
City of Palo Alto Utilities CFL Point of Purchase Pilot Profile #87

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Executive Summary

The City of Palo Alto operates a combined municipal utility that serves electricity, gas, and water. Several factors make this relatively small utility an interesting case study for energy efficiency: First, Palo Alto is a highly-educated community. Second, the City has among the lowest electricity rates in California. Third, since its service territory is adjacent to Pacific Gas & Electric, one of the nation's leading DSM utilities, residents of Palo Alto have come to expect progressive energy efficiency programs.

Since 1976 Palo Alto has had a colorful history of energy efficiency innovation. Currently the City offers a range of programs including financing for solar hot water heaters, supplements for school curricula, and bill analysis. While California's prolonged drought caused the utility to focus on water efficiency nearly exclusively from 1990-1992, in 1993 Palo Alto introduced a number of new programs including an innovative pilot program to promote compact fluorescent lamps, the focus of this profile.

Many larger utilities are exploring their opportunity to provide incentives directly to manufacturers rather than customers. By doing so, manufacturers will not only promote lower-cost, energy-efficient products, but downstream markups will be minimized. Palo Alto wanted to develop a manufacturer rebate program for compact fluorescent lamps (CFLs), but was unable to do so because of its relatively small size. Therefore staff elected to experiment with a vendor-based approach for a one-month long pilot program.

The ensuing program was quite simple: The City bought CFLs in bulk and provided them to local hardware stores for resale. Then vouchers were sent to residential customers. While the City bought CFLs for approximately \$12 each, customers with vouchers could purchase up to 2 lamps for \$9 apiece, resulting in a small utility subsidy for each lamp put in service. Interestingly, the vendors, the City's four hardware stores, did not directly profit from the sales of the lamps, but were pleased with increased foot traffic and ancillary sales of lamps and other goods.

Palo Alto's experiment achieved higher participation than expected and also higher penetration than expected. Not only were all the lamps that were initially purchased sold, but the utility had to purchase more lamps to fulfill demand. Customers also bought additional compact fluorescent lamps at their full list price, proving to the hardware store owners that consumer demand for CFLs warrants stocking the lamps and giving them adequate display space. Furthermore, a survey of program participants revealed that participants were satisfied with the lamps' life, light quality, and brightness, and fully 85% of survey respondents claimed they will purchase the lamps again at a discounted price.

CITY OF PALO ALTO UTILITIES CFL Point of Purchase Pilot Program

Sector: Residential

Measures: Three types of compact fluorescent lamps; Philips Earthlight SLS-15, Philips Earthlight SLS-23, and Lights of America 30-watt circline

Mechanism: Utility purchased compact fluorescent lamps (CFLs) in bulk. Customers received vouchers to purchase up to 2 CFLs for \$9 each. Hardware stores stocked and sold the utility-subsidized CFLs without a mark-up as a service to the community

History: Pilot program ran April 1 - 30, 1993. Larger scale program planned for Fall 1994

1993 PROGRAM DATA

Energy savings: 169 MWh
Lifecycle energy savings: 1.48 GWh
Peak capacity savings: NA
Cost: \$20,200

CONVENTIONS

For the entire 1994 profile series all dollar values have been adjusted to 1990 U.S. dollar levels unless otherwise specified. Inflation and exchange rates were derived from the U.S. Department of Labor's Consumer Price Index and the U.S. Federal Reserve's foreign exchange rates.

The Results Center uses three conventions for presenting program savings. **Annual savings** refer to the annualized value of increments of energy and capacity installed in a given year, or what might be best described as the first full-year effect of the measures installed in a given year. **Cumulative savings** represent the savings in a given year for all measures installed to date. **Lifecycle savings** are calculated by multiplying the annual savings by the assumed average measure lifetime. **Caution:** cumulative and lifecycle savings are theoretical values that usually represent only the technical measure lifetimes and are not adjusted for attrition unless specifically stated.

Utility Overview

The City of Palo Alto is located approximately 35 miles south of San Francisco in Santa Clara County and has a population of 57,300. The City was named for a tall redwood tree under which an early Spanish exploration party camped in 1769. The high technology industry which has made Santa Clara County famous, has its roots in Palo Alto, in large part because of the presence of Stanford University which is adjacent to the City. Counting Stanford University employment, the City has about 76,500 jobs.[R#5]

Palo Alto's housing stock increased by 3,850 units during the 1970-1990 period, reaching nearly 25,000 units. Approximately one-third of the City's land area is open space. The City's median household income was \$55,333 in 1990 and one-third of the residents over the age of 25 had at least one graduate degree.[R#2]

Palo Alto is the only city in California that owns all of its municipal utilities (electricity, gas, and water) and these services are provided by City of Palo Alto Utilities (referred to hereafter as CPA, the City, the utility, or Palo Alto). The City of Palo Alto electric utility was established in 1900 following the buyout of the Peninsula Lighting Company and the gas utility originated in 1917. As Palo Alto's electric demand increased the City had to shut down the original steam plant and in 1923 entered into a power purchase contract with Pacific Gas & Electric (PG&E). In 1964, with the development of the Central Valley Project (CVP), the City was able to enter into a 40-year contract for hydroelectric power.[R#1]

