Title
NEW UTILITY STRATEGIES FOR SAVING ENERGY IN THE COMMERCIAL SECTOR

Authors
Maves, S.
Harris, J.P.

Publication Date
1982-08-01

LBL-14818

Lawrence Berkeley Laboratory
UNIVERSITY OF CALIFORNIA

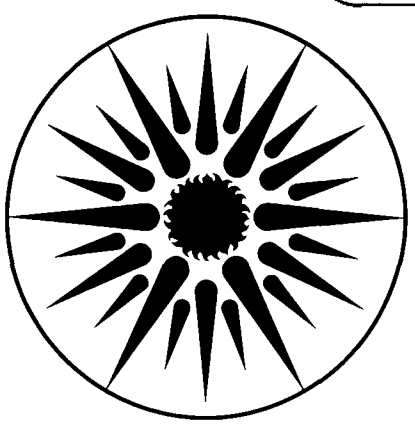
ENERGY & ENVIRONMENT DIVISION

Presented at the Second ACEEE Summer Study on Energy Efficient Buildings, Santa Cruz, CA, August 22-28, 1982

NEW UTILITY STRATEGIES FOR SAVING ENERGY IN THE COMMERCIAL SECTOR

Sharon Maves and Jeffrey P. Harris

August 1982



ENERGY AND ENVIRONMENT DIVISION

Prepared for the U.S. Department of Energy under Contract DE-AC03-76SF00098

DISCLAIMER

LBL-14818
EEB-BED 82-12

Paper presented at the Second ACEEE Summer Study on Energy Efficient Buildings, Santa Cruz CA, August 22-28, 1982.

New Utility Strategies for Saving Energy in the Commercial Sector

Sharon Maves
Jeffrey P. Harris

Energy and Environment Division
Lawrence Berkeley Laboratory
University of California
Berkeley CA 94720 USA

August 1982

This work was supported by the Assistant Secretary for Conservation and Renewable Energy, Office of Building Energy Research and Development, Building Systems Division of the U.S. Department of Energy under Contract No. DE-AC03-76SF00098 and by the Bonneville Power Administration, Portland OR.

NEW UTILITY STRATEGIES FOR SAVING ENERGY IN THE COMMERCIAL SECTOR*

Sharon Maves
Jeffrey P. Harris
Energy and Environment Division
Lawrence Berkeley Laboratory
University of California
Berkeley, CA 94720 USA

ABSTRACT

The large electric and gas utilities in California have been conducting energy conservation programs for their commercial customers for several years. Although each utility tailors its conservation programs to the specific characteristics of its territory, the changes that have been introduced since the programs started reveal several important common trends.

Initially, most utility energy audit programs emphasized visiting a large number of buildings, identifying energy conservation opportunities, and writing recommendations to building owners or operators. Experience with this approach showed that the average implementation rate of measures recommended by auditors was unacceptably low.

Utilities in California and elsewhere are now beginning to restructure their programs to emphasize an on-going relationship with their commercial customers rather than a one-time audit; increased attention to the energy management process, including operations, maintenance, and investment decision-making; and accountability for actual measured savings in energy use and peak load, rather than for the number of audits performed or measures recommended.

These emerging new directions may be able to improve program impact and cost-effectiveness, but careful monitoring and evaluation remain essential. We point to some ways in which utilities elsewhere in the country might benefit from the California utilities' experience.

*This work was supported by the Bonneville Power Administration and the Assistant Secretary for Conservation and Renewable Energy, Office of Buildings Energy Research and Development, Building Systems Division of the U.S. Department of Energy under Contract No. DE-AC03-765F0098.

1. INTRODUCTION

To learn from the nonresidential conservation experience of California utilities, we conducted telephone interviews with five major utilities: the Sacramento Municipal Utility District (SMUD), Pacific Gas and Electric (PG&E), Southern California Edison (SCE), Los Angeles Department of Water and Power (LADWP), and San Diego Gas and Electric (SDG&E). In addition, we studied annual reports on their Nonresidential Load Management Standards programs and spoke with the Conservation Division staff at the California Public Utilities Commission and the Load Management program staff of the California Energy Commission.

Despite significant differences among California utilities, in terms of customer mix, load characteristics, system operation and economics, and program design details, there are many similarities in their current programs to help nonresidential customers save energy. First, the utilities are all relying on different program strategies today than they were initially. At first, utilities emphasized the number of commercial audits performed, the total square footage or energy consumption audited, or the amount of potential energy savings from measures recommended by the auditor. Now, utility conservation programs are beginning to focus on the energy and peak load savings actually achieved, and on differences among their customers in terms of resources, motivations, and constraints. Utilities are diversifying their service delivery approach to maximize energy and peak savings per program dollar.

