# Low Cost Energy Efficiency Programs

# Program Document

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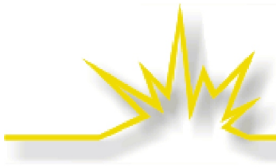

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# CHAPTER 1
# INTRODUCTION AND METHODOLOGY

## INTRODUCTION

### *Impetus for This Research*

What impact will utility restructuring have on energy conservation? This question is nagging at the minds of many regulators, environmentalists, and utilities. Although some participants in this debate purport to have the answer, the fact that there are divergent views indicates that the answer is not at all clear.

Some observers believe that competition will create demands for a wide variety of energy efficiency products and services. They envision a world where consumers will buy efficiency services, and make investments in energy efficient technology, to the level that is cost-effective to them. Utilities will respond to this newly unleashed demand by offering, on an unbundled basis, energy efficiency products and services. Non-utility providers will also become more active in this market.

Others argue that well-known market barriers will continue to keep consumers from making optimal energy efficiency decisions to the detriment of society, consumers, and utilities. Their view is that utilities will be discouraged from offering energy efficiency because of lost revenues, upward pressure on rates, and the need to sell power from utility-owned generation. Customer barriers to efficiency investment which have, to date, limited customer investment in energy efficiency will still exist. Further, utilities that offer energy efficiency services only in response to consumer demand will cease to view energy efficiency as an energy resource, ignoring the potential for energy efficiency to contribute long run cost reductions in the delivery of electricity.

This study, performed by Pacific Energy Associates (PEA) and The Regulatory Assistance Project (RAP), was undertaken to determine through empirical research the relative success of utility energy efficiency programs with a track record, and that are compatible with a competitive industry. By "compatible with a competitive industry" we mean that they are low cost or have no cost to the sponsoring utility or government entity, yet are effective in saving energy and offering customers desired services. Our focus was on commercial and industrial energy efficiency programs.

In many jurisdictions, utilities are the key stimulants, if not deliverers, of energy efficiency services. With uncertainty surrounding competition, utilities are concerned about anything that will increase rates, including energy efficiency. To reduce rate pressures, many utilities have proposed cutting all DSM programs, some have explicitly proposed offering only programs that

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pass the RIM test[1] and others have revised programs to reduce or eliminate direct costs to the utility. Low or no cost to the utility means that the programs capture significant amounts of conservation resources, yet participants pay most or all of the cost of the programs.[2]

A key assumption behind these proposed reductions in program investment is that competition will drive utilities to compete based primarily on price. A corollary assumption is that if utilities offer energy efficiency, they will offer unbundled services that are no cost or low cost to ratepayers (non-participants).

Given that utilities are trying to reduce if not eliminate their share of program costs, we wanted to answer the more specific question:

> *If we were limited to no cost or low cost energy conservation programs only, what kind of programs would be offered, and how would they likely perform?*

This report focuses only on low cost programs and their results. It is intended for program planners and those interested in the details of energy efficiency programs rather than for policy makers and strategists. For the latter, a companion document summarizes our research into low cost programs and synthesizes those findings by comparison to the best performing utility programs.

**We found alternative, low cost programs that save energy at a fraction of the cost of typical rebate programs (2-4¢/kWh). We also found that low cost programs come at a price: narrower markets, lower market penetrations, and less comprehensive energy efficiency installations. Given the nature of customer decision making structures and investment criteria, energy savings levels comparable to rebate program results cannot be achieved without a significant utility investment. While the data available are not sufficient to quantify the market that cannot be reached for less than 1¢/kWh, we believe that low cost programs will achieve less than half the savings that have been demonstrated by cash incentive programs.**

## Organization

The next section describes the methods and approaches used in this project. Chapters 2 and 3 contain the main results of our review. Chapter 2 looks at information and technical assistance programs, including energy audits and targeted or specialized technical assistance. Chapter 3

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[1] The Rate Impact Measure (RIM) test is a method for calculating energy savings benefits and costs. A program that passes the RIM test will have no rate impact, on average, over the life of the energy savings.

[2] Previously, many utilities had been willing to help pay part of the cost of energy efficiency, even if it raised rates, as long as it reduced costs to all ratepayers in the long run.

examines experience with financing programs: loans packaged with technical assistance and the use of energy service charges.

Where possible, we provided the following information for each important program:

- market context
- why this type of program was worth looking at
- description of the program
- why it works well or not—critical factors
- lessons learned, likely success and likely limits
- limitations to conclusions

Appendix A provides a chart summarizing programs reviewed in the course of selecting the programs studied in detail in this report (as explained in the next section). Detailed reviews of selected programs are provided in Appendix B. Appendix C provides a brief review of operation and maintenance programs done for a previous PEA client. The material in Appendix C was not updated because current studies by other projects are likely to render it obsolete (as explained in the next section). Appendix D includes a taxonomy of terms concerning financing program features that may be helpful to understanding this work.

## METHODOLOGY

### *Research Questions*

Specifically, this research project sought to address, to the extent possible within a finite budget, the following types of questions:

- If utilities and regulators decide that conservation should be pursued only when the utility costs are negligible, how much of the conservation resource will be addressed? In this study, we assume that the resource in question is the set of conservation actions which pass a total resource cost test. We avoid detailed issues regarding the precise measure and threshold of cost effectiveness, because this varies between utilities and year-to-year for the same utility. Based on our experience, we assume that the payback period for cost-effective measures (the amount of time before bill savings cover the cost of the measure) varies from a few months to more than five years.

- If extremely low utility cost is a goal, what types of programs are available that seem to meet the goal?

- What kind of program performance can be expected from extreme low-cost programs (e.g., depth of treatment, breadth of market served, realization of intended savings, persistence of savings)?

- How does that compare with the best performers today? The low-cost programs were compared to some of the better-designed programs offering cash incentives.

Currently, speculation on these issues is rife. This study attempts to ground the theoretical arguments by looking at the experience of the best programs which attempt to acquire conservation at a very low price and have a significant track record. We sought evaluated programs, but also incorporated some programs which have significant information based on regulatory filings or program tracking reports.

**Issues Not Addressed or Partially Addressed**

In this exercise, we chose to focus on programs which acquire conservation from one customer at a time. Market transformation programs have been demonstrated to acquire conservation over a long period of time at very low costs, but require coordinated, long-term commitments from utilities, regulators, and other players in conservation markets. Other recent publications address this important type of program in depth (Hastie et al. 1996; Geller and Nadel 1994; ESJ 1995). It remains to be seen whether retail utilities will provide the necessary sustained resource commitment in the absence of strong regulatory direction.

We also did not address some new program concepts which are recently being tested and lack a track record. For example:

- Some utilities are just beginning to experiment with end-use pricing, or the bundled sale of electric service with energy efficiency, for fixed fees. There is not enough data available to shed much light on these experiments (Gandhi and DiGiacomo 1994; Beard 1995).

- There are also a range of programs designed to provide value-added services to customers, such as productivity enhancement, increased levels of service, etc. While these other goals are important, the key question for our study is the ability to deliver energy efficiency at very low cost. These other programs often fail to quantify conservation benefits, making their value as conservation acquisition tools difficult to assess.

For budgetary and schedule reasons, we focused primarily on energy efficiency and on the commercial and industrial sectors. These sectors are the major focus of many utility DSM efforts, and also provide most (not all) of the recent documented experience with innovative low-cost alternative program designs.

For clarity, we did not include programs which focus primarily on demand reduction. The technology, program and market structures are often quite different for energy conservation programs as compared to demand reduction programs. Energy efficiency and demand programs may experience significantly different futures in a deregulated world. To include both in one study would only lead to confusion.

Resource bidding programs were not included. A review of these programs was recently completed by Lawrence Berkeley Laboratories (Goldman and Kito 1994). Most of the programs did not fall in the low-cost category and some of the lowest-cost programs proved to be driven by fuel-switching to gas. Since most electric utilities do not wish to promote fuel-switching, we concluded that inclusion of such programs would muddy our own results.

We also did not address conservation pursued by customers on their own. Neither did we include conservation implemented through energy service companies working independently of utility programs. While customers and ESCOs achieve a significant amount of conservation, in the experience of the authors, the scope of activity is often more modest than what can happen when utilities are co-investors. This is true in a number of respects:

- Larger and more sophisticated customers often are better-organized and more sophisticated about conservation.

- ESCOs prefer to finance conservation in large transactions with large customers who are somehow constrained internally from doing conservation. Only some of these customers are willing to work with performance contractors.

- Conservation opportunities when equipment fails and is rapidly replaced are a difficult target for ESCOs and are often neglected by customers. Performance contracting for new construction has also been limited.

- Some customers lack the cash flow to do conservation and are not interested in borrowing or dealing with ESCOs.

- Few ESCOs or customers will invest in measures with paybacks beyond two-three years, even if these measures would pass a total resource cost test.

This study assumes that customer and ESCO activity (absent utility involvement) is part of the "natural" conservation market. Our review attempts to discern when the programs studied are truly achieving savings beyond those achieved through the natural market.

While some of the programs discussed in this study address operation and maintenance efficiency opportunities, we avoided extensive study of programs aimed primarily at O&M opportunities. This was done to avoid duplicating two reviews which were occurring in parallel to our project, one by the Wisconsin Center for Demand Side Research and one by Portland Energy Conservation, Inc. for the Department of Energy. As an introduction to the topic, previous work by PEA on this subject is provided in Appendix C. Suffice it to say that operations and maintenance and hardware-based conservation opportunities overlap, but only to a limited degree. If utilities found ways to achieve all O&M conservation at little or no cost (this would be a significant achievement) it would only capture a fraction of the available conservation resource.

Finally, in comparing the studied program costs to cash incentive programs, the study team did not perform an extensive review of the cash incentive programs. The study team provided comparison data from programs which were well respected based on the authors' previous experience. Thus, there is some risk that we overlooked a very low cost cash incentive program and consequently overstated the relative benefits of the innovative approaches featured in this study.

In summary, this study does not provide a complete or perfect picture of low-cost/no-cost conservation approaches and their promise. However, it does provide important empirical perspective for some of the leading ideas being promoted in the program and regulatory marketplaces.

### *Approach*

Our primary interest was in looking at what can be achieved in major end-use markets, given the variety of low-or-no utility cost approaches available. We were also interested in exploring the broadest possible range of approaches possible within our budget and schedule.

We started by looking for programs with no subsidies to customers or, at best, low-cost subsidies. Not surprisingly, we discovered that the utility cost of the lowest-cost successful approaches differed by market and by technical approach. We then looked, for each major market and program type, for the lowest cost program which was apparently successful.

To the extent possible, we answered these questions based on program and evaluation data and interviews with key program personnel. In some cases the authors of this study offer inferences about broad program applicability when our research can only provide program experience in one market for a limited period of time. These inferences sometimes build on extraneous market research and prior program experience. Because well-documented program experience is rare, this type of inference is required of virtually any broad-based study of program design options. We have clearly indicated where conclusions are based on direct program experience and where they are extrapolated.

#### *Method*

The first step in our process was to develop and screen a broad list of programs to identify potentially low-cost programs with significant, documented experience (Level 1 list). We began by calling knowledgeable consultants, regulators, and utility employees in different regions of the country to identify candidate programs.

A series of follow-up phone calls was used to narrow the list to those programs which appeared to have the following characteristics, based on preliminary information:

- a cost less than $.01/lifetime kWh (non-levelized)

- adequate data to pursue
- something unique to offer to the study
- documentation which might be acquired by the end of the study period.

Each of these programs was briefly documented (Level 2 summaries). Level 2 summaries provided only enough detail to assess whether each program had unique attributes and/or the lowest cost of similar programs with adequate documentation. Programs were eliminated, for example, if they only had a few customers, if contracts had not been signed, if they were more costly than another similar program, or if data sources proved to be less useful than anticipated. Programs which have received significant national publicity were included sometimes even if the information was somewhat sketchy in order for readers to be able to place these programs in the context of other options.

Appendix A provides, in tabular form, the list of utility programs considered at Level 2. We have not included the Level 2 reports in this study because they are too brief to be of much use to the reader and sometimes were out of date by the time this study was completed.

Based on the Level 2 reports, we selected a subset of programs for detailed examination. The detailed summaries of these programs (Level 3 reports) are provided as Appendix B. The Level 3 reports were selected to maximize coverage of program types and markets. We also narrowed in on programs with both cutting-edge approaches and established track records. In some cases we discarded well-documented failures which might not reflect the best current thinking. Where there were multiple programs which seemed important enough, we sometimes covered multiple, similar programs.

Based on the Level 3 reports, we developed chapters focusing on the major types of programs: audits and technical assistance, and financing. Within each of these categories, conclusions were drawn by market. Then overall conclusions by market were developed and included in the Executive Summary. In pulling together these summaries, we found that the Level 3 reports left significant gaps for some program types/markets. Where possible, we pulled together information collected along the way about additional programs to fill these gaps.

*Units*

As much as possible the authors present cost information in standard terms for easy comparison. We used cost per lifetime kWh, unlevelized, wherever possible because analysts use different discount rates to levelize costs. Presenting lifetime kWh presumes knowledge of measure lifetimes for which there are also a variety of assumptions; we used the estimates of the sponsoring organizations or the program evaluations where available, and an average life of 15 years otherwise. Unless otherwise noted, all cost data presented are the utility's cost.

*Program Performance Benchmarks*

Where possible, programs were compared in terms of market penetration, comprehensiveness and quality of treatment, cost per unit of savings, and overall ability to reach a broad market. The nature of the available data often required that comparisons be limited or based on qualitative impressions.

In addition, the authors tried to assess whether the studied programs were succeeding in addressing key barriers to successful implementation of conservation. Barriers, or market imperfections, which often prevent full implementation of societally cost-effective conservation include customer lack of information or expertise, customer difficulty in assessing or pooling risks, diffusion of benefits due to small amounts of conservation available at many sites or through many events, lack of capital or on-hand cash, lack of management time or ability to manage and maintain projects, distrust of outside experts and their proposals, difficulty in verifying savings on a small scale, and the difference in investment criteria between utilities and customers.

Utility programs are generally designed to remove specific barriers listed above. Each program posits a different implicit theory about which barriers are critical and which services can overcome them. Programs offering large cash incentives explicitly address the issue of meeting customers' investment criteria by improving the payback of the measures. The programs studied in this report generally assume that, with the right marketing and services, customers will invest in conservation with less of a cash co-investment by the utility, or none at all. This premise depends both on customer investment criteria and on the initial payback of different measures; measures which will pay back over many years may be less susceptible to approaches which do less to reduce customer costs.

The importance of each of these barriers varies significantly by market segment. Accordingly, the project team tried to focus on the barriers successfully overcome for each program in its key markets, and those barriers apparently not overcome. Where programs appear to fail to overcome key barriers, we also tried to assess why this is so. This sometimes helps discern whether a program concept only needs to be fine-tuned or is structurally insufficient to overcome market barriers.

# CHAPTER 2
# COMMERCIAL AND INDUSTRIAL TECHNICAL ASSISTANCE PROGRAMS

## INTRODUCTION

### Why These Programs Are Worth Examining

Utilities and governmental entities have offered a wide range of technical and informational conservation services to customers. These services have ranged from initial technical and economic analyses of prospective conservation measures through assistance with the specification, procurement, installation, commissioning, operation, maintenance and verification of savings from the energy-efficient equipment. This chapter focuses on technical assistance programs which feature technical and economic analyses of prospective measures (usually called energy audits), but which also often include some of the follow-up services described above.

The primary purpose of technical assistance programs is to identify energy efficiency opportunities for the customer. The level of detail can vary greatly. For example, a walk-through survey of a customer's home, commercial business or industrial facility may result in observations and recommendations given orally during the audit; the auditor may enter data about the building and its energy applications, equipment type and condition into a hand-held computer which will then generate written recommendations on-site; or specialized consultants may be employed to conduct extensive analysis and prepare fully documented evaluations of alternative technology options.

A review of energy audit programs is important because the lack of reliable and credible information about energy efficiency options has been one of the primary barriers to consumers making appropriate and cost-effective energy efficiency investments. In reviewing these programs, two key questions are confronted:

- The first question is, "How much energy efficiency can be achieved by overcoming this information barrier alone?" This chapter is primarily focused on answering this question through a review of several successful, representative, and well-documented audit programs. However, this report recognizes that most audit programs are difficult to properly evaluate because they are offered along with incentive and financing programs. Even in the many cases where an audited customer proceeded with conservation measure installations without an incentive, the simple presence of the incentive option is often integral to the customer's decision-making process thus complicating the evaluation.

- A second question is, "Which market events are the most appropriate emphasis of this analysis: conservation investments in existing or new facilities?" Technical analysis of prospective conservation measures can take place for both new or existing facilities. The primary difference between these cases is that the analysis of the costs and benefits of efficiency measures in new buildings is based on a comparison with a "baseline" of

equipment that was originally "intended" for the building, whereas the baseline for existing buildings is usually pre-installation characteristics of the building.

Evaluating the effectiveness of design assistance in new construction as a low/no-cost approach is difficult since these services are usually tightly integrated with new construction incentive programs. In addition, we have not been able to identify impact evaluations that have evaluated design assistance for new construction separate from incentive programs. As a result, this review focuses on technical assistance/audit programs for existing building retrofit situations, where there is documented and evaluated experience.

Many utilities who are trimming their DSM budgets in the face of high rates and competitive pressures want to continue to meet DSM goals. Some utilities may believe that they will be able to motivate customers to implement the audit recommendations without offering financial incentives. Certainly, customers are much more aware of the potential benefits from DSM as a result of extensive utility DSM programs, so to the extent the market has changed, customers may be willing to invest in energy efficiency without utility incentives.

Even utilities who are less committed to maintaining and achieving DSM goals may want to maintain a semblance of DSM support. In either case, C&I audit programs will be an appealing option to utilities who are refocusing their DSM activities.

**Market Context/Background**

Energy audit programs have been widely implemented by utilities using various rationales. Starting in 1978, federal law required utilities to meet the requirements of the Residential Conservation Service, and subsequently the Commercial and Apartment Conservation Service, which required that utilities offer information about opportunities for efficiency improvements in the homes of residential customers, and in apartment buildings or the premises of small commercial businesses.

Both of these requirements ended in the mid 1980s, but utilities saw the value of getting closer to their customers, and understanding what was going on the customer's side of the meter. Many utilities began to offer information and technical assistance, through audit programs, as a means to encourage energy efficiency, independent of the requirements of federal law.

Evaluations of these information-only programs conducted in the early 1980s focused on finding out whether audit recipients were in fact taking the actions that were recommended by the audits, and if not, why not. These customer surveys found that participants in the audit programs were taking some of the operations and maintenance (O&M) actions but that implementation of recommended capital investments was weak or non-existent. In probing why these more costly measures were not implemented, frequent responses included a lack of capital and paybacks that were too long.

To overcome these obstacles, some utilities planned and implemented incentive programs to help customers pay for the capital improvements. Also in the early to mid-1980s, utilities began to understand that these demand-side management programs offered a cost-effective energy resource as an alternative to conventional power supplies. Utility payments for DSM were justified by the concept of acquiring a resource that was cheaper than the alternatives. But for many of these programs, energy audits of the customer's building continued to be a closely aligned if not integrated part of the incentive program. Energy audits were important in identifying the most cost-effective energy efficiency improvements that could be supported by utility payments.

As DSM targets became more aggressive, often pushed by state regulators, utilities had to work harder to meet higher energy or demand savings goals. Not only were energy audits essential technically, as a means of identifying the most cost-effective opportunities, but they also became useful marketing opportunities. That is, utilities running DSM incentive programs used the audit as a sales opportunity to explain the incentive programs, how to participate in them, and what the energy conservation measures and paybacks were for that specific customer.

Energy audit programs in many cases became completely subsidiary to the incentive programs with no effort made to track their activity and results; in some cases the audit programs continued to be identified as a separate program but still primarily played a supporting role to the incentive programs.

**Different Types of Audit Programs**

As noted above, utility audit programs have generally evolved from more technically superficial and generalized service offerings to more technically rigorous and targeted approaches. Audit services are now more tailored to properly match the actual service needs, sophistication, and energy savings opportunities of the customers. For example, low cost, “dip-stick” audits may be used to serve numerous but disaggregated and small facilities (i.e., small commercial operations). These methods can yield reasonably accurate results without incurring the higher costs of more comprehensive audit services. However, large and energy-intensive facilities (such as large commercial buildings and industrial process) merit more comprehensive and expensive audits and even engineering analysis. Commercial audit programs can take on various forms depending on the interaction of the following program features.

- Depth of technical assessment. Audit programs can vary depending on the depth of technical assessment offered by the audit. At its most basic form, the walk-through audit provides useful information concerning low and no-cost measures, operation and maintenance improvements, and straightforward retrofit opportunities (e.g., bulb or ballast replacements). Many very early utility audit programs were typically of this type and were strictly informational in purpose.

More comprehensive audits entail more detailed documentation of a facility, a more comprehensive checklist of conservation measures, site-specific analysis of costs and savings, and provisions for the identification of more complex/custom-styled conservation measures that merit more detailed evaluation. In addition, the services offered by these programs often included more assistance to the customer in implementing the recommendations including bid review and specifications, vendor screening and referrals, and sometimes quality control assistance. This approach is most commonly associated with mainstream utility incentive and financing programs.

At the most technical end of the spectrum, audits can entail detailed engineering analysis including computer simulations and detailed measure and design specifications. This level of technical service is most associated with larger, complex commercial and industrial facilities.

- Audit program focus. Audit programs can also vary in the breadth of their focus in terms of the types and sizes of commercial and industrial facilities that are targeted. For example, walk-through audits and comprehensive audits have been typically offered to small- and medium-sized commercial facilities. Engineering analysis services have typically been targeted to larger, more complex commercial and industrial facilities either through narrowly defined technical assistance programs or through the customized service path of a more generalized commercial/industrial audit program. In its most extreme form, some utilities have offered targeted audit services to very specific markets, such as specific facilities (e.g., aluminum mills, lumber mills) and even specific end uses (e.g., compressed air, process steam). Such narrowly defined, "stand-alone" technical assistance programs work best with facility types (usually targeted industrial facilities) and end uses (usually some type of industrial process) that: a) as a whole, represent a sizable proportion of the utility's overall load; b) as individual loads are sufficiently large to merit individual engineering analysis services; and c) require highly specialized technical services. This report examines a technical assistance program targeted at industrial facilities with compressed air end uses offered by Ontario Hydro.

- Integration with other program offerings. Pure "stand-alone" audit programs were more common during the late 1970s and early 1980s, prior to the broad implementation of conservation incentive programs by utilities. As would be expected, these programs are more easily evaluated since they have not been "contaminated" by the influence of utility incentives. Two well-evaluated programs from this era are examined in this report.

  More typically since the mid-1980s, audit programs have been tightly integrated with and subservient to other utility offerings, such as incentive/financing programs. Two programs offered by Pacific Gas and Electric and San Diego Gas and Electric are representative of this approach and are reviewed in this report.

Utilities may also structure audit and technical assistance programs to act as marketing vehicles and "gateways" to utility incentive programs, although they also provide for and promote independent action on the part of customers as well. In these cases, the audit programs can serve as both "stand-alone" services as well as adjuncts to utility incentive/financing programs. Ontario Hydro's program is one example of this approach.

Finally, utilities are beginning to experiment with customer-financed audit programs in response to customer pressures for competitive rates and services. An experimental program by Niagara Mohawk Power Corporation may be suggestive of the new roles that such programs may play in encouraging customer-initiated conservation.

## COMPREHENSIVE AUDIT PROGRAMS

This section reviews several well-documented, comprehensive audit programs including stand-alone audit programs and audit/technical assistance programs associated with utility C&I incentive programs.

### Stand-alone Audit Programs

Of those programs for which we have documentation, Seattle City Light's C&I audit program is the earliest (Coates and Bradley 1983). It began in 1979 and continued until 1985 when its role changed to support the utility's new incentive program. The C&I audit program was conducted under different names during this period, but essentially it offered a free audit to small, medium and large commercial and industrial customers. A site visit was made and a walk through of the building or facility was done to identify potential energy conservation measures (ECMs). These ECMs were summarized in a letter back to the customer with general information about energy savings and paybacks. The emphasis of the recommendations was on low-cost operation and maintenance (O&M) actions.

Portland Energy Conservation Inc. (PECI) also conducted a C&I audit program during a similar period, from 1981 to 1984 (PECI 1984). PECI was established in 1979 as a non-profit to implement the energy policies adopted by the Portland, Oregon City Council. Like Seattle City Light (SCL), PECI offered audits with an emphasis on O&M measures. The interesting aspect of the PECI program, however, is that the cost of the audits was covered by a no-interest, one-year loan to the customer. If the customer implemented the recommendations, the loan was forgiven. Partial implementation of recommended ECMs resulted in forgiveness of part of the debt, based on the ratio of implemented savings to total recommended savings.

Both the SCL and PECI programs were operated in a time mostly without rebates and incentives. (SCL did have a small rebate program for water tank wraps and replacement of 40 watt fluorescent lamps with 34 watt lamps.) Information about their performance is helpful because we want to know what audit programs could accomplish in the absence of financial incentives to customers. On the other hand, both programs were operated and evaluated over ten years ago.

The market response observed then could be different today, given that customer awareness about energy efficiency has increased, in large part due to utility programs.

**Combined Audit/Incentive Programs**

For a more current view of C&I audit programs, two California utilities offer examples. Pacific Gas and Electric (PG&E) and San Diego Gas and Electric (SDG&E) have both operated C&I audit programs since at least the mid-1980s. Both offer free energy audits and both offer other financial incentives for the installation of ECMs. The SDG&E program targets the small to medium commercial and industrial customers, accounts that are not assigned to be tracked by a specific account representative. In 1992-1993 SDG&E used this program to generate participants in its incentive programs (Regional Economic Research 1991; SDG&E 1994).

The PG&E program, which has been ongoing since at least 1982, currently offers a mix of services tailored to the complexity of the customer's facility. The majority of the audits done are for small commercial customers, but the utility will also spend thousands of dollars for a comprehensive in-depth analysis of a large industrial customer using an independent industry expert. PG&E's experience is extensive since they have done an average of over 14,000 C&I audits per year from 1990-1993 (ADM et al.1993; Friedman 1995).

*Results*

There are measurable energy savings for well-designed and marketed C&I audit programs. Electricity savings for the four programs discussed are shown in Table 1.

