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Pacific Gas and Electric Company
Subcompact Fluorescent Lamp Program
For
Multi-Unit Dwelling Customers

Executive Summary

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Executive Summary

Introduction

The California Public Utility Commission's Board of Energy Efficiency identified the Multi-Unit Dwelling (MUD)[1] sector as underserved. Pacific Gas and Electric Company (PG&E) was seeking to increase efficiency program participation and market transformation within the MUD sector through a *Subcompact Fluorescent Lamp (Sub-CFL) Program*[2], hereinafter referred to as the "Program." This Program, initiated in July 2000, was designed by PG&E to increase the sales and use of compact fluorescent light bulbs in this underserved sector. PG&E engaged the services of Battelle Pacific Northwest Division (Battelle) to undertake this Program. The scope of the Program and results of implementing the Program are summarized below.

PG&E MUD Customer Sector Size and Lighting Baseline Assessment

The MUD sector is characterized by "common areas" and "tenant (living) units." In most MUD properties, electricity use for common areas is billed to common area accounts and paid for by the owner/operator. Electricity use in inhabited (living) units is, typically, billed to the tenant. For billing purposes, common areas include walkways, grounds (maintenance and irrigation), parking areas, pools, recreational facilities, laundry rooms, vacant units, and manager storage and offices. In a small percentage of MUD properties across the nation, all electricity usage is billed to a "master metered" account and paid by the owner/operator with tenant electricity costs recovered in rents and fees billed to the tenant.

The primary end-use target for sub-CFL sales under this Program was replacement of incandescent light bulbs in common areas. Thus, the first objective was to sell sub-CFLs directly to MUD owners/operators for the common areas. Selling sub-CFLs directly to tenants was a secondary objective.

Based on customer account data received from PG&E, commercially available databases on multifamily properties in California from the private sector, and a statewide survey jointly undertaken in 2000 by the four California investor-owned utilities, there is an estimated 1 million common area and tenant customers that receive electricity from PG&E [1,2]. Of these 1 million, more than 700,000 PG&E customers reside in buildings having five or more units; this is the targeted customer base for the Program.

[1] The MUD sector is defined as multifamily complexes of 5 or more living units.

[2] Sub-CFLs are defined in terms of length, price, and wattage. In general, the sub-CFLs cost between $5 and $10 each at the retail level. The sub-CFLs are screw-in lamps that range in length from less than 6 inches to 4.5 inches, depending on the wattage, which ranges from 15W to 26W. Sub-CFLs are designed to fit into almost all incandescent light bulb fixtures. They are shorter than conventional screw-base CFLs due to innovations in both tube configuration and ballast design.

From the statewide survey data, the common area incandescent light bulb stock for MUD, condominium association, and homeowner association complexes served by PG&E is given in Table 1.

Table 1. Common Area Incandescent Light Bulb Stock in MUD, Condominium Association, and Homeowner Association Complexes Served by PG&E

Property	Outdoor Light Bulbs	Indoor Light Bulbs	Total Light Bulbs
MUD Complexes	198,000	97,000	295,000
Condos/Homeowners	64,000	36,000	100,000
Total	262,000	133,000	395,000

Thus, the total common area (indoor+outdoor) stock of incandescent light bulbs in MUD complexes/properties is estimated to be 295,000. Inclusion of condominium and homeowner property associations adds another 100,000 incandescent light bulbs. This brings the estimated maximum number of incandescent light bulbs available for replacement with sub-CFLs under this Program to 395,000.

Approach to Reach the MUD Sector

The focus of the Program was to reach the MUD sector through property/apartment associations in the PG&E service territory. Statewide in California, approximately 25 to 40% of MUD complexes are members of at least one apartment association, and thus the apartment association information channel was used as *the* initial point of entry to the MUD sector [3].

A key benefit of working through the associations is the credibility of the information delivery channel. Surveys conducted indicate that association members read the materials that come from their associations, and they trust their associations [3]. The second most trustworthy information source is their electric utility. Thus, for this Program, the initial contact with the MUD sector was through the apartment associations located within the PG&E service territory.

