

Addressing Program Attribution in the Wake of the California Energy Crisis

Tami Rasmussen, KEMA-XENERGY Inc., Oakland, CA
Kathleen Gaffney, KEMA-XENERGY Inc., Oakland, CA
Rob Rubin, San Diego Gas and Electric Company, San Diego, CA

ABSTRACT

This paper describes the results of a multi-phase market effects evaluation of the California Residential Lighting and Appliance Program implemented by the state's investor-owned utilities, Pacific Gas and Electric, Southern California Edison, Southern California Gas Company, and San Diego Gas and Electric, from 1999 through 2001. The purpose of the study was to evaluate the effectiveness of the Program and to measure the market effects attributable to the Program.

The evaluation framework was initially designed to support a broad, long-term assessment of upstream market effects. However, in light of the California energy crisis and the many non-utility actors that were suddenly influencing energy efficiency and conservation behavior, the evaluation was expanded to explicitly account for these other influences.

The study results showed that all of the leading indicators of market effects improved over the program treatment period. Additionally, market shares for ENERGY STAR[®] appliances and lighting equipment also increased relative to nationwide market shares. Ultimately, the evaluators attributed the heightened awareness of conservation and the consumer "call-to-action" to the energy crisis and its accompanied media attention, but credited cumulative utility interventions in both the consumer and supplier markets for energy-efficient products with laying the groundwork for the increased sales of ENERGY STAR products in 2001.

Introduction

This paper describes the results of a multi-phase market effects evaluation of the California Residential Lighting and Appliance Program implemented by the state's investor-owned utilities (IOU), Pacific Gas and Electric, Southern California Edison, Southern California Gas Company, and San Diego Gas and Electric, from 1999 through 2001. The purpose of the study was to evaluate the effectiveness of the program and to measure the market effects attributable to the program.

Background

In 1997, the California Public Utilities Commission (CPUC) declared that the purpose of energy-efficiency programs should be to transform the markets for energy-efficient goods and services so that individual customers and suppliers in the future competitive market will make more rational choices. California's IOUs developed statewide designs for the major 1999 energy-efficiency programs to be consistent with market transformation objectives. One such statewide market transformation program was the California Residential Lighting and Appliance Program (program), which was designed to address barriers to the adoption of energy-efficient appliances and lighting products. The program primarily focused its activities at influencing the supply-side of the market to increase the production, stocking, promotion, and sales of energy-efficient appliances and lighting products.

Program Description

Table 1 below provides a summary of the program’s major activities from its inception mid-year 1999 through its end in December 2001 (KEMA-XENERGY 1999, 2001, 2002). During the first year of the program, the downstream activities that had been conducted in prior years were continued, but the program’s emphasis was shifted toward generating upstream market effects. The program offered manufacturer incentives, retailer salesperson incentives and training, co-operative advertising, and in-store merchandising support. For example, in 2000, over 3,000 salespeople were trained in more than 600 retail locations throughout California. Also in 2000, trained contractors visited over 1,100 retailers to assist in product merchandising, and a total of \$1.8 million was spent on co-operative retailer advertising.

Table 1. Overview of Major IOU Lighting and Appliance Program Activities (1999–2001)

Strategy	Delivery	Products	Magnitude of Effort		
			1999	2000	2001
Financial Incentives	Consumer rebates, manufacturer buydown	CFLs, torchieres, fixtures	600,000	92,000	7,500,000
	Consumer rebates, retailer incentives	Refrigerators, clothes washers, dishwashers, room AC	250,000	50,000	200,000
Upstream Market Support	Salesperson training	All	Start-up	Significant	None
	Merchandising support, field visits	All	Start-up	Significant	Limited
	Co-op advertising	All	None	Significant	Limited
Total Dollars			\$30m	\$33m	\$36m

California’s Energy Crisis

In 2001, however, the program emphasis shifted again—from longer-term market transformation-oriented goals and toward achieving the immediate- or short-term goal of peak energy savings. This shift in policy was instigated by the California energy crisis, which intensified in the summer of 2001 with anticipated and real shortages of energy supply occurring during peak hours. Once again, the programs returned to offering downstream incentives with each utility supplementing the statewide effort with targeted initiatives designed to achieve immediate energy savings.

