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Customer Incentives For Water Conservation

A Guide

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A GUIDE TO:
CUSTOMER INCENTIVES FOR WATER CONSERVATION

CALIFORNIA URBAN WATER AGENCIES
with
CALIFORNIA URBAN WATER CONSERVATION COUNCIL
and
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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FOREWORD

California Urban Water Agencies (CUWA) is an organization of the largest urban water providers in California, which serve water to metropolitan areas comprising about two-thirds of the state's 31 million population. CUWA was formed to work on water supply issues of concern to the large urban areas in California. Among those concerns is water use efficiency; in particular, urban water conservation.

Cosponsor of this Guidebook is the California Urban Water Conservation Council (CUWCC). This council is a broad-based organization which administers the 1991 Memorandum of Understanding Regarding Urban Water Conservation in California, the agreement that forms the basis of progressive conservation programs for the large majority of urban Californians.

As urban water conservation programs grow and mature, there is strong interest in many communities in providing incentives, monetary and other types, to stimulate further involvement of consumers. But the questions of which types of incentives to offer, and how to manage and optimize incentive programs have remained largely unanswered.

CUWA and CUWCC decided it was time to provide solid information on a variety of water conservation incentive programs to help water agencies design and evaluate programs on a more rational, thoughtful basis. U.S. EPA provided a grant (X820683-01-1) for the major funding for this project. Obviously, none of these project sponsors recommend specific approaches, devices, or price levels.

We were pleased to obtain the services of Barakat & Chamberlin, a leading consultant to water and energy utilities, to conduct this work. We were also pleased to invite representatives of water agencies, industry, and environmental and other public interest organizations to serve on an active Project Advisory Committee. Their work is acknowledged and appreciated.

CALIFORNIA URBAN WATER AGENCIES

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Alameda County Water District
Contra Costa Water District
East Bay Municipal Utility District
Los Angeles Department of Water & Power
Metropolitan Water District of Southern California
Municipal Water District of Orange County
Orange County Water District
San Diego County Water Authority
San Diego Water Utilities Department
San Francisco Public Utilities Commission
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Chapter 1
INTRODUCTION

> Incentive—Something that incites or has the tendency to incite to determination or action. (*Webster's Ninth New Collegiate Dictionary*, 1991.)

As a result of the political, economic, and environmental barriers to procuring new sources of supply, water agencies are increasingly turning to conservation to achieve permanent reductions in demand. The focus on demand-side management (DSM) as a reliable resource poses a plethora of new challenges for water agencies. One of these challenges is to motivate customer participation in conservation programs. While acquiring supply-side resources is predominantly the responsibility of the water agency, conservation requires customer action.

Customers choose to participate or not to participate in conservation programs for many reasons. Customers may perceive barriers to adopting conservation technologies or behaviors. These barriers can take a variety of forms, including economic or financial impediments, insufficient knowledge or skills, interference with established lifestyles, mistrust of conservation technologies, or difficulty in procuring water-efficient appliances or equipment. A water agency can offer a variety of incentives to customers to overcome these barriers. For the purposes of this handbook, we define an incentive as follows:

> Any transfer of something of value from an agency to a customer for the express purpose of encouraging participation in a conservation measure or program.

For many water agencies, convincing customers to adopt water-efficient technologies and behaviors is an unfamiliar responsibility. The U.S. Environmental Protection Agency (EPA), California Urban Water Agencies (CUWA), and California Urban Water Conservation Council (CUWCC), recognizing the novelty of this task for many water agencies, commissioned this handbook to assist water agencies with the selection and design of appropriate, cost-effective customer conservation incentives.

CUWA and the CUWCC have another reason for supporting this project: The Memorandum of Understanding Regarding Urban Water Conservation in California (MOU), which links water utilities serving 25 million Californians in the largest water conservation program ever undertaken, requires signatories to evaluate financial

incentives to encourage customer participation in conservation programs. This handbook will assist California water agencies in meeting their commitments under the MOU. The applicability of the various incentives in this handbook to the Best Management Practices (BMPs) required by the MOU is illustrated in a series of matrices contained in appendix B of this handbook.

WHAT THIS HANDBOOK IS (AND ISN'T)

The information presented in this handbook comes from extensive research, including:

- A literature review;
- A mail survey and follow-up interviews with staff members from approximately 40 water agencies (a list of responding agencies is found in Appendix A);
- Several in-depth case studies; and
- Development and application of a cost-effectiveness framework.

All program costs and savings estimates presented in this handbook are from agency reports and were not verified by the authors of this handbook.

This handbook is intended as a guide to help water agencies through the process of selecting incentives that are appropriate and cost-effective for their jurisdiction. It is not intended to be a "cookbook" for incentive programs. Each agency will have to go through the process of determining how water is used in its service territory and identifying appropriate conservation measures. For example, this handbook will not help an agency determine whether it should have an ultra-low-flush toilet (ULFT) retrofit program. Rather, if an agency decides to have a ULFT retrofit program, this handbook discusses the range of incentives available—including rebates, direct installation programs, low-interest loans, and others—to encourage customers to participate in that program. It also provides a cost-effectiveness framework to help the agency determine how much of an incentive customers need to participate in the program and how much of an incentive the agency can afford to offer.

In selecting appropriate incentives, each agency will have to consider carefully its water supply situation and the needs of its customers. This handbook is intended to

help structure and guide that process. No incentive is appropriate for all jurisdictions. No handbook can substitute for careful thought and analysis.

For each of the incentives discussed in the following chapters, there may be local political or institutional constraints that preclude or limit the use of that incentive. Some of the incentives are controversial for a variety of reasons, including impact on established industries or lifestyles. As they select incentive mechanisms, water agencies must consider these issues as well as the issues that are raised in this handbook.

Regardless which type of incentive an agency offers, three points should be kept in mind. Each of these will help keep overall incentive costs down.

- **Flexibility is valuable.** It is important to reevaluate incentives as conditions change. Many of the most successful programs are those that were reevaluated as situations changed—for example, as droughts ended—and were redesigned accordingly. Adaptive management can enable programs to remain effective over time.

- **Program implementation affects water savings.** The type and level of incentive is only one feature of program design. All elements of program design and implementation affect the level of water savings the program will achieve. For example, extensive follow-up will enable an audit program to achieve greater water savings, albeit at greater program implementation cost.

- **Program marketing is key.** A good marketing campaign may enable an agency to offer a lower level of incentive. In addition, marketing requirements may change over time. For example, during a drought, customer awareness of the need for conservation may be higher, and thus programs may not require as much marketing.

HANDBOOK ORGANIZATION

The incentives discussed in this handbook fall into four categories:

- Information incentives
- Access to conservation technologies

- Cash transfers
- Financing

Within each of these broad categories there is a variety of different incentives and they can be combined within and across categories.

This handbook is structured as follows:

- Chapters 2 through 5, which are based on the experiences of water agencies across the U.S., provide a summary of the types of water conservation customer incentives, the advantages and disadvantages of each, and the costs and water savings associated with these incentives. Examples of incentive programs offered by water agencies are cited whenever possible. However, some incentives are still relatively untested in the water industry but have been used extensively in the energy industry; examples of these are drawn from energy utilities.

- Chapter 6 presents a comprehensive cost-effectiveness framework and shows how it can be used to help determine the appropriate level of an incentive.

- Chapter 7 presents three in-depth case studies—two actual and one hypothetical—to provide a better understanding of incentive design and implementation issues and to illustrate the application of the cost-effectiveness framework.

- Chapter 8 describes market research that water agencies can conduct to help them design more effective incentive programs.

Chapter 2
INFORMATION INCENTIVES

Lack of information about water-conserving technologies and behaviors may prevent customers from using water efficiently. Utilities can provide customers with information about conservation in many different ways, including guidebooks, brochures, hotlines, and other media approaches. These materials may focus on particular conservation measures or on the need for conservation in general.

Public education about the benefits of water conservation is critical for raising customer awareness and generating community support for conservation. In fact, many water agency staff members involved with incentive programs claim that creating general awareness of the importance of water conservation is a key factor in encouraging program participation. In some cases, public education is the driving force behind an inclusive program. However, in this handbook we distinguish between public information/education programs and informational incentives. We define the latter as *the provision of information for which customers would otherwise have to pay*. Specifically, this section reviews the use of indoor and outdoor audits to provide site-specific information and seminars and workshops to provide specialized training and skills.

AUDITS

Audits provide potentially valuable information to customers on conservation technologies and behaviors, sometimes including estimates of how much money customers could save on their water bills by adopting these measures. The receipt of such information could encourage the installation of water-efficient technologies or the adoption of conservation behaviors by some customers.

For purposes of our discussion, an audit has two components: (1) a systematic customer-specific on-site survey of water usage patterns and needs; and (2) specific recommendations on ways for that customer to increase the efficiency of water use.

Audit results presented to the customer might, for instance, identify and recommend installation of cost-effective water conservation measures that have a specified payback (e.g., two years or less). Audits may focus on indoor and/or outdoor water use for residential or nonresidential customers. Residential and nonresidential audits have different components and will be discussed separately.

Residential Audits

Residential audits involve sending trained agency staff or outside contractors to evaluate indoor or outdoor water uses (or both). Some water agencies offer audits to all residential customers, while others target subsets of customers based on housing type (e.g., all single-family residences or pre-1980 multifamily buildings) or on quantity of water use (e.g., top 20% of users). Many residential audit programs include direct installation of conservation devices.

Residential audits are further divided into indoor and outdoor (landscape). The surveys reported the following audit components.

Residential Indoor Audits

- Perform meter test for leaks (i.e., turn off all water-using equipment and see if meter still registers use);
- Perform dye tablet leak detection tests in toilets;
- Adjust toilet floats;
- Check toilet flapper valves;
- Test shower flow rate;
- Check for faucet leaks;
- Check water level settings on dishwashers and washing machines;
- Calculate water savings for various water level settings on appliances;
- Check cycles for water softeners;
- Check toilet flush volume; and
- Identify opportunities to replace standard toilets, faucets, etc., with water-conserving models.

Residential Outdoor Audits[1]

- Provide basic information on soil, water, and plant relationships;
- Gather information about:
  - Landscape size
  - Irrigation equipment
  - Plant mixes
  - Environmental factors (shade, slope, etc.)
  - Soil type
  - Pool, spa, fountain, other water features
  - Overall appearance of landscape
- Locate meter; show customer how to read it;
- Turn on irrigation system; identify leaks, overspray, and runoff;
- Perform soil tests;
- Evaluate irrigation system:
  - Check controller station settings
  - Check for matched precipitation rates
  - Check sprinkler heads for damage, misalignment
  - Check that landscape manager knows how to program controller
  - Conduct a precipitation test of the sprinkler or irrigation system
- Examine drip irrigation systems for emitter size and spacing;
- Prepare an irrigation schedule; assist in resetting of controller;
- Check for faucet leaks; and
- Suggest additional water-saving opportunities where appropriate—e.g., pool and spa coverings, appropriate plant selection and grouping, irrigation equipment upgrade.

[1]Some of these landscape measures may only be applicable for large landscapes.

Contra Costa Water District (CCWD), California. CCWD has a residential water audit program that targets high water users. Auditors check toilets and faucets for leaks, install low-flow showerheads and toilet dams, perform a lawn irrigation system audit, and prepare a lawn watering schedule for the customer. Each audit lasts approximately one hour. CCWD estimates that the cost of each audit, including equipment, labor, and management, averages $39.

North Marin Water District, California. North Marin conducted a pilot home water audit program in 1988, offering a free audit and direct installation of conservation devices to the upper quartile of single-family water users. The initial mailing was sent to 1,276 randomly selected single-family upper quartile water users; approximately 19% responded. The cost of performing an audit was $45 per single-family home.

Several survey respondents described combined water and energy audits offered in collaboration with local energy utilities.

City of Mountain View, California. Mountain View conducted a residential audit program jointly with the local energy utility, Pacific Gas & Electric (PG&E). Mountain View scheduled the audits with their customers and PG&E contractors performed the audits. In this case, Mountain View joined an already operating PG&E audit program by providing the water devices and some additional training for the auditors regarding water conservation. Once the interest in the audits died down, it no longer made sense to give the PG&E auditors special training for a few audits per year. Therefore, the water audits are currently performed by City staff.

City of Anaheim, California. Anaheim also offers single-family and multifamily customers combined water/energy audits. Auditors are sent to a Metropolitan Water District of Southern California (MWD) training program for water audit skills, as well as an Edison Electric Institute program on energy audit skills. The Anaheim auditors install showerheads, toilet dams, and compact fluorescent lightbulbs during the audit.

City of Pasadena, California. Pasadena has offered two versions of residential water audits: the LITE Bill program and the Home Water Survey. The LITE Bill program, offered from November 1989 through October 1990, was an elaborate program that featured door-to-door canvassing of all city

residents and offered a combined water and energy audit and direct installation of conservation devices. The program included an Energy Eaters survey, which presented a detailed analysis of the customer's electric bill, by appliance. Survey information was run through a computer program, which generated a report that was sent to the participant.

The Home Water Survey began in August 1988 (although multifamily units were not included until August 1990) and is still being offered. The Home Water Survey is a simpler and less expensive program for the agency than the LITE Bill program. Each survey includes an indoor and outdoor component and lasts one to two hours. Participants receive free devices and direct installation of low-flow showerheads, toilet dams, faucet aerators, hose bib timers, moisture meters, and soil enhancers. The audit also includes leak detection, soil analysis, irrigation system check-up, and a lawn watering schedule. Customers receive written recommendations at the end of the audit, but the analysis is less sophisticated than the one performed for the LITE bill program. For the Home Water Survey, Pasadena has successively targeted (by mail) tiers of water users, beginning with customers using 55% above average, then customers using 40% above average, until they targeted all customers using at least 10% above average.

The cost of the LITE bill program was approximately $75 per audit, while the Home Water Survey costs approximately $50 per audit.

Audits can be performed by utility staff or by outside contractors, community groups, or students. All of these approaches have been used successfully. However, water agency staff members involved with residential water audits stressed the customer educational component of the audits and the need for well-trained auditors to accomplish this.

Cost of a residential audit depends on the services provided. A one-hour indoor-only residential audit costs approximately $25 to $40. When an outdoor audit is included, costs range from $45 to $75/audit.

Very few agencies in our survey have completed evaluations or studies of water savings associated with their residential audit programs. The few that have done so report savings ranging from 25 to 40 gallons per household-day. All of these programs included audits of both indoor and outdoor water use. The evaluated programs all included other incentives—such as free devices, discount coupons, and direct installation—so water savings cannot be attributed solely to the audit.

There is no consensus among agencies about the value of landscape audits for single-family residential customers. The landscape audit is typically the most time-consuming component of residential audits, and water savings are disputable. Because most of the changes are behavioral, the persistence of any savings is uncertain. Also, an MWD study showed that many customers under-irrigate their landscapes.[2] Another problem cited with the outdoor component of the residential water audit is that auditors cannot rectify most of the bigger problems that they identify. Even if they are able to diagnose major problems, those problems are likely to be systemic and beyond the skills of the typical residential auditor. In general, residential auditors receive minimal landscape training and apparently have little prior experience with irrigation systems. In some cases, respondents noted, auditors do not know how to program the controllers. Furthermore, some of the information provided to customers is not practical—for example, some auditors told customers to water their lawns for 10 minutes twice a day, but the customers' controllers could not be programmed to do this. The North Marin Water District in California attributes only 1.8 gallons per capita daily out of a total estimated savings of 8.5 gallons per capita daily to the outdoor component of the pilot home water audit program.

Other respondents, in contrast, said that overwatering of landscapes was the most common source of residential excess use, and that residential landscape audits were very useful to customers. In support of this view, the evaluation of the Contra Costa Water District audit program in California attributed three times more savings to the outdoor component of the audit (29.1 gallons/household-day) than to the indoor component (8.9 gallons/household-day).[3] Evaluations of several other residential audit programs are under way and may help establish the level of savings achievable with this incentive. Aside from water savings, residential audits tend to be popular among water retailers as a service that they can offer to their customers.

[2]*Planning and Management Consultants, Ltd. Analysis of Residential Landscape Irrigation in Southern California* (Metropolitan Water District of Southern California, Planning Division, December 1991).

[3]John B. Whitcomb, *Measuring the Water Reduction from Contra Costa Water District's 1989 Residential Water Audit Program* (Brown and Caldwell: May 1991).

Nonresidential Audits

Industrial Audits

Industrial audits are highly site specific and require specialized training and skills. In these audits the auditor generally tabulates and diagrams how and why water is used throughout the facility. Once this is established, the auditor can look for inefficient uses and identify potential efficiency improvements. Industrial audits may include the following measures:

- Perform all of the indoor residential audit components;
- Record hours of operations for each water-using process or piece of equipment;
- Identify water needs for each use;
- Measure amount of water and verify flow rates (this may involve installing temporary or permanent meters on major processes or flows);
- Identify flow and quality of wastewater resulting from each use;
- Evaluate heating, ventilation, and air conditioning (HVAC) systems;
- Evaluate water-using process equipment (e.g., check on/off valves for spray equipment); and
- Prepare a water balance diagram to illustrate all water uses from the supply source through the on-site processes, machines, and buildings, and on to evaporation and waste discharge.

Metropolitan Water District of Southern California, California (MWD). MWD has recently begun an industrial audit program. Potential audit participants receive a walk-through survey to evaluate the potential for water savings. If this scoping visit indicates that a full-scale audit is warranted, a detailed water management study is performed. Each of these studies typically cost $5,000 to $15,000. Program costs are split between MWD (a wholesale water provider) and the participating member agency in an innovative way: MWD and the member agency are responsible for auditing facilities with equivalent daily water use. For example, if MWD audits a facility that uses

20,000 gallons daily, the member agency can meet its responsibilities by auditing five facilities that each use 4,000 gallons daily. This program design addresses the fact that large industrial sites can be extremely complex and that small water agencies may not have the technical capability to conduct those audits or the resources to hire outside contractors.

City of Phoenix, Arizona. Since 1987, Phoenix has offered audits to large commercial, industrial, and institutional customers using over 50,000 ccf/month. There have been approximately 100 participants to date. The city staff consider the free audit to be effective at encouraging participation, but would like to create an arrangement whereby customers agree to maintain contact with the city regarding implementation of the recommendations from the audit.

City of Mountain View, California. Mountain View offers audits to their large users, which include commercial, industrial, and multifamily customers. The audits include three elements:

- An analysis of domestic water use (conducted by the city's water conservation coordinator);
- An analysis of process, cooling, and other indoor water uses (conducted by an engineering consultant); and
- An analysis of landscape irrigation (conducted by an irrigation specialist).

Twenty of Mountain View's largest users were offered the opportunity to participate, and seven of them eventually did. These included research and development firms, silicon chip manufacturers, and business office parks. The audits identified ways the participants could save a total of 50% of their current water use. Most of these savings could be made by improvements in production processes. The types of improvements identified include: reusing process water, recycling the final deionized rinse water, updating deionization systems, and repairing or adjusting cooling towers. All of the recommendations had an 18-month or better payback on the initial investment. Participants have agreed to implement at least 50% of the recommended measures with an 18-month or better payback or reimburse the City for the cost of the audit. These measures

must be implemented within one year of the presentation of the water analysis findings.

The cost of an industrial audit to a water agency depends on many factors, including the type of facility, what services are provided, and who performs the audit. Most agencies use outside contractors to conduct industrial audits.

In our survey, industrial audit costs to the agency ranged widely, from a few hundred to several thousand dollars. For example, the City of Phoenix estimates that, depending on the facility, the costs of their commercial/industrial audits range from $1,000 to $7,000. In the City of Mountain View program, process audits cost approximately $2,000. MWD estimates that its water management studies typically cost $5,000 to $15,000. These costs are rough estimates of the price that customers would have to pay for similar audits.

Due to the highly site-specific nature of industrial processes, it is difficult to evaluate the savings associated with industrial audit programs. None of the programs included in our study has yet completed such an evaluation. An MWD staff member involved with industrial audits estimates that approximately 15% to 20% efficiency improvements are possible at industrial sites. The same staff member estimated that just through the MWD audit program and follow-up, approximately 25% of the recommended measures are implemented. He believes that additional economic incentives would be necessary to increase that percentage.

The Mountain View audit program identified savings of approximately 50% for the program participants. A study of industrial water conservation in San Jose, California found average savings of 30% to 40%.[4]

Commercial and Institutional Audits

All of the water agencies in our survey that offer audits to commercial and institutional customers include these customers in their industrial audit programs, rather than offering a separate program. Commercial and institutional audits typically include the following components:

[4]Brown and Caldwell Consultants, *Case Studies of Industrial Water Conservation in the San Jose Area* (San Jose: February 1990).

- Perform all of the residential audit components; and
- Evaluate heating, ventilation, and air conditioning (HVAC) systems.

Institutional customers are often considered to be high visibility customers, serving many people, and are frequently on very limited budgets. Institutional audits of federal facilities are supported by the Energy Policy Act of 1992, which requires federal facilities—including military bases, government office building, courts, post offices, and social security offices—to implement all water and energy conservation measures that have a payback of ten years or less. When adhered to, this law boosts the cost-effectiveness of institutional audits at governmental facilities by guaranteeing implementation of the recommended measures. Also, this law allows savings from conservation to be reinvested through the same federal facility's program budget.

San Diego County Water Authority, California (SDCWA). The SDCWA targets large users, such as the U.S. Navy and San Diego State University, in its commercial/industrial/institutional audit program. The SDCWA audit of a Navy base identified many cost-effective measures. The SDCWA is also assisting with project funding; until recently, federal facilities were not allowed to accept funds for water conservation projects.

Contra Costa Water District, California (CCWD). CCWD has a commercial audit program that targets indoor uses for commercial, institutional, and industrial customers. This program also includes direct installation of showerheads and toilet tank displacement devices, when appropriate.

City of Portland, Oregon. Portland has a new water evaluation program for commercial, institutional, and industrial customers. This program, which is targeted at peak season high-volume users, focuses on single-pass cooling systems, rinse water in process industries, and large turf irrigation.

Large Landscape Audits

Large landscape audits contain the same components as described in the residential outdoor audit description above. Some agencies limit participation to customers with designated landscape meters or with a specified minimum irrigated acreage; others target public institutions, including schools and parks. The cost of a landscape audit is in the $200 per acre range. Usually outside expertise or training is required for an agency to conduct irrigation or large landscape audits. Texas A&M University and the

Lower Colorado River Authority train San Antonio Water Service staff to conduct landscape audits. The San Diego County Water Authority offers landscape audits cooperatively with Resource Conservation Districts and the University of California Agricultural Extension Service.

City of Tucson, Arizona. Tucson Water offers large landscape audits cooperatively with the University of Arizona Agricultural Extension Service, and has entered into an intergovernmental agreement (IGA) for this purpose.

The Tucson program began in 1990 and targets large multifamily complexes. The program includes continual follow-up: participants are contacted by telephone every three to six months to determine whether they have implemented the recommended measures or whether any additional assistance is needed. From this follow-up the agency has learned that there is a tremendous amount of turnover among landscape managers at these properties, creating a continual need for reeducation. There is also a great deal of mistrust of new irrigation technologies, particularly because the landscape maintenance personnel perceive their primary responsibility to be ensuring that the grass is as green as possible. For these reasons, Tucson has shifted the emphasis of its landscape program to training management personnel and landscapers on irrigation techniques. For additional information on this and other landscape personnel training programs, see page 17 of this chapter.

City of Tampa, Florida. Tampa offers landscape audits for multifamily, commercial, and institutional customers. The agency staff does not consider this program to be particularly effective. The biggest barrier seems to be that water is very inexpensive and not a major component of operating costs. The agency staff members noted that when customers do participate it is usually because they have already budgeted funds for landscape improvement for that fiscal year. Therefore, the agency believes that is important to be out working with customers significantly in advance of inviting them to participate in an audit program. The staff members felt that at a minimum it is important to begin contacting the customers six to eight months in advance, so that landscape improvements can be put into the budget. At the same time, it is important to work with professional associations to build support for this type of program.