To strategically position the Program and to open up an avenue for strategic marketing, a working relationship was first established with the California Apartment Association (CAA). The CAA is a statewide organization that represents 19 regional/local apartment associations within the state, of which 14 associations are within the PG&E service territory. The CAA represents tens of thousands of MUD owner/operators and property management companies, which together manage more than 1.5 million rental units. Establishing a relationship with the CAA gave immediate credibility to the Program as well as an entrée to the CAA member associations in the PG&E service territory.

In addition to the apartment associations, other large MUD groups and associations (designated as "non-aligned") were targets for the Program. These included retirement

communities (such as Rossmore, Walnut Creek), the Presidio of San Francisco, the Non-Profit Housing Association of Northern California, and the California State University system (university-owned student apartments).

Sub-CFL Products and Prices

This Program took advantage of a U.S. Department of Energy (DOE) Emerging Technologies Program managed by Pacific Northwest National Laboratory (PNNL), operated by Battelle for DOE. DOE had already incurred the cost of putting a competitive centralized procurement of these new-to-the market sub-CFLs in place [4]. The use of this centralized procurement was free to PG&E and thus formed the basis for bringing sub-CFLs to PG&E's MUD sector. PG&E matched Battelle's expertise in sub-CFLs and the MUD market with the need to increase market transformation and energy efficiency efforts in the MUD sector.

The sub-CFLs available for this Program were restricted to only those that were Energy Star®-certified and only those being sold in the DOE sub-CFL program.[3] At the time this Program was launched, there were four sub-CFL suppliers qualified to sell lamps in the DOE sub-CFL program: JKRL USA[4], Casselberry FL; Lights of America, Walnut, CA; Sunpark Electronics Corporation, Torrance, CA; and Surya Roshni, Inc., Beaverton, OR.

PG&E determined that the most effective means to reach the Program goals was to buy down the first cost of the sub-CFLs that would be sold by these suppliers *directly* to the MUD sector customers. Thus, through formal agreements between Battelle and the four sub-CFL suppliers, a buy-down (incentive) payment of $3/lamp was provided to the suppliers by PG&E through Battelle for each documented lamp sale. This buy-down was reflected in a reduced price to the MUD sector customers of a minimum of $3 less than the prices available through the DOE sub-CFL program at the time the sub-CFL sales in this Program began—in early October 2000.

The agreements with the suppliers spelled out the sales reporting requirements. A key part of the agreements was to ensure that the lamps were only sold to qualifying MUD owners/operators, tenants or property management firms, and to capture customer data for reporting to PG&E. Thus, ground rules were set such that each supplier had to collect adequate data during the order-taking process to ensure that the buyer qualified for the Program—that 1) the lamps were purchased for a multifamily dwelling 2) the dwelling in which the lamps were to be installed was served electricity by PG&E, and 3) the lamps would not be resold. These data were recorded by the suppliers on the order form.

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[3] The CFL products and prices for the DOE sub-CFL program were available for purchase nationwide on www.pnl.gov/cfl at the time this Program was launched.

[4] Company name was changed in July 2001 to AbleLight/JKRL USA.

®Energy Star is a registered trademark of the U.S. Environmental Protection Agency that has been licensed to the U.S. Department of Energy.

The model information and delivered unit prices at the start of the program for the smallest purchase size (either 6 or 10 lamps) are shown in Table 2.