The utility has a 25 square mile utility service area. The City currently provides electricity, water, and gas to 24,570 residences and 2,595 commercial/industrial customers. Electric rates are among the lowest in the State, averaging 4.86 ¢/kWh for residential customers, 5.94 ¢/kWh for commercial customers, and 5.41 ¢/kWh for industrial customers. All rate increases must be approved by the City Council. Presently the City has a three-tiered residential rate structure where higher usage is priced at higher rates.[R#1,7]

PALO ALTO FY 1992/93 ELECTRIC STATISTICS

<i>Number of Customers</i>	27,358
<i>Number of Employees</i>	213
<i>Energy Sales</i>	1,041 GWh
<i>Energy Sales Revenues</i>	\$57.63 million
<i>Summer Peak Demand</i>	193 MW
<i>Generating Capacity</i>	230 MW
<i>Reserve Margin</i>	19%
<u>Average Electric Rates</u>	
<i>Residential</i>	4.86 ¢/kWh
<i>Commercial</i>	5.94 ¢/kWh
<i>Industrial</i>	5.41 ¢/kWh

The City buys 175 MW of capacity from the Western Area Power Administration (Western), which markets power from the Central Valley Project. The CVP is a series of hydroelectric projects in Northern California. This project was designed as a multi-purpose project, providing water for irrigation as well as flood control, recreation, and electric generation. By 1985, the City's electric power consumption reached the maximum that could be purchased from CVP. As a result, Palo Alto purchased 23% of the Calaveras County 243 MW hydroelectric facility. Including purchases, the City has a peak capacity of 230 MW. Peak demand for 1993 was 193 MW, occurring in June and creating a reserve margin of 19%. The utility sold 1,041 GWh in 1993 and had electric revenues of \$57.63 million. Commercial/industrial customers accounted for 828 GWh of sales in 1993, with the residential sector purchasing 154 GWh including 46 GWh for multi-family housing.[R#1,2,5,7] ■

Utility DSM Overview

DATA ALERT: There is no cost or savings data available on electric DSM programs from 1990 through 1992 because Palo Alto's conservation programs focused almost solely on water savings during this period due to the severe drought in California. DSM capacity savings for 1993 do not include savings from residential programs. [R#7]

The City of Palo Alto began its energy conservation programs in 1976. Because Palo Alto is a combined electric, gas, and water utility, the City's conservation options are more open-ended than most utilities, whose programs typically focus on a single end-use. Palo Alto conservation programs are implemented by the Resource Conservation section and in 1993 the utility spent \$272,000 on electric DSM rebates. During the next 20 years the City hopes to reduce its electric load by 15% through conservation efforts. In 1993, DSM programs accounted for 756 kW in capacity savings and 3,842 MWh in energy savings. [R#3,4,6,7]

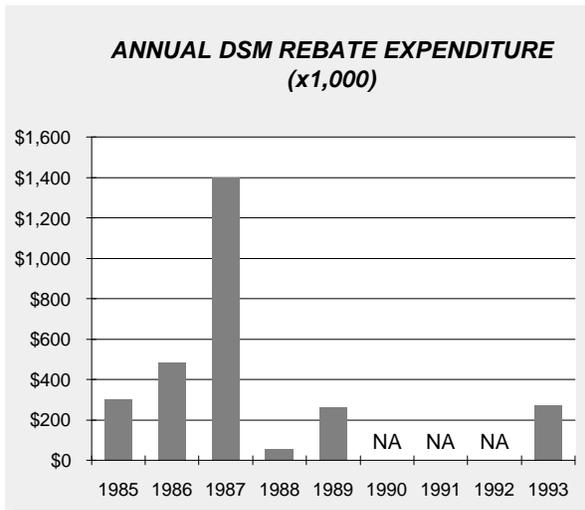
Palo Alto is situated in the metropolitan San Francisco area, which is also home to Pacific Gas & Electric (PG&E), one of the leading DSM utilities in the country. Because PG&E receives so much media exposure for its conservation efforts, there is a great deal of pressure on Palo Alto to offer similar services to its customers. This has led Palo Alto to develop innovative DSM programs, including

PALO ALTO DSM PROGRAMS

- Residential**
- Energy Audits
- CFL Point of Purchase (Pilot)**
- Schools Outreach
- Solar Financing
- Refrigerator Rebate (Pilot)
- Home Weatherization Financing
- Commercial / Industrial**
- Technical & Informational Services
- Project Design Review Assistance
- Energy Audits