For customers who have participated in the Tampa program, audits identified as much as 65% residential savings. The most popular changes made by

participants are revising irrigation schedules and installing rain-activated shut-off devices. The agency also found that there is a much greater likelihood of measure implementation if the property manager, maintenance staff, or landscape contractor accompanies the auditor. However, because it is a voluntary program, the agency feels that requiring one of those individuals accompany the auditor is too much of a barrier to participation.

The Tampa program was initiated as a pilot. The agency will continue to offer these audits on a request basis, but will not do extensive marketing. Instead, emphasis is shifting to a newly initiated residential landscape audit program.

City of Pasadena, California. Pasadena has recently instituted a large turf audit pilot program. Customers with over 2,500 sq. ft. of landscaping qualify for the program, but participants have typically been much larger (e.g., one industrial park, three golf courses, one college). Although the program has not been formally evaluated, the Pasadena water conservation staff keep close track of implementation. The program appears to be quite successful. All participants have at least changed their watering schedules, and many have implemented other recommended measures as well.

The pilot ends in September 1993, and Pasadena will move into full-scale implementation. The city is considering the addition of financial incentives, such as rebates or shared savings. Potentially the city will require installation of recommended measures with payback of less than two years, or may require some copayment for audits if the recommended measures are not implemented.

North Marin Water District, California. North Marin conducted a pilot large landscape audit program. All commercial/government customers with annual water consumption of 400 ccf or greater were included in an initial site selection screening. An initial site audit was performed to assess the irrigation system's operating condition and design configuration, and to determine if an audit and subsequent irrigation scheduling changes could result in significant reductions in water use. Customers chosen for participation included one private park, as well as city parks and schools. A total of 86 acres were audited.

Few of these large landscape audit programs have been formally evaluated. An analysis of the North Marin pilot program found savings ranging from 7% to 16% of expected water use. The San Diego County Water Authority program also provides

some indication of potential savings. In fiscal year 1992, the SDCWA completed 155 audits, covering 2,116 acres. The program costs for the year were $176,614 and estimated potential savings for the year were 300 acre-feet. These savings are just for the current year; there should be continued savings over the following years for any measures that are implemented. However, these savings are potential savings, as identified by the audit. An evaluation of actual savings was hindered by the recent drought, but renewed evaluation efforts are under way.

The SDCWA landscape audit program also offers interesting information regarding potential savings from different site types. Overall, the greatest potential savings came from homeowners associations, which represented 44.5% of the sites audited and yielded 58.7% of potential savings. Proportionally, the greatest potential savings came from commercial/industrial sites, which represented only 7% of the sites audited but yielded 25% of all potential water savings. Lowest potential savings came from schools (14% of sites, 4% of savings) and parks (30% of sites, 12% of savings) because they frequently did not have the budget or staff to make the recommended changes. Interestingly, although small sites (less than three acres) represented only 7% of sites audits and only 3% of the acreage audited, those sites yielded at least 21% of all potential water savings. SDCWA staff members noted that these smaller sites frequently do not have full-time landscape staff, and were thus less likely to be using water efficiently prior to the audit.

Program Participation and Implementation of Recommended Measures

The ultimate success of an audit program must be judged by the amount of conservation that occurs as a result (perhaps a partial result) of the audits. There are two prerequisites to achieving a positive result:

- Customers must participate in the audit program in sufficient numbers; and
- Customers must follow audit recommendations (technological and/or behavioral).

Even if audits are provided free of charge, survey respondents described several reasons why customers may not take advantage of them. First, there are issues of confidentiality, particularly for industrial customers who may not want outside auditors inspecting proprietary production processes. Second, there is a time commitment required of the participant. This commitment can be as little as one hour or less or as extensive as several days, depending on the customer being audited and the depth of

the audit. Related to this are potential scheduling difficulties—particularly if audits are only offered during standard working hours—as well as other administrative difficulties of signing up for an audit. Third, certain types of sites may present particularly complex institutional challenges, which require cooperation from various parties (e.g., homeowners associations, property management services, and landscape contractors).

To obtain participation from the more reluctant customers it may be necessary to combine a free audit with other customer incentives. Many of the agencies in our survey offered free devices or free installation at the time of the audit; they found that this was an important factor in encouraging participation. (See Chapter 3 for additional discussion of these incentives.) However, another respondent noted that including direct installation as an incentive made installation, rather than education, the measurable task. As a result attention may become focused on achieving high installation rates—even in inappropriate locations where the devices might not save significant amounts of water—and education opportunities may be lost.

Some water agencies make audits a prerequisite for rebate or financing programs. For example:

> **East Bay Municipal Utility District, California (EBMUD).** EBMUD requires customers to submit to an audit, as well as to sign an agreement to install the recommended equipment, in order to qualify for an irrigation rebate. EBMUD considers this a very effective incentive program design. The San Diego County Water Authority is in the process of implementing a similar program.

In another approach to increasing participation, some California water agencies encourage or require audits for customers who apply for variances from drought allocations. Once the audit has been performed, customers must take the recommended steps in order for savings to occur. There are several reasons why they may not implement the recommendations:

- Up-front cost of purchasing and installing the measures;
- Time required to locate, purchase, and install the measures;
- Inconvenience of changing behavior patterns;
- Lack of technical knowledge required to install the measures; or
- Mistrust of the recommended measures.

Survey respondents address these barriers in different ways. Some have required participants to implement particular measures (e.g., those with no more than a specified payback period) or to reimburse the agency for the cost of the audit.

> **City of Mountain View, California.** Mountain View requires participants in the Large User Water Analysis Program to implement measures that will achieve at least half of the savings with an 18-month or better payback period, or to reimburse the City for the cost of the audit (usually approximately $2,000). Participants have one year to implement these measures.

Other agencies have combined their audit programs with other customer incentives, such as free device distribution, direct installations, leak repairs, rebates, or vouchers. For example:

> **City of Tampa, Florida.** Tampa offers a rebate of 50% of the cost of implementing recommended measures in their landscape audit program. However, because of relatively low water rates, program staff do not find this program particularly effective at encouraging participation.

Notes on Audit Program Design

The following suggestions were made by survey respondents based on their experiences with audit programs:

- Devote sufficient resources to selecting and training auditors.
- Offer audits at times that are convenient for participants.
- Encourage customers to accompany the auditor so that the auditor can educate the participant on water conservation.
- Present results to the participant in oral and written form.
- Look for opportunities to cooperate with other water agencies. For certain types of audits it may be most cost-effective to have one program that provides services to many districts.

- Consider collaborating with the local energy utility to offer joint energy and water audits.
- Perform a pre-audit site survey for commercial and industrial customers to gather base information prior to the actual audit.
- Include a follow-up visit to ensure proper installation of recommended measures and to evaluate persistence of savings.
- Provide customers with information on implementation and costs of recommended measures.
- In calculating payback period of conservation measures, include energy savings and avoided wastewater costs, if appropriate.
- Utilize residential energy audit experience.

TRAINING PROGRAMS

Many customers are not aware of actions they can take to conserve water or do not have the necessary technical expertise to implement conservation measures. Training programs or workshops that provide the necessary information or skills may encourage customers to undertake or expand their conservation efforts.

Workshops or training courses can be offered or sponsored by the utility for specific groups of customers. Most of the training programs currently offered by water agencies target landscape/irrigation or commercial, industrial, and institutional water use. Some of the survey respondents noted that these classes and workshops offer a good opportunity to create partnerships with universities, horticultural societies, community groups, or other organizations that have the required technical expertise and have well-established reputations in providing community education.

Survey respondents described three types of workshops: irrigation, residential landscape design, and commercial/industrial water conservation.

Irrigation Workshops

Seattle Water Department, Washington. Seattle offers a three-day landscape auditor training course, which is a prerequisite for the Irrigation Association certification exam. The class is open to commercial and institutional customers and is targeted at large irrigators, such as parks and schools.

Some agencies offer irrigation workshops at no charge; others require participants to pay some portion of the costs. The Seattle Water Department charges participants $45 for its three-day landscape irrigation auditor training course, while the course has a $250 value. The agency found that requiring participant contributions made customers more likely to actually attend the course, because people believe that they get what they pay for and that a "free" training will not be worthwhile. However, requiring customers to pay a portion of the costs may discourage some people from attending. A City of Phoenix staff member noted that offering classes for free increases the likelihood that field staff may be able to attend; particularly for landscape, these are often the people with the most direct opportunity to change water use practices.

If an agency does require participants to pay a portion of the workshop cost, the actual incentive is then the difference between what the utility charges and what participants would have to pay to receive comparable training or information on their own.

Residential Water-Efficient Landscape Design Workshops

The focus of residential landscape workshops is to teach customers to use creative landscaping techniques and low-water-use plants to develop practical and attractive landscapes that use little water. These workshops can also include information on efficient irrigation systems and techniques, as described in the earlier discussion of irrigation workshops.

San Diego County Water Authority, California (SDCWA). The SDCWA offers a four-hour water-efficient landscape class for which participants are charged $10. The agency estimates that comparable classes at nurseries and community colleges cost up to $50 or more.

City of Phoenix, Arizona. Phoenix has conducted introductory residential water-efficient landscape workshops for the past four years, offering 14 two-hour workshops annually, with an average of 40 participants per workshop. Phoenix has recently expanded its program to include more advanced water-efficient landscape design workshops to be conducted by two different

landscape consulting firms. One firm offers a weekend (12-hour) workshop utilizing site/use analysis techniques and computer imaging systems to develop conceptual landscape plans. The other contractor offers a more hands-on approach to developing landscape plans, using bubble diagrams, tracing paper, and colorizing.

These advanced classes have approximately 25 participants and feature significant one-to-one assistance that focuses on each participant's landscape. Participants are charged $20; similar individualized consultation with a landscape architect would usually cost over $200. The agency's budget for a total of 19 workshops is approximately $46,000. The City of Phoenix considers these workshops to be an important part of its education program and believes that the xeriscapes that result from the classes can serve as models in the community.

Water agency staff members involved with these programs indicated that these water-efficient landscape workshops are very popular among customers. San Diego County Water Authority staff said that they had a "positive and overwhelming" response to their workshops, and that classes were over-enrolled until the agency scheduled additional workshops. The City of Phoenix noted in the survey that, "Residents have shown an overwhelming interest in the implementation of water-efficient landscape principles which increase property value, improve home salability, reduce water use, reduce maintenance costs, improve community aesthetics and pride, and enhance regional identity." A staff member from another water agency cautioned that landscape retrofits may be very expensive and these workshops may be more appropriate in areas where new housing is being developed. Consistent with this reasoning, the City of Phoenix intends to target its next round of xeriscape workshops at homeowner associations in new developments.

Commercial/Industrial Water Conservation Workshops

Industrial customers were widely cited by respondents as a difficult-to-reach customer class. Some of the problems described include the site-specific nature of industrial conservation, the high cost of the measures, and up-front capital requirements. Training is one approach that many respondents believe to be successful in reaching these customers.

City of Phoenix, Arizona. Phoenix Water Department offers water conservation workshops to commercial, industrial, and institutional customers.

While discussing landscape conservation measures, one agency staff member noted that, "Hardware alone never saved a nickel." Almost all irrigation systems can be run with a high degree of efficiency—but not unless they are operated correctly. Irrigation training workshops attempt to address this by educating landscape maintenance personnel.

These workshops teach low-water-use irrigation methods and are particularly relevant to sites with extensive turf areas, including parks and open space, golf courses, industrial parks, and schools. Some water agencies also invite to these classes property managers or landscapers for multifamily housing or condominium/townhouse complexes with large landscaped areas.

Topics covered in these workshops include efficient irrigation techniques, such as drip irrigation, as well as methods for improving soil conditions to promote water penetration and retention. Most of them focus on evapotranspiration (ET), scheduling, controller programming, auditing matched precipitation rates, and maintenance programs. They may also cover new technologies such as soil and rain sensors and use of ET data, such as the California Irrigation Management Information System (CIMIS) program sponsored by the California Department of Water Resources.

San Diego County Water Authority, California (SDCWA). The SDCWA offers a basic irrigation course, in Spanish and English, to field-level workers at large turf sites and private landscape maintenance companies. California Polytechnic State University at San Luis Obispo (Cal Poly), under contract to SDCWA, developed the class and trained local Resource Conservation District staff to teach the course. The course, which runs three to four hours, emphasizes soil/plant/water relationships, basic irrigation concepts, and what landscape maintenance workers can do to save water. The course takes a "hands-on" approach and is taught in the field. Once the program caught on, the agency was flooded with requests for the workshop. The program began in March 1992, and there have been over 400 participants to date.

Surprisingly, middle managers have also participated in the SDCWA program. According to SDCWA staff members, reaching these supervisors can be very helpful because they are often involved with purchasing equipment, but frequently buy the least expensive alternative, rather than the model that will help their system run most efficiently. Also, this training teaches supervisors what is achievable, so that they know what level of water use and conservation they can realistically expect their staff to achieve.

Metropolitan Water District of Southern California, California (MWD). A CIMIS training program funded by MWD is offered in five counties in Southern California. The class is offered through University of California Extension Service and through Cal Poly. The program has been offered for five years and is marketed and administered through farm advisors in each county. The course is open to all landscape professionals; in most cases there is no cost to participants. (An equivalent Cal Poly class offered through the Department of Water Resources costs participants approximately $250, which suggests the value of the incentive.)

City of Phoenix, Arizona. Phoenix Water Department offers half-day commercial landscape classes covering turf irrigation, system design, and landscape conversion. Classes are designed in-house by conservation program staff. These classes are very popular and always filled to capacity (40 participants per class). Participants include facility managers from hotels, golf courses, and cemeteries. Costs to the agency are approximately $250 for the facility, $10 per participant for materials, plus approximately 60 hours of staff time.

City of Tucson, Arizona. Tucson Water also offers training in irrigation techniques. The program is targeted at schools, parks, and recreation areas, but is also open to landscape companies. The training program was initiated when it became clear through the landscape audit program that management personnel and landscapers did not have the expertise to maintain low-water-use landscapes. The full-day workshop is offered at no cost to participants. Three workshops have been offered, and the response has been very positive.

City of Santa Monica, California. Santa Monica offers an irrigation training with the goal of providing the City with trained maintenance personnel. The program is targeted at minority youth and is offered through the regional jobs training program. The course provides training in basic irrigation system maintenance and repair, use of ET information, and irrigation water audit techniques. Students receive a $400 stipend if they attend 95% of the classes and complete all required materials. At the end of the course participants are prepared to take the California Landscape Contractors Association Certified Landscape Technician Test and the Irrigation Association Landscape Auditor Exam. The course participants currently include students as well as adults currently working in the landscape profession who are interested in skills enhancement and professional certification.

Half-day or full-day workshops are offered on a variety of topics, including cooling tower efficiency, water conservation in hospitals, and water conservation in hotels. These workshops, which are designed in house, have been offered to customers since 1987 and there have been over 800 participants to date. Topics vary depending on demand, which in part is determined by surveying participants in each class about what future workshops they would find most useful. Currently the most popular courses are commercial landscape classes.

Metropolitan Water District of Southern California, California (MWD). MWD's commercial/industrial program has a heavy emphasis on training. MWD has offered two training programs. The first is a Cooling Tower Training Program. Eight of these full-day workshops have been offered. MWD fully funds and develops the classes, with the assistance of outside contractors. There is no charge to participants. Member agencies host the classes and invite participants, who typically are building managers, cooling tower operators, conservation coordinators, and other appropriate individuals.

The second class offered is a Commercial & Industrial Conservation Program Coordinators training. As a water wholesaler, MWD does not have commercial/ industrial customers, but can train conservation coordinators from its member agencies to set up industrial conservation programs. This class is designed to provide the necessary skills.

The Conservation Coordinators Training is a full-day class that covers how water is used in different industries, as well as such topics as program planning, marketing, and assessment. Participants learn how to conduct a simple water audit and view a videotaped site visit to a typical industrial facility, including an interview with the facility engineer and a physical inspection of the water-using features of the building. In small groups, participants then apply the methods and principles learned in the class to the televised site. Each group assesses the climate, lists conservation opportunities, and performs back-of-the-envelope calculations to estimate savings. MWD has thus far offered 12 of these classes, which are very popular with member agencies. This training was also offered in Northern California through the California Urban Water Agencies (CUWA), the Department of Water Resources, and local water agencies.

Results of Training Programs

It is difficult to determine the amount of water savings actually attributable to training programs. None of the agencies surveyed have estimated the actual level of savings achieved by these programs. The agencies in our survey that offer these programs plan to continue to offer them, and many are actually expanding their training programs. Survey respondents differed on how effective they thought the training programs are, but many respondents noted that these programs are good for public relations. Also, the classes that include auditing skills provide a cadre of trained auditors that may improve the effectiveness of audit and direct installation programs (described elsewhere in this handbook).

Chapter 3
ACCESS TO CONSERVATION TECHNOLOGY

In Chapter 2, we discussed how incentives in the form of information—through audits or training—can increase customer awareness of water conservation. However, customers cannot install cost-effective conservation technologies if they lack access to those technologies. Even if the measures are available in the market, it may take time and effort to locate, purchase, and install those measures. Water agencies can address this barrier by improving customers' access to conservation technologies. An agency can either directly distribute and/or install conservation devices, or can take steps to increase the availability of those technologies in the market, such as offering financial incentives to distributors or retailers. This chapter discusses these two approaches to improving customer access to conservation technologies.

DEVICE DISTRIBUTION/DIRECT INSTALLATION

Distributing conservation devices is one direct approach to increasing customers' access to conservation technologies. Many of the earliest water conservation customer incentive programs—some dating back to the early 1980s—involved free device distribution. In a device distribution program, an agency procures conservation devices and makes them available to customers, usually free of charge. While this incentive provides a financial benefit to customers, many of the devices typically included in these programs are relatively inexpensive. Thus, it is likely that the inconvenience of procuring the device is a greater barrier to adoption by customers than is the cost of the device. Convenience to the customer is therefore a critical component of this incentive.

Device distribution programs can vary along several dimensions, including:

- Which devices are included in the program;
- The distribution method; and
- Who installs the devices.

Discussions of each of these dimensions follow.

Which Devices Are Included in the Program

While a few water agencies give away single devices, such as ultra-low-flow toilets (ULFTs) or showerheads, many water agencies included in the survey procure and distribute free conservation kits containing a variety of devices. Devices typically included in the kits are toilet tank displacement bags, dye tablets for toilet tank leak detection, faucet aerators, shower flow restrictors, and low-flow showerheads. Most kits also include installation instructions, as well as informational and promotional materials. Some agencies also include landscape water conservation devices, such as sprinklerheads or moisture meters. However, these are rarely included unless accompanied by a water audit because the devices themselves are unlikely to achieve water savings in the absence of appropriate instruction.

Many agencies that distribute conservation kits report that they chose this incentive approach because the kits were inexpensive and could be widely distributed. The costs of the kits ranged from $0.50 to $25 each, depending on the items included. Most kits cost under $10, before distribution, marketing, and other administrative costs.

Some survey respondents noted that customers had experienced problems with the quality of the devices included in kits, particularly with faucet aerators, and particularly in earlier programs. They felt that higher quality devices would improve participation. Seattle Water Department conducted an extended customer preference study[5] to determine the showerhead to be offered in its conservation kits, and felt that the resulting offer of a high-quality product was the single factor that most encouraged customers to participate in the program.

Survey responses indicate that participation in many of the device distribution programs is limited to residential customers. However, several agencies make kits or showerheads available to commercial and institutional customers as well. For example, San Diego County Water Authority provides showerheads, "flushometer" retrofits, and sprinkler heads for public institutions—a program that the agency deems extremely effective.

[5]For more information on gauging customer preferences, see Chapter 8 of this handbook.

Distribution Method

Conservation devices can be mailed or delivered door-to-door, or customers can pick up the devices at designated locations ("depots"). Some agencies also give away devices at special events, such as county fairs. The method of distribution, marketing strategy employed to promote installation of the kit items, and the level of follow-up and installation assistance, all affect the installation rate. Mailing the kits or distributing them door-to-door can achieve a higher penetration rate in terms of number of households receiving the kit and overall number of installed devices. However, depots and other approaches that require some customer motivation to acquire the kit tend to have higher installation rates relative to the number of kits distributed.

City of Phoenix, Arizona. Phoenix tried several different distribution approaches for its conservation kits, including door-to-door distribution, depot pick-up, and direct installation by staff. They found that depot distribution was a highly cost-effective way to get kits into the hands of people who would actually install the devices. However, they noted that some of the more sophisticated measures, such as early closure flush valves and dual flush mechanisms, probably would not be successfully installed by homeowners. Therefore, even though such devices may have greater per-home savings potential, they are not appropriate for distribution by canvass or depot methods. Phoenix also found that the level of follow-up was a key factor in program success, and that there was a direct relationship between program costs and water savings.

City of Tampa, Florida. Tampa hangs kits on the doorknobs of residences. Kits contain two toilet tank dams, two low-flow showerheads, three faucet aerators, teflon tape, a pamphlet on finding and fixing leaks, device installation instructions in both Spanish and English, a general water savings tips card, a window display card, and toilet leak detection dye tablets. Follow-up canvassing is done to encourage residents to install the devices, collect any unused equipment, provide adapters if necessary, and verify installation. Tampa considers this to be an extremely effective program. As with the Phoenix program, follow-up is considered a key to this success.

Bridgeport Hydraulic Company, Connecticut. All 62 utilities in the state of Connecticut distributed conservation kits to their customers, as required by state law. Bridgeport Hydraulic Company distributes the kits by mail upon request,

and through depot pick-up. It also provide kits free of charge to United Illuminating Company to be installed directly as part of United Illuminating energy audits and direct installation programs. Elderly, disabled, or other special-needs customers can have the devices installed directly by Bridgeport Hydraulic service personnel. These distribution methods were chosen to ensure that the devices were actually installed rather than distributed to people who would not use them.

City of Mountain View, California. Customers can pick up showerheads, faucet aerators, and toilet dams at the Mountain View Public Service Department during normal business hours. Mountain View has also distributed these items at local street fairs and special events. Customers are required to sign an agreement to install the showerhead and to allow an inspection to verify installation.

City of Fresno, California. Fresno hired a contractor to deliver conservation kits to all residential customers. Kits contain two low-flow showerheads, toilet tank displacement devices for two toilets, two toilet leak detection tablets, and instructions. A telephone hotline was established to answer customers' questions. The hotline offers assistance in six languages.

Some agencies in the survey include device distribution as an element of their audit programs. For example, Pasadena, California, gives customers low-flow showerheads, toilet dams, faucet aerators, hose bib timers, moisture meters, and soil enhancers as part of its Home Water Survey. Mountain View, California, auditors install low-flow showerheads, faucet aerators, and toilet dams during residential audits.

Who Installs the Devices

Distributing conservation devices only saves water if the devices are actually installed and left in place. Most conservation device distribution programs rely on participants to install the devices. However, some programs include direct installation as part of the incentive. In that case, agency staff or agency sponsored contractors install the measures for free or at a reduced charge.

City of Santa Monica, California. For a $35 fee, Santa Monica offers customers direct installation of a ULFT and low-flow showerhead. Santa

Monica supplies and installs the devices. This program is extremely attractive to customers because of the minimal effort required on their part.

City of Fresno, California. Fresno offers direct installation of conservation kit devices, by appointment, to residents who are unable to install the devices themselves.

Some agencies limit installation services to elderly and handicapped customers or to multifamily buildings, while others offer it to all participants. Several survey respondents noted that as a component of their direct installation programs the installer takes away and disposes of the original fixture to discourage people from reusing it.