Table 2. Sub-CFL Products and Prices at Start of the Program

Supplier	Model	Wattage	Description				Initial Unit Price[c]
			Light Output	Lifetime	MOL[a]	MOW[b]	
JKRL	YERSB15P	15	900 Lumens	10,000 hours	5.25"	2.50"	$3.80
	YERSB20P	20	1200 Lumens	10,000 hours	5.40"	2.50"	$4.05
	YERSB23P	23	1380 Lumens	10,000 hours	5.40"	2.63"	$4.35
	YERSB26P	26	1560 Lumens	10,000 hours	5.80"	2.63"	$4.60
Lights of America	2415	15	900 Lumens	10,000 hours	4.68"	2.40"	$4.25
	2420	20	1200 Lumens	10,000 hours	4.18"	2.50"	$4.25
Sunpark	SP15SL	15	900 Lumens	10,000 hours	5.20"	2.28"	$2.50
	SP20SL	20	1200 Lumens	10,000 hours	5.20"	2.28"	$2.70
	SP23SL	23	1380 Lumens	10,000 hours	5.60"	2.28"	$2.90
Surya	PMI/ET15	15	900 Lumens	8,000 hours	4.56"	2.25"	$2.95

[a]MOL = Minimum Overall Length; [b]MOW = Minimum Overall Width; [c] Price includes delivery, is for the smallest order quantity (minimum order size set by supplier), and reflects the $3 PG&E incentive.

Program Sales, Goals, and Results

Sub-CFL orders were taken starting the first week of September 2000 and were terminated the first week of March 2001 with total lamp orders of 87,942. The history of lamp orders by month is given in Figure 1.

An order was considered "sold" only after it was fulfilled (i.e., delivered to the customer). Hence, throughout the Program, there were usually significantly more orders than sales (delivered lamps), as the backlog of orders to be delivered was substantial until early August 2001. All lamps were delivered by the end of August 2001. The sub-CFLs delivered each month, by sub-CFL supplier, is shown in Table 3.

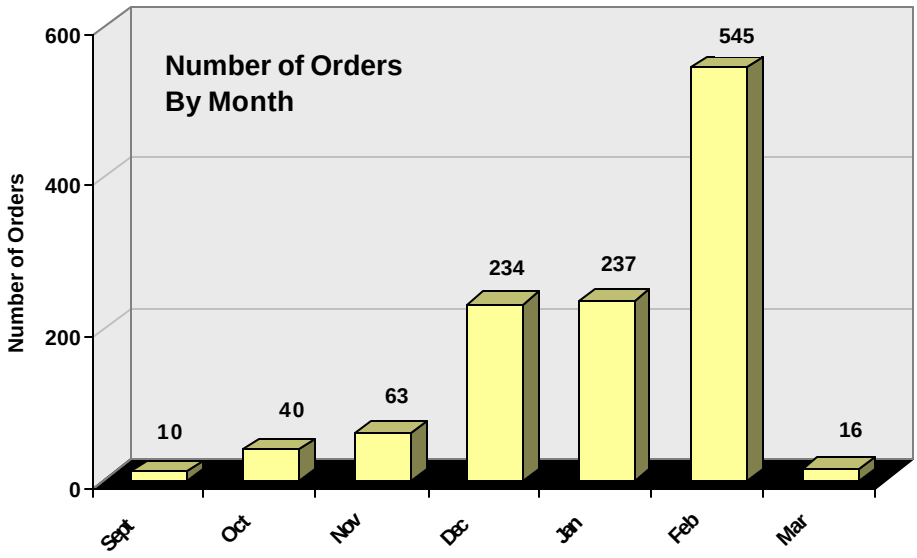
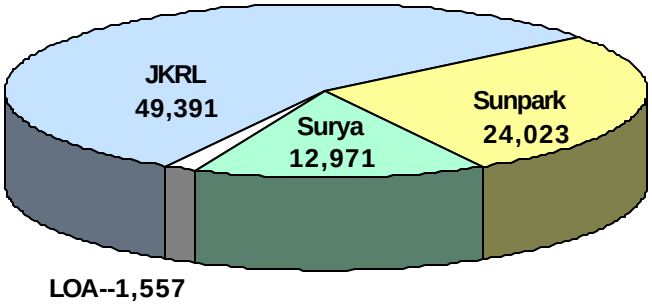