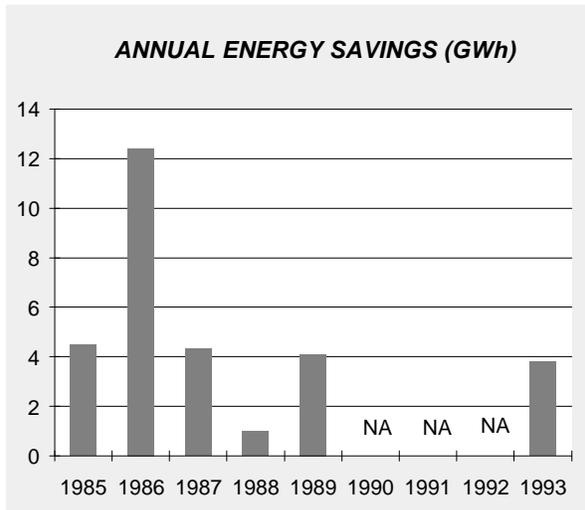
"Michael the Energy Mastermind" which ran from 1983 through 1988 and consisted of a PC-class computer placed in retail stores and programmed to engage customers in simple dialogues about their energy saving opportunities. The computer summarized the value of various savings options in such everyday terms as extra movies and filled gas tanks. By associating energy savings with familiar and desirable activities or commodities, the program sought to ensure that consumers would remember what they had just learned about the benefits of efficiency investments. The computer also told customers in which

UTILITY DSM OVERVIEW	ANNUAL DSM REBATE EXPENDITURE (X1000)	ANNUAL ENERGY SAVINGS (GWh)	ANNUAL CAPACITY SAVINGS (MW)
1985	\$301	4.5	1.49
1986	\$486	12.4	2.05
1987	\$1,400	4.3	2.86
1988	\$53	1.0	0.44
1989	\$262	4.1	1.49
1990	NA	NA	NA
1991	NA	NA	NA
1992	NA	NA	NA
1993	\$272	3.8	0.76
Total	\$2,775	30.1	9.09



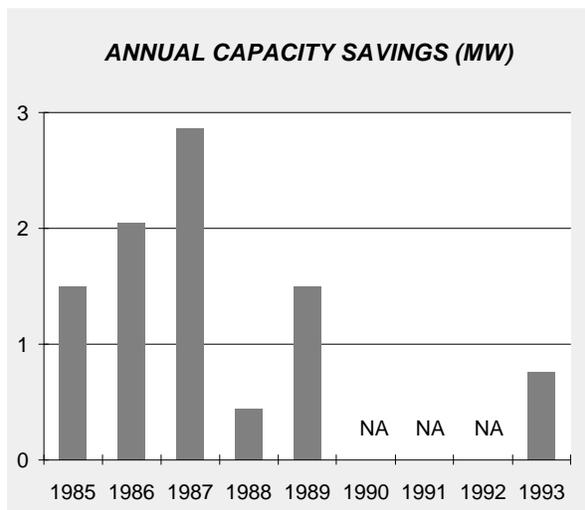
aisle of the store to find what they needed and where to go for more help.[R#6,7,10]

In the past the City has run a variety of other conservation programs including a Furnace Replacement program, a Weatherization program, Energy Audits, the commercial PARTNERS program (a comprehensive rebate program which included thermal energy storage), and Bill Analysis. The City currently offers a Solar Financing program which provides loans for solar domestic water heating and solar pool heating system installations. A Home Weatherization Financing program currently provides single family homes with low interest loans for insulation and other measures. Interested residential customers can receive free energy audits which analyze energy and/or water use and provide recommendations for efficiency improvements. For commercial/industrial customers Palo Alto offers information services, Project Design Review Assistance, and energy audits.[R#3,7]



Palo Alto offers a resource conservation schools program for students in grades K through 12. The City provides classroom presentations, hands-on science demonstrations, and videos, as well as teaching materials and curriculum planning guides.[R#3]

During 1993, Palo Alto also ran a pilot residential Two-Option Compact Fluorescent Mail-in program. Participants had the option of purchasing CFLs on their own and then receiving a \$5 utility rebate or purchasing a CFL from the utility at cost through a mail order program. The Two-Option program was run separately from the Point of Purchase CFL program, the subject of this profile. A pilot Refrigerator Rebate program and Commercial Lighting Rebate program were also implemented in 1993.[R#7,9] ■



Program Overview

After hearing the success stories from large utilities such as Southern California Edison (SCE) and Pacific Gas & Electric (PG&E) regarding their manufacturer rebate programs for compact fluorescent lamps (CFLs), the City of Palo Alto became interested in implementing a similar program with the requisite changes necessary for a small utility. The resulting program was the Residential Compact Fluorescent Lamp Point of Purchase pilot program (referred to as the Point of Purchase or POP program) which was implemented in April 1993.[R#6]

