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MEETING WATER UTILITY REVENUE REQUIREMENTS: FINANCING AND RATEMAKING ALTERNATIVES

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EXECUTIVE SUMMARY

Water supply is a rising-cost utility industry. Three key forces affecting industry costs and revenue requirements are (1) the need to comply with regulatory provisions of the Safe Drinking Water Act (SDWA), (2) the need to replace and upgrade an aging water delivery infrastructure, and (3) the need to meet growing water demand associated with population growth and economic development. While much attention is paid to the SDWA as a source of costs, it is not the primary cost culprit (except for very small water systems). In reality, SDWA compliance costs may pale in comparison to costs associated with infrastructure and demand growth needs. As a general principle, the SDWA should not be used to justify special regulatory treatment of all water utility costs.

The capital needs of the water supply industry over the next few decades will be substantial enough to cause utilities and the governments that own or regulate them to explore alternative financing approaches. The growing diversity of options has several positive effects. For some water systems, innovative financing alternatives may provide the only way to keep up with growing needs. For others, constraints on financial resources may threaten their viability. Economic theory dictates that, for a price, capital markets will support the industry's financial requirements. The real question is whether that price will be affordable to water utility customers.

Water utilities, like other regulated utilities, have pressed hard for the use of ratemaking methods designed to reduce risks and enhance financial stability. The industry's perspective on rising costs and how to address them must be tempered by a reasoned regulatory perspective. Ten ratemaking approaches are reviewed: construction-work-in-progress, phase-in plans, accelerated depreciation, depreciation expense for contributions and advances, automatic adjustments and pass throughs, special-purpose surcharges, expedited proceedings, future test year, preapproval of expenditures, and incentive regulation. The advantages and disadvantages of each method, from an economic regulatory vantage point, are summarized. No method is appropriate for every circumstance or jurisdiction.

Meeting revenue requirements in a rising-cost industry also calls for the design of rate structures or tariffs to ensure an adequate flow of revenues. Several emerging rate-design techniques are examined. Two methods (dedicated-capacity charges and system-development charges) directly concern the issue of revenue requirements associated with demand growth. Four methods (contract rates, conservation surcharges, seasonal rates, and zonal rates) address the allocation or reallocation of costs in response to changing conditions and policies. The use of these rate-design techniques can be linked to a variety of public policy goals, including the need to enhance the financial viability of the water industry under the current cost pressures.

For many water systems, the least-cost means of providing service is not achievable through special financing or ratemaking arrangements but through structural change aimed at improving the efficiency of water utilities and the viability of the water supply industry. Structural change in the water sector can be understood in terms of two major dimensions: consolidation and change in ownership. Consolidation helps achieve economies of scale in water supply. A change in ownership, namely privatization, can help achieve additional efficiencies.

Although daunting, rising costs can be mitigated. Water utilities should take full advantage of planning, efficiency, and other strategic management practices to control costs. In addition, regulators will want to do everything appropriate within their power to impose downward pressure on water utility revenue requirements.

When considering various financing and ratemaking alternatives, and the interactions among them, regulators may choose to create a more flexible regulatory environment for water utilities in which the prompt recovery of prudently incurred costs is facilitated. Financing and ratemaking innovations may be particularly essential with respect to small water systems, which are most affected by rising costs. It also may be appropriate, or even necessary, to provide water utilities with better performance incentives to minimize costs and improve operational efficiency. When regulators can be convinced that aggressive measures are being taken to hold down revenue requirements, utilities may be more likely to attain approval for innovative alternatives that mitigate against the inevitable cost impacts.

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FOREWORD

Water utility revenue requirements now are being notably impacted by at least three major elements--the cost of compliance with the Safe Drinking Water Act, the need for infrastructure improvement, and regular growth in demand. Water utilities of whatever ownership and (virtually) whatever size are scrambling accordingly to fit their financing and ratemaking strategies to the new changes in revenue requirements.

This study takes a comprehensive look at the various choices available to water utilities in accomplishing this, and the attendant implications for public utility regulation.

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The authors dedicate this report to the memory of our colleague, mentor, and friend, Robert J. Mulligan, of the New York Public Service Commission staff.

CHAPTER 1

INTRODUCTION

Water supply is a rising-cost industry. Water supply utilities, and their regulators at the federal, state, and local levels, are increasingly aware of the water supply industry's changing revenue requirements. Three key forces affecting the industry's costs are (1) the need to comply with regulatory provisions of the Safe Drinking Water Act (SDWA), (2) the need to replace and upgrade an aging water delivery infrastructure, and (3) the need to meet growing water demand associated with population growth and economic development. In addition, water utilities face a variety of secondary cost forces. These include the sometimes high cost of borrowing to finance capital projects (especially for small systems) and the shift to nonsubsidized, self-sustaining operations (especially for publicly owned systems).[1]

The concurrent and mutually reinforcing impact of these forces on many utilities presents a substantial pressure on both capital and operating costs, a pressure not previously experienced by the water supply industry. However, the nature of these costs should not be taken for granted but closely scrutinized. Moreover, the water supply industry must be held accountable for making prudent decisions in response to its changing cost profile. The industry must be able to fully justify the use of alternative approaches to meeting revenue requirements. Water utility regulators should be open to the consideration of alternatives but vigilant about how these methods are applied. Regulators will want to be especially cautious about affecting the incentives that determine whether utility costs are effectively managed. Thus, the industry perspective on rising costs and how to address them should be tempered by a reasoned regulatory perspective.

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[1] See David F. Russell and Christopher P.N. Woodcock, "What Will Water Rates Be Like in the 1990s?" *American Water Works Association Journal* 84 (September 1992): 68-72.

Each of the three sources of cost pressure has distinctive relevance. No unique factor, including federal drinking water quality regulations, can be singled out as the principal determinant of the industry's financial situation. Regulatory compliance costs associated with the SDWA, which are manifested primarily in the area of water treatment, pale somewhat in comparison to projected capital and operating needs associated with infrastructure improvement and demand growth.

Meeting additional revenue requirements in the already capital-intensive water supply industry depends on the optimal integration of financing and ratemaking strategies. A number of strategies are available, some conventional, some unconventional, and others untried by water supply utilities. Options available to some utilities may not be applicable to others. Regulation of investor-owned systems by state public utility commissions superimposes an oversight and ratemaking structure that may affect the appropriateness of certain options for jurisdictional utilities. For all types of utilities, regardless of their ownership, the emphasis on least-cost financing and ratemaking options is growing.

The purpose of this study is to assist water utility regulators in assessing cost impacts and changing revenue requirements and in making informed choices among alternative financing and ratemaking mechanisms. The report takes a comprehensive look at financing and ratemaking strategies for water utilities. A conceptual framework for the analysis appears in figure 1-1. The framework does not consider all types of utility costs and their effects on overall revenue requirements but instead narrows attention to the three cost culprits responsible for most of the *additional* revenue requirements. Thus, the framework is intended not as a closed model but rather as an illustration of principal relationships among fundamental variables.

The research begins by considering the effects of the SDWA, an aging infrastructure, and demand growth on water utility capital and operating costs. These factors do not account for all changes in costs, but they are key determinants. Cost causation is salient because it can affect utility and regulatory choices. Special emphasis in the analysis is given to the SDWA because of its contemporary prominence and sometimes controversial role in cost causality. An analysis of aggregate cost estimates is