As an SCE conservation manager summarized, "You need a goal for both contacts [or number of audits conducted] and for energy savings. If you emphasize one or the other, you get one or the other."

Utilities have determined that the energy audit is most effective when implemented as part of a broader energy management process. Achieving and maintaining the savings identified in an audit requires an initial com-

mitment by the customer. This must be followed by a sustained utility-customer relationship that reinforces energy management decisions by providing regular feedback on the customer's progress in saving energy.

These changes in emphasis are not fully implemented in any of the California utilities, but the direction of movement is clear. The emerging strategy is even reflected in new names for the utility programs. "Commercial audit" programs have been renamed "energy management" programs. These revised programs are placing less emphasis on one-shot audits than on helping their customers build permanent energy management capabilities. The utilities have found that they must maintain an ongoing involvement with their customers' energy management efforts in order to meet their conservation goals.

2. KEY FACTORS FOR PROGRAM EFFECTIVENESS

Both energy auditors and program managers in California utilities tend to agree on many of the factors necessary to achieve energy savings. These include:

- how well the level and type of utility services are matched to the savings potential of each building,
- the amount of interest and commitment each customer demonstrates,
- the resources invested in ongoing auditor training and technical support,
- the quality of interaction between auditor and customer,
- the effort devoted to long-term follow-up with the customer, and
- the proper mix of financial and non-financial incentives available to the customers.

Finally, it is important to both the utility and the customer to establish reliable means of monitoring changes in energy use and determining which changes are attributable to energy management actions. Each of these factors is discussed below.

2.1 Customer ranking by energy use helps utilities identify potential energy savings and establish program priorities.

All of the utilities in California use some system of energy ranking, or "indexing," to quickly identify which customers may have the most potential for energy savings. Although utilities will respond to any customer who requests help in saving energy, the level and type of savings is increasingly being tailored to amount of energy likely to be saved.

Most California utilities first categorize their customers by Standard Industrial Classification (SIC) codes, then rank them according to the energy they use (in Btu, kWh, or kW) per square foot of building area. Some utilities then contact their customers in order, from the most to the least energy-intensive within each SIC category.

Another approach is based on the assumption that the largest customers, whether or not they are the most energy-intensive, often represent the best prospects for saving energy and peak electricity load, per person-day of utility staff time.

Still other utilities contact a mix of large and small customers each year, while trying to be at least somewhat responsive to customers who express interest in conservation but may not be large or intensive energy users.

Customers may be categorized in other ways, too. Some utilities distinguish between their public and private customers, focusing their initial efforts on either one or the other. In communities where local or regional government agencies have active energy conservation programs and take a leadership role, the utility may decide that the best opportunity for achieving savings lies in cooperating with the municipality. PG&E, for example, was quick to assist schools that requested their auditors' technical services.

In other regions, utilities view public agencies as less aggressive in pursuing conservation than the private building owners and operators. LADWP has noticed, for example, that certain government customers have not been receptive to energy-saving practices such as daytime janitorial services, a practice that is fairly common and a proven success in private businesses. LADWP's approach to this discrepancy has been to concentrate first on working with their private customers, accumulate success stories, and then return to the public agencies in a few years with even more persuasive evidence.

SDG&E has also observed that government customers often take longer than private customers to implement energy-saving measures, especially when the recommendations must be approved by many successive layers of management. Progress may also be delayed by changes in elected officials, advisory councils, and personnel, as well as sudden changes in budget priorities.

The degree to which California's utilities directly solicit customer involvement in their conservation programs varies widely,

but their intent is to contact all customers eventually. Several programs invite participation via bill-stuffers and newspaper ads, while others rely on the response they receive when they visit customers. Still other utilities aggressively solicit involvement, at least from their large commercial customers. In most cases, managers of commercial audit programs try to design their programs to ensure that all customers in their territory will be contacted within a specified number of years. This approach helps to address a question of equity: large and small energy-users alike will, within a specified period of time, have equal access to their utility's conservation services.

2.2 A customer's commitment to energy savings should be confirmed at an early stage, prior to proceeding with an intensive energy audit or other services.

Each of the utilities contacted in California requires customers to indicate their willingness to invest in conservation measures before the auditors will provide more than a brief walk-through audit. One utility will only audit a large company with many facilities when all of the managers of individual facilities express an interest in the program.

