Electric and Water Utilities: Building Cooperation and Savings

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Energy and water conservation are both current policy issues of great concern to utilities and government officials. To date, only a few electric utilities and water suppliers have cooperated on joint conservation programs, despite the potential for increased energy and water savings, reduced program costs, and increased program participation. Communication between the energy and water fields on conservation programs has been limited, despite industry similarities that make success in program transfer likely. This paper addresses three areas where electric and water utilities can cooperate and learn from each other.

First, utilities, municipalities and state regulators might consider water conservation efforts that also save energy, including: water efficient showerheads; agricultural water conservation programs; and municipal water conservation programs that reduce energy costs for water pumping, distribution and treatment. Also, a few electric utilities have experimented with joint utility programs with water suppliers. Finally, some innovative water conservation programs may provide alternative program models for saving electricity.

Introduction

Both energy and water conservation are currently receiving great attention. This year's Congressional debate encompasses the role of energy conservation in a National Energy Strategy, and water conservation in California's federal Central Valley Project and Clean Water Act reauthorization. Local and state concerns include drought, wetland impacts of new water supply development, environmental impacts of new energy development (including hydropower), and costs of new supply and treatment facilities.

There are compelling reasons to link the two issues. Water use reductions can result in reductions in consumer and utility energy used to heat, treat and pump water. There's great potential for increased energy and water savings, reduced program costs, and increased program participation through joint efforts. Utilities can also anticipate more efficient utility operation, efficient resource use, and greater customer satisfaction.

Yet to date, only a few electric utilities and water suppliers have cooperated on conservation programs. Communication between the energy and water fields on conservation programs has been limited, despite industry similarities that make successful program transfer likely. Utilities attempting joint programs have uncovered institutional difficulties in program design and implementation. This situation may be changing: a number of interviewees for this project commented that interest in joint programs has grown dramatically in recent months.

This paper addresses three areas where electric and water utilities can learn from each other: (1) water conservation measures that can save energy; (2) joint energy and water utility programs; and (3) innovative water conservation efforts that may provide useful energy program models.

Industry Similarities and Differences

Electric and water utilities share a long term concern about additional demand for and sources of new capacity and supply. Individual utilities in both industries also face short term shortfalls. Both industries share concern for the environmental externalities of utility activities.

The mix of public and private ownership differs for each industry. About 80% of the U.S. population with centrally supplied water is on a public system, and virtually all wastewater services are publicly owned (Wade Miller 1987). But 76% of the population is served by investor-owned electric utilities (IOUs).

Only one fifth of water utilities, primarily the smaller ones, are regulated by state public utility commissions (PUCs). Only 12 PUCs have some authority over public water utilities. While 44 PUCs require conservation planning or demand management for electric utilities, and 36 for gas utilities, only 14 require this for water utilities (Beecher 1991). Also, there is no water equivalent of the six federal power marketing agencies.

The average water supply or wastewater service area is smaller. Roughly 7,000 communities under 10,000 population have their own centralized wastewater treatment. About 64% of community water systems serve 500 people or less (Wade Miller 1987). This results in less industry sophistication, on average, about operations, budget, management and planning.

Only seven of some 200 IOUs provide both water and power (Edison Electric 1991). But at least 25% of the 2,000 public electric utilities provide water services as well (American Public Power Association 1991).

The nature and variability of demand for the service differs somewhat. In both industries peak demand is important, but surface water suppliers are more likely to refer to peak day or week than peak hour. However, a recent study has revealed significant hourly variations in water demand (Rothstein 1991). Groundwater use, because there is less storage, can reflect peak hour use. A significant amount of water (14% of domestic, 18% of commercial, and even more for industry) is self supplied.

Water Conservation Measures That Save Energy

Reductions in water use from municipal, industrial and agricultural water conservation programs all create reductions in energy used to heat, treat, and pump water. Water conservation measures that save hot water typically can provide the greatest joint savings: one gallon of water saved reduces electricity for hot water by nearly 100 Watt hours (Wh). But water savings from many other conservation measures can result in energy savings to a water utility in particular situations.