Many agencies surveyed feel that direct installation is an important component of their programs; however, one survey respondent found it better to have homeowners install devices themselves to avoid scheduling difficulties and potential customer reluctance to let an installer into their homes. Also, direct installation programs require a greater staffing commitment than limiting the incentive to device distribution. Several agencies surveyed have retained contractors to distribute or install the devices. Some agencies operate hotlines to answer customers' installations questions.

Device distribution or direct installation programs can be offered in collaboration with local energy utilities, particularly for low-flow showerheads, which conserve both water and energy. Examples of these partnerships are shown in the following table.

Water Agency	Energy Utility
Seattle Water Department, WA	Seattle City Light, Puget Power
San Diego County Water Authority, CA	San Diego Gas & Electric
City of Mountain View, CA	Pacific Gas & Electric
City of Portland, OR	Portland General Electric
Bridgeport Hydraulic, CT	United Illuminating

Installation and Retention Rates

Survey respondents differed on how effective they found the device distribution programs. Most agencies in our survey have not conducted evaluations of the savings

associated with their device distribution programs; therefore estimates of the incentives' effectiveness were subjective. A few agencies have surveyed program participants and have estimated the following installation and removal rates:

City of Phoenix, Arizona, used three different distribution methods: (1) canvass—door-to-door distribution in limited areas, with little publicity, and staff door-to-door follow-up; (2) depot-1—pickup at two customer service locations; and (3) depot-2—pickup at the two customer service locations and supplemental temporary neighborhood depots, as well as direct mail solicitation. Phoenix found the following installation and retention rates from its three different distribution methods:

Measure	Canvass[a]	Depot-1[b]	Depot-2[c]
Toilet dam installation (% of households receiving kits who initially install the toilet dam)	64%	77%	88%
% Retention of installed toilet dams after one year	92%	90%	88%
Showerhead installation (% of households receiving kits who initially installed the showerhead)	59%	75%	80%
% Retention of installed showerheads after one year	96%	95%	92%
Installed at least one of the two devices	75%	90%	90%
Installed both devices	48%	62%	70%

[a]Behavior Research Center, Inc., *City of Phoenix Retrofit Survey*, Prepared for the City of Phoenix Water & Wastewater Department, November 1989.
[b]Behavior Research Center, Inc., *City of Phoenix Retrofit Survey*, Prepared for the City of Phoenix Water & Wastewater Department, August 1991.
[c]Behavior Research Center, Inc., *City of Phoenix Retrofit Survey, Phase II*, Prepared for the City of Phoenix Water & Wastewater Department, August 1992.

City of Tampa, Florida, estimates the following installation and retention rates:[6]

Measure	Installation Rate (% of households receiving kits)	% Retention of Installed Devices After 1 Year
Toilet dams	81%	70%
Showerheads	74%	85%
Faucet aerators	80%	88%
Installed at least one device	94%	

City of Fresno, California, estimates that 90% of households receiving kits installed at least one of the devices.

City of Bridgeport Hydraulic, Connecticut, estimates the following installation rates:[7]

Measure	Installation/Use (% of households that ordered kits)
Showerheads	43%
Toilet dams	50%
Faucet aerators	47%
Lead detection tablets	23%
Installed at least one device	61%

Much of the information reported by respondents was gathered through telephone surveys and may be less reliable than actual on-site inspections. The Tampa study, however, used on-site inspection as well as a mail survey, and statistical tests found no

[6]Jack C. Kiefer and William Y. Davis, *Tampa Residential Retrofit Evaluation: Analysis of Pilot Program* (City of Tampa Water Department, August, 1991).

[7]Amy Vickers and Associates, *Evaluation of the 1991 Residential Retrofit Program* (Bridgeport Hydraulic, February 1992).

differences between field and mail survey samples with respect to toilet dam installation and removal, and showerhead removal.

The Phoenix evaluation of its initial canvass distribution conservatively estimates daily water use savings of 9 gallons per person.[8] The Tampa study also found savings of 9 gallons per person daily.[9] The Contra Costa Water District results cited earlier (40 gallons/household-day) were in part attributable to direct installation of showerheads and toilet tank displacement devices.[10]

REBATES TO BUILDERS, DEVELOPERS, MANUFACTURERS, AND DISTRIBUTORS

Offering an economic incentive to the manufacturers and distributors of water-efficient appliances or equipment increases their stake in encouraging the purchase of that equipment, and may thus increase the likelihood that they will stock and market it. This method is included here because the incentive to the customer is not directly financial, but lies in the increased availability of efficient technologies or appliances. Rebates to builders, manufacturers, or distributors have not yet been used in the water industry, but some programs from the energy industry can illustrate the nature of this type of incentive.

> **Pacific Gas & Electric Company, California (PG&E).** The PG&E Refrigerator Salesperson Incentive Program was developed because manufacturers informed PG&E that retailers discontinue stocking efficient models during months when no customer rebates are offered. The program is designed to retain demand for efficient refrigerator production by offering salespeople and dealers incentives for selling efficient refrigerators.
>
> Incentive levels are based on the efficiency level of the models, as compared with mandated standards. The incentives for 1992 were as follows:

[8]Planning and Management Consultants, Ltd., *Phoenix Emergency Retrofit Program: Impacts on Water Use and Consumer Behavior* (June 1988).

[9]Kiefer and Davis.

[10]John B. Whitcomb, *Measuring the Water Reduction from Contra Costa Water District's 1989 Residential Water Audit Program* (Brown and Caldwell, May 1991).

Energy Efficiency (% above standards)	Salesperson Incentive	Dealer Incentive
15.0% to 19.9%	$10	$3
20.0% to 24.9%	$15	$5
25.0% to 29.9%	$20	$10
30.0% to 34.9%	$25	$15
35.0% to 39.9%	$35	$25
40.0% or more	$45	$35

In 1991 the program exceeded its goal of 30,000 units by over 70%. For 1992 the program increased its goals to 40,000 units and was still able to exceed that goal by 16%.

City of Seattle, Washington. Seattle Water Department is considering a rebate to manufacturers of washing machines to increase the commercial availability of residential horizontal-access washing machines. The Department hopes that in a relatively short amount of time this program could transform the marketplace and eliminate the need for agency rebates. The rebate program would likely involve energy and wastewater utilities as well.

Chapter 4
CASH TRANSFERS

In Chapters 2 and 3 we discussed the types of incentives that provide information about water conservation technologies and that make those technologies more accessible to customers. Customers may be unwilling, however, to pay the price of investing in water conserving devices. To help overcome this barrier to conservation investments, water agencies can lower the total cost of the customer's investment by paying for all or a portion of the costs of the measure. These payments can take the form of rebates, vouchers, grants, or bill modifications. This chapter discusses such cash transfers, which are considered by most agencies to be an extremely effective tool for obtaining program participation, particularly for residential customers.

DIRECT REBATES

Rebates are a common and popular form of financial incentive involving cash payments from an agency to a customer to offset all or a portion of the out-of-pocket cost of a conservation measure. Rebates are paid *after* a measure has been purchased or installed. Proof of purchase or of installation may be required.

Rebate programs vary along many dimensions, including:

- The qualifying measures
- Eligible customer classes
- Rebate magnitude
- Rebate delivery arrangements
- Inspection requirements

Survey respondents used rebates to offset customers' expenditures on a number of measures: ULFTs; landscape conversion; installation of more efficient irrigation systems; heating, ventilation, and air conditioning (HVAC) system improvements; and industrial process modifications. Descriptions of these programs and the corresponding rebate levels follow.

Ultra-Low-Flush Toilets (ULFTs)

ULFT rebates are the most common incentive offered by survey respondents. In the simplest version of this incentive, customers purchase and install a ULFT and submit the receipt to their water agency, who then refunds all or a portion of the purchase (or purchase and installation) costs. The program has many variations: In some cases customers must call in advance to reserve the rebate to ensure that the agency has sufficient funds available. In other cases rebates can be paid directly to plumbers, who procure and install the ULFT for a reduced charge and recoup the majority of their payment from the rebate. In the latter case, some agencies require customers to sign their rebates over to the plumber, to ensure that customers are aware of the rebate program.

The rebate may take the form of (1) a flat dollar amount; (2) a percentage (50% to 100%) of the price, usually up to a certain maximum dollar amount; or (3) a flat rate depending on the price of the toilet (e.g., $50 for toilets that cost under $200, $100 for toilets that cost over $200).

Rebates range from $10 to $240 per toilet for standard ULFTs. The majority of programs offer $60 to $100 per toilet. This level appears to be sufficient to attract participation in most residential toilet retrofit programs, although there may be regional variation due to different costs of parts and labor. Several programs surveyed began with higher rebate levels and then lowered the rebate to $60 to $75 per toilet. Staff members from some agencies said that lowering the rebate did not result in a noticeable decline in participation. Lowering the rebate has resulted in decreased participation for some other agencies, but staff members also attribute the decline in participation to market saturation or changing local water supply conditions.

One program began with rebates of $30 per toilet for single-family households and $20 per toilet for multifamily households, but then raised rebate levels to $40 per toilet for all residential customers to stimulate participation. Rebates below $40 per toilet do not appear to provide sufficient incentive. Many survey respondents noted that the necessary rebate level depends on local water supply conditions and the public perception about the need for conservation. For example, drought surcharges or rationing greatly increased program participation for many California agencies because of heightened public concern and awareness. Now that these surcharges are no longer in effect, staff members believe that higher rebates may be necessary to entice participants. For more discussion about the appropriate rebate level, please see Chapter 6 of this handbook on cost-effectiveness.

A few programs limit participation to residential customers, but the majority offer this incentive to commercial, industrial, and institutional customers as well. Toilets for some customers may be in high use locations, such as airports. These may require a different class of equipment that is likely to be significantly more expensive. They would also justify a higher rebate amount. The following agencies offer ULFT rebates to nonresidential customers:

San Diego County Water Authority, California (SDCWA). The SDCWA offers rebates of $75 per ULFT to commercial, industrial, and institutional customers. In the Public Institution Retrofit program, the agency targets high-use, high-visibility public buildings and reimburses the customer for the full cost of the toilet plus installation materials. These costs have typically ranged from $100 to $200 per toilet. However, the cost can be as high as $600 per toilet for vandal proof stainless steel toilets in public buildings.

Los Angeles Department of Water and Power, California (LADWP). Besides offering rebates to residential customers, LADWP offers a rebate of $75 per ULFT to nonresidential customers, and there is no limit on the number of rebates per account. However, less than 1% of total rebate applications have come from nonresidential customers.

City of Palo Alto, California. Palo Alto found that in the small commercial sector, 63% of applicants for the $75 ULFT rebate were community organizations, such as churches, daycare centers, and community centers. A limit on the number of rebates and a restriction to tank-type toilet retrofits were found to be disincentives for participation by small commercial customers.

Some survey respondents offer lower rebates for additional retrofits after the first toilet or limit the number of rebates per household. This approach is adopted in response to studies illustrating that water savings are highest for the first ULFT installed, decreasing for additional toilets per household.[11] Water savings are also higher per toilet in multifamily units, which tend to have fewer toilets per person and therefore more intensive use per toilet.[12] However, these customers are often harder to attract

[11]T. Chesnutt, A. Bamezai, and C. McSpadden, *The Conserving Effect of Ultra Low Flush Toilet Rebate Programs* (A&N Technical Services, June 1992).

[12]Ibid.

to these programs because of the high capital outlay to retrofit an entire multifamily building.

Some survey respondents felt that it would be more effective to give away toilets directly rather than go through the rebate process. However, they acknowledged that this could limit the style options available to customers, which is of concern to many participants, particularly in higher income areas.

Another approach to delivering ULFT rebates that is gaining in popularity is the use of community-based organizations.

> **Los Angeles Department of Water and Power, California (LADWP).** The community-based organization (CBO) approach was pioneered by a partnership between the LADWP and the Mothers of East Los Angeles (MELA), a group that originally formed to protest the siting of an incinerator in their neighborhood. In 1992 this group approached LADWP and offered to take over the ULFT program in the East Los Angeles area.
>
> The program benefits all parties involved: the resident gets a free toilet and MELA gets $25 for each toilet they install. Members of the CBO are very effective at marketing the toilets because they can approach the community directly, relying on established personal relationships. The original toilet rebate program in East Los Angeles was generating only approximately 50 toilet rebates a year; MELA installs up to 500 toilets a week.
>
> The LADWP/MELA partnership has served as a model that is being copied throughout California. Its success is largely attributed to the fact that the partnership ties water conservation into other issues that are important to the community. For example, with profits from the program, MELA has established a scholarship fund and a Spanish-language hotline for battered women. A detailed case study of the LADWP/MELA program is included in Chapter 7 of this handbook.

As the following examples illustrate, water wholesalers can assist their member agencies in offering ULFT rebates as well.

> **Metropolitan Water District of Southern California, California (MWD).** MWD has created a turnkey program for ULFT rebates that member agencies can take advantage of. This turnkey approach allows agencies to take advantage

of economies of scale without making a major resource commitment. The program is operated through a contractor who is responsible for procuring the toilets, marketing, maintaining the database, making inspections and administering rebates. MWD pays 50% of the program costs (now $60 per toilet) and the member agency pays 50%. MWD has also modified the program so that member agencies with no money to contribute can also offer the rebates to their customers. In this case the member agency's share is paid by the customer.

City of San Jose, California. San Jose was able to meet its ULFT program goals for a fraction of the anticipated cost by joining efforts with the Santa Clara Valley Water District (a water wholesaler) and several other water retailers. This cooperative approach reduced the city's nonpersonnel costs from the original projections of $12.7 million to $7 million. Additionally, by targeting older multifamily dwellings, which tend to have older fixtures, the program was able to exceed the original projected water savings.

Staff from other agencies also cited successful partnerships with local businesses that donated in-kind services, such as pick-up of old toilets for recycling.

Multifamily accounts are more difficult to attract to these rebate programs than are single-family accounts, in part because of the high initial cost of retrofitting multiple unit dwellings. One approach used in the energy industry to reach multifamily residences is a rebate program for bulk purchases of equipment.

Pacific Gas & Electric Company, California (PG&E). PG&E's Contract Refrigerator Rebate Program offers property managers and builders an incentive when they purchase highly energy-efficient refrigerators in quantities of five or more. Incentive levels for 1992 were $50, $75, and $100 for units that were 20%, 25%, and 30% more efficient than 1990 Federal Energy Standards. PG&E's annual report on demand side management programs notes that, "Most property managers and builders do not choose efficient models without a program that offers an incentive. The contract refrigerator program promotes and encourages the value of efficient refrigerators to a market that is difficult to penetrate."[13]

[13]PG&E, *Annual Summary Report on Demand Side Management Programs* (San Francisco, Calif., 1993).

This approach could be used for toilets or other water-efficient appliances, such as washing machines.

Efficient Landscape Rebates

Landscape rebate programs pay customers to install low-water-use landscaping or to convert all or part of their lawn to nonturf landscaping. Participation in this type of program is predominantly by residential customers.

The amount of rebate paid in a landscape conversion program is usually based on the amount of land converted to water-efficient landscape. Alternatively, the rebate may be based on the percentage of a customer's landscapable area that is converted to nonturf. A third rebate structure cited in the survey was rebate of a portion of the connection fees for participants who installed low-water-use landscapes.

Many landscape professionals are concerned that some landscape conversion programs do not distinguish between appropriate and inappropriate uses of turf. They feel that landscape conversion programs should promote appropriate uses of turf and other landscaping.

Water agencies that offer rebates for turf conversion or efficient landscape design include the following:

> **North Marin Water District, California.** North Marin pays $35 per 100 square feet of turf removed, to a maximum rebate that depends on the type of dwelling unit. The maximum rebates are $200 for single-family homes; $150 per dwelling unit for townhouses, condominiums, triplexes, and fourplexes; $150 per dwelling unit for apartment buildings; and $80 per dwelling unit for senior citizens complexes.
>
> The North Marin Water District reported that during the peak water use month the savings were 24 gallons per day per 100 square feet of turf removed; over the year, savings averaged 9 gallons per day per 100 square feet of turf removed. This estimate may not adequately consider the effect of careful irrigation management on turf water use.
>
> This program encountered opposition from sod and seed producers because of its impact on their industries.

City of Glendale, Arizona. Glendale pays $100 to customers who install or convert over 50% of total landscapable area to nonturf. Preconstruction appointments are scheduled with homeowners to review landscape plans. The program staff member makes suggestions to the homeowner regarding irrigation systems, frequency of watering, placement of plants, and other design issues. Glendale conducts follow-up inspections to ensure that rebate requirements have been met. The program has been very popular, particularly among new residents who are unfamiliar with the plants suitable for landscaping in an arid climate.

City of Mesa, Arizona. Mesa has a Water Development Fee Rebate Program that reimburses a portion of the connection fee for customers who install a low-water-use landscape. All customer classes are eligible. For landscape areas less than 2,500 square feet, the rebate is 10% of the water development fee; for landscaped areas larger than 2,500 square feet, the rebate is 25% of the water development fee. Because the fee has changed over time, the exact amount of the rebate has also changed. Currently the 25% level provides a rebate of $247.50, while the 10% level provides a rebate of $99. Field audits are conducted to verify compliance with program requirements.

City of Austin, Texas. Austin recently began a Xeriscape It! program, offering rebates in the form of water bill credits to single-family customers who replace St. Augustine grass with Buffalo grass or other xeriscaping. There are additional requirements (e.g., grass to be replaced must receive at least six hours of direct sunlight). The rebate level is $0.08/sq. ft. installed (for new landscapes) or replaced (for existing landscapes), with a maximum rebate of $240. Initially, rebates were lower (5¢/sq.ft replaced for existing landscapes; $0.03/sq. ft. installed for new landscapes), but were raised to increase participation.

Efficient Irrigation Equipment

Water agencies can provide rebates to customers who improve the efficiency of their irrigation system. Of the agencies included in our survey, only a few offered irrigation equipment rebates; therefore it is difficult to generalize about rebate levels. The following examples from the survey may provide an order of magnitude estimate for this type of incentive.

City of Glendale, Arizona. Glendale pays a $35 rebate to residential customers who install automatic timers on an underground irrigation system.

East Bay Municipal Utility District, California (EBMUD). EBMUD currently offers rebates to irrigation-only customers varying between 10% and 75% of the cost of measures and installation. To qualify for the rebate, the participant must agree to conduct a landscape audit, install the recommended measures, and allow a follow-up inspection to confirm proper installation.

When the program began, rebates were set at 30% of the measure cost, which resulted in an average rebate of $450. Rebate levels were modified in 1993, however, to tie rebate levels to how much water the measure saves.

Industrial HVAC and Process Modifications

Many approaches are available for providing rebates to industrial customers. Rather than offering flat per-item rebates, most programs included in our survey offer customized rebates for industrial customers, based on the anticipated water savings of the measures. Some agencies, such as the City of San Jose, link industrial water conservation rebates to reductions in wastewater flows. As with irrigation system rebates, these programs were not common among survey respondents and it is not possible to generalize about the appropriate level of rebates for HVAC and process equipment.

Examples cited by survey respondents of industrial water conservation measures that qualify for rebates include switching from water-cooled to air-cooled HVAC systems, converting to recirculated water, installing water-efficient process equipment, and installing controls or timers. The program may be limited to a pre-approved list of qualifying technologies, or an agency may choose to work with commercial/industrial customers on a one-to-one basis to determine appropriate measures.

City of Palo Alto, California. The Palo Alto Utilities Department uses the customized approach for its Water Efficiency Program and rebates 50% of project costs up to $10,000 cumulative per account, with a minimum qualifying rebate of $375. Indoor plumbing measures were the most common projects in the program, with 13 out of 19 projects related to this area.

Palo Alto conducted a survey to find out why participation levels were low. The city found that:

- Companies are currently cautious about nonurgent expenditures.
- Many customer-initiated water conservation projects had already been completed.
- The customer's payback on water conservation does not justify the expenditure. (Project costs are disproportionately high in relation to the value of conserved water, even when considered with wastewater or other savings.)
- The time frame of rebate availability was short compared with customers' budget cycle.
- Facilities managers are too busy to identify projects or evaluate their feasibility.
- A lack of data on indoor water end uses has hampered the identification of potential projects.

Los Angeles Department of Water and Power (LADWP) has a Technical Assistance Program (TAP) for commercial, industrial, and institutional customers that will pay $1.25 for each 1,000 gallons of water saved over a two-year period. The minimum per-project savings that qualify is 400,000 gallons over two years, and the maximum rebate is $25,000 per project per fiscal year, up to 100% of project costs. Projects are subject to pre-approval and to post-installation inspection.

Participation in the TAP program has been minimal, most likely because water bills represent a very minor portion of operating costs. One potentially effective approach to increasing participation in this program is to involve contractors. For example, one contractor who installs recirculating clothes washers in convalescent homes generated eight TAP applications.

City of San Jose, California. Since 1991, San Jose has offered monetary incentives to commercial, industrial, and institutional customers who reduce wastewater flows by a minimum of 200 ccf/year. Initial incentive levels were

set at $1/ccf/year, with a minimum rebate of $200 and a maximum of $5,000. The incentive level was later raised, to encourage participation. Currently, incentive levels are $2/ccf/year, with a minimum incentive of $400 and a maximum incentive of $20,000. There have been 16 participants to date.

Rebate Program Administration

Most agencies surveyed indicated that they believed their rebate programs were effective at encouraging program participation among residential customers. Several program administrators felt that the getting the rebate to the customer quickly, either at time of inspection or at point of purchase, made the rebate even more successful at encouraging customer participation. Conversely, delay in processing rebate applications was considered to be a real problem by many agencies, as was not having sufficient funds allocated.

Survey respondents indicated that the greatest barrier to rebate programs was customers' mistrust of the chosen technologies and mistrust of the estimated savings, whether for low-water-use landscape, low-flow showerheads, or ULFTs. An associated barrier is industry and contractor resistance to these technologies—particularly to ULFTs. Survey respondents reported that some plumbers actively dissuade customers from installing ULFTs, telling customers that these models lead to increased plumbing problems. (These warnings may be based on difficulties that were experienced with early model ULFTs.) Therefore, a rebate program might be effectively combined with an education program to alleviate customer concerns about these technologies and to educate retailers and service staff, including plumbers, HVAC technicians, and landscapers.

Survey respondents also indicated that installation costs and lack of knowledge about how to install the devices may also pose barriers to customer participation. Rebates can be combined with direct installation or training programs to address this barrier.

Survey respondents made the following additional observations and suggestions regarding program design:

- Recycle the old toilets, if possible. This provides additional environmental benefits, and is convenient for customers who then do not need to worry about disposal of the old unit. However, pick-up and disposal may be expensive for water agencies that do not have a market available for the old toilets and fittings.

- Provide a pre-approved list of technologies (including models) that qualify for rebate.
- Notify distributors and manufacturers about the program so that they can have the approved models in stock.
- Consider providing easier access to the rebate through discount coupons or vouchers distributed by water agencies.
- Market ULFT rebates to low-income customers to increase water savings per rebate. (Low-income households tend to have the highest person-per-toilet ratio and would not likely otherwise purchase the devices.)
- Develop one-to-one relationships between an agency representative and a customer contact, particularly when designing rebate programs for large commercial/industrial customers.
- Estimate the likely magnitude of response and have sufficient funds allocated to pay out rebates. Waiting lists may cause frustration among participants and may damage program image.
- Maintain program flexibility. Program staff from several agencies noted that to be successful, incentives should be adaptable to changing circumstances.

GRANTS

The differences between grants and rebates are subtle, and in many cases the terms are used indistinguishably. For the purpose of this handbook, the primary difference is that rebates are usually tied to a specific measure, while grants are made for larger scale, systemic changes and may be calculated on the basis of project costs or on the amount of anticipated water savings. Additionally, grants may be made before the project is completed, to help the customer pay up-front costs.

