Fact Sheet

A NATIONAL DRINKING WATER CLEARINGHOUSE FACT SHEET

Water Conservation Measures

Summary

Water is a finite resource, and in many areas, future water supplies are uncertain. Individuals are usually aware when there is a drought, however, because water is inexpensive, there are often few incentives to reduce water loss. Water has no viable substitutes, and its depletion bodes profound economic and social impacts. Citizens and utilities need to consider water conservation programs.

This fact sheet considers the role of water conservation as an integral part of long-term resource planning. It might be more appropriate to use the term "water demand management." Traditional water supply management seeks to provide all the water the public wants, which, in some sections of the country, translates to a constant search for untapped sources.

What methods conserve water?

The water demand management methods described in this fact sheet incorporate the methods the August 1998 U.S. Environmental Protection Agency (EPA) *Water Conservation Plan Guidelines* recommend for water systems serving 10,000 or fewer people. EPA's Basic guidelines suggest (1) metering, (2) water accounting and loss control, (3) pricing and costing, and (4) education or information.

EPA's Guidelines are not regulations, but recommendations that suggest 11 different conservation methods. How appropriate and desirable any given method is must, in the end, be accepted by the individual community and utility. Pricing may be the primary way to encourage conservation, however, utilities should not automatically rely on any single method.

Meter All Water

Metering is a most important part of water demand management. In fact, unless a utility is 100 percent metered, it is difficult to enforce any conservation program. According to a U.S. Housing and Urban Development document, metered customers use an average of 13–45 percent less water than unmetered customers because they know they must pay for any misuse or negligence. A U.S. General Accounting Office report states that metering also assists in managing the overall water system, since it can help to:

- locate leaks in a utility's distribution system by identifying unaccounted-for blocks of water,
- identify high use customers, who can be given literature on opportunities for conserving, and
- identify areas where use is increasing, which is helpful in planning additions to the distribution system.

Once water meters are installed, equipment begins to deteriorate. Eventually meters will fail to measure flows accurately. The question of how long to leave a meter in service has long troubled the waterworks industry. According to a *Journal of the American Water Works Association* (AWWA) article by Tao and a Community Consultants report, average losses of accuracy, for periods greater than 10 years, range from 0.03–0.9 percent per year. To be fair to both customers and the utility, meters must be maintained at regular intervals.

Account for Water, Repair Leaks

The EPA Guidelines recommend that all water systems—even smaller systems—implement a basic system of water accounting. The cost of water leakage can be measured in terms of the operating costs associated with water supply,

treatment, and delivery. Water lost produces no revenues for the utility. Repairing larger leaks can be costly, but it also can produce substantial savings in water and expenditures over the long run.

Water accounting is less accurate and useful when a system lacks source and connection metering. Although the system should plan to meter sources, unmetered source water can be estimated by multiplying the pumping rate by the time of operation based on electric meter readings.

A utility may want to consider charging for water previously given away for public use or stepping up efforts to reduce illegal connections and other forms of theft.

Drinking water systems worldwide have begun to implement programs to address the problem of water loss. Utilities can no longer tolerate inefficiencies in water distribution systems and the resulting loss of revenue associated with underground leakage, water theft, and under registration. As pumping, treatment, and operational costs increase, these losses become more and more expensive.

If a utility does what it can to conserve water, customers will tend to be more cooperative in other water conservation programs, many of which require individual efforts. In *Economics of Leak Detection*, Moyer states that of the many options available for conserving water, leak detection is a logical first step. A highly visible leak detection program that identifies and locates water system leakage encourages people to think about water conservation before they are asked to take action to reduce their own water use. When leaks are repaired, water savings result in reduced power costs to deliver water, reduced chemicals to treat water, and reduced costs of wholesale supplies.

According to Le Moigne's technical paper *Using Water Efficiently: Technologies Options*, old and poorly constructed pipelines, inadequate corrosion protection, poorly maintained valves and mechanical damage are major factors contributing to leaks. In addition to loss of water, water leaks reduce pressure in the supply system. Raising pressure to compensate for such losses increases energy consumption and can make leaking worse, as well as causing adverse environmental impacts.

A World Bank technical paper by Okun and Ernst shows that, in general, it is normal to be unable to account for 10–20 percent of water. However a loss of more than 20 percent should raise a red flag. It should be noted that percentages are great for guidelines, but volume of water lost is probably more meaningful. According to AWWA's *Leak Detection and Water Loss Reduction*, once a utility knows the volume of water lost, it can determine revenue losses and decide the best way to correct the problem.

EPA's Guidelines recommend that each system institute a comprehensive leak detection and repair strategy. This strategy may include regular onsite testing using computer-assisted leak detection equipment, a sonic leak-detection survey, or another acceptable method for detecting leaks along water distribution mains, valves, services, and meters. Divers can inspect and clean storage tank interiors.