Figure 1. History of Sub-CFL Orders

Table 3. Sub-CFL Lamp Delivery History

Supplier	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	TOTAL
JKRL	936	1,306	1,850	6,771	583	0	2,786	4,421	23,506	2,028	5,204	**49,391**
LOA	72	180	157	546	602							**1,557**
Sunpark	1,503	1,059	2,651	7,069	5,042	6,699						**24,023**
Surya	186	2,638	3,943	2,102	4,102							**12,971**
TOTAL	**2,697**	**5,183**	**8,601**	**16,488**	**10,329**	**6,699**	**2,786**	**4,421**	**23,506**	**2,028**	**5,204**	**87,942**

The total sales (delivered lamps) by manufacturer are shown in Figure 2. As determined from Figure 2, JKRL sold 56% of the lamps followed by Sunpark (27%), Surya (15%), and LOA (2%).[5]



[5] In early January 2001, LOA voluntarily discontinued taking orders in the Program.

Figure 2. Total Lamp Sales by Supplier

The Program goals for PG&E were as follows:

1. Increase the "targeted consumers" awareness of the benefits of sub-CFLs.
2. Increase the demand for sub-CFLs by targeted consumers.
3. Increase the supply of sub-CFLs in PG&E's service territory.
4. Recruit property associations to act as a point of distribution for sub-CFLs to targeted consumers.
5. Educate the targeted consumers on the benefits of the Energy Star-certified sub-CFLs.
6. Assist the targeted consumers in reducing their energy costs by using sub-CFLs.

Program Goal #1 was met through several venues including attending two property association trade shows, 15 property association membership meetings, direct mailing of educational/promotional material and a sample sub-CFL to 187 property management firms and 50 of the largest master-metered properties, mailing program and educational material and order forms to nearly 10,000 MUD complexes, and the creation of a web site (www.pnl.gov/sub-cfls) specifically for this Program.

Program Goal #2 was met by a final Program sales tally that represents the potential replacement of approximately 22% of the current stock of incandescent light bulb in sockets in the common areas of MUD complexes in the PG&E service territory. Based on data taken by the suppliers at the time of the order, the customers indicated that over 96% of the purchased lamps would be used in the common areas of MUD properties with the remaining 4% to be used in non-common areas.

Program Goal #3 was met by making available a choice of 10 sub-CFL products in wattages of 15W, 20W, 23W and 26W, from four suppliers at incentivized prices at the conclusion of the Program ranging from $1.85 to $3.05/lamp delivered. The total sales by wattage is shown in Figure 3. Three of the four suppliers indicated that they had no significant sales to the targeted customers nor any retail-store sales in the PG&E service territory before the Program; these three suppliers sold 98% of the lamps in this Program. These same three suppliers reported a significant number of lamp sales (at non-incentivized prices) to other customer groups and retail outlets in the PG&E service territory (and throughout the West Coast) since the initiation of this Program.