The Metropolitan Water District of Southern California established a Conservation Credits Program in September 1988. The first participating member agency received a grant early in 1989. The program pays member agencies the lesser of $154/acre-foot (AF) saved over ten years or 50% of project costs. The program is the cornerstone of MWD's conservation efforts

and has played an important role in funding conservation programs in Southern California. Since the program's inception, 19 agencies and 78 programs have received funding. The majority of these programs are ULFT rebate programs or showerhead/conservation kit distribution programs. Many of the Southern California incentive programs discussed in this handbook have received Conservation Credit funding.

To qualify, a project must have measurable, verifiable savings. Member agencies submit an application specifying anticipated program costs and savings. Once a project is approved, a letter of agreement is signed between MWD and the participating agency.

Pilot programs are funded in a slightly different manner. MWD pays 75% of its share up front and the remaining 25% upon performance verification. (However, even if projected savings do not occur, the member agency is not expected to reimburse MWD.)

MWD is currently trying to expand the Conservation Credits Program to help member agencies meet the Best Management Practices (BMPs) that most California water agencies have agreed to implement. To this end, pilot programs and evaluations are under way on numerous types of programs, such as landscape audits, for which savings are uncertain.

BILL MODIFICATIONS

A bill modification is another delivery mechanism for a cash transfer. It differs from a rebate in that the agency is not required to allocate funds to pay customers. Instead, the modification reduces the amount the customer must pay to the agency. The modifications may be a one-time reduction or an ongoing bill discount. Unlike conservation rate structures, which create incentives for all types of conservation, bill modifications are tied to a specific conservation measure.

City of Santa Monica, California. In December 1989, Santa Monica implemented the Bay Saver Incentive Fee in conjunction with the Bay Saver Fixture Rebate program to encourage residents to install ULFTs and low-flow showerheads. The program's goals are to conserve water and to reduce wastewater flows to the regional wastewater treatment facility and ultimately outflow to Santa Monica Bay. In addition to receiving a $75 rebate, customers who retrofit their toilets and showerheads avoid a monthly Bay Saver fee of

$2.00/month for single-family households and $1.30/month for multifamily households. (Initially, the fees were set at $1.00/month for single-family households and $0.65/unit for multifamily households, but they were doubled to increase participation.) There have been over 32,500 participants to date.

The Bay Saver fee paid by nonparticipants is used to fund the ULFT program. It also raises public awareness because it appears on the bimonthly water bill. Until recently the cumulative charge amount of these fees to date also appeared on the customer's water bill, which was an effective reminder of how much they were losing by not replacing their toilet. However, this aspect of the program will be discontinued because it confused customers, who thought that the cumulative total represented a new charge, rather than what they had already paid.

North Marin Water District, California. North Marin discounts the connection fee for developers who install landscapes meeting the District's water conservation criteria. The criteria relate to square feet of turf and to irrigation system design. Developers submit a plan showing turf layout. The District must approve the plan and conduct post-installation inspection prior to issuing the discount. The landscape criteria, connection fees, and discounts are as follows:

Type of Dwelling Unit	Maximum Turf Area (sq. ft.)	Connection Fee	Discount
Single family	800	$2,940	$200
Town house/condominium	400	$2,350/unit	$150/unit
Apartment building (5+ units)	130	$1,380/unit	$100/unit
Senior citizens unit	95	$980/unit	$80/unit

In 1992, few single-family detached homes participated, whereas all new apartment projects did. The agency attributes this to the scale of savings: projects involving multifamily dwellings can save large amounts. Cumulative participation since program inception in 1986 has been 25 single-family dwellings, 412 townhouse/condominium units, and 387 apartment building units.

VOUCHERS

A voucher pays for all or part of a conservation measure *at the time of purchase.* Unlike a rebate program, in which customers may have to wait weeks or months for repayment, vouchers do not require customers to have up-front cash to purchase the conservation measure. For this reason, vouchers are particularly attractive to owners or managers of multifamily dwellings, because the up-front cost of retrofitting multiple units can be prohibitively expensive. From an agency's perspective, a voucher system can be easier to administer than a rebate system because processing is done for a small number of retailers rather than for each individual customer.

San Diego County Water Authority, California (SDCWA). The SDCWA is implementing a ULFT voucher program that will be administered by a contractor. Customers who want to participate will call to receive a voucher. The consultant will confirm on a database that the caller is actually a customer in the qualifying service territory. The contractor will then send the customer a voucher worth up to $75, along with a list of approved toilets and participating dealers. The voucher has a 30-day expiration date. At the time of purchase the customer will owe only approximately $30 for the toilet, depending on the model selected. The contractor is also responsible for picking-up the old toilet for recycling. At the time of recycling pickup, the customer will also get a free low-flow showerhead.

SDCWA staff members feel that the voucher program offers them a much better program tracking system. Retail stores send a bill and supporting documentation to the contractor, who can check the serial numbers on the vouchers to verify that the information matches customer record. The agency does not have to worry about running out of funds for a voucher program, because it issues only the number of vouchers covered in the program budget. Furthermore, the contractor can call customers if the voucher is not used or if the customer does not call to schedule recycling pickup of the old toilet. Finally, because customers are prescreened to ensure that they live in the service area, SDCWA will not need to conduct as many postinstallation inspections as it did prior to issuing rebates. SDCWA estimates that costs under the voucher program will decrease from $115 per toilet to less than $100 per toilet, largely as a result of the decreased number of inspections.

The voucher idea came out of a meeting SDCWA held with its member agencies on how to cut red tape in ULFT programs. Waiting for rebates had been a big problem, which vouchers will address. Also, staff members felt that

while rebates are a good way to start a program, they are unlikely to achieve the highest market penetration possible because too much effort is required on the part of program participants. The agency also suspects that a lower subsidy can be offered in a voucher program than is required for a rebate program, because customers do not need to make an initial capital layout.

One potential problem with a voucher system is the possibility of fraud. Water agency staff members raised this concern, citing the San Diego Gas & Electric rebate program for refrigerators. SDG&E discovered that customers who were buying the appliances did not really live in the SDG&E service territory. Also, the agency discovered that retail stores were submitting falsified paperwork, redeeming vouchers for customers who had not bought qualifying models. The program was later modified to provide for better verification and accountability. SDCWA believes that its voucher program will avoid the SDG&E pitfalls by carefully prescreening who receives a voucher.

Marin Municipal Water District, California (MMWD). MMWD provides vouchers to participants in the agency's loan program for ULFTs. The voucher is good for a loan of up to $150, which customers agree to pay back through bimonthly payments of $12.50 on their water bill. The agency has a customer approval process to ensure that the participant has an active account and good credit with MMWD. Currently, customers can use the vouchers like cash if they utilize a contractor to install the toilet. The contractor then redeems the voucher from the agency. If customers purchase and install the toilet themselves, they use the voucher like a rebate: customers pay for the toilet up front and then send the voucher to MMWD for a refund. MMWD is considering modifying the program to allow the vouchers to be redeemed directly at retail stores by customers who choose to do their own installations. Approximately one-third of program participants do the installation themselves, which is a higher rate of self-installation than the agency had anticipated.

Vouchers are also used by energy utilities, often for lower priced items for which a rebate program is not justified. For example, PG&E offers "instant rebates" for water heater blankets ($5 voucher), furnace or air conditioner filters ($1 voucher), or low-flow showerheads ($4 voucher or 50% of purchase price, whichever is less). PG&E markets this program through bill stuffers, and the coupons themselves are available at local retailers. Some utilities include the voucher itself as a bill stuffer.

Chapter 5
FINANCING AND OTHER TYPES OF INCENTIVES

Chapter 4 discussed incentives involving cash transfers. In this chapter we turn to financing incentives that do not involve direct transfer of cash. Financing incentives spread the cost of conservation equipment over time, thereby enabling customers to avoid large cash outlays. Therefore, these incentives are of most interest in cases where installation of conservation technology has a high up-front cost. To date, very few water agencies have offered financing arrangements to their customers. However, financing incentives are currently being explored or are in pilot stages in several locations. This chapter describes these early efforts as well as some examples from the energy industry, where financing incentives have been used extensively. In particular, two types of financing incentives will be discussed:

- Low-interest loans
- Shared-savings programs

LOW-INTEREST LOANS

Low-interest loans are an appropriate incentive when up-front capital costs are a barrier to participation. Only one water agency in our survey offered a loan program.

Marin Municipal Water District, California (MMWD). MMWD offers residential customers no-interest loans of $150 for purchase and installation of ULFTs, repayable through $12.50 payments on bimonthly water bills. The program uses a voucher system, as described in Chapter 4. There is no limit on the number of toilet retrofits, and the program is open to all customer classes. Increasing numbers of applications are coming from commercial and multifamily accounts, with some accounts installing several hundred ULFTs.

MMWD chose to offer loans because they are a low-cost option for the agency, which still provide some assistance to people interested in taking action to reduce water use during the recent drought. Participation was diminished by the fact that the program was not implemented until the drought ended, and the sense of immediacy has faded. However, there have still been 2,500 vouchers mailed to customers, approximately half of which have been used.

Loan programs are more common in the energy industry. For example:

Detroit Edison, Michigan, provides residential customers low-interest loans to upgrade insulation or to replace old water heaters with high-efficiency models.

Lakeland Department Electric & Water Utilities, Florida, offers residential customers low-interest loans for improving energy efficiency of their homes.

Northern States Power Company, Minnesota, North Dakota, South Dakota, and Wisconsin, offers commercial and industrial customers low-interest loans for general energy-efficiency and lighting applications. The loan term is variable, up to five years.

The Peoples Gas Light and Coke Company, Illinois, offers multifamily property owners low-interest loans and technical assistance for the installation of energy-efficiency measures. Although the program is open to all multifamily dwellings, the utility targets buildings that house low- to moderate-income tenants.

Idaho Power Company, Idaho, offers low-interest loans for energy efficiency retrofits to commercial and residential customers. Loans are generally used for lighting measures among commercial customers and for water heaters among residential customers.

SHARED SAVINGS

Shared savings programs allow customers to pay for conservation measures through savings achieved by those measures, or allow the water agency to recapture all or a portion of the measure costs through those savings. Typically this requires knowing what the water bill would be in the absence of the efficiency improvements. The customer's new bill is then comprised of the new, lower charge for water use (reflecting conservation) plus a charge to repay the agency for the conservation devices. The combination of those two charges should still be less than the customer's average bill prior to program participation. The latter charge is discontinued after a specified period of time, when the agency has been fully reimbursed for the improvements. These programs are increasing in popularity in the energy industry, but

are still relatively new in the water industry. Agencies that offer shared savings include:

City of Santa Monica, California. Santa Monica is negotiating a shared saving pilot program. For the pilot, the agency has proposed retrofitting the Santa Monica Business Park, a 49-acre multipurpose commercial development with over 13 buildings, 1 million square feet of office space, and 6.61 acres of irrigated turf and shrub areas. The retrofit would include replacing all toilets, installing faucet aerators, and making irrigation system improvements. Total cost of the project would be $82,350. MWD, Santa Monica, and the business park would each pay for a portion of the retrofit. The business park would be responsible for repaying $43,325.

If the project proceeds, the business park will use a portion of the savings to repay MWD and Santa Monica over five years. Savings will be calculated using historical water use records. Anticipated savings could be as high as 60%, but an estimate of 35% was used for the purpose of calculating the repayment period.

Based on savings of 35%, the retrofit has the following projected annual savings:

Interior use	$6,248
Exterior use	$2,577
Reduced wastewater charge	$4,090
Total	$12,915

If the savings are higher than 35%, the payback would occur even faster. If the business park does not achieve the predicted savings, the owners would still have to repay Santa Monica and MWD for their investment. After the payback period is complete, the business park should continue to save approximately $12,915 annually in water and wastewater charges. Also, the City of Santa Monica has selected 1990 water use levels as the base year from which future rationing targets will be set. Therefore, the business park will not be penalized for conservation in future rationing programs.

The Marin Municipal Water District, California (MMWD). The MMWD loan program described earlier (in which customers repay a no-interest loan to the water agency through bimonthly payments of $12.50 on their water bill) is also, in effect, a shared savings program. It assumes that a large portion of the customer's bimonthly payment is actually made up by savings on the water bill.

Shared savings programs in the energy industry are largely run by energy service companies (ESCOs) who agree to take their payment for the installation of energy efficiency measures out of the savings achieved by those measures.

LEASING

Utilities may lease equipment to their customers. This arrangement enables customers to avoid up-front capital costs for equipment. It can also increase access to conservation technology by making available equipment that customers do not need to purchase but could use for a limited time, such as leak detection equipment. Leasing programs can be combined with shared saving programs by allowing customers to make their lease payments through savings on their water bills.

Leasing has been used by many energy utilities, both for expensive industrial equipment and for smaller applications, such as compact fluorescents light bulbs. For example:

Burlington Electric Department, Vermont, leases compact fluorescent lightbulbs to their customers at a nominal fee per bulb per month. Lease payments are added to the monthly bill. The lease duration is five years, after which point the lease stops.

Philadelphia Electric Company, Pennsylvania, also leases compact fluorescents to residential customers.

Traverse City Light & Power Department, Michigan, leases audit-identified energy-efficient equipment to commercial and industrial customers. Equipment ownership transfers to the customer at the end of the lease period.

While leasing is not yet used as an incentive in the water industry in the United States, a pilot program leasing water-efficient washing machines is under way in

commercial laundromats in Mexico. The specific technology being leased is a washing machine that cycles water from the last rinse cycle (by which time it is basically clean water) back into the first wash cycle. This technology has energy savings too, because the machines save hot water. A meter on the washing machine charges the laundromat for water each time it cycles through, in effect charging repeatedly for the same water, but at a lower rate. The laundromat has lower water bills because it pays less for the reused water.

Payments for the reused water go toward paying for the equipment. At the end of the lease, the laundromat can buy the machine or continue to lease it (perhaps at a lower rate). Once the equipment is installed the process is nonintrusive; the customer retains complete autonomy over the business.

OTHER TYPES OF PROGRAMS

Water agencies may wish to consider targeting incentive programs where they can achieve the most cost-effective savings. In particular, conservation measures installed by low-income customers or in new construction may yield greater or more cost-effective savings than would participation from other customers, for reasons enumerated below.

Low-Income Programs

Residential conservation measures can often achieve the highest per-measure savings in low-income housing because there tend to be a greater number of people per household, so each appliance or fixture is used more intensively. However, it takes targeted incentive design and marketing to reach this population. Low-income customers are unlikely to participate in rebate programs because they do not have the up-front capital. Voucher programs or direct installation are likely to be more attractive to these customers. Several water conservation customer incentives have been targeted at low-income customers.

Los Angeles Department of Water and Power, California (LADWP). LADWP targeted a conservation kit distribution to 60,000 low-income customers. Each customer was contacted three times by mail. The first letter announced that the kit would be coming. The second mailing included the kit. The third mailing asked if the customer had received the kit, gave them a number to call if they did not receive a kit, and offered installation assistance.

A follow-up mail survey indicated that 75% of the customers who received the kit installed the measures.

City of Pasadena, California. Pasadena also has targeted low-income customers in their ULFT program. Initially Pasadena offered a rebate plus free installation, but had limited success because people could not afford to purchase the toilets. Now Pasadena provides the toilets and offers installation. This approach is working much better. Pasadena targeted the low-income population by a mailing to all Section 8 (subsidized low-income housing) property owners. To retain customer privacy and protect anonymity, the offer was included as a bill stuffer sent by the Pasadena Finance Department along with rent supplement checks. This program has been very successful; the first week alone the City got 200 to 300 responses.

Pasadena also offers free leak repair to low-income customers. Flyers advertising this service were sent out through Maintenance Assistance/ Homeowners (MASH) (a nonprofit organization that does external house repair for low-income homes) and other CBOs. Those organizations provided address labels without names (addressed to "Resident"). Working with CBOs that already offer services to low-income customers is likely to be an effective way of reaching this population.

NEW CONSTRUCTION

Targeting new construction for water conservation customer incentives can be a cost-effective way of achieving water conservation because it frequently is less expensive to install water-efficient measures during construction then to retrofit existing structures. A variety of incentives, especially cash transfers and financing incentives, are appropriate for new construction. The major difference in a new construction program is that incentives are often targeted at developers rather than customers.

Several of the landscape programs discussed earlier—such as the City of Austin, Texas, Xeriscape It! program and the North Marin Xeriscape Credit Program, are open to new construction. Also, the Phoenix landscape training program plans to target homeowners associations in new developments. However, no water agencies currently offer programs that comprehensively address water use in new construction. Through plan review, low-interest loans, and rebates, a water agency may be able to encourage purchase of water-efficient equipment and appliances by all customer classes. Dozens

of these programs have been used by the energy industry, most of which offer design assistance or financial incentives.

Pacific Gas & Electric, California, Residential New Construction Program offers rebates to builders who surpass the State Building Energy Standards by 10%.

Orange & Rockland Utilities, New York, offers rebates to builders and homeowners to construct homes to energy-efficiency standards higher than those required by the state.

Potomac Electric Power Company, Washington D.C., offers technical assistance and financial incentives to building designers and developers for designing and constructing energy-efficient commercial buildings and installing energy-efficient equipment.

New England Electric System, Massachusetts, Design 2000—Commercial/ Industrial New Construction Program offers incentives to architects, developers, and general contractors for developing energy-efficient buildings. NEES provides free technical assistance (including a free computer energy analysis of the building), as well as rebates and grants.

Central Maine Power's Efficient New Construction, New Construction Lighting Rebate, and Calculated New Construction Rebate Programs all provide design assistance and rebates.

Chapter 6
A COST-EFFECTIVENESS FRAMEWORK FOR CALCULATING CUSTOMER INCENTIVES

INTRODUCTION

The handbook thus far had focused on the *types* of customer incentives that are appropriate for particular conservation programs. This chapter shifts the focus from the type to the appropriate level of incentive.

Incentives are designed to overcome specific barriers to customer participation in conservation programs. A "big enough" incentive is one that exceeds the magnitude of those barriers. The usefulness of cost-effectiveness analysis is directly related to the difficulty of quantifying the magnitude of the barriers to participation. Since many of those barriers are noneconomic, the value of cost-effectiveness analysis is somewhat limited.

The cost-effectiveness framework presented in this chapter will likely be most useful in calculating appropriate cash transfers (rebates, grants, vouchers), financing (low-interest loans, shared savings programs), and bill modifications (one-time or ongoing). In all of these cases, the barriers that are to be overcome are primarily economic in nature.

The appropriate type of customer incentive and its amount are closely interrelated. Customers may respond much better to an incentive of less economic value than other incentives offered, because of noneconomic factors that influence their decisions. For example, a customer who faces cash constraints may prefer a $50 voucher to a $75 rebate because the voucher reduces the up-front capital needed to make the purchase.[14] Moreover, effective marketing of a particular incentive type may well reduce the amount of the economic incentive that must be offered. Therefore, as is the case with all analytic tools, the results of applying the cost-effectiveness framework will have to be combined with other information and a healthy measure of judgment by utility managers and planners.

[14]Determining those noneconomic factors is one of the major goals of the market research discussed in Chapter 8.

PERSPECTIVES OF WATER CONSERVATION COST EFFECTIVENESS

Cost-effectiveness analysis is a way to systematically compare the benefits and costs of an investment. In performing cost-effectiveness analysis of conservation programs, it is critical to carefully specify the perspective from which the benefits and costs will be assessed. Each perspective provides important information that is helpful in interpreting the analysis.

Over the past decade, California energy utilities and regulators have painstakingly developed a framework for analyzing the cost-effectiveness of demand-side management (DSM) programs.[15] The following discussion is consistent with that framework, with adjustments to reflect the differences between water service and electric or gas service.

The perspectives from which cost-effectiveness will be evaluated can be defined in a variety of ways, depending on many factors. For example, situations in which there are several levels of water providers (wholesalers and retailers) may require a somewhat more complex analysis. It is particularly important to clearly understand the following four cost-effectiveness perspectives:

- Program participants
- The water utility
- The water supply system
- Society

Figures 6-1 through 6-3 summarize the flow of economic benefits and costs that defines these perspectives. The figures build upon one another. Thus, Figure 6-1 describes the benefits and costs that define the participant and utility perspectives. Figure 6-2 expands the view to include the water supply system. Figure 6-3 takes an even broader view to incorporate the societal perspectives.

Following are discussions of each of these cost-effectiveness perspectives:

[15]See California Public Utilities Commission and California Energy Commission, *Standard Practice Manual: Economic Analysis of Demand-Side Management Programs* (December 1987).

Program Participants

Participants in a conservation program are affected by the program in several ways. Some of these effects are not easily quantified, such as potential inconvenience or perceptions of reduced service levels (e.g., poorer quality showers from low-flow showerheads) or feelings of well-being due to customers' belief that conservation is inherently the "right thing to do." Figure 6-1 shows the quantifiable economic benefits to participating customers which include the savings on their water bills due to reduced consumption and the value of whatever incentive is received from the water purveyor. In addition, participants may see reduced electric, gas, and/or wastewater bills. The major economic cost to participants is the cost to purchase and/or install the conservation device or measure.

The Water Utility

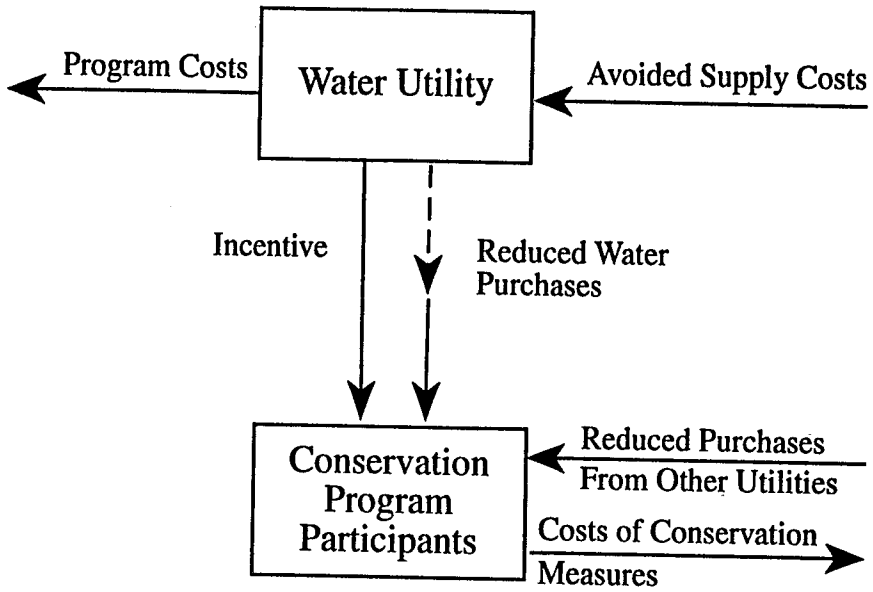
As indicated in Figure 6-1, the major quantifiable benefit of a conservation program to the water utility is the avoided cost of new supply. As a demand-side resource, conservation reduces the need for new supplies and thereby reduces long-term costs to the agency and its ratepayers. Determining the magnitude and timing of these cost reductions may be extremely difficult and requires the utility to single out *the* marginal supply source, that is, the one capital investment that would be scaled back or postponed as a result of conservation. Electric utilities and their regulators have wrestled with marginal cost issues over the past decade or more. Water utilities are beginning to address similar issues.

The costs of the program to the utility include the incentives to participating customers, as well as any other costs associated with the program (e.g., administrative or marketing expenses).

