

Efficient Appliance and Lighting Market Transformation for Multifamily Properties in California¹

*JW Currie, Pacific Northwest National Laboratory
GB Parker, Pacific Northwest National Laboratory*

ABSTRACT

This paper presents a novel approach to implementing energy efficiency in California's multifamily sector – a traditionally “underserved” market segment for energy efficiency programs – through centralized or negotiated procurement of new and emerging efficient ENERGY STAR[®] lighting and appliances. The approach, which relies on reaching the multifamily segment through local/regional apartment associations, is being implemented through market transformation programs at Southern California Edison (SCE) and Pacific Gas & Electric (PG&E), the two largest utilities in California.

The objective is to permanently change the lighting and appliance purchasing behavior of multifamily owners/operators, as well as their tenants, and to eventually expand the procurement program to include other underserved residential buyers groups such as senior communities. Given the success to date, we suggest that other utilities, or market transformation organizations, consider adopting, or testing out, our multifamily market transformation program design.

INTRODUCTION

Multifamily (MF) households account for a significant portion of the United States residential sector. Approximately 27% of U.S. households reside, as renters, in MF properties (>2 units) with 2/3 of these renter households residing in properties having more than 5 rental units (U.S. Bureau of Census March 1997).

MF renters are relatively mobile with more than 1/3 relocating in any given year (Goodman 1999). Furthermore, the majority of immigrant households reside in MF properties. In California, for example, 14% of all apartment residents have moved into the country during the past 10 years (Goodman 1999). In addition, the median annual income of MF households is less than that of homeowners (Goodman 1999). Finally, the median energy use for a MF unit is significantly less than that for a single-family house (Energy Information Agency 1997).

MF properties are unique in that two different types of energy customers are represented— owners/operators and tenants. Both types of customers are usually located on the same property and within the same building. Owners/operators and tenants are usually assigned different electric and gas tariffs. Many utilities assign commercial tariffs to owners/operators and have then tried to implement standard commercial energy efficiency programs but with little success.

Also, owners/operators typically purchase some equipment for which they have little responsibility for paying the energy bill. For example, owners/operators

typically purchase refrigerators, dishwashers, wall/window air conditioners, and lighting fixtures for apartment units but, typically, do not pay the apartment electric bills. This creates significantly different incentives for owners/operators and tenants to purchase energy-efficient equipment.

Taken together, the above characteristics are the primary reasons why energy efficiency programs that have been designed for single-family households and small commercial businesses have not proven successful in MF properties. Thus, the term “underserved” is used to characterize the state of energy efficiency program design and effectiveness relative to the MF sector.

The task now facing U.S. utilities is to design and implement effective energy efficiency programs for MF properties and, in addition, to transform the MF markets for the end-use measures targeted. Because the MF sector has been historically underserved, this is a formidable challenge indeed. The effort requires combining the appropriate, and in some cases, new, technologies with novel implementation approaches.

PNNL MULTIFAMILY TECHNOLOGY RESEARCH

Research at the Pacific Northwest National Laboratory (PNNL), related to transforming the MF sector, has focused on both new and emerging technologies coupled with a novel and innovative implementation approach. The MF technologies considered to date are lighting, refrigerators, dishwashers, wall/window air conditioners, and coin-operated clothes washers. The primary technology focus has been to develop screw-base subcompact fluorescent lamps (sub-CFLs), and field verification of efficient refrigerator and coin-operated clothes washer cost and performance.

Sub-CFLs

CFLs have been available for well over a decade. Electric utilities have spent millions of dollars subsidizing the manufacture, distribution, and purchase of CFLs. However, the acceptance and use of this technology in the residential sector is abysmal. The most recent U.S. Department of Energy residential lighting survey finds that less than 50% of U.S. households are aware of the technology, less than 9% of the households use the technology, and, incredibly, *“less than 1% of all lights used 15 minutes or more per day are compact fluorescent”* (Energy Information Administration September 1996).