Manufacturer rebate programs typically consist of an incentive paid directly to the manufacturer to lower products' retail prices. Theoretically, this incentive mechanism should reduce the amount of markup at each level of the distribution chain (manufacturer, distributor, retailer) so that the customer winds up paying less for the product at the store. Typically these incentives are administered at the manufacturer level through contracts with utilities. Palo Alto hoped to design a similar program that provided residential customers with easy access to low cost, high quality CFLs, with minimum impact on utility staff time.[R#6]

To get started on their program, the City of Palo Alto researched other utilities' programs, determined which CFL products to offer, and talked to manufacturers and distributors. Because Palo Alto is a small utility, it ran into a big obstacle: Manufacturers felt that it would be an undue burden on them to participate in this type of a program with such a small utility. Therefore, Palo Alto Utilities decided to try to offer the benefits of a manufacturer rebate program in another way.[R#6]

Instead of working with the manufacturers, CPA teamed up with local hardware stores and developed a manufacturer-style rebate program, but without the manufacturer. Historically, hardware stores in Palo Alto were unable to reap the benefits of manufacturer-rebate-subsidized prices on CFLs. Therefore, few CFLs were stocked, and even fewer sold, in large part due to the lamps' prohibitive first costs. CPA, acting as a wholesaler, bought 2,600 CFLs in bulk at a discounted price, subsidized the cost to the hardware stores and sold nearly all 2,600 CFLs to residents with CPA vouchers through the Point of Purchase pilot program. The hardware stores sold the lamps at no markup.[R#6,8]

The program was designed to motivate residents of Palo Alto to purchase high quality CFLs. Vouchers were sent to all residential customers which enabled them to purchase up to 2 CFLs at the subsidized price of \$9 each. A total of 22,970 vouchers were mailed through the program with 1,234 residents participating, thereby garnering a response rate of 5.4%. The program took place during the month of April 1993 so that program implementation would coincide with Earth Day and its resulting publicity.[R#8]

Based on the success of the pilot POP program, Palo Alto has designed and recently received City Council approval for a larger scale Point of Purchase program. This program will be implemented for up to 8 weeks in the Fall of 1994, timed to coincide with Energy Awareness Month and Public Power Week, as well as the end of daylight savings time, traditionally a peak period for lamp sales. The program will also be closely modeled after the 1993 pilot program. The utility is planning a budget of \$95,000 for the program with a net cost of \$50,000 following vendor repayments. The 1994 POP program may offer energy-efficient halogen floodlights in addition to CFLs, with bill inserts sent to all Palo Alto customers allowing them to buy 4-5 CFLs, instead of two, at the special program price. The program will also emphasize the higher wattage lamps to increase program savings and in response to customer preference, revealed by a follow-up survey. Furthermore, it is possible that lamps will be available from additional sources beyond the four Palo Alto hardware stores.[R#8,9] ■

MARKETING

A month before the POP pilot program began, Palo Alto included a general description of compact fluorescent lamps and their benefits in all residential utility bills. Additionally, a week before the program began, an educational advertisement on CFLs was run in a local newspaper to promote the lamps.[R#6,8]

The main marketing piece was the customer voucher. At the beginning of the program in April, the special vouchers were mailed to 22,970 Palo Alto residential accounts with local mailing addresses. Participating hardware stores were listed on the voucher and the lamps for sale were described. These vouchers advised customers that, "For Earth Day your Mother wants you to: clean your room, eat your vegetables, and use an energy efficient CFL." The voucher was a tri-fold brochure that not only promoted the benefits of CFLs, but was used to verify Palo Alto residency of participants. [R#6,8]

In the first two weeks of the program, more advertisements were run describing the program, lamp specifications, and hardware store locations. All of these advertisements had a similar look to the vouchers to help increase program awareness, although the vouchers had more detailed information about the benefits of the lamps. A final advertisement was run after the program to thank the hardware stores and the residents for their participation in the pilot program.[R#6,8]

In addition, in-store educational material was also a factor in making the program a success. Fact sheets addressing frequently asked questions were provided to all the stores, including information on selecting and installing the proper CFLs for the customer's needs. Each store was also given a working display of an electric meter with two sockets, one for a CFL and one for its incandescent equivalent. This display clearly demonstrated for customers the energy savings of compact fluorescent lamps.[R#6]

DELIVERY

From April 1, 1993 through April 30, 1993 the City of Palo Alto and local hardware stores teamed up to provide customers with compact fluorescent lamps at a price of \$9 apiece, compared to the typical price range of \$15 to \$25. Three different bulbs were made available: the Philips SLS-15, Philips SLS-23, and Lights of America 30-watt circline. In order to purchase lights at the discounted price, customers had to fill out and present the voucher that was mailed to all customers by the City. Participants had to be Palo Alto residents and there was a limit of two lamps per voucher. Vouchers were valid throughout April 1993. The four hardware stores in Palo Alto participated in the program. Customers could return any bulbs they were not satisfied with within 2 weeks of purchase to the hardware store or beyond that time directly to the utility. Participants returning bulbs were given the option of receiving replacement bulbs or their money back.[R#2,7]