Conservation programs also impose another type of cost on the utility—namely lost revenues, which are the "flip side" of the bill reduction benefits to program participants. The revenue losses associated with conservation programs are a critical concern for utility managers, since resulting losses must be recovered through increased rates. The treatment of conservation-induced revenue losses has been a matter of some controversy among energy utilities and their regulators. In fact, a separate cost-effectiveness perspective (the so-called ratepayer impact measure or RIM test) has been developed, which is distinguished from the utility perspective by its consideration of revenue losses.

Figure 6–1

Benefits and Costs of Water Conservation
Participant and Utility Perspectives



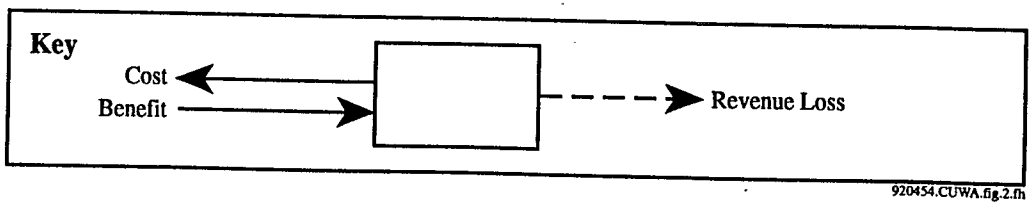


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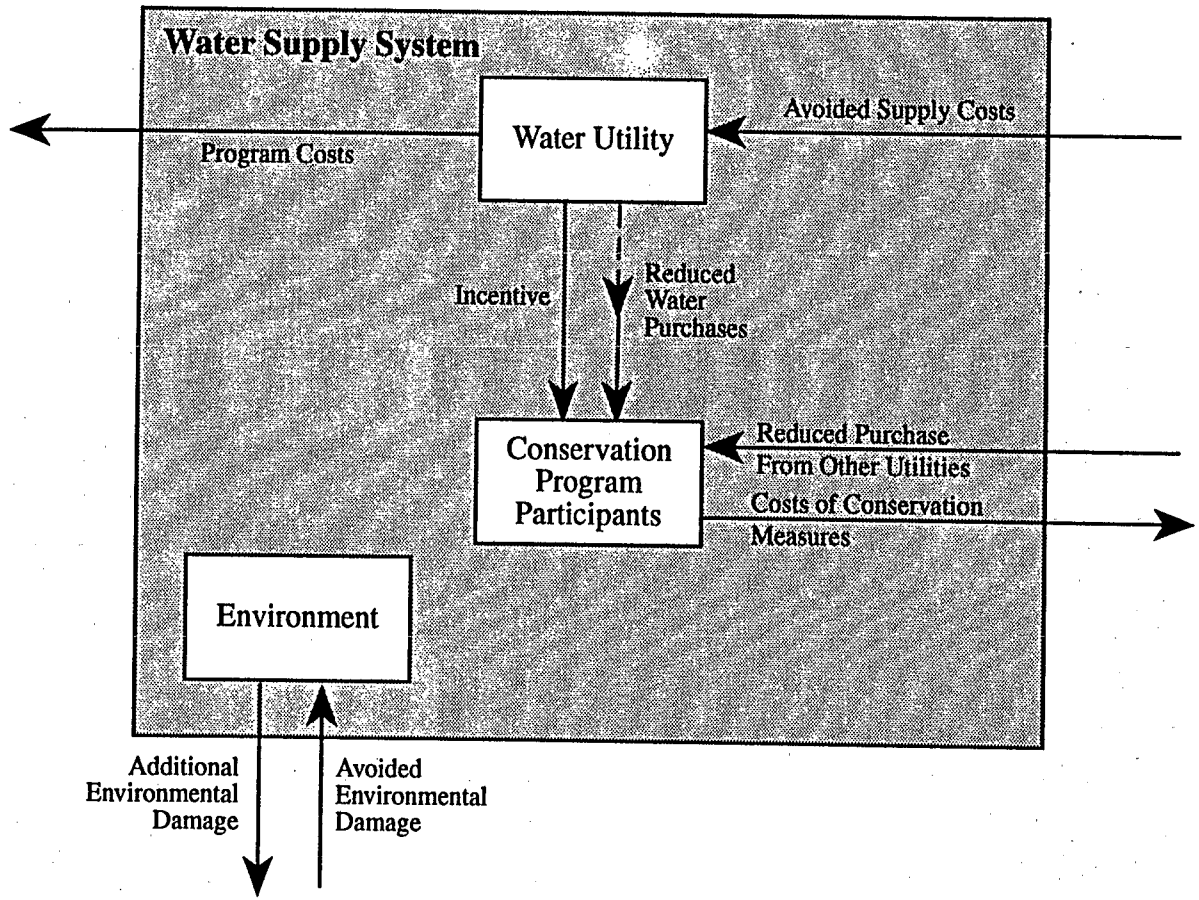
Figure 6–2

Benefits and Costs of Water Conservation
Water Supply System Perspective



Note: Arrows that cross boundaries of shaded areas represent benefits or costs from those perspectives.

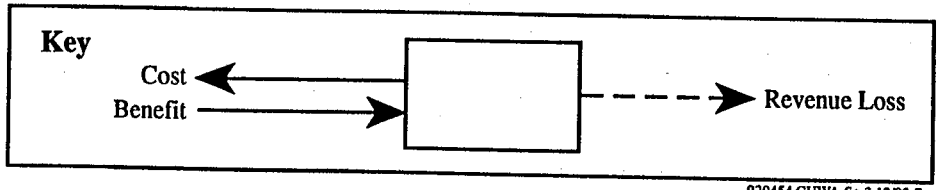


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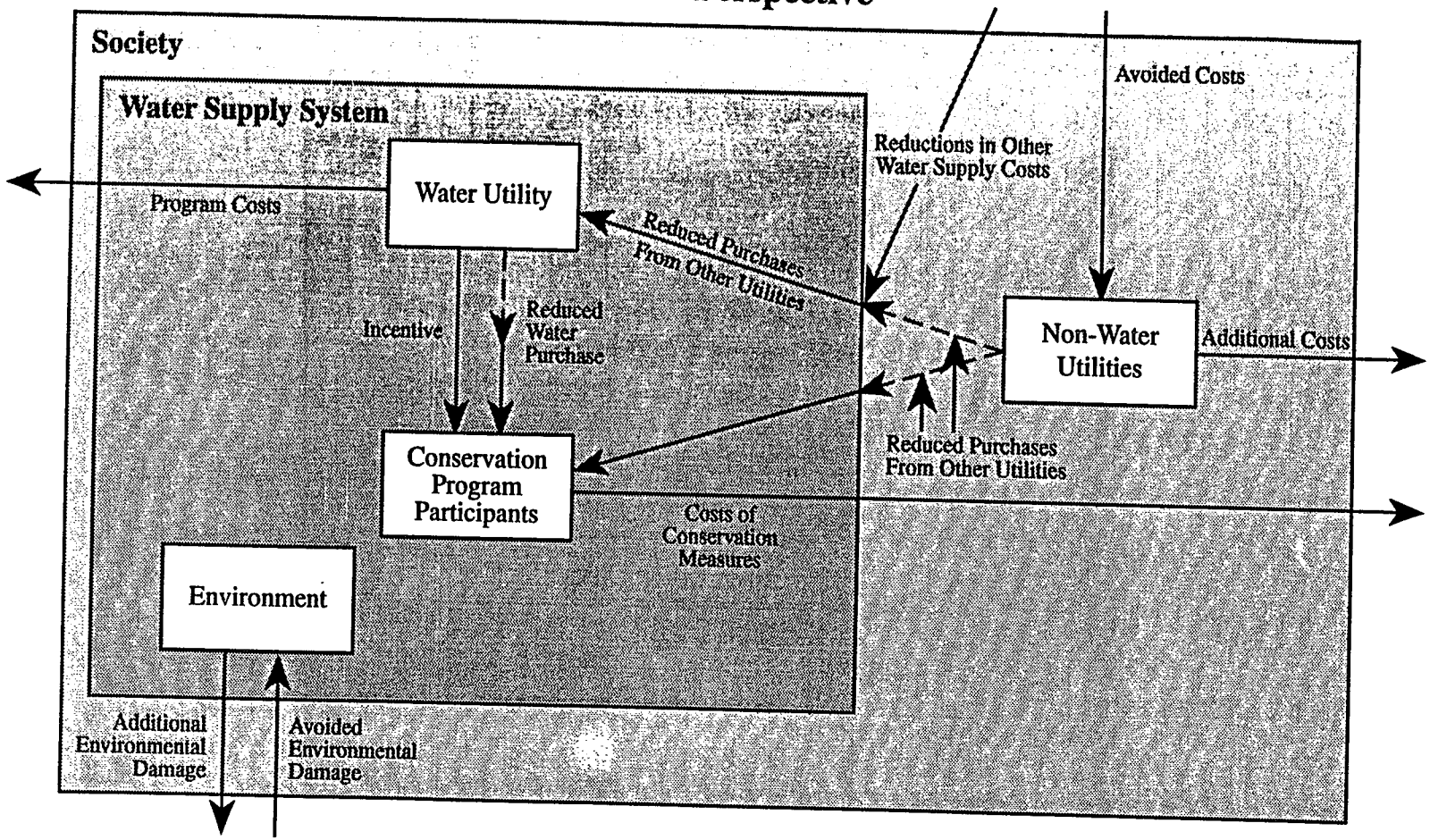
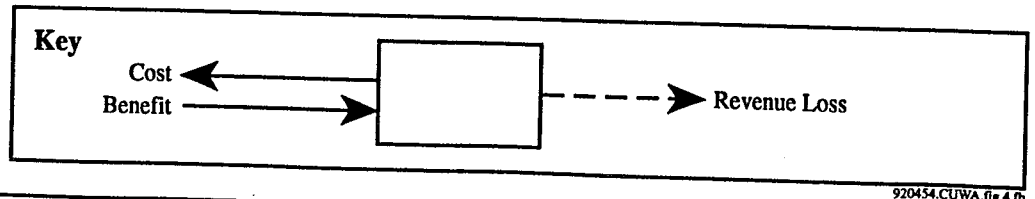
Figure 6–3
Benefits and Costs of Water Conservation
Societal Perspective



Note: Arrows that cross boundaries of shaded areas represent benefits or costs from those perspectives.



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While few dispute the importance of conservation-induced revenue losses, there is much less unanimity on the extent to which they should be a primary consideration in evaluating conservation programs. Many believe that revenue losses are best viewed as a shift of the cost burden from customers that participate in conservation programs to those that do not participate. This transfer payment says little about the economic viability of the conservation program itself.[16]

Put another way, not including revenue losses in a cost-effectiveness analysis of a conservation program is equivalent to assessing the program's impact on average water bills. That is, a positive cost-effectiveness result implies that average bills across participating and nonparticipating customers will decrease; a negative result implies a higher average bill. In contrast, the inclusion of revenue losses shifts the focus to average *rates* rather than average *bills*.

Later in this chapter we discuss the significance of considering revenue losses in the cost-effectiveness analysis used to calculate appropriate incentive levels.

The Water Supply System

For purposes of this discussion, we define the "water supply system" as the water purveyor,[17] the program participants, and the environment. The benefits and costs from this perspective include the benefits and costs from the water utility and participant perspectives as well as any impacts that a conservation program has on the environment. These environmental impacts will include any avoided environmental damage associated with the marginal supply resource.

The perspective of the water supply system is important because it is not affected by the transfers of funds among entities, assessing instead the benefits and costs of a conservation measure to the system as a whole. Revenue losses and incentive payments are therefore not considered, since (as illustrated in Figure 6-2) such transfers do not "cross the boundary" of the water supply system. (In other words, the utility costs and the participant benefits cancel each other out.) This perspective

[16]This is essentially the position taken by the California Public Utilities Commission in its evaluations of energy conservation programs. The commission has taken the view that, while rate impacts should not be ignored, they are subordinate to the other cost-effectiveness tests. See, for example, CPUC Decision No. 89-12-057, December 20, 1989.

[17]When wholesale as well as retail agencies are involved, the analysis must consider all of these providers.

compares the avoided supply cost benefits (including avoided environmental costs) with the incremental program and conservation measure costs.[18]

Society

The broadest cost-effectiveness perspective is that of society as a whole, illustrated in Figure 6-3. For the purposes of this discussion, "society" includes not only the water supply system but also other types of utilities that might be affected by the conservation program.[19]

This perspective not only "cancels out" transfer payments between the water utility and participating customers; it also eliminates transfers among the water utility and other utilities. Thus, the water utility's avoided costs of purchases from nonwater utilities are not considered, but other avoided water utility costs are included. The costs that are avoided by the electric, gas, and/or wastewater utilities are viewed as societal benefits, while any additional costs that are incurred by these utilities as a result of the water conservation program are societal costs.[20]

USING THE COST-EFFECTIVENESS PERSPECTIVES TO CALCULATE APPROPRIATE INCENTIVE LEVELS

The societal and water supply system perspectives are useful for asking questions such as, "Which program components should receive greater emphasis?" or "Should the program be done at all?" Since incentive payments play no role in these perspectives, they have little to say about appropriate incentive amounts. A conservation program must answer these questions *before* the issue of the appropriate incentive amount is even addressed.

A program that is not societally cost-effective results in a net loss of societal resources. Such a program should be carefully examined. It may be that the cost-

[18]As shown in Figure 6-1, another benefit from this perspective might include the reduced charges paid by the program participant to non-water-supply (e.g., wastewater) utilities.

[19]Strictly speaking, this perspective also considers any non-environmental "external" impacts of water conservation. For example, certain "third-party impacts" associated with water transfers may be avoided.

[20]Some wastewater systems report that they may incur additional costs or reduced revenues due to water conservation. If so, this would also be a cost to society.

effectiveness results have not adequately captured all of the difficult-to-quantify societal benefits. Alternatively, the program may have to be redesigned to improve its cost effectiveness. For example, in the case of a ULFT rebate program, a focus on the types of customers with greater water savings per installed toilet could increase societal cost-effectiveness. Achieving greater efficiencies in program administration could have a similar result. If improvements in cost-effectiveness cannot be achieved, resources should be diverted to other programs.

The distinction between the two perspectives is one of degree: some decision makers focus on impacts on the water supply system; others take the more all-encompassing view embodied in the societal test.

Once a conservation program is determined to be cost-effective to society or to the water supply system, the question of the appropriate incentive amount can then be addressed. The participant and water utility cost-effectiveness perspectives are useful in addressing this issue.

Use of the Participant Perspective

The participant perspective addresses the question, "How much of an incentive do customers need?" Assume that an agency is considering a "cash for grass" rebate program. Program participants face an initial outlay equal to the difference between the capital and installation costs for replacement landscaping and the water agency rebate. Financial benefits, which consist of water bill savings, are spread over time. If we assume that the typical customer will require a two-year simple payback for this type of investment, we can compute the necessary incentive level, based on assumptions about replacement landscaping costs and projected water rates.[21]

Offering an incentive that makes participation cost-effective from the participant perspective still does not guarantee participation. The issue of what motivates customers to undertake various conservation measures is complicated. Research in the energy sector has shown that the effects of financial incentives on residential conservation program participation are inconsistent. Several studies have shown that participation rates are influenced less by the existence or magnitude of an incentive

[21]There is little firm evidence that a two-year payback is appropriate.

than by the way programs are implemented or marketed.[22] Other studies have shown some degree of correlation between incentive size and program participation but lack sufficient data to determine the optimum incentive size.[23] Further, financial incentives alone appear to be inadequate for program success.

Commercial investments, in contrast, are more often made on the basis of relative profitability. Survey and focus group results have shown that the single most important criterion for evaluation of commercial conservation investments is projected payback.[24] While the required payback for conservation investments is uncertain, it is thought to be short. Data from nine sources on the average payback from conservation measures already in place nationwide suggests that planning for a payback of two to three years is reasonable.[25] Five of the nine studies showed average paybacks of two years or less. A two-year payback is generally used as a rule of thumb for commercial conservation incentive design, because the uncertainty associated with projected benefits encourages customers to seek such short payback periods.

The research makes clear that noneconomic factors—including the adequacy of the marketing effort, perceptions of risk, and the time and effort required to implement the measure—also significantly affect investment decisions. For example, marketing has been found to have a considerable effect on the penetration levels of conservation programs, particularly in the residential sector. In fact, some studies have shown that it is possible to obtain high participation rates with little or no financial incentives if a program is well marketed.[26]

Uncertainty about the purported benefits of conservation investments can also be a major barrier to participation in conservation programs.[27] Uncertainties include performance and aesthetics of the equipment and future changes in rates that affect the dollar savings associated with the investment. Some of this risk can be reduced—for

[22]Linda Berry, *The Market Penetration of Energy-Efficiency Programs* (Oak Ridge National Laboratory, April 1990).

[23]Ibid., pp. 34–35.

[24]Xenergy, Inc., *DSM Commercial Customer Acceptance Volume 1: Program Planning Insights*, EM-5633 (Palo Alto, Calif.: Electric Power Research Institute, January 1988).

[25]Ibid. p. 2–8.

[26]Berry, pp. 32–33.

[27]Xenergy, p. 2–12.

example, through customer access to information and equipment warranties. However, the credibility of the source of information to the consumer has been found to be important.[28] Community groups, trade allies, and peers seem to be the most effective communication media for this type of information.

The time and effort required to implement conservation measures can also be an important determinant of program participation. Despite the purported benefits, if significant effort is required on the part of the consumer, he or she may find that conservation is not worth the bother.

The foregoing observations are based on a large body of market research that has been performed for energy conservation programs. There is little comparable research on water conservation programs. Two important conclusions probably do apply:

- For residential customers, noneconomic factors play at least as large a role as economic incentives in customer participation decisions.
- For commercial customers, economics play a much more central role, and projected payback periods are critical determinants of willingness to participate.

The market research that we discuss in Chapter 8 will help agencies better define what is necessary to overcome program participation barriers. Until that information becomes available, the prior experience of the energy and water utility industries, along with judgment, will have to be relied upon. The important point is that, regardless of the particular criterion that is chosen to represent the "push" needed by customers, the foregoing type of analysis will translate that into an incentive level.

Use of the Water Utility Perspective

The utility perspective compares avoided supply costs with program and incentive costs (and potentially revenue losses) to the utility. The maximum incentive that a utility can "afford" is the level at which *the present value of net utility benefits is zero.* In other words, the incentive that can be justified from the water utility perspective is one that represents a long-term utility "break even point." This can be expressed mathematically as follows:

[28]Berry, p. 45; Xenergy, p. 3–19.

$$UC + I_{max} - \sum_t \frac{ASC_t \{- LR_t\}}{(1 + r)^t} = 0$$

or

$$I = \sum_t \frac{ASC_t \{- LR_t\}}{(1 + r)^t} - UC$$

where

r	=	discount rate
ASC_t	=	avoided supply costs in period t
LR_t	=	lost revenues in period t (if included)
UC	=	present value of utility program costs other than incentive payments
I_{max}	=	present value of maximum cost-effective incentive

For example, if we assume that the per-customer present value of avoided supply cost associated with a conservation program is $100, and the program also includes a $20 per customer initial administrative cost, then the maximum rebate that the utility could "afford" to pay is $80. If we further assume that the present value of the future lost revenue stream is $50, *and that we wish to consider that lost revenue as a utility cost*, the "affordable" incentive is reduced to $30.

A more complete illustration of this approach will be shown when the cost-effectiveness framework is applied to the case studies in Chapter 7.

Thus, the decision whether to incorporate revenue losses has a profound effect on the maximum incentive that a water utility is willing to pay. This is a difficult decision, and one that each water provider must base on its own circumstances. The remainder of this handbook will assume that revenue losses are *not* considered in incentive determination. This is based on:

- The general practice in the energy utility industry;
- The critical nature of conservation as a resource in many parts of the country; and
- The logic of focusing on the magnitude of average bills rather than average rate levels. This better serves the goal of placing conservation on a "level playing field" with supply resources.

Some utilities may wish to explicitly consider avoided environmental costs in the calculation of appropriate incentive levels. Doing so would yield higher permissible incentives and thereby offer greater encouragement to conservation programs in cases where they avoid significant levels of environmental damage.

EXTENSIONS OF THE COST-EFFECTIVENESS FRAMEWORK

The basic framework can be extended to define additional cost-effectiveness perspectives that distinguish between wholesale and retail utilities or that isolate impacts on particular nonwater utilities (e.g., electric, gas, or wastewater). Such an expanded framework can be particularly useful when attempting to determine the manner in which the costs of customer incentives should be divided among the utilities that are affected by water conservation programs.

The energy utility industry is currently exploring new and more sophisticated cost-effectiveness perspectives. For example, the so-called "value test" is a complete test of economic efficiency and explicitly considers such customer impacts as changes in quality of service, long-run rate impacts, and the ability of a program to overcome market barrier costs.

Another example of how the cost-effectiveness methodology can be refined is in the consideration of so-called "freeriders." These are program participants who would have taken the conservation action even without a utility incentive. For such customers, the incremental utility benefit as a result of the conservation program is zero. The existence of large numbers of such customers will reduce the avoided supply costs and, therefore, the incentive payments that the utility can afford. Clearly, the utility should attempt to design conservation programs to minimize freeridership.

The treatment of freeridership issues is illustrated in Chapter 7.

Chapter 7
CASE STUDIES

This chapter presents three case studies, two actual and one hypothetical. Chapters 2 through 5 of this handbook focused on the types and amounts of incentives water agencies can offer. This chapter looks more closely at program design and implementation issues and at the effectiveness of specific incentives in encouraging customer participation and in achieving conservation. The two actual case studies were developed through interviews with agency staff and review of program materials and documentation. Each case study includes, when available, a detailed description of the following elements:

- The conservation program
- Program goals
- Target market
- Incentive structure
- Implementation methods
- Marketing approaches
- Program budget
- Participation levels
- Water savings

The cost-effectiveness framework presented in Chapter 6 has been applied to each case study to determine appropriate incentive levels. The case studies have been selected to illustrate a variety of program features. The case studies are:

- **The Los Angeles Department of Water and Power (LADWP) Ultra Low Flush Toilet Retrofit Rebate Program.** This program was selected because of the burgeoning number of ULFT rebate programs. LADWP's ULFT program has gone through several phases that will be explored, including the use of partnerships with community-based organizations (CBOs), an approach that LADWP pioneered and that is currently gaining in popularity.

- **The Seattle, Washington, Home Water Savers Program.** This program was selected to illustrate a regional utility partnership, several examples of which were cited in Chapters 2 through 5 as cost-effective approaches to implementing incentive programs. Additionally, as a device distribution program this is a good candidate for a case study because device

distribution is often the first water conservation program an agency implements.

- A hypothetical combination water audit/no-interest loan program for industrial customers. This case study was developed to illustrate a multi-level (wholesaler-retailer-customer) incentive program, and to focus on a program that targets industrial customers.

LOS ANGELES DEPARTMENT OF WATER AND POWER: ULTRA LOW FLUSH TOILET REBATE PROGRAM

Program Description

Los Angeles Department of Water and Power (LADWP) sells water to retail customers in the City of Los Angeles, California. LADWP purchases some of its water from the Metropolitan Water District of Southern California (MWD). Through its Conservation Credits Program, discussed in Chapter 4 of this handbook, MWD assists LADWP with funding the ULFT rebate program and also provides input into program implementation.

The LADWP ULFT retrofit program has two variations. The standard program, which began in 1990, offers a rebate to all customers who install an approved model ULFT. Current rebate levels are $100/ULFT for single-family residential and condominium customers, and $75/ULFT for all other customers. Customers are responsible for purchasing and installing the toilet.

The Community-Based Organization (CBO) program, which began in 1992, offers a ULFT to residents at no cost; the CBO receives $25/installed toilet. The CBO markets the program to the community and distributes the toilets, usually at a centralized location (depot). The Metropolitan Water District of Southern California (MWD) pays the full program costs to a subcontractor, who handles all program elements, including procuring toilets, and locating and training the CBO staff. LADWP reimburses MWD for 50% of program costs.