**Table 1**

**Energy Audit Programs Impact and Cost**

| Utility | Average Annual Participants | Electric Savings[3] | Utility Cost/Lifetime Savings (unlevelized) |
|---|---|---|---|
| SCL | ~100 | 6% net | $.004/kWh |
| PECI | ~100 | 10.2% gross | $.008/kWh |
| SDG&E | ~150 (audit only) | 5.4% gross | not available |
| PG&E | ~14,000 | 0-5.1% net (commercial)<br>6.8% net (industrial) | $.15/kWh |

Sources: Coates and Bradley 1983; PECI 1984; Regional Economic Research 1991; SDG&E 1994; ADM et al. 1993.

Participation levels are low. Precise data on the eligible populations are not available for every program but based on city size, the Seattle, Portland and San Diego programs appear to have served far less than one percent of the C&I customers. The best performer of those examined is PG&E which has consistently been serving about two percent of the eligible customers each year.

The impact evaluations that produced these estimates were all conducted in different ways, and as noted in the table some are estimated gross savings (before and after estimates for the participating customers) and some are estimated net savings (gross savings minus changes in the electricity use of non-participants). A rough approximation of net savings is in the range of three to six percent.

The costs of these programs range from very low to fairly high, depending on assumptions about the persistence of savings. To the extent that the measures undertaken rely on human behavior as in O&M measures, the general belief today is that the savings cannot be counted on for very long, perhaps a few years at best. If the measures are more capital intensive, resulting in the installation of more efficient equipment, then the belief is that these are longer lasting, perhaps ten to 15 years.

The SCL evaluation assumed that the mostly O&M measures had a life of ten years, probably an unrealistic assumption, but over that duration the cost per lifetime kWh would be $.004, or less than half a cent. PECI's evaluation states that the measures were mostly O&M but that some were investments in equipment and hardware, so PECI assigned a weighted measure life of 6.8 years. This assumption results in a cost per lifetime kWh of $.008. Since the savings are gross

[3] Energy savings are presented as they are reported in the program evaluations, net or gross. Gross savings are savings estimates based on a before and after analysis of energy consumption by participants. Net savings are the gross savings minus changes in the electricity use of non-participants. Net savings are generally considered a more accurate portrayal of the savings that can be attributed to a program because net savings analysis takes into account market forces other than the program, or what savings would have occurred in the absence of the program.

savings, presumably some of the savings would have happened anyway without the program. Reducing the kWh attributable to the program would of course increase the cost per kWh. PG&E assumed that the savings attributable to the audits would last only one year. This conservative assumption yields a cost per lifetime kWh of $.15. These results illustrate what a difference the lifetime assumption can make. If we standardize the measure lifetime assumption at five years, the SCL, PECI and PG&E programs have a cost of $.008, $.011 and $.03 per lifetime kWh, respectively.

An evaluation of the PG&E 1982-1986 audit program was conducted four to seven years after participation (Warner et al. 1991). Analysts found that implementation of audit recommendations occurs over several years after the audit and that evaluations that analyze savings too soon after the audit will miss the later impacts. The evaluation estimated gross energy savings of 9.8 percent of total electricity use and 9.5 percent of total gas use. The authors conclude that "audit programs by themselves do not sufficiently motivate customers to implement measures quickly. Without proper financial incentives and installation assistance, customers will prolong the implementation process for up to five years."

While the authors' conclusions had to do primarily with control over the timing of savings, another point is that if capital investments are made as a result of the audit programs, then this could have an important bearing on the level and persistence of savings. However, it is also important to remember that the analysis estimated gross savings. Because it is difficult to construct and maintain a comparison group of non-participants for the period covered by the study, it is also difficult to assess whether a large proportion of the savings estimated in the study would have happened without the program, i.e., much of it may have happened anyway and if so these savings should not be attributed to the program.

Even when we normalize all three programs to the same assumed measure lifetime, however, the PG&E program still costs about three times more than either the SCL or PECI programs. Some reasons for this difference might include more detailed audits, more varied levels of support, more education, in short a more complex web of services. Certainly in the years between the SCL and PECI programs and the more recent PG&E program, utilities have become more sophisticated in their understanding of customer needs and have learned to tailor audit services to the complexity of the facilities and end-use applications.

Audit programs do not result in all recommended measures being implemented. PG&E reported that ten to 50 percent of recommended measures for commercial customers were implemented depending on the measure. A separate evaluation of PG&E's commercial audit program found that 55 percent of measures were implemented over a four-to-seven-year period (Warner et al. 1991). The primary determinants of whether or not a recommended measure was implemented were payback and the capital cost. SCL asked participating audit customers why they had not implemented recommendations, and were told that low business capital, poor business conditions and high interest rates were the main impediments. As mentioned in the background

section, these responses led utilities to add financing and cash rebates options to motivate greater implementation of recommended measures.

*Audit Programs Assessment*

There is significant experience across many utilities with energy audit programs. In recent years audit programs have played a supporting role to utility DSM incentive programs, with the result that the audit programs have been redesigned to increase the effectiveness of the incentive programs rather than being the focus of improvement efforts. This means that we may not know just how effective they could be if given the utility's full attention.

The savings from evaluated C&I audit programs are a modest three to six percent. This compares to net savings of 11 to 26 percent for comprehensive incentive programs (Nadel et al. 1994). So while audit programs should not be dismissed as not saving any energy, they clearly will not save anywhere near the levels associated with an aggressive incentive program.

While the savings are modest compared to an incentive program targeting the same market segments, the cost of C&I audit programs may be attractive relative to incentive programs. If one assumes a ten year life for measures implemented as a result of audit programs, then the levelized cost to the utility is low, about 0.5 to 0.8¢ at a five percent real discount rate. If one assumes that the measure life is short, say three years, then the cost is comparable to the most cost effective C&I incentive programs, about one to two cents.

While most early audit programs concentrated on O&M measures, there is some evidence that a significant percentage of recommended capital measures do get implemented, albeit over a several year period. If this is the case, and the savings would not have occurred anyway over the years subsequent to the audit, then a longer measure life may be assumed and a lower levelized cost would result.

Participation in C&I audit programs can be a steady two percent per year according to PG&E results. By comparison, a Wisconsin Electric Smart Money incentive program is reported to have achieved an annual participation rate of eight percent (Nadel et al. 1994). If energy resources are desired an audit program will probably be a slow way to get them, and the utility will have little influence over the timing of the acquisition.

There are limitations to these conclusions:

- Will audits result primarily in O&M savings? If they do, the persistence of savings must be questioned. O&M savings will cut costs for a customer but a utility cannot count on long-term savings from those actions. The actions taken by customers in response to audits were primarily of an O&M nature, although Warner et al. (1991) state that five to seven years after the audits for PG&E about half the measures implemented were low cost or no cost, leading to the conclusion that the other half were more capital-intensive measures.

- A second limitation on these conclusions is that there is little experience with audit-only programs unaccompanied by incentive programs. The information about audit-only programs is dated and the market has been changed in most places by more aggressive utility DSM activity. The rate of market-driven DSM may have picked up, so that an audit only program now would not achieve beyond the level of naturally occurring energy savings. Alternatively, one could argue that the market is better educated today as a result of the utility DSM programs, and that customers will be more willing to undertake capital-intensive measures identified in an audit. But we do not really know whether audit only programs will have an impact without the reinforcement of other programs, without the availability of incentives to keep the market buzzing. For example, Ontario Hydro has reported that participation rates in all information and technical assistance programs have been much lower than expected once the incentives were eliminated (Knight 1995). Apparently just the knowledge of the availability of incentives motivated customers to participate in the technical assistance programs even though many of them ended up investing in efficiency measures without using or qualifying for incentives. Thus, the simple availability of incentives was a very important factor in getting customers' attention let alone their participation in energy efficiency programs.

- Third, with a more competitive market the emphasis of audit programs could shift to the largest C&I customers, those most likely to shop for power elsewhere if they are given the opportunity. In other words, audit programs may be cost effective but will they get all the cost-effective savings? The answer appears to be no, in two ways. First, even participants in audit programs leave some cost-effective savings behind. Second, if audits are targeted to the largest customers, the vast majority of smaller customers will not identify, much less achieve, cost-effective savings.

The program as customer service vs. program as energy resource argument must be transformed into a recognition that both characteristics attend DSM programs. Utilities that do not pay attention to audit programs' resource benefits (though small) will not assess the programs' energy savings impacts; without this information they will not forecast demand as well; and may make uneconomic investments as a result.

In the early 1980s, C&I audit programs were a good way for utilities to develop technical capability on the customer's side of the meter, and to learn how to market utility services to these customer classes. They were a good springboard to more aggressive energy efficiency programs. If utilities return to emphasizing audits and de-emphasizing incentive programs, they certainly have gained a lot of experience which could be used to make audit programs more effective. Technical assistance could be packaged with audits to provide, for example, performance specifications, bid review, inspections and quality control and general project coordination. The point would be to help customers make decisions and move beyond the audit, reduce risk and reduce the hassle, all without incentives. It would be a tougher sell for utilities than if they had

incentives to focus the customer's attention, but it would reduce some of the obstacles that customers face on their own.

## TARGETED TECHNICAL ASSISTANCE PROGRAMS

Targeted technical assistance programs consist of comprehensive engineering feasibility services that are conducted for selected types of customers and energy end uses. To achieve maximum impact, these programs are usually targeted at customers and end uses that offer significant energy savings potential with relatively short paybacks. Service targeting can occur through two general approaches: targeting of specific industries that have common manufacturing processes, such as aluminum mills or lumber mills; and targeting of specific end uses that may be used by different industry types, such as compressed air, process steam, arc furnaces, motor drives, etc. These programs are especially applicable to the industrial sector because some process support functions common to many facilities offer easily targeted, low-cost conservation opportunities. Industrial customers typically pay close attention to their industrial processes and to those factors which affect productivity and quality. However, the efficiency of process support equipment, which provides heating, cooling, compressed air, light, etc., often receives limited attention as long as the equipment is working. As a result, a well-designed and targeted program can tap into a significant pool of conservation at a modest cost and a short time frame (Easton Consultants 1994).

Targeted technical assistance programs can be operated as stand-alone utility programs, although they are usually packaged with accompanying incentive and marketing programs. These services can be offered by specially designated utility representatives, contracted professionals with expertise in the given process or end use, or some combination of the two whereby utility personnel offer basic services and experts are called-in to address specific cases (Kyricopoulos 1994).

This section examines a successful targeted technical assistance program—Ontario Hydro's Compressed Air Program.

### Ontario Hydro Compressed Air Program

Ontario Hydro's Compressed Air System Checkup program aggressively marketed technical assistance targeted at compressed air systems in industrial operations. This program was examined because it served a market that represents a significant portion of industrial energy use and savings potential at many facilities, and because it achieved a significant amount of cost-effective energy savings that were largely customer funded.

*Program Description*

The Compressed Air System Checkup program was a component of an integrated package of Energy Management programs conducted by Ontario Hydro from 1989 through 1994 (Ontario

Hydro 1994a and 1994b). The Energy Management programs consisted of both incentive and information/technical assistance programs that were designed to achieve reductions in electricity demand through electrical efficiency improvements, fuel switching from electricity to alternative fuels, and load shifting from peak periods to lower use periods. As part of its offerings to the business-industrial markets, Ontario Hydro targeted several key industrial markets for technical assistance including compressed air end uses for industrial processes. These technical assistance programs were intended to encourage industrial operators to participate in the utility's industrial incentive-driven programs.

The Compressed Air System Checkup program was designed to identify improvements to compressed air systems used at industrial facilities. The program provided utility paid audits, system checks, and feasibility studies targeted at small-medium industrial customers in key market segments. The studies were conducted by engineering firms under contract with Ontario Hydro. The utility paid the consultants half of the costs of the feasibility studies upfront, the customers paid the rest. However, if the customer completed a minimum percentage of the study's recommendations, Ontario Hydro paid for the entire study.

Program marketing was primarily conducted through direct/personal marketing approaches by Ontario Hydro field advisors and sales staff. These field staff initially identified technical assistance opportunities and brought in the "leads." The utility provided customers with a list of qualified consultants/contractors from which they were free to select. The consultants subsequently conducted feasibility studies and prepared recommendations and proposals for compressed air system improvements which were reviewed by the utility as a quality control measure. Customers were subsequently encouraged to take advantage of the incentive-driven programs, although most either were not qualified (mostly due to short paybacks) or elected to act on their own.

*Results*

Several hundred companies had visits from the consultants who provided a report and accompanying recommendations from 1992 to 1994 (Petrovchik 1995). As of August 1994, program penetration rates were estimated to be 30 percent of the targeted population over a two year period. Program implementors found that a customer's decision to participate was usually a function of the size of the customer's energy bill and its impact on the customer. There were many cases where major savings with good paybacks were discovered, but customers wanted to focus their limited funds on production and thus elected not to proceed with the efficiency improvements.

Energy savings from the program have been reported to be very good. The feasibility studies identified about 100 kW of savings per site on the average. The site visits and reports were

inexpensive, mostly in the $2,000 to $3,000 range. The program has achieved energy savings from compressed air systems in three general areas:

- The efficiency of the air compressors themselves. Most projects addressing compressors dealt with maintenance rather than equipment replacement. For example, a low cost project involving a $3,000 investment in maintenance activities for a 350 h.p. compressor system allowed an industrial facility to shut down a compressor line that was operating 24 hours a day.

- The efficiency of the distribution lines and overall systems. Of particular interest to the utility were the potential effects of operation and maintenance (O&M) measures on the system efficiency. This proved to be a particularly rich area for low cost efficiency improvements. For example, in one very old facility, a one-inch hole was found in a compressed air line, constituting a major leak and an energy savings opportunity. In another old plant, 7,000 feet of unused but pressurized lines was removed after assistance from the program.

- Secondary energy savings opportunities which were addressed by the program, including controls, end use tools using compressed air, and operating practices for the compressed air system.

Although customers served by the program had the opportunity to apply to the Ontario Hydro incentive programs, most of the customers were ineligible for incentives due to the very short paybacks identified by the studies (typically less than two years). Ontario Hydro staff estimate that 75 percent of the customers went ahead with the compressed air efficiency recommendations (at least some of them) at their own expense without benefiting from the incentive programs (Knight 1995). See Table 2.

Evaluation reports are currently being prepared for the 1994 program. The following table provides a summary of net load impacts from the compressed air program for the 1993 program year for the major market segments served by the program: natural resource; general manufacturing and automotive; chemical, food and beverage; and metals. Customer 16-hour MW savings are used by Ontario Hydro as a proxy for utility system impact for program planning and reporting purposes. These results reflect the actual savings on the customers' premises during the winter peak 16-hour period (7:00 a.m. to 11:00 p.m. weekdays).

The most significant finding, from the perspective of this report, is that a very large proportion of program savings (79 percent) are ascribed to the information/technical assistance programs, and only a modest proportion (21 percent) occurred through incentive programs.

**Table 2**

**1993 Load Impact Results**
**Business-Industrial Markets**
**Short-Term Incremental Net kW**
**(16-Hour kW)**

| Market Segment | Incentive Programs | Information Program | Total |
|---|---|---|---|
| Natural Resources | | | |
| • Compressed Air | 348 | 2,601 | 2,949 |
| % of Total | 12% | 88% | |
| | | | |
| General Manufacturing and Automotive | | | |
| • Compressed Air | 429 | 309 | 738 |
| | 58% | 42% | |
| Chemical, Food and Beverage | | | |
| • Compressed Air | 85 | 335 | 420 |
| | 20% | 80% | |
| Metals | | | |
| • Compressed Air | 0 | 5 | 5 |
| | 0% | 100% | |
| | | | |
| Totals | 862 | 3,250 | 4,112 |
| | 21% | 79% | |

Source: Ontario Hydro 1994a

*Assessment*

Ontario Hydro's Compressed Air Program represents a successful example of an information and technical assistance program that made good use of a targeted marketing and end-use approach. The program achieved a high level of customer participation (30 percent) in only two years and yielded significant energy savings at low cost which we estimate at less than $.01 per lifetime kWh. Seventy-nine percent of the energy savings were obtained through the technical assistance programs and did not entail any incentives. This program provides the following lessons and accompanying caveats:

- The industrial sector offers a substantial reservoir of energy savings that can be captured with cost-effective investments with very short paybacks. Often, these investments simply entail improved operation and maintenance procedures and not capital outlays.

- A well-designed and marketed targeted technical assistance program can successfully capture at least some of these savings without relying on extensive expenditures for incentives. However, the program must be effectively designed and implemented to overcome the major market and institutional barriers to these types of investments including: lack of credible information about savings opportunities; higher priority concerns (such as productivity goals) that attract the limited financial and administrative resources of facilities; inadequate availability of time for decision makers to consider new investment options and for facility operators to diagnose savings opportunities; the low tolerance of facility operators for administrative "hassle" and procedures; and the preference of decision makers and facility operators for tightly focused, bottom-line, credible recommendations.

- Technical assistance approaches are also transferable to other industrial end uses, as evidenced by Ontario Hydro's overall experience with industrial customers. The 1993 program year evaluation found that nearly half of all load reduction in the industrial sector was due to the information programs (48 percent) and the remainder was generated by the incentive programs (52 percent). However, caution must be exercised in interpreting these results since these technical assistance programs were not operating in a vacuum but, rather, as part of a well-integrated package of marketing and incentive programs.

- The availability of a comprehensive package of utility incentives and other services was vital in obtaining industry participation in the targeted technical assistance program. It is uncertain whether a non-incentive approach would be effective in the long run. This uncertainty is demonstrated by the utility's more recent experience (Knight 1995). Funding for Ontario Hydro's energy management programs was dramatically reduced in 1994. DSM programs will in the future focus on marketing, technical assistance, utility co-funding of feasibility studies, but will not entail capital incentives. According to the Monitoring and Evaluation Department, participation rates in all information and technical assistance programs have been much lower than expected once the incentives were eliminated. This has been the case even for those markets which normally did not qualify for incentives (usually due to very short paybacks) but which proceeded with energy efficiency improvements. Apparently just the knowledge of the availability of incentives motivated customers to participate in the information/technical assistance programs even though many of them ended up investing in efficiency measures without using or qualifying for incentives. Thus, the simple availability of incentives was a very important factor in getting customers' attention let alone their participation in energy efficiency programs. There is a complex dynamic at play in terms of customer decision-making process and market/attitudinal barriers that is not adequately addressed by simple information programs. Therefore, the ability of non-incentivized technical assistance programs (whether targeted or not) to capture significant amounts of conservation resources has not been adequately evaluated.

- Much of the savings realized by the compressed air program were achieved through lower-cost operation and maintenance measures in older industrial facilities which often had glaring inefficiencies. As previously noted, over 75 percent of the energy savings from compressed air measures were performed without utility incentives since much of these savings involved measures with very short paybacks that rendered them ineligible for the utility incentives. It is undetermined how effective this approach would be in capturing the next tier of energy savings potential; namely, higher cost and more involved operation and maintenance measures, and higher cost capital measures that would require a long-term investment perspective.

## CUSTOMER-FINANCED AUDIT PROGRAM

### NMPC Subscription Service Program

Utilities are beginning to experiment with customer-financed audit programs in response to customer pressures for competitive rates and services. Most noteworthy is Niagara Mohawk Power Corporation's (NMPC) Subscription Service Program, which may be suggestive of the new roles that such programs may play in encouraging customer-initiated conservation. NMPC's large commercial and industrial customers complained of high rates. One component of rates that they focused on was the DSM costs. These customers asked to be relieved of paying the DSM costs, on the rationale that they had done all cost-effective DSM and could not benefit from the utility-run programs. This program is highlighted here because it is a direct response to the competitive pressures felt by the utility and customer concerns about high rates. The program is also current, visible and is receiving considerable scrutiny supported by intensive evaluation efforts.

*Program Description*

The Subscription Service Program is a three-year experiment that began in March 1993. It is essentially an energy audit program with some added requirements and motivations built in. About 360 of NMPC's largest customers have been given the option of participating in the utility's energy efficiency rebate programs and contributing to the cost of these programs (Option A), or making themselves ineligible for the programs and avoiding a portion of the conservation charge (Option B). However, customers choosing Option B must complete a comprehensive energy audit at their own expense, within six months after becoming eligible and applying for the option. If at a later time customers believe they can benefit from participating in the standard rebate programs, they may switch to Option A by paying the conservation charge they would have incurred during the period they were in Option B.

Option B customers are not required to implement the audit recommendations. An important question that the experiment may answer is, "Will customers choosing Option B adopt energy efficiency measures without any financial incentives from the utility?" Concerns were expressed

that large customers would attempt to avoid the conservation charge and then do nothing with the audits. The intent, as New York PSC Chairman Peter Bradford explained it, is not to let these customers "decide whether to participate in conservation programs. It is about allowing them to choose which energy efficiency programs suit them best and how best to pay for them."(Bradford 1993)

Option B customers are not required to implement the audit recommendations, however, the utility has a stake in implementation. A portion of NMPC's energy efficiency performance incentive (shareholder incentive) depends on savings from the actions of these Option B customers. To encourage implementation, NMPC will help these customers find financing or recommend qualified energy service companies to implement the recommendations.

NMPC has established an arrangement with two banks which have agreed to finance installations provided that consumer credit requirements are met. The loan relationship is directly between the banks and the customer; NMPC does not play a role. NMPC is considering an arrangement by which the bank loan could be repaid via the utility bill. The convenience to the customer, and the assurance to the bank, could have the effect of making the loan option more attractive.

Another facilitation role performed by NMPC has been the qualification of six energy service companies (ESCOs) which can also provide financing as well as a range of other technical and project management services. The October 1994 status report from NMPC mentions that one ESCO has partnered with five large industrial customers (all subsidiaries of one parent company, and another ESCO is working with a large federal government account. It is not yet clear whether these are isolated examples, or indicative of a trend.

*Results*

The results available to date rely primarily on evaluations of the audits performed for Option B customers, plus some follow-up work with the customers themselves (Gallaher and Rutter 1995). Later evaluations will estimate energy savings potential.

- Approximately 360 customers are eligible for the Subscription Option Program; as of late 1994, about 38 percent, or 137 customers, had selected Option B. Although only 38 percent of eligible customers, Option B customers represent about 54 percent of eligible energy consumption because they tend to be larger industrial customers, whereas Option A customers tend to be large commercial customers.

- An evaluation of the audits for a subsample of 28 customers found them of average quality in terms of completeness, technical quality and level of detail or effort devoted to process energy use. However, the quality was rated above average for customers with electricity usage greater than 50 million kWh, for customers where electricity cost accounts for more

than ten percent of total manufacturing cost; and the quality was judged greater for facilities with more than one million square feet.

- The audits identified and recommended over 950 energy conservation measures (ECMs) with significant potential savings. By one count, the audits reviewed found 520 million kWh in savings, or about nine percent of the Option B participants' loads. The biggest savings potentials were found in motors, drives and air compressors; process improvements; and lighting.

- About 59 percent of the savings potential has a payback of three years or less.

- However, the recipients of the audits have no plans to implement two-thirds of the savings potential identified.

- A subsample of Option B customers were asked to cite reasons why ECMs would not be implemented. The reasons given were poor payback (51 percent), lack of available capital (34 percent), a lack of management interest (9 percent), and an uncertain business future (6 percent). Several of these reasons are related. For example, capital may not be available or management may not be interested because of a poor or uncertain business environment. Or capital may be available, but at unfavorable terms that produce an unattractive payback. These reasons are similar to those given in the 1980s for why commercial and industrial customers did not implement energy audit recommendations, and are the reasons why utilities instituted rebate and incentive programs, to overcome these barriers. However, to date Option B customers have made little use of the two banks that NMPC arranged for referrals, nor has there been much use of the ESCOs for financing or project management.

- Energy savings targets have been adjusted (prorated) to reflect the actual number of participants in Option B. For 1994, the adjusted target is 32,000 MWh and for 1995 the target is 62,000 MWh. Savings from ECMs installed through October 1994 total 20,748 MWh, or 64 percent of the 1994 goal.

- NMPC is not tracking program costs because they are very small. It was estimated that less than one full time equivalent is devoted to the program.

*Assessment*

In taking lessons from this experiment, there are two caveats to keep in mind. First, the experiment is not over yet. The results from actual installations will not be known for some time, so conclusions are based on the assumption that final results will resemble what surveyed participants say they will do. Second, the participants in Option B are well aware that they are living in a fishbowl, that there are political dimensions to their actions, and that proving that Option B will lead to savings will increase the chances of their continuing to avoid the DSM charge. This may not be a major factor in their decisions to invest in recommended ECMs, but

this awareness does introduce a degree of artificiality. And it reinforces a human tendency to say to an interviewer
what the participant thinks the audience wants to hear, which is "Yes, we plan to implement the audit recommendations."

Given these caveats, the major conclusions from the NMPC Subscription Option Program are as follows:

- Even though many large customers think that they have done all they could to make their facilities energy efficient, there is significant cost-effective energy savings potential remaining. If customers do not know of these cost-effective opportunities, the conclusion is that information barriers continue to be a problem for an efficient market in energy efficiency.

- A significant fraction of cost-effective savings will not be acquired. Participants in Option B said that they have "no plans to implement" two-thirds of the kWh savings from recommended ECMs (ADM 1995).[4] Fifty-nine percent of the savings have a payback of less than three years; 34 percent of the savings are planned to be implemented within the next three years. Assuming that all of the planned actions are for the savings with paybacks of less than three years, 25 percent of the savings, which happen to have short paybacks, are not planned to be implemented. In addition, 21 percent of the savings (three to five year paybacks) and 20 percent of the savings (over five year paybacks) are not planned to be implemented. It appears that overcoming the information barriers alone is sufficient to the adoption of some of the most cost-effective savings, but not all of it; and that overcoming information barriers is insufficient to the adoption of most or all of the longer payback measures (in excess of three years).

- That planned actions will result in about one-third of the identified savings being achieved may depend on a motivated utility. In another situation, a utility without a shareholder incentive riding on implementation of audit recommendations may not achieve even this level of savings potential. If the utility is very concerned about the impacts of lost revenues, or the level of electricity prices relative to its competition, even a shareholder incentive may not be enough to overcome a lack of enthusiasm. Because of the program's visibility, NMPC wants to show a success. This element may not always be present in other situations if the spotlight is not on the program.

- The audits were judged to be of average quality overall but better than average for certain types of customers. The evaluators believe that audits can be complete and comprehensive if audit contractors are given a little more oversight and quality control.