PNNL determined that the primary barriers to accepting this technology were 1) first cost and 2) length. CFLs were too expensive and too long to fit into many fixtures. In response to these problems, PNNL set a goal in 1997 to partner with manufacturers to bring to market, a screw-base CFL that was no more than 5 inches long, \$5 in price, and equivalent in light output to a 100W incandescent bulb. These goals are close to being achieved with the availability of a 15W lamp that is 4.56 inches in length, with a delivered cost of less than \$5 in lots of one thousand.

Refrigerators

PNNL has been involved in deploying and monitoring existing and new, high-efficiency refrigerator stock in the New York City Housing Authority (NYCHA) multifamily public housing since 1996. PNNL designed and implemented a durable six-sensor metering protocol to collect detailed time-series data on ambient and compartment temperatures, compartment door-opening activities, and power usage. Metering and demographic data were, also, collected and analyzed for the same representative sample of apartments. Annual savings from installing the highly efficient refrigerators were significant, averaging nearly 550 kWh savings per refrigerator (Pratt September 1998), making these refrigerators highly cost-effective. These findings led PNNL staff to conclude that the efficient refrigerators being installed by NYCHA were excellent candidates to use in market transformation promotion programs.

Clothes Washers

PNNL recently completed field verification of the performance and cost of high-efficiency, family-size clothes washers in a military barracks (Parker 2000). Six conventional washers were compared with 6 new high-performance washers from each of 4 manufacturers. Each of the 30 washers was metered in real-time for hot water use and temperature, cold-water use and temperature, machine energy use, and the number of cycles completed.

The total average water savings of the high-performance washers, compared to the conventional washers, was 38,780 gallons/year/machine. The machine energy savings was 140 kWh/year/machine and the hot water energy savings was 8.1×10^6 Btu/year/machine. These findings led PNNL researchers to conclude that the high-performance clothes washers are an excellent technology to promote through a variety of market transformation programs.

MULTIFAMILY MARKET TRANSFORMATION PROGRAM DESIGN

California Multifamily Characteristics

We were asked by SCE and PG&E to assist them in designing and implementing new approaches to transform the markets for MF electric end-use equipment. Collectively SCE and PG&E serve more than 8 million households, over 2 million of which are in MF properties (ADM Associates 2000).

Tenant electric bills are relatively small, averaging \$30-\$40 per month (Currie 1998). Owner/operator bills for MF property common areas average about \$100 per month for properties with 2 or more units and \$125 per month for properties have 5 or more apartment units. Given that owners/operators purchase the electricity using equipment for which they pay the bill, that their electric bill is significantly higher than tenant bills, and that they purchase much of the electricity using equipment for which the tenant pays the bill, we concluded that

the owner/operator must be the first and primary focus for our market transformation (MT) effort.

Focusing first on the owner/operator has additional advantages. For properties having 5 or more units, the owner/operator usually has a permanent presence in the form of an onsite manager, and this person is almost always available. Thus, the cost to contact and interact with the owner/operator is much less than with tenants. Also, owners/operators have an established and maintained line of communication to the tenants. If a successful MT program could be implemented with a significant percentage of forward-thinking owners/operators, this group may be able to be incentivized as *de facto* agents for the utility in assisting with, and promoting, MT activities for the tenants. The first critical step is a successful MT program with owners/operators.

Buyer Attitudes

An effective MT program design should account for the purchasing attitudes of the targeted buyers since we are attempting to permanently change their purchasing behavior. We relied on survey data we collected at trade shows, as well as published data, to help in this regard (ADM Associates 2000, Opinion Dynamics Corporation 2000, Currie 1998.)

From the surveys referenced above, the following buyer attitudes, regarding appliance and lighting purchases, were identified and were critical in designing our program.