Several factors motivated LADWP to initiate a ULFT retrofit program. The agency tries to be at the forefront in promoting conservation. It had already nearly saturated the market with efficient showerheads, particularly after a 1988 city ordinance mandated that LADWP provide, and that customers install, low-flow showerheads and toilet tank displacement bags. Since 1988, LADWP has distributed 1.5 million

showerheads and at least 3 million toilet bags. Surveys indicated a sustained penetration rate of 60% for installed showerheads. Therefore, in 1990, four years into the drought, LADWP was ready to take the next step in conservation. Other factors influenced the decision as well:

- The Board of Commissioners felt that conservation was critical;
- Goleta and Santa Monica already had implemented ULFT programs; and
- Studies emerging from the Metropolitan Water District of Southern California (MWD) indicated that significant water savings were available from ULFT retrofits.

The driving element of the chosen program implementation mechanism was that the customers would do most of the work. They would select, buy, and install an approved ULFT, and provide the necessary documentation; then LADWP would provide a rebate.

LADWP considered other options, such as procuring, warehousing, and distributing ULFTs. However, it was felt that warehousing would be cumbersome in a service territory as large as LADWP. Also, this method would limit customer choice of models. Another option considered—having a contractor distribute and install toilets—seemed administratively difficult, more expensive, and would have required more careful LADWP monitoring. Instead, LADWP selected the simple rebate option.

Program Goals

The program goal for the first year was to install 7,500 ULFTs. The program actually installed 90,000 ULFTs during that time. As discussed later, the drought and mandatory rationing were primary reasons for the unexpected participation level. The current goal is to maximize the number of installed ULFTs, subject to funding limitations.

Target Market

When the standard program began in February 1990, it was targeted at residential customers. In December 1990, the program was opened to all LADWP customers. There was little information quantifying the savings available from installing the

ULFTs in nonresidential buildings; however, the Board of Commissioners wanted to make rebates available to all customers. The actual percentage of rebates that are given to nonresidential customers has been less than 1% and this case study focuses on the residential sector.

The CBO program targets low-income customers, who were not responding to the standard rebate offer.

Incentive Structure

Under the current standard program, single-family residential and condominium customers are eligible for a $100/toilet rebate, and other customers are eligible for $75/toilet rebate. There is no limit on the number of retrofits per household or per account.

Under the CBO program, CBOs provide customers with a ULFT at no cost, and the CBO receives $25/installed toilet. Again, there is no limit on the number of toilets per household or per account.

Preliminary cost-effectiveness analysis done by LADWP prior to program implementation indicated that a $100 rebate would be cost-effective from the agency's perspective, based on marginal costs of $230/AF and presumed ULFT savings of 29 gallons daily. However, the major factor in selecting the rebate level of $100 was that it was the level being offered in other nearby jurisdictions, such as Santa Monica and Goleta. Also, LADWP knew that at least one major supplier offered a mid-level ULFT for $85. Therefore, $100 seemed a reasonable rebate level that would cover purchase price as well as a portion of installation costs.

The structure of the CBO program was developed when the Mothers of East Los Angeles (MELA), a community-based organization, approached LADWP and offered to run the program in their neighborhood. Because many low-income customers do not have the cash to purchase a ULFT, the rebate program was not an effective incentive for them. By offering residents a free toilet, LADWP has been able to achieve a much higher participation rate in low-income areas.

Implementation Methods

The Standard Program: Phase I

During Phase I of the program, customers could purchase any ULFT model on the LADWP approved list. The list was generated by the city's Building and Safety Department, which develops specifications for all mechanical equipment sold in Los Angeles. LADWP retained a contractor to manage most aspects of program administration. The contractor did all the necessary marketing, information gathering, verification, and application processing. Once the customer had sent in the application and proof of purchase, the contractor would schedule an inspection. After inspection, the customer was then sent a rebate check for $100 per ULFT. In Phase I of the program all toilets were inspected before the customer received a rebate.

Almost from the beginning, the program began to snowball. The ongoing drought and drought-related ordinances were clearly primary motivators in program participation. Significant boosts in participation occurred in March 1991, when LADWP began mandatory 10% rationing; in May 1991, when LADWP increased rationing to 15%; and again in June and September 1991, when program discontinuation was anticipated. Monthly participation rates are illustrated in Figure 7-1.

Four years of decreased consumption due to drought had depressed revenues. In one 12-month period, LADWP spent $25 million on rebates, while operating with a 30% decrease in revenue due to the drought. Therefore, due to funding difficulties, the program was discontinued in October 31, 1991. By the end of Phase I, LADWP had issued rebates for 230,000 ULFTs.

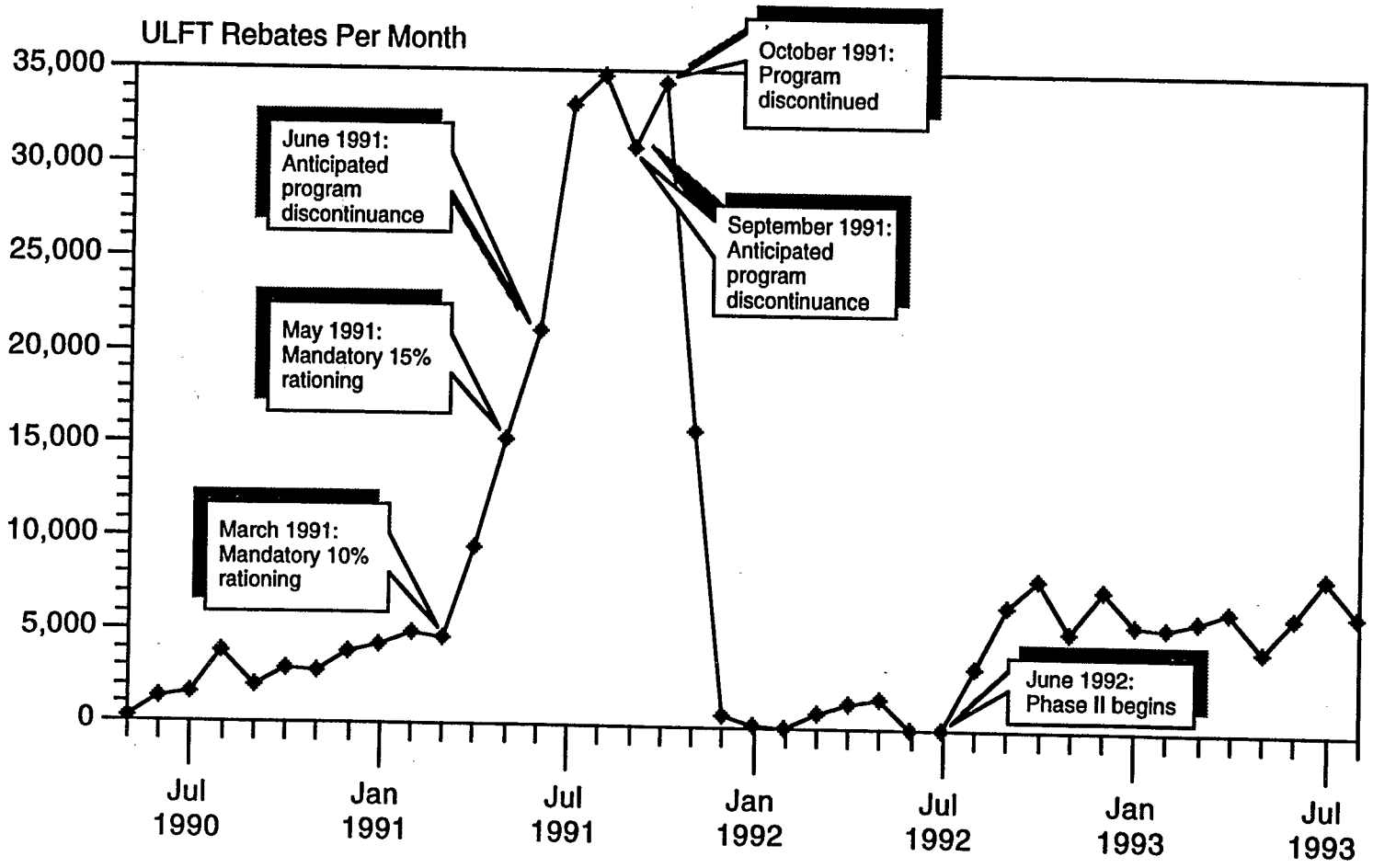
Discontinuing the program was difficult but necessary. In addition to the lack of funds, the program needed design changes to handle the magnitude of applications. The program had been designed to process 7,500 rebates/year and could not provide adequate customer service while processing 230,000 toilet installations during the first 18 months. Customers were waiting as long as 12 weeks to receive a rebate, while program literature promised rebates in four to six weeks.

Standard Program: Phase II

LADWP redesigned the program and started Phase II on July 1, 1992; Phase II is ongoing at this time. The same contractor is handling the program, but many changes have been made in program administration. One change was the implementation of a

Figure 7–1

LADWP Monthly ULFT Rebates



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reservation system for rebates. Customers who are interested call to reserve a rebate, and they are then mailed an application. The customer has 60 days to purchase the ULFT(s). Reservations are not mandatory to receive a rebate; however, rebates are subject to funding availability, so reservations are recommended.

Another major program change is that the rate structure was revised to allow conservation programs that resulted in hardware installation to be charged directly to the ratepayer just like purchased water from MWD. This provides the ULFT program with a funding mechanism. Prior to this change the program was funded out of the conservation budget.

Also, before starting Phase II, LADWP reevaluated the rebate structure and level. Instead of offering $100 per ULFT rebate for all customers, the program was redesigned to offer $100 rebates for single-family residences, including condominiums, and $75 for other customers. There is still no limit on the number of ULFTs that could be installed. The difference in rebate was largely introduced because multifamily building owners, it was felt, would get ULFTs for a lower per-unit price because they would be purchasing in bulk, and could also write off the investment. A $75 rebate still seemed high enough to induce participation. Also, LADWP staff members felt that multifamily owners are more aware of utility bills than single-family residents and are more likely to conduct economic analyses and realize that it is to their benefit to install the ULFTs, even with a lower rebate level.

LADWP also considered a tiered rebate, which was supported by evidence that the first ULFT installed per household provides higher savings than additional ULFTs. However, LADWP did not want to create additional administrative burdens.

Finally, in Phase II LADWP decreased the number of inspections. In Phase I, LADWP inspected every ULFT before issuing a rebate. In Phase II, only a portion are inspected, with applications for multiple rebates having a higher likelihood of inspection. Approximately 25% of all applications, representing 75% of all ULFTs, are inspected. This has decreased administrative costs, and LADWP believes that the level of fraud is minimal and does not warrant the expense of inspecting every installation.

The CBO Program

The CBO program began in September 1992. As with the standard rebate program, LADWP has eliminated itself from most of the details of program administration. For the first ten months of the program, LADWP paid $100 to a subcontractor for each

installed ULFT. The subcontractor handled all aspects of the program, including toilet purchase and storage, and $25 payment to CBO, for this price.

Starting in June 1993, LADWP created a separate agreement with MWD for the CBO program. MWD pays the full program costs to the contractor and LADWP reimburses MWD for its share (50%). Recently the rebate amount increased to $110 per toilet to cover a $10 per toilet fee to have the old toilets recycled. The LADWP 50% share is now $55 per toilet.

The subcontractor locates a willing CBO and procures the ULFTs. The subcontractor also trains the CBO members on detail of program operations, such as how to maintain a database to track participation and how to install the ULFTs if necessary.

The CBO is paid $25 per toilet to cover its program expenses. CBOs generally do not have much funding available and would not be able to operate the program if not provided the money. Generally the CBO staff market the program door to door and establish a depot where residents can pick up the ULFT. Some CBOs also offer direct installation for participants or installation by local plumbers at discounted rates.

The CBO component of the program is increasing. The CBOs distributed 10,000 ULFTs during FY 1992 through 1993. For FY 1993 through 1994, CBOs are likely to distribute 63,000 ULFTs. Currently four CBOs are running ULFT programs:

- Mothers of East Los Angeles
- Koreatown
- First African Methodist Episcopal Church
- Keeping the World at Peace

Marketing Approaches

The program has always had several marketing mechanisms, including press conferences, point-of-purchase displays, bill stuffers, and a LADWP newsletter, which is mailed separately from the water bill. According to customer research, most customers learn of the program through bill stuffers or the LADWP newsletter.

LADWP also made a formal presentation to one plumbing wholesaler who supplies thousands of toilets to independent plumbers. Plumbers are quite active in marketing the program, frequently offering to procure and install the toilet in return for the rebate or for a small additional charge.

Because the program began during the drought, and customers were concerned about the mandatory rationing, marketing the program was not a problem. It basically sold itself. LADWP had more trouble keeping up with the program demand than with increasing customer awareness of the program.

Low-income customers were significantly more difficult to reach, but initiation of the CBO program addressed this by having members of the community market the program, typically by going door to door.

Program Budget

The following table shows program expenses for fiscal year 1992 through 1993. The structure of program funding for the ULFT program has varied somewhat over time. Recently the process has been simplified: for the standard applications, LADWP pays its contractor for program administration, and pays participants $100 per toilet (single-family residences and condominiums) or $75 per toilet (all others).

ULFT PROGRAM EXPENSES
FY 1992–1993

Number of ULFTs installed	65,167
Rebates to customers	$5,545,700
Payment to MWD for CBO Program (since June 1993	$86,405
Payment to contractor (program administration)	$846,789
LADWP expenses (1 FTE, printing brochures, etc.)	$80,000
Subtotal	$6,558,894
Reimbursement from MWD (@ 50%/ULFT)	($2,772,850)
Total	$3,786,044

LADWP buys water from the Metropolitan Water District of Southern California (MWD) to augment existing supplies. Formerly, under the Conservation Credit Program, MWD would reimburse LADWP for up to 50% of the program cost, subject to available funds. Currently MWD reimburses LADWP $60 per toilet.

Until recently, the CBO program funding was comparable to the standard program in that LADWP wrote $100 checks to the subcontractor for each toilet installed. Starting in June 1993, LADWP created a separate agreement with MWD for the CBO program. MWD pays for the costs up front, and LADWP reimburses MWD for its share (50%), which at this time is $55 per toilet. Until this change was made, the CBOs were included under the standard program, so the numbers in Table 1 do not accurately separate out all payments for the toilets installed under the CBO program.

65,167 ULFTs were installed during FY 1992 through 1993.

Participation Levels and Water Savings

ULFTs in Los Angeles are estimated to save 46 gallons daily in multifamily households and 29 gallons daily in single-family households.[29] The standard program is currently processing approximately 4,000 ULFT rebates per month and the CBO program is distributing approximately 2,500 ULFTs per month. From program inception in February 1990 through August 1993, approximately 310,000 ULFTs have been installed.

Application of Cost-Effectiveness Tests

The following analysis evaluates the cost effectiveness of the standard program based on estimates that were available during the program planning stage before Phase I, and again using the numbers that were available at the beginning of Phase II.

The ULFT program can be described as encouraging early adoption of this technology, since the California plumbing code requires all "natural" toilet replacements to be ULFTs. Therefore, some portion of lifetime savings would occur even in the absence of the program. This issue can be handled in several ways:

- The ULFT natural replacement rate can be calculated and savings from those toilets can be subtracted out of the estimate of program savings;
- The assumed level of "freeridership" can be increased; or

[29]Thomas Chesnutt, Anil Bamezai, and Casey McSpadden, *The Conserving Effect of Ultra Low Flush Toilet Rebate Programs,* (A&N Technical Services: June 1992).

- The assumed lifetime of the measure can be shortened in the cost-effectiveness analysis, thereby lowering the savings attributable to the program.

We have taken the latter approach and assumed a 15-year life estimate for ULFTs.

As discussed in Chapter 6, the two cost-effectiveness perspectives that are relevant to determining appropriate incentive levels are those of the participant and the utility.

Phase I

Participant Perspective

From the participant's perspective, program costs include costs of purchasing and installing a ULFT. Program benefits include water and wastewater bill savings, as well as the rebate payment. We assume that participants require a two-year payback on their investment. As discussed previously, payback period is only one factor that determines customer participation.

In 1990, when LADWP initiated the program, the best available information did not distinguish between ULFT savings in single-family and multifamily households. The participant test reflected the following values:

Savings per toilet = 29 gallons/day × 365 days = 10,585 gallons/year	= 14.15 ccf/year
Average marginal water rate	= $1.20/ccf
Average customer water bill savings/year = 14.15 ccf × $1.20/ccf	= $16.98/year
Marginal sewer rate	= $0.75/ccf
Average customer sewer bill savings/year = 14.15 ccf × .75/ccf	= $10.61/year
Average customer combined two year water and sewer bill savings	= $55.18
Average cost per installed ULFT	= $150

Required rebate to achieve a two-year payback is therefore $150 to $55.18 = $94.82

The Utility Perspective

The utility perspective determines the level of incentive that the water provider can afford. Recall that in Chapter 6, we defined affordable incentives as those that do not increase the present value of the utility's revenue requirement. In this case, the incentive cost is the cost of the rebate. The maximum allowable rebate is the difference between the present value of the agency's avoided water supply costs (plus any reimbursement from MWD) and the program costs.

During program planning, projected administrative costs were $20/participant. Marginal cost was $230/AF, which was the cost of purchasing MWD water. The program assumed a ULFT lifetime of 30 years. However, as explained earlier, we use a 15-year life of measure in this cost-effectiveness analysis to account for the early-adopter effect.

As described above in the participant test,
Savings = 29 gallons/toilet × 365 days = 10,585 gallons/year = .033 acre foot yearly (AFY)

Based on the $230 marginal cost of supply, an 8% discount rate, and a 5% escalation rate, the present value of utility avoided costs over the assumed 15-year life of the measure is $2774/AFY.[30]

Net present value (NPV) of avoided supply costs per toilet = $2774/AFY × .033 AFY = $92
NPV of program costs per toilet = $20

It is therefore cost-effective for LADWP to offer a rebate of up to $72, plus any additional reimbursement from MWD. Under the Conservation Credit Program, MWD paid LADWP an incentive of $154 per acre-foot of savings over the program life. In this case, because a ULFT saves approximately half an acre-foot over its assumed 15-year lifetime, MWD would pay $77/ULFT. Therefore the maximum cost-effective rebate that LADWP could offer would be $149 ($72 + $77).

[30]This avoided cost figure may be conservative, because marginal costs have more than doubled in the three years since 1990.

Given the results of the participant perspective and the utility perspective the cost-effective incentive should be in the range of $95 to $149. The chosen level of $100 falls within this range.

Phase II

When Phase II of the program began, marginal costs had changed, water and sewer rates had increased, and estimates of savings per toilet had been refined to reflect differences in single-family and multifamily retrofits. Also, the average price of ULFTs had fallen considerably. Based on the updated information, the cost-effectiveness analysis follows.

Participant Perspective

The following variables changed since Phase I:

Average marginal water rate per billing unit	= $1.62/ccf
Marginal sewer rate/billing unit	= $1.37/ccf
Average cost per installed ULFT	= $125
Savings per toilet	= 29 gpd for single family retrofits and 46 gpd for multifamily retrofits

For single-family residences:

Savings per toilet = 29 gallons/day × 365 days = 10,585 gallons/year	= 14.15 ccf/year
Average customer water bill savings/ year = 14.15 ccf × $1.62/ccf	= $22.92
Average customer sewer bill savings/year = 14.15 ccf × $1.37/ccf	= $19.39
Average customer combined two year water and sewer bill savings	= $84.62

The required rebate for a two-year payback for single-family customers is therefore $125 - $84.62 = $40.38

For multifamily residences:

Savings per toilet = 46 gallons/day × 365 days = 16,790 gallons/year	= 22.45 ccf
Average customer water bill savings/ year = 22.45 ccf × $1.62/ccf	= $36.36
Average customer sewer bill savings/year = 22.45 ccf × $1.37/ccf	= $30.76
Average customer combined two year water and sewer bill savings	= $134.24

Since bill savings exceed the ULFT cost, multifamily customers require no rebate to achieve a two-year payback.

The Utility Perspective

The following variables changed since Phase I:

- Program costs at this time average $13/participant, not including the rebate;
- Marginal cost is now $600/AF, which is the cost of reclaimed water; and
- MWD provides flat $60/ULFT reimbursement.

Based on the $600/AF marginal cost of water, an 8% discount rate, and a 5% escalation rate, the present value of utility avoided costs over the assumed 15-year life of the measure is $7,236.

NPV of avoided supply costs per single family ULFT retrofit = $7,236/AFY × .033 AFY = $239
NPV of avoided supply costs per multifamily ULFT retrofit = $7,236/AFY × .052 AFY = $376

It is therefore cost effective for LADWP to offer single-family residences a rebate of up to $286 per ULFT ($239 - $13 + $60 MWD reimbursement). The chosen level of $100 falls within this limit.

It is cost effective for LADWP to offer multifamily customers rebates of up to $423 per ULFT ($376 - $13 + $60 MWD reimbursement). The chosen rebate level of $75 is well within that limit, and is not unreasonably low given that multifamily customers require no rebate to achieve a two-year payback.

Discussion

It is interesting to note that lower water savings per retrofit means that higher rebates are required by the participant because lower water bill savings require a higher rebate to achieve an equivalent payback. However, lower savings per retrofit translate into lower affordable rebates by the utility because of lower avoided costs.

Similarly, the increase in marginal costs and corresponding increase in rates that occurred prior to Phase II created opposing pressures on rebate levels. In particular, the higher rates make payback periods shorter, decreasing the rebate required by the customer. At the same time, the increased marginal costs raise the value to the agency of each retrofit, raising the affordable rebate. Therefore, although single-family customers require only $40 to achieve a two-year payback, and multifamily customers need no rebate to achieve a two-year payback, it is still a good investment for LADWP to offer rebates to these customers.

SEATTLE WATER DEPARTMENT: HOME WATER SAVERS PROGRAM

Program Background and Description

Home Water Savers was a door-to-door conservation kit distribution program offered in June through October 1992 by a regional utility partnership that included the Seattle Water Department, Seattle City Light, and Puget Sound Power and Light. The Bonneville Power Administration (BPA), Washington Natural Gas, and the Municipality of Metropolitan Seattle (METRO) (the regional wastewater agency), also contributed financial support.

The Seattle Water Department sells water directly to residents of the City of Seattle, who are also served by Seattle City Light. Approximately 24% of these customers have nonelectric water heaters. The Seattle Water Department sells water wholesale to 28 water agencies in other areas. Residents in those areas are predominantly served by Puget Power, and approximately 60% of those customers have nonelectric water heaters. Therefore, once the program design was complete, the two electric utilities

covered program costs for all customers with electric water heaters and Seattle Water covered the cost for customers with nonelectric water heaters. In turn, Bonneville Power Administration reimbursed a portion of program costs for Seattle City Light.

While conducting studies to update the conservation element of the Seattle Water Department's water supply plan, the Department identified efficient showerheads as one of the most cost-effective measures to reduce demand.[31] In late 1989, the Seattle Water Department conducted a pilot study of 2,000 single-family homes to test distribution methods and installation rates of various devices. Based on the results of this pilot, the Water Department decided to pursue an efficient showerhead program using a door-to-door drop-off method. Analysis showed that the program would be cost-effective even if the Water Department had to cover the entire program cost; nevertheless, the Water Department sought involvement from other regional utilities because of the energy and wastewater savings the program could achieve along with water savings.

In 1991, the Bonneville Power Administration agreed to cover the cost of efficient showerhead distribution programs offered by its wholesale customers. At this point, Seattle City Light agreed to participate in the joint venture with the Seattle Water Department.