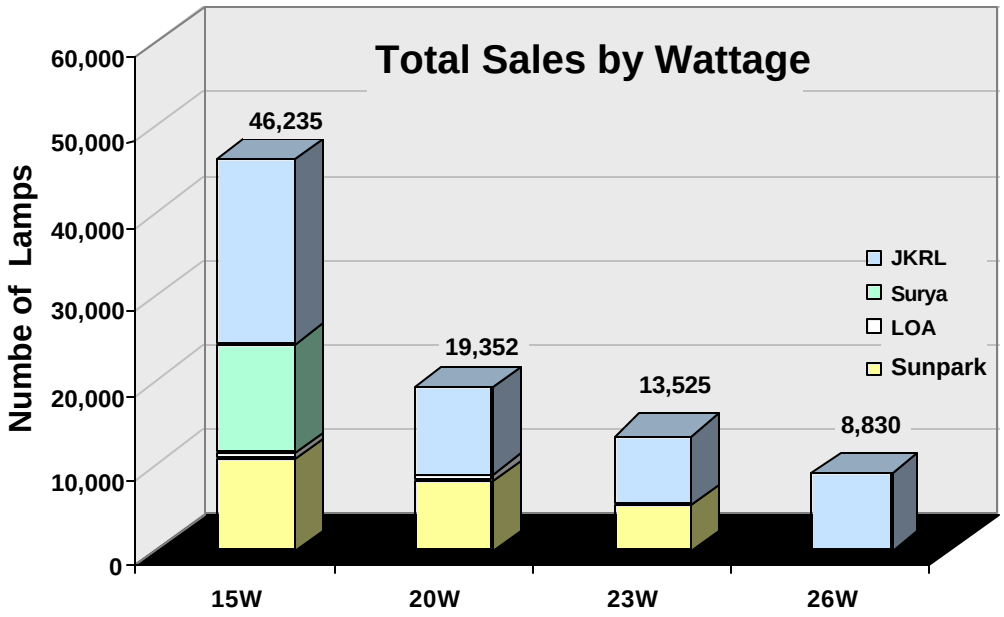


Figure 3. Sub-CFL Sales by Wattage

Program Goal #4 was indirectly met by establishing a working relationship with 15 property associations in the PG&E service territory representing over 9,000 owners/operators who manage approximately 37,100 MUD properties and 556,500 MUD units. Though the property associations were not a point of sales or distribution of the sub-CFLs themselves, they clearly acted as the primary and credible conduit through which their membership was reached with promotional, educational and sales information about the sub-CFLs. Program promotion ads were placed in nine association journals over a 4-month period, and articles on the Program (and value of the sub-CFLs) appeared in six MUD publications early in the Program. Analysis of the sales data shown in Figure 4 indicates that over 62% of the buyers who responded to the question (asked by the suppliers at the time of the order), heard about the sub-CFL program through their property association. Including "printed materials," much of which appeared as advertisements in property association journals or fliers handed out at association-related activities, this number increases to nearly 94%.