- NMPC appears to be on track in meeting its adjusted energy savings goals, at least for 1994. Although 1996 goals are not known yet, if they are equal to or a little higher than 1995, the

[4] In a separate analysis using a different sample, respondents said they do not plan to implement about 47 percent of the savings (RTI 1995).

three-year goal total will be about one-third of the savings potential identified by the audits. These goals are modest but perhaps realistic for an audit-only program.

## SALARY GUARANTEE

Previous sections examined programs to overcome information barriers, and programs to overcome capital and cash flow barriers. This section reviews a relatively new approach that addresses these barriers as well as institutional barriers. This approach shows that information barriers have to do with perception and lack of understanding about the potential impact of good energy management practices, as well as with technical issues. For financially strapped public institutions the financial barriers are as much inadequate staffing as lack of capital. This program's primary goals are to provide increased attention to utility bill management and to remove the risk facing a special category of consumer, school districts, when they invest in staff for energy management. These goals are achieved by providing a salary guarantee for school district staff dedicated to resource conservation in school district operations.

### Resource Conservation Manager

The driving force behind the Resource Conservation Manager (RCM) program was Oregon's State Superintendent of Public Instruction, who was responding to the threat of massive budget reductions brought about by passage of a statewide initiative which had the effect of limiting school funding. This superintendent enlisted the support of executive management from the prominent electric and gas utilities as well as the school boards. The utilities became the primary sponsors of the project. The coalition initially included Portland General Electric, Northwest Natural Gas, the Bonneville Power Administration, the Oregon Department of Energy, the Oregon Department of Education and five school districts. Three other districts were added later in 1994-1995, and similar programs are starting up in at least three new areas in Oregon and Washington. The Washington State Energy Office, Washington Water Power, Puget Power and PacifiCorp are now involved.

The coalition of project sponsors identified the main barriers that prevented school districts from developing and implementing comprehensive energy management plans. These barriers include:

- school boards and administrators underestimate the cost of poor maintenance, inefficient equipment and undefined building operating schedules;
- the perception that energy conservation and management is highly technical, requires large sums of money and engineering expertise and is outside the experience of school district staff; and
- school district officials are not convinced that energy management saves money.

*Program Description*

Based on these barriers, the program was designed to help schools save electricity, fossil fuel, water and increase recycling efforts through the hiring of resource conservation managers. The key element of the RCM program has project sponsors providing school districts with insurance against financial risk by agreeing to pay the shortfall between the RCM salary and savings gained from improved efficiency. Beyond this, the sponsoring utilities agree to provide technical support for the RCM, while school districts provide space and staff support and commit to implementing RCM recommendations in the form of an energy policy and a tracking system.

Initially, no capital investments are made, as the program relies heavily on behavioral changes in the operation of the school plant and equipment. Discovery of O&M opportunities is based upon school district-wide energy accounting and monitoring systems set up by the RCM. The resulting conservation actions usually consist of changes to operating hours and schedules of the heating plant and lighting systems and modification of lighting levels. Significant savings have also resulted from reductions in waste disposal costs due to the heavy emphasis on recycling. Experience to date indicates that savings resulting from these changes can cover the costs of the RCM to the school district, and may pay for modest additional capital improvement retrofits (Watson et al. 1994).

The initial program was developed as a two year test (June 1993-June 1995). Project sponsors contracted with a full-time project coordinator to manage and market the program directly to the schools boards. A part-time technical coordinator was also hired to train the RCMs. RCM training consists of three-to-four days of classroom training followed by one-on-one assistance, and then intensive backup assistance over the first two months. Ongoing technical support has been provided by the utilities' technical staffs and the Oregon Department of Energy.

As employees of the school districts, RCMs are located on-site. Monthly meetings of the project coordinator and the RCMs facilitate a total quality management approach. The RCM is responsible for four elements of the project:

- school facility conservation programs,
- school district resource savings and plans,
- energy and resource survey and tracking,
- involving teachers and students in school conservation activities.

To accomplish these tasks, the RCM works closely with the school district's facilities management personnel. Energy accounting software and training is used to develop consumption and cost profiles on each facility. Consumption trends are tracked and analyzed over time and enable the RCM to identify conservation opportunities. Full energy and resource conservation plans are developed with the assistance of principals and teachers. A goal of ten percent annual reduction in energy and solid waste has been typical. Using the baseline data and plans, a series of operating guidelines and schedules are adopted relating to control over lighting, heating, solid waste and reporting data.

The program does not contain typical financing or incentive mechanisms. What is unique is the "salary guarantee." The sponsoring utilities enter into a contract with the school districts to cover the financial risks of the RCM salary should energy savings fall short of the salary.[5] This feature has proven to be key, especially when signing up budget-constrained schools districts.

Beyond low-cost or no-cost savings measures, the program hopes to fund capital improvements through savings in excess of the RCM salaries. There is some indication that this is taking place. However, none of our sources could provide any specific information on this issue.

*Results*

Total costs for the RCM program include both administrative/overhead costs and the RCM salaries (Bingold 1995). Administrative costs of $319,500 (including actuals and projections through June 1995) were paid by project sponsors and included initial start-up costs for computers, labor, training and on-going operating costs of the project coordinator. For at least one sponsor (BPA), raw administrative costs of $35,000 were subject to loadings of nearly 70 percent, so it is obvious that the program can be operated more cheaply.

First year RCM salary costs were $197,340. Salaries for year two are estimated to be about the same. The salaries are paid directly by the school districts and are not included in the administrative costs mentioned above.

Table 3 reflects RCM salaries, avoided cost savings for the first nine months of the project, and an avoided cost projection for the first year (through June 1994 with 3 months projected). This information is pertinent because it illustrates actual results on an individual school district basis. The five school districts comprise a total of 106 buildings.

[5] Gas and electric utilities share the risks equally.

**Table 3**

**Resource Conservation Manager Initial Results**

| District | RCM Project Cost | Actual Avoided Cost Accrued | Paid by Actual Savings | Total Avoided Cost Projected | % of Cost Paid by Savings Projected* |
|---|---|---|---|---|---|
| Ashland | $33,458 | $30,126 | 90% | $38,926 | 116% |
| Rainier | $21,582 | $24,840 | 115% | $27,090 | 126% |
| St. Helens | $21,582 | $38,891 | 180% | $43,391 | 201% |
| N. Clackamas | $80,718 | $86,647 | 107% | $107,747 | 133% |
| Hillsboro | $40,000 | $65,558 | 164% | $72,358 | 181% |
| Total | $197,340 | $246,062 | 125% | $289,512 | 147% |

Source: (Watson et al. 1994)
* Does not include utility and state technical support costs.

Taken together, actual avoided costs outweighed project costs for the five school districts. At the individual school district level, four of five had a net benefit based on actual costs, while all five have a net benefit if projections are included.

Using pre-evaluation numbers from the Bonneville Power Administration (Adelman 1995), we estimate the total resource cost of the RCM program, including all costs from the three utility sponsors and the cost of the RCM salaries, to be 6 cents/lifetime kWh (assuming a one year measure life). The utility cost of the region-wide program, which does not include costs of the RCM salaries paid by the school districts, is 2.7 cents/lifetime kWh saved. These costs are not significantly lower than costs for many incentive programs, but like most new programs, they could be improved. Start-up costs will diminish, and longer-term savings would make a big difference. Furthermore, these results consider only the electric savings benefits, not the benefits in terms of fossil fuel reduction, recycling, and water conservation.

**Table 4**

**RCM Initial Estimated Cost**

| | Region-Wide Program |
|---|---|
| TRC (includes RCM salaries) | 60 mills/lifetime kWh saved |
| Utility cost (no RCM salaries) | 27 mills/lifetime kWh saved |

The issue of persistence of the RCM measures is being investigated as part of the current impact evaluation. The measure lives for this project, which were used in the calculations above, were assigned a value of only one year as they were based largely on behavioral changes related to operation of the school facilities. Results to date indicate that two of five school districts duplicated savings from year one in year two. The other three school districts enjoyed a substantial increase (39 percent) in savings in year two. The impact of even greater savings in year two effectively improves the cost-effectiveness projections listed above.

The program is currently undergoing an in-depth set of evaluations by BPA. The process evaluation consists of three elements: 1) interviews with the RCMs, 2) interviews with key supporters, such as principals and facility personnel and 3) focus groups with teachers and parents.[6] Even though these evaluations are not yet complete, we believe the information we have tracked down for the purposes of this report, is fairly reliable.

The evaluator at BPA indicated that to date all of the conservation managers have delivered savings in excess of their salaries, such that no school district has had to invoke the guarantee (Coleman 1995).

Gross energy savings per school district have been calculated to be approximately 14 percent (the range is 12-15 percent), in excess of the ten percent conservation target. To determine this, the evaluation team used ENACT software. These estimates were based on actual bills and were weather adjusted. They do not reflect comparison to energy use trends for a non-participant group. Data included in Table 5 below originate from a recent U.S. DOE award submittal and reflect actual program activity from June 1993 to December 1994 and projections through June 1995.

[6] See Coleman et al. 1995.

**Table 5**

**RCM Project Savings Summary**

| Resource | Units Saved | Dollars Saved |
|---|---|---|
| Electricity | 11.9 million kWhs saved | $596,023 |
| Electric Demand | not available | $56,251 |
| Natural Gas | 838,000 therms saved | $469,543 |
| Garbage | 2.2 million cu. ft. eliminated | $163,180 |
| Water | 35.7 million gallons saved | $47,749 |
| Total | | $1,332,746 |

Source: Adelman 1995

From the table, approximately 85 percent of the savings are attributed to reductions in fuel use. Reductions in solid waste and water use make up the remaining 15 percent. Project sponsors have also calculated other benefits in terms of the following pollutants avoided:

- 114.3 million pounds carbon dioxide
- 143,000 pounds sulfur dioxide
- 160,000 pounds nitrogen oxide

*Assessment*

The results of the pilot indicate there are many benefits to the RCM approach. While these benefits accrue mostly to the school districts and society, the RCM approach has been shown to be a potentially inexpensive DSM effort even for a single fuel/electric utility. To a dual fuel utility, the pilot has shown that the avoided cost benefits can be even more significant.

While there are advantages to a program with multiple sponsors (e.g. shared risks), one drawback is the duplication of function and costs by the sponsors. In this case, each of the three utility sponsors committed personnel resources to oversee its participation in the program. The result was an increase in the overall cost of the program. With this in mind, single entity sponsorship of the RCM program would likely reduce overall costs.

The RCM pilot has been useful in determining criteria on how to target school districts with potential to support an RCM. For example, the pilot has established a threshold of 25 buildings and 75,000 Btu per square foot of consumption as required to support the salary of one RCM

position. In one case, one RCM was required to support three different districts in order to meet this threshold (Bingold 1995).

School board buy-in and support are essential. Without this support, RCMs will have great difficulty establishing and carrying out resource savings plans.

Across the school district, policy level guidelines for heating and cooling temperatures and building operating hours and energy accounting procedures are critical to achieve and retain savings.

The length of the salary guarantee in most cases was one or two years. Participating school districts were willing to look beyond this two year window and commit to adding to their staff because they knew they had to get "their house in order." Now, near the end of the two-year project, with pressure on utility DSM budgets, it is unclear if the utilities will continue to offer the salary guarantee. The good news is that while some sponsors may be considering modifications to the RCM agreement, none are totally backing away from the program.

Finally, it is not yet clear whether long-term savings will be achieved. For this to occur, the RCM savings will have to be repeated annually, and/or big enough (extra beyond the RCM salary) to generate significant capital investment in longer life measures.

## CONCLUSIONS

Audit and technical assistance programs for commercial and industrial customers have always been important components of utility DSM programs because they directly address several key market barriers to customer investments in energy efficiency capital improvements: lack of credible information about savings opportunities; higher priority concerns (such as sales and productivity goals) that attract the limited financial and administrative resources of C&I facilities; inadequate availability of time for decision makers to consider new investment options and for business/facility operators to diagnose savings opportunities; the low tolerance of business/facility operators for administrative “hassle” and procedures; and the preference of decision makers and business/facility operators for tightly focused, bottom-line, credible recommendations.

In recent years audit programs have played a supporting role to utility DSM incentive programs, with the result that the audit programs have been redesigned to increase the effectiveness of the incentive programs rather than being the focus of improvement efforts. This means that we may not know just how effective they could be if given the utility's full attention.

The programs examined in this chapter demonstrate that stand-alone audit programs can capture significant energy savings, although far below the experience of the best incentive programs. In addition, audit/technical assistance programs that are integrated with incentive programs and other utility services have generated significant efficiency investments by customers that did not

entail utility incentives. However, as we have seen, the presence of well marketed and attractive 0utility incentive programs is sometimes key in obtaining customer participation in audit/technical assistance programs. The ability of audit/technical assistance programs to capture these savings on their own is uncertain.

Utilities are likely to offer energy audit programs in a more competitive world for several reasons:

- First, audit programs may help utilities comply with regulatory requirements of minimum DSM support.
- Second, audits are a good way to stay in touch with the energy service needs of customers.
- Third, energy audits can provide a valuable customer service.
- Fourth, they have a relatively small rate impact.
- Fifth, audit programs can be part of a response by utilities which have signed the Global Challenge memorandum of agreement with the federal government to reduce greenhouse gases.
- Last, and for the more cynically minded, audit programs may give the appearance of action without aggressively targeting results. They may give a favorable impression without reducing sales significantly.

Nevertheless, the findings of this chapter suggest that audit/technical assistance programs are powerful tools for utilities that, with the right type of marketing, customer targeting, customized services (such as, performance specifications, bid review, inspections and quality control and general project coordination), and possible linkage with low cost financing offerings, could allow utilities to capture a significant proportion of energy efficiency that is very low cost.

In addition the combination of salary guarantees and technical support provides an effective and potentially low cost tool for achieving operations and maintenance savings for large organizations which are not committing adequate resources to building operations and maintenance.

# CHAPTER 3
# CONSERVATION FINANCING

## INTRODUCTION

Since the advent of utility and government investment in energy conservation in the 1970s, program sponsors have experimented with the provision of loans as part of a portfolio of services to help customers invest in energy efficiency measures. Since the early 1980s energy service companies have also offered financing options. Some equipment vendors have offered financing for many more years.

The intent of this section is to build on the base of past experience with financing by investigating some of the newer innovations and more complete efforts to use financing to acquire comprehensive conservation at a low cost. More specifically, this section will:

- Assess the degree to which utility financing programs change either the number of commercial and industrial markets where conservation takes place, or the extent of conservation activities within those markets;

- Assess the cost of these financing efforts relative to cash incentive programs (rebate or custom incentives) to achieve similar goals in similar markets; and

- Identify other program features associated with market success.

### Different Types of Financing Programs

Financing programs have offered a variety of both financing and other services. Loan programs can be designed to recover all or part of the costs of the loan and administration, and can be used with a variety of technical services (including those discussed in the previous chapter), marketing approaches, administrative vehicles, cash incentives, guarantees, or shared savings provisions. These options are described and distinguished in Appendix D- Financing Program Variables.

The history of financing programs is not extensive, not is it clearly enough evaluated to assess empirically the market response and cost of each program variant. In the sections that follow, the authors point out the more salient features of the programs experiencing a high or low degree of success.

### Early History

Through the 1970s and 1980s, the history of conservation loan programs in the commercial and industrial sector has not been very encouraging. In general, customers were found to prefer cash grants to loans, particularly if both involved high utility investment levels. For example, Puget

Power offered a loan program and then offered both loan and cash options at a rough equivalent cost to the utility. The majority of customers took the cash. However, many utilities discovered customer groups which are not willing or able to pay the remaining up-front cost for conservation after utility rebates are offered.

*Institutions*. Many government and nonprofit entities have had difficulty providing capital due to budget constraints or the complexity and cumbersomeness of their budget systems (George 1987). Some utility programs and energy service company efforts focused on offering financing as a way for institutions to pay for conservation out of their existing annual budgets. For example, Northeast Utilities' Energy Action Program, a cash incentives program, has at times offered only enough money to bring the customers payback based on energy savings to three years. To help cash-strapped hospitals, the utility offered a revolving loan fund. An energy service company was also linked to school districts and other customers to assist with financing. Some utilities and many ESCOs also developed leasing arrangements to get around government prohibitions or constraints on borrowing.

*Industrials*. Program experience has shown that some large industrial customers will not allocate their own capital resources to conservation even if utilities offer partial cash subsidies. This is often due to higher priorities, periodic capital squeezes, or simply lack of a process for approving money for a conservation investment. Some utilities offer to pay a larger share of the conservation cost for these customers (Notheast Utilities' Energy Action Program) or package conservation with other customer incentives such as special rates to capture the customer's commitment (BPA's Aluminum Smelter Program). Other utilities, such as Pacific Power and Light, are experimenting with Energy Service Charge or loan programs for these customers.

*New Construction*. Developers of new buildings are often capital-constrained. When projects run over budget, energy efficiency enhancements are often the first features to go. Through the 1980s most utility new construction programs focused on eliminating first cost differentials for efficient equipment instead of financing.

*Others*. A variety of other customers have shown some interest in loans, if the terms are simple enough and the rates are attractive. Similar to the cases cited above, these customers often do not have capital or credit they are willing to dedicate to conservation, cannot work through their own capital investment procedures, or, in some cases, are philosophically averse to rebates.

At the same time, loan programs have faced a number of obstacles which limited participation:

*Delivery.* Many utilities found that their organizations are not well-structured for administering debt. Problems have included inflexible billing systems and a lack of expertise or poor organization to address risk assessment, paperwork, debt policy etc. Other utilities have relatively few problems in these areas.

*Transferability*. Energy Service Charges have generally been designed so that the debt stays with the building if the occupant moves. For rental residential projects, this has proven to be a significant barrier. Thus far, there are few indications that this is causing a problem in the commercial sector.

*Competitive Interest Rates*. Many industrial and institutional customers can acquire capital at a lower cost than private utilities or ESCOs. These customers are often hesitant to use outside capital even if they do not allocate their own capital to conservation.

*Approval*. Debt extends and complicates the approval process for energy efficiency projects in many firms. Complex financing arrangements may increase perceived risk by requiring more attention to financial details, or by requiring a long-term relationship.

*Motivation*. Many customers, particularly in the retail and small office sectors, are on short term (under 4 year) leases (George et al. 1986). In this situation, neither the tenant nor owner has much financial motivation to incur debt to reduce operating costs. In general, most businesses where electric bills are a trivial proportion of overall costs are not highly motivated to conserve.

*Scale*. For smaller businesses and developers of small construction projects, the cost per kWh saved is often higher due to administrative dis-economies of scale, less intensive operating schedules, etc. The result is the prospect of small loans for economically marginal transactions. These same barriers have made it expensive to acquire conservation through cash incentives. However, loan programs often carry a higher administrative overhead than cash rebate programs, increasing the problem.

*Timing*. Replacement of failed equipment (e.g., package HVAC units, motors, compressors) and lighting change-outs during remodeling often occur very quickly. Equipment sales in these situations often come through vendors and customer personnel who lack the time or understanding to assess conservation options or participate in programs. It often takes considerable time to arrange loans, making them impractical for these rapid events.

**Review Focus**

The review focused on three types of financing programs.

*Energy Service Charge (ESC)*

An Energy Service Charge is basically a loan from a utility which is repaid through a charge on the utility bill. The loan is usually designed to provide positive cash flow; the projected energy bill savings exceeding the monthly loan charge. Program designers have asserted that, through this feature, ESCs make financing more appealing to customers. Only recently has enough information become available to perform a preliminary assessment of ESC performance. Recent ESC programs are also of interest because they have included more carefully tailored packages

of technical and marketing services than some earlier loan programs, increasing odds for success.

In particular, the authors focused on Southern California Edison's ENvest SCE program and ESC programs run by PacifiCorp for new commercial, industrial retrofit, and small commercial retrofit conservation markets. Energy Service Charge programs are also included in the Community-Based Marketing and Delivery category, below.

*Community-Based Marketing and Delivery*

Some of the programs with highest penetration levels, such as the Hood River and Espanola Projects, have been located in cohesive communities and have used the community network extensively in marketing. A prior review of Small C&I programs by PEA (Keegan and Gordon 1993) showed that municipal utilities in small to medium cities had greater success in marketing programs with modest incentives. For this study, the authors focused on the New London Resource Project, a joint gas/electric utility conservation financing program currently operating in New London, Wisconsin. Additional information was collected about a program run by the Burlington, Vermont municipal utility.

*State Government-Based Revolving Loan Fund Programs*

The programs were reviewed to assess the degree to which they offer useful models or lessons for utility programs. This was viewed as important considering the extensive track record of several of the programs. While the cost of capital to government entities is generally lower than that available to utilities, the programs could reflect what a utility could offer at a modest subsidy. Information was collected about programs in Oregon, Iowa, and Texas.

In our investigation, we did not try to avoid "simple" utility loan programs which do not collect payments through an Energy Service Charge. In fact, information is provided about Burlington Electric's program which utilizes bank loans. However, other "simple" loan programs did not surface from our initial research as having compelling data and low costs. Thus, the emphasis in this report on ESC programs reflects which programs are being heavily promoted and reported by utilities. Based on the information collected, the authors cannot make an assessment about whether the ESC feature (billing to collect loan or lease payments on the utility bill) is critical to program success or not.

For each program, the usefulness of the information collected was in some respect hampered by data limitations or limited program experience.

- Of these programs, PacifiCorp's New Commercial FinAnswer is the only program to have a completed impact evaluation based on load data.

- The ENvest program has completed few transactions and is targeted only at very large customers (over $1 million each in electric utility revenue).

- PacifiCorp has not evaluated its industrial program since early in the program's genesis.

- Only for PacifiCorp's program, Burlington's program, Oregon's programs, and the New London program were extensive data available on the types of measures installed.

- Only for SCE's, PacifiCorp's, the state programs, and Burlington's program were extensive data available on the types of customers who participated.

All told, while the information available from these case studies is inadequate to precisely define the market for loans at various utility investment levels, it is sufficient to place some crude bounds on the market and tentatively draw a relationship between investment and results.

## ENERGY SERVICE CHARGE PROGRAMS

### Southern California Edison's ENvest-SCE Program

*Description*

This program offers project integration, implementation, and financing designed to provide positive cash flow. The term of the loan can be up to the lesser of fifteen years or 80 percent of the weighted average projected measure life. Other features include warranties that the equipment will work as specified for the financing period (but no guarantee of measured dollar savings, per se), and coordination of the overall design and installation project utilizing a qualified network of service providers. A ratepayer investment is set at a maximum of 20 percent of total investment, depending on the level of investment required to assure that the customer receives 20 percent of annual bill savings after lease or loan payments.

The rest of the cost is recovered from customers through payments on either loans or equipment leases, in either case collected through a surcharge on the electric bill. Building analysis and installation are provided by contractors under ENvest direction, coordination, and quality oversight and with financing from SCE.

*Results*

In 1994, Southern California Edison's ENvest division had succeeded in closing 8 transactions worth $27.7 million (SCE 1995a). By June, 1995, the program had $45 million worth of contracts, primarily with government customers. The utility expects to complete another $50 million worth of agreements in 1995 (SCE 1995a).

The ratepayer cost in mills/kWh remains to be seen. Based on initial SCE projections for example sites (SCE 1993), the cost might be expected to be somewhere in the range of 2 to 6 cents/lifetime kWh overall and .4 to 1.2 cents/lifetime kWh to the utility. Figures toward the middle of the range seem more likely for the program as a whole.

The measures include low-cost measures and capital-intensive measures with longer paybacks. Press accounts mention lighting, replacement of HVAC equipment, ventilation upgrades, economizers, variable speed drives for supply fans, fan motor downsizing, insulation, windows and control systems (SCE 1994a, b, c, 1995b). Some projects have also addressed gas and water savings.

*Assessment*

Along with the New London Resource Project (see below), ENvest appears to be lower in cost than most of the other programs, and appears to be reaching a significant market. The most important remaining questions are:

- To what extent is the program resulting in conservation activities which would not occur in the absence of the program? The program is at least accelerating conservation in government buildings, and is probably making jobs more comprehensive. However, with many ESCOs focusing on the same key markets, it is possible (but not certain) that much of the work would have occurred over several years even without ENvest.

- To what extent is the program enhancing the efficiency of equipment upgrades which would have occurred (albeit less efficiently) without the program? While this is a perfectly rational way to market efficiency, the 20 percent or less of program costs paid by ratepayers may prove to be a much larger percent of the incremental cost of upgrading the efficiency of planned improvements.

- What is the scope of the market for this service? The program manager has been quoted as saying that many industries want faster paybacks than the program provides. It has not been tested for smaller businesses and new construction. Deals with private businesses have been limited in number so far. Based on market experience of other programs, it may take a higher level of ratepayer investment to get to these markets, and a more streamlined process to get to the smaller customers. Based on the experience of prior programs, it is also possible that the reach of the program within the large commercial and institutional retrofit market may also be limited; the direct experience of the authors is that only some of these customers are willing to undertake financing, and only some of those would consider the payment terms proposed by SCE.

- In the long run, will regulators and private conservation energy service companies allow SCE to play a central role as "arranger-for profit" for conservation transactions? A recent review of ENvest for the California Energy Commission by Wisconsin Energy Conservation Corporation raises questions about whether the program may be structured in a way to compete illegally with private sector full-service ESCOs (Edgar et. al., 1995).

This program appears to be promising and low cost. Even if the breadth of its market does not increase, it may demonstrate a low-cost way to get at a major "slice" of the retrofit market in large urban areas, namely large financing-oriented institutions and a limited number of larger private businesses.

**PacifiCorp's New Commercial FinAnswer Program**

*Description*

PacifiCorp has operated the FinAnswer energy service charge program for new commercial construction since 1981. This program has the most extensive track record and documentation of any Energy Service Charge program. Although the cost per kWh of this program is higher than for some others, FinAnswer received significant attention in this review study because, unlike the other programs reviewed, it covers the new commercial market.

The program includes a **custom** element, which involves detailed analysis of building plans, simulation of savings, and a site-specific calculation of savings. It is used for larger and more complex buildings.

The **prescriptive** path involves less building-specific energy analysis, and offers the customers a "better" package of efficiency measures (estimated to save 10-15 percent of typical building electric use) or a "best" package (estimated to save over 30 percent) (PacifiCorp 1995b). The prescriptive track was initially used for buildings under 12,000 square feet, plus all non-refrigerated warehouses. It is currently being expanded for use in other buildings where detailed simulation is not warranted.