In order to get the program started, CPA staff met with the owners of the four hardware stores in Palo Alto to determine whether they would participate in this program. CPA/retailer consignment contracts were developed and signed to describe the liabilities and responsibilities of each. Once contracts were signed between CPA and all four hardware stores, residents were invited to go to any one of them to buy the \$9 lamps during April. Even though the hardware stores were not going to make any profit from the CFL sold with vouchers, they were all anxious to participate. The stores expected to benefit from program advertisements, increased foot traffic, and a sense of public goodwill from being tied in with a community-sponsored environmental program. The stores were also encouraged to charge their usual price for CFLs and keep any profits from the sale if anyone wanted to buy additional CFLs without a voucher.[R#6] 

Implementation (continued)

Since CPA wanted to make the customers' experience with CFLs positive as well as affordable, staff researched and then chose lamps that offered bright, high quality light, and that would fit in most fixtures without any modification. Each lamp had an electronic ballast and tri-phosphor coating to ensure quick starting and high quality light. Wattages of 15, 23, and 30 (60, 90 and 150-watt incandescent equivalents) were chosen to offer customers a wide range of brightness. The lamps selected were also some of the smallest available, allowing customers to fit them into the greatest number of applications possible. [R#6,8]

CPA bought the 3 different CFL models in bulk for an average of \$12.32 per bulb. CPA subsidized each lamp cost further to get the lamp price down to \$9 each. For the pilot program, the hardware stores agreed to forego any price mark-up in order to keep the CFL price below \$10, the perceived affordability barrier shown by studies. The stores reimbursed CPA at \$9 a lamp for voucher purchases or at the CPA bulk cost for each lamp sold without a voucher, although the stores charged full list price for bulbs sold without vouchers. While CPA did not have to pay sales tax on the bulk purchase, customers did have to pay sales tax on the lamps at the hardware store. [R#6]

Once the program began it essentially ran itself, with most of the details taken care of by the participating hardware stores. For instance, the hardware stores answered most customer questions, while the utility's role was to keep the stores stocked with lamps and to answer any questions the hardware stores could not handle. The utility, however, did all of the pre-program design and all of the post-program wrap up. [R#6,8]

MEASURES INSTALLED

CPA's program offered three different CFL lamps for installation, all having an electronic ballast and tri-phosphor coatings. The smallest bulb offered was the Philips Earthlight SLS-15. It is equivalent to a 60-watt incandescent and has an estimated 10,000-hour lifetime. The midrange-

sized bulb offered, the Philips Earthlight SLS-23, is equivalent to a 90-watt incandescent and also has a 10,000-hour life. The largest bulb, the Lights of America 30-watt circline, a 150-watt incandescent equivalent with a modular lamp and ballast design, has 9,000 hours of bulb life and 65,000 hours of ballast life. [R#2]

PURCHASED MEASURES	PHILIPS SLS - 15	PHILIPS SLS - 23	LOA 30	TOTAL
1993	978	1,074	568	2,620

Initially the Utilities Department purchased 2,303 lamps for the program. Midway through the program an additional 366 lamps had to be added to the program inventory to satisfy customer demand. A total of 840 Philips SLS-15 bulbs were sold with vouchers and 138 were sold without vouchers. The Philips SLS-23 was the best selling lamp with 1,031 sold with vouchers and 43 sold without vouchers. A total of 532 Lights of America 30-watt lamps were purchased with vouchers and 36 were purchased without vouchers. A total of 49 lamps were not sold. Of the 49 not sold through the program, 28 were purchased by a hardware store for their own supply, another indication of the program's success in convincing hardware stores that the lamps are indeed a marketable commodity. [R#8]

STAFFING REQUIREMENTS

Bruce Lesch was the program manager for the POP pilot program, devoting a total of 200 hours of his time to the program. Mr. Lesch was instrumental in program planning and once the program started he went to each hardware store twice weekly to answer any questions and provide new bulbs. [R#7]

Additional Palo Alto staff worked a total of 217 hours on the program, primarily during the planning and evaluation stages. In total, the program required the time of 1/5 full-time equivalent (FTE). [R#7] ■

Monitoring and Evaluation

MONITORING

One of the elegant aspects of the program was its built-in monitoring system. The program's compact fluorescent lamps were tracked primarily via the vouchers that form the core of the program. The utility knew the exact number of vouchers mailed to its residential customers. Based on the number of vouchers redeemed, the utility could easily track and calculate participation and penetration of the lamps in customers' homes. As the vouchers changed hands, from the utility to its customers to the hardware stores and back to the utility, the program was explicitly tracked at a minimal cost.