For several years, Puget Power also had been offering free efficient showerheads to customers (outside of the Seattle Water Department service area) who mailed in a card requesting one. Approximately 26% of eligible customers mailed in the request cards. Ultimately, Puget Power acknowledged the benefits of a joint utility venture, particularly the public relations benefits of cooperation among all regional utilities. and agreed to delay implementation of its program in the Seattle Water Department service territory until the joint venture could be implemented. METRO and Washington Natural Gas also agreed to contribute financial support.

Participants agreed that the benefits of collaborating included:

- Reducing each utility's program costs;
- Increasing program credibility; and

[31]Brown and Caldwell, *Single Family Pilot Residential Retrofit Project for Water Conservation,* conducted by Seattle Water Department, Northeast Lake Washington Sewer & Water District, and Municipality of Metropolitan Seattle (December 1990).

- Enhancing customer service by allowing all customers to participate regardless of the type of water heater.

Each element of program planning (product selection, marketing, distribution, and evaluation) involved a committee process that included representatives from each agency. Additionally, a steering committee and a planning committee were established to ensure coordination and to make overall policy and management decisions.

The participating utilities agreed that product distribution needed to be tailored to the needs and preferences of each participating electric utility. Therefore Seattle Water worked with Seattle City Light and Puget Power to plan separate distribution efforts for each electric utility's service area. The actual 1992 summer "household blitz" was mounted by the electric utilities, which contracted with a service agency and a private contractor to perform the distribution.

To ensure customer satisfaction and measure persistence, the utilities conducted an extensive customer preference study to determine which showerhead should be included in the kits. The study included on-site product comparison testing as well as a survey component. Customers in the survey were offered six showerhead models to choose from. The model selected for the program was preferred by 67% of the customers surveyed.

Programs in other jurisdictions often offer two showerheads in each conservation kit. The program planning committee in this case decided to include only one showerhead in the kit, because according to the federal census, the average Seattle household has only 1.3 showers. The committee felt that giving away more showerheads than people could use would conflict with the Seattle anti-waste ethic, evident in the City's aggressive recycling program. However, the committee decided to make additional showerheads available upon request by mail or telephone. This approach was well received. The other items in the kit were included largely because of their low cost. Even a relatively low installation rate for these items could achieve cost-effective savings.

This case study focuses on the initial phase of the program, which involved door-to-door distribution of kits to all one- to four-unit dwellings in the Seattle Water Department direct and wholesale service areas. The second phase, which is under way, involves direct installation of kit measures in larger multifamily buildings, as well as toilet leak repair.

Program Goals

The overall goal was reduce consumption of water and energy resources in the participating utilities' service territories. High installation rate of kit devices was a corresponding program goal, which influenced the product selection, choice of delivery mechanism, marketing approaches, and other program features.

Target Market

The first phase of the program, from June through October 1992, targeted all one- to four-unit dwellings (330,000 households) in the Seattle Water Department service territory. In October 1992 the program began to target larger multifamily buildings. Commercial customers will be added to the program in 1994.

Incentive Structure

The program incentive was a free kit containing a variety of devices:

- One water- and energy-efficient showerhead (2.5 gpm)
- One bathroom faucet aerator (1.5 gpm)
- One toilet fill cycle diverter
- Toilet leak detection dye tablets
- Plumbers teflon tape
- An instruction booklet

Instruction materials also asked customers to install their own glass jar as a toilet tank displacement device and instructed them how to do so.

Shower-arm adapters and additional kit materials were available at no charge upon request. In addition, customers with electric water heaters received a kitchen faucet aerator with adjustable spray when they requested additional kits or when they brought their old showerhead to community centers. The cost of aerators was covered by Seattle City Light and Puget Power.

Free installation of devices was available to elderly or disabled customers upon their request. (This service was requested by less than 1% of participating households.)

Implementation Methods

The 1989 pilot test showed that the canvass and drop-off method was the most cost-effective approach to delivering the kits. With a door hanger as prenotification, personal drop-off, and a follow-up visit, this approach achieved a 34% showerhead installation rate in the pilot. Water Department staff members felt that with a regional marketing program, as well as changes in the showerhead model based on the results of the customer preference survey, the full-scale program could achieve a 42% showerhead installation rate.

In the full program, which ran from June through October 1992, kits were delivered free of charge, door to door, with both prenotification (postcard) and follow-up services (return for unused device pick-up). A private contractor distributed the kits in the Puget Power service territory, and the Seattle Conservation Corps, which is a division of Seattle's Department of Housing and Human Services, delivered kits in the Seattle City Light service territory. Telephone hotlines were established to answer questions, solve problems, and send additional kit materials.

Marketing Approaches

The program was marketed regionally through radio advertising and newspapers. A consultant was retained to develop the marketing and advertising plans and materials. The advertisements provided general information and education about the water, energy, money, and environmental resource savings from installing efficient showerheads.

The advertising campaign was scheduled to run for eight weeks, to correspond with the projected kit distribution period. However, due to changes in distribution timing and a depleted marketing budget, advertising ran out before the end of the distribution period. This was unfortunate, as later studies showed that installation rates were highest during the time the program had a high level of publicity.

The participating utilities felt that program marketing was one of the most difficult areas of program implementation in this utility partnership. They suggest obtaining early participation agreements and consensus on program concepts before developing a marketing plan.

Program Budget

The program cost, including marketing and evaluation, was $3,362,296. Seattle Water Department's share of that was $1,276,496. The breakdown of costs is illustrated in the following table.

PROGRAM COSTS

	Seattle Water Dept.	Puget Power	Seattle City Light	Program Total	Cost per Kit
Kit Items	$712,070	$284,912	$1,255,779	$2,252,761	$6.83
Distribution	$383,090	$155,190	$701,655	$1,239,935	$3.76
Marketing	$156,000	$35,000	$125,000	$316,000	$0.96
Evaluation	$25,336		$43,200	$68,536	$0.20
TOTAL	$1,276,496	$475,102	$2,125,634[a]	$3,877,232	$11.75

[a]Partial BPA reimbursement.

METRO's contribution of $100,000 and the Washington Natural Gas contribution of $125,000 helped offset the costs for gas and other hot water customers. Seattle City Light's costs include $1,226,600 in fixtures purchased directly by the Bonneville Power Administration.

Program Evaluation

Several evaluation components were included in the program plan. A Phase I survey, which is complete, included these elements:

- A short-term survey conducted two to five months after customers received their kits assessed installation rates for each kit item, potential barriers to participation, additional purchases of conservation products, household conservation activities, showering and bathing habits, customer satisfaction, and demographic household characteristics related to showerhead use.

- A control group survey assessed similar information for a comparison group of Tacoma residents who were not given the opportunity to participate in the program.

- Business trends interviews assessed the type of showerhead and aerator products carried by wholesalers in the Puget Sound area and sales trends for these and other conservation products over the past six years.

A Phase II survey contacted customers one year after they received the kit to assess the long-term retention rates for all of the kit devices. Phase III will focus on multifamily buildings receiving direct installation services in the Seattle City Light Service area. This final phase will also consolidate research concurrently conducted by the Bonneville Power Administration, and will include an impact evaluation of energy and water savings from all residential building types.

Installation Rates and Water Savings[32]

The Phase II survey[33] of the completed residential program shows that 68% of households that received the kits installed the showerhead. Within the first year, 4% subsequently removed the showerhead, resulting in 64% still installed in 1993. The dramatic increase in installation rate over the pilot was attributed to a variety of factors, including the selection of a different showerhead as a result of the customer preference survey; a severe drought; and the marketing campaign. One-year installation rates for the other products are as follows: faucet aerator, 44%; leak detection tablets, 31%; toilet fill cycle diverter, 32%; and glass displacement jar, 21%.

Installation rates were not uniform over time or across neighborhoods. Participants who received their kits during the first three weeks, when the program received maximum publicity, had the highest initial installation rates (68%). Also, there were higher installation rates among those who first heard about the program through a friend or family member (66%), television (65%), or a major newspaper (62%), than among those who first learned about the kit when it was delivered to their door (44%).

The primary reason the survey respondents said that they installed the showerhead was the drought (70%) or to cooperate with the city (14%). Few (only 7%) said that they installed the showerhead primarily to save money on water or energy bills. (However,

[32]Separate evaluations of program savings have been done in the Seattle City Light and Puget Power service territories. To simplify the cost-effectiveness analysis, this case study uses numbers from the Seattle City Light evaluation.

[33]Karen Brattegani, *Seattle City Light Survey Research Report for the Home Water Savers Program: Phase II Report*, prepared by Research Innovations for Evaluation Unit, Energy Management Services Division, Seattle City Light, (December 1993).

respondents were only asked to give the primary reason and were not asked about secondary reasons.) This may reflect the high level of environmental awareness in the Seattle area, while bill savings may be a bigger factor in other locations. This finding demonstrates the limited role of economics in predicting levels of customer participation. As emphasized throughout this handbook, economic considerations are only one of many dimensions that influence program participation.

Approximately 11% of participants who did not install the showerhead claimed that they already had an efficient model installed. (On-site surveys during the pilot showed that customers were often mistaken about this.) Aside from that group, the greatest barriers to participation were lack of showerhead fit, respondents' lack of time and skill to install the showerhead, and respondents' preference for their own wall-mounted or hand-held showerheads.

Freeridership, as explained in the preceding chapter, refers to program participants who would have paid for and installed the measures even in the absence of the incentive program. In this case, freeridership was estimated by determining the proportion of Tacoma residents (the nonparticipant sample) who purchased efficient showerheads during the kit distribution period. Tacoma offered an unusual opportunity as a control group because Tacoma receives the same media advertising as Seattle so that those residents received the same information and advertising. Also, Tacoma had similar drought conditions and lawn watering restrictions. However, Tacoma residents did not have free showerheads delivered to their homes.

According to a survey of Tacoma residents, a total of 9% of Tacoma households had purchased a low-flow showerhead from July through November 1992. Normal purchasing during similar periods before and since is approximately 3%. This leaves a net of 6% of displaced purchases attributable to the program.

Also, the showerhead program can be described as an "early adopter" program because a certain percentage of showerheads normally are replaced each year, and the plumbing code now requires these to be efficient showerheads. Therefore, some portion of lifetime savings would occur in the absence of the program, even for participants who are not freeriders. This issue can be handled in several ways in the cost-effectiveness analysis:

- The showerhead natural replacement rate can be calculated and those savings subtracted out of program savings;
- The freerider level can be raised; or

- The lifetime of the measure can be shortened in the cost-effectiveness analysis, thereby lowering the savings attributable to the program.

We use the latter approach in the following cost-effectiveness analysis.

Application of Cost-Effectiveness Tests

As discussed in Chapter 6, the two cost-effectiveness perspectives that are relevant to determining appropriate incentive levels are those of the participant and the utility.

Participant Perspective

The program includes few if any economic costs to participants, other than those who pay for toilet repairs to repair leaks discovered as a result of the use of the leak detection tablets. Economic benefits are in the form of water, energy, and sewer bill reductions.

The magnitude of these economic benefits can be calculated from the water savings shown in the following table.

WATER SAVINGS PER KIT[a]

Measure	Gallons Saved per Day
Showerhead	11
Toilet bottle	3.3
Fill cycle diverter	3.3
Faucet aerator	2
TOTAL	19.6 (9.56 ccf/year)

[a]Both the Seattle Water Department and Seattle City Light are still doing program evaluations. Final savings estimates may change.

- Average marginal rate per billing unit = $1.36 (weighted average of peak and off peak rates, assuming that water savings are uniformly distributed throughout the year)

- Average customer water bill savings/year = 9.56 ccf × $1.36/ccf = $13.00
- Marginal sewer rate/billing unit = $2.81/ccf
- Average customer sewer bill savings/year = $2.81/ccf × 9.56 ccf = $26.86
- Average customer electricity savings = 430 kWh annually
- Average customer electricity rates = 3.45 cents/kWh
- Average customer electricity bill savings/year = $14.84

Average customer combined annual water, sewer, and electricity bill savings = $54.70.

In deciding whether to install the delivered devices, most customers implicitly weigh these economic benefits against the inconvenience and perceived adverse service impacts.

For customers who use the leak detection tablets and discover a leak, the following calculation demonstrates the expected payback period for an investment in toilet repairs:

The Seattle Water Department estimates that repairing a leaking toilet saves 13.3 gallons daily. For participants who pay a plumber to perform repairs, we assume the cost is approximately $50. Payback for these customers can be calculated as follows:

13.3 gallons/day × 365 = 4,854 gallons = 6.49 ccf
6.49 ccf × ($1.36 + $2.81) combined water and sewer bill savings = $27.06

$50/$27.06 = 1.85 years

For participants who perform the repairs themselves, we assume the cost is less than $10.00. Payback for these participants is less than five months:

$10.00/$27.06 = .36 year = 4.4 months

Utility Perspective

The utility perspective is used to determine the level of incentive that the water provider can afford. Recall that in Chapter 6, we defined affordable incentives as those that do not increase the present value of the utility's revenue requirement. In this case, the incentive cost to the utility is the cost of the kit itself.

The following table estimates the present value of the agency's avoided water supply costs, using the results of the Phase II survey, as well as the following information about the water agency's marginal costs of supply.

The agency's marginal source of supply is a new dam on the North Fork Tolt River. The marginal cost of water is $1.85/ccf during peak season (June through September); this represents the levelized cost of this dam plus transmission and distribution costs. Off peak (October through May), the agency's marginal cost of supply is $0.25/ccf, which represents non-capacity-related costs, such as pumping and treatment costs. Assuming that program savings are distributed uniformly throughout the year, the weighted average of avoided costs is $0.78/ccf. All calculations assume a 3% real discount rate.

SAVINGS PER KIT

	Water Savings per Device (gallons/day)	Water Savings (ccf/year)	Installation Rate	Lifetime of Measure (years)	Present Value of Avoided Supply Costs ($/ccf)	Savings per Kit, by Measure
Showerhead	11	5.37	64%	10[a]	$6.65	$22.86
Faucet aerator	2	.98	44%	5	$3.57	$1.54
Fill cycle diverter	3.33	1.62	32%	3	$2.20	$1.14
One-quart glass jar	3.33	1.62	21%	15	$9.31	$3.16
Toilet leak repair[b]	13.3	6.49	1%	4	$2.90	$0.19
TOTAL	37.16	18.13				$28.89

[a]The showerhead lifetime was reduced from 15 years to 10 years to account for the freerider and early adopter effects.
[b]In a survey of participants in the pilot study, 15% reported that they used leak tablets; 3% (of total) reported that they found leaks; and 1% (of total) reported that they fixed those leaks.

The present value of the agency's avoided supply costs is $28.89 per distributed kit. Since the actual kit cost was only $11.75, this program is highly cost-effective to the utility. In fact, since the marketing, distribution, and evaluation costs were approximately $4.92 per kit as previously illustrated in Table 2, the agency could afford to spend up to $23.97 per kit ($28.89 – $4.92) on kit items. The contributions of the other utilities further increase the attractiveness of the program to the Seattle Water Department. Thus the utility could cost-effectively increase the customer incentive to increase installation rates. Alternatively, given the apparent close relationship between program publicity and installation rates, these rates could have also been cost-effectively improved by devoting more resources to program marketing.

HYPOTHETICAL INDUSTRIAL INCENTIVE PROGRAM

The following hypothetical case study is offered to illustrate a range of program features that were not found in any single program surveyed. Although the numbers

are not based on an existing program, they have been chosen as realistic estimates of what this type of program would cost and what it could save.

This case study addresses the issue of how to structure multilevel (wholesaler-retailer-customer) incentives. The assumed incentive to customers will be a zero-interest loan. We will focus on the following questions:

- What form and level of incentive do customers require?
- Given these requirements, how much of an incentive do retailers require from the wholesale supplier?
- How much of an incentive can the wholesaler afford to pay to the retailer?

Program Description

A water wholesaler offers grants to its retail agencies to develop industrial water conservation programs. Grants are given on a per-acre-foot basis for anticipated savings as described in grant proposals submitted by member agencies.

One member agency uses this grant to implement a program targeted at medium and large industrial users. Due to the site-specific nature of industrial water conservation, the program has two components: a free industrial water audit to identify appropriate measures and a no-interest loan for the installation of recommended measures. The grant from the wholesaler is used to seed a revolving loan fund that allows the agency to lend at below-market rates and to subsidize the audits.

Target Market

The retail agency is a public agency with annual water sales of 300,000 acre-feet (AF). Industrial customers represent 10% of these sales (30,000 AF). The top 20% of industrial customers account for 80% of the demand in this customer class (24,000 AF). The program targets this top 20% of industrial customers. There are 75 customers in this group. Average water use among these customers is therefore 320 AF/year.

Incentive Structure

The incentive offered from the wholesaler to the retail water supplier is a per-acre-foot grant. The incentive offered by the retailer to industrial customers is a free on-site audit to identify cost-effective conservation measures and a no-interest loan for the installation of some or all measures recommended by the audit. In order to minimize risk and maintain cash flow, the agency has determined that it does not want to lend money for longer than a five-year term.

Through discussions with its industrial customers, the agency believes that a sufficient incentive for these customers to participate would include no initial cash outlay, as well as an expectation of no negative annual cash flow. In other words, annual loan payments must not exceed annual water and wastewater bill savings.

Marketing Approaches

Program marketing relies heavily on personal contact. The water agency sends a direct-mail letter describing the program to each of the targeted customers, and advising them that they will be contacted by a water agency representative within the following week. Mail materials include examples of qualifying measures and potential savings.

Each targeted customer is then contacted by telephone to see if the company has any interest in participating. An in-person meeting with an agency representative is scheduled with each customer who expresses interest. Notices about the program are also sent to trade associations and industry groups.

Implementation Methods

The water agency retains a contractor to conduct the water audits. Once a customer has expressed initial interest in participating, the contractor performs a walk-through audit to estimate whether there will be significant water savings available. The agency representative meets with the facilities manager to explain the details of the program. Once the agreement is signed, the contractor schedules the facility audit. Results of the audit and recommendations are presented in a meeting with the facility manager and other appropriate individuals. The customer then prepares a loan application to finance particular recommended measures.

Water Savings

Measures implemented and savings achieved by customized industrial programs vary widely. A study of industrial water conservation in the City of San Jose, California, showed available savings of 30% to 40%. Industrial audits conducted for the East Bay Municipal Utilities District, California (EBMUD), indicated average savings of 15%. Savings in this hypothetical program are assumed to average 20%. Since the average water use in the target market is 320 AF/year, average annual savings would be 64 AF/participant, or a total potential savings of 4,800 AF annually.

Application of Cost-Effectiveness Tests

The retailer has determined that loans will be of five-year duration and carry no interest. How large a loan must customers receive in order to participate? How large a loan can the utility afford? In what ways must the program design change to accommodate both perspectives? Finally, how great a grant can the wholesaler afford?

To address these questions we rely on the various perspectives of cost-effectiveness analysis. We begin with the following assumptions.

▪ Industrial retail marginal water rates	= $250/AF
▪ Industrial retail marginal wastewater rates	= $750/AF
▪ Retailer's current marginal cost of supply	= $300/AF
▪ Wholesaler's marginal cost of supply	= $400/AF
▪ Average capital cost per acre-foot of annual conservation savings	= $10,000
▪ Agency audit and administrative costs per acre-foot of annual conservation savings	= $200 ($12,800 per customer)
▪ Average longevity of savings	= 15 years
▪ Discount rate	= 8%
▪ Annual escalation rate	= 3%

Participant Perspective

In order to meet the customers' need for nonnegative annual cash flow, annual loan payments must be limited to $1,000/acre-foot-yearly (AFY), which is the sum of the water and wastewater rates faced by the customer. Thus, the loan amount must be

limited to $5,000. However, the average $10,000/AFY cost of conservation yields a $2,000 annual payment. Therefore, as long as rates stay at their current levels, these terms would not be sufficient incentive to encourage this customer to participate in the program.

For the program to be attractive to the participant, the retailer could offer an up-front grant, such that the annual payment on the remaining loan is equal to the value of annual water and wastewater bill savings. In this case, the agency would have to offer a $5,000 grant and a $5,000 loan.

Retailer Perspective

From the retailer's perspective, the costs of the program are the audit and administrative costs, the foregone interest on the loan, and the cost (if any) of a grant. The benefits of the program are the avoided costs of new supply.

Based on the $300 marginal cost of supply, 8% discount rate, and 3% escalation rate, the present value of the avoided supply costs over the 15-year assumed savings term is $3,145/AFY. The present value of the incentive required by participants is:

$1,005 + $5,000 = $6,005/AFY

(Note that $1,005 is the present value of the foregone interest on a $5,000 zero-interest loan.)

When the audit and administrative costs are added to this, the total revenue requirement is $6,205/AFY. The retailer therefore requires $3,060 ($6,205 - $3,145) in additional incentive from the wholesaler.

Wholesaler Perspective

From the wholesaler's perspective, the cost of the program is the payment to its retailers, and the benefits of the program are the avoided costs of new supply. We assume the variable portion of administrative costs associated with the program is minimal.

Based on the wholesaler's $400 marginal cost of supply, the 8% discount rate, and 3% escalation rate, the present value of the wholesaler's avoided costs over the assumed

15-year savings term is $4,193/AFY. This is the maximum payment that is cost-effective from the wholesaler's perspective and exceeds the $3,060/AFY required by the retailer. Thus the wholesaler can afford the incentive that the retailer requires to meet the perceived needs of the customers.

Chapter 8
MARKET RESEARCH FOR BETTER PROGRAM DESIGN

INTRODUCTION

Customer incentives are designed to encourage program participation by helping customers overcome barriers that limit their participation. Given the wide range of possible incentives, it is important to understand these barriers so that incentives can be designed and marketed appropriately.

This handbook describes various customer incentives and explains some of the factors that make certain types of incentives more effective than others in different situations. This information can broaden the range of options that a water agency considers offering to its customers, as well as help narrow that range to the most appropriate choices. However, detailed information about customers' water use patterns, and the customers' specific needs and preferences, can be tremendously helpful in designing and marketing effective incentive programs.

The search for this type of information is a form of *market research*. Market research can help water agencies to design conservation programs by illuminating:

- The water uses to target;
- The barriers to conservation for those water uses;
- The incentives that will help customers overcome those barriers; and
- The manner in which to market the incentive program to reach the targeted audience.

In the past, few water agencies have considered market research relevant to their mandate of providing customers with a reliable, high-quality water supply. However, that mandate increasingly requires the active consideration of conservation as a resource alternative. In many cases, conservation offers a cost-effective, environmentally benign source of water supply.

One way in which conservation differs from traditional water supply resources is that conservation often depends on voluntary customer participation. For this reason, water agencies must learn to behave more like private businesses: they must recognize customer needs and preferences, understand how their customers use water, and use this information to create and market conservation programs. Market research can help identify these customer needs, preferences, and water use patterns.

Market research is a complex undertaking and cannot be covered in depth within the scope of this handbook. Rather, the purpose of this chapter is to provide a general introduction to some of the types of research that agencies may want to conduct to help design more effective incentive programs and, indeed, to help better meet the needs of customers. Agency staff should consult other sources before actually developing and conducting this research.

Market research can be conducted in several ways:

- **Literature reviews**—searching for and reviewing relevant studies and evaluations, including research that has been done by water agencies, research institutions, and academic institutions. Lessons learned from literature reviews should be applied with caution; the needs, preferences, and behaviors of one agency's customers may not predict all customers' responses to an incentive program.

- **Focus groups**—assembling a representative group of customers and hosting a structured discussion, with a moderator trained to ask questions and probe for answers.

- **Customer surveys**—developing a set of questions that may be administered to customers by mail, telephone, or in person.

- **Analysis of observed behavior**—reviewing available information on customer reaction to and participation in conservation programs, including current and past programs of the agency conducting the analysis and those of other agencies.