Both paths offer a loan for the full cost for upgrading efficiency of building components and free (until 1995) commissioning and verification services. In Oregon, where the majority of program activity takes place, businesses are eligible for a 35 percent state tax credit for energy conservation measures. Thus, in Oregon, program participants can access an effective 35 percent discount on measure cost plus a loan for the full cost of the measure.

With the exception of the incentive structure and the depth and quality of the commissioning component, FinAnswer is similar in broad outline to several successful new commercial cash incentive programs offered by other utilities (e.g., New England Electric's Design 2000, Northeast Utilities' Energy Conscious Construction).

Under FinAnswer, loans are offered at three points below the prime interest rate, well under the utility's cost of capital. Loan payments are collected through a charge on the customer's bill. The obligation to repay remains with the property if the tenant moves or the owner sells.

*Results*

Based on the most recent evaluations of FinAnswer (PacifiCorp 1995a and 1995b), the present value of the utility investment appears to be about 44 percent of the total cost of the program for the custom path, and 54 percent for the prescriptive path. However, in Oregon, where the 35 percent tax credit is available, the total utility/state investment in the measures is higher, and the customer contribution is lower. The total joint utility/state investment is probably close to 76

percent.[7] It is important to consider the joint effect because most states do not have an analogous tax credit. The combined utility/state investment is a good indicator of what is required to achieve the levels of savings and penetration experienced by the PacifiCorp program in Oregon.

For comparative purposes, we examined the incentives under two new commercial building conservation programs with similar overall designs, but utilizing cash rebates instead of ESC loans: New England Electric System's (NEES) Design 2000 program and Northeast Utilities' (NU) Energy Conscious Construction Program. NEES's program has three program tracks (MacAteer 1995):

- Under a **comprehensive** track, the utility pays 100 percent of incremental cost for measures. Measure recommendations are developed through brainstorming and simulation analysis. Installation of at least four measures is required.

- Under a **custom** track, measures are analyzed and qualified separately. The average incentive is probably between 50 percent and 75 percent of the incremental cost of conservation improvements (measure cost).[8]

- Under a **prescriptive** track, rebates are offered which pay roughly 50 percent of the incremental cost of conservation.

NU also offers a comprehensive track, which pays 100 percent of incremental cost of conservation measures except for lighting measures which are funded based on a complex formula at levels between 75 percent and 100 percent of incremental cost. Lighting incentive levels probably average somewhere in the middle to upper part of this range (Wajcz 1995). Lighting is a significant fraction of the savings under PacifiCorp's, NU's, and NEES's programs.

Utility payments as a proportion of cost are compared in Table 6. For NEES and NU programs, 20 percent administrative costs were assumed to convert the share of incentive costs paid by the utility to a proportion of overall costs. This comparison indicates that FinAnswer probably pays a significantly smaller proportion of overall costs than the other programs under most conditions.

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[7] In Oregon only, the present value of the utility investment is 51 percent for the custom approach and 52 percent for the prescriptive approach. Adding 35 percent results in 86 percent and 87 percent, respectively. However, the tax credit only covers measure cost, which is only a portion of program cost. Therefore the totals should be adjusted down somewhat. We assumed that 30 percent of program cost is not eligible for tax credits.

[8] NEES pays the lesser of: 75 percent of incremental cost, 50 percent of full cost, or enough to bring the customer payback based on full cost down to two years. The latter two rules apply for measures where the full cost is the incremental cost, e.g., adding on an energy management system where none was planned.

**Table 6**

**Comparative Utility Payment Levels for New Commercial Building Conservation Programs**

| | % of Measure Costs | % of Total Costs |
|---|---|---|
| PacifiCorp | | |
| Oregon | | about 76%* |
| All States | | |
| Custom | | 44% |
| Prescriptive | | 54% |
| NEES | | |
| Comprehensive | 100% | 100% |
| Custom | 50-75% | 58-79%** |
| Prescriptive | 50% | 58% |
| NU | | |
| Lighting | 75-100% | 79-100%** |
| Other | 100% | 100% |

* Includes State tax subsidy

** Assuming that administrative costs = 20 percent for New England programs

Program cost estimates are summarized in Table 7.

**Table 7**

**Costs for PacifiCorps's New Commercial FinAnswer Program**

| | Cents/Lifetime kWh | |
|---|---|---|
| | Custom 1993 | Prescriptive. 1993 |
| Utility | | |
| levelized | 1.8 (2.9) | 2.0 (3.3) |
| unlevelized | 1.2 (1.9) | 1.4 (2.3) |
| Total | | |
| levelized | 3.3 | 4.6 |
| unlevelized | 2.2 | 3.1 |

Source: PacifiCorp 1995a and 1995b

The cost numbers in parentheses are for Oregon only and are combined state/utility costs. We took the Oregon-only program costs as reported by PacifiCorp, and added (35 percent times 70 percent) of the total cost. The 35 percent is the Oregon tax credit which applies only to the cost of measures. The 70 percent is our rough guess of the proportion of total program costs represented by measure cost.

It is interesting that in Table 7 the total cost (unlevelized) of the FinAnswer custom program (2.2¢/kWh) is less than the utility cost (also unlevelized) for NEES (2.5¢/kWh). These numbers imply that the average conservation measure in PacifiCorp's program is much less expensive than in NEES's program.

While some of this could possibly be explained by efficiencies in program design at PacifiCorp, many equally plausible explanations exist which would have divergent and sometimes unknowable implications for comparison of cost effectiveness between PacifiCorp's financing program and NEES's rebate program. These include differences between programs caused by climate, electric heat saturations, building stock characteristics, construction practices and codes, local equipment costs, free rider assessment methods used by the two utilities, and cost accounting differences. This profusion of possible explanations demonstrates why we believe that a comparison of percent of total cost paid by the utilities in the two programs is clearer, simpler and more useful.

While a direct numerical comparison between programs is problematic, it may provide an optimistic estimate of potential cost savings from offering either the PacifiCorp program on its own, or with a rebate equivalent to the Oregon tax credits. The FinAnswer unlevelized cost for all states shown in Table 7 (1.2¢/kWh for custom and 1.4¢/kWh for prescriptive) is about half of the 2.5¢/kWh for NEES's overall program (Massachusetts Electric 1995). However the PacifiCorp costs for Oregon, including tax credits, as shown in Table 7 (1.9¢/kWh for custom and 2.3¢/kWh for prescriptive) are only 8 to 24 percent lower than NEES's costs. Given the variables discussed above, this difference is well within measurement error.

FinAnswer's market penetration, measured as a percent of floor space impacted within the target market, was estimated for both custom and prescriptive programs.

- For the custom program, the penetration rate was estimated at 36 percent in 1993 and 45 percent in 1994 (PacifiCorp 1995a).

- Within Oregon alone, the custom program penetration rate was estimated at 90 percent in 1993 and 73 percent in 1994.

PacifiCorp analyzed the penetration of the prescriptive program as a portion of new building floor space in buildings under 12,000 square feet (PacifiCorp 1995b). The resulting numbers were clearly unreliable, as they exceeded 200 percent in Oregon in one year and exceeded 100 percent in Oregon for all program years combined.

For purposes of assessing overall program impact on the entire new construction market, prescriptive program penetration would be additive to the custom penetration. Using the floor space data from the two reports, total penetration was estimated.

- This resulted in a combined penetration rate of 155 percent in 1993 and 138 percent in 1994 for Oregon.

- For all states served, the combined penetration rate was estimated at 45 percent in 1993 and 61 percent in 1994.

These results indicate the difficulty, acknowledged by PacifiCorp, in using Dodge data on new building starts as an estimate of new construction activity; many rural areas are under-reported, some new construction in other areas are not reported, and the geographic reporting areas are not contiguous with utility boundaries.

While it is clear that PacifiCorp's penetration estimates should be severely discounted, it is the judgement of the authors that the program penetration in Oregon is within reasonable distance of that for other similar programs which offer rebates instead of an ESC loan. For example, penetration has been roughly estimated at more than 50 percent for the NEES program.[9] Other utilities with roughly analogous programs have achieved penetrations of 70 percent of new buildings with incentives covering 50-75 percent of incremental cost (United Illuminating), and 63 percent of floor space with incentives covering 80 percent of cost (B.C. Hydro) (Nadel et al.1994).

However, the system penetration (in all areas where the program is offered) for FinAnswer is much lower than for these other programs, and would be even lower if discounted for the obvious overestimate for the prescriptive approach, and if Oregon were removed due to the market distortion caused by its tax credit. Without the 35 percent tax credit, the program is having only a modest impact on new construction markets. With the tax credit, its impact may be comparable to rebate programs which cost roughly the same amount.

**PacifiCorp's Industrial FinAnswer Program**

*Description*

This program is in many respects similar to the New Commercial FinAnswer, only it is offered to industrial customers. Unfortunately, the only program evaluation is about two years old and was published early in the program's history.

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[9] (Nadel et al. 1994) provides an estimate of 35-39 percent penetration in 1993; 1994 documents from NEES indicate significant acceleration since that time.

*Results*

At the time of the evaluation (PacifiCorp1993b) the program had resulted in 13 accepted proposals and 8 customers who either refused to participate or had no projects. However, a total of 39 customers had been solicited and had not yet responded. Measures contracted for included lighting, air compression, motors, drives, and a couple of refrigeration sites.

Cost data were largely projections based on contracts, not installations. Cost projections from the preliminary evaluation are summarized in Table 8. For the contracted jobs, the utility was projected to pay 29 percent of program cost. The presence of free riders was not assessed in developing these estimates.

**Table 8**

**Costs for PacifiCorp's Industrial FinAnswer Program**

| | Cents/lifetime kWh |
|---|---|
| Utility | |
| levelized | .7 |
| unlevelized | .5 |
| Total | |
| levelized | 2.5 |
| unlevelized | 1.9 |

Source: PacifiCorp 1993b

*Assessment*

Two major concerns about the program were raised during the evaluation:

- Few of the customers responded, and many with audits dropped out. This is consistent with prior market research and program experience indicating that only a subset of industrial customers are interested in conservation loans.

- The program had not yet installed improvements to actual production processes. Process improvements are the largest, most lucrative, and most difficult type of conservation measures in the industrial sector. Major process improvements often require extensive and specialized study. Should the program venture into this type of measure, a 50 percent

dropout rate, after studies are completed, would both result in high administrative cost and reduce the potential resource available.

While the program approach appears interesting, the evaluation was too early in the program history to draw any conclusions.

PacifiCorp recently announced that they have sold the value of their expected loan collections from their conservation programs to Citicorp, at a 15 percent reduction in the cost of capital. This is possible, presumably, because Citicorp has a lower cost of capital, and because some of PacifiCorp's older debt may be at higher interest rates.

## COMMUNITY-BASED MARKETING AND DELIVERY

### New London Resource Project

*Description*

This program is an experiment with offering ESC loans through a community-based marketing program. The electric and gas utilities offer 6 percent loans for all-fuels conservation and electric-to-gas fuel switching in the small town of New London, Wisconsin. The program includes community-based marketing, walk-through audits, referral to vendors, and quality control. It is operated with less than 3 FTE for all customer types. Along with the community-based market feature, it is also of interest that the designers deliberately decided not to run a program which requires importation of contractors, in order to enhance the local community structure. The program attempts to install conservation through the "natural" local market of equipment distributors and installers, minimizing overhead (Berkowitz et al. 1994).

The program implementors fully leveraged community connections to promote the program.

*Results*

Pre-evaluation reports show that the program resulted in treatment of about a third of the 300 eligible customers in a year and a half (Berkowitz et al. 1994). Staff indicate that treatment is a mixture of retrofit and modification of customer-initiated remodels. The program is dominated by the installation of efficient ballasts and bulbs, but includes some fuel switching, heating system conversion, and water efficiency measures.

Participants include a wide array of small and medium sized customers, plus a handful of larger institutions and businesses. The program currently offers capital which is provided by a bank at six percent interest. Based on rough PEA calculations, the implicit cost based on typical private utility interest rates is between .5¢ and 1¢ per lifetime kWh. Total resource cost is probably somewhere between 1.5 and 3¢/kWh, consistent with most lighting retrofit programs.

*Assessment*

This program may provide an excellent low-cost model for utilities working in small-town environments. The keys to success, according to the developers, are positive cash flow financing, successful use of the community network and community leaders to promote the program, and use of the local contracting infrastructure to minimize program delivery costs (Berkowitz and Edgar 1995). However, several questions remain:

- Realization rates from evaluations of programs for small commercial typically indicate that actual savings are 40-60 percent of engineering estimates. This was incorporated into the higher of PEA's estimates of cost, and explains the band of uncertainty.

- Will the installations, selected by customers and contractors with little utility oversight, be comprehensive?

- What is the cost/benefit for smaller customers (<50 kW)?

- It is not clear whether this model can be used to deliver large-scale savings from complex mechanical measures, where the walk-through audit approach may be inadequate.

- It is also unclear whether the model can be applied to utilities with less focused service territories or to large cities.

**Burlington, Vermont Electric's Energy Advantage Program, Top Ten, and Smartlight Programs**

*Description*

The Energy Advantage program retrofits commercial buildings with less than 200 kW of connected load (small/medium customers). It is of interest here because it provides more data on what can be achieved for retrofit in smaller buildings with a low-interest loan. It is different from the Energy Service Charge programs in that the loan interest rate is reduced through utility investment, but the loans are serviced through a bank working in conjunction with the utility.

The Energy Advantage program offers energy audits and financing at below-market rates over a five-year term. To pay for the loans, the utility collects 75 percent of the projected customer electric bill savings from the measures for up to five years (until the loan amount is recovered). If the measure is cost effective, and the full loan cost exceeds the amount that can be collected this way, the utility will itself pay the difference.

A similar program called the Top Ten Program is offered for the 30 largest customers. The program has similar terms. These customers include commercial and institutional customers, plus a few food processing and other industrial customers.

Burlington also offers the Smartlight compact fluorescent light bulb leasing program for commercial customers. Under this program, the utility will lease up to 100 compact fluorescent lamps for $.35 per bulb per month, with the fee included on the electric bill. The customer gets to use the bulb for two months free before the lease payments begin. Lease payments cease if the customer returns the bulb for any reason. This program is marketed in large part through Energy Advantage contacts and other normal customer contacts. It constitutes a minor share of overall program savings.

Burlington is not aggressively marketing these programs due to limited resource needs. This differentiates their efforts from the intensive marketing in New London. However, the utility uses the intimate system of connections in a small city to help promote the programs.

*Results*

Summary statistics on the various programs are shown in Table 9. All data as shown are from 1991-4, except for Commercial Smartlights, which began as a separate program in 1993. All savings estimates and resulting cost/unit savings estimates are based on tracking system data. Burlington has not yet released impact evaluations of these programs.

**Table 9**

**Burlington Electric Department Program Results**

| PROGRAM | UTILITY COST | TOTAL COST | UTILITY COST | ENERGY SAVINGS |
|---|---|---|---|---|
| | per lifetime kWh | per lifetime kWh | as percent of total | MWh/year* |
| Energy Advantage | $.017 | $.039 | 44% | 1,889 |
| Top Ten | $.010 | $.028 | 37% | 8,152 |
| Smartlights | $.013 | $.023 | 58% | 461 |
| Combined | $.012 | $.030 | 39% | 10,502 |

Source: Burlington 1994 and 1995

*Annual MWh saved as a result of four years of program activity.

The Top Ten program appears to be reaching most or all of the intended customers. The major issues are scheduling of projects in relation to other capital improvements.

The Energy Advantage program has achieved about four percent annual market penetration in its more active years. According to program management, this includes a significant number of the smaller customers who typically are less interested in conservation and with whom it is more difficult to arrange financing. The Smartlight program is reaching fewer customers than Energy Advantage in the same market.

The utility is currently not interested in accelerating penetration of these programs due to the lack of a near-term need for resources. Lighting measures have dominated all the programs to date, although liquid pressure amplifiers for refrigeration are beginning to play a significant role in the Energy Advantage program. In telephone discussions with PEA, staff appeared to be focused on comprehensiveness and sophisticated about equipment choices.

*Assessment*

Like the New London Resource Project, the Burlington programs address a modest-size city. The program manager acknowledges that the strong in-town network has helped market the program. The incentive appears well-designed to work with investment criteria of more committed customers and assure comprehensive conservation. The higher costs for this program (compared to New London) appear to reflect the incentives, and also a larger investment in energy analysis. Data is not available to assess whether this is actually resulting in more comprehensive installations or not.

The primary remaining unanswered questions are listed below.

- Evaluated savings.
- Cost/transaction for small (<50 kW) jobs.
- Because this program works on a small scale in a small city, and delivers only 4 percent of the candidate customer base per year, it is difficult to assess whether the financial incentives provided are sufficient to reach the majority of the market.

## STATE GOVERNMENT-SPONSORED LOAN PROGRAMS

Energy efficiency financing programs are offered by the States of Oregon, Texas and Iowa. These programs offer conservation loans at interest rates ranging from about four percent to nine percent. All three programs have an extensive track record of ten years or more, and have achieved significant penetration into the institutional market including governmental, educational, and non-profit facilities. In addition, Oregon's program has had significant activity

with privately sponsored conservation and renewable energy projects. Finally, all three programs have successfully developed effective marketing and promotional strategies for the institutional sector, and offer technical assistance tailored to these markets.

**Oregon Small Scale Energy Loan Program**

*Description*

The Small Scale Energy Loan Program (SELP), which is operated by the Oregon Department of Energy (ODOE), provides loans to residences, businesses, non-profit organizations, state agencies, schools and local governments (Tumidaj and Gordon 1993 and ODOE 1995). While general obligation bond sales provide the loan funds, program costs are paid for by borrowers (which are usually folded into the loan). As a result the program is self-supporting. Loans range from $5,000 for residential projects, to several hundred thousand dollars for schools, to $16 million for industrial conservation and renewable energy generation projects.

ODOE has made extensive efforts to make SELP useful to public agencies by structuring it to meet their specific needs. For example, SELP offers "Muniloans" to schools, cities, counties and special service districts which are funded by general obligation bonds and, thus being federal tax free, are floated at lower rates than commercial bonds. SELP also offers variations on its core loan program to assist public facilities to finance engineering analyses.

The actual loan rate is a function of the bond type that the project is eligible for based on federal tax code guidelines: government purpose and therefore tax-exempt bonds for projects that save energy in publicly owned and operated facilities, and federally taxable bonds for projects that save energy for businesses and homeowners. The loan rates are set at the bond rate plus up to 1.5 percent, which covers the costs of bond issuance and program administration. Current interest rates are 7.2 percent for public projects and 9.5 percent for private projects. The private rate is close to the cost of capital to some private utilities.

The loan term is based on the type of project, its projected energy savings, and other financial judgments. Many loans may run 15 to 20 years, especially for generating projects.

SELP loans for private projects are usually matched with the State of Oregon's Business Energy Tax Credit (BETC). The BETC is a 35 percent tax credit that is applied to the state income tax for energy conservation and renewable resource measures over a five-year period.

*Results*

From 1981 through April, 1995, SELP has made 449 loans for $257.3 million (ODOE 1995 and Jordan 1995). During this same period, SELP received 732 applications for over $527 million worth of loans. Thus the loan approval/closed rate has been 61 percent of the loan applications

and 49 percent of the loan request amount. The distribution of loans by resource type is shown in Table 10 (these figures omit recent loans that were not categorized).

**Table 10**

**Small Scale Energy Loan Program Results**

| **Resource Type** | **Loans** (number) | **Loan Amount** (in $ millions) | **Loan Distribution** (based on $ value) |
|---|---|---|---|
| Renewables/Generation | 87 | $149.5 | 59% |
| Conservation | 263 | 79.5 | 31% |
| Ground-source Heat Pumps | 77 | 23.1 | 9% |
| Waste Heat/Other | 17 | 4.0 | <2% |
| Totals | 444 | $255.6 | 100% |

Source: Oregon Department of Energy 1995

Most of the SELP loans, in terms of loan value, have gone toward renewable energy generation projects, such as small-scale hydro and biomass projects. Conservation loans, although accounting for over half of the loans, constitute only 31 percent of the program's total loan value. Of the conservation loans, approximately one-third of the loans were for conservation investments in privately-owned facilities and about two-thirds for conservation investments in publicly-owned facilities. More recently, the program has been financing mostly conservation projects, many of which have been state buildings. The conservation projects financed by SELP have been fairly diverse including HVAC, energy management, and heat recovery systems, as well as lighting measures. In addition, ground-source heat pumps have proven moderately popular for larger facilities.

This program is structured more as economic development and local government/school assistance programs than as a resource acquisition program. Thus, program cost-effectiveness figures have not been compiled from a resource acquisition perspective and comprehensive impact evaluations have not been conducted. Although engineering estimates of energy savings/-production are developed for each project, these estimates have never been compiled across the program nor has there been any follow-up attempt by the program to verify these savings.

*Assessment*

The SELP program has been successful in financing public agency energy efficiency projects and renewable resource development projects. ODOE has had a long track record with SELP and has been aggressive in making it useful, especially to public entities. SELP is popular with public agencies primarily because the application procedures are straight-forward, the loan repayment schedules are flexible, and SELP funding is often easier to obtain and administer than through local bonding authorization.

SELP loans have also been used to finance energy efficiency measures in large commercial and industrial projects and has also proven to be useful in economic development and business retention efforts. These business loans are often been matched with the state's Business Energy Tax Credit. However, these private sector projects have been modest in number and represent a small proportion of the overall market. Similarly, the scope of SELP's role in economic development, although important for specific projects and businesses, has been small overall.

**Texas LoanSTAR Program**

*Description*

The Texas LoanSTAR program is a revolving loan pool which offers low interest loans for energy efficiency improvements in state, public school, and local government buildings. The $98 million revolving loan pool was endowed with funds from the "oil overcharge" settlement funds and, as a result, is currently self-sustaining by maintaining the principal. The program is administered out of the Governor's Energy Management Center (Wiley 1995).

The loan term is based on the combined estimated simple payback of the package of retrofitted measures but does not exceed four years. The interest rate is currently 4.04 percent, well below market rate loans. The maximum loan amount is $1.2 million for a local government or an independent school district and $4.8 million to state agencies and universities. Costs for project engineering and design, conservation measures, and installation costs are all folded into the loan. The costs for the initial energy analysis and post-installation on-site metering is paid from interest derived income.

Candidate projects compete for financing based on the estimated payback, the ability of the project to repay the loan through energy savings, the technical viability of the project, and feasibility of project metering. Eligible improvements which may be financed through the program include energy conservation measures, such as lighting, HVAC, motors, energy management systems, etc.; retrofits using alternative or renewable energy technologies; and load management.

The program has more recently established a statewide Monitoring and Analysis Program (MAP) in order to verify energy and cost savings from the program, identify effective operation

and maintenance measures, identify the most effective energy efficiency measures, and establish a database of energy use in the institutional and commercial sector. MAP is conducted primarily through the Energy Systems Laboratory at Texas A&M University.

*Results*

The program was implemented in two phases. During Phase I, the program was offered to state institutions from 1984 through 1986. During Phase II, the program was extended to public schools and local governments. The program has reportedly impacted a wide variety of non-profit and governmental buildings in Texas, but, thus far, has not been offered to privately-owned businesses.

Typical project savings are in the 25 percent range, but can be as high as 35 percent with operation and maintenance enhancements (Haberl 1995). For example, MAP is current monitoring 19 sites which encompass 92 buildings with 11.5 million square feet of floor area where retrofits have been fully or partially completed. The capital costs of the retrofits being monitored is $17.7 million. MAP has found measured savings from the retrofits in these sites of 2,528 billion Btu which equals $14.28 million in cost savings. The measured energy savings are 119 percent of the savings estimated by the energy audits and represent 24 percent of the pre-retrofit energy costs at these sites. The strong technical emphasis of program services has resulted in more comprehensive conservation measures such as lighting, HVAC systems, motors, energy management systems, boilers, and heat recovery systems.

*Assessment*

The Texas LoanSTAR program is currently limited to publicly-owned facilities. However, the state is considering expansion of services to the commercial sector as well.

The program displays several key strengths; namely, a sizable loan pool available at low interest rates, a strong quality control effort, and a comprehensive monitoring and evaluation program. The program's strong emphasis on quality control, verification of savings, and the use of monitoring and analysis to regularly upgrade program features and services place it in a strong position to expand to privately-owned facilities. The enhanced accuracy of energy evaluations and performance of efficiency measures would help to overcome the credibility barrier for owners of commercial facilities and make a loan program, however structured, more attractive.

**Iowa Energy Bank**

*Description*

Initially established in 1986 as a subset of Iowa's Building Energy Management Program (BEMP) and administered by the Department of Natural Resources (DNR), the Iowa Energy Bank facilitates and finances energy efficiency improvements in Iowa's public and non-profit

facilities (The Results Center 1994). Under the BEMP, the State of Iowa offers financing for state-owned facilities through a separate facilities improvement entity, all other public and non-profit facilities are covered under the Iowa Energy Bank. The Energy Bank has been incrementally expanded since its inception to encompass a) school districts, education agencies, and community colleges; b) hospitals; c) private colleges; and d) local governments. Each of these four sectors are served by different tracks within the Energy Bank, but all use roughly the same three step process for identifying and implementing energy efficiency improvements.

- First, an energy audit or walk-through is conducted to identify energy efficiency opportunities. These results are reviewed by the DNR who can authorized an engineering analysis or actual installations. The audits are performed by pre-approved auditors at no-cost to participants through DNR.

- Second, if necessary, an engineering analysis is conducted which provides detailed specification on energy efficiency measures, costs, and projected savings. The DNR offers short-term, interest free loans to underwrite these studies.

- Third, financing is offered to the facility owners/operators.

Until recently, most financing arrangements under the program consisted of lease financing. Currently there are financing tracks which serve different markets: lease financing for hospitals and private colleges (this was available to all participants until 1993); and a capital loan note established in 1993 for the other participants. The bulk of the program's financing comes from private financing sources with some augmentation by "oil overcharge" funds and other federal funds for program administration.

Lease financing repayments are structured for terms ranging from three to twelve years in order to make payments less than or equal to the energy savings. The lease financing interest rate is set slightly above the A bond rate (from 0.87 percent to 0.92 percent depending on the loan term) as determined by a designated bond index. The lease financing participants pay loan fees (calculated differently depending on the market sector served) which cover part of the administrative costs and which are usually folded into the loan.