Also in response to the energy crisis, California residents were inundated with messages from a variety of sources to conserve energy. The state introduced an aggressive media campaign called “Flex Your Power” that relied on mass-market television and print advertisements to encourage residents to engage in conservation activities such as adjusting their thermostat, using appliances off-peak, and turning off lights and other equipment when not in use. Simultaneously, the media broadened its coverage of the energy crisis to include conservation tips for residents and businesses.

Evaluation Framework

In response to the shift in the program’s emphasis mid-year 2001, the evaluation framework was modified to adapt to the new program goals and delivery strategies. Initially, the evaluation was designed to support a broad, long-term assessment of upstream market effects. The evaluation was based on a program theory that hypothesized that specific interventions at key points in the market would bring about specific market changes that would result in lasting, sustainable market effects. As such, data collection tasks were designed to measure changes in key market indicators over time.

During the first year of the evaluation, baseline measurements of the relevant market effects indicators were developed. These baseline data collection activities included in- and out-of-state interviews with retailers and consumers as well as mystery shopper and floor stock surveys.¹ In 2000, the evaluation continued to track changes in key market indicators. The 2000 evaluation activities also included tracking key market transformation milestones such as training a specific number of salespeople and conducting a certain number of in-store merchandising visits. The final year of the evaluation included data collection to measure changes in indicators of market effects, while a number of activities designed to track performance of key downstream interventions were added to address the shift in programmatic focus.

Table 2 provides an overview of the major research activities conducted over the period of 1999–2001 in support of the evaluation.

Table 2. Major Research Activities Conducted in Support of the CRLAP Market Effects Evaluation

Year	Upstream Data Collection				Downstream Data Collection			
	Retailer Interviews	Out-of-State Retailer Interviews	Mystery Shopper Store Surveys	Floor Stock Store Surveys	General Population Surveys ²	Purchaser Surveys	Out-of-State Purchaser Surveys	CFL Program Adopter Surveys
1999	•	•	•			•	•	
2000	•		•	•				
2001			•		•	•		•
Total number of surveys	200	100	550	130	700	2,000	500	800

As mentioned above, the initial evaluation framework was designed to measure indicators of market effects in order to test the validity of the program theory. If the theory was found to be valid, that is, if changes in key market indicators were measured that coincided with program interventions, then the program design would be found to be effective. The context under which this framework was developed was one that preceded the California energy crisis, where the utilities were the only major external influence on energy-efficient appliance and lighting markets. As such, the evaluation design did not explicitly include an assessment of attribution to test whether the market changes were actually caused by the utility program interventions.

The California energy crisis intensified during the summer of 2001 when the final phase of the evaluation was underway. The initial evaluation design specified that the final phase’s activities would include taking the final measurement of the key indicators of market effects. However, in light of the crisis and the many non-utility actors that were suddenly influencing energy-efficiency and conservation behavior, the evaluation was expanded to explicitly account for these other influences. Some of the new features of the evaluation that were added in late 2001 included a general population survey battery to measure consumer awareness of and participation in these non-utility programs and their influence on energy-efficiency behaviors. Also, a survey of CFL adopters was conducted that compared the major CFL program delivery mechanisms that were in the market in 2001.³

¹ The mystery shopper surveys were conducted by professional surveyors posing as shoppers at a sample of retailers and recording various attributes of the products that were stocked and promoted by salespeople.

² 1,170 general population surveys were conducted in 1998 in support of the *CBEE Baseline Study on Public Awareness and Attitudes Towards Energy Efficiency* (Hagler Bailly 1999).