Increasingly, water systems are using remote sensor and telemetry technologies for ongoing monitoring and analysis of source, transmission, and distribution facilities. Remote sensors and monitoring software can alert operators to leaks, fluctuations in pressure, problems with equipment integrity, and other concerns.

Each system should institute a loss-prevention program, which may include pipe inspection, cleaning, lining, and other maintenance efforts to improve the distribution system and prevent leaks and ruptures. Whenever possible, utilities might also consider methods for minimizing water used in routine water system maintenance procedures.

Costing and Pricing

In a Journal of the *American Water Works Association* article "Long-Term Options for Municipal Water Conservation," Grisham and Fleming stress that water rates should reflect the real cost of water. Most water rates are based only on a portion of what it costs to obtain, develop, transport, treat, and deliver water to the consumer. Experts recommend that rates include not only current costs but those necessary for future water supply development. Only when rates include all costs can water users understand the real cost of water service and consequently, the need to conserve.

When utilities raise water rates, among other factors, they need to consider what members

of the community can afford. According to Schiffler, the ability to pay for water depends on a number of variables, including its intended use. In households, the assumption is that if the share of water costs does not exceed 5 percent of total household revenue it can be considered as socially acceptable. This rule of thumb has no specific foundation, but is widely used.

Many utility managers argue, correctly, that an effective water conservation program will necessitate rate increases. In *Water Conservation*, Maddaus states that a reduction in water use by customers in response to a water conservation program can decrease a water utility's revenues, and the utility may need to re-examine the water rate structure needs and possibly raise rates to compensate for this effect.

Water charges have typically been looked at as a way of financing the operation and maintenance (O&M) costs of a water agency, rather than as a demand management measure to encourage water-use efficiency. As a World Bank document states, political objections and constraints to increasing water charges are often seen as insurmountable. However, low water charges encourage consumption and waste and can put pressure on O&M budgets, leading to poor water treatment and deterioration in water quality.

In *Water Strategies for the Next Century*, Rogers et al. advocate a positive price for water that is less than the cost of desalination, but not zero. Desalination presently costs about $2 a cubic meter. The ideal is to charge a reasonable amount that sends the message to the users.

EPA suggests that systems consider whether their current rate structures promote water usage over conservation. Nonpromotional rates should be implemented whenever possible.

Systems that want to encourage conservation through their rates should consider various issues, such as the allocation between fixed and variable charges, usage blocks and breakpoints, minimum bills and whether water is provided in the minimum bill, seasonal pricing options, and pricing by customer class.

Numerous sources recommend tying sewer prices to water prices. Billing for wastewater is not included in this analysis; however, it is expected to become a more significant motivation for reducing water use over the next 15 years.

Information and Education

According to Maddaus, water conservation initiatives are more likely to succeed if they are socially acceptable. Measuring social acceptability, an exercise in anticipating public response to a potential water conservation measure, may be measured with a two-part survey technique. First, conduct interviews with community leaders to assess the political and social atmosphere. Second, assess the response to selected specific measures via a questionnaire mailed to a random sample of water customers.

The public tends to accept lawn watering restrictions, education, home water-saver kits, low-flush toilet rebates, and a low-flow fixtures ordinance for new construction. Overall acceptance of conservation is strongly related to attitudes about the importance of water conservation, as well as to age, income, and type of residence.

Howe and Dixon note that, "Public participation is now widely understood to be a necessary input for both efficiency and equity." Public participation should be part of any long-term public education program, as well as an element of plan development. A plan responsive to public needs usually receives continuing support.

The EPA Guidelines state that water systems should be prepared to provide information pamphlets to customers on request. Consumers are often willing to participate in sound water management practices if provided with accurate information. An information and education program should explain to water users all of the costs involved in supplying drinking water and demonstrate how water conservation practices will provide water users with long term savings.

An informative water bill goes beyond the basic information used to calculate the bill based on usage and rates. Comparisons to previous bills and tips on water conservation can help consumers make informed choices about water use. Systems can include inserts in their customers' water bills that provide information on water use and costs or tips for home water conservation.

School programs can be a great way to get information out. Systems can provide information on water conservation and encourage the use of water conservation practices through a variety of school programs. Contacts through schools can help socialize young people about the value

of water and conservation techniques, as well as help systems communicate with parents.

Workshops and seminars can be used to solicit input, and water equipment manufacturers can be invited to these sessions to exhibit their equipment. Maddaus suggests that a number of groups may have a role in water conservation planning:

- Elected officials from all jurisdictions immediately affected by the process;
- Staff persons from private water companies, key personnel from local government agencies, and state agency people;
- Representatives of major local economic interest groups—major industries, chambers of commerce, builders' associations, farm bureaus, boards of realtors, and landscape contractors;
- Representatives of major community forces, such as federated civic associations, neighborhood associations, school boards, local unions, churches, and local press and media owners;
- Representatives of local government interest groups;
- Local professionals, such as economists and engineers; and
- Representatives of major water users, for example, food processing plants and homeowners' associations.

Where can I find information?

Information in this fact sheet was obtained from the following sources:

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