Hardware stores were of course integral to the program and because of the program design they were also directly motivated to provide accurate tracking of the program's effect. The utility kept a precise count of the number of lamps provided to each hardware store. Since the store owners were responsible to repay the utility \$9 for each voucher they received, and the full list price of lamps sold without vouchers, they had a direct incentive to return the exact number of vouchers to the utility. As such, the utility knew the exact number of lamps sold at discounted prices through the program and also the number of lamps sold at list price by the participating hardware stores, an induced effect of the program, or what is now commonly called free ridership.[R#7]

EVALUATION

Program savings are based on engineering estimates coupled with standard industry values for free ridership and the results of the post program survey which was used to determine program measure attrition.[R#7,8] The utility sent a post program survey to all participants. Of the 1,234 program participants, 830 responded to the survey. A few key results of this survey include:

With regards to product quality, 97% of participants liked the long lamp lifetime, 84% found the light quality acceptable, 75% found the brightness level acceptable, and 70% thought the lamps' start-up times were acceptable. In terms of participant motivation, 59% purchased the lamps for the dollar savings and 41% purchased the lamps to benefit the environment. Only 14% of participants had tried CFLs previously and were satisfied enough to try them again through the POP program. A total of 85% of participants said they would purchase CFLs again, especially if the price was discounted. The survey found a non-retention rate of 11% for the program.[R#8]

Palo Alto Utilities completed a brief process evaluation of the POP program in April 1994. This evaluation summarizes the motivation for the program, target market, product selection, marketing and implementation, savings and costs.[R#8] ■

Program Savings

SAVINGS OVERVIEW	ANNUAL ENERGY SAVINGS (MWh)	CUMULATIVE ENERGY SAVINGS (MWh)	LIFECYCLE ENERGY SAVINGS (MWh)	ANNUAL CAPACITY SAVINGS (MW)
1993	169	169	1,484	NA

DATA ALERT: Reported savings are net savings, adjusted for a free ridership rate of 5% and a non-retention rate of 11%, which creates a net to gross ratio of 84%. The non-retention rate is based on the participant survey. Palo Alto did not estimate capacity savings for the program as the utility felt kW savings were not significant for such a program. [R#7]

lamps were purchased by customers, with 217 lamps purchased at full list price. Of the 22,970 customers sent vouchers, 1,234 purchased lamps, equaling a participation rate of 5.4%. Savings per customer total 137 kWh for 1993. For the upcoming 1994 POP program, Palo Alto hopes to sell approximately 5,000 bulbs over a two-month period. [R#7,8]

First year net annual energy savings for the Point of Purchase program are estimated to be 169 MWh. Gross savings were estimated at 201 MWh. Palo Alto estimates that over the lifetime of the bulbs sold through the program, energy savings of 1,484 MWh will be achieved, as well as customer savings of \$123,238. [R#2,7]

FREE RIDERSHIP

Palo Alto has assigned a free ridership rate of 5% to the POP program based on an EPRI study of similar programs run by other utilities. Free ridership was not addressed by the participant survey. [R#7]

PROGRAM PARTICIPATION	NUMBER OF PARTICIPANTS	PARTICIPANTS' ANNUAL ENERGY SAVINGS (kWh)
1993	1,234	137

Non-Participants 95%



Participants 5%

PARTICIPATION RATES

Program participants are defined as utility customers using program vouchers to purchase CFLs. Although the maximum number of lamps a customer could purchase at the subsidized price was two, the average number of lamps purchased by customers was 2.1. This occurred because most participants (94%) bought two or more lamps, paying full price for the extra units. A total of 2,620

MEASURE LIFETIME

The utility assigned an average measure lifetime of 8.8 years to the program for the three types of bulbs sold. The utility assumes a burn rate of 3 hours per day for each lamp provided through the program. [R#7] ■

Cost of the Program

COSTS OVERVIEW	ADMIN. (x1000)	MARKETING (x1000)	PURCHASE COST OF CFLs (x1000)	GROSS PROGRAM COSTS (x1000)	MONEY RETURNED FROM VENDORS (x1000)	NET PROGRAM COST (x1000)	NET COST PER PARTICIPANT
1993	\$5.1	\$4.1	\$32.9	\$42.1	\$21.9	\$20.2	\$16.34

DATA ALERT: Near the end of the Point of Purchase program, Palo Alto realized the supply of LOA-30 and SLS-23 lights was running out. Instead of purchasing additional lamps, the City used lamps left over from a previous program. Because this previous program was much smaller in scope, the utility's cost per lamp was much higher. This higher price was calculated into the average program price of the lamps. [R#7]

The Results Center calculated the cost of saved energy for the program in 1993, which ranged from 1.57 ¢/kWh at a 3% discount rate to 1.71 ¢/kWh at a 5% discount rate, and 2.02 ¢/kWh at a 9% discount rate.