³ See “Mass Deliveries of CFLs as a Response to the Energy Crisis: Evaluation of California’s 2001 Compact Fluorescent Bulb Programs,” prepared for Pacific Gas & Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company by KEMA-XENERGY Inc, T. Rasmussen, K. McElroy.

The final phase of the evaluation included an assessment of the major non-utility influences, which likely affected the market indicators that were being measured. However, our approach was not to undertake a formal assessment of program attribution. Instead, we qualitatively assessed attribution based on observing the effects of utility and non-utility influences on consumer and supplier behaviors.

The remainder of this paper presents highlights of the key market indicators that were measured by the evaluation, and concludes with a qualitative assessment of attribution of the observed market effects to utility and non-utility program interventions.

Results ⁴

As mentioned above, the evaluation was designed to collect time series data on leading indicators of market effects, including the following:

- Consumer Awareness and Knowledge
- Consumer Attitudes
- Self-reported Consumer Behaviors
- Product Availability
- Product Exposure.

Consumer Awareness and Knowledge

Indicators of consumer awareness and knowledge of energy efficiency increased moderately over the program treatment period. However, baseline measurements of these indicators were fairly high to begin with. For example, the percentage of the population that rated themselves to be “highly knowledgeable” about energy efficiency increased from 42 percent to 57 percent from 1998 to 2001. The percentage of the population that was aware of CFLs increased from 58 percent to 68 percent during the same time period.

Notably, one indicator of consumer awareness and knowledge did increase significantly over the study period. In 2001, every household was aware of at least one energy-efficiency measure they could take in their home, versus 67 percent in 1998. However, as shown in Table 3 (Hagler Bailly 1999, KEMA-XENERGY 2002), the types of improvements at the top of the consumer’s mind shifted from energy efficiency to conservation measures.

Table 3. Top Five Energy-Efficiency Improvements Cited by General Population—Unprompted

Rank	1998		2001	
	Measure	Percent	Measure	Percent
1	Insulation of ceilings, walls, or floors	31%	Turning off lights	29%
2	Weatherstripping	23%	Adjusting thermostats	24%
3	Turning off lights	20%	Weatherstripping	14%
4	Double pane windows	19%	CFLs	13%
5	Insulation of water heater tanks and pipes	14%	Refrigerator replacement	13%
	Cited at least one improvement	67%	Cited at least one improvement	99%
	Base	1,170	Base	721

⁴ Note that unless otherwise indicated, all data presented in this paper are from the market effects evaluation of the California Residential Lighting and Appliance Program.

Some of the increased knowledge that occurred during the program period was likely due to the state's energy crisis. Over one-third of consumers said their knowledge regarding how to save energy increased since the crisis. However, the focus of the media and the state's Flex Your Power campaign in 2001 was on conservation, not energy efficiency. Consumer focus groups conducted in 2001 indicated that the messages that consumers heard during the crisis were "common sense" and did not necessarily impart new information. Instead, these messages tended to reinforce what they had already learned over the years from their utility companies, the media, and from teachers and parents.⁵

Consumer Attitudes

Changes in indicators of consumer attitudes towards energy efficiency over the study period mirrored changes in awareness and knowledge. Baseline measurements of attitude indicators were relatively favorable towards energy efficiency to begin with and experienced modest increases from 1998 to 2001. Consideration of energy efficiency as an important product attribute among the general population experienced more significant positive changes, particularly for appliances, from around 20 percent to one-half.

Consumer Behavior

Indicators of consumer energy-efficiency behavior, based on self-reported perceptions of past behavior, increased moderately from already high baseline levels over the study treatment period. For example, self-reported energy-efficient appliance purchase shares increased from around one-half to two-thirds of all appliance purchasers. An indicator of overall energy-efficiency effort in the home improved similarly to observed changes in awareness and attitudes, where the initial measurement was high (average rating of 6.5 on a 1 to 10 scale) and the final measurement was slightly higher (average rating of 7.6).