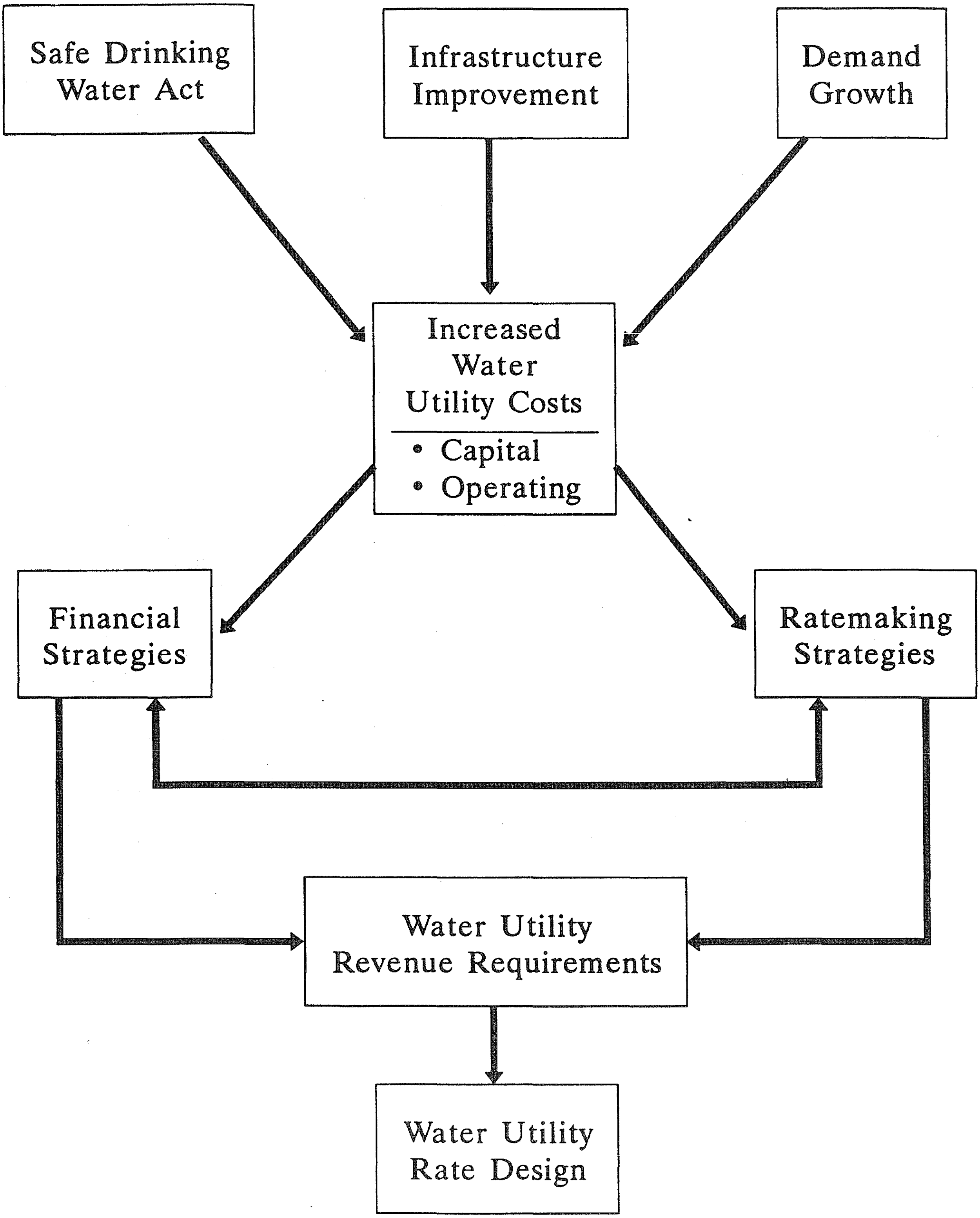

Figure 1-1. Conceptual framework for the analysis.

followed by the consideration of financing and ratemaking alternatives for meeting revenue requirements. Also considered are rate-design alternatives (such as system-development charges) that can enhance utility revenues under some circumstances, and structural alternatives (such as privatization) that can improve efficiency and expand utility financing options.

Water Supply as a Capital-Intensive Industry

By one estimate, in the middle 1980s, the U.S. water economy, encompassing all public and private facets of water, accounted for annual expenditures exceeding $77 billion (about 2.5 percent of the gross national product).[2] Most of the economic activity in the water sector is at the local level. Of the $77 billion, $12 billion were attributed to local water supply operations, $14 billion were attributed to local wastewater operations, and $2.5 billion were attributed to other local water management activities. The financial dimension of the water sector rivals that of many major industries. According to Neil S. Grigg, who prepared these estimates, "Although the total size of the industry seems large, its importance is out of proportion to its size."[3]

Using the standard of capital investment per revenue dollar, the water supply is among the most capital-intensive of all utility sectors. One outdated but frequently cited study asserted that large water systems require as much as ten to twelve dollars in capital for every dollar of revenue generated, a much higher ratio than the ratios of other industries.[4] Using contemporary data, provided in table 1-1, the previous estimate

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[2] Neil S. Grigg, *Water Resources Planning* (New York: McGraw-Hill, 1985), 54.

[3] Ibid., 52-3.

[4] Science Management Engineering and TBS, Inc., *Urban Water System Characterization* (1979), 15, as reported in Wade Miller Associates, Inc., *The Nation's Public Works: Report on Water Supply* (Washington, DC: National Council on Public Works Improvement, 1987).

TABLE 1-1
UTILITY PLANT AND OPERATING REVENUES FOR MAJOR PUBLIC UTILITIES
(In Millions of Dollars for 1991)

Utility Industry	Total Utility Plant ($mil)	Total Operating Revenues ($mil)	Ratio of Plant to Revenues (e)
Telecommunications (a)			
AT&T	$22,116	$33,534	.7
Local exchange carriers	235,247	83,890	2.8
Telegraph carriers	1,038	408	2.5
Natural Gas (b)			
Distribution	28,657	17,812	1.6
Transmission	48,467	19,818	2.4
Integrated companies	19,129	11,047	1.7
Combination companies	22,786	15,245	1.5
Total investor-owned	119,772	63,922	1.9
Electricity (c)			
Major investor-owned	480,898	167,007	2.9
Publicly owned generating	81,536	21,083	3.9
Water Supply (d)			
Major investor-owned (NAWC)	9,027	2,319	3.9

Sources: Authors' construct based on the following:
(a) Federal Communications Commission, *Statistics of Communication Common Carriers* (Washington, DC: Federal Communications Commission, 1991), 8.
(b) American Gas Association, *1991 Gas Facts* (Arlington, VA: American Water Works Association, 1992), 146-159.
(c) Energy Information Administration, *Financial Statistics of Major Investor-Owned Electric Utilities, 1991* and *Financial Statistics of Major Publicly Owned Electric Utilities, 1991* (Washington, DC: Energy Information Administration, U.S. Department of Energy, 1993), 16-20. For publicly owned utilities, the data are for generating electric utilities only.
(d) National Association of Water Companies, *1991 Financial Summary for Investor-Owned Water Utilities* (Washington, DC: National Association of Water Companies, 1992), 11. Composite data for 167 investor-owned water utilities are reported.
(e) The data for the different utility industries, and the calculated ratios, are considered reasonably comparable for illustrative purposes.

seems exaggerated.[5] Although the water supply industry does command a relatively high plant-investment-to-revenue ratio, about 3.9 to 1, the ratio for water is comparable to that for publicly owned electric utilities that generate power. The water ratio is only about 25 percent more than the ratio for the investor-owned electricity industry (2.9 to 1) and the ratio for telecommunications local exchange carriers (2.8 to 1). Water's ratio is, however, considerably higher than the ratios for the natural gas industries. Thus, even in the capital-intensive public utility sector, water supply has significant capital requirements.

Capital investment in water supply mainly is a function of the need to establish production capacity; maintain a complex storage, transmission, and distribution network; and meet both fire-protection specifications and peak demands. In general, the water supply industry has high fixed costs and low capital-turnover rates. However, the capital intensity of the water supply industry, as measured here, also can be explained by the industry's relatively low variable (operating) costs, which translate into relatively low operating revenues. In other words, the high capital-intensity ratio for water is as much a function of a low denominator (revenues) as it is a function of a high numerator (utility plant).[6]

Investments in water supply tend to be large and indivisible, the "lumpiness" feature that also is typical of other public utility industries. Many of these capital investments, including treatment plants and the transmission and distribution infrastructure, may have very long service lives. Because capacity is added in large increments, there may be periods of underutilization, which can pose significant financial problems in terms of cost recovery. Of course, the utility with plentiful capacity is in a good position to accommodate demand growth, if indeed growth is on the horizon. In

[5] Total utility plant in service is used for this analysis, which does not include depreciation, construction-work-in-progress (CWIP), or fuel.

[6] In fact, the earlier estimates of ten to twelve dollars in capital per revenue dollar might be explained on the basis of artificially low revenues. In particular, revenues for subsidized municipal systems, for example, may not reflect the full cost of water.

reality, many water utilities are not well positioned to deal with demand growth or the other additional cost pressures. The potential result is cost shock for the utility and rate shock for customers.