The bulk of this section focuses on customer surveys, which are the most widely used form of market research. It is important to note an inherent limitation of this type of survey research: self-reports may differ from reality. Participants may try to give responses that they believe reflect upon them favorably, rather than reporting their actual beliefs or behaviors. To the extent that external verification is possible (for example, by on-site visits to confirm presence of conservation devices), it strengthens credibility of the survey results.

Where appropriate, this section also points out how the other approaches, which generally require a smaller commitment of agency resources, may also provide valuable insights into customer preferences. Ultimately, a water agency has to balance its expenditures on market research against other program expenditures. However,

expenditures on market research should be viewed as an investment that can boost the effectiveness of the planned incentive program as well as future incentive programs.

POTENTIAL MARKET RESEARCH COMPONENTS

A water agency could collect a large amount of potentially useful customer information. How much of this information to collect depends on the needs and resources of the agency and the agency's existing level of knowledge. This chapter presents a range of research alternatives that represent varying levels of knowledge, complexity, and expense. More sophisticated analyses are best built upon the foundation of knowledge that can be obtained by more basic research.

This section discusses the following research questions:

- How do customers use water?
- What are customers' attitudes toward and knowledge of water use and conservation?
- How do customers make appliance/equipment purchase and use decisions?
- How do water needs, preferences, and attitudes differ among subgroups of customers?
- Which incentive program designs are most likely to encourage customer participation?

For each of these research questions, we discuss what type of information will be obtained by focusing research on each of these questions, why each type of information is useful in designing incentive programs, and how to get this information.

How Do Customers Use Water?

A water use survey can help determine the purposes for which customers use water and how much water they use for each of those purposes. Electric utilities have compiled detailed information regarding customer uses of electricity, but water

agencies, for the most part, do not have this type of information regarding current water use patterns. A few agencies have started to collect and use this information.

City of Phoenix, Arizona. In 1990 and again in 1993, Phoenix conducted a survey on customers' water use patterns and attitudes toward conservation. This survey covered such topics as how many baths and showers are taken weekly; how many loads of laundry are done at home weekly; how often the dishwasher is run; whether the bathroom has ULFTs, toilet tank displacement devices, or low-flow showerheads; and how often landscaping is watered and with what method. Phoenix uses this information as a barometer to evaluate trends in public awareness and attitudes toward water conservation. Results of the survey help determine how future efforts are directed.

Marin Municipal Water District (MMWD), California. MMWD is conducting a water conservation baseline study that will serve as a basis for proposing water efficiency and conservation programs. The study will: determine the level of water efficiency and conservation measures in place and their effect on use; assist in identifying efficiency and conservation opportunities; aid in gaging consumer receptiveness to various conservation-related programs; and provide a basis for an ongoing demand monitoring program.

Why Is This Information Useful for Program Design?

Identifying customers' water use patterns is a logical first step in market research for any agency that does not have this information. Understanding the use patterns of water users can help to target specific water uses in conservation programs. For example, if landscape watering is a large component of usage, then offering incentives for water-efficient landscaping or efficient irrigation systems might be an effective approach to conservation. Similarly, if many industrial customers have cooling towers, then a workshop on cooling tower efficiency improvements might be a wise investment of resources.

How Can an Agency Obtain This Information?

A literature review can prevent duplication of effort by compiling the research results—including customer surveys and program evaluations—of other water

agencies. While a literature search may provide some information on general water use patterns of customers, an agency survey of its own customers will provide a more accurate view of water use in that agency's territory. This type of survey can contain questions regarding building structure, equipment ownership, and customer habits. Possible questions for residential customer surveys include the following:

- Does your home have a dishwasher? If so, approximately how old is it? How many loads of dishes are washed per week?
- Does your home have a washing machine? If so, approximately how old is it? Is it top loading or front loading? How many loads of clothes are washed per week?
- How many showers are in the house? Do any of the showers have flow restrictors or low-flow showerheads?
- If you have a car, how frequently do you wash it at home?
- Do you have a swimming pool or spa/jacuzzi?
- Is there an on-site well? Is it used for indoor uses, outdoor irrigation, or both?

These questions are offered as examples of the topics that a water use survey could cover. They are not exhaustive, nor are they presented in any particular order. The actual wording, format, and layout of questions are all important components of survey design. These sample questions—as well as sample questions presented throughout this chapter—should not be used without review and modification as necessary for your purposes.

Customer Attitudes Toward and Knowledge of Water Use and Conservation

The second level of information pertains to customers' attitudes toward and knowledge of water use and conservation. This type of analysis can reveal:

- The accuracy of customers' perceptions regarding their level of water use;
- Their knowledge about alternatives to their current use patterns;

- Their sources for this information; and
- The perceived barriers to modifying water use patterns (e.g., technological, financial, informational, temporal, perceived risk, or institutional).

Why Is This Information Useful for Program Design?

Determining customers' attitudes is an important step in revealing potential barriers to conservation, as well as in identifying the appropriate incentives that will help overcome those barriers. Identifying customers' sources of information will help determine effective points of intervention to change attitudes and perceptions. For example, if customers think that ultra-low-flush toilets (ULFTs) don't work well, and that information is coming from retailers, then working to educate retailers can be a cost-effective way to increase the success of a ULFT program. If customers perceive financial barriers to conservation, then economic incentives should encourage participation. If they don't have information on how to conserve water, then informational incentives could be more effective.

How Can an Agency Obtain This Information?

Some valuable information about customer attitudes and perceptions can be gauged by analyzing the preferences revealed in past behavior. For example, the low participation rates of industrial customers in water conservation rebate programs indicates that total costs may not be as important as other factors, such as perceived risk, for this customer class.

Focus groups can also be a particularly effective way to determine the underlying attitudes and knowledge of customers. Water agencies can assemble groups of customers to discuss water use and conservation. A trained moderator can encourage participants to elaborate on their responses in order to elicit the attitudes and beliefs that engender those responses. Focus groups do not provide details on the number of customers with a given attitude or belief, but they can identify many of the water issues and concerns that are important to customers.

A survey can also be used to assess attitudes and knowledge. For example, one type of question that might be included in this type of survey could be:

On a scale of 1 (strongly disagree) to 5 (strongly agree), please rate the following statements:

- *I'm skeptical about water-efficient equipment because I know people who have had trouble with it.*
- *I don't know enough about many of the water-efficient technologies.*
- *Water-efficient technologies cost too much to install.*
- *Water-efficient technologies save enough in water bills to pay for the extra initial cost in a few years.*
- *Most of our plumbing fixtures and appliances are already water-efficient.*

How Do Customers Make Appliance/Equipment Purchase and Use Decisions?

The next level of complexity is to probe the decision-making mechanism for purchasing and using water-related appliances. This type of research attempts to identify the roles of all parties involved in decision-making and what factors they take into consideration.

Why Is This Information Useful for Program Design?

What are the primary factors that customers consider when purchasing new appliances or equipment? Who is involved in making purchase decisions? Is initial cost the primary factor or is reliability of the equipment paramount? Understanding customer purchase and use decisions should help illuminate barriers to efficient water use and identify what types of incentives would be likely to encourage program participation. For example, if up-front cost is the major factor in selecting equipment, then a low-interest financing program may encourage the customers to select water-efficient models.

This type of research could be particularly valuable for encouraging conservation in new construction, because that is when many appliance and water fixture purchases are made. This information can also help reach commercial/industrial/institutional

customers, who may have multiple levels of management involved in purchasing decisions. Illuminating the roles and concerns of those different parties involved in purchase decisions can help an agency better address those concerns.

How Can an Agency Obtain This Information?

Focus groups and surveys can be used to obtain information on equipment/appliance purchase and use decisions. For example, two survey questions for a commercial/industrial customer might include:

> *On a scale of 1 to 5 (where 1 means not at all important and 5 means extremely important), how important is each of the following in your firm's decision to purchase equipment:*
>
> - *Compatibility with existing equipment*
> - *Initial purchase price*
> - *Operating cost*
> - *Payback period*
> - *Recommendation of supplier or contractor*
> - *Reliability or life of equipment*
> - *Availability of equipment*
>
> *What is the maximum payback period that you require to justify an investment in water-efficient equipment?*

A substantial amount of research has been done on consumer decision making; however, the decision-making process is still not well understood. One problem with trying to gain insight into how customers make decisions is that responses to direct questions may not reflect actual behavior. In particular, people are likely to report a higher level of conservation awareness than actually figures into their decision. A partial solution is to question customers about past purchases. Asking them to report what they did in fact consider when making a specific purchase—rather than asking hypothetical questions about what they would consider—may provide more accurate responses, because customers can report on an actual occurrence rather than idealizing how they would like to behave in a future situation.

Research on water use patterns, attitudes and knowledge, and decision making can be combined, if desired, into one research phase. Another approach is to stage the research: first, conduct a literature review to identify issues; second, conduct focus

groups to structure the types of responses consumers have to the issues; third, conduct a survey of a random sample of customers in order to generalize the results to the entire population. An alternative plan is to survey a subset of customers (e.g., those with swimming pools) in depth regarding attitudes and decision making.

The next two types of market research are more complex and represent a significant leap in analytic sophistication. These techniques should follow and build upon a base of information gained by conducting more basic research.

How Do Water Needs, Preferences and Attitudes Differ Among Customer Subgroups?

Market segmentation is the process of classifying groups of consumers within an overall market into groups with similar needs and preferences, and then targeting product development and marketing toward the satisfaction of those needs. This is a widely accepted practice in the business world and is becoming increasingly popular among energy utilities.

The essentials of market segmentation involve:[34]

- Identifying customer segments that—by virtue of distinct characteristics such as needs, attitudes, use patterns, demographics, etc.—represent opportunities for distinct marketing programs;
- Selecting particular segments to target; and
- Developing and positioning for those segments offerings that will cost-effectively satisfy customer and utility objectives.

The following discussion draws heavily on the Electric Power Research Institute (EPRI) market segmentation program called CLASSIFY.™ EPRI has the most extensive utility-related experience with market segmentation research, and CLASSIFY represents a state-of-the-art market segmentation program. While CLASSIFY cannot be used by water agencies for the purposes of program planning (because the

[34]D. Chakravarti, P. E. Hendrix, and W. L. Wilkie, *Market Segmentation Research*, Vols. 1 and 2 (Palo Alto, Calif.: Electric Power Research Institute, 1987), Monograph 3.
John Berrigan and Carl Finkbeiner. *Segmentation Marketing: New Methods for Capturing Business Markets* (New York: HarperBusiness, 1992).

information it contains is energy specific), it still offers a valuable model for understanding what market segmentation is and why it can be helpful in program design.

Why Is This Information Useful for Program Design?

Underlying needs and preferences that guide such decisions as whether or not to participate in a conservation program may vary widely within traditional customer classes. For example, some residential customers may base their decision purely on economics, while others are motivated by environmental consciousness. EPRI market research found that for 85% of the participation decisions examined in a national survey of customers, energy needs characteristics such as convenience or safety predicted program participation more accurately than demographic characteristics such as income and education.[35] (EPRI, 1989)

A segmentation study can determine the distribution of customer needs within particular classes. A water agency can then more appropriately design incentives and market programs to particular segments. For example, a water agency could use needs-based segmentation to develop a plan for encouraging residential customers to install low-water-use landscapes. If the segmentation study showed that budgetary concerns for a certain group of customers were of less importance than aesthetic concerns, a rebate would probably be a less cost-effective incentive than a series of xeriscape workshops that emphasized how pleasing the resulting landscape would be.

How Can Water Agencies Get This Information?

The methodology for market segmentation analysis requires surveying customers' responses to a variety of statements regarding their water-use needs or preferences. The first step is to determine the different needs and concerns that water customers identify as important. This can be done using focus groups or one-to-one interviews. The second step is to use the issues raised by the focus groups or interviews to generate survey questions. The survey asks customers to use a rating scale to respond to statements that reflect their water needs and preferences. The survey does not ask

[35]National Analysts (Philadelphia, Penn.), Synergic Resources Corp. (Bala Cynwyd, Penn.), and QEI, Inc. (Davis, Calif.), *Residential Customer Preference and Behavior: Market Segmentation using CLASSIFY™*, EPRI EM-5908 (Palo Alto, Calif.: Electric Power Research Institute, March 1989).

directly about any water conservation program, but rather asks participants to rank statements such as:

- *I shop around for appliances to make sure I'm getting the best price.*

- *I track my monthly water bills very carefully.*

- *I like the convenience offered by lots of different cycle and water level controls on a washing machine.*

The survey provides more detailed information than the initial interviews or focus groups because of the larger sample size and also because the more general statements raised by the focus groups are disaggregated into more specific statements to which survey participants are asked to respond.

Using a technique known as *factor analysis*, the responses to the survey questions are sorted into common ideas or concepts. Factor analysis assumes that a respondent's ratings of the statements depend on underlying needs. The larger number of statements included in the survey can then be narrowed down to a smaller number of underlying needs.

For example, the EPRI CLASSIFY model identified the following personal benefits and concerns relating to energy use:[36]

- Convenience
- Enthusiasm for high-tech products
- Comfort
- Appearance
- Conservation and budgetary issues
- Personal control
- Safety
- Search minimization
- Task-oriented versus area energy use (e.g., individual lights for different parts of a room rather than overhead lighting)

We would expect a comparable list developed for water use to include some similar dimensions; it would also likely include some different ones.

[36]National Analysts, et el.

Using an analytic technique known as *cluster analysis*, customers are then grouped together on the basis of their survey responses. Customers classified in the same segment share similar perceptions and needs, and differ from customers in other segments regarding those perceptions and needs. The EPRI study identified the following six energy-needs-based segments:[37]

- **Pleasure seekers**—like all of the benefits: comfort, safety, appearance, personal control, convenience, and high-technology.
- **Appearance conscious**—more concerned with the image and aesthetic benefits of new appliances, and less concerned about budget and conservation issues.
- **Resource conservers**—more concerned than most other customers with conservation and budget issues, and willing to relinquish control of their household energy use in order to conserve energy.
- **Lifestyle simplifiers**—exhibit less concern with comfort, convenience, and new technology than any other segment.
- **Hassle avoiders**—interested in avoiding the effort and costs of searching for programs, products, and services.
- **Value seekers**—willing to accept search costs in pursuit of other needs/benefits.

Again, these categories may not be definitive for water-related needs, but rather are illustrative of the concerns that may motivate customers.

One limitation of market segmentation is that segments must still be correlated with observable characteristics in order to reach a given segment. (It's hard to send out a mass mailing addressed to "hassle-avoiders.") However, the segmentation analysis will enable the agency to significantly improve the targeting of its incentives, as well as its overall conservation program design and marketing.

[37]National Analysts, et al.

Which Incentive Program Designs are Most Likely to Encourage Customer Participation?

Segmenting the market enables utilities to determine the general types of incentives that may or may not be appropriate for particular groups of customers. However, it does not address the issue of the specific incentive features that do a better or worse job in encouraging customers to take part in a conservation program. One way to obtain this information is to survey a sample of customers and ask program participants to rank the reasons they chose to participate. Similarly, an agency can survey nonparticipants and ask why they have not participated and what incentives might encourage their participation.

Such a customer survey is relatively easy and inexpensive to perform and can provide useful information. Nevertheless, its results must be interpreted with caution. Customer self-reports of *reasons* for doing or not doing something (in this case participating in a conservation program) are generally not particularly reliable. For this reason researchers often rely on a technique known as *conjoint analysis*, which attempts to replicate the trade-off process customers use when making such decisions. This type of analysis attempts to clarify the structure of respondents' preferences among multi-attributed product or program options, in this case the features of an incentive program.

Unlike market segmentation surveys—which ask customers to respond to general statements regarding water use—conjoint analysis surveys ask them to react to specific program configurations and reveals the relative contribution of each feature to a customer's preference for the product. The term "conjoint" refers to the fact that customers are reacting to a combination of program features, rather than evaluating each attribute separately.

Why is this Information Useful for Program Design?

This information can be used to predict individual respondents' reactions to a variety of incentives or programs. It can also help illustrate the trade-offs that customers are willing to make. For example, assume that a water agency determined, for an identifiable customer group, that the key barrier to participating in a ULFT retrofit program was an unwillingness to assume the financial risk of potentially unrealized water use reductions and attendant bill savings. The most cost-effective incentive then might be some type of shared-savings program—whereby the agency assumes a portion of that risk—rather than a rebate program. Alternatively, the agency might

structure a program that guarantees a particular (e.g., two-year) payback on the initial investment.

If we assume, in contrast, that the most important barrier is a lack of convenience or availability, then a direct installation program will probably obtain a higher participation rate.

How Can an Agency Obtain this Information?

The methodology for conducting a conjoint analysis is as follows:

- Identify relevant incentive attributes;
- Construct a set of hypothetical incentive program designs;
- Ask respondents to rate the options individually or to rank order preferences;
- Calculate the relative value of each attribute level (e.g., how changes in a rebate level influence a customer's preference for purchasing a ULFT);
- Calculate the importance of each attribute relative to other attributes; and
- Estimate customer program preferences or estimate program participation by market segments.

For example, industrial customers might be given the following three options for a particular piece of equipment and be asked to rate how likely they are to purchase and install the item.

Option #1	
Purchase price	$300
Utility rebate	None
Installation	Agency
Monthly bill discount	None
Monthly operating cost	$80

Option #2	
Purchase price	$300
Utility rebate	$60
Installation	Customer
Monthly bill discount	None
Monthly operating cost	$80

Option #3	
Purchase price	$300
Utility rebate	None
Installation	Customer
Monthly bill discount	None
Monthly operating cost	$80

Customers are given the same items of information for each option (e.g., purchase price, monthly operating cost), but the value or level of each feature varies. By changing one or two feature levels in each option, researchers can isolate and quantify customer preferences regarding the relative importance of each feature and how changes in each feature affect customer preferences for that product.

GENERAL SURVEY ISSUES

Survey design and administration is a broad and complex field that is beyond the scope of this handbook. In general, agencies that decide to proceed with customer surveys must be cognizant of at least the following issues:

- **Sample selection.** The first step in sample selection is to identify the relevant population from which to draw the sample. The second step is to select a subgroup that represents that population. This involves selecting participants in such a way as to ensure that any member of the population being sampled has an equal likelihood of being selected for inclusion in the sample. This is important in order to obtain results that are generalizable from the sample to the larger population.

- **Survey participation.** High participation is important for the quality of results. If only a small percentage of the selected sample actually completes the survey, then the results might reflect a so-called "nonresponse bias," with nonrespondents differing in some important ways from respondents. The results might then not be generalizable to the larger population. There are many survey design and administration techniques to minimize this problem.

- **Survey design.** Survey questions must be carefully worded to elicit the desired information while minimizing the effort required of participants. Ideally, surveys should be pretested to ensure that participants understand the questions as they are intended, and to avoid unforeseen difficulties with survey completion.

- **Survey administration.** Surveys can be administered in person, by telephone, by mail, or with some combination of these. Issues to consider include cost and time constraints, the compatibility of the administration technique, and the complexity of the survey instrument. Selection and training of interviewers must be done carefully to ensure uniform survey administration.

- **Data analysis.** Volumes have been written on the subject of analyzing survey data. As a rule, the rigor and depth of the analysis should be determined by the types of conclusions to be drawn and the type of data that have been collected. Thus, the form of the data analysis and the design of the survey instrument must be considered simultaneously, rather than sequentially.

CONCLUSION

An incentive program will be effective only if it encourages customers to participate. Obtaining information on how customers use water, and their attitudes and preferences toward water use and conservation, will help water agencies select appropriate incentives to which customers will respond. The following techniques may help a water agency obtain this information:

- Market research on water use patterns, customer attitudes and knowledge, and decision-making procedures;

- Market segmentation to identify customer submarkets; and

- Conjoint analysis to determine the relative importance customers place on the various features of a multi-attributed product.

Market researchers have spent many years analyzing customer purchasing patterns, but these decisions are still imperfectly understood. Market research will not provide *the* answer to designing the perfect customer incentive program. However, the additional information from this research should help water agencies design incentives that address the specific needs of its customers.

Appendix B
MATRICES OF INCENTIVE APPLICABILITY TO BMPs, BY CUSTOMER CLASS

Appendix A
SURVEY OF WATER CONSERVATION CUSTOMER INCENTIVES
– RESPONDENTS –

Appendix A: SURVEY OF WATER CONSERVATION CUSTOMER INCENTIVES
– RESPONDENTS –

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Appendix B
MATRICES OF INCENTIVE APPLICABILITY TO BMPs, BY CUSTOMER CLASS

INCENTIVE APPLICABILITY TO BEST MANAGEMENT PRACTICES (BMPs)*

BMP #1: Interior & Exterior Water Audits for Residential and Governmental/Institutional Customers

	Residential	Commercial	Industrial	Institutional	Irrigation-only	Water Agencies
Audits	best			best		
Training programs						
Device distribution	best			best		
Equipment leasing/loan						
Dealer incentives						
Rebates	good			good		
Grants				better		
Vouchers	good					
Low-interest loans				good		
Shared savings						
Connection fee reductions						
Ongoing bill reductions	good			good		

#2c: Residential Plumbing Retrofit

	Residential	Commercial	Industrial	Institutional	Irrigation-only	Water Agencies
Audits	better					
Training programs						
Device distribution	best					
Equipment leasing/loan						
Dealer incentives						
Rebates						
Grants						
Vouchers	better					
Low-interest loans						
Shared savings						
Connection fee reductions						
Ongoing bill reductions						

* Best Management Practices (BMPs) are a series of water conservation measures included in the Memorandum of Understanding Regarding Urban Water Conservation in California (MOU).

BMP #3: Distribution System Audits, Leak Detection, and Repair

	Residential	Commercial	Industrial	Institutional	Irrigation-only	Water Agencies
Audits						best
Training programs						best
Device distribution						
Equipment leasing/loan						best
Dealer incentives						
Rebates						
Grants						good
Vouchers						
Low-interest loans						
Shared savings						
Connection fee reductions						
Ongoing bill reductions						

BMP #5: Large Landscape Water Audits and Incentives

	Residential	Commercial	Industrial	Institutional	Irrigation-only	Water Agencies
Audits		best	good	best	best	
Training programs		best	good	better	best	
Device distribution						
Equipment leasing/loan						
Dealer incentives						
Rebates		better	good	better	better	
Grants		better	good	better	best	
Vouchers						
Low-interest loans		good	good	good	better	
Shared savings						
Connection fee reductions						
Ongoing bill reductions		better	good	better	better	

BMP #9: Commercial and Industrial Water Conservation

	Residential	Commercial	Industrial	Institutional	Irrigation-only	Water Agencies
Audits		best	best			
Training programs		better	better			
Device distribution		good	good			
Equipment leasing/loan						
Dealer incentives						
Rebates		better	better			
Grants		best	best			
Vouchers						
Low-interest loans		best	best			
Shared savings		better	better			
Connection fee reductions						
Ongoing bill reductions		good	good			

BMP #12: Landscape Water Conservation for New and Existing Single Family Homes

	Residential	Commercial	Industrial	Institutional	Irrigation-only	Water Agencies
Audits	best					
Training programs	best					
Device distribution	good					
Equipment leasing/loan						
Dealer incentives	better					
Rebates	better					
Grants						
Vouchers	better					
Low-interest loans	good					
Shared savings	good					
Connection fee reductions	best					
Ongoing bill reductions	better					

BMP #16: Ultra Low Flush Toilet Replacement

	Residential	Commercial	Industrial	Institutional	Irrigation-only	Water Agencies
Audits						
Training programs						
Device distribution	better	good		good		
Equipment leasing/loan						
Dealer incentives	good	good	good	good		
Rebates	best	best	good	better		
Grants		good		good		
Vouchers	good					
Low-interest loans	good	good	good	good		
Shared savings	good	good	good	good		
Connection fee reductions						
Ongoing bill reductions	good	good	good	good		