More recently, the Energy Bank has offered a capital loan note for schools, community colleges, and local governments. The loan note is tied to the taxing ability of the jurisdiction. The interest rate is set slightly above the A bond rate (as determined by a designated bond index) and ranges from 0.12 percent above that rate for a 12 year note, to 0.85 percent above for a three year note.

Energy Bank financing services are handled by a financing team consisting of a financial consultant, a law firm, and a capital investment firm. This team assists participants to obtain and structure their financing. In some sectors (e.g., hospitals) the Energy Bank also provides an insurance pool. However, participants may seek their own financing arrangements if they so desire.

The Energy Bank is directly marketed by DNR representatives to the local governments and school districts. In addition, DNR works through governmental, hospital, and college associations to market the program and provide services.

*Results*

Cumulative participation (i.e., followed-through with installations) in the Energy Bank through 1993 has been 390 participants or 22 percent of eligible participants (mostly consisting of school districts). About 54 percent of the program participants have financed the energy efficiency improvements through the Energy Bank, the remainder have either self-financed (41 percent) or have not financed (5 percent) projects.

From the inception of the program through 1993, projected energy savings from the program were solely derived from the savings estimates provided by the energy audits and engineering analyses. For projects completed from 1988 through 1993, the average annual savings for all projects and on the average is provided in the following table for only those projects which received financing from the Energy Bank.

**Table 11**

**Iowa Energy Bank Results**

| Fuel Type | Total Annual Savings | Average Annual Savings Per Participant |
|---|---|---|
| Electricity | 11,874,611 kWh/year | 56,012 kWh/participant |
| Natural Gas | 1,739,397 ccf/year | 8,205 ccf/participant |

Source: The Results Center 1994

The DNR has not conducted any formal evaluations of the program to confirm program savings estimates. It has conducted "spot checks" of projects to ensure quality control and to act as case studies. Starting in 1994, DNR offers energy accounting and monitoring services to participants who wish to verify the achievement and maintenance of estimated savings.

The Results Center estimated the Energy Bank's cost effectiveness for the energy savings (based on audit estimates) financed by the Bank. The costs considered here include costs to the customer. There is a small administrative subsidy from other State funding sources to run the program which does not appear to be included. Table 12 illustrates the estimated costs of both electricity and natural gas savings (converted into kWh equivalents) expressed in 1990 dollars. The 1988 figure is for the program's first year in operation and consisted of a single large project. Otherwise, estimated program costs have been very low although these figures are

uncertain given that they are based on audit/engineering estimates and not on post-installation impact evaluations.

**Table 12**

**Iowa Energy Bank Cost of Savings**

| Year | Cost/lifetime kWh* |
|---|---|
| 1988 | 6.6 cents/kWh |
| 1990 | 1.2 cents/kWh |
| 1991 | 1.2 cents/kWh |
| 1993 | 1.6 cents/kWh |

Source: The Results Center 1994
*Based on an average measure lifetime of 14.2 years.

*Assessment*

A number of key components of the Iowa Energy Bank have been important in its ability to achieve significant penetration into the public facility sector, including personalized marketing to decision-makers; cooperation from key associations which assisted DNR in marketing and serving its members (e.g., hospital and college associations); a comprehensive service package which included both audit and complete financing services that was accessible to the participants; and flexibility in meeting the specific needs of market segments and individual customers.

The Iowa Energy Bank, much like SELP and Texas LoanSTAR, has been effective in reaching a significant proportion of targeted markets—namely publicly-owned and non-profit facilities—and in providing services tailored to the needs of the participants. However, the lack of a comprehensive evaluation effort limits our ability to assess the actual effectiveness and cost effectiveness of these approaches.

**Overall Assessment of State Loan Programs**

Overall, these three state government sponsored loan programs offer an effective financing package tailored to a receptive audience. Several major features account for their relative levels of success:

- Coherent markets with long-term investment perspectives. All three programs offer convenient financing and technical assistance to public (e.g., governmental facilities and schools) and non-profit institutions (e.g., hospitals and private schools). These markets are similar in that they tend to make budgetary and capital improvement plans on a multi-year basis; engage in decision-making processes that are not driven by short-term market and profit-oriented obligations, but rather by longer-term, service-oriented needs; and tend to have a more fixed and predictable funding base. As a result, these public and non-profit markets are more consistently responsive to financing offerings (so long as each entity does not need to find its own source of capital) than is usually the case for private, for-profit

facilities. In addition, this market coherence simplifies the service package and marketing/promotional efforts.

- Flexible financing packages. The state programs offer financing packages that are tailored to the needs and the decision-making processes of these markets. All three programs are fairly flexible in the way that the financing package is tailored. For example, Iowa's Energy Bank and SELP allow considerable flexibility in the loan terms, allowing customers to match the loan repayments with the energy savings levels from the conservation investments. In addition, these programs usually allow the participants to fold administrative and technical assistance cost-share into the loan package in order to minimize their up-front, out-of-pocket costs. As another example, Iowa's Energy Bank responded to a market barrier in the hospital market by developing an insurance pool.

- Tailored technical assistance and audit services. All three programs have tailored technical assistance and audit services to a) address the decision-making criteria of the public/non-profit facility and to b) ensure quality control reliability of the investment's performance. The Texas LoanSTAR program, in particular, has a very strong energy monitoring and commissioning component which has improved the reliability of energy savings estimates and the credibility of the program's offerings.

- Targeted marketing and streamlined service provision. All three programs have taken steps to ensure effective marketing and project management that is responsive to the participants. For example, although local governments at can obtain bond financing at rates equivalent to what Oregon's SELP offers, the program's ability to offer simplified one-stop shopping and loan administration without the need to seek voter approved bonding authority has proven to be very attractive.

- Innovative funding pools. Texas LoanSTAR alone relies exclusively on a designated loan pool (funded by oil overcharge funds) to finance its projects. It is unlikely that such a source of funds will be available in the future to underwrite loan programs in other areas. However, Iowa and Oregon have successfully used third-party financing and revenue bonds, respectively, to underwrite their financing programs. For example, Iowa's Energy Bank uses third-party financing to underwrite its lease financing program and local banks are able to finance the capital loan notes for public institutions. Oregon's SELP uses the bond market (for both taxable and tax-exempt bonds) to underwrite its loan program. In both cases, Iowa's and Oregon's programs have sufficient maturity and credibility to merit the interest of investors.

- Loan subsidies. An important observation about these state-sponsored loan programs is that, at least once operational, the level of financing subsidization (i.e., for the interest rate) is relatively low. Table 13 illustrates the current financing rates for Texas LoanSTAR and Oregon's SELP programs (these span the range of interest rates for state-sponsored programs). It also shows the level of subsidy compared to a private utility program with a 9.8

percent cost of capital (actual cost for one private utility which offered these interest rates to customers). Using a consistent set of assumptions[10] for all of the programs, the interest rate subsidy was calculated as 1) a percentage of the capital cost of the conservation projects (the "% Cost Adder"); and 2) the cost of the subsidy to the sponsoring organization.

Table 13 also illustrates that the magnitude of the interest subsidy, when expressed as a percent of capital outlay, is very sensitive to the interest rate and the loan term. For example, the subsidy from loan programs can be substantial and equivalent to a modestly-sized rebate program when the interest rate is very low or when the term is long (e.g., 12 percent to 22 percent subsidy levels for Texas LoanSTAR). However, under all conditions, the levelized cost of a private utility providing subsidies similar to those for the Texas loan program is very low; that is, 0.65¢ per lifetime kWh or less. Furthermore, programs such as the private sector loans under Oregon's SELP, which is essentially a self-financed program that offers market-based loans, add next to nothing to the cost of the investor owned utility (IOU) program.[11] These programs suggest that high levels of activity can be achieved for at least certain targeted markets (i.e., public and non-profit institutions) with relatively low levels of subsidies.

It should be noted that these comparisons are based on a typical utility's current cost of capital, which is substantially lower than was the case when these state loan programs first started in the early 1980's. During most of the lives of these programs, market interest rates were usually double digit values. Thus, the cost of interest subsidies were significantly higher during the 1980's and often approximated the subsidies for utility rebate programs.

[10] Assumptions for the hypothetical investor owned utility conservation loan program includes: a 2.5 percent inflation rate; a utility cost of capital based on current interest rates; and a non-levelized (total) resource cost of 3 cents per lifetime kWh (a typical value for a range of evaluated utility commercial and industrial programs).

[11] However, Oregon's SELP program penetration is aided by a 35 percent tax credit.

**Table 13**

**Cost to a Private Utility of Providing Similar Interest Rates for Conservation Loans as are Provided by State Loan Programs**

| **Loan Program** | **Interest Rate** | **% Cost Adder due to Present Value of Interest Subsidy*** | **Cost of Interest Subsidy*** ($/lifetime kWh) |
|---|---|---|---|
| ***4 - Year Term*** | | | |
| Texas LoanSTAR | 4.04% | 12.2% | $.0037 |
| SELP-Public | 7.2% | 5.6% | $.0017 |
| SELP-Private | 9.2% | 1.3% | $.0004 |
| IOU Capital | 9.8% (assumed) | -- | -- |
| ***7 - Year Term*** | | | |
| Texas LoanSTAR | 4.04% | 21.6% | $.0065 |
| SELP-Public | 7.2% | 10.1% | $.0030 |
| SELP-Private | 9.2% | 2.4% | $.0007 |
| IOU Capital | 9.8% (assumed) | -- | -- |

Source: PEA calculations

*These estimates are based on and made in reference to a hypothetical investor owned utility conservation program with a non-levelized cost of 3 cents per kWh. The "cost adder" is the percent increase in the captial cost of the projects due to the interest rate subsidy. The "cost of interest subsidy" is the incremental cost of the subsidy compared to the IOU base case.

- The extent to which these programs are providing a comprehensive set of cost-effective conservation measures is unclear. While the Texas LoanSTAR program requires a simple payback of four years or less for the combined package of measures, individual measures can have longer paybacks. The total costs from the Iowa program (in the 1¢ to 1.5¢/kWh range) are much lower than averages typically seen in comprehensive retrofit programs (often 2¢ to 3¢/kWh), raising the issue of whether the program is only achieving partial savings. Given the impressive savings results from LoanSTAR and the diverse mix of measures in the other programs, it is clear that the programs are not just skimming the cream; the primary

remaining question is whether they are only capturing a portion of the short and medium-payback measures or are capturing most cost-effective measures. A secondary remaining question is whether the lower interest rate for the Texas program results in more comprehensive savings.

- To what extent are the experiences of these three programs transferable to utility programs? These programs demonstrate that for coherent markets with long-term financing perspectives—especially public and non-profit facilities—well-managed financing programs with well-integrated technical assistance and quality control services can be very effective. However, these pre-conditions are not as prevalent in the private business sector, where investment decision-making is largely driven by short-term investment criteria, rapidly changing market conditions and competitive forces, a general need to limit long-term debt, typically very short timelines, and competing priorities. The private markets where the state loan program model may have the greatest application are with large owner-occupied facilities and centrally managed chains and franchises (groceries, banks, etc.). However, based on prior experience and market research, not all of these customers are interested in using their equity to finance conservation, and some already have very low costs of capital. Thus, a loan program would need to find a niche among these markets.

## CONCLUSIONS - FINANCING PROGRAMS

This section discusses what the programs discussed above teach us about the ability to achieve high penetration and comprehensive savings at low cost through financing programs. Overall findings are summarized in Table 14.

**Table 14**

**Financing Programs Track Record**

| **Market Segment** | **Best Examples** | **Cost** ¢/lifetime kWh | **Utility** % of Cost | **Penetration** % of Market | **Compre-hensiveness** | **Certainty** |
|---|---|---|---|---|---|---|
| Commercial Retrofit | | | | | | |
| Small | NewLondon | .05-1.0¢ | 33% | 33%/18 mo | ? | Medium |
| | Burlington | 1.2¢ | 39% | 4%/yr | ? | Medium |
| Large | SCE? | 0.4-1.2¢ | <20% | Low | High | High |
| Commercial Replacement | ??? | ??? | ??? | ??? | ??? | ??? |
| Small | SCE? | 0.4-1.2¢ | <20% | ??? | H* | Low |
| Large | | | | | | |
| New Commercial | | | | | | |
| Small | PacifiCorp Oregon | 2.5¢** | ~ 76%** | High | ? | Medium |
| Large | PacifiCorp Oregon | 2.0¢** | ~ 76%** | High | High | High |
| Government /Nonprofit | SCE | 0.4-1.2¢ | <20% | ??? | High | Low |
| | State Revolving Loan | 0.17-0.65¢ | 6-21% | Moderate | Moderate - High?? | High for Texas LoanSTAR |
| Industrial | PacifiCorp | 0.5¢ | 29% | ? | Maybe Low | Low |

*High comprehensiveness, but perhaps limited range of opportunities covered.
**Includes 35 percent Oregon state tax credit.

**Small to Medium Retrofit**

The Burlington program, and particularly the New London Resource Project, have demonstrated an ability of low-interest loan programs to significantly impact the retrofit market for small and medium-sized buildings. It appears that, under current interest rates, utilities can run such programs for a very modest cost, in the range of 0.5-1¢ per kWh. Given Burlington's success with bank loans, it is unclear that the Energy Service Charge feature is the key to success. The good news about these programs is subject to several caveats:

- The low overhead demonstrated by the New London Resource Project appears to be applicable to measures and customers where extensive, utility-sponsored analysis is not required to persuade the customer to install or to assure the utility that the measures are appropriate. This eliminates more sophisticated lighting design approaches and mechanical measures.

- Savings, comprehensiveness, and quality of installation have not yet been evaluated. In particular, progress with non-lighting measures has been limited. While this is also the case for most rebate programs for the small customers, there is a market for mechanical measures in medium-sized customers for HVAC which is not yet being reached.

- The most advanced example has reached a third of available customers. Thus, it is not yet clear whether this program approach appeals to most customers, or just some of them.

- The successful examples have been small towns where the community network is tightly knit, and can be engaged to support the program. It is unclear whether the results can be reproduced on a large scale. It is also unclear whether similar results can be achieved by utilities who do not share an identity with the town. In its Pacific Environments program for the town of Albany, Oregon, PacifiCorp tested an Energy Service Charge coupled with high-quality technical services (PacifiCorp, 1992a). The ESC was designed to recover all conservation costs over a period of up to 12 years. The program had high delivery costs, low penetration, and was not cost effective. The term of financing was too long for many customers. It is difficult to discern whether the technical delivery and/or the utility identity (a large for-profit utility) were other issues hampering this pilot.

- The cost effectiveness of these programs for small buildings (e.g., under 50 kW connected load) is not as clear; results are available for the programs as a whole.

**Institutional Retrofit**

The state revolving loan funds have experienced significant success with programs for institutions offering low-interest loan funds and technical assistance for conservation analysis. These programs have resulted in large cumulative volumes of conservation over many years. While cost-effectiveness information is not available, it can be imputed from the offered interest rates that these programs, if offered by a private utility, would involve only modest subsidies to cover the cost of capital. The technical assistance provided by these programs is intensive, but is

rolled into the program cost. Thus, analogous programs could conceivably be run by utilities to serve institutional customers for well under $.01/lifetime kWh.

The ENvest SCE program has demonstrated the ability of a private utility to engage the Federal and State governments with a program offering comprehensive project management services, equipment performance warrantees, and an Energy Service Charge for major retrofits (projects generally over $1 million.) The ratepayer subsidy is less than 20 percent of the cost of measures. Thus, if we were to assume that the average cost of conservation under this program is four cents/kWh, the ratepayer cost would be less than one cent. While this rough calculation is highly uncertain, it shows that the program is highly economical to the ratepayer. Beyond very large retrofit projects, the scope of the potential market for this program is unclear. However, the state experience with loans indicates that smaller institutions will work with a customer-friendly program of technical assistance and financing.

**Large Commercial Retrofit**

There is no one low-cost program which clearly has reached a broad swath of the large commercial retrofit market. However, several programs have reached a portion of this market. The Oregon SELP program included a few commercial projects, but not enough to assess the ability of similar loan programs to reach a broad market. Furthermore, the program was assisted by a 35 percent state tax credit, equivalent to a 35 percent rebate. The Burlington program appears to be working with several medium to large buildings, as is the New London program.

Prior program experience of the authors indicates that:

- Large Commercial Retrofit often involves more complex measures, and therefore more technical analysis, than the New London or Burlington programs. Thus, one would expect the analysis costs to be higher. Otherwise, costs should be no higher than for these programs.

- In general, large customers are more willing to invest in conservation than smaller ones, because they have larger energy bills and see electricity as a more important cost component. However, there is considerable diversity regarding interest in conservation and interest in loans.

- Community appeal may be less critical with large customers, since utilities can market to them intensively and amortize the overhead costs against more kWh of savings.

Thus, if properly marketed, we might expect a low-interest conservation loan or ESC program with similar terms to the Burlington or New London programs to elicit a significant level of response among exsisting large commercial customers. The portion of the market which would not respond is not known. Costs may be somewhat higher if higher levels of technical analysis and quality control are required.

**New Commercial**

PacifiCorp's FinAnswer has demonstrated the ability to reach a large fraction of the market at a cost which is similar to that for successful contemporary rebate programs, if one includes tax credits in the implicit program cost. Where tax credits are not available, the penetration has been only modest. Part of PacifiCorp's success formula is a comprehensive program of technical assistance, including a world-class commissioning program. It is unclear how the program would fare without these features.

**Industrial**

Evidence of the receptivity of industrial customers to utility-sponsored financing is preliminary and mixed. There are indications, both in the limited evaluation data available and in market research, that a large share of the market is not interested in this approach. Yet PacifiCorp has had some success (not yet quantified reliably) and some customers have participated in the Burlington Top Ten program. While costs appear relatively low, several questions remain:

- Can much in the way of process conservation can be achieved?
- Can high penetration can be achieved?
- Are these programs are really less expensive than rebate approaches?

BPA has run a successful, evaluated cash incentive program which has paid $.05 per first year kWh of estimated savings. To increase participation and comprehensiveness, the program was modified to pay the lesser of $.15 per first year kWh or 80 percent of project costs. While this program may not be acquiring all measures which are cost effective to BPA (since the incentive pays a lesser fraction of the cost for long payback measures) it has achieved significant success in process conservation as well as process support measures.

The overall cost for BPA's program under the initial incentive scheme has been estimated at $.008/lifetime kWh levelized (Nadel and Jordan 1993). Impact evaluation of a series of early BPA case studies arrived at a weighted mean levelized cost of $.003 per lifetime kWh, and a median cost of $.0062 per lifetime kWh (Spanner and Brown 1993). Financing programs may cost less than very low-cost rebate programs, but not by much; the costs for the least expensive cash incentive programs are already very low.

This leaves the questions of whether the financing programs can achieve high penetration and comprehensive treatments.

**Equipment Replacement**

It appears that some portion of small and medium building lighting remodeling jobs are being impacted by the New London or Burlington programs. However, there is no information about the proportion of lighting replacements that the programs are missing. It is possible that the New London program is capturing most lighting replacement opportunities at low cost. Given the activity level at Burlington, this is less likely.

There is no indication that any of the financing programs studied are addressing volume markets for replacement at or near failure for motors, package HVAC systems, compressors, or other modular (packaged or discrete) mechanical equipment.

Large conservation opportunities created where customers overhaul large systems or renovate buildings, and replace equipment in the process, tend to run on a slower track and are more amenable to financing. In this realm, FinAnswer is working with major renovations, and ENvest SCE is working with major HVAC system overhaul/replacement. Data is not available to distinguish costs for these activities from the retrofit costs discussed above.

Thus, the low-cost programs appear to be touching replacement markets, but leaving many lost opportunities.

# APPENDIX A

RAP Project
No/Low Subsidy Program Review

**RAP PROJECT**
**No/Low Subsidy Program Review**
**Summary of Audit Programs**
**Level 2**

| | **Seattle City Light C/I Audit Program** | **Portland Energy Conservation, Inc. C/I Audit Program** |
|---|---|---|
| **Program Time frames:** | 1979-1985 | 1981-1984 |
| **Financing:** | Free audit; rebates available during evaluation period were limited to replacement of 40 W fluorescent tubes with 34 W tubes, and a DHW tank wrap. | No-interest, one year loan covered the cost of the audit. No capital financing nor rebates available. |
| **Target Markets:** | Commercial and industrial customers, mostly commercial, but both small and large. | Commercial and industrial customers. |
| **Description:** | Emphasis was on low-cost tuning, maintenance and operation actions. | Loan was forgiven if customer implemented recommendations. Debt pro-rated for partial implementation based on savings. Emphasis on O&M measures. |
| **Cost:** | Cost to utility of $148,000. Unlevelized cost of $.04/first year kWh. | Audit fees were $162,000; electric savings 2,844,830 kWh/year. Unlevelized cost was $.057/kWh. Average measure life expected 6.8 years. |
| **Participation:** | 275 customers as of the end of 1982. | 420 customers |
| **Evaluation:** | • Evaluated participants from | • Evaluated 72 firms |

| | | |
|---|---|---|
| | July 1981 to December 1982<br>• Net energy savings using non-participant control group<br>• Cost effectiveness | • Compared evaluated savings to audit estimates. |
| **Program Results:** | • Energy savings were related to size of customer. No significant savings for small and medium customers, but significant savings for large customers. Overall savings for all participants compared to non-participants was 6%<br>• First-year savings of 3.4 million kWh | • Of 374 recommendations to the 72 evaluated firms, 94% were implemented.<br>• Engineering estimates of gross savings were 10.2% of total electrical use, compared to 12.1% of audit projections<br>• Engineering estimates of non-electric savings were 17.5%. |
| **Source:** | Brian Coates and Roland Bradley, *Evaluation of the Walk-Through Survey Program for Commercial and Industrial Customers,* Seattle City Light, June 1983<br><br>Brian Coates and Carin Weiss, *Evaluation of the Energy Management Partnership Program,* Seattle City Light, May 1984 | Portland Energy Conservation Inc., *Results of the Evaluation Project of the Commercial Building Audit Loan Program Volume 1*, December 12, 1994 |

**RAP PROJECT**
**No/Low Subsidy Program Review**
**Summary of Audit Programs**
**Level 2**

| | **SDG&E Non-Residential Energy Audit Program** | **SDG&E Non-Residential Audit Program** |
|---|---|---|
| **Program Time frames:** | 1985-1988 (evaluated) | 1992-1993 (evaluated); history undetermined |
| **Financing:** | Free audit; rebate programs available | Free audit; used to generate participants in incentive programs |
| **Target Markets:** commercial/ | Small to large commercial and industrial; 13% of firms audited 1987-89 were industrial | Small and medium industrial customers (unassigned accounts) |
| **Cost:** | Not analyzed in available documentation | Not analyzed in available documentation |
| **Participation:** participation. | 452 customers audited in 1987-89 | 305 customers received audit only with no follow-up visit or incentive program<br><br>571 customers subsequently participated in SDG&E incentive program. |
| **Monitoring and Evaluation:** | Focus on 1987-89 participants Realization rates estimated (evaluated energy savings divided by audit-estimated potential savings). Adoption rates estimated. | Energy savings (gross) evaluated for 2 groups; those customers who subsequently participated in a SDG&E incentive program (354 sites) and did not receive a post-audit visit (237 sites) |

| | | |
|---|---|---|
| **Program Results:** | • 83% of potential energy savings were achieved<br>• 98% of potential demand savings were achieved on average.<br>• 89% of energy efficiency actions taken would not have occurred without the audit (11% were free riders, would have occurred anyway) | • Participants are predominantly commercial rather than industrial.<br>• Audit-only customers saved 5.4% of average consumption. Customers who received an audit and participated in an incentive program saved 11% of average consumption. |
| **Source:** | Regional Economic Research, *SDG&E Non-Residential Audit Evaluation Final Report*, February 4, 1991 | San Diego Gas & Electric, Marketing Information & Planning, *Non-Residential Energy Management Services: Small & Medium Commercial/ Industrial Audit Program Analysis of Gross Energy Impacts,* September 1994 |

**RAP PROJECT**
**No/Low Subsidy Program Review**
**Level 3 Summary**

**Project Sponsor:** Pacific Gas and Electric Company

**Project Name:** Non-Residential Energy Management Services Programs

**Program Type:** Audit

**Target Market:** Commercial, Industrial and Agricultural customers

**Program Purpose:** Energy and peak savings

**Program Timeframe:** 1982-present (Commercial)

**Contact Person:** Forrest Harrison, PG&E Program Evaluator, (415) 973-4082
Geoff Friedman, PG&E Asst Program Manager, (415) 973-4580

**Program Description**

"Through its Energy Management Services (EMS) programs, Pacific Gas and Electric (PG&E) offers a range of information and evaluation services to help its commercial, industrial, and agricultural (CIA) customers manage their energy consumption. The services that PG&E offers vary from walk-through energy audits with verbal recommendations made during the audit to special consultant studies. Program field staff help customers in determining the mix of options that meets their needs. Informational seminars, rate analyses, and incentive program information are also provided under the auspices of the programs.

"The CIA EMS programs provide customers with suggestions for ways to improve the efficiency of their energy use and recommendations for measures that they can install to achieve savings in their energy use...[T]here are two major aspects of an EMS audit to a customer that are of interest.

> One aspect of an EMS audit is to provide a customer with suggestions and verbal recommendations for no cost or low cost measures to improve the efficiency with which energy is used. The savings that PG&E has claimed for the Commercial and Industrial EMS programs are based on assumptions regarding the implementation of these suggestions by customers.
>
> The other aspect of an EMS audit is to recommend to the customer relatively more capital intensive measures (including those for which PG&E offers incentives) that could be installed to improve the efficiency with which energy is used at a facility. PG&E currently does not claim savings from this aspect of the EMS program." (ADM Associates et al. 1993)

**Program Marketing and Delivery**

The program has changed over the years. The range of products varies with the level of complexity of the facility. For the last two or three years, large industrial customers get comprehensive audits, conducted by industry experts and costing thousands of dollars. PG&E account reps have done simple audits with the support of in-house engineering staff. Outside contractors are also used. For the last few years, 1991-1993, PG&E has performed 10,000 to 13,000 audits per year. About 70 percent of these are for small commercial customers.

**Financing Structure**

Financing is not a part of this program. Although the program does encourage customers to implement recommended capital intensive measures by participating in one of PG&E's rebate programs, the EMS programs are operated as stand-alone programs. Savings and costs are reported only for measures done outside of PG&E's incentive programs.