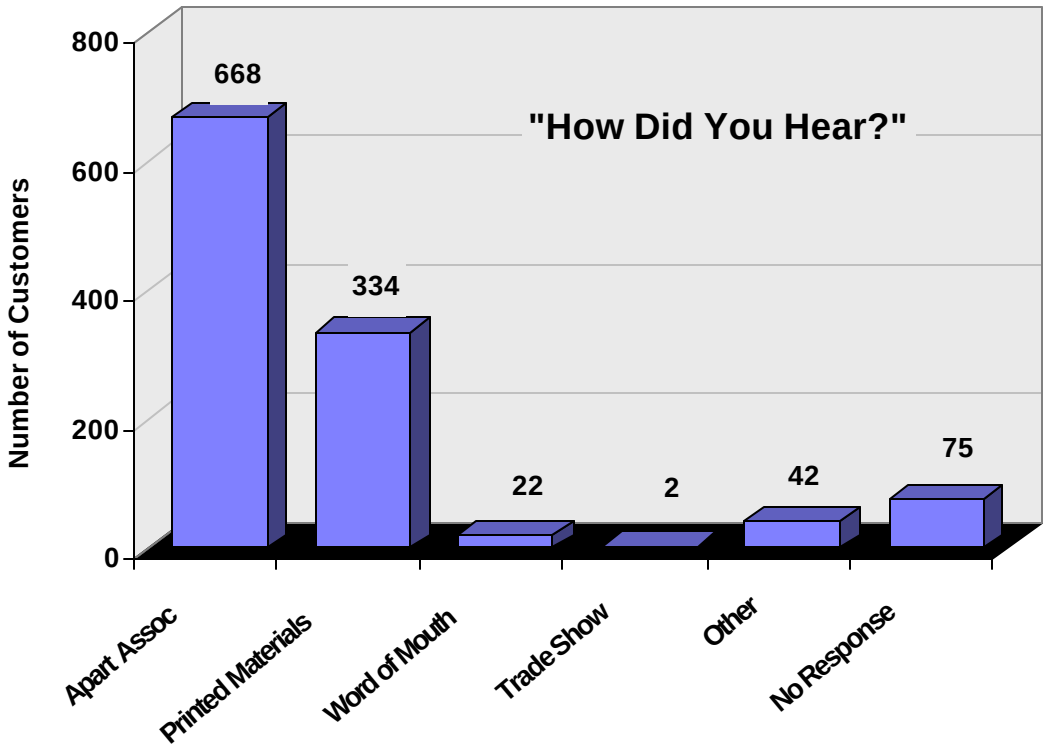


Figure 4. Customer Source of Program Information

The buyers learned about the Program in different ways as the Program progressed (see Figure 5). In the early months, almost all of the sales appear to be due to information from apartment associations, reflecting the considerable effort expended meeting with these associations and handing out Program literature. As time progressed, however, and the Program, printed advertisements began to appear in association publications, the response to printed materials was about the same as response to information from apartment associations. Word-of-mouth information does not appear to have been a major information source. However, since word-of-mouth is expected to flow from MUD owner/operator to MUD owner/operator, and since this communication is likely to take place in the context of an apartment association, the impact of word-of-mouth communication is also difficult to define precisely.

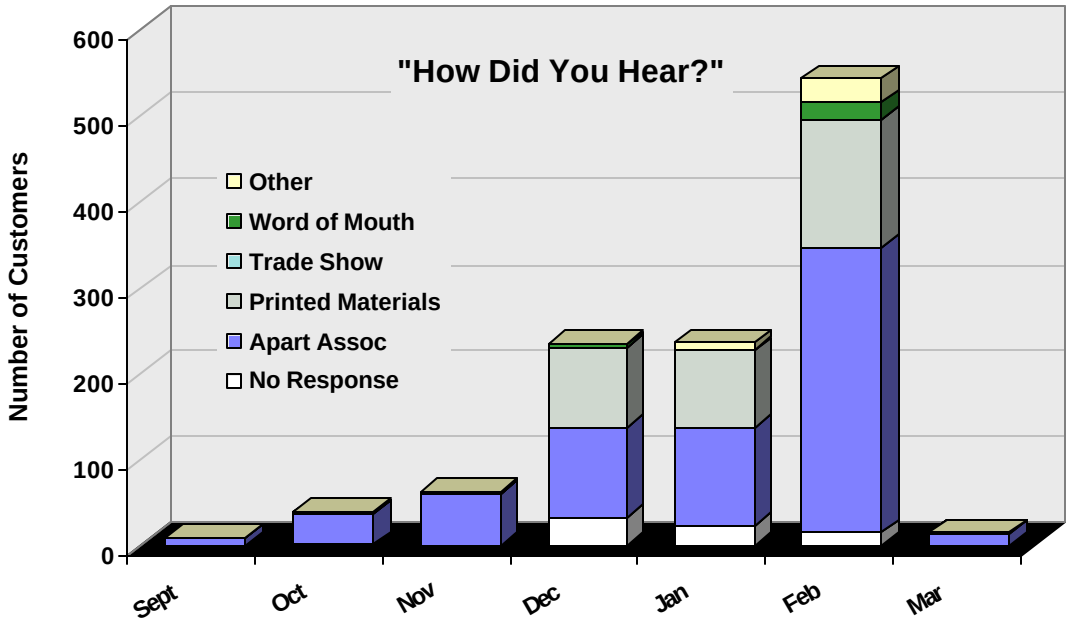


Figure 5. Customer Source of Program Information by Month

Program Goal #5 was met through educational, promotional and sales material that strongly emphasized Energy Star in all Program materials, and the association of Energy Star with quality, and energy and cost savings. See Attachment 1 for a sample of sales and promotional materials. All materials contained the Energy Star logo and referenced and linked to the Energy Star program in the web site. Also, in the contract with the sub-CFL suppliers, was a requirement that the Energy Star logo appear on all sub-CFL packaging.