SCE spent several months auditing all of the outlets of a fast-food chain in its service territory, and found a significant potential for savings. When the results were presented to the company's management, SCE auditors were told that, since energy was only four percent of the company's operating expense, the company was no longer interested. SCE now audits only one outlet in a chain and then presents the results to the chain's management to test their willingness to implement the recommendations.

Another California utility conducts audits in stages that are progressively more detailed. The auditor will continue on to the next stage only when the customer has implemented some of the measures previously recommended. This relatively new approach should, in principle, provide valuable feedback to the auditor as well as the customer. Ultimately, the result should be more effective use of the auditor's time, an increased percentage of measures implemented, and perhaps more likelihood that recommended measures will actually achieve the expected savings.

2.3 Auditor training is receiving increased attention as a means of increasing implementation rates and energy savings.

Concerned with how long audits were taking to complete, SCE conducted a test to determine how the number of person-hours spent affects audit quality. The results revealed that audit quality is more dependent on the experience and ability of the auditor than on the amount of time spent at the site. SCE, like most other California utilities, has recently expanded its auditor training program. Since labor costs account for 65 to 80 percent of an audit program's expenses, the current trend toward more extensive and time-consuming training programs indicates a consensus among utilities that energy savings depend greatly on knowledgeable and experienced auditors.

Training programs in California range from "apprenticeship" training in the field to extensive classroom instruction. PG&E, with more than 100 commercial auditors, has switched the emphasis of its training program from how to perform audits quickly to how auditors can most effectively "market" conservation. PG&E, LADWP, and SCE all require their new auditors to spend several weeks in classroom training before they join closely-supervised audit teams in the field. Additional formal training may be required for auditors who will work with retrofit contractors or perform highly technical engineering assessments. All of the utilities sponsor occasional workshops for their auditors to bring them up to date on new energy technologies and analytical methods.

2.4 Energy auditors are beginning to pay as much attention to decision-making by building owners and operators as to the buildings themselves.

The role of the auditor is evolving as the utilities move toward more long-term customer contact. This transition has meant defining an auditor's job more specifically in some cases and more generally in others. In one utility we interviewed, where the auditors work as part of a team, the auditor is a specialist, solely responsible for surveying buildings. Other members of the team then work with the building owner or operator to devise the list of recommendations and to follow up on the owner's progress.

In another utility, former energy auditors are now designated "energy management representatives," and assigned to work closely with a customer for several years, in all phases of the program. An energy management representative must thus be familiar with the many different incentives and options his or her utility offers. Several utilities have found that this continuity is beneficial to their program. Customers often feel more comfortable calling someone who they know is familiar with their facility, to discuss the implications of implementing a recommended measure.

In referring to the success of LADWP's program for large commercial customers, a manager summarized, "It isn't enough to give customers just the information, you have to go out and help them get the contractor, and

then have good follow-up. Success requires one-to-one contact."

An auditor who is under pressure to meet an audit quota may choose to spend his or her time on scheduling and conducting new audits, rather than on following-up with previously audited customers. Most utility conservation personnel we spoke with warned against this. Continuing customer contact appears to be a crucial element in assuring that recommended conservation measures are implemented.

One promising approach to maintain the necessary liaison between customer and auditor without requiring enormous time commitments from either is to schedule periodic workshops on specific technical or management topics, targeted at customers but organized and presented by utility personnel.

2.5 Long-term customer contact is essential to achieve long-term energy savings.

The current trend towards more comprehensive energy management programs is a natural outgrowth from programs which have been adding progressively more call-backs and post-audit visits to each "audit." Call-backs serve many useful purposes for the auditors, utility, and customers. Each call-back provides feedback to the auditor on the appropriateness of his or her recommendations, offers the auditor another opportunity to "sell conservation," and encourages the customer to ask more questions that may ultimately determine whether or not he implements a given measure. In addition, this feedback provides the utility with a direct source of information on the common barriers to conservation among its customers. The information gleaned from this process has led many utilities to initiate new financial incentive programs and to establish even more opportunities for feedback to customers.

SDG&E has lengthened the waiting time before they call back audited customers. Auditors found that few of their recommendations had been implemented by the time they conducted their first post-audit visit, 90 days later. When SDG&E auditors lengthened the interval to 180 days, the overall recorded implementation rate doubled.

Of course, this does not demonstrate that delaying the follow-up contact actually improved the implementation rate as of six months after the audit, but we suspect that in SDG&E's case the 90-day contact may have been a little premature. Waiting 180 days allowed the auditor both to provide feedback on actions taken, and to urge the customer to continue implementing the next most cost-effective measures.