**Cost Information**

Still seeking info

**Program Evaluation**

Many program impacts occur more than one year after program participation because of the customer's decision making structure, capital availability, or technology replacement schedule. As a result, evaluations conducted just one year after implementation will miss impacts that are directly related to the program. The first evaluation used for this summary was reported by Warner et al. (1991). It looked at customer decision making and implementation rates over time for the commercial EMS program. It was conducted in late 1989 on program participants primarily from the years 1984 and 1985.

"From 1982 to 1986, PG&E conducted over 9,600 commercial and industrial on-site audits using XenCAP. Each audit addressed the major electric and gas end uses for potential energy savings. Customers were given computer generated audit reports that explained the specific energy savings recommendations. In addition to the customer reports, the XenCAP system developed a detailed database that includes customer contact information, end-use consumption estimates, equipment inventories, and recommended energy conservation measures. This database facilitated a detailed measure-by-measure evaluation of the audits and customer motivations several years after the audit program."

The evaluation was done by calling back the customer and using the high resolution data within the XenCAP database to ask a series of questions, including:

Was the measure implemented? When?

What were the reasons for implementing or not implementing?
Was the measure fully implemented or just partially?
Is the measure still installed and functioning as designed?

Rather than asking customers whether they had installed measures using a generic master list of recommendations, or relying on the customer's memory to generate the list of recommended measures, the customers were asked only about those measures that were specifically recommended as recorded in the database.

Another evaluation, this time of all the non-residential EMS programs, was conducted in 1993 to estimate the energy and demand impacts from 1990-1992 participants. Savings estimates were made for three groups of measures:

No cost/low cost measures installed by customers who received only an EMS audit and who did not subsequently participate in a PG&E rebate program.

No cost/low cost measures installed by EMS audit customers who did participate in a rebate program.

Capital intensive measures installed by customers who received an EMS audit and who implemented these measures without a rebate from PG&E.

Impact analysis for EMS customers who did not implement capital intensive measures was done using statistical analysis of billing data, and net-to-gross ratios estimated from survey data. For those customers who did implement capital intensive measures, estimates were made from the product of measure-specific implementation rates (obtained from telephone interviews) and measure-specific engineering estimates of achieved savings (based on site visits and verification of critical assumptions). Net-to-gross ratios, developed from survey data regarding free-ridership, were then applied to the gross savings estimates.

**Program Results**

The audits recommended on average six energy conservation measures (ECMs) per customer. Half of these recommendations were low-cost or no-cost measures. Within the four to seven year period following the audit, approximately 55 percent of recommended ECMs were implemented. Over 90 percent of participants had implemented at least on ECM. "Based on the XenCAP engineering estimates, these implemented measures correspond to a total program savings of 163 GWh per year, or 9.8 percent of the total electricity use targeted in the program, and 5.0 million therms per year, or 9.5 percent of the total gas use." (Absent any description of control groups or other methods to estimate the level of naturally occurring energy savings, it is assumed that these are gross savings reported.)

Nearly half the installed ECMs were low-cost or no-cost measures. ECMs among all end uses were implemented. Implementation did not drop off significantly until the cost exceeded $4,000.

In terms of timing, the evaluation found that nearly one-third of the total program savings came from ECMs installed more than two years after the audit. Weighted by energy savings, only 29 percent of the ECMs were installed in the first year; an additional 10 percent in the second year; an additional 6 percent in years three and four; and finally 4 percent in the fifth year for a total of 55 percent of recommended ECMs.

The authors conclude that "audit programs by themselves do not sufficiently motivate customers to implement measures quickly. Without proper financial incentives and installation assistance, customers will prolong the implementation process for up to five years. Because most utility programs require careful accounting and monitoring of program impacts, audits by themselves do not give utilities the control they need over the resource acquisition schedule."

Results of the 1993 impact evaluation are presented separately for commercial, industrial and agricultural customers. Only the commercial and industrial results are summarized here.

Commercial Sector

The Commercial EMS Program served from 10,000 to 16,000 customers per year during the period 1990 to 1992. For those customers who only received an audit, multiple regression analysis estimated net savings of 2.7 percent for retail businesses, 5.1 percent for habitation (presumably hotels and motels), 0.9 percent for office buildings, and no statistically significant savings for food handling businesses.

For those customers who made capital improvements without a rebate, savings were presented per ECM and ranged from zero to 44 percent, the latter for changing or adding evaporative cooling. Most of the ECMs were lighting; changing to fluorescent lighting and electronic ballasts saved from 8-16 percent.

Gas savings were bigger. For low or no cost actions, the food handling subsector saved 6.5 percent, habitation 11.2 percent, retail 12.3 percent, and office nothing (or savings were not statistically significant). For capital measures, HVAC ECMs saved 25.3 percent for habitation subcategory and 13.4 percent for office buildings, but no statistically significant results for food handling and retail. For hot water, capital gas measures showed savings only for habitation, at 11.5 percent.

Industrial Sector

The Industrial EMS Program served about 850 customers per year during the period 1990-1992. Customers who received an audit only are estimated to have saved 6.8 percent of electricity use. The capital intensive measures saved from -6 percent to 588 percent, the negative savings being

for outdoor sodium lights (probably where there had been insufficient light before), and the very high savings for cleaning air conditioning condenser coils (though this doesn't sound like a capital measure). If these two outliers are eliminated, the measure specific savings range from 5 to 18 percent.

**Unanswered Questions**

Cost effectiveness.

**Documentation**

ADM Associates, Cambridge Systematics and Elrick & Lavidge, *Impact Evaluation of 1990-1992 Nonresidential Energy Management Services Programs*, Final Report prepared for Pacific Gas and Electric Company, December, 1993.

Kellogg L. Warner, Peter Rumsey, and Grayson Heffner, "New Insights through Long-Term Evaluation of Commercial Audit Programs," in Proceedings of the 1991 Energy Program Evaluation Conference, Chicago.

**RAP PROJECT**
**No/Low Subsidy Program Review**
**Level 3 Summary**

**Program Sponsor:** Ontario Hydro

**Program Name:** Compressed Air System Checkup

**Program Type:** Utility paid audits and technical assistance

**Target Market:** Industrial facilities with compressed air systems.

**Program Purpose:** Energy savings

**Program Timeframe:** 1992 - 1994

**Persons Contacted:** Ontario Hydro:
Mike Sanio, Industrial Market Segment Manager: 416-592-3395
Martin Petrovchik, Program Designer: 416-592-3657
Olivia Tu, Program Evaluation Manager: 416-592-6204
Alison Knight, Program Evaluator: 416-592-6208
Peter Kyricopoulos, Barakat & Chamberlin

**Program Description**

*Overview*

The Compressed Air System Checkup program was a component of an integrated package of Energy Management programs conducted by Ontario Hydro from 1989 through 1994. The Energy Management programs consisted of both incentive and information/technical assistance programs and were designed to achieve reductions in electricity demand through electrical efficiency improvements, fuel switching from electricity to alternative fuels, and load shifting from peak periods to lower use periods. Distinct programs were developed for the consumer markets, i.e., existing homeowners, new homeowners, and farm operators; and business markets, i.e., commercial and industrial customers. Since the compressed air program was part of an integrated programmatic package, additional contextual information is provided in the following.

As part of its offerings to the business-industrial markets, Ontario Hydro developed an umbrella program known as the Industrial Study Initiative which sponsored a variety of energy efficiency feasibility studies that were partially or wholly subsidized. Under this umbrella program, Ontario Hydro targeted several key industrial markets for technical assistance including compressed air end uses for industrial processes.

These technical assistance programs were intended to encourage industrial operators to participate in the utility's industrial incentive-driven programs which included the following (only programs possibly related to compressed air systems are mentioned):

- Savings By Design. Performance-based and prescriptive incentives for new construction and major renovations.

- Accelerated Payback. A comprehensive program which offered incentives to all industrial customer with over 10,000 kWh in annual consumption. The incentives covered incremental costs for both retrofit projects and new plant designs. This program was replaced in late 1993 by the Business Power Saver Plan with reduced incentives.

- Guaranteed Energy Performance. This program offered incentives to contractors (i.e., ESCOs) who guaranteed the economic performance of energy efficiency projects in existing commercial and industrial projects.

- High Efficiency Motors. Incentives were offered to customers to buy high efficiency motors for retrofit or new construction, and to vendors for stocking such motors.

*Compressed Air Program*

The Compressed Air System Checkup program was designed to identify improvements to compressed air systems used at industrial facilities. The program provided utility paid audits, system checks, and feasibility studies targeted at small-medium industrial customers in key market segments. The studies were conducted by engineering firms under contract with Ontario Hydro.

The primary focus of the program was to determine the potential of energy efficiency improvements in industrial plants with compressed air systems. There were two major technical issues that were addressed by the program design:

- The efficiency of the air compressors themselves. Most projects addressing compressors dealt with maintenance rather than equipment replacement.

- The efficiency of the distribution lines and overall systems. Of particular interest to the utility were the potential the effects of operation and maintenance (O&M) measures on the system efficiency.

- Secondary technical issues which were addressed by the program include:
  - Controls.
  - End use tools using compressed air
  - Operating practices for the compressed air system.

The program primarily focused on compressors and air line maintenance. In addition, there was a strong emphasis by the program to influence O&M behaviors.

*Current Status*

Funding for the Energy Management programs was dramatically reduced by 1994. As a result, the air compressor program, along with all of the other programs at Ontario Hydro, are either in a state of flux or have been terminated. The utility has redefined its industrial goals as: a) assist customers in expanding (economic development); and b) retain existing customers in the face of competitive power sources/fuels, etc. DSM has been demoted to a secondary role to the extent that it can support the primary goals. The DSM programs are being reformatted into this new framework. DSM programs will in the future focus on marketing, technical assistance, utility co-funding of feasibility studies, but will not entail capital incentives.

According to the Monitoring and Evaluation Department, participation rates in all information and technical assistance programs have been much lower than expected once the incentives were eliminated. This has been the case even for those markets which normally did not qualify for incentives (usually due to very short paybacks) but which proceeded with energy efficiency improvements. Apparently just the knowledge of the availability of incentives motivated customers to participate in the information/technical assistance programs even though many of them ended up investing in efficiency measures without using or qualifying for incentives.

**Program Marketing and Delivery**

Program marketing was primarily conducted through direct/personal marketing approaches by Ontario Hydro field advisors and sales staff. These field staff initially identified technical assistance opportunities and brought in the "leads."

The utility provided customers with a list of qualified consultants/contractors from which they were free to select. The consultants subsequently conducted feasibility studies and prepared recommendations and proposals for compressed air system improvements. Apparently, the consulting community quickly picked up on this effort and began to identify leads and address them either on their own or through the program.

The utility reviewed these studies and accompanying recommendations and provided approval for specific recommendations as an initial quality control measure. Customers were subsequently encouraged to take advantage of the incentive-driven programs, although most either were not qualified (mostly due to short paybacks) or elected to act on their own.

**Program Financing/Incentive Structure**

The Compressed Air System Checkup program was developed as a subset of Ontario Hydro's Industrial Study Initiative Programs. These programs were intended to encourage industrial operators to participate in the utility's industrial rebate programs.

In addition, the utility paid the consultants half of the costs of the feasibility studies upfront, the customers paid the rest. However, if the customer completed a minimum percentage of the study's recommendations, Ontario Hydro paid for the entire study.

**Cost Information**

Several hundred companies had visits from the consultants who provided a report and accompanying recommendations. The site visits and reports were inexpensive, mostly in the $2,000 to $3,000 range.

**Program Evaluation**

Customer 16-hour MW savings are used by Ontario Hydro as a proxy for utility system impact for program planning and reporting purposes. These results reflect the actual savings on the customers' premises during the winter peak 16-hour period (7:00 a.m. to 11:00 p.m. weekdays). The utility's evaluation methodology for annual load impacts consist of the following five steps:

- Engineering estimates of energy savings from energy efficiency measures installed under the Ontario Hydro program are adjusted through a "verification audit." The audit consists of a detailed review of the engineering estimates for a particular project followed by telephone calls and/or site visits to customers. Further adjustments are made by the Evaluation Section based on updated information on equipment specifications/performance and technology specific evaluations.

- Net customer MW savings are determined based on the application of free-rider estimates that were obtained from separate evaluation studies.

- Short-term incremental net MW savings incorporate line loss savings.

- Cumulative system net MW savings from 1989 are calculated to reflect savings attrition.

- Estimates for long-term system net MW savings to the Year 2005 are adjusted to reflect the "decay" in savings from persistence factors and the "advancement" of natural conservation due to the programs.

**Program Results**

*Program Penetration*

Several hundred companies had visits from the consultants who provided a report and accompanying recommendations from 1992 to 1994. As of August 1994, estimated program penetration rates are 30% participation of the targeted population over the two year period. Customer participation was usually a function of the customer's energy bill, i.e., its size and its impact on the customer. There were many cases where major savings with good paybacks were discovered, but the customer wanted to focus their limited funds on production.

Energy savings "returns" from the program have been reported to be very good. The feasibility studies identified about 100 kW of savings per site on the average.

Most customers had the opportunity to apply to other Ontario Hydro incentive programs, such as the ones listed in the overview. But most of the customers were ineligible for incentives due to the very short paybacks on the study recommendations. Ontario Hydro staff estimate that 75% of the customers went ahead with the recommendations (at least some of them) without the incentives (see following table). Sometimes the consultants would work through the Ontario Hydro program; sometimes they did it themselves.

**1993 Load Impact Results**
**Business-Industrial Markets**
**Short-Term Incremental Net kW**
**(16-Hour kW)**

| Market Segment | Incentive Programs | Information Program | Total |
|---|---|---|---|
| Natural Resources | | | |
| • Compressed Air | 348 | 2,601 | 2,949 |
| % of Total | 12% | 88% | |
| General Manufacturing and Automotive | | | |
| • Compressed Air | 429 | 309 | 738 |
| | 58% | 42% | |
| Chemical, Food and Beverage | | | |
| • Compressed Air | 85 | 335 | 420 |
| | 20% | 80% | |
| Metals | | | |
| • Compressed Air | 0 | 5 | 5 |
| | 0% | 100% | |
| Totals | 862 | 3,250 | 4,112 |
| | 21% | 79% | |

*Load Savings Estimates*

Evaluation reports are currently being prepared for the 1994 program (as of April 1995). The following provides a summary of net load impacts from the compressed air program for the 1993 program year. A very large proportion of program savings (79%) are ascribed to the information/technical assistance program.

*Case Studies/Anecdotes*

Program staff found that air leakage in compressed air systems could reach up to 50%. There were "amazing stories" about such inefficient systems. For example:

- A low cost project involving a $3,000 investment in maintenance activities for a 350 h.p. compressor system allowed the facility to shut down a compressor line that was operating 24 hours a day.

- In another, very old facility, a one inch hole in was found a compressed air line, constituting a major leak. The floor operators assumed that that was how the system normally worked.

- Another old plant was able to remove 7,000 feet of unused but pressurized lines after assistance from the program.

*O&M Emphasis*

The program also emphasized behavioral changes; it was not just focused on technical fixes. Utility staff and consultants attempted to effect a behavioral change through O&M. However, they were confronted with a major barrier: additional O&M activity by the maintenance departments meant additional costs. Although these additional costs for O&M could provide substantial savings to the facility, these benefits would not accrue to the maintenance departments.

However, several companies were inspired by the Ontario Hydro program and formed "teams" to address other issues such as water quality and usage, air quality, etc.

According to program implementors, it was a successful program from the customers' viewpoints, but it was very difficult to evaluate from Ontario Hydro's perspective, especially with respect to O&M measures. It is hard to account for the behavioral success in terms of kWh as opposed to the technical measures themselves. The utility conducted pre- and post-treatment metering of the compressed air systems, but these measurements are only valid for the year that they were conducted.

Program staff noted that electric billings are not usually a major budget item for industrial facilities compared to other costs; therefore, it is hard for the facility to justify extra labor for maintenance versus labor for the production lines. In addition, the findings of the Ontario Hydro-sponsored technical assessments sometimes made the maintenance department look bad.

**Documentation Utilized**

- Peter Kyricopoulos, et. al., *Garnering the Industrial Sector: A Comparison of Cutting Edge Industrial DSM Programs*, 1994 ACEEE
- Monitoring and Evaluation Department, *1993 Net Load Impact of Energy Management Programs*, Ontario Hydro, May 1994.
- Monitoring and Evaluation Department, *Impact Evaluation Report: Power Savers Audit Program,* Ontario Hydro, August 1994.

**RAP PROJECT**
**No/Low Subsidy Program Review**
**Level 3 Summary**

**Project Sponsor:** Niagara Mohawk Power Corporation

**Project Name:** Subscription Option Program

**Program Type:** Audit Program

**Target Market:** Existing facilities of very large industrial and commercial customers

**Program Purpose:** Energy Efficiency and Demand Reduction

**Program Timeframe:** March 1993 to March 1995

**Contact Person:** Dennis Trepanier, Marketing Program Coordinator, NMPC (315) 428-5009
Carl Pietrykowski, Program Manager, NMPC, (315) 428-5009
Susan Sowek-Ruiz, Energy Efficiency Analyst, New York Public Service Commission, (518) 486-2882
Marsha Walton, Associate Project Manager, New York State Energy Research and Development Authority, (518) 432-4630

**Program Description**

About 360 of NMPC's largest customers have been given the option of participating in the utility's energy efficiency rebate programs and contributing to the cost of these programs (Option A), or making themselves ineligible for the programs and avoiding a portion of the conservation charge (Option B). However, customers choosing Option B must complete a comprehensive energy audit at their own expense, within six months after becoming eligible and applying for the option. If at a later time customers believe they can benefit from participating in the standard rebate programs, they may switch to Option A by paying the conservation charge they would have incurred during the period they were in Option B.

Option B customers are not required to implement the audit recommendations, however NMPC will help these customers find financing or recommend qualified Energy Service Companies, to implement the recommendations. A portion of NMPC's energy efficiency performance incentive (shareholder incentive) depends on savings from the actions of these Option B customers.

This is a pilot program authorized by the PSC for two years only. Concerns were expressed that large customers would attempt to avoid the conservation charge and then do nothing with the audits. The intent, as New York PSC Chairman Peter Bradford explained it, is not to let these customers "decide whether to participate in conservation programs. It is about allowing them to choose which energy efficiency programs suit them best and how best to pay for them."

The charge avoided is about 1.5 mills/kWh, which represents about 40 percent of the DSM costs charged to large customers. These costs cover DSM rebates and the utility's financial incentives. Option B customers are still required to pay the remaining 60 percent, which covers DSM information program and administrative costs, and net lost revenues related to NMPC's DSM programs.

Assuming that 100 percent of customers eligible for Option B participate, a target of 60,000 MWh was set for 1994 and another 115,000 MWh for 1995. As will be described later, these targets have been adjusted to reflect actual participation.

**Program Marketing and Delivery**

Because NMPC is looking to Option B customers to help the utility meet its DSM targets, it has a stake in implementation of the audit recommendations. NMPC plays the role of facilitator by helping customers who need financing to obtain it. NMPC has established an arrangement with two banks which have agreed to finance installations provided that consumer credit requirements are met. The loan relationship is directly between the banks and the customer; NMPC does not play a role. To date, there has not been much activity in financing through these banks as most participants are using internal funds. However, recent evaluations show that Option B customers are stating the lack of capital to be a major reason (34 percent) for not implementing audit recommendations. While the capital may be available from the banks, it may be at terms insufficiently favorable to produce attractive paybacks; poor payback was cited in 51 percent of the cases as the reason for not implementing recommendations.

NMPC is considering an arrangement by which the bank loan could be repaid via the utility bill. The convenience to the customer, and the assurance to the bank, could have the effect of making the loan option more attractive.

Another facilitation role performed by NMPC has been the qualification of six Energy Service Companies (ESCOs) which can also provide financing as well as a range of other technical and project management services. The October 1994 status report from NMPC mentions that one ESCO has partnered with five large industrial customers (all subsidiaries of one parent company),

and another ESCO is working with a large federal government account. It is not yet clear whether these are isolated examples, or indicative of a trend.

**Financing Structure**

The Subscription Option Program itself does not offer financing. NMPC had no specific information about the terms of bank loans, indirectly confirming the fact of little use of third party financing.

**Cost Information**

NMPC is not tracking program costs because they are very small. It was estimated that less than one full time equivalent is devoted to the program.

**Program Evaluation**

There are currently two evaluation tracks being pursued. One evaluation track is being managed by the New York State Energy Research and Development Authority (NYSERDA), and the other track is being pursued within NMPC.

The NYSERDA work has been contracted out to the Research Triangle Institute (RTI) and has an independent panel which is asked to comment on workplans and draft reports. The primary focus of this work is to evaluate the energy audits, and to prepare estimates of the technical, economic and market potential for energy savings in the large customer market. The latter objective relies on the energy audits themselves, a follow-up on-site survey of a subset of Option B participants, and participants' statements about their implementation plans. The evaluation of the audits has been completed; the estimates of savings potential will be complete in the first half of 1995.

The evaluation being conducted internally to NMPC has as its objective to estimate the energy savings impacts of the program, with a focus on 1994 activity. It is expected to be completed by July 15. 1995. A survey is being conducted of each Option B customer to find out what actions have been taken, whether additional actions are planned, and what the schedule is for additional actions. The questions are specific to audit recommendations, and if only a portion of the audit recommendation has been implemented, the customer is asked to estimate a percent. The energy savings impacts are then estimated from the engineering estimates in the audit recommendations, or pro-rated based on the percent completed as reported by the customer.

NMPC customer service representatives are coordinating the surveys because some customers are touchy about being pestered about this program, so discretion is important. Service reps may therefore discuss the survey on-site or over the telephone, but it is not a technical inspection to determine what has been installed; responses are based on customer statements.

This in-house evaluation will attempt to estimate energy savings from all DSM actions taken by Option B customers, whether or not the actions were in response to the energy audit recommendations. Trying to attribute savings only to the energy audit stimulus, i.e. net savings, is not considered appropriate because Option B customers have generally maintained that they don't want to pay the DSM charge because they are doing DSM on their own. Thus this evaluation considers the question of free riders (those who would have done the DSM anyway) moot. There may not be universal agreement with this approach.

**Program Results**

Actual implementation of recommended Energy Conservation Measures (ECMs) will not be known for the first two years of program operation until later in 1995. This is not surprising given that the vast majority of audits were not completed until late 1993, and some even later. Even if a company intends to implement a recommendation, it takes time to make the decision, and to budget the funds to do the project. If the project is a process improvement, it may be necessary to schedule the improvement with planned downtime to avoid any adverse effects on production time. Significant industrial projects have been known to take several years from audit to installation. Frustrating as it may be, a complete answer simply may not be clear for another year or two.

Approximately 360 customers are eligible for the Subscription Option Program; as of late 1994, about 38 percent, or 137 customers, had selected Option B. Although only 38 percent of eligible customers, Option B customers represent about 54 percent of eligible energy consumption because they tend to be larger industrial customers, whereas Option A customers tend to be large commercial customers.

Energy savings targets have been adjusted (prorated) to reflect the actual number of participants in Option B. For 1994, the adjusted target is 32,000 MWh and for 1995 the target is 62,000 MWh. Savings from ECMs installed through October 1994 total 20,748 MWh, or 64 percent of the 1994 goal.

The evaluation of energy audits conducted by RTI for NYSERDA evaluated the audits from 117 of the Option B customers. In addition, ADM Associates evaluated the audits of 112 of the Option B customers. Most of the following results are from these evaluations. Although most of the audits evaluated are of the same customers, some of the differences between the two sets of results can probably be attributed to the different set of audits, and perhaps to different definitions for grouping responses.

Option B customers are much bigger energy consumers than Option A customers, but their electricity use, as a proportion of total energy use, is much smaller (20 versus 47 percent). For Option B customers, a much greater proportion of electricity is used for motors, and much less for HVAC and lighting end uses.

Based on the 117 audits reviewed by RTI, 520 million kWh have been identified as the technical potential savings for the Option B customers. This represents about 9 percent of the Option B customers' loads. Most of the savings come from motors and drives (32 percent), lighting (20 percent), and process uses (15 percent). The 112 audits reviewed by ADM showed potential savings of 440 million kWh. Motors, drives and air compressors account for 39 percent, lighting accounts for 15 percent, and process improvements account for 36 percent of the savings. Although the shares differ, in both reviews these three categories of measures do offer the biggest potential.

Both audit evaluations found that about 55 percent of the recommended savings have paybacks of three years or less.

In 59 percent of the audits reviewed by RTI, customers indicated the likelihood of implementing the recommendations within the next two years. Of those who responded, 14 percent of the ECMs were scheduled or complete, 16 percent were likely to be implemented, and 27 percent of ECMs were planned to be implemented as the existing measure failed, such as lighting or motor upgrades. In terms of kWh potential, 10 percent is scheduled or installed, 37 percent is likely to be installed, and 11 percent of the kWh potential is planned for replacement of failure of existing equipment. Put another way, 58 percent of the potential is likely to be achieved, and 42 percent of the potential is not planned to be implemented, according to customer reports. This should be contrasted to the ADM review of audits, which found that 66 percent of the potential is not planned to be implemented.

In the latter part of 1994, follow-up surveys were undertaken on a sample of Option B participants. The purpose of the on-site surveys was to supplement the energy audit with information regarding potential energy savings estimates.

From this survey, the 28 customers were asked to cite reasons why ECMs would not be implemented. The reasons given were poor payback (51 percent), lack of available capital (34 percent), an uncertain business future (6 percent), and a lack of management interest (9 percent). Several of these reasons are related. For example, capital may not be available or management may not be interested because of a poor or uncertain business environment. Or capital may be available, but at unfavorable terms that produce an unattractive payback. These reasons are similar to those given in the 1980s for why commercial and industrial customers did not implement energy audit recommendations, and are the reasons why utilities instituted rebate and incentive programs, to overcome these barriers.

This follow-up survey also evaluated the quality of the audits for the 28 customers and found them of average quality in terms of completeness, technical quality and level of detail or effort devoted to process energy use. However, the quality was rated above average for customers with electricity usage greater than 50 million kWh, for customers where electricity cost accounts for more than 10 percent of total manufacturing cost; and the quality was judged greater for facilities with more than one million square feet.