According to the American Water Works Association's *Water Industry Data Base (WIDB),* 438 of the nation's 612 largest water utilities (which serve more than 95 million customers) anticipated a capital outlay of more than $4 billion in 1990.[7] This amount is 25 percent more than the previous year ($3.0 billion) and nearly 60 percent more than capital outlays for 1986 ($2.6 billion). At the time of the survey, these utilities had 86 surface water treatment facilities in procurement or under construction and 108 facilities planned within the next five years. In addition, a total of 82 groundwater facilities were underway and 129 were planned. Within a year, these systems replaced 1,588 miles of pipe and added 4,750 miles of pipe to meet expansion needs. They also anticipated adding 521 laboratory personnel and spending $15.9 million on laboratory equipment and $9.0 million on commercial laboratory services. The profile of utility costs is changing dramatically, not just for the largest water supply utilities but for the industry as a whole.

Aggregate Water Supply Cost Estimates

Higher costs loom large for the water utility industry, as foretold in an assessment prepared for the National Council on Public Works Improvement by Wade Miller Associates, Inc., *The Nation's Public Works: Report on Water Supply.*[8] The report, published soon after the enactment of the 1986 SDWA, was based on an assessment of wide-ranging forecasts and the assumptions behind them. The price tag for the nation's water supply needs was estimated to range from $4.8 to $7.1 billion per year, for a period spanning two decades. This estimate, now six years old, includes costs associated

[7] American Water Works Association, *The Water Industry Data Base: Progress Report, Utilization Examples, Selected WIDB Statistics* (Denver, CO: American Water Works Association, 1991).

[8] Wade Miller Associates, Inc., *Report on Water Supply*, 42.

with infrastructure improvement, demand growth, and regulatory compliance, as detailed in table 1-2. Each type of cost also is associated with specific impacts on water utility source and transmission, treatment, and distribution facilities. It was predicted that $1.8 to $3.5 billion annually will be allocated to deferred maintenance and replacement for the treatment and distribution infrastructure, $2.6 to $2.7 billion annually will be allocated to meeting new demand growth, and $.4 to $.9 billion annually will be allocated to upgrading treatment facilities for regulatory compliance. Importantly, both capital and operating costs are reflected in these estimates.

TABLE 1-2

REPORT ON WATER SUPPLY
ESTIMATES OF REQUIRED ANNUAL WATER SUPPLY EXPENDITURES
(In Millions of Dollars)

	Driving Forces			
Facilities	**Deferred Infrastructure Maintenance & Replacement**	**Meeting Demand Growth**	**SDWA Regulatory Compliance**	**Total**
Source & Transmission	---	$1,000	---	$1,000
Water Treatment	$1,060-1,480	245-345	$400-900	1,705-2,725
Distribution System	700-2,000	1,400	---	2,100-3,400
Total	$1,760-3,480	$2,645-2,745	$400-900	$4,805-7,125
Percent of total	37-49%	55-39%	8-13%	100%

Source: Wade Miller Associates, Inc., *The Nation's Public Works: Report on Water Supply.* (Washington, DC: National Council on Public Works Improvement, 1987), 42.

Many cost studies do not account for the cost of routine operation and maintenance, even though additional expenses for personnel, training, treatment chemicals, laboratory analyses, and other outside services should be anticipated. For example, although much attention has been paid to the substantial capital costs required for SDWA compliance (for building treatment facilities), the revenue requirements picture is incomplete without an accompanying analysis of the potential growth in operating costs. SDWA monitoring requirements impose significant operating costs for smaller water systems. Moreover, maintenance expenses and capital investments have a symbiotic relationship. As explained in the *Report on Water Supply,* "Since routine operation and maintenance may obviate or forestall future capital needs, it is important that routine operation and maintenance, not just deferred maintenance, be considered a component of both existing and future needs."[9] In other words, well-maintained systems may be able to enjoy significantly lower capital costs for rehabilitation and replacement.

Although the cost estimates in the *Report on Water Supply* can be considered generally reasonable, and useful for illustrative purposes, they fall somewhat short of more recent projections of capital and operating needs. Total capital expenditures for a twenty-year period beginning in the early 1990s were projected to be about $160 to $190 billion.[10] These translate to total annual capital costs of about $8 to $9.5 billion. Adding operation and maintenance costs would place the estimate of total costs well beyond the earlier estimates. Yet the cost proportions allocated to regulatory compliance, infrastructure improvements, and demand growth needs are not necessarily affected.

A critical analysis of relative cost impacts is presented in chapter 2. Essentially, the SDWA is expected to require capital expenditures of about $20 billion over twenty

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[9] Ibid., 40.

[10] David W. Schnare and John E. Cromwell, "Capital Requirements for Drinking Water Infrastructure," in *AWWA Seminar Proceedings: Capital Financing* (Denver, CO: American Water Works Association, 1990). This estimate includes $20 billion in SDWA costs and another $20 billion in SDWA-induced infrastructure improvements, over a baseline range of $120 (not trended) to $150 (trended). An interest rate of 10 percent was used.

years, or about $1 billion annually.[11] An additional $20 billion in SDWA-induced infrastructure improvements also are anticipated, or another $1 billion annually. These costs are attributed to the backlog of improvements that water supply utilities will confront as they bring their systems into compliance. However, yet another $1 to $2 billion will be needed for other infrastructure improvements unrelated to the SDWA. The remainder of total projected costs (another $5 billion of the $8 to $9.5 billion) is presumed to be needed for other capital projects, especially projects for meeting demand growth. Thus, direct SDWA capital expenditures of $1 billion account for about 12 percent of the total projected capital costs.[12] These "ballpark" estimates, particularly the estimate of secondary improvement costs associated with the SDWA, should be viewed with appropriate circumspection. Changing assumptions can affect the results in significant ways. However, the estimates do provide a very useful perspective, particularly for considering the relative impact of the SDWA on water supply costs.

The actual cost impact of federal drinking water standards on individual water utilities depends on a variety of site-specific factors, including specific water contamination problems, as well as particular water utility characteristics, such as system age, size, location, and supply sources (especially groundwater versus surface water). The most important cost determinant is system size. In a previous NRRI analysis of a small sample of individual utilities, the annual cost of compliance was estimated to be as low as $3 and as high as $2,062 per revenue-producing million gallons (including both capital and operating costs).[13] An important cost determinant is the type of treatment

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[11] Schnare and Cromwell, "Capital Requirements." The 12 percent estimate is based on capital expenditures of $20 billion divided by a total investment of $160 to $190 billion for a twenty-year period. James P. McFarland, John E. Cromwell and Elizabeth L. Tam, and David W. Schnare, "Assessment of the Total National Cost of Implementing the 1986 SDWA Amendments," in *Proceedings of the Seventh Biennial Regulatory Information Conference* (Columbus, Ohio: The National Regulatory Research Institute, 1990), 281-302.

[12] Put differently, SDWA costs account for a 15 increase over baseline capital costs.

[13] Patrick C. Mann and Janice A Beecher, *Cost Impact of Safe Drinking Water Act Compliance for Commission-Regulated Water Utilities* (Columbus, OH: The National Regulatory Research Institute, 1989).

technology implemented, which depends largely on the contamination problem in the water supply. Large utilities that enjoy substantial economies of scale in water treatment will have considerably less difficulty meeting the requirements than smaller utilities.

SDWA costs affect more than water utilities. Substantial program costs will fall on the federal government and especially the states, most of which have primacy over drinking water and are responsible for SDWA implementation. Only a handful of states have been successful in building their drinking water regulatory capacity (through fee structures and appropriations), while the rest are struggling for resources.[14] Without adequate governmental resources, state primacy for SDWA implementation can be threatened. The comprehensive impact of all water quality regulations (including the effects of the Clean Water Act) is even greater.[15]

As the state drinking water agencies complete their first rounds of SDWA-mandated water sampling, more information is becoming available on actual water contamination problems. Even though the regulations for some contaminants have not been finalized, many water utilities have begun to incorporate anticipated requirements in the planning and engineering design of water treatment facilities. As they do, data regarding the true cost impact of the SDWA on individual utilities can be gathered. The difficult part of the analysis, of course, will be to separate regulatory compliance costs from costs associated with upgrading the water delivery infrastructure and meeting growing demand.