Some of the improvements in consumer behavior that occurred during the program period can be attributed to the energy crisis. More than one-third of consumers said that "a lot" of their recent energy-saving activity occurred since the crisis. However, most of those activities were behavioral. The survey results indicated that most consumers focused on turning off lights and other equipment they were not using, adjusting thermostats to decrease heating and cooling loads, and using major appliances off-peak to help reduce their bill during the crisis.

Product Availability

Indicators of product availability—namely manufacturer production and retailer stocking of energy-efficient appliances and lighting equipment—increased significantly over the study period. For example, the share of ENERGY STAR[®]-qualified appliance models being produced by manufacturers skyrocketed for refrigerators, increasing to over half in 2002 from 9 percent in 1998. Increases for the other appliances were less dramatic, but were significant nonetheless, as shown in Table 4.

⁵ *Assessment of Customer Behaviors and Practices Due to 1-2-3 Cashback*, Quantum Consulting, KEMA-XENERGY Inc., October 2002.

Table 4. Number and Percent of Models that are ENERGY STAR®-Qualified

Appliance	Number of ENERGY STAR-Qualified Models		Percent of ENERGY STAR-Qualified Models	
	1998	2002	1998	2002
Refrigerators	223	312	9%	50–60%
Clothes Washers	32	91	4–6%	13%
Dishwashers	185	267	22%	30%
Room Acs	81	159	41%	50%

Source: www.energystar.gov, May 1998 and April 2002.

Retailer stocking of energy-efficient appliances also increased over the program treatment period. Table 5 (KEMA-XENERGY 1999, 2002) provides a snapshot of retailer floor stocking behavior at the beginning and end of the most intensive upstream program treatment year. As shown, energy-efficient product stocking increased significantly over the one-year period.⁶ (Note that other important components of retailer behavior with regard to energy-efficient product stocking practices are shown in the next subsection “Product Exposure.”)

Table 5. Percent of Retailer Floor Stock that is Energy Efficient^a

Appliance	January 2000	December 2000
Refrigerators	5%	9%
Clothes washers ^b	9%	14%
Dishwashers ^b	22%	31%
Room AC ^b	3%	22%

^a Bears the ENERGY STAR logo for clothes washers, dishwashers, and room air conditioners, and meets the 2001 federal minimum efficiency standard for refrigerators.

^b SDG&E territory only.

Figure 1 (KEMA-XENERGY 1999, 2002) illustrates product availability changes from the consumer perspective. The solid bar shows the percentage of purchasers who wanted to purchase an energy-efficient appliance but could not due to availability issues. The cross-hatched bar shows the percentage of purchasers who experienced some issues with availability, such as increased search time, difficulty locating an efficient product with the desirable features, but who ultimately purchased an energy-efficient appliance or CFL.⁷ As shown, the percent of purchasers who experienced availability issues declined significantly from 1998 to 2001. For room air conditioners and clothes washers in particular, there were no availability issues in 2001. Changes in the federal minimum efficient standard in July of 2001 and the ENERGY STAR specification in January of 2001 temporarily affected ENERGY STAR refrigerator availability during the second half of 2001, as indicated by the 10 percent of purchasers who were not able to purchase an ENERGY STAR refrigerator due to lack of availability.

⁶ Changes in room air conditioner federal minimum efficiency standards and accompanying ENERGY STAR® qualification in October 2000 affected the dramatic increase seen in SDG&E’s territory for ENERGY STAR® shares of room air conditioner retailer availability during 2000.

⁷ The percent of respondents who did not purchase a CFL due to availability issues was not asked in 2001, so the comparison data is not available.