- Low first cost is the overwhelming purchase criterion.
- Direct toll-free or internet-based purchase is only a short-term (trial) option.
- Maintenance of traditional purchase and distribution channels is critically important.
- Significance of ENERGY STAR label is not understood.
- Appliance is purchased when an existing appliance fails; there is little on-site warehousing of spare appliance inventory.
- Apartment associations, of which many owners and operators are members, are the most credible sources of information.

It was clear that an effective MT program should mesh well with how MF owners/operators like to conduct business and that working with apartment associations would be important.

Program Design Elements

Given our findings above, we concluded that the most cost-effective approach to reaching MF owners/operators and, ultimately, tenants is to develop a collaborative working relationship with apartment associations and lighting and appliance manufacturers. Our approach is shown in Figure 1.

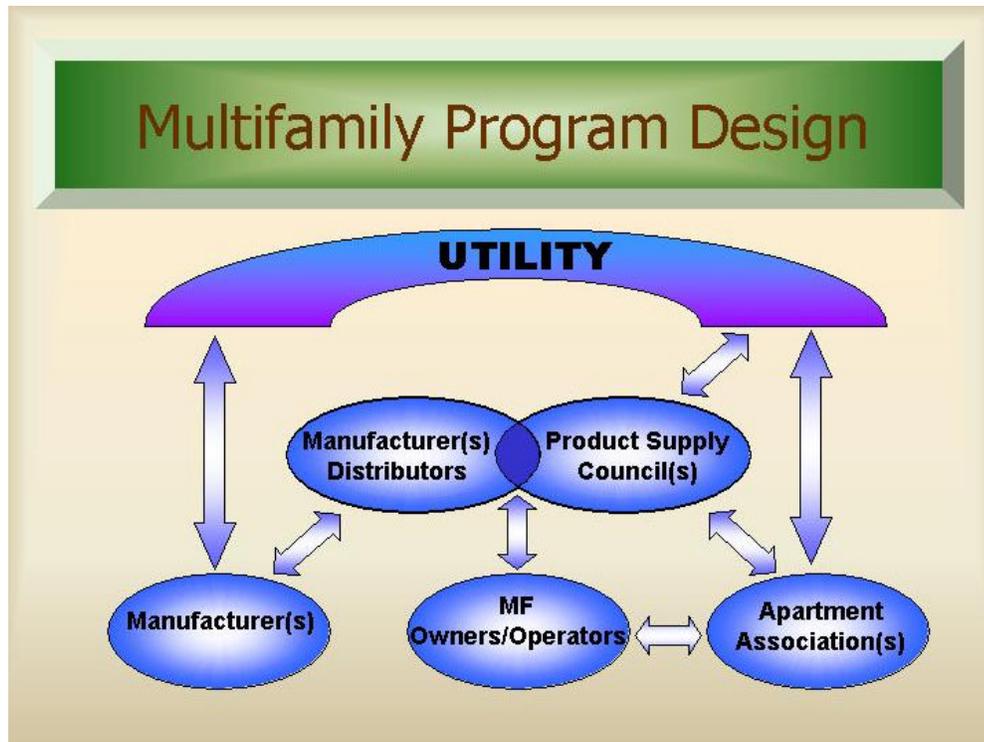


Figure 1. Multifamily Market Transformation Program Design

Our program design is intended to cost-effectively reach MF owners/operators while building credible and sustainable product and information delivery channels. We have had success following the steps described below and believe they can be implemented by other utilities. The key elements of the program design are:

- Build formal relationship with apartment associations
- Build relationship with appliance manufacturers
- Identify specific low first-cost ENERGY STAR appliance or lighting
- Work closely with product supply councils
- Negotiate lowest possible first cost
- Promote purchase of specific appliance or lamp through distributor.

Build Relationship with Apartment Associations

It is crucial to build formal working relationships with the apartment associations. We have purchased memberships in associations on behalf of the utilities we are working with. We have had several meetings with association officers to explain our objectives and to jointly map out a strategy. The collaboration resulted in the utilities promoting the MT program at association trade shows, attending monthly association meetings, purchasing advertising space in association journals, and publishing technical articles in association journals that explain the benefits of ENERGY STAR lighting and appliances.