Many water industry analysts continue to view the SDWA amendments of 1986 as the driving force behind rising water utility costs. This presumption is understandable given that a doubling of the current level of investments in water treatment may be

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[14] U.S. Environmental Protection Agency, *Obtaining Drinking Water Funding: A Review of Eight State Capacity Efforts* (Washington, DC: U.S. Environmental Protection Agency, 1992). According to the EPA, successfully funded drinking water programs can be found in Montana, Florida, Kentucky, and Louisiana.

[15] U.S. Environmental Protection Agency, *Environmental Investments: The Cost of a Clean Environment* (Washington, DC: U.S. Environmental Protection Agency, 1990).

required.[16] However, even with these required investments, the SDWA may not live up to its dire reputation.

A number of points are relevant when considering the rising cost of water with respect to the SDWA. First, since drinking water quality is the focus of the SDWA, its primary impact is in the area of water treatment, although it has secondary effects on many other water system components. Second, for many systems, the principal cost impact of the SDWA will not be capital expenditures but operating expenses associated with water quality monitoring. Third, not all water treatment costs are a function of federal drinking water standards. Fourth, water treatment comprises only a portion of water utility capital and operating expenditures. Moreover, even for treatment plants, only part of the capital expenditures required are actually for water treatment equipment. Fifth, economies of scale in water treatment are substantial, meaning that SDWA costs are more consequential for small water systems. Sixth, the marginal benefits of the SDWA rarely are considered but are important to the evaluation of total impacts associated with drinking water quality regulations. Seventh, even repeal of the SDWA would not eliminate the bulk of industry costs because of substantial needs in the areas of infrastructure and demand growth.

Although it might be politically soothing to "blame the feds" for rising drinking water costs, especially given the often preemptive nature of federal regulations, such posturing can be misleading given the actual magnitude of SDWA compliance costs relative to other costs. An important implication of these findings is that regulatory compliance costs with respect to water treatment should not be used to justify changes in economic regulation that exceed the scope of these costs. In others words, doomsday predictions about the SDWA should not be used to rationalize special treatment for all costs when not all costs are SDWA-driven. The SDWA has triggered an interest in various regulatory alternatives, but any reconsideration of the regulatory regime should take a broad view of the industry's revenue requirements and the forces underlying them.

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[16] Schnare and Cromwell, "Capital Requirements." See also, McFarland, Cromwell, Tam, and Schnare, "Assessment of the Total National Cost."

Meeting Revenue Requirements

Federal drinking water standards will affect water utility revenue requirements, but perhaps not as dramatically as expected or as significantly as the other cost forces. Upgrading the water delivery infrastructure to replace aging or obsolete facilities will be necessary regardless of capital needs for regulatory compliance.[17] For many water systems, replacements and improvements are long overdue and the cost of these endeavors will far exceed original infrastructure investments. In addition, many water utilities will face increasing water demand due to population growth or economic development. This source of cost pressure is strongly influenced by local and regional economic conditions and economic, political, environmental and other constraints on future water withdrawals.

Drinking water quality regulations are manifested primarily in the cost of water treatment; infrastructure improvements are manifested in the cost of treatment and distribution; and demand growth needs are manifested in the cost of treatment, distribution, transmission, and supply sources. Some unfortunate water supply utilities will face the combination of all three cost pressures at once. Cost and rate impacts will be most severe for those systems with an outdated rate structure and an inadequate revenue stream for meeting revenue requirements. Most of the systems facing these circumstances are very small, and were experiencing viability problems (financial, managerial, and technical) even before they began to face additional cost pressures. Their future in the water supply industry is precarious at best.

Costs are not the only determinant of utility revenue requirements. Alternative financial instruments have implications for ratemaking and rates, whether in the context of regulation by state commissions or in the context of oversight by controlling governmental boards (such as a city council). For a utility to remain viable, rates must produce sufficient revenues to cover its financial obligations. Likewise, the process of

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[17] See Wade Miller Associates, Inc., *Report on Water Supply*.

ratemaking may affect the feasibility of particular financial solutions. Rates kept artificially low may make it especially difficult to attract external capital.

The scholarly literature has begun to document the changing cost character of water supply. Until recently, however, comparatively little research has focused on alternative financing mechanisms that might be used by water utilities to increase internally generated cash flow or reduce the weighted average cost of capital. Most business firms generate 60 to 70 percent of their financial capital from internal cash flow (earnings plus depreciation) and use external sources to fund their remaining needs. The pressure on water utilities to seek alternative, innovative, and often external funding sources appears to be mounting as compliance, infrastructure, and expansion costs increase.

Certain ratemaking approaches can be interpreted as alternative financing mechanisms because they affect cash flow and other aspects of a utility's fiscal situation. Regulators have an interest in how these approaches affect the financial viability and stability of water utilities, as well as how they ultimately affect ratepayers.[18] This report considers the advantages and disadvantages of several ratemaking (or regulatory) strategies, including methods to mitigate rate shock, reduce regulatory lag and uncertainty, and boost cash flow to regulated water utilities.

The availability of different financing and ratemaking strategies does not make their implementation a certainty. Several interrelated factors determine which strategies are feasible. Because of their small size and weak financial structure, many water systems lack the ability to attract capital through the same mechanisms as larger utilities.[19] Many small water utilities lack a substantial rate base because their original capital costs were recovered through the purchase price of houses in a residential

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[18] See National Association of Regulatory Utility Commissioners, Water Committee and Staff Subcommittee on Water, *Discussion Papers of Selected Regulatory Issues* (Washington, DC: National Association of Regulatory Utility Commissioners, 1992).

[19] Raymond W. Lawton and Vivian Witkind Davis, *Commission Regulation of Small Water Utilities: Some Issues and Solutions* (Columbus, OH: The National Regulatory Research Institute, 1983).

subdivision. Furthermore, the ratemaking process generally does not consider contributed plant as an asset that can be placed into rate base (for earning a return) or depreciated (an expense).[20] Without a sufficient rate base, equity, or physical assets to serve as collateral, small water utilities find it difficult and expensive to raise capital. Anecdotes of the owner of a very small water utility using a home or car for financing collateral are widely circulated. Also, many water systems with ownership of physical plant do not adequately provide for system depreciation, and thus are in a poor position to replace or upgrade infrastructure. The need to make capital improvements to comply with more stringent drinking water standards adds to the financial stress of small water systems.

Financing and ratemaking methods also may vary according to utility ownership and the jurisdiction of the state public utility commissions. The nation's many small water utilities tend to be privately owned, although not all are regulated. Commission jurisdiction varies from state to state.[21] Some commissions exempt very small utilities from regulation or provide simplified procedures. As already noted, publicly owned utilities finance their capital differently from privately owned utilities. The ratemaking process, too, varies according to ownership structure.

The water industry as a whole is expected to require a substantial infusion of capital. The need to raise capital externally focuses attention on whether water utilities can perform well in the financial capital market. The factors that have placed pressure on utility costs may also be perceived as sources of risk for the industry. The industry already is heavily capitalized and must compete for additional investment dollars. New attention must be paid to water utility capital markets and what is needed to attract

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[20] Some states allow the use of depreciation expense for customer advances or contributions in some cases, as discussed in chapter 5.

[21] Janice A. Beecher and Ann P. Laubach, *1989 Survey on State Commission Regulation of Water and Sewer Systems* (Columbus, OH: The National Regulatory Research Institute, 1989); and Janice A. Beecher and Patrick C. Mann, *Deregulation and Regulatory Alternatives for Water Utilities* (Columbus, OH: The National Regulatory Research Institute, 1990).

capital, including favorable ratings by financial agencies. Some utilities may be unable to effectively compete, especially small utilities. On the other hand, an increasing and sustained demand may stimulate new sources of capital or result in utilities being able to rely on internally generated sources of funds.

Tax laws and other laws also affect the use of different financing and ratemaking strategies. Publicly owned and privately owned utilities are affected differently. Tax-exempt financing is more readily available to publicly owned systems. Tax implications may affect the determination of least-cost options. Also, utilities in some jurisdictions may be legislatively prohibited from using certain strategies, such as a future test year, in ratemaking proceedings. Another important legal issue is whether system improvements associated with the SDWA qualify for special financing arrangements or tax treatment because they are required by law, and whether publicly and privately owned utilities are affected differently in this regard.