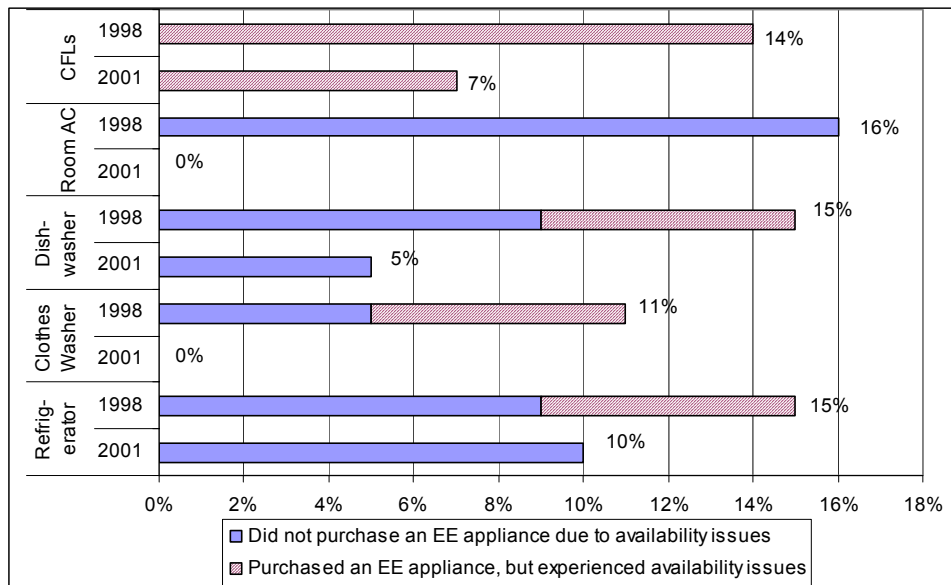


Figure 1. Consumer Self-Reported Availability Issues

Product Exposure

Changes in product exposure over the program treatment period were also found to be significant, based on the results of mystery shopper survey results. Of the many indicators of product exposure at the retail level that were tracked by the shoppers, the results of three key product exposure indicators are:

- The percent of the initial units shown to the shopper by the salesperson that were described as being energy efficient (unprompted),
- The percent of all units that were described as being energy efficient (unprompted and prompted), and
- The percent of all units shown that had the ENERGY STAR logo on them (unprompted and prompted).

Figures 2 and 3 (KEMA-XENERGY 1999, 2001, 2002) illustrate the increase in these indicators over time for both lighting products and appliances.