COST PER PARTICIPANT

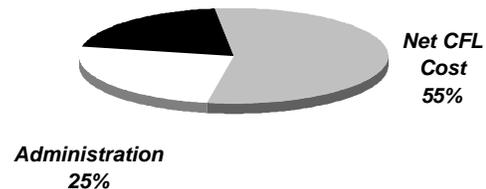
In terms of utility incurred costs for lamp purchases, the average cost per lamp for the entire program was \$12.32. Customers spent a total of \$21,900 on the program, equal to \$17.74 per participant (note that per The Results Center convention, \$21,900 is a levelized figure, bringing the cost per participant below the simple calculation of \$9 per bulb times 2.1 bulbs per customer). In terms of net program costs, Palo Alto spent \$16.34 per participant. [R#7] ■

In 1993, Palo Alto spent \$5,100 on program administration, \$4,100 on marketing, and \$32,900 to purchase the CFLs. Therefore gross program costs totaled \$42,100. The utility received \$21,900 back from customers via the hardware stores, creating a net program cost of \$20,200. [R#8]

COST EFFECTIVENESS

Palo Alto calculated the program's benefit/cost ratio for cost effectiveness. Using the Total Resource Cost test, staff found the program to have a B/C ratio of 1.12; using the Rate Impact Measure test, the program's benefit/cost was 0.44. [R#8]

Marketing 20%



COST OF SAVED ENERGY AT VARIOUS DISCOUNT RATES (¢/kWh)	3%	4%	5%	6%	7%	8%	9%
1993	1.57	1.64	1.71	1.79	1.86	1.94	2.02

Environmental Benefit Statement

AVOIDED EMISSIONS BASED ON: 169,000 kWh saved 1993						
<i>Marginal Power Plant</i>	<i>Heat Rate BTU/kWh</i>	<i>% Sulfur in Fuel</i>	<i>CO2 (lbs)</i>	<i>SO2 (lbs)</i>	<i>NOx (lbs)</i>	<i>TSP* (lbs)</i>
COAL: Uncontrolled Emissions						
A	9,400	2.50%	364,000	9,000	2,000	0
B	10,000	1.20%	389,000	3,000	1,000	1,000
Controlled Emissions						
A	9,400	2.50%	364,000	1,000	2,000	0
B	10,000	1.20%	389,000	0	1,000	0
C	10,000		389,000	2,000	1,000	0
Atmospheric Fluidized Bed Combustion						
A	10,000	1.10%	389,000	1,000	1,000	0
B	9,400	2.50%	364,000	1,000	1,000	0
Integrated Gasification Combined Cycle						
A	10,000	0.45%	389,000	1,000	0	0
B	9,010		349,000	0	0	0
GAS: Steam						
A	10,400		212,000	0	0	0
B	9,224		184,000	0	1,000	0
Combined Cycle						
1. Existing	9,000		184,000	0	1,000	0
2. NSPS*	9,000		184,000	0	0	0
3. BACT*	9,000		184,000	0	0	0
OIL: Steam--#6 Oil						
A	9,840	2.00%	307,000	5,000	1,000	1,000
B	10,400	2.20%	325,000	5,000	1,000	0
C	10,400	1.00%	325,000	1,000	1,000	0
D	10,400	0.50%	325,000	2,000	1,000	0
Combustion Turbine--#2 Diesel						
A	13,600	0.30%	407,000	1,000	1,000	0
REFUSE DERIVED FUEL: Conventional						
A	15,000	0.20%	483,000	1,000	2,000	0

In addition to the traditional costs and benefits there are several hidden environmental costs of electricity use that are incurred when one considers the whole system of electrical generation from the mine-mouth to the wall outlet. These costs, which to date have been considered externalities, are real and have profound long term effects and are borne by society as a whole. Some environmental costs are beginning to be factored into utility resource planning. Because energy efficiency programs present the opportunity for utilities to avoid environmental damages, environmental considerations can be considered a benefit in addition to the direct dollar savings to customers from reduced electricity use.

The environmental benefits of energy efficiency programs can include avoided pollution of the air, the land, and the water. Because of immediate concerns about urban air quality, acid deposition, and global warming, the first step in calculating the environmental benefit of a particular DSM program focuses on avoided air pollution. Within this domain we have limited our presentation to the emission of carbon dioxide, sulfur dioxide, nitrous oxides, and particulates. (Dollar values for environmental benefits are not presented given the variety of values currently being used in various states.)

HOW TO USE THE TABLE

1. The purpose of the accompanying page is to allow any user of this profile to apply the City of Palo Alto's level of avoided emissions saved through its CFL Point of Purchase Pilot Program to a particular situation. Simply move down the left-hand column to your marginal power plant type, and then read across the page to determine the values for avoided emissions that you will accrue should you implement this DSM program. Note that several generic power plants (labelled A, B, C,...) are presented which reflect differences in heat rate and fuel sulfur content.

2. All of the values for avoided emissions presented in both tables include a 10% credit for DSM savings to reflect the avoided transmission and distribution losses associated with supply-side resources.