**Unanswered Questions**

When utilities conduct incentive DSM programs, they typically have access to information specific to each project for which they pay money. This information includes engineering estimates of savings for each ECM installed as installed, not as planned, as well as information about total project costs validated by project invoices. In the case of the Subscription Option Program, like most other utility programs that do not involve utility financing or cash payments, that specific information is usually unavailable, or at least the utility feels that it has no leverage by which to require that information from the customer.

In order to assess what energy savings resulted from the Subscription Option Program, the evaluation method relies on asking the customer what actions they took. Self-reporting may be the best approach that is available for this program, but it carries several potential weaknesses. The reports are second hand in that the customer plant personnel report to the utility customer service rep, who reports to the program administrators. Customer personnel and utility personnel change, so that the familiarity with the specific audit recommendations may be only general, and their knowledge of what was actually installed may also be weak.

And finally, there is always the possibility of bias, since these customers know the purpose of the program and know that the program will be judged a success only if they can be shown to have taken energy efficiency investments.

So the unanswered question is whether we will get a reliable estimate of the energy savings. Judgement of that result will have to wait until an evaluation with full documentation of methodology is available.

**Documentation**

ADM Associates, Inc., Report on Quality Assurance Review of Facilities Audits Performed Under DSM Subscription Option B. Prepared for Niagara Mohawk Power Corporation, April 1995.

Peter Bradford, "Clarifying the New York PSC's Ruling on Niagara Mohawk's Industrial Conservation Programs," a Conversation with Peter Bradford, in The Electricity Journal 6:2 (March 1993), pp. 76-77.

M.P. Gallaher and K.A. Rutter, Evaluation of Subscription Option Program Energy Audits: Task 1 Report: Evaluation of Energy Audits. Prepared for NYSERDA, February 1995.

M.P. Gallaher, K.A. Rutter, and K.H. Lee, Evaluation of Subscription Option Program Energy Audits: On-Site Survey Results. Prepared for NYSERDA, December 1994.

Lynn Hoagland, NMPC evaluator, personal communication March 8, 1995.

K.H. Lee, M.P. Gallaher, S. A. Johnston, R. J. McCall, and James R. Youngberg, Evaluation of Subscription Option Program Energy Audits: Workplan. Prepared for NYSERDA, June 1994.

K. H. Lee and K.A. Rutter, Evaluation of Subscription Option Program Energy Audits: Methodology Plan for Estimating Energy and Demand Savings Potential in NMPC's Largest C&I Customers' Facilities. Prepared for NYSERDA, January 1995.

Robert O. Marritz, "Industrials Can 'Opt Out': Who Won, Who Lost in New York's New Shared Savings Experiment," in The Electricity Journal 6:1 (January/February 1993), pp.14-16.

Carl Pietrykowski, NMPC Program Manager, personal communication March 7, 1995.

Research Triangle Institute, Addendum:Subscriptive Service Program (EVAL 33), attached to report of Terry McHugh to John C. Crary of the New York PSC, October 31, 1995

**RAP Project**
**No/Low Subsidy Program Review**
**Level 3 Summary**

**Program Sponsor:** Portland General Electric, Northwest Natural Gas, BPA, Oregon Dept. of Energy and Dept. of Education

**Program Name:** Resource Conservation Manager (RCM)

**Program Type:** Salary Guarantee

**Target Market:** Institutional - schools

**Program Purpose:** Energy savings

**Time frame:** June 1993 to June 1995

**Contact Person:** Jerry Bingold, North American Energy Management, (503) 624-8619

**Program Description**

The Resource Conservation Manager (RCM) concept grew out of a series of meetings between Energy Smarts Partners (project sponsors) and several other west coast agencies who had identified the main barriers that prevented school districts from developing and implementing comprehensive energy management plans. These barriers included:

1) that school boards and administrators underestimate the cost of poor maintenance, inefficient equipment and undefined building operating schedules;

2) the perception that energy conservation and management is highly technical, requires large sums of money and engineering expertise and is outside the experience of school district staff; and

3) that school district officials are not convinced that energy management saves money.

Based on these barriers, the project sponsors collaboratively designed a two year test pilot to help schools save electricity, fossil fuel, water and increase recycling efforts through the hiring of resource conservation managers. The key element of the RCM program has project sponsors providing school districts with insurance against financial risk by agreeing to pay the shortfall between the RCM salary and savings gained from improved efficiency. Beyond this, the sponsoring utilities agree to provide technical support for the RCM, while school districts provide space and staff support and commit to implementing RCM recommendations in the form of an energy policy and a tracking system.

Initially, no capital investments are made, as the program relies heavily on behavioral changes in the operation of the school plant and equipment. Discovery of O&M opportunities is based upon school district-wide energy accounting and monitoring systems set up by the RCM. These usually take the form of changes to operating hours and schedules of the heating plant and lighting systems and modification of lighting levels. Significant savings have also resulted from reductions in waste disposal costs due to the heavy emphasis on recycling. Experience to date has indicated that savings resulting from these changes can cover the costs of the RCM to the customer and may pay for modest additional capital improvement retrofits.

The pilot was originally a three utility collaborative effort covering five schools districts from different areas of the state. Word-of-mouth has spread the success about the program so that it has recently expanded to other utility sponsors and school districts covering much of Oregon and Washington. A similar concept, but one without the utility sponsorship and guarantee, was originally described in a Washington State Energy Office publication (Energy Excellence in Public Schools), and later implemented successfully for eight years in the Eugene, Oregon School District #4.

**Program Marketing and Delivery**

The driving force behind building the Energy Smarts Partners coalition was Oregon's State Superintendent of Public Instruction who was responding to the threat of massive budget reductions brought about by passage of a statewide initiative which had the effect of limiting school funding. This superintendent enlisted the support of executive management from the

prominent electric and gas utilities as well as the school boards. The utilities became the primary sponsors of the project.

The program was developed and launched over a period of about one year (92-93). Project sponsors contracted with a full-time project coordinator (BRACO Energy Services, now North American Energy Services) to manage and market the program directly to the schools boards. Expediency and political pressure drove initial marketing efforts. There were no pre-established guidelines for targeting school districts for this program. Five school districts participated in the initial pilot. Three others were added later in '94-'95. Similar programs are starting up in at least three new areas in Oregon and Washington.

A part-time technical coordinator (Conservation Control Corp) was also hired to train the RCMs. RCM training required about 2 months. Ongoing technical support has been provided by the utilities' technical staffs and the Oregon Department of Energy.

As employees of the school districts, RCMs are located on-site. Monthly meetings of the project coordinator and the RCMs are used to help facilitate a total quality management approach. The RCM is responsible for four elements of the project: 1) school facility conservation programs, 2) school district resource savings and plans, 3) energy and resource survey and tracking, and 4) involving teachers and students in school conservation activities. To accomplish these tasks, the RCM works closely with the school district's facilities management personnel. Energy accounting software and training is used to develop consumption and cost profiles on each facility. Consumption trends are tracked and analyzed over time and enable the RCM to identify conservation opportunities. Full energy and resource conservation plans are developed with the assistance of principals and teachers. A goal of 10% annual reduction in energy and solid waste has been typical. Using the baseline data and plans, a series of operating guidelines and schedules are adopted relating to control over lighting, heating, solid waste and reporting data.

**Program Financing/Incentive Structure**

The program does not contain typical financing or incentive mechanisms. What is unique, is the "salary guarantee." The sponsoring utilities enter into contract with the school districts to cover the financial risks of the RCM salary should there be any shortfall in energy savings. Utilities share the risks on a 50-50 split basis. This feature has proven to be key, especially when signing up budget-constrained schools districts.

Another goal for the program was for capital improvements to be funded through savings in excess of the RCM salaries. There is some indication that this is taking place. However, none of the information sources could reveal any specific information on this issue.

**Cost Information**

Raw costs. Total costs for the RCM program include both administrative/overhead costs and the RCM salaries. Total administrative costs of $319,500 (includes actuals and projections through June '95) were paid by project sponsors and included initial start-up costs for computers, labor, training and on-going operating costs of the project coordinator. For at least one sponsor (BPA), raw administrative costs of $35,000 were subject to loadings of nearly 70%. So, it is obvious that the program can be operated more cheaply.

First year RCM salary costs came in at $197,340. Salaries for year two are estimated to be about the same. The salaries are paid directly by the school districts and are not included in the administrative costs mentioned above.

The table below, from the 1994 ACEEE publication, reflects RCM salaries, avoided cost savings for the first nine months of the project, and an avoided cost projection for the first year (through June 1994 with 3 months projected). This information is pertinent because it illustrates actual results on an individual school district basis. The five school districts comprise a total of 106 buildings.

| District | RCM Project Cost | Actual Avoided Cost Accrued | Paid by Actual Savings | Total Avoided Cost Projected | % of Cost Paid by Savings Projected |
|---|---|---|---|---|---|
| Ashland | $33,458 | $30,126 | 90% | $38,926 | 116% |
| Rainier | $21,582 | $24,840 | 115% | $27,090 | 126% |
| St. Helens | $21,582 | $38,891 | 180% | $43,391 | 201% |
| N. Clackamas | $80,718 | $86,647 | 107% | $107,747 | 133% |
| Hillsboro | $40,000 | $65,558 | 164% | $72,358 | 181% |
| Total | $197,340 | $246,062 | 125% | $289,512 | 147% |

Taken together, actual avoided costs outweighed project costs for the five school districts. At the individual school district level, 4 of 5 had a net benefit based on actual costs, while all five had a net benefit if projections were included.

Cost Effectiveness.

| | Region-Wide Program | BPA Service Territory Only |
|---|---|---|
| TRC (includes RCM salaries) | 60 mills/lifetime kWh saved | Not Available |
| Utility cost (no RCM salaries) | 27 mills/lifetime kWh saved | 39 mills/lifetime kWh saved |

Based on PEA estimates using pre-evaluation numbers from BPA, the total resource cost of the RCM program, including all costs from the three project sponsors and the cost of the RCM salaries, came in at 60 mills/lifetime kWh (one year measure life). The utility cost of the region-wide program, which does not include costs of the RCM salaries paid by the school districts, was 27 mills/lifetime kWh saved.

Using data from FY 1994 only, BPA estimated its utility cost at 39 mills/lifetime kWh saved ($58,400/1,506,720 kWhs). The BPA figures include all program start-up costs and only the project coordination costs and savings for schools in the BPA service territory. The 39 mill estimate also reflects the high loading (70%) that BPA programs can incur. This estimate could be lower for many other organizations with lower overhead costs.

The issue of persistence of the RCM measures is being investigated as part of the current impact evaluation. The measure lives for this project, which were used in the calculations above, were assigned a value of only one year as they were based largely on behavioral changes related to operation of the school facilities. Results to date indicate that two of five school districts duplicated savings from year one in year two. The other three school districts enjoyed a substantial increase (39%) in savings in year two. The impact of even greater savings in year two effectively improves the cost effectiveness projections listed above.

**Program Evaluation**

The program is currently undergoing an in-depth set of evaluations by BPA. The process evaluation consists of three elements: 1) interviews with the RCMs, 2) interviews with key supporters, such as principals and facility personnel and, 3) focus groups with teachers and parents. Results will be published in the up-coming Chicago evaluation conference - summer 1995. A final impact evaluation is scheduled for the fall of '95 following completion of the second year of the pilot.

Even though these evaluations are not yet complete, the information we have tracked down for the purposes of this report, we believe to be fairly reliable.

**Program Results**

The evaluator at BPA indicated that to date all of the conservation managers have delivered savings in excess of their salaries, such that no school district has had to invoke the guarantee.

Energy and Peak Savings (pre-evaluation). Actual savings per school district have been calculated to be approximately 14% (range=12%-15%), in excess of the 10% conservation target. To determine this, the evaluation team used ENACT software. Results were based on actual bills and were weather-adjusted. They do not reflect impact of comparison to a control group. Data included in the table below originate from a recent USDOE award submittal and reflect actual program activity from June 1993-Dec. 1994 and projections through June 1995.

| RCM Project Savings Summary | | |
|---|---|---|
| | Units Saved | Dollars Saved |
| Electricity | 11.9 million kWhs saved | $596,023 |
| Electric Demand | not available | $56,251 |
| Natural Gas | 838,000 therms saved | $469,543 |
| Garbage | 2.2 millon cu. ft. eliminated | $163,180 |
| Water | 35.7 million gallons saved | $47,749 |
| Total | | $1,332,746 |

From the table, approximately 85% of the savings are attributed to reductions in fuel use. Reductions in solid waste and water use make up the remaining 15%. Project sponsors have also calculated other benefits in terms of the following pollutants avoided:

- 114.3 million pounds carbon dioxide
- 143,000 pounds sulfur dioxide
- 160,000 pounds Nitrogen oxide

Lessons Learned.

- The results of the pilot indicate there are many benefits to the RCM approach. While these benefits accrue mostly to the school districts and society, the RCM approach has been shown to be a fairly cheap DSM effort even for an single fuel - electric utility. To a dual fuel utility, the pilot has shown that the avoided cost benefits can be even more significant.

- The length of the salary guarantee in most cases was one or two years. Participating school districts were willing to look beyond this two year window and commit to adding to their staff because they knew they had to get "their house in order." Now, near the end of the two year project, with pressure on utility DSM budgets, it is unclear if the utilities will continue to offer

the salary guarantee. The good news is that while some sponsors may be considering modifications to the RCM agreement, none are totally backing away from the program.

- While there are advantages to a program with multiple sponsors (e.g. share risks), one drawback is the duplication of function and costs by the sponsors. In this case, each of the three initial sponsors committed manpower resources to oversee their participation in the program. The result was an increase in the overall cost of the program. With this in mind, single entity sponsorship of the RCM program would likely reduce overall costs.

- The RCM pilot has been useful in determining criteria on how to target school districts with potential to support an RCM. For example, the pilot has established a threshold of 25 buildings and 75,000 Btu per square foot of consumption as required to support the salary of one RCM position. In one case, one RCM was required to support three different districts in order to meet this threshold.

- School board buy-in and support are essential. Without this support, RCMs will have great difficulty establishing and carrying out resource savings plans.

- Across the school district, policy level guidelines for heating and cooling temperatures and building operating hours and energy accounting procedures are critical to achieve and retain savings.

**Unanswered Questions About the Program**

Will capital investments be made from the extra savings beyond the RCM salary?

**Documentation Utilized**

IRT Results Center Profile #68 - Portland General Electric, Energy Smarts for Schools
Roberta M. Watson, Yvonne C. Coleman and Jerry L. Bingold 1994, "A Cooperative Approach to Resource Conservation in Public Schools," *Proceedings of ACEEE 1994 Summer Study*, pp. 4.277-4.287.
Personal Communication with Jerry Bingold, Project Manager, February 1995.
Personal Communication with Yvonne Coleman, BPA-Evaluation, March 1995.
Personal Communication with Ken Keating, BPA-Policy/Analysis, March 1995.
Personal Communication with Ellie Adelman, BPA, March 1995.
Demand-Side Report, "Pilot Programs Starting Up in 1995", March 2, 1995

**RAP PROJECT**
**No/Low Subsidy Program Review**
**Level 3 Summary**

| | |
|---|---|
| **Project Sponsor:** | Southern California Edison (SCE) |
| **Project Name:** | ENvest- Demand-Side Management Pilot Program |
| **Program Type:** | Loan Payable through Electric Bill or Lease |
| **Target Market:** | Retrofit in Government and C&I Sectors; targeted to accounts with over $1,000,000 in annual electric sales revenue. (This is the marketing target; projects larger than $250,000 for the private sector and $100,000 for the public sector are technically eligible). |
| **Program Purpose:** | Energy Efficiency and Demand Reduction |
| **Program Timeframe:** | 1993 through 1995 |
| **Contact Person:** | Contact Person: Rick Phelps- ENvest Director of Sales and Marketing (818) 812-7604 or Lynda Yana 818-812-7547 |

**Program Description**

The goal is to test integrated project design, implementation, and financing mechanism as a way to acquire DSM and make a profit.

The program uses contractors to package, install, and maintain cost-effective, environmentally friendly energy efficient equipment for government and C&I customers. Focus is on providing energy solutions to customer problems, rather than just financing. ENvest is intended to use volume buying power of the utility to make energy efficiency measures less expensive and to use utility credibility to build customer confidence. ENvest staff directly market the program and assign jobs to ESCos, lighting installers, and other contractors for implementation. ENvest staff direct and control the activities of ESCos, assuring that projects meet utility and customer needs.

SCE cost-shared a prior projects with the local gas company, but has not yet done that under ENvest.

**Program Marketing and Delivery**

**Marketing.** Marketing is performed by ENvest technical sales force in coordination with SCE's account coordinators. A contractor performs an energy audit at SCE and the customer's

behest. Once an agreement is made about delivery, SCE bids out the installation. SCE acts as a general contractor and quality control agent. School projects take 3-4 months to complete. Larger projects take longer.

**Staffing and Organization.** ENvest is a separate division of SCE (part of the regulated utility) with a separate staff of 27. Half are new employees. ENvest is not tied to the SCE department performing DSM. ENvest employees do not directly perform implementation, focusing on contractor coordination and quality control.

**Contractors.** As of June, 1995, about half of the work was going to full-services energy service firms, and the rest to equipment/installation contractors.

**Financing Structure**

**Role of Ratepayers versus Stockholders.** Ratepayer investment capped at $23 million (20% of program costs). Shareholder funds are used for the remaining $75 million. The ratepayer investment helps buy down the cost of more costly measures ($13M), includes a pool to cover any credit losses ($2 M, unlikely to be tapped since most projects are public institutions) and also covers administration ($8 million). SCE expects to recover shareholder investment with the regulated rate of return (currently 12.1%). This includes recovery of SCE's investment in measures and engineering, on-going carrying costs, provisions for credit losses and warrantee charges, and rate of return.

**Financial Offerings.** SCE offers both loan and equipment lease (called service charge by SCE) options. Only the loan has been used to date. SCE offers fixed and variable rate loan options; the customers almost universally prefer the fixed rate. The charge is set to recover SCE's costs, loan amortization, SCE's rate of return, and recovery of taxes. The variable rate may be adjusted annually for changes to authorized rate of return, and adjustments to credit warranty, or other costs based on actual performance.

Although this was not in the initial plans, SCE has engaged in tax-exempt municipal leasing to allow leases for government projects at 7-7.5% interest. Loans for private sector transactions are expected to cost 9-10%.

**Customer Financial Benefits.** In theory, the customer should receive at least 20% of the estimated value of savings for several years, and then the full value after the term of the loan is completed. The customer can add measures not included in SCE's proposal and decrease their share of the savings. In one case, for example, a customer added a new thermal energy storage system.

**Billing.** The charge for the loan is on the energy bill. SCE staff report that there was no big problem altering the bill.

**Term.** Loan periods are restricted to no more than 80% of the expected weighted average useful life of the equipment or 15 years, whichever is least. The typical payback period for government projects has been 12 years. Private sector projects will generally require a shorter payback to assure customer acceptance.

**Guarantee.** SCE warrants that the equipment will perform as specified in the final proposal (E.G., a chiller must save .6 kW/ton in operation) for a given period of time, but does not guarantee bill savings. Monitoring and verification of savings is performed. Thus far, SCE has not encountered a situation where savings differed significantly from expectations. If efficiency standards are not met and the equipment cannot be replaced, SCE will adjust the service charge. Their warrantee is in essence a one-stop packaging of manufacturer's warranties. SCE appears to be using their position in the marketplace to exact manufacturer assurances, then acting as a clearinghouse and backup guarantor for them.

**Cost Information**

In 1994, SCE has engaged in nine projects with a total contract value of $27.7 million. The smallest were about $800,000. As of June, 1995, $45 million in work was contracted. Data from case studies reported in various energy specialty publications are included in Table I.

Staff reported to the press that they expect another $50 million worth of contracts in 1995.[12]

The cost/kWh from the program is unclear. Examples filed with SCE's proposal for the program (real-world building conservation opportunities, but not ENvest projects) had total unlevelized costs between 2 and 6 cents per lifetime kWh. If the ratepayer's share is a fifth of that, it could range from .4 to 1.2 cents per kWh. None of the examples in the press provide enough information to assess what costs really are.

In a press account[13] SCE claimed that the nine 1994 contracts would save 50 million kWh, with a value to the customer of $5 million/year. At a contract value of $27.7 million for the nine projects, this would amount to a customer cost of $.55 per annual kWh. If a typical measure life is 15 years, this would amount to a customer cost of $.04/lifetime kWh. This does not include any additional costs borne directly by the customer that are not part of the loan package. Neither does it include any ratepayer subsidy, which may add as much as an additional 20%, nor any fossil fuel savings. Assuming that the $27.7 million represents front-end customer costs, the average payback to the customer would be 5.5 years.

It is not clear whether the $27.7 million is the value of the energy services or that plus the cost of financing. Thus, these estimates may overstate program costs.

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[12] *Demand-Side Report*, March 2, 1995

[13] Ibid.

**TABLE I- CASE STUDY SUMMARIES**

| | Cost | Simple Payback | Term | Annual Savings |
|---|---|---|---|---|
| **Irvine Unified School District** (4 schools) | $ .82M | 9.5 yrs | 12 yrs | 600,000 kWh<br>1,433 mbtu |
| **Chet Holifield Fed Building** | $3.8M | 7.0 yrs | | |
| **660 Tower @ Newport Ctr** | $1.0M | 4.4 yrs | 7 yrs | 2,500,000 kWh<br>??? gas |
| **Santa Monica** | $1.2M | 5.1 yrs | | |

**Program Evaluation**

None thus far. SCE plans to evaluate the overall program in conformance to Statewide protocols. They may do some end-use metering of individual buildings to help ascertain performance.

Cost and savings estimates above are "prospective" savings based on energy audits, and are not necessarily reliable. They do, however, provide a rough idea of the scope and economics of the transactions.

**Program Results**

**Overall Savings.** Savings for case studies found in the press are included in Table I.

**Measures.** In general, the program appears to be oriented toward a broad range of technologies including capital-intensive measures with longer paybacks. Press accounts mention lighting, replacement of HVAC equipment, ventilation upgrades, economizers, variable speed drives for supply fans, fan motor downsizing, insulation, windows, and control systems. Some projects have also addressed gas and water savings.

**Markets.** The program has concentrated on the government sector, with one large office project. The government sector is an ideal market for financing and comprehensive technical services, because many government entities lack the access to capital and the technical organization to pursue improvements in energy-using equipment. Equipment is often old and run-down to the point where paybacks for outright replacement are tolerable. Some

government agencies will also withstand paybacks of many years if the improvement meets multiple goals, such as lower maintenance costs, improved building conditions, environmental mitigation (e.g., chiller coolant change-outs), etc. ENvest appears to be working well with these advantages.

In one press account[14] the program manager was quoted as saying that only one industrial contract had been signed (details confidential) because industrial customers typically are looking for paybacks of less than five years.

SCE may find that they can sell an equipment/financing package when the customer needs to replace worn-out equipment as well as get energy savings. This is a niche market of significant size where the program may be most useful. However, if this is the case, the majority of the financing is going to buy new equipment, and only a fraction is paying for the incremental cost of making that equipment more efficient. In this case, the ratepayers' 20% of total investment may in fact be a much larger proportion of the cost of efficiency. Much of the program cost, and the basis for SCE's profit, may be loans for capital improvements.

**Unanswered Questions**

Customer cost/kWh.

Ratepayer cost/kWh.

Actual Savings. Results may be somewhat less than projected, but, based on the use of detailed technical studies and SCE's track record as a technically competent DSM utility, there is at least hope that the differences may be modest.

Size of Potential Market. ENvest is selling to many customers, but so far not to a cross-section of C&I customers.

ENvest is explicitly targeting very large conservation projects in large facilities. A significant fraction of the conservation resource exists in smaller facilities.

Based on PEA's prior program experience, ENvest may encounter difficulty selling ENvest's financial terms to many private sector customers and even some government entities. The term of payment and the customer share are less attractive than many prior shared savings arrangements which met with customer resistance. It is unusual for a private corporation to take on a 10-12 year debt for anything other than major capital improvements. ENvest may succeed in getting short payback improvements piggybacked on basic building investments (e.g., new HVAC or lighting system). However, it is unclear what portion of these more modest costs the 20% ratepayer investment would cover. ENvest may respond by focusing on short-payback measures only

[14] *Demand-Side Report*, March 2, 1995

(decreasing comprehensiveness) or simply looking for niche markets where the program can profitably run on a limited volume.

Institutions also vary in their technical capabilities, financial needs, and ability to take on debt in any form. It is clear that ENvest has identified a major niche market which can be addressed at low cost; large capital improvements projects in the public sector with energy savings and a willingness to incur debt to a utility through the Energy Service Charge process. It is less clear whether this niche covers most of the institutional sector or just a significant chunk of it.

The degree of free ridership in the program is also unclear. This is a credit to the program's ability to identify customers with clear savings goals (e.g., Federal government), identify available low-cost financing (tax-exempt lease-back arrangement), etc. However, by finding the most willing and lucrative markets, SCE may have also found those customers who would have gone forward without SCE, perhaps with the assistance of private-sector ESCos. This question would be difficult to answer without interviews with the participants. SCE staff believe that many of their government customers lack the capital and personnel to pursue major efficiency projects. They also argue that their 1994 program activity was about a third of the combined investment in conservation under the Federal Energy Management Program, indicating that ENvest is getting work done at a faster pace than the Federal government and other ESCos working with them.

By structuring the projects to involve in-depth analysis and packaging fairly comprehensive sets of measures, SCE probably at least increased the conservation investment and accelerated the pace of conservation investment in the facilities it treated.

Relationship to Private Sector. ENvest is playing a similar role to private sector Energy Service Companies (ESCos), in that they are brokering financial and technical services as a package. Yet, they are doing this out of the regulated side of the utility and using some ratepayer capital. The original proposal met with some limited protests around what amounted to constraint of trade issues. SCE argues that they are increasing the amount of work available to conservation service providers because much of the program activity wouldn't have happened without their efforts. At the same time, a significant amount of profit is associated with the project management that SCE is doing. If SCE plans to expand the program, these issues may be raised again. Pressure may push SCE to attempt to run the program out of an unregulated subsidiary. This would reduce several advantages of the program, including utility reputation and accountability and the ability to charge through the utility bill.

**Sources**

Interviews with Rick Phelps, program manager- 2/?/95, 3/7/95, and 6/18/95.