Residential Hot Water

Hot water heating is the second largest residential energy and water use. Over half of U.S. residential hot water is heated by natural gas, but still hot water uses about 6% of all electricity (RMI 1991). Showers use about 22% of the typical household indoor water budget (Vickers 1990).

This suggests that water efficient showerhead programs can benefit both electric and water utilities and their customers. According to one estimate, installing water efficient (2.75 gpm) showerheads can save 275 kWh/person/year (Maddaus 1987).

For the Bonneville Power Administration, water efficient showerheads and faucet aerators were estimated to be an order of magnitude less expensive than the marginal cost of new traditionally supplied power. BPA now offers to buy power conserved through residential showerhead retrofit programs from its member utilities (Newsham pers comm).

Water Efficient Fixture Standards

Utility support for energy efficient appliance standards has become commonplace in the electric utility field. Support for water efficient plumbing fixtures and appliances should benefit energy utilities as well. Total energy savings from retrofitting all residential showerheads, faucets, and toilets would be 63 million kWh a day, assuming that all shower water and 25% of faucet water is heated 40 degrees, only 35.3% of households have electric water heaters, 40% of households have pre-1980 fixtures, 50% have post-1980 conventional fixtures, and 10% already have water efficient fixtures.

At least eight states now have water efficient showerhead standards of 2.5 gpm or less (NWF 1992); national adoption of these standards in 1994 may be a reality when a National Energy Act is complete. Water savings for shower use could reach 34%-50%, depending on the flow rate of existing showerheads, with associated energy benefits (Vickers 1990).

Nine states also require kitchen faucet aerators of 2.5 gpm or less, and three states have lavatory faucet standards of 2.0 gpm or less. (NWF, 1992) Proposed national standards would result in an estimated 15-48% less faucet water use (Vickers 1990). Assuming a 15% water use reduction, energy savings could total 31 kWh/household/year.

Resource efficient dishwashers can reduce water use by 1034 gal/hh/yr and energy use by 287 kWh/hh/yr. Clothes washers can save 4368 gal/hh/year and 903 kWh/hh/yr (DOE 1991). Current energy efficient appliance standards should account also for water use.

Water efficient toilets, while not using hot water, can still result in community energy savings. Water conserved reduces requirements for electricity for pumping, distribution, drinking water and wastewater treatment. 1.6 gal/flush standards already apply in at least 14 states, (NWF 1992) saving an estimated 43-594 Wh/hh/day, depending on volume of individual fixtures replaced and on community energy costs for pumping, distribution and treatment.

Table 1. Water and Energy Use Reductions from Water Conservation Measures

Measure	Water Use Reduction (gal/hh/day)	Energy Use Reduction (Wh/hh/day)
Showerhead	12 - 22	1,156 - 2,353
Faucet	3	86 - 112
Toilet	22 - 59	43 - 594
(Analysis of Vickers, 1990)		
Dishwasher	3	810
Clotheswasher	13	2,565
(Analysis of DOE, 1990)		

Table Notes: Range of water savings reflects range of flow rates for fixtures replaced. Figures reflect savings for replacing all fixtures in household, not a single fixture. Energy savings are based on water supply and wastewater treatment costs range of 2 to 10 Whrs/gallon; all shower water heated 40 degrees F; 25% of faucet water heated 40 degree F.)

Water Efficient Landscaping

Joint savings are not limited to indoor water use. Water efficient landscaping around a home can reduce summertime air conditioning loads (Meier 1989). Water pumping and distribution for irrigating landscapes uses energy, and can coincide with summer peak electric use in arid areas. A turf rebate program in North Marin CA showed that water efficient residential landscapes use less than half the water, with accompanying energy reductions for pumping, and almost one third the fertilizer of traditional lawns (Nelson 1986).

Estimated community energy savings from replacing lawn with a water efficient landscape are nearly 12 Wh/day for 100 square feet of land (Nelson 1986; NEOS 1991). One common program for large nonresidential turf areas, a water audit and irrigation scheduling, could save up to 3 Wh/day for each 100 sq ft (NEOS 1991).