Program Goal #6 was met by installing the purchased sub-CFLs in sockets that contained incandescent light bulbs. At the electricity rates in effect for the MUD sector at the conclusion of the Program (13 cents/kWh), a MUD customer who replaced a single 60W incandescent light bulb with a 15W sub-CFL (the most popular wattage sold) will save $28/year in electricity costs if the light bulb is burning 12 hours/day. Estimated overall program savings are shown below.

Estimated Program Electricity Demand and Energy Savings

Electricity demand (kW) and energy (kWh) savings from the installation of the sub-CFLs are substantial. The estimates of demand savings are given in Table 4. For ease of analysis, these estimates assumed that all sub-CFLs sold in the Program replaced existing operating incandescent light bulbs and that all sub-CFLs were installed in common areas (inside+outside) of MUD properties. For analysis purposes, sub-CFL replacements for incandescent light bulbs were assumed as follows:

- ✓ 15W sub-CFLs replaced equal numbers of 40W and 60W incandescent light bulbs.
- ✓ 20W sub-CFLs replaced equal numbers of 60W and 75W incandescent light bulbs.
- ✓ 23W sub-CFLs replaced equal numbers of 75W and 100W incandescent light bulbs.
- ✓ 26W sub-CFLs replaced 100W incandescent light bulbs.

Table 4. Sub-CFL Program Estimated Demand Savings

Gross Savings kW	Peak Savings May Through Mid-August kW	Peak Savings Mid-August Through April kW
4,063	1,341	4,063

The gross demand savings estimation in Table 4 was straightforward based on the wattage savings of the sub-CFLs being substituted for the incandescent light bulbs and assumes that all of the sub-CFLs are illuminated.

Two estimates were produced for the peak savings in Table 4.

1. The first peak kW savings estimate in Table 4 is for the time of year (May through Mid-August) when the peak period (1200-2000 hours) occurs between sunrise and sunset (i.e., daytime). For this period, it was assumed that all *interior* common area sub-CFLs were on, and all *exterior* common area sub-CFLs were off. The statewide multifamily survey results from Table 1 indicate that 33% of all common area light bulbs are interior with the remainder being exterior. Thus, the peak savings, based on number of interior sub-CFLs turned on from the first of May through the middle of August (taking into account daylight savings) is estimated to be 1,341 kW (4,063 kW-gross savings x 0.33).

2. The second peak kW savings estimate in Table 4 is for the time of year (mid-August through April) when sunset occurs within the peak period (1200-2000 hours). It was assumed that all exterior common area bulbs are turned on at sunset. Thus, the peak savings from the middle of August through the end of April is the same as the gross savings because it was assumed that all the common area bulbs are on, at least for an instant, at the same time during the peak period after sunset.

The gross energy (kWh) savings estimate is straightforward based on the wattage savings of the sub-CFLs being substituted for the incandescent light bulbs and assumes that the sub-CFL lifetime is the rated hours of operation. The peak energy savings follows the same approach used to estimate peak demand savings. It was assumed that all interior

common area bulbs are on during the 8-hour peak period (1200-2000 hours) and exterior common area bulbs are only on between sunset and sunrise. The gross and peak energy savings are shown in Table 5.

Table 5. Sub-CFL Program Estimated Energy Savings

Gross Savings kWh	Peak Savings kWh
39.7×10^6	5.96×10^6

References

[1] Opinion Dynamics Corporation. *Multifamily Baseline Study Final Research Report*. February 2000.