Finally, the regulatory environment exerts a substantial influence on the use of various financing and ratemaking strategies. The regulatory environment encompasses federal drinking water regulation, the state public utility commissions, and even the governments that operate their own water systems. This environment affects the other influences, such as options available to small systems, perceptions of financial risk, and legal considerations. It may promote least-cost options or pose a barrier to their use. In the larger scheme of things, regulation figures prominently in the long-term financial viability of the water supply industry. Certainly the investor-owned water industry recognizes this fact; it devotes considerable resources toward lobbying regulators in an attempt to create a more favorable regulatory environment. In the tradition of utility regulation, of course, the industry's perspective must appropriately be balanced with other, and often competing, points of view.

A Regulatory Perspective

As cost pressures build, water utility managers spell relief, "r-a-t-e r-e-l-i-e-f." Regulators may want to spell relief somewhat differently. Water system revenues should be adequate to meet costs associated with building and maintaining capacity, while providing a competitive rate of return to investors (in the case of privately owned systems) or avoiding cross-subsidization (in the case of publicly owned systems). In the case of privately owned systems, if operating costs are stable, revenues need only grow enough to provide the same return investors could obtain elsewhere. The primary factors that can increase water system revenues, assuming stable operating costs, are rising consumption per customer or rising numbers of customers. Yet per-capita water demand is very stable. Historically, growth has not brought about substantial revenue increases for most large systems. Without growth in per-capita demand, revenues can lag behind cost increases simply caused by inflation. Today, many water utilities are experiencing rising operating costs, due not simply to inflation but to the additional forces featured in this report. When revenues do not keep pace with costs, a reassessment of revenues and rate structures is triggered. But rising revenue requirements properly trigger a reassessment of managerial prudence and operational efficiency as well.

In recent years, the National Association of Water Companies (NAWC) launched a campaign to alert regulators to the financial pressures on the industry and urge their consideration of regulatory alternatives to ease the industry's financial burdens.[22] The industry has strived to demonstrate to regulators that it has fared poorly relative to other utilities in financial and regulatory terms. To remedy what it perceives as low earnings, the industry has asked for higher authorized returns, use of future test years (or comparable adjustments), automatic adjustment clauses, postclosing interest, and limited

[22] Andrew Chapman, Treasurer of the Elizabethtown Water Company, spent the summer of 1991 on the "campaign trail," making his presentation on "Investor-Owned Water Utilities in the 1990s" to the regional meetings of the National Association of Regulatory Utility Commissioners (NARUC). The timing was strategic in that Elizabethtown was soon to face rate hearings in which many of these issues would be addressed.

scope rate cases.[23] To remedy what it perceives as poor cash flow, the industry has asked for higher authorized returns, construction-work-in-progress (CWIP) on large projects, and higher depreciation rates. Some spokespersons have asked for regulatory preapproval of investments, phase-in plans to reduce rate shock, acquisition adjustments, higher returns to cover interest expenses, and more efficient regulation.[24]

Obviously, most of the methods advocated by the industry favor investors over ratepayers in terms of costs and risks. Many of the methods are aimed at reducing the uncertainty and time lag in cost recovery associated with regulation. Although the SDWA sometimes is used as the rationale for special treatment, certain approaches could extend well beyond the scope of SDWA costs. Implementation of all of the alternatives advocated by the industry would seriously undermine regulatory oversight of the investor-owned water industry.

Before any strategy can be approved and adopted, regulators must make several determinations about the nature of water utility costs. Segregating SDWA effects on costs from those of infrastructure upgrades and expansion to meet growing demand will be a difficult but important task. Each type of cost suggests unique regulatory questions. SDWA costs raise questions about best available technologies and regulatory approvals from state agencies with jurisdiction over water quality. Infrastructure improvement costs raise questions about the prudence of investments, including timing rehabilitation programs to mitigate against cost impacts. Demand growth costs raise questions in the areas of least-cost or integrated resource planning, a comparison of demand-side management options to supply-side options. Regardless of the source of costs, least-cost financing should be a priority for all water utilities.

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[23] Ibid., slide 25. See also, Andrew M. Chapman, "Achieving Authorized Rate of Return: Wishful Thinking for Water Utilities," *Public Utilities Fortnightly* 127 (February 15, 1991): 39-43.

[24] Dom D'Ambruoso as cited in Keith W. Bossung, "The Pre-Approval Approach to Ratemaking: The Massachusetts Experience," *New England Water Works Association Journal* 105 (September 1991): 165-68.

Once the true nature of costs is established, regulators must evaluate the merits of financing and ratemaking alternatives in the context of jurisdictional and public policy considerations. The alternatives preferred by water utilities would undoubtedly enhance the industry's financial position but not without consequences for ratepayers. CWIP in rate base, for example, can help utilities reduce debt and equity costs and attract investors. However, CWIP also can increase rates, cause intergenerational inequity, shift risk from investors to ratepayers, induce more construction than might be needed, and limit opportunities to review the prudence of the investment decision. Adjustment clauses for purchased water, power, chemicals, or labor would improve cash flow and reduce regulatory lag, but they may reduce incentives to the utility for using these resources efficiently.

In the face of substantial cost pressures, it should come as no surprise that the water supply industry would seek to reduce financial uncertainty and risk. At least as important to the industry is the desire to reduce regulatory uncertainty and risk. But the very factors that place the industry in financial turmoil also justify continuing the judicious application of fundamental regulatory standards. As costs rise, the role of regulatory oversight is increasingly apparent. However, rising costs also call for a reconsideration of methods used within the broad regulatory framework. Methods that improve water system efficiencies and mitigate against rising costs will be of special interest to regulators, who bear the ultimate responsibility for choosing methods appropriate to their jurisdiction and public policy goals.

Report Structure

The remainder of this report expands on the regulatory policy themes introduced above. Chapter 2 provides a more detailed analysis of the cost pressures on the water supply industry. Chapter 3 considers the process of determining water utility revenue requirements, as well as the implications of rising costs for regulatory risk. The debt profile of the water utility industry and a variety of financing alternatives are presented in chapter 4. Chapter 5 provides an assessment of ratemaking alternatives and chapter 6 reviews several rate-design alternatives. Consideration of structural change as a financing option, especially privatization of water supply, appears in chapter 7. The report concludes with a brief discussion of the role of evaluation in these endeavors.

CHAPTER 2

THE RISING COST OF WATER

During the decade of the 1970s, the twin shocks of rapidly increasing energy prices and higher rates of inflation metamorphosed a historically passive regulation of the electricity and natural gas sectors into a very active and continuous regulatory review process.[1] Similarly, in the decade of the 1990s, the triple impacts of federal drinking water regulations, the need for massive replacement of obsolete and aging water system infrastructure, and continued demand growth are having a fundamental effect on the water supply industry. Moreover, these forces may be changing a historically passive water utility regulatory process into a more active one. This chapter examines the three leading cost culprits that have led to the consideration of some potentially substantial changes in water utility regulation.

The Cost of Clean

In 1990, the U.S. Environmental Protection Agency issued a report commonly known as *The Cost of Clean.*[2] The report's estimates of the cost impact of environmental regulations in the areas of water, air, and solid waste are highly comprehensive and reasonably current. They are derived from a meticulous examination of data generated from a variety of sources. The focus of the report is exclusively on improving environmental quality; thus cost estimates in the water area are limited to

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[1] Paul L. Joskow, "Inflation and Environmental Concern: Structural Change in the Process of Public Utility Price Regulation," *Journal of Law and Economics* 17 (October 1974): 291-327.

[2] U.S. Environmental Protection Agency, *Environmental Investments: The Cost of a Clean Environment* (Washington, DC: U.S. Environmental Protection Agency, 1990).

water treatment costs. Government costs are included in the estimates for capital and operating outlays. Program implementation costs are included as operating costs.