Industrial and Institutional Conservation

Combined energy and water savings in the industrial and institutional sectors can be dramatic, even with measures that pay back to the customer quickly. But in both the water and energy fields, there is less program experience with this sector. Solutions are often site specific and require sophisticated audits and upfront funds.

Interviews revealed that a number of industrial water conservation programs promote energy savings, but few have reported documented joint results. In San Jose, most individual conservation measures selected for 30 industries participating in an audit program were analyzed for energy or water savings, but not both. Joint data for one measure, an efficient spray cleaning system for a meat packing plant, illustrate the potential savings: 22.4 million gal/yr and nearly 29,000 therms/yr, for a payback just over 2 years (Black and Veatch 1991).

An audit of a medical center in Ventura, CA identified two measures that would produce both water and energy savings with joint savings of $25,000/year, with a payback period of less than 1.5 years. Water and energy savings from two measures recommended for a Ventura bottling plant would cover costs in about 4 months (Pike, pers comm). A condensate recovery process installed at a refinery reduced water use by 23.6 million gal/yr, saving $52,000/yr, and saving energy costs of $96,000/yr, with a two year payback. A wastewater reuse process for a textile finishing facility paid back in under four and a half years and reduced water and energy bills by $23,000/yr (Pimentel pers comm).

Water Supply and Wastewater Treatment

Reduced flows from water conservation programs reduce community energy costs for water supply and, where indoor water use is reduced, reduce wastewater treatment and pumping energy use. Energy use for the entire water supply and wastewater treatment system, with moderate pumping, ranges from 1.9 to 5 Wh/gal (QEI 1992; McCabe 1991).

Wastewater treatment plant energy use has been documented more completely than drinking water treatment. Wastewater treatment plants nationally use over 30 billion kWh/yr to treat nearly 10.6 trillion gallons. Flow dependent energy consumption in wastewater treatment processes is 24-99% of total energy consumed; reduced flows of 20% can reduce energy consumption 10-17% (Battelle 1990). Analysis of the effects of California's mid-1970's drought shows that a dramatic 50% flow reduction yielded a 20% reduction in wastewater treatment plant energy use (Koyasako 1980). Modeling of three typical community wastewater treatment systems identified energy cost reductions of 12-23% from conservation programs reducing flows 14-22% (Dyballa 1991). Energy and other savings associated with reduced wastewater treatment plant flow can significantly contribute to offsetting the cost of moving toward more energy intensive tertiary wastewater treatment (Baker 1975).

Energy needed to pump and distribute water supply ranges widely across the nation. Where water supply utilities pump groundwater from deep aquifers or import water from another watershed, electricity use for water supply may be much higher. In parts of Southern California, water supply pumping requirements alone may be as high as 9 Wh/gallon (QEI 1992). The State Water Project, which supplies 17 million people in Southern California with water pumped from the northern part of the state, used 6.44 MW in 1988 (McCabe 1991). Utilities in these situations can present untapped conservation potential for electric utilities.

Leak Detection

Electricity consumption for pumping and treating water can be significantly reduced by detecting and repairing leaks in water mains. A statewide leak detection program in 288 communities sponsored by the Tennessee Department of Economic and Community Development eliminated 18.7 billion gallons of leaks and reduced pumping system electric consumption by over 51 million kWh per year (Johnston 1991; Johnston pers comm).

Table 2. Energy Use Associated with Water Use (Watt hours per gallon)

Water supply and wastewater treatment (average): (QEI, 1992; McCabe, 1991)	1.9 - 5
Wastewater treatment (average): (Battelle, 1991)	2.85
Wastewater treatment (marginal): (Analysis based on Battelle, 1991)	1.14 - 1.7
Water supply treatment and distribution (average): (McCabe, 1991)	2.5
Long distance water pumping (via California Aqueduct): (QEI, 1992)	9.0
Long distance water pumping (via Colorado River Aqueduct): (McCabe, 1991)	4.42
Elevate 1,000 feet at 50% pumping efficiency: (Typical efficiency of irrigation pumps.) (Brush, personal communication)	6.0
Elevate 1,000 feet at 70% pumping efficiency: (Maximum pump efficiency) (Brush, personal communication)	4.0
Elevate temperature by one degree Farenheit: (Meier, 1985)	2.44
Heat one gallon 40 degrees F: (Typical average heat change of shower hot and cold water mixture.) (Meier, 1985; Maddaus 1987)	97.6