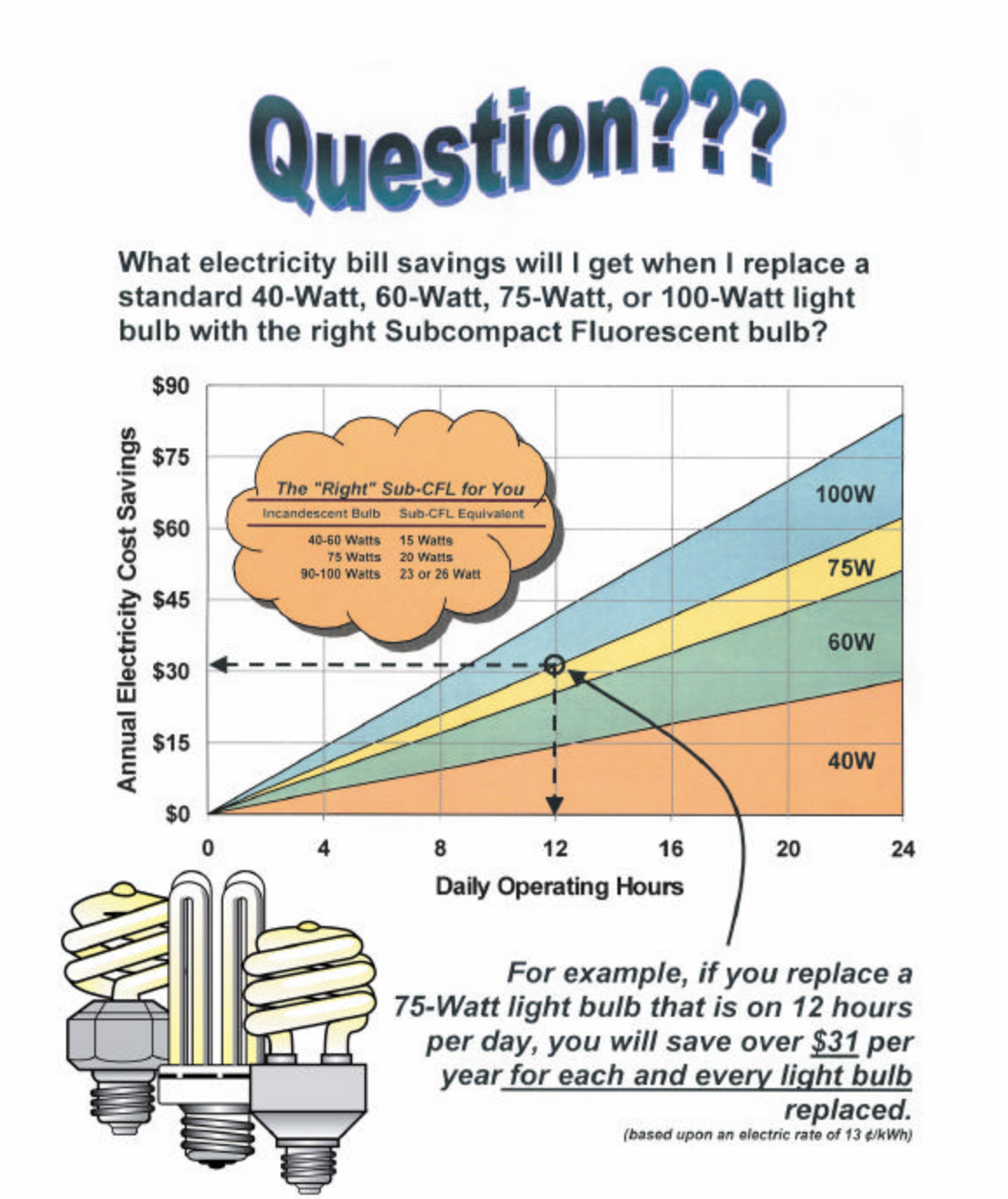
[2] ADM Associates, Inc. and TeckMRKT Works LLC. Statewide Survey of Multi-Family Common Area Building Owners Market. June 2000.

[3] *Transforming Private Multifamily Properties to Efficient Appliances and Lighting via Centralized and Negotiated Procurements.* Published in the Proceedings of the ACEEE Summer Study, August 2000. See http://www.pnl.gov/buildings/.

[4] M.J. Scott, J.W Currie, and G.B. Parker. *How to Build Markets for Energy Efficient Technologies.* Published in Strategic Planning for Energy and the Environment. F. William Payne, Editor. Vol. 18, No. 4, 1999.

Attachment 1

Program Educational and Sales Fliers



Sample Program Educational Flier

Program Promotional Flier at Start of Sales