Program proposal and program description (July 30, 1993) as provided by SCE

California PUC Advice Letter # 1011E and 1011E-A, dated July 30, 1993 and September 7, 1993

"Santa Monica Deal Near with Socal Ed's ENvest Program for $1.2 Million Dollar Project". Demand-Side Report- December 22, 1994.

"ENvest Program Attracts SCE Customers", Strategies, Newsletter of the Association of DSM Professionals, Fall, 1994.

"Schools Get HVAC Retrofits from Util.-Sanctioned Firm", Energy User News, September, 1994.

"Socal Ed's 'ENvest-SCE' Program Inked Contracts Worth $27.7 Million in '94", Demand-Side Report, March 2, 1995.

**RAP Project**
**No/Low Subsidy Program Review**
**Level 3 Summary**

**Program Name:** New London Resource Project (NLRP)

**Program Sponsor:** New London Utilities (electric-muni), Wisconsin Public Power, Inc., Wisconsin Gas Company and Wisconsin Energy Conservation Corporation (WECC)

**Program Type:** Community-based, demand side resource acquisition program utilizing an energy service charge to repay a bank loan.

**Target Market:** 2600 residential, 300 commercial and 18 industrial customers. Activity is generally retrofit in all sectors, although some commercial new construction has been completed. Size of target population in terms of kWhs and therms is unknown.

**Program Purpose:** Energy efficiency and test of DSM market transformation potential

**Program Timeframe:** Design 6/92 to 9/93. Implementation end of 1993 through 1995.

**Contact Person:** Paul Berkowitz, or George Edgar @ (608) 249-9322.

**Program Description**

The NLRP is an all-sector community-based, demand-side acquisition project based in New London, Wisconsin (population about 7000). A unique collaboration of sponsorship by a municipal and an investor-owned utility has helped to launch this integrated program which targets reduction in electricity, natural gas and water consumption. Significantly, the program design was developed with the active participation of a community advisory committee, assuring both a good "fit" with community needs and an initial base of support. The overall objective is to marshall the community's resources to achieve significant energy conservation without the incorporation of end-use rebates as an incentive for customer participation. Instead of rebates, the program offers positive cash flow financing to all sector groups. Beyond energy efficiency upgrades in homes and businesses, this project also offers tree planting, and energy education in schools.

The NLRP has one aspect that sets it apart from other previous, high profile community-based efforts (e.g. Hood River, Espanola). It is that community leaders were very interested in a slower, market transformation approach which developed their own energy efficiency infrastructure, as opposed to a high production effort which could have adverse short and long term impacts on existing trade allies. As such, outside contractors were used only for services that the local community contractors could not provide (e.g., some industrial, refrigeration, and motor measures). The community took the time necessary to establish an energy efficiency infrastructure in retail outlets and with contractors and builders.

Another noteworthy aspect of the project has been the willingness of the project sponsors to experiment with different marketing and program delivery approaches and make necessary mid-course corrections. As such, the project is proving to be a good test bed for the creative ideas of its sponsors. Successful concepts are already being deployed in other more recent and cost effective community-based projects.

While the project has addressed all sectors and has implemented some especially innovative ideas in the residential market, this report focuses on the commercial sector.

**Marketing and Delivery**

The project heavily leverages community dynamics to market the program. Since there is no specific marketing or advertising budget, word-of-mouth is relied upon most heavily. While the community advisory group has been instrumental in marshalling general support from community and business leaders, various meetings and workshops have been used to provide a forum for participating commercial businesses to encourage other businesses to participate. Since rollout, project activity levels have remained fairly constant. WECC expects no drop-off in customer response for the remainder of 1995, and cites a recent outreach effort, laced with heavy testimonials from satisfied commercial customers, which provided an additional 30 leads.

Since it is difficult to exclude customers in a community-based program, especially if it is vendor-promoted, WECC does not maintain any eligibility requirements. Therefore, all customers are eligible for an audit. Initially, WECC provided full blown energy audits to businesses. In time, a concern over the high cost of auditing services motivated WECC to move away from this approach. Now, brief walk-through assessments (free of charge) are provided by WECC (1 FTE required) to quickly screen for all cost effective measures. Likely prospects are then referred to the local building trades for more in-depth analysis as required. In order to facilitate measure comprehensiveness, WECC works with the customer and trade allies to solicit bids on all measures. The customer has the final say about comprehensiveness however, and is free to select measures of choice. WECC typically completes its facilitation process by arranging the loan financing, and providing quality control over the installation. Positive cash flow financing is used as the hook, but some customers select shorter terms, with negative cash flow, to get the loans off their books faster. Neither WECC nor the utility sponsors guarantee the bill reduction or savings.

**Financing and Incentive Structure**

Funding for the energy conservation measures continues to be provided at only a 6% rate of interest. While this rate was offered by a bank, the utility decided to use their internal cash flow to provide the money. Repayment is made through a single energy service charge placed on the customer's bill. WECC assists the utility sponsors by performing the loan repayment calculations (1 FTE + 1/2 FTE project supervision required). Repayment can be as long as 7 years, however, it is common for commercial customers to either request shorter terms (often 3-5 years), or pay the loans off early. The financing details are passed on to the electric utility for the purposes of setting up and billing the energy service charge. The electric utility and gas utility later settle their cash differences.

Regarding the 6% rate of interest, WECC managers state that for this project, New London Utilities was able to provide internal funding and a bank line-of-credit ($300,000 to $500,000; not used to date) at a very attractive rate. This rate is below that available for many preferred bank customers. WECC claims no utility loan subsidy is provided. To offer a similar deal, investor-owned utilities, with cost-of-capital in the range of 9 to 10%, would be required to provide a loan subsidy (buy-down) that would cost the equivalent of 5 to 15% of measure cost, depending on the term. Depending on assumptions used (see cost section, below, this could add $.001 to $.005/lifetime kwh to the cost.

Recently, WECC has initiated another community-based program with Northern States Power in Park Falls, Wisconsin, which offers utility funding at a low rate (6.99%) using internal funds from the investor-owned utility. It is not clear whether the rate reflects the true cost of capital to the utility or involves a modest subsidy.

**Cost Information**

The following summary of project costs are the coordinator's best estimate. The numbers do not reflect all of the commercial and industrial activity due to anomalies of cost tracking in a multi-sponsor, trade ally driven project. The cost figures represent the following commercial sector project accomplishments:

- 104 audits completed
- 59 jobs financed
- 6 additional jobs financed by the owner
- 17 jobs pending installation
- 4 jobs awaiting bids

| NLRP C&I Project Costs (Through 3/95) | | | | |
|---|---|---|---|---|
| Fuel type saved | Start-up Costs* | Operating Costs | Measures | Total |
| Electric | $21,768 | $98,600 | $190,300 | $310,668 |
| Gas | $14,512 | $71,700 | $74,800 | $161,012 |
| Fuel Switch | | $0 | $16,100 | $16,100 |
| Water | | 9,000 | $12,100 | $21,100 |
| Total | $36,280 | $179,300 | $293,300 | $508,880 |

* The total start-up costs for all sectors/fuel types was $90,700 (4/92-3/93). Figures in this column reflect only the costs attributed to the commercial sector portion of the program (40%). These costs were then allocated to fuel type based on estimated BTU's saved (60% electric, 40% gas).

Beyond the $293,300 in financed energy conservation measures, the project has over $200,000 of loan commitments in the pipeline ($161,400 are electric measures). By contrast, the residential portion of the program has less than $70,000 loaned to date.

**Cost Effectiveness**

Based on rough PEA calculations, on an electric kWh only basis, the raw non levelized TRC of this program is in the range of 15 to 17 mills per lifetime kWh, depending on length of loan term at payoff. Utility costs of the program run approximately 5 mills per lifetime kWh. A 15 year measure life was assumed. Since this analysis was done in advance of any impact evaluation, engineering estimates of energy savings were used instead of actual metered savings. To adjust for the potential error of relying on engineering estimates of savings, and to provide a more conservative estimate of program cost effectiveness, we then applied a typical small C&I program realization rate of 50% to these estimates. This factor adjusts for possible overestimates of hours of operation, change in KW, replacement of burned out fixtures, and mis-specification of baseline efficiencies and is based on other program experience in small C&I retrofit. The result of this adjustment effectively doubles the TRC and Utility cost estimates above. The WECC program managers expect realization rates in excess of 50%. They also emphasized that subsequent community-based programs, similar to NLRP, were being started and operated at about half the initial cost due to improvements they have made in the original program delivery approaches.

**Program Evaluation**

This program has not been evaluated. An impact and process evaluation is planned for 1996, and will be conducted by Wisconsin Center for Demand-Side Research.

**Program Results**

*Measure installations.* To date, the bulk of the commercial jobs have included lighting efficiency measures. Most of this work revolves around installations with measure lives assumed to be 15 years, such as change-outs with T-8's and electronic ballasts and other fixture replacements. De-lamping and reflectors have not been included in the project.

While it has been common for the project to finance the full measure cost of installations (mostly lighting retrofits), in a few instances (for boiler replacements and other HVAC), incremental incentives were provided to move customers into higher efficiency equipment. WECC appears to have followed the tenets of good field work and been careful not to promote the early retirement of equipment with remaining useful life.

The project seems to have had a modest level of fuel-switching. This is mostly concentrated in the area of water heating. In this case, it has been most common for electric tanks to be changed out in favor of gas units, with the new polaris gas water heater in highest demand due to the gas company's promotion of a new leasing program. Beyond this, there have only been a few cases of fuel-switching of space heating systems (electric to gas). Following is a listing of the type and incidence of measure installations for the project to date:

| Measure type | Completions | Probable installation | Total |
|---|---|---|---|
| Lighting | 39 | 4 | 43 |
| Space heat repl. | 3 | 2 | 5 |
| Programmable thermostat | 1 | 2 | 3 |
| Vent dampers | 1 | 0 | 1 |
| Insulation | 0 | 1 | 1 |
| Return Duct | 1 | 0 | 1 |
| Water heating | 9 | 3 | 12 |
| Water saving | 15 | 1 | 16 |
| Fuel switching | 2 | 2 | 4 |
| Refrigeration | 0 | 1 | 1 |
| Total | 71 | 16 | 87 |

*Savings.* Details concerning the savings associated with the project in 1994 are as follows:

| Estimated Energy Savings | | |
|---|---|---|
| Electric | Number of jobs | 42 |
| | kWhs saved | 1,467,502 |
| | KW saved | 412.68 |
| Gas | Number of Jobs | 13 |
| | Therms | 30,854 |
| | Peak day | na |
| Water | 1000 gallons saved | 588 |

Beyond the numbers above, the project has identified another 427,000 kWhs in 6 probable installations and 10,000 therms in 5 probable installations. In contrast, the residential sector program to date has saved a total of 450,000 kWhs and 37,000 therms.

*Penetration rates.* WECC has audited 104 of 318 total C&I customers (33%) in 1.5 years since field work began. 87 of 318 customers (27%) have or plan to install measures funded through energy service charges. Beyond this, an additional six jobs have been completed through owner financing that are not included in these figures. Participation for both the residential and commercial programs has been relatively level year-to-year.

The industrial sector program began in mid 1994, and showed no major completions as of early 1985. However, WECC has prospected one large industrial customer, Hilshire Farms (goal is 10% energy reduction nationally), who is considering a massive motor replacement effort. To accommodate this financial drain, and ensure adequate funding for the other on-going activities of the project, WECC is assisting project sponsors in securing additional bank funding. An update in June, 1995 indicated that several more industrial jobs were underway or likely to start. These included replacement of boilers and lighting in a cheese factory, lighting and water conservation measures in an infant furniture manufacturer, new boilers, lighting, efficient fans, and air heat recovery measures in a lumber mill. A hospital has done a lighting retrofit and is reviewing boiler replacement. Many of the boilers are obselescent (but not yet failed) and customers are taking advantage of opportunities to install staged boilers which follow load better than single units.

*Markets.* As one would expect in a small community, the commercial DSM market in New London consists of a cross-section of business of all sizes. Of the 42 completions to date, one customer (a grocery store) accounted for over 46% (676,000 kWhs) of the project energy savings. In addition to this, the three largest jobs (2-grocery, 1-high school), accounted for over 62% of

project electrical savings. Included in the remaining bulk of jobs, half of which could be considered medium to large-sized customers, 19 averaged less than 8,000 kWhs saved. As such, project participation has come from a broad array of customers of all sizes, including many retail establishments, offices, institutional and industrial customers and apartment complexes.

We were unable to get a clear explanation of the conditions under which the bank offered 6% interest loans. We had some indication that the bank was able to offer the money as part of a community development effort, but details were not available. As such, we were not able to determine if another utility would have access to similar financing, nor what the particular channel might be for these below market rate loans. What is clear, is that New London has succeeded in one primary project objective. They have demonstrated that through using loans, instead of rebates, that were still able to achieve a significant market penetration for their program over a short time period. The emphasis on positive cash flow financing (even if some customers chose short-term loans with negative cash flow for the initial years), and the high community profile were likely critical to achieving these results.

While the project has certainly been a success from a penetration standpoint, what is unclear is the comprehensiveness of the installations. In order to achieve positive cash flow on a short term loan, the measure mix must be inexpensive relative to energy savings. WECC explained that the customers ultimately drive the decision as to which measures are installed, even if WECC makes sure that the major options are explored. This is likely the reason why the majority of measure installations have centered on lighting tube and ballast replacements. This upgrade was often cheap enough to provide positive cash flow at the 6% interest rate over terms often less than seven years.

*Economic Development.* The program manager states that local contractors can't keep up with the work generated by the project. One review estimates that 60-70% of the capital financed through the program (overall, including residential) has been retrurned to the local economy, creating additional jobs, both directly and through further circulation of the money in the local economy.

**Unanswered questions about the Program**

- Will the installations, selected by customers and contractors be comprehensive? What is the impact on measure comprehensiveness of the need to deliver positive cash flow financing? Are more expensive measures routinely being dropped off in order to attain that goal?

- What is the cost/benefit for smaller customers (<50KW)?

- It is not clear from this case study whether this model, without augmentation, can be used to deliver large-scale savings from complex mechanical measures, where the walk-through audit approach may be inadequate.[15]

- It is also unclear from this case study whether the model can be applied to utilities with less focused service territories or to large cities.

- What is the technical potential of the buildings and what is the percent load that is treated?

- What were the conditions under a utility can secure money and pay 6% interest, 7 year term loans? Could another utility access similar financing through any particular channels and implement the program without incurring any loan subsidies?

- Is the program spurring new lighting purchases or enhancing the efficiency of planned and budgeted customer lighting purchases?

**Documentation Available**

- New London Resource Project: An Integrated Approach For Delivering Demand-side Management Services, Berkowitz, Karl and Edgar, November 1994.

- "Program Snapshot: The New London Resource Project", in *Energy Efficiency News and Views V1#2,* IRT, Inc., May, 1995.

[15] Whole heating systems have been replaced, but trade allies were previously experienced at system installation; complex controls or system add-ons are more technically difficult and may experience a larger trade ally training/experience/equipment stocking barrier.

**RAP PROJECT**
**No/Low Subsidy Program Review**
**Project Tracking Outline**

| | |
|---|---|
| **Project Name:** | Burlington Electric Energy Advantage |
| **Project Sponsor:** | Burlington Electric |
| **Screening Status:** | Level 2; Brief Review Only |
| **Program Type:** | Audit/Loan payable thru electric bill/Grant |
| **Target Market:** | All C&I retrofit |
| **Program Purpose:** | Energy Efficiency |
| **Program Timeframe:** | 1993?- |
| **Contact Person:** | Tom Buckley, Conservation Manager |
| **Short Program Description:** | Utility-sponsored contractor audit. |
| **Financing Structure:** | Customer pays 75% of estimated savings value for 5 years or total, whichever is greater. Utility pays the rest. Rebate option has equivalent value (to first year's savings??) |

| **Cost Information:** | 1992 | 1993 |
|---|---|---|
| Utility Cost | 4.95c/kwh | 1.38c/kwh |
| Total Cost | 7.35c/kwh | 3.01c/kwh |

| | |
|---|---|
| **Documentation Available:** | Program Brochure (undated).<br>"Annual Report on DSM Program Implementation for the Period January through December 1993, March 11, 1994, Burlington Electric Department |

**Screening Status Rationale:** Revisit cost information.

**RAP PROJECT**
**No/Low Subsidy Program Review**
**Summary of Loan Programs**
**Level 2 Summary**

| | **Oregon Small Scale Energy Loan Program** | **Texas LoanSTAR Program** |
|---|---|---|
| **Program Time frame:** | 1981 to Present | 1982 to Present |
| **Financing:** | Loan program | Revolving loan pool with low Interest loans targeting public buildings. |
| **Source of Loan Funds:** | State general obligation bonds | $98 million revolving loan pool on "oil overcharge" settlement funds. |
| **Targeted Markets:** | • Schools, local government and special service districts<br>• Residences<br>• Businesses (commercial & industrial) | • State, local government and school buildings |
| **Interest Rate:** | Based on the bond type for which the project is eligible:<br>• Government purpose: prevailing market rates for G.O. Bonds which are federal tax free<br>• Private purpose: market rate loans (federally taxable) | 4.04% this rate is well below market rates. |
| **Loan Size:** | Depends on the market served:<br>• Residential: up to $15,000 for conservation or renewable projects<br>• Businesses: ranges from thousands to millions for conservation or renewable projects<br>• Public sector: ranges from thousands to millions for conservation or renewable projects. | • Maximum amount to a local government or independent school district = $1.2 million<br>• Maximum amount to state government and universities = $4.8 million |

| | | |
|---|---|---|
| **Loan Terms:** | Depends on the type of project, project savings, etc. May run up to 15 to 20 years for renewable generation projects. | Depends on the combined estimated simple payback of the retrofitted measures, but within Four years. |
| **Eligible Measures:** | • Energy conservation<br>• Renewable energy projects; both on-site and generation projects | • Energy conservation: e.g. lighting, HVAC, shell, motors EMS systems, controls, etc.<br>• Retrofits using alternative or renewable energy<br>• Load management |
| **Administrative Cost Recovery:** | • Public loans: either folded into the loan or subsidized by remaining oil overcharge funds<br>• Private loans: folded into the loan, program self supporting | • Loan proceeds pay for the retrofits, engineering and design, and installation costs<br>• On-site metering (for evaluation purposes) and energy analysis is paid through interest income. |
| **Program Results:** | As of 1993: 401 loans for $202.2 million. Loan approval rate = 59% of applications and 46% of loan request amount.<br>Loans by resource types:<br>• Hydro + 47%<br>• Conservation = 24%<br>• Biomass = 15%<br>• Waste heat = 11%<br>• Other = 3%<br>Loans by project type:<br>• Renewable resource = 71%<br>• Public conservation = 18%<br>• Private conservation = 11% | Awaiting information |
| **Monitoring & Evaluation:** | SELP has not had an independent program evaluation nor a savings verification procedure. Loan approval contingent on review by a staff engineer. | Monitoring and Analysis Program (MAP) established in 1989. On-site metering is used to verify program savings and make programmatic adjustments. |

**RAP PROJECT**
**No/Low Subsidy Program Review**
**Summary of Loan Programs**
**Level 2 Summary**

| | **Iowa Department of Natural Resources: Energy Bank** | **City of Oslo, Norway Oslo Ekon Fund** |
|---|---|---|
| **Program Time frame:** | 1988 to Present | 1982 to Present |
| **Financing:** | Two financing mechanisms target different markets:<br>• Lease financing for hospitals and private colleges.<br>• Capital loan note for schools, community colleges, and local governments<br>Program uses a financial consultant and a capital investment company to arrange financing. | Revolving fund administered by the municipal utility that provides both loans and grants for energy efficiency.<br>• Loans currently account for 85% of the fund's use<br>• Grants currently account for 15% of the fund's use |
| **Source of Loan Funds:** | Private financing sources augmented by "oil overcharge" funds and federal funds. | Initially funded by a utility rate surcharge (0.16 cents/kWh) and interest "profits" form the loans. The fund became self-sufficient in 1991. |
| **Targeted Markets:** | • School districts, hospitals, private colleges, community colleges, and local governments. | • Open to all energy users of all fuel types. |
| **Interest Rate:** | • Lease financing: four year leases or greater = 0.87% above the A bond rate: <four year = 0.92% above the A bond rate.<br>• Capital loan note rate is a function of the lease term: e.g. 0.85% above the bond index for 3 years, 0.12 above the bond index for 12 years. | ? |
| **Loan Size:** | • Lease financing: minimum project | No apparent limit |

| | | |
|---|---|---|
| | size of $15,000<br>• Capital loan note: tied to the taxing ability of the jurisdiction. | |
| **Loan Terms:** | Repayment usually structured over a 3 to 12 year period. Maximum flexibility is offered. | Many loans are on a 20 year amortization schedule. |
| **Eligible Measures:** | • Electric and gas measures including lighting, shell, and HVAC. | • Primarily weatherization measures for all fuels including wood, but also load management. Aggressive minimum technical standards must be met for fund support. Also, only measures with 2+ year paybacks are funded. |
| **Administrative Cost Recovery:** | • For lease financing = 3.5% admin. fee is charged.<br>• Public funds (state, federal, oil overcharge) are used for monitoring, accounting, marketing, and technical assistance. | • Administrative and audit costs are covered by the fund. |
| **Program Results:** | • Program penetration (1993): 390 participants or 22% of the targeted market, most of which have been school districts.<br>• Cumulative energy savings (1988-1993): 23.75 million kWh & 3.5 million of ccf of gas. | • Program participation=20,000 customers as of 1992.<br>• Cumulative project costs = over $110 million<br>• Cumulative energy savings = 2.528 GWh equivalent. Annual energy savings from all projects = 471 Gwh.<br>• Average measured savings after two years = 21% for single family, 14% for multi-family, and 18% for commercial/industrial. |
| **Monitory & Evaluation** | • Previously, the program relied on audit and engineering analysis estimates. DNR will begin to offer energy accounting and monitoring services in 1994. | • All projects are inspected after installations are done prior to contractor reimbursements.<br>• 10% of the projects are sampled after two years to |

- No formal evaluation has been done, rather, spot checks of projects.

evaluate savings.

# APPENDIX B

Matrix of Programs Receiving Initial Review

# APPENDIX C

O & M Program Review

# APPENDIX D

Financing Program Variables

RAP Project
Low Cost Program Review
Level 2 Programs Reviewed

| Sponsor | Program Name | Type | Market | Purpose |
|---|---|---|---|---|
| Alabama Power | Alabama Resource Center | Tech Assistance | Large Industrial | Customer Service |
| Alaska Hsing Finance Corp | Alaska Craftsman Home | Education/info | New Res Const. | Energy Efficiency |
| Austin, Tex Electric | Energy Star New Home Program | | | |
| Burlington Electric Dept. | Energy Advantage | Audit/incentive | C&I retro<200kw | Energy Efficiency |
| Burlington Electric Dept. | Smartlight | Leasing | R&C lighting | Energy Efficiency |
| Cal. Energy Coalition | Energy Cooperatives | User Coop | Large C&I | Load shift/shedding |
| Carolina Power and Light | EE Plant Program | Tech Assistance | "Key" Industrial | EE/Load Management |
| Conn. Valley Electric Co. | C&I Pilot | Loan | C&I Retrofit | Energy Efficiency |
| Consumers Power | Bright Futures | Audit/Install | C&I Retrofit | Energy Efficiency |
| Duke Power | Motors Program | Education/Info | Ind. Motor Buyers | Energy Efficiency |
| Georgia Power | Industrial Audit Program | Audit | Industrial | Cust. service |
| Int. Council for Local Envi. Init. | Ontario Muni EE Improve Facil. | Financing | Municipalities | Energy Efficiency |
| Iowa Dept. of Nat. Res. | Energy Bank Program | TA, Loan/Lease | Institutions | Energy Efficiency |
| Niagara Mohawk | Subscription Service Program | Audit/ESCo | Industrial Retrofit | Energy Efficiency |
| Ontario Hydro | Industrial Performance | Training/recruit | Ind. trade allies | EE/Load Management |
| Ontario Hydro | Compressed Air Check-Up | Audit/TA | Key Small-Med industry | EE/Load Management |
| Oregon Dept. of Energy | Small Energy Loan | Audit | All sectors | EE/Renewables |
| Oslo, Norway and Oslo Energi | Oslo Kon Fund | Revolving Loan | R,C&I | Energy Efficiency |
| Pacific Gas and Electric | Commercial Audit | Audit | Commercial Retrofit | Energy Efficiency |
| Pacificorp | Home Comfort Program | Audit/Loan | Res Retrofit | Energy Efficiency |
| Pacificorp | FinAnswer | Audit/ESC | Large New C&I | Energy Efficiency |
| Pacificorp | FinAnswer 12000 | Audit/ESC | Small New C&I | Energy Efficiency |
| Pacificorp | Pacific Environments | Audit/ESC | Small C&I Retro | Energy Efficiency |
| Penn Electric | Ind. Electrotech | Info/rebate | Industrial | Load shedding |
| Portland Energy Conservation, Inc. | Energy Audit Loan Program | Audit | C&I Retrofit | Energy Efficiency |
| Portland General Electric | C&I Programs | Audit/rebate | All C&I | Energy Efficiency |
| Portland General Electric/BPA, etc. | Resource Conservation Manager | Guarantee | Schools | Energy Efficiency |
| PSI | Industrial Program | Design/rebate | Ind. Retrofit | Not available |
| San Diego Gas and Electric | Non-Residential Energy Audit | Audit | C&I Retrofit | Energy Efficiency |
| Seattle City Light | Walk Through Survey | Audit | C&I Retrofit | Energy Efficiency |
| South Cal. Edison | Envest | Full Service ESC | Com Retrofit | EE/Load Management |
| Taunton, Ma. Muni | Smartlight and Lightwaves | Leasing | R&C Lighting | Energy Efficiency |
| Texas | Texas LoanSTAR Program | Audit/O&M/Loan | Institutional Retro | Energy Efficiency |
| United Illuminating | Deferred Payment | Loan | C&I | Energy Efficiency |
| Wash State Energy Off. | Motormaster | Information | C&I Motor Buyers | Energy Efficiency |

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| Wisc. Elec. Power Co. | End-use Pricing | Energy Service | C&I | Energy Efficiency |
| Wisc. Energy Cons. Corp. | New London Resource Project | Audit/ESC | C&I | Energy Efficiency |
| Wisc. Power and Light | Bright Ideas for Bus. | Audit/incentive | C&I Retrofit | Energy Efficiency |