Pumping Agricultural Water

Several electric utilities have begun to explore the conservation potential of more energy efficient agricultural pumps. But the same result may be achievable, at similar cost, by a focus on on-farm water efficiency measures. Savings may be greatest for agricultural groundwater use. Energy use for groundwater pumping ranges from 0.3 to 2.8 Wh/gal in the southern San Joaquin Valley predrought (Brush pers comm).

On-farm water, and thus energy, savings from particular agricultural practices vary greatly due to variations in soil type, crop, rainfall, and other factors. Some techniques are very inexpensive, such as irrigation scheduling, which can save over 200,000 gal/acre/yr at a cost of $1.50/acre (Benbrook and King 1991) and from 0.2 - 2.1 Wh/gal, depending on groundwater depth and pumping efficiency. Other methods, such as drip irrigation systems, require some upfront funds but can reduce water applications by 16-23%. LEPA (Low Energy Precise Application) irrigation has received attention as demonstrations show that it reduces both water and energy use (California Board 1991).

The California Energy Commission has funded several projects aimed at increasing irrigation efficiency, based on the energy cost of moving irrigation water. Pacific Gas and Electric's agricultural pumping program focuses on boosting pump efficiencies and includes incentives for at least two measures that save both water and energy: low pressure nozzles for irrigation sprinkler systems, and surge irrigation to more evenly distribute furrow irrigation water and reduce pumping costs (Backus pers comm).

Joint Program Efforts

A least a dozen utilities across the U.S. have experimented with joint utility programs with water suppliers. The majority appear in Connecticut and California, two states where both water and energy utilities have strong motive to implement conservation. The following case examples are not an exhaustive list of current programs.

Both electric and water utilities in Connecticut are motivated to participate in joint programs by state agency policies, including a state requirement for utilities to offer residential water conservation retrofit kits. In California, several years of drought and high energy costs for water transport and delivery have spurred interest in water conservation. A few case examples follow.

Methodology for Case Examples

This section and the one following are based primarily on interviews of selected key participants for each case example, and for other utility programs, utilizing a standard set of interview questions on program development and implementation, estimated results, and keys to success. Individual opinions are not attributed to protect confidentiality.

Northeast Utilities

Northeast Utilities (NU) teamed up with three water utilities in its service area to deliver a residential kit including showerheads, faucet aerators, toilet dams, compact fluorescent lamps, and water heater and pipe wraps. A NU/Metropolitan District Commission pilot program visited 1100 homes to install efficient measures. NU paid for energy efficiency devices and the bulk of the labor. Water utilities purchased water efficiency devices; installation costs for hot water measures were paid by NU for electric water heaters and by MDC for gas water heaters. Installation costs for elderly and handicapped were shared (Jones and Dyer 1992).

Bridgeport and New Haven, Connecticut

United Illuminating (UI) has experimented with joint program delivery with Southern Connecticut Gas and two water suppliers subject to the state retrofit program requirement: the public Regional Water Authority (RWA) serving the New Haven area and investor owned Bridgeport Hydraulic (BH). A private contractor brokered the arrangements between utilities. Program results were mixed.

Cooperation began with Homeworks, a UI direct installation program for low-income homes providing showerheads, faucet aerators, toilet dams, compact fluorescents, hot water wraps and pipe wraps. RWA didn't continue to participate after concluding a 800 home pilot program. But at the end of the first year with BH, over 2,000 homes had been served. UI funded the bulk of the program, with water utilities financing the marginal costs of supplying water saving measures.

BH also has its own much larger distribution system for non-electric, non-low income households, reaching over 27,000 households in its first year. But joining forces with UI provides in-home installation for little more than delivering kits on request: $1 per household plus the cost of the kits. This year's joint UI/BH goal is three and a half times last year's services.