Table 2-1 presents aggregate water quality cost estimates for the period 1988 to 2000, not including financing costs. Unamortized capital costs for both drinking water treatment and total water quality are estimated to peak in 1996, with drinking water treatment costing about $6 billion in that year. Several observations can be made from these estimates. The data indicate variations in cost based on capital versus operating investments, public versus private expenditures, existing versus new regulations, federally mandated costs versus total management costs, and drinking water regulatory costs versus water quality regulatory costs. Some observers may be surprised by the fact that only about one-third of drinking water regulatory costs can be attributed to federal environmental mandates. Moreover, Safe Drinking Water Act (SDWA) costs pale in comparison to those associated with water quality regulations under the Clean Water Act (CWA); expenditures under the CWA will constitute nearly 90 percent of the total cost of clean water. The CWA focuses primarily on water pollution and wastewater management, while the SDWA focuses on drinking water standards that must be met by public water suppliers. The statutes are interrelated to the extent that they share the broad goal of water quality. Polluters (namely, nonpoint-source polluters) burden the ecosystem, while also burdening water utilities (and their customers) with the cost of cleanup. In theory, and in the very long term, pollution reduction under the CWA could reduce certain drinking water treatment needs under the SDWA. However, many drinking water standards address naturally occurring contaminants that cannot be blamed on pollution or resolved by pollution-prevention measures.

An emerging literature addresses the capability of society at large to pay for environmental quality in drinking water and other areas.[3] Across the nation, many municipalities have conducted their own studies of the cost of environmental compliance

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[3] U.S. Environmental Protection Agency, *Paying for Progress: Perspectives on Financing Environmental Protection* (Washington, DC: U.S. Environmental Protection Agency, 1990).

TABLE 2-1
AGGREGATE WATER TREATMENT AND WATER QUALITY COSTS FOR THE PERIOD 1988 TO 2000 (a)

	Costs in Millions (1986 dollars)		
Sector Incurring Costs	**Capital**	**Operating**	**Total**
Costs under Existing Regulations (b)			
U.S. Environmental Protection Agency	$ 0	$ 1,735	$ 1,735
State government (c)	889	769	1,658
Local government (d)	12,705	17,423	30,128
Private	2,846	3,902	6,748
Total Existing Regulations	16,440	23,829	40,269
Costs Under New Regulations (b)			
Local government	8,097	7,384	15,481
Private	1,814	1,652	3,466
Total New Regulations	9,911	9,036	18,947
Total Drinking Water Costs	26,352	32,866	59,218
Federally Mandated	9,953	9,204	19,157
Total Water Quality Costs (e)	157,785	287,956	445,741
Federally Mandated	157,785	287,956	445,741
Grand Total Water Costs	184,137	320,822	504,959
Federally Mandated	167,738	297,160	464,898

Source: Authors' calculations based on U.S. Environmental Protection Agency, *Environmental Investments: The Cost of a Clean Environment* (Washington, DC: U.S. Environmental Protection Agency, 1990), 4-13 and 4-19.

(a) Capital costs do not include financing costs. Unamortized capital costs for drinking water treatment and total water quality are estimated to peak in 1996. The estimates may be affected by rounding.
(b) Existing and new regulations are delineated by the reauthorization of the Safe Drinking Water Act (SDWA) in 1986. SDWA impacts are first indicated in 1988, after which they account for all federally mandated drinking water regulations.
(c) Almost all state costs are for regulatory program implementation.
(d) Local government generally refers to publicly owned, municipal water systems.
(e) Total water quality regulations are for point-source and nonpoint-source pollution control, including public and private expenditures for wastewater treatment.

with federal environmental mandates.[4] Estimates of clean water costs for the 1990s for several U.S. cities are as follows:[5]

- New York City ($10.4 billion)
- Boston ($6 to 8 billion)
- Los Angeles ($5.3 billion)
- Cincinnati ($2.2 to 2.5 billion)
- Sacramento ($1 to 3 billion)
- San Diego ($1.3 to 2.5 billion)
- Seattle ($1.2 billion)
- Honolulu ($800 million)
- Portland ($500 million)
- Atlanta ($460 million)
- Bellingham, Washington ($35 million)

Table 2-2 places the cost of clean water in the context of other major federal mandates for Ohio's major metropolitan areas.[6] Again, the cost of water quality in accordance with the CWA is at the top of the list, followed somewhat distantly by the cost of compliance with the SDWA. Together, CWA and SDWA costs comprise about 90 percent of the total cost of federal environmental mandates to Ohio's cities during the 1992-2001 decade. The cost impact per household for the period is estimated to be about $2,136.

National estimates of the cost of environmental compliance also are available. It is estimated that in 1987, the average household paid approximately $419 for environmental services in the areas of drinking water treatment, wastewater treatment,

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[4] Frequently cited are studies for Anchorage, Alaska; Columbus, Ohio; Lewiston, Maine; Phoenix, Arizona; and Littleton, New Hampshire.

[5] National Water Education Council, *Cause for Concern: America's Clean Water Funding Crisis* (Boston, MA: National Water Education Council, 1992), 7.

[6] The cities are: Akron, Cincinnati, Cleveland, Columbus, Mansfield, Lima, Springfield, Toledo, and Zanesville. A total of 1,336,875 households were represented in the study.

TABLE 2-2

COST OF COMPLIANCE WITH MAJOR ENVIRONMENTAL MANDATES FOR OHIO'S METROPOLITAN AREAS

Mandate	**Total Costs 1992-2001**
Clean Water Act	$2,108,655,842
Safe Drinking Water Act	**462,412,118**
Solid waste disposal	163,111,228
Clean Air Act	47,134,880
Resource Conservation and Recovery Act (RCRA)	25,243,609
Occupational Safety and Health (OSHA)	20,110,344
Asbestos Hazard Emergency Response Act (AHERA)	14,740,002
Underground storage tanks	9,598,450
Explosive gas monitoring	1,248,700
Infectious waste	1,144,550
Toxic Substances Control Act (TSCA)	1,043,400
Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)	604,664
Superfund Amendments and Reauthorization Act (SARA) Title III	326,800
Federal Rivers and Harbors Act	35,000
Total	**$2,855,409,587**
Total cost per household at 0% financing	**$2,136**

Source: Ohio Municipal League, *Metropolitan Area Cost Report for Environmental Compliance* (Columbus, OH: Ohio Municipal League, 1992), 37.

and solid-waste management.[7] By the year 2000, simply maintaining the current level of quality will cost the average household an additional $180 annually; new standards will cost another $48 per year. Thus, an increase of more than 50 percent in household payments will be required between 1987 and 2000.[8] Although every community will be affected, the estimated increase for communities of 500 or less in population is striking. In the year 2000, households in these very small communities may be required to pay $1,580 for environmental compliance, an amount nearly 2.5 times the amount paid by the average household. The cost of clean for these communities is very high indeed.

State and local governments and public utilities frequently contend that federal estimates of environmental compliance costs are too low. Most studies of local impacts emphasize the cumulative effect of federal environmental mandates. A report prepared for Columbus, Ohio, has been widely cited for its analysis, which is appealing to SDWA critics in part because of Columbus's image as a microcosm of U.S. demographics:

> Over the last few years there has been a significant change in federal legislative policy that is having an important impact on local government. The number of environmental mandates has increased substantially to the point where an average of 22 different federal and state mandates have been implemented in each of the last three years. The funding available from federal and state government bodies to assist with compliance with the new mandates has been decreasing at an alarming rate, while the share of costs to local governments has been increasing at a dramatic rate. Because of these changes, the costs to the City of Columbus over the next ten years is expected to be **$1,088,484,880** in 1991 dollars just to comply with the environmental mandates that have already been enacted

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[7] Apogee Research, using various sources, as reported in U.S. Environmental Protection Agency, *A Preliminary Analysis of the Public Costs of Environmental Protection: 1981-2000* (Washington, DC: U.S. Environmental Protection Agency, 1990), 30. These data are based on a sample of 8,032 cities, towns, and townships, and encompass drinking water, wastewater treatment, and solid waste management.

[8] These data also are suggestive about economies of scale in environmental services Communities in the 100,000 to 250,000 population range are estimated to have the lowest annual household payments ($436), with both smaller and larger communities predicted to have higher average costs.

> into law. An additional twenty (20) federal laws are either proposed or are in the development phase. Compliance costs for such proposed laws are not included in the costs identified here.[9]

The Columbus report reflects at least two sources of frustration. First is the high cost of compliance; second, and at least as frustrating, is the reality of modern federalism. Today, state and local governments bear the fiscal burden of many federal regulatory mandates with little or no federal funding. So frustrated are state and local officials that they declared October 27, 1993 as National Unfunded Mandates Day.[10] Environmental politics is a politics of money as much as anything else.

