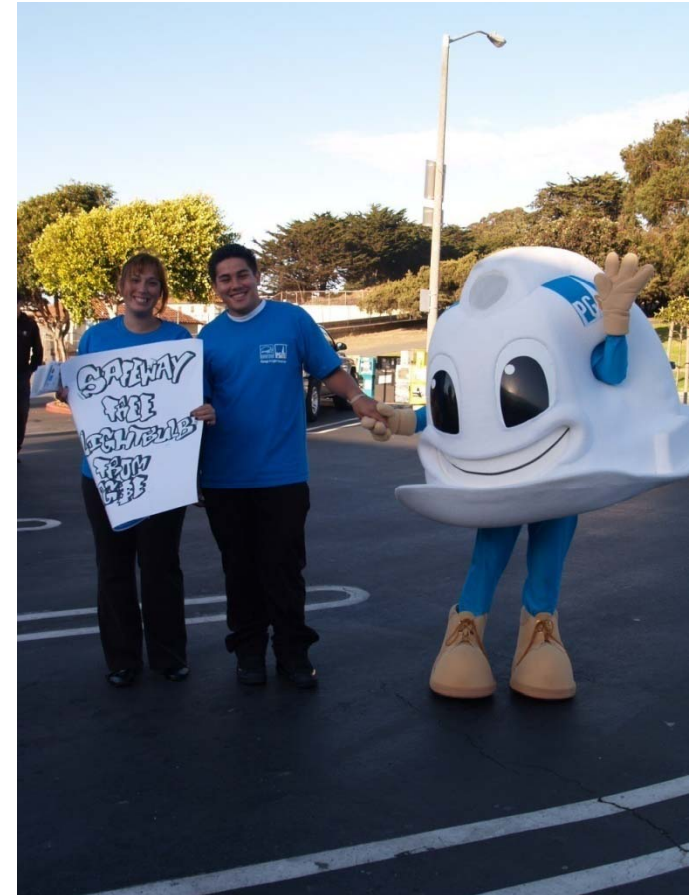
- **Since 2000, PG&E has incented almost 75 million CFLs**
 - **Partnerships with manufacturers and retailers developed diverse set of participants**
 - 14 manufacturers partnering with more than 640 retailers, representing over 2,000 locations
 - **Focused on increasing customer awareness**
 - Launched “There’s a Better Bulb” advertising campaign and www.pge.com/cfl
 - Handed out one million bulbs in Change A Light campaign
-

Lessons Learned from 2006-2008

- Retailers reluctant to stock specialty products other than spirals
 - Periodic overstocking of discounted product on retailer shelves
 - Product arbitrage through internet sales
 - Lack of data available on product saturation in homes and businesses
- ** All issues are concerns for program measurement and evaluation

Change A Light Campaign: October - November 2007

- One million CFLs handed out
- 600+ events throughout service territory, involving 1,000+ employee volunteers
 - 12 events at retailer partners featuring PG&E mobile education center
- Local office distribution of CFLs
- Uploaded over 200,000 Change a Light pledges to ENERGY STAR website
- More than 130 local, national and international print and media broadcast hits
 - Christian Science Monitor, LA Times, SF Chronicle, Associated Press, Reuters, NBC Nightly News



Lessons Learned from Change A Light

- CFLs recipient demographics were similar to general population in PG&E's territory
- One in four recipients had never purchased a CFL before
- Over 80 percent of recipients immediately installed their free CFL
- Only one percent of CFLs were installed and then removed
- Majority of CFL recipients were satisfied with the quality of the bulb

2009-2011 Program Strategy

- Build on 2006-2008 Successes
 - Program Structure will be very similar
 - Three quarters of residential energy savings are expected to come from lighting in 2009-11 portfolio
 - Increase distributor and retailer stocking of high energy efficient products
 - Allow distributors and retailers to sell the products at introductory prices to stimulate the market.
 - Continue successful in-store point-of-purchase rebates and training for retailer sales staff on the advantages of the energy-efficient lighting

2009-2011 Program Strategy: Addressing Program Evaluations

- Limit overstocking and arbitrage:
 - Limit CFL sales to sixteen spirals and and five specialty lamps per person
 - Request smaller packaging (Four or less) of CFLs
 - Request square footage and store type by retailers in allocation agreement
 - Increased monitoring by manufacturers of on-line sales of program incented product
 - Enhanced requirement of sales data

2009-2011 Program Strategy: Addressing Program Evaluations

- Increase availability of specialty lamps
 - Structure incentives to increase volume of specialty lamps
 - Continue testing of specialty lamps
 - Launch Super-CFL product specification

Super CFL

- Develop a specification for CFL lamps that is more stringent than ENERGY STAR
- Create products that promote greater customer acceptance by improving:
 - Color/color rendition
 - Flicker
 - Noise
 - Dimming “survival” (for non-dimming lamps)
 - Color shift under dimming conditions (for dimming lamps)
 - Time to full brightness
 - Reduce mercury content to 1.5 mg (or less)

PG&E's Upstream Lighting Program

- What impact do new technologies (i.e. Super-CFL, LED lamps) have on the program?
 - New technology like "Super CFL" LED technology provides an opportunity and options to penetrate additional sockets in residential home that are not being addressed presently
 - These include dimmable sockets, recessed can lighting needs, under cabinet lighting, cove lighting etc.
 - Emerging Technologies will develop product specifications on emerging products and technologies, such as LED lighting and the Super CFL, and provide information on new products

PG&E's Upstream Lighting Program

- What's the three to five year plan for CFL's?
 - Continue to include base Energy Star bulbs in our program until such time as the "Super CFL" technology is completely developed and has been integrated into the market place
 - Promote statewide super CFL standard beyond ENERGY STAR standard
 - Light emitting diodes (LED) and pin-based ENERGY STAR fixtures that meet aggressive ENERGY STAR standards
 - Support aggressive enhancement and enforcement of California building energy codes and standards
 - Look at other product technologies adaptable to Upstream model, such as Consumer Electronics

For more information

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