Preliminary program water savings from showerheads and faucets: 8.6 gallons per capita day (pre-1980 homes) and 4.8 gpcd (post-1980), depending on the flow rates of fixture being replaced (DiBona pers comm).

Philadelphia

A nonprofit agency in Philadelphia has for five years helped both the city water department and electric utility identify low income customers for residential retrofits. For the electric utility, this program coordinated with the federal low income weatherization program. Utilities are concerned with reducing unpaid bills in this city with relatively high rates and many low income households. While each utility sends their own staff to retrofit, both utilities (as well as the city) contribute to support of the nonprofit, which acts through neighborhood centers as a depot for materials.

Seattle, Washington

Seattle Water Dept., Seattle City Light, Puget Sound Power and Light, Metro (the regional sewer authority) and Washington Natural Gas plan to launch in mid-1992 a $5 million collaborative effort to deliver nearly 800,000 residential retrofit kits in the Seattle area. Each utility has taken responsibility for a major program task: product purchase, household distribution, marketing, etc. Program funds will be pooled, with charges to each utility based on the particular materials and energy use in the home (Seattle 1992).

Kits will include showerheads, faucet aerators, toilet retrofit, and hot water wraps. The group plans a major media splash, direct installation on request for some categories of customer, and perhaps an incentive for residents to return old showerheads to ensure installation of the new ones. The showerhead model was selected based on extensive consumer preference testing, again to ensure a high installation rate.

The collaborative began when the Water Department and Seattle City Light were both planning installation programs in multifamily buildings, and the first step was to blend the two. The electric utility will cover most costs, with the water department paying incremental labor and materials. The Bonneville Power Administration provided added incentive for the electric utilities by offering to cover 75% of their costs, based on the value of the estimated electricity savings to Bonneville.

Pasadena, California

In Pasadena, where both water and electric services are city owned, the one-year Lite Bill program provided citywide door to door canvasing, residential energy and water audits, and installation of water efficient showerheads, compact fluorescent lamps, and toilet dams as well as other items. Perhaps the first joint delivery program, marketing focused on reducing consumer costs. About 35% of all city residents in 4-unit or less buildings (134,000 population) participated.

Pasadena received an economic incentive for this program from its water wholesaler. Metropolitan Water District of Southern California's Conservation Credits program paid an estimated $373,500 to the City, based on its avoided pumping costs for supplying the water conserved. The City expects a four year payback from reduced water purchases, reduced energy costs for pumping water, and reduced electricity peak load (Pape 1990).

Austin, Texas

In 1985, the city of Austin's water department began a water conservation program, as a result of three events: first, a water supply capacity problem; second, a wastewater plant capacity problem; and finally a Texas Water Commission order to conduct a retrofit program. Over 6 years, the City's door to door retrofit program was offered to the entire community. An attempt to involve the city owned electric retailer was thwarted by the discovery that most residences use gas heated hot water. But the city electric department now includes showerhead installations in their residential energy audit and weatherization programs for homes with electric hot water.

The private gas company had its own residential energy program; by the time a deal was negotiated to add specific gas-saving items to the water program, most of the city had been serviced. The gas company now installs showerheads in its programs, for city residents that haven't yet done it. Attempts to involve the Lower Colorado River Authority (LCRA), primarily an electric wholesaler and a partial water wholesaler for Austin, also were unsuccessful, despite LCRA's establishment of water conservation goals for the City.

North Marin and Western Area Power Administration (WAPA)

WAPA sponsored an irrigation audit and scheduling program for large turf users in North Marin, CA. The North Marin Water District and its wholesaler, Sonoma County Water Agency, provided staff support and some funding.

Direct program costs of $14,000 and virtually no customer costs yielded 12,000,000 gallons and 32,000 kWh worth of savings for 16 large turf users measured. The payback period for the project was under one year (NEOS 1991).