However, an important limitation of the local cost-impact studies is that they rarely attempt to incorporate the variety of important factors that might mitigate against the cost of compliance, as discussed at the conclusion of this chapter. A second limitation is that the analysis fails to place SDWA costs in the context of the other cost pressures. In the case of Columbus, for example, meeting demand growth will probably have a far greater cost impact than the SDWA. A third important limitation of the Columbus report, and others like it, is that its authors meticulously seek out all costs associated with compliance, while they pay little or no attention to the benefits of environmental regulations and their monetary value to the community. Some recent estimates of the national benefits and costs associated with specific contaminant standards under the SDWA are presented in table 2-3.

Drinking water contamination associated with *giardia lamblia, cryptosporidia, legionella, salmonella,* and *escherichia coli (e. coli 0157:H7)* are very costly to

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[9] City of Columbus, Environmental Law Review Committee, *Environmental Legislation: The Increasing Costs of Regulatory Compliance to the City of Columbus* (Columbus, OH: City of Columbus, 1991), abstract.

[10] "State, Local Officials Decry Unfunded Federal Mandates," *Waterweek* 2 (November 8, 1993), 2. Leading members of the coalition supporting the day were the U.S. Conference of Mayors, National League of Cities, National Governors' Association, National Association of Counties, National Conference of State Legislatures, International City/County Management Association, and Council of State Governments.

TABLE 2-3
BENEFITS AND COSTS OF SELECTED DRINKING WATER STANDARDS

Regulated Contaminant	Number of Systems to Treat	Total Affected Population (000)	Total Annualized Costs ($millions)	Annual Cases Avoided and Reduced Exposure
Fluoride	400	110	<$10	Reduced exposure to 110,000 people
Surface Water Treatment (a)	10,200	48,000	500	Eliminates 87,000 giardia lamblia outbreak and endemic cases
Total Coliform	monitor only	240	70	Reduced exposure to 240,000 people
Phase II				
Aldicarb	400	280	10	Reduced exposure to 280,000 people
Cadmium	200	192	10	Reduced exposure to 190,000 people
Ethylene dibromide	1,300	959	30	70 cancer cases
Lead and Copper				
Lead (a)	52,000	156,500	380-460	Reduced exposure to 156 million people
Copper (a)	<100	87	<10	Reduced exposure to 87,000 people
Phase V				
Antimony	200	304	30	Reduced exposure to 304,000 people
Dinoseb	<100	4	<1	Reduced exposure to 4,000 people
Arsenic	200	3,000	<10	10 cancer cases

Source: U.S. Environmental Protection Agency, *Technical and Economic Capacity of States and Public Water Systems to Implement Drinking Water Regulations: Report to Congress* (Washington, DC: U.S. Environmental Protection Agency, 1993), 38-9.
(a) A treatment technique is required.

communities and their citizens. Only the most serious contaminations receive widespread attention, such as the outbreak of *cryptosporidia* in Milwaukee and the discovery of a new or mutant strain of *e. coli* in New York City (both in 1993).[11] But according to one analysis, nine different bacteria, viruses, and protozoa accounted for seventy-six waterborne outbreaks in the last five years.[12] These incidents are used to justify the surface-water treatment provisions of the SDWA. Only a small exposure to microbial pathogens can have immediate and potentially deadly consequences. By comparison, the potential effects of chemical and radionuclide exposure are long term, making risk assessment more difficult and controversial. The water supply industry generally favors more consideration of risk variations in the establishment of drinking water regulations.

Nevertheless, any analysis of the cost impacts of drinking water regulations is potentially biased without recognizing the marginal benefits of maintaining high-quality drinking water. In fact, the exclusive focus on costs actually may undermine the process of establishing public support for environmental programs that are essential to public health.[13] Recent survey data suggest that the public is willing to pay more for safe drinking water.[14] How much more is a subject of debate.

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[11] According to Michael Burke of the New York Department of Health, "The bacteria *E. coli* itself poses no threat to human health... [but] it does indicate the presence of other, more dangerous bacteria." "'Mutant Bacteria' in NYC System Likely Came From Gulls," *U.S. Water News* 10 (October 1993), 9.

[12] Joan B. Rose, Charles N. Haas, and Charles P. Gerba, "Waterborne Pathogens: Assessing the Health Risks," *U.S. Water News* 9 (June 1993): 7.

[13] Although the analysis of benefits is important, a strict benefit-cost test for determining the value of drinking water regulations is not recommended here because of the potential for distorted results. Some environmental advocates have vowed to "die on our swords" before allowing the use of benefit-cost analysis in conjunction with SDWA implementation. "Drinking Water Forum Takes Utilities to Task on Trust," *Waterweek* 2 (September 27, 1993), 3.

[14] "Survey Shows Public Will Pay for Safe Drinking Water," *Waterweek* 2 (November 8, 1993), 7.

The Safe Drinking Water Act

Because the focus of this report is water supply utilities, the SDWA is the environmental mandate of interest (compared with the many other mandates identified above). The first federal drinking water legislation, the Interstate Quarantine Act, was enacted in 1893; the federal standards for drinking water were issued in 1914.[15] The SDWA was enacted by Congress in 1974 following the creation four years earlier of the U.S. Environmental Protection Agency (EPA) and the discovery of trihalomethanes in certain public drinking water supplies. An SDWA timeline is provided in table 2-4. Especially significant were the 1986 amendments because they accelerated the rate at which the EPA is supposed to set drinking water standards.[16] The amendments also accelerated the pace of investment in water treatment and related infrastructure.

The 1986 SDWA Amendments called for the initial establishment of standards for eighty-three contaminants and the regulation of twenty-five new contaminants every three years thereafter.[17] Also required were the development of a surface water treatment rule, disinfection of public water supplies and disinfection byproduct regulations, extensive water system monitoring and reporting (M/R) both for regulated and unregulated contaminants, and public notification procedures for when systems are not in compliance. In conjunction with the SDWA, the EPA sets maximum contaminant levels (MCLs), requires specific treatment measures for certain contaminants (such as lead), and defines best available technologies (BATs), all of which can be controversial.

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[15] For an excellent review of SDWA history, see Frederick W. Pontius, "SDWA: A Look Back," *American Water Works Association Journal* 85 (February 1993): 22.

[16] Some environmental groups have complained that SDWA implementation schedules have not been met by the EPA. See also, U.S. General Accounting Office, *Drinking Water: Compliance Problems Undermine EPA Program as New Challenges Emerge* (Washington, DC: U.S. General Accounting Office, 1990).

[17] The actual number of regulated compounds is eighty-six, because radium and dichlorobenzene are regulated as two compounds and hexachlorobenzene was added by the EPA to the list of contaminants.

TABLE 2-4
SAFE DRINKING WATER ACT TIMELINE

Year	Action	Statute	Regs	Regulatory Area
1974	SDWA	PL 93-523	--	Safe Drinking Water Act
1975	-----	-----	1	Interim rules
1976	-----	-----	22	Interim regulations
1977	Amendments	PL 95-190	--	-----
1978	-----	-----	--	-----
1979	Amendments	PL 96-63	23	Trihalomethanes
1980	Amendments	PL 96-502	--	-----
1981	-----	-----	--	-----
1982	-----	-----	--	-----
1983	-----	-----	--	-----
1984	-----	-----	--	-----
1985	-----	-----	--	-----
1986	Amendments	PL 99-339	23	Revised fluoride
1987	-----	-----	31	Volatile organic chemicals
1988	Amendments	PL 100-572	--	-----
1989	-----	-----	35	Surface water treatment and coliform
1990	-----	-----	--	-----
1991	-----	-----	62	Phase II and lead and copper
1992	-----	-----	84	Phase V
1993	-----	-----	86	Radionuclides
1994	-----	-----	87	Sulfate
1995	-----	-----	111	Phase VI, phase VIB, and arsenic
Proposed amendment (a)		H.R. 170	--	Groundwater Safety Act
Proposed amendment		H.R. 688	--	Sole-Source Aquifer Protection Act
Proposed amendment		H.R. 5445	--	SDWA Amendment
Proposed amendment		H.R. 2840, S. 1445	--	Lead Contamination Control Act
Proposed amendment		S. 35	--	Safe Bottled Water Act
Proposed amendment		S. 2900	--	Moratorium on certain drinking water regulations, establishment of
Proposed amendment		S. 3106	--	Deadline for compliance with certain drinking water regulations, extension of
Proposed amendment (b)		H.R. 3392	--	SDWA Reauthorization
Proposed amendment		S. 1547	--	SDWA Reauthorization

Source: Adapted from Frederick W. Pontius, "SDWA: A Look Back," *American Water Works Association Journal* 85 (February 1993), 22. (a) 102nd Congress. (b) 103rd Congress.