Build Relationships With Appliance Manufacturers

It is important to develop and maintain relationships with appliance manufacturers at the national, regional, and local levels. We provided our contacts with estimates of the market potential for the appliances and screw-base CFLs that are MT technology targets of this program. We met with several manufacturers to emphasize the importance of promoting specific ENERGY STAR appliances having the lowest possible first cost. Finally, it is critical to secure manufacturer support prior to attempting to negotiate prices with distributors. This is because manufacturers may choose to structure special prices for distributors to pursue the MF market, and they will likely need to consider the impact on their local retailers.

Identify Specific Low First-Cost ENERGY STAR Appliance or Lighting

The importance of having the lowest possible first cost ENERGY STAR appliance cannot be overstated. MF owners/operators are extremely sensitive to first cost—more so than another other market segment we have ever dealt with. The primary reason is the “split incentive” issue. For refrigerators, dishwashers, and wall/window AC, the MF owners/operators buy the appliance but do not pay for the electricity to operate the appliance. As such, the owner/operator will almost always buy the lowest cost, reliable appliance available. We have observed, for example, that just a few dollars difference on the cost of a refrigerator can shift the outcome between many sales and almost no sales.

Work Closely with Product Supply Councils

All apartment associations have “product supply councils” comprised of members who are focused on providing goods and services to other members of the association; i.e., MF owners/operators. Included in the product supply council are lighting and appliance distributors. The distributors speak at luncheons, attend monthly meetings, advertise in the association journal, and purchase booth space at trade shows. It is critical that distributors are chosen from the product supply councils to receive apartment association support for the MT program.

Negotiate Lowest Possible First Cost

Once the distributor(s) has been identified, one or more meetings are required to arrive at the carryout price. It is important to describe the extent of advertising and promotional activity that the utility will engage in to promote both the specific appliance and the distributor as the place to purchase it. Furthermore, the distributor and manufacturer should be presented with an analysis showing the size of expected annual sales and the increased “foot traffic” that the utility promotion will generate. With this approach, we have been able to reach carryout prices on selected ENERGY STAR appliances that are only 2 - 5% above the price that manufacturers charged the distributors – without any utility buy-down or incentives.

Promote Purchase of Specific Appliance or Lamp Through Distributor

After the “deal” is structured, the utility needs to aggressively follow through on its end of the bargain to promote the specific appliance or lighting product. The promotion includes several complementary activities. These include advertisements, flyers, and technical articles placed in apartment association monthly journals and/or mailed to association members. Finally, the utility should purchase booth space at association trade shows and promote the utility’s ENERGY STAR program and the specific appliances and lighting products in the program. This includes handing out flyers, sample products, and contests or drawings for ENERGY STAR appliance giveaways.

RESULTS

We currently are promoting several ENERGY STAR products for SCE and PG&E; 10 sub-CFLs, 3 refrigerators, and one dishwasher. In addition, we are evaluating 3 different brands of high-performance coin-operated clothes washers. We initially worked directly with 5 apartment associations representing over 10,000 owners/operators and over 100,000 tenants and are expanding our efforts to work with an additional 14 associations representing nearly 30,000 owners/operators and over 250,000 tenants.

Sub-CFLs

We are promoting ENERGY STAR sub-CFLs (<http://www.pnl.gov/cfl>) with both SCE and PG&E. There are over one million incandescent lighting sockets in MF exterior and common areas served by SCE and PG&E (ADM Associates 2000). These lamps are on at least 12 hours per day and with electricity costs of 10-12 cents/kWh, sub-CFLs are extremely cost-effective for the owner/operator.

The major activity is with PG&E. We are purchasing 10,000 sub-CFLs outright for giveaway to condition the market. PG&E will then “buy down” the sub-CFLs by \$3 per bulb on direct purchase from the suppliers by owners/operators until a maximum of 100,000 bulbs have been sold. At that time, our MT sub-CFL activity will be folded into the statewide California ENERGY STAR retail lighting program.