Continuing long-term customer contact was mentioned by several utilities as a key factor in their program's success. "Vigilance and regular contact," one SDG&E representative reported, "are necessary to prevent the normal course of business from deterring a conservation project."

In part, this is due to the long lead time needed to implement some conservation measures. The steady presence of a utility representative can often act as a catalyst, speeding up the implementation of conservation measures. The representative can also serve an important function by providing the customer with periodic updates on new products or energy management procedures that may lead to earlier, less expensive, or more effective implementation. As an SDG&E advocate of continuing customer contact emphasized, "Often the technology and rate schedule will change while the customer's decision on a recommendation is in progress. A constant information flow is required between the representative and the customer."

2.6 In-house reorganization can lead to greater job satisfaction and implemented savings.

Historically, most utility program managers simply divided new audit requests among their staff. As the focus of audit programs has shifted from the number of audits performed to the savings achieved, auditors have been given more freedom to choose both the customers and colleagues with whom they want to work. One PG&E supervisor observed that this flexibility has led to more job satisfaction among his staff, positive customer feedback, and a program that is more implementation-oriented rather than purely advisory.

Some auditors choose to work with only a few large customers at one time, while others prefer working with many smaller customers. Given this freedom, auditors often form teams in order to combine the expertise of several individuals. The make-up of the team might change occasionally to fit the characteristics of individual customers.

We should point out that this auditor-team arrangement would not be feasible if utility managers required individual auditors to meet an annual quota of audits performed, rather than emphasizing savings achieved by the audit staff as a whole. It is inherently difficult to credit a single auditor with the appropriate share of each customer's savings. Utility supervisors may have to accept increased management complexity as the price of the improved morale and program cost-effectiveness that accompanies these changes.

2.7 Financial incentives for the customers have proven effective, but are still experimental.

Many of California's utilities are either offering or experimenting with financial incentives for their customers. SDG&E found that 73 percent of their audited customers cited budgetary constraints or management reluctance as their major reason for not implementing cost-effective recommendations. (In this particular case, SDG&E noted that this figure is probably high due to the short interval between the initial audit recommendations and the post-audit visit.) All of the utilities surveyed pointed to the conflict between implementing energy-saving and cost-saving measures on the one hand, and fiscal constraints or other corporate objectives on the other. Financial incentives, if well designed and attentive to the customer's point of view, can be one effective means of overcoming these hurdles.

SCE pays incentives to their large customers (greater than 500 kW demand) on a graduated scale based on expected payback periods. Incentives are paid only for measures with a payback period greater than two years. A customer might receive, for example, $.03 per kWh saved for a retrofit with a payback period between 37 and 48 months--but only on the condition that measures with shorter paybacks are also implemented. SCE is now experimenting with a modified schedule which encourages their large customers to implement measures that reduce peak demand (kW) as well as electricity consumption (kWh).

SCE offers at least two additional incentive programs in the form of hardware rebates, one for their small commercial customers, and the other for air-conditioning and lighting contractors. For their small commercial customers, specific items such as time clocks and skylights are assigned a dollar value per item or per annualized kWh saved. SCE attributes a 25 million kWh annual savings and 5,000 kW peak load reduction to their $301,000 investment in direct rebates.

The third SCE incentive program awards merchandise "points" to contractors who sell conservation hardware to SCE's nonresidential customers. This hardware must be used to retrofit or replace existing equipment. SCE estimates that this program resulted in an annualized savings of 3 million kWh and a peak demand reduction of 93 kW.

While SCE is convinced that financial incentives promote energy savings, they note that the systems they are experimenting with are still in an "embryonic stage." SCE is shifting away from the fixed-payment-per-item method to incentives that are based on actual energy and peak load savings. This in turn requires the Company to pay increased attention to monitoring customer billing data and developing techniques for screening out extraneous influences, a point we return to below.

PG&E's customers have responded enthusiastically to the Company's Commercial Lighting Incentives Program. In the first four months of the program, PG&E paid over $1 million in refunds to their customers who converted to energy-efficient fluorescent ballasts and upgraded other lighting systems to more efficient sources. The amounts of individual refunds were based on estimated life-cycle electricity savings for each customer. The $1.17 million invested in direct refunds stimulated, according to PG&E, an estimated simple life-cycle savings of 113.4 million kWh and a cumulative reduction of 5,000 kW in peak demand.