Lompoc, CA and WAPA

WAPA also sponsored an analysis of current and planned municipal water conservation programs in the City of Lompoc (population 34,000). Current programs include residential retrofit kit distribution, residential water audits, system water audit and leak detection, ULF toilet ordinance, ULF retrofits, lawn watering guides, large turf irrigation audits, urgency water conservation ordinance, and education and public information programs, Water and energy savings for these programs were estimated at 162 million gallons (9% of current demand), 400 MW of electricity, and over 16,000 mmBTU of natural gas. The benefit-cost ratio predicted for these programs was 4:1, but the actual ratio was probably even higher. The predicted water demand reduction of 9% was exceeded; the programs achieved a reduction of 14.4% (NEOS 1990).

Southern California Edison (SCE) and Metropolitan Water District (MWD)

These two utilities cooperated in a joint retrofit program for low-income households. SCE paid for electric retrofit devices, MWD supplied toilet flapper valves, and the two utilities split the labor costs. SCE and MWD are also planning to cooperate to distribute showerheads through SCE's in-home energy audit program (Jones 1992; Dave Gardener pers comm).

Programs that Didn't Work

There are other cases where joint programs were discussed but not implemented, illustrating the institutional pitfalls of working together. In one New England case, the city water department, after being approached by the electric IOU about a joint residential retrofit program, decided it would be more cost effective to conserve water by fixing leaking mains. In another New England case, a public water supplier approached the electric IOU about joining in a planned residential retrofit program, but they could not agree on cost distribution or on program timing. Timing of the existing water and energy retrofit programs, and distribution of costs, were major stumbling blocks in one western city with in-house water and power services.

Innovative Water Conservation Models

Some water conservation programs may provide alternative program models for saving electricity. Several examples are discussed below.

Negotiated Best Management Practices

From 1989 to 1991, major water suppliers and environmental groups in California negotiated a voluntary statewide list of 16 water conservation best management practices, and estimated reliable water savings from each practice. To date over 60 water suppliers, including almost all major water utilities, have signed an agreement committing to a timetable for implementing these measures. The measures, if implemented in the Metropolitan Water District of Southern California (a water wholesaler serving 15 million people), will result in an estimated total water savings of 15% over 20 years (Maddaus 1991).

Table 3. Water Conservation Best Management Practices in California MOU

- Water audits and incentives for residential and governmental/institutional customers
- Commercial/industrial audit, incentive programs
- Large landscape water audits and incentives
- Landscape conservation requirements for commercial, industrial, institutional, governmental development
- Residential landscape water conservation
- State plumbing code enforcement
- Door to door plumbing retrofit
- Distribution system audits, leak detection
- Metering
- Conservation pricing
- Public information programs
- School education
- Water waste prohibition
- Financial incentives
- ULF toilet rebate
- Water conservation coordinator

The process of negotiation was similar to collaboratives between electric utilities and environmental groups, but involved virtually the entire water industry in the state. Participants hope that bringing together the different parties to define an acceptable level of conservation activity will reduce controversy over future water development, and ease the process of obtaining state approvals for water rights and transfers. The agreement also contains a list of "potential" best management practices, which the group agrees to study further to develop dependable savings estimates. Savings estimates as well as the measures themselves were negotiated.

State Requirements

An innovative, perhaps unique, 1989 state law in Connecticut requires all water utilities (both investor owned and public) serving at least 250 hookups or 1,000 customers (about 75% of the state's population) to offer water conservation retrofit kits to their residential customers (Ruzicka 1990). A few state Residential Conservation Service programs have ordered electric and gas utilities to offer or install energy conservation measures by regulation, but few, if any, programs this sweeping in nature have been legislated.

The program began in 1991 with kits of showerheads, aerators, toilet displacement devices and leak tablets. For most parts of the state, it will last three years. While there is no immediate water supply crisis, the state has identified long term water supply concerns in nearly 25% of its river sub-basins.

Residential Hookup Fees and Rebate Programs

California communities provide two successful examples of hookup fee programs aimed at reducing water use in new construction. Because of high outdoor water use and community low-flow plumbing fixtures ordinances, these programs are targeted at outdoor water use. Such programs may be easier to implement for water than energy, where the water utility is part of municipal government.