Refrigerators

We are promoting 3 ENERGY STAR refrigerators, all of which are at least 30% more efficient than the current U.S. government standard. Owners/operators own over 1 million standard refrigerators across the two California utilities. We were not able to document any owner/operator purchases of ENERGY STAR refrigerators prior to implementing our program with SCE. In our initial program with 5 associations, we have been promoting a 15 ft³ refrigerator. Distributors report sales to us and their data indicate that this refrigerator is now capturing over 25% of sales to owners/operators. A key reason is that we were able to negotiate a price that was competitive with other standard 15 ft³ models.

We have not been as successful with an 18.5 ft³ model. In 6 months of promotion, there were no reported sales because our negotiated price, which is only 2.5% above the distributor cost, is still over \$50 above other standard models of similar size.

In July 2000, California implemented a \$100 rebate for all refrigerators that are at least 30% more efficient than the federal standard. At that time owners/operators began purchasing the 18.5 ft³ refrigerator.

Dishwashers

We estimate that MF owners/operators, served by PG&E and SCE, own at least 1.5 million standard dishwashers (ADM Associates 2000) with roughly 200,000 being replaced annually. We recently initiated a promotion of an ENERGY STAR dishwasher program for SCE's owners/operators. The distributor is selling the dishwasher at a very competitive price and at a 6% markup over his cost. Early indications are that this promotion will result in many sales.

Coin-operated Clothes Washers

There are approximately 200,000 standard coin-operated clothes washers owned by owners/operators across the two utilities (ADM Associates 2000). We are initiating a field verification and MT program in a MF senior citizen community that has more than 1000 coin-operated clothes washers. We will first meter the existing washer stock to determine a baseline and then substitute 4 high-performance washers from each of 3 different manufacturers to demonstrate the performance and monetary savings. Included in the field verification will be survey data from consumers on the acceptability of the high-performance washers. Next, we will promote the results through the news and TV media in the community. Finally, we will disseminate the results to our network of apartment associations via articles in the association journals and presentations at monthly meetings. We will then negotiate with one or more of the manufacturers and their distributors for very low promotion prices and we will jointly advertise with the distributors and promote the washers.

SUMMARY & CONCLUSIONS

The primary objective of our efforts has been to permanently change the purchase behavior of MF owners/operators for appliances and lighting – and to do so without relying upon direct utility financial incentives such as rebates. We have devised a cost-effective approach that utilizes formal working relationships with apartment associations and equipment manufacturers. Finally, we have achieved some successes – measured as significant and/or first time sales of ENERGY STAR appliances to owners/operators who have never before purchased energy efficient equipment. We have, also, determined that owners/operators are exceptionally sensitive to first cost. In some cases, prices negotiated with manufacturers and distributors may not be low enough to induce sales. In these

instances, direct financial incentives are required if the target market segment is going to be penetrated.

Our program has been in existence for about two years. Much of that time has been spent designing and testing our approach of reaching owners/operators through the apartment associations. We believe that we have demonstrated the value and cost-effectiveness of this paradigm – that this approach can permanently impact the purchasing behavior of owners/operators – and the concept can now be transferred to other utilities and MT organizations. However, the challenge remains to reach the tenants.

In calendar year 2000, we plan to test approaches for reaching the tenants. Our current plan is to begin working with some of the more forward thinking owners/operators we have encountered. We have ideas on how to help them promote specific ENERGY STAR appliances and these include fliers targeted for tenants, free workshops, and a fully metered “green apartment building” demonstration to show the monetary savings that are produced by purchasing energy and water efficient equipment.

ENDNOTES

¹Portions of this research are funded by California Utility Customers and administered by Southern California Edison and Pacific Gas & Electric, under the auspices of the California Public Utilities Commission.

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