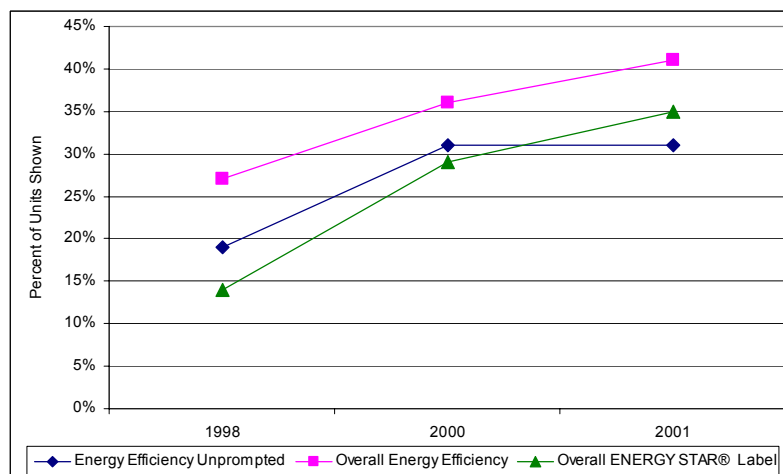


Figure 2. Lighting In-Store Experience for Mystery Shoppers Over Time

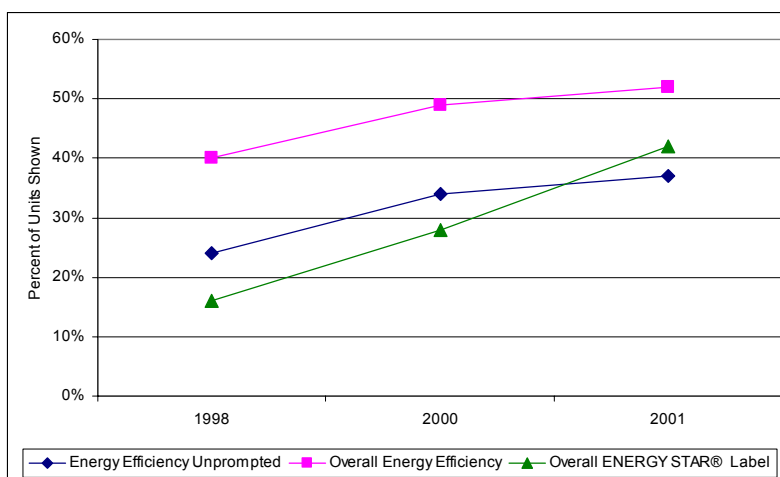


Figure 3. Appliance In-Store Experience for Mystery Shoppers Over Time

Market Shares

Market shares for energy-efficient appliances and lighting products became available during the final phase of the evaluation from a separate study (RER 2002, 2003). These “lagging” indicators of market effects were incorporated into the final evaluation results and are presented below.

Figure 4 presents the market shares for ENERGY STAR appliances purchased over the period of 1998 through 2002 for the state of California and for the United States. During the program treatment period (1999–2001), market shares in California increased fairly substantially. Changing federal minimum efficiency standards and ENERGY STAR specification for room air conditioners and refrigerators account for the “temporary” dip seen in 2000 for ENERGY STAR room air conditioner market shares and in 2002 for ENERGY STAR refrigerator market shares. In 2002, market shares declined, but, with the exception of refrigerators, sustained the rate of increase achieved from 1998 through 2000.⁸

ENERGY STAR clothes washer shares followed a similar pattern of moderate growth nationwide. ENERGY STAR dishwasher market shares nationwide grew rapidly from 2000 to 2002, ending at 30 percent of all dishwashers sold, compared to 40 percent in California. For refrigerators and room air conditioners, the effects of the changes in federal efficiency standards and ENERGY STAR qualifications appear to have had a more sustained negative effect on market shares nationwide than California.

Figure 5 (RER 2002, 2003; USDOE/D&R International 2002) presents market shares for CFLs, where the national market share increased steadily similarly to California’s share, but at a much slower rate.

⁸ In 2002, the utilities were prohibited by the CPUC from offering refrigerator rebates. *National ENERGY STAR® Appliance Sales Tracking System*, United States Department of Energy/D&R International (Appliances 2002).