No examples were uncovered of communities with hookup fees based on new units that assume use of indoor water conservation fixtures; water efficient plumbing fixtures ordinances are more common and achieve similar results.

Marin Municipal Water District offers a sliding scale hookup fee based on predicted water use. Hookup fees in this area are substantial, and largely driven by outdoor water use, providing a strong incentive for planting water efficient landscaping. A home with a quarter acre lot could save $12,000 in hookup fees with water efficient irrigation (RMI 1991).

North Marin Water District offers rebates on hookup fee for multifamily builders who reduce turf area. For townhouses and condominiums, the discount until recently was $190 per unit if turf is limited to 400 square feet or 20% of project area; for apartments, it was $95 if turf is limited to 200 square feet per unit. Participation was 95% of eligible new construction in the second and third years of the program, resulting in 15% water use reduction for townhouses and 8% for apartments. Discounts were calculated based on costs to the water district (RMI 1991). Mesa, Arizona offers a 25% rebate of a $990/home hookup fee for installing water efficient landscaping. As of August 1990 the city had paid over $900,000 in rebates to 1700 participants (RMI 1991).

Offset Programs

A few California water utilities go a step further, requiring builders to offset the water required for new construction as a condition of receiving a building permit. To account for possible errors in estimating water savings, and to provide additional capacity, offset program requirements are typically ratios of 2:1 or 3:1 water savings to consumption in new construction.

In 1991, Santa Barbara amended its 1988 growth moratorium to allow new construction with water offsets, at 2:1 for residential and 3:1 for commercial units. In the past year, only a few permits for new hookups have been issued. Most builders have funded city-supervised retrofit program rather than implement their own. The offset program may end this year with termination of the City's drought emergency, the original motive for the moratorium.

Morro Bay, CA, a coastal community, was ordered in 1978 by the state to stop issuing new building permits. In 1985 Morro Bay began an offset program aimed at actually reducing total water demand. Results after three years showed that actual savings were less than predicted, and that the program was leveling total demand, not reducing it. The City adjusted both per measure estimates and the ratio, and also allowed builders to donate to the city's leak detection and repair program in lieu of retrofitting. On average, the program required complete retrofitting of 10 existing units for each new unit built. In 1989 the City imposed a complete moratorium due to the drought, after about 40% of the city's existing housing stock had been retrofitted through the program.

Conclusions

Joint delivery of water and energy programs has potential to benefit both utilities and their customers, and to reduce resource demand. Showerhead retrofit programs yield particularly large reductions in both energy and water consumption. But, depending on the nature of a utility's demand, other water conservation programs offer substantial savings potential as well.

There are several potential pitfalls, most institutional in nature. Institutional issues most often arise when IOUs try to work with public water departments, which are governed by different rules. Sometimes a third party, often a contractor, can serve as intermediary. Surprisingly, efforts within a municipality (where both water and electricity are managed ultimately by the same elected officials) do not appear easier. Municipal departments may be resource strapped, with no easy way to finance new programs, and competition for budget resources.

Participation is often motivated by actions of outside organizations, such as anticipated PUC rulings. Each participant must be able to see their goals, and motivations, served by the program. Different utility goals for program timing are often a stumbling block. The program must be user friendly for all concerned, and the joint delivery system must be able to track progress and savings from each utility's perspective, both for billing and for documentation purposes.

Financing a program can be a source of difficulty. While a joint retrofit program is less expensive per household for each utility than an individual utility program, it is more expensive for at least one party than the cost of simply offering kits without installation or home delivery.

Most programs to date have concentrated on residential savings. An area with great future potential savings is combining water and energy savings for industrial and commercial facilities.

Significant potential exists for including gas utilities in joint programs, although to date institutional barriers have resulted in few successful program examples. For both gas and electric utilities, a concern is the balance of residential hot water that is gas and electric heated.

Finally, some water conservation programs may provide alternative program models for saving electricity.

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Personal Communication and Interviews

Note: All personal communication and interviews conducted March 1992 unless otherwise noted

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