Time-of-use rates are also a common means of encouraging commercial customers to shift their demand to off-peak times, thus reducing the utility's need for large peak capacity.

These are just a few examples of financial incentive programs offered, or under consideration, in California. All of the utilities are strong advocates of financial incentives for commercial customers, agreeing that incentives are necessary to achieve their conservation goals.

The Los Angeles Department of Water and Power does not now offer any financial incentives because their municipal status does not allow a pass-through of billing revenues to pay for them. They are studying ways to generate the revenue and believe they may be able to offer financial incentives in the future.

In general, advocates of incentives argue that the avoided cost of producing more energy more than covers the expenses of financial incentives. The issue of how much, in what form, and to whom conservation incentives should be paid will be a subject for extensive study and experimentation among California utilities during the next few years.

2.8 Non-financial incentives may become an increasingly important element of conservation strategies in the future.

Several utilities now conduct informational workshops for facility and owners managers to learn how to reduce energy consumption in their buildings. This approach establishes more personal contact between the utility and its customers and allows building owners and managers to exchange information and experience with their peers. It is also a relatively low-cost way to impart useful information to several customers at once.

Engineering Interface, Ltd., of Ontario, Canada takes the workshop approach one step further. The firm provides an extensive commercial audit and energy services program to a large number of Canadian schools, hospitals, other public facilities, and privately owned buildings. As an integral part of their package of services, called "SUMAC" (System for Utility Monitoring, Analysis, and Control), Engineering Interface brings together several building managers representing different accounts but dealing with similar facilities. These small groups meet regularly to discuss the results of computer-based audits and follow-up monitoring on their buildings.

As the building managers begin to implement the recommended energy-saving measures, they meet regularly to compare progress. Those managers who have achieved savings are credited by their immediate peers. Managers who do not show as much progress tend to be, in this setting, more responsive to suggestions and help. An instructor for the workshops observes, "People tend to correct each other. They will believe each other more readily than they believe us."

This approach concerns itself as much with psychology as with technology. The firm is convinced that this peer reinforcement has led their clients to "lasting energy savings achieved quickly, for relatively low cost, and with a pronounced positive impact on the skills and understanding of operating personnel."

2.9 Accounting for energy savings and attributing them to retrofits or operational changes can be complicated--an estimate at best.

Accounting for savings and establishing their true causes may be one of the most difficult tasks in a conservation program. Nonetheless, both are a necessary part of any savings-based program. Each utility in California seems to have its own method of determining energy savings. Some utilities rely on engineering calculations for the specific measures implemented. Other utilities monitor actual changes in their customers' energy-use bills and then adjust these for weather, occupancy, and/or production level. LADWP combines the two methods by comparing billed usage before and after retrofit, then adjusting the difference in energy use for factors such as changes in occupancy, cooling degree-days, and changes in the structure (such as major renovations or additional floor space). These results are then compared with earlier engineering predictions. As the results from the two methods have usually been in close agreement, LADWP believes that their adjustment formula is a useful tool.

A similar approach is taken by Engineering Interface in presenting the adjusted billed usage data to building managers on a monthly basis. By systematically recording the installation date of retrofits and the start-up date of new energy management practices, it is possible to infer the impact of specific actions.

A carefully organized and maintained data base not only provides useful feedback for individual auditors and customers, but also represents a cumulative record from which valuable statistics on energy use by building type, size, and age can be extracted. These data can in turn provide the base case against which newly audited buildings can be compared.

3. CONCLUSION

We believe that there may be some useful lessons to be drawn for other utilities in the U.S. from the extensive experience of California utilities in designing, implementing, and refining commercial sector conservation programs. In developing new commercial conservation programs or re-examining existing programs, we would recommend that utilities:

- develop auditor training programs and recruitment criteria that emphasize "salesmanship" skills as well as solid technical knowledge,
- emphasize the importance of customer commitment to an ongoing energy management effort,
- provide for long-term personal contact with building owners and managers, emphasizing the importance of "quality" and continuity as well as the quantity of time spent with customers,
- monitor and analyze both usage data and customer characteristics in order to compare predicted and actual energy usage, and to compare similar buildings in the same utility service area,
- base financial incentives for customer investments in conservation, at least in part, on the actual energy and peak load savings achieved rather than on the level of expenditure or "effort" alone.

TECHNICAL INFORMATION DEPARTMENT
LAWRENCE BERKELEY LABORATORY
UNIVERSITY OF CALIFORNIA
BERKELEY, CALIFORNIA 94720