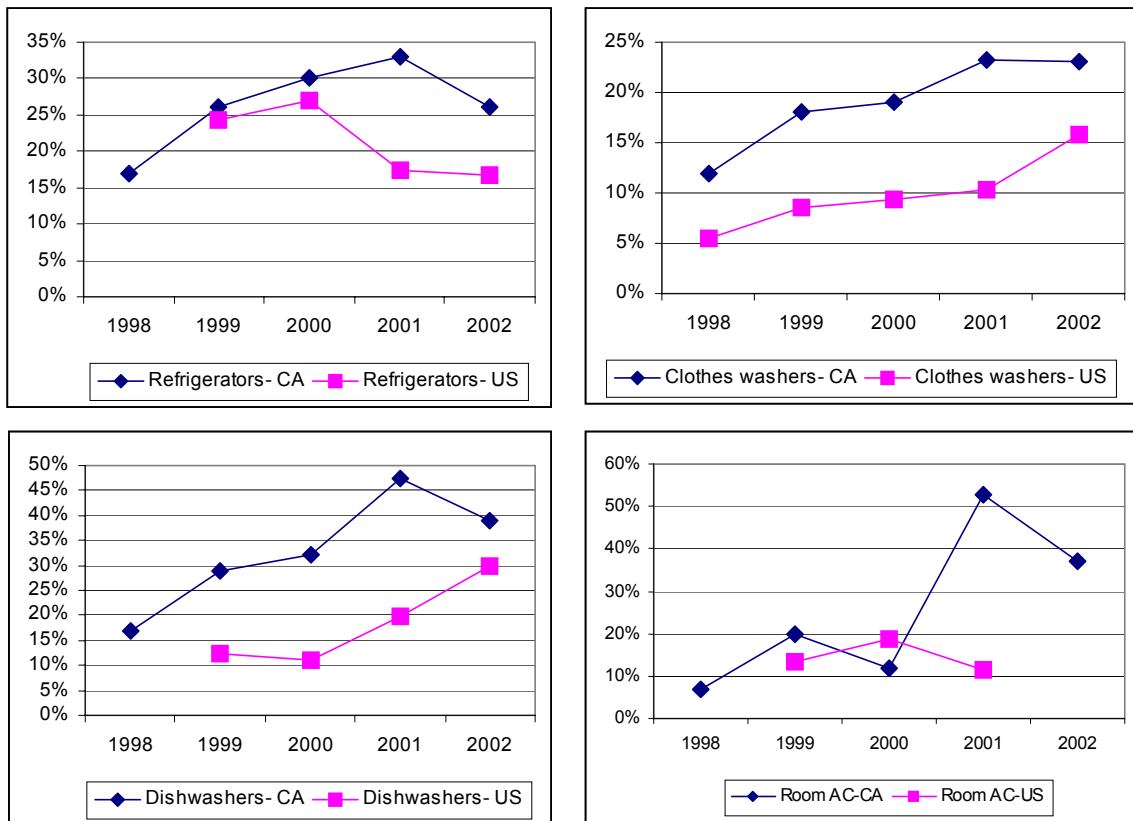


Figure 4. Market Shares for ENERGY STAR Appliances: 1998–2002⁹

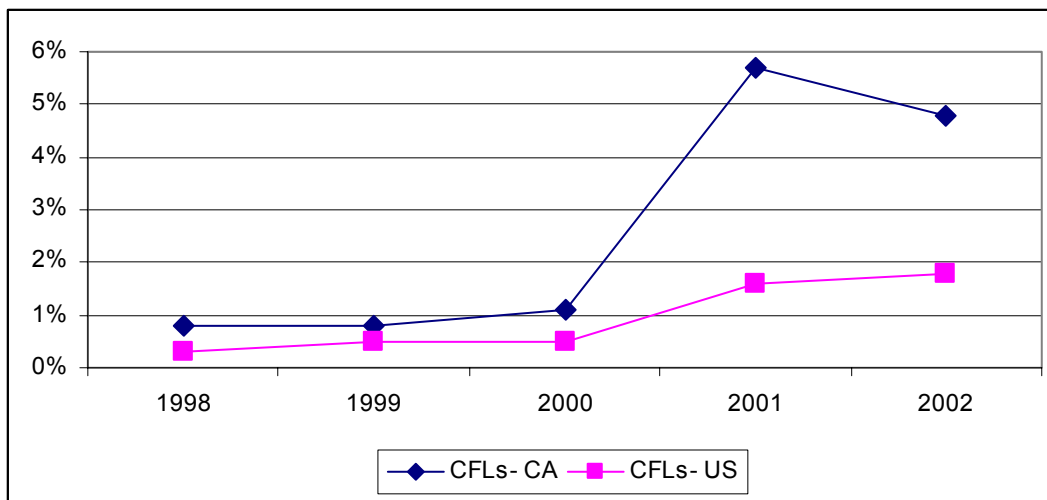


Figure 5. Market Shares for Compact Fluorescent Lamps: 1998–2002¹⁰

⁹ 1998 result is for the last two quarters of 1998. 2002 result is for the first two quarters of 2002.