3. Various forms of power generation create specific pollutants. Coal-fired generation, for example, creates bottom ash (a solid waste issue) and methane, while garbage-burning plants release toxic airborne emissions including dioxin and furans and solid wastes which contain an array of heavy metals. We recommend that when calculating the environmental benefit for a particular program that credit is taken for the air pollutants listed below, plus air pollutants unique to a form of marginal generation, plus key land and water pollutants for a particular form of marginal power generation.

4. All the values presented represent approximations and were drawn largely from "The Environmental Costs of Electricity" (Ottinger et al, Oceana Publications, 1990). The coefficients used in the formulas that determine the values in the tables presented are drawn from a variety of government and independent sources. ■

* Acronyms used in the table

TSP = Total Suspended Particulates

NSPS = New Source Performance Standards

BACT = Best Available Control Technology

Lessons Learned / Transferability

LESSONS LEARNED

The pilot Point of Purchase program showed that a smaller utility can boost CFL sales by offering the lamps to customers at reduced prices.

Palo Alto's hardware stores clearly demonstrated their willingness to participate in such a program. Due to the minimal financial risk of a consignment agreement and other benefits, the hardware stores have indicated interest in being involved in similar programs in the future. By participating in the program, the hardware stores saw additional sales as well as the arrival of customers who had never been in their stores before.

CPA received the majority of the CFL purchase price back from the hardware stores, so a small subsidy was able to go a long way in bringing the initial CFL costs down for consumers.

Very few customers have returned their CFLs. With a positive response to the lamps from customers and the fact that several lamps were purchased without vouchers, an added benefit of the pilot program was the indication that there is a solid market for CFLs in Palo Alto.[R#6]

The Resource Conservation staff has come up with the following lessons learned from the pilot POP program. Many of these ideas have been incorporated into the proposed design for the 1994 POP program:

Make sure that all of the lamps are in the utility's possession before the program starts: A primary obstacle

the City had to face was the last minute withdrawal of the supplier who won the bid to provide the SLS 15 lamps for the POP program. Palo Alto was notified one week before the pilot program was to begin that the supplier could not deliver on time and could not get any lamps at all due to a nationwide shortage. The City eventually found enough lights but had to pay a premium (\$14.95 per lamp plus shipping compared to \$12.25 per lamp and free shipping.)[R#7]

Emphasize higher wattage lamps: While the lower wattage lamps used in the pilot program were smaller and fit into more applications than higher wattage lamps, the lower wattage lamps did not sell as well. The smaller lamps also had a higher return rate. In addition, higher wattage lamps achieve greater energy savings as the delta between standard and high-efficiency lamps increases for higher wattage lamps.[R#7]

Use bill stuffers instead of direct mail vouchers: Because all Palo Alto residential customers received the lamp vouchers as well as the added POP pilot marketing, mailing vouchers separately is not considered necessary for the proposed 1994 POP program. By using only bill stuffers to market the 1994 program, the utility can further minimize program costs.[R#7]

Increase benefits for the vendors: Two of the four vendors in the pilot POP program did not display the lamps but instead kept them in the back of the store or under the counter, waiting for customers to request them. Apparently the vendors were interested in the program solely as a way of bringing people into their stores. Sales of the

lamps were incidental. In fact, on credit card purchases the vendors actually lost 4% of the sale cost as the credit card company's charge to the hardware store was not recouped from the utility.

Program staff note that better incentives are needed to get vendors to promote the lamps more enthusiastically. During the pilot phase, the store with the best display far outsold the other three stores. Similarly, three of four stores were late in paying the money owed Palo Alto Utilities from lamp sales, however all money was paid within 60 days of the billing due date. Therefore, incentives for early payment and penalties for late payment are being considered. The payment timing was not a major issue however, as the amount of money owed was quite small compared to Palo Alto's total utility budget.[R#7]

TRANSFERABILITY

The utility recently won a grant from the California Municipal Utilities Association to demonstrate to other utilities how to run a similar program. This \$8,500 grant will supplement program costs in return for a report documenting the POP program.[R#7,8]

There are a variety of program design options that have been used to promote CFLs, including programs implemented by Central Maine Power, Northeast Utilities, and Boston Edison (See The Results Center Profiles #19,21,23). Initially Central Maine Power used the local Lions Club to distribute bulbs at a nominal charge to customers. In the latter stages of the program, it became quite similar in design to Palo Alto's program, providing cou-

pons to purchase two bulbs at \$9 apiece. CMP found the best redemption rate was achievable by having the coupons available at the point of purchase.

Northeast Utilities developed a mail order program for approximately 40 energy-efficient lighting products, with products for sale at substantial discounts. Boston Edison has offered its Residential Efficient Lighting program since 1987, offering mail-in and on-site ("instant") rebates for efficient lighting measures.

It is interesting to note that in terms of ¢/kWh, the Palo Alto program was more cost effective than the three other programs mentioned above. In addition to having a low cost of saved energy, the Palo Alto program should be relatively easy for other small and medium sized utilities to replicate, due to the low cost and limited staff time required to implement the program. The primary challenge with such a program is convincing local retailers to participate. ■

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