¹⁰ 1998 result is for the last two quarters of 1998. 2002 result is for the first two quarters of 2002. For CFLs, the market share data is for the United States excluding California.

Conclusions

The energy crisis and its subsequent media attention can be credited with raising the profile of energy conservation, reinforcing the existing knowledge base that consumers had gained over the years, and increasing conservation activities among the general population. In other words, energy conservation and energy-efficiency messages that residents had heard over their lifetime rose to “top-of-mind.” This interpretation is consistent with high baseline levels of awareness, knowledge, and attitudes measured by the evaluation prior to the energy crisis.

Supplier behavior also changed over the study period, such that manufacturers were producing more ENERGY STAR-qualifying units, and retailers were stocking and promoting them at a higher rate. The utilities were particularly active in supporting these supply-side actors through substantial financial and technical training support provided during the program. In addition to providing rebates for ENERGY STAR appliances, as had been done historically, the program provided extensive upstream support including co-operative advertising, salesperson training and incentives, and point-of-purchase displays. These long-term partnerships culminated in 2000 with almost \$30 million spent on salesperson training and merchandising and advertising support.

While it is impossible to determine whether retailers and manufacturers would have been able to respond to the increased demand for ENERGY STAR products in 2001 in absence of the program, it is unlikely that they would have been as prepared to translate the consumer “call-to-action” into the very high levels of energy-efficient purchases that occurred in 2001. Likewise, had the energy crisis been solely responsible for all of the energy-efficient activity that occurred in 2001, market shares for energy-efficient goods would have been expected to slump in 2002. Instead, ENERGY STAR appliance and CFL market shares sustained the rate of increase from 2000 to 2002 that was achieved during the program treatment period prior to the crisis.

In conclusion, while the energy crisis and its accompanied media attention led to heightened awareness of conservation, cumulative utility interventions in both the consumer and supplier markets for energy-efficient products can be credited with laying the groundwork for the increased sales of ENERGY STAR products in 2001. Moreover, the sustained rate of increase in ENERGY STAR market shares seen post-energy crisis in 2002 underscore the lasting effects that the program created in the marketplace.

References

- Hagler Bailly. 1999. *CBEA Baseline Study on Public Awareness and Attitudes Towards Energy Efficiency*.
- KEMA-XENERGY Inc. 1999. *Phase 1 Market Effects Study of California Residential Lighting and Appliance Program*. Prepared for San Diego Gas & Electric Company, Pacific Gas & Electric Company, and Southern California Edison Company. Oakland, Calif.
- KEMA-XENERGY Inc. 2001. *Phase 3 Market Effects Study of California Residential Lighting and Appliance Program*. Prepared for San Diego Gas & Electric Company, Pacific Gas & Electric Company, and Southern California Edison Company. Oakland, Calif.
- KEMA-XENERGY Inc. 2002. *Phase 4 Market Effects Study of California Residential Lighting and Appliance Program*. Prepared for San Diego Gas & Electric Company, Pacific Gas & Electric Company, and Southern California Edison Company. Oakland, Calif.

- Quantum Consulting, and KEMA-XENERGY Inc. 2002. *Assessment of Customer Behaviors and Practices Due to 1-2-3 Cashback*.
- Rasmussen, T., and K. McElroy. 2002. *Mass Deliveries of CFLs as a Response to the Energy Crisis: Evaluation of California's 2001 Compact Fluorescent Bulb Programs*. Prepared for Pacific Gas & Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company. Oakland, Calif.
- RER, Inc. 2002. *California Residential Efficiency Market Share Tracking: Appliances, 2001*. San Diego, Calif.
- RER, Inc. 2003. *California Residential Efficiency Market Share Tracking: Lighting Volume I, 2002*. San Diego, Calif.
- U.S. Department of Energy, & D&R International. 2002. *National ENERGY STAR[®] Appliance Sales Tracking System*. Washington, D.C.