SDWA reauthorization legislation introduced in 1993 potentially would scale back some of the provisions of the SDWA, particularly with respect to the regulation of additional contaminants and the extent of monitoring requirements.[18] However, many of the essential provisions of the 1986 amendments would remain intact. To the extent that they do, projected SDWA cost impacts will be largely unaffected.

The legislative and regulatory scope of the SDWA is immense in terms of water utility responsibilities, as well as regulatory responsibilities for the federal and state agencies accountable for SDWA implementation. According to experts David Schnare and John Cromwell, the estimated impact of the SDWA on water utility capital costs is $20 billion over twenty years, plus an additional $20 billions for SDWA-induced infrastructure improvements.[19] Understandably, much less certainty accompanies the estimate of secondary cost impacts (which rightfully can be classified as infrastructure costs). On an annual basis, the total capital cost impact of the SDWA is estimated to be about $1 billion in primary capital expenditures and $1 billion in secondary capital expenditures. Another $1.25 billion in annual operation and maintenance costs related to the SDWA (including monitoring) can be expected.[20]

Not all SDWA regulations have the same effect on water systems and the cost of compliance. Four rules are expected to be particularly expensive: the Surface Water Treatment Rule, the Lead and Corrosion Control Rule, the Ground Water Disinfection Rule, and the Radionuclides Regulations. The latter two rules have yet to be promulgated.

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[18] Correspondence dated October 21, 1993, from the National Association of Regulatory Utility Commissioners (NARUC).

[19] David W. Schnare and John E. Cromwell, "Capital Requirements for Drinking Water Infrastructure," in *AWWA Seminar Proceedings: Capital Financing* (Denver, CO: American Water Works Association, 1990), 4. A 10-percent discount rate was used for this analysis. The results are reasonably consistent with the aggregate costs data for new regulations reported in table 2-1.

[20] Ibid., 17.

TABLE 2-5
TOTAL ANNUAL COMPLIANCE COSTS FOR FINALIZED SDWA RULES (a)
(In Millions of 1991 Dollars)

RULE	NUMBER OF SYSTEMS AFFECTED (b)	POPULATION AFFECTED (000) (b)	CAPITAL COST	ANNUAL O&M COST*	ANNUAL-IZED COST (c)	AVERAGE ANNUAL MONITOR-ING COST (d)	TOTAL ANNUAL COMPLIANCE COST
Fluoride	385	107	36.6	$3.6	$7.1	$0.2	$7.3
Phase I VOCs	1,824	4,550	185.1	16.2	33.6	28.0	61.6
Surface Water Treatment Rule	10,228	48,000	3,308.0	200.7	513.0	20.6	533.6
Total Coliform	200,183	(e)	0.0	0.0	0.0	135.6	135.6
Phase II SOCs	3,110	2,660	568.6	27.4	81.1	22.3	103.4
Phase II IOCs	165	192	55.2	4.8	10.0	4.8	14.8
Lead & Copper (f)	51,957	156,587	4,226.3	209.1	453.3	36.4	489.7
Phase V SOCs & IOCs	256	340	248.3	16.2	39.6	5.2	44.8
TOTAL	--	--	$8,628.0	$478.0	$1,137.7	$253.1	$1,390.8

Source: U.S. Environmental Protection Agency, *Technical and Economic Capacity of States and Public Water Systems to Implement Drinking Water Regulations: Report to Congress* (Washington, DC: U.S. Environmental Protection Agency, 1993), 43.

(a) These estimates pertain only to final SDWA rules. Cost estimates were not provided for prospective rules for radionuclides, groundwater disinfection, phase V sulfates, arsenic, and trihalomethanes (THMs, under the disinfection byproduct rule).
(b) This refers to the number of systems (and the populations served by those systems) that will have to take action because they exceed a rule's standard.
(c) Includes capital costs amortized over 20 years at 7 percent (per recent OMB guidelines) and one year of O&M expense (except for lead and copper, some cost components of which are amortized over a much longer periods). Does not include arsenic or THM costs under interim regulations.
(d) Costs reflect the fact that, except for SWTR, coliform, and lead rules, most systems are expected to obtain waivers from additional monitoring.
(e) All public water systems are required to monitor for coliform; therefore all those served by public water systems are affected by the rule.
(f) The estimate for the lead rule corresponds to a source water action level of 15 ug/L plus pipe replacement, after instituting optimal corrosion control, in roughly 60 percent of connections.

Cost estimates for the *finalized* SDWA rules are reported in table 2-5. Total annualized compliance cost is expected to be about $1.4 billion.[21] The key components of this estimate are annualized capital costs ($660 million), annual operation and maintenance costs ($478 million), and annual monitoring costs ($253 million). Operation and maintenance, including monitoring, accounts for about half of annualized costs.[22]

Not included in the EPA's $1.4 billion estimation are compliance costs associated with rules not yet finalized. At the time of the EPA study, rules were not promulgated for radionuclides, groundwater disinfection, disinfection and disinfection byproducts (trihalomethanes), sulfate, and arsenic. Very rough estimates of the cost impact of these rules have been attempted. However, rule-specific estimates are considered unreliable because of the need to make too many assumptions about the standards and affected systems. Assuming the reasonableness of the total capital cost estimate of $1 billion, the remaining rules will add another substantial increment to capital costs, not to mention operation and maintenance costs.

All aggregate SDWA cost estimates (and other aggregate cost estimates) should be viewed with considerable caution. Moreover, average cost estimates can mask significant variations. Every individual water system will be affected differently and only time (and a detailed audit) will tell the true impact of these regulations. Nonetheless, a general assessment of costs is useful for putting the SDWA in perspective.

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[21] This estimate assumes a twenty-year amortization schedule for capital expenditures (except for the lead and copper standards) at a 7 percent interest rate (per Office of Management and Budget guidelines), and an eighteen-year monitoring cycle. The EPA previously estimated the total cost of all rules at $3.1 billion using a 10 percent interest rate. See U.S. Environmental Protection Agency handout dated January 8, 1991, revision to "Estimates of the Total Benefits and Total Costs Associated with Implementation of the 1986 Amendments to the Safe Drinking Water Act," dated November 27, 1989.

[22] This finding is consistent with the Schnare and Cromwell analysis, when considering operation and maintenance costs relative to direct SDWA capital costs: $1.25/$2.25 = 56 percent.

Trends in SDWA Costs

Detailed data on trends in drinking water treatment costs can be found in the EPA's *Cost of Clean* report. Using the unamortized cost data for the period 1975 to 2000, a strong correlation between total and federally mandated treatment costs is apparent.[23] Excluding financing costs, capital costs and total costs are expected to peak in 1996. Figure 2-1 depicts annualized trends in water treatment costs based on the EPA's assumptions of a twenty-year capital life at a 7 percent interest rate. Operating costs are included in total annualized costs and also are shown separately. Although the federal regulatory mandates clearly determine the shape of the trends, they equally clearly do not account for all water treatment costs. It also appears that costs might begin to levelize at the turn of the century.

Figure 2-2 reports annualized water treatment costs for the publicly and privately owned water supply sectors using the same assumptions. In this analysis, the impact of the new regulations (the 1986 SDWA amendments) is overlaid on existing cost trends. Although the public sector bears substantial water treatment costs, the relative cost impact of the SDWA, as projected, is comparable for both sectors.

Utility Impacts

Site-specific factors are the key determinants of many SDWA compliance costs.[24] In particular, system size and type of required treatment technology appear to be most critical in determining the effect of the SDWA on the cost of water supply for specific water utilities. Some treatment technologies are less costly than others, but many water utilities will have limited discretion regarding the choice of technology to be implemented because of the type of contaminants in their water sources.

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[23] The R-squared value for the correlation between total and mandated capital cost is .97 (n=22); the R-squared value for the correlation between total and mandated operating costs is .96 (n=22).

[24] Patrick C. Mann and Janice A. Beecher, *Cost Impact of Safe Drinking Water Act Compliance for Commission-Regulated Water Utilities* (Columbus, OH: The National Regulatory Research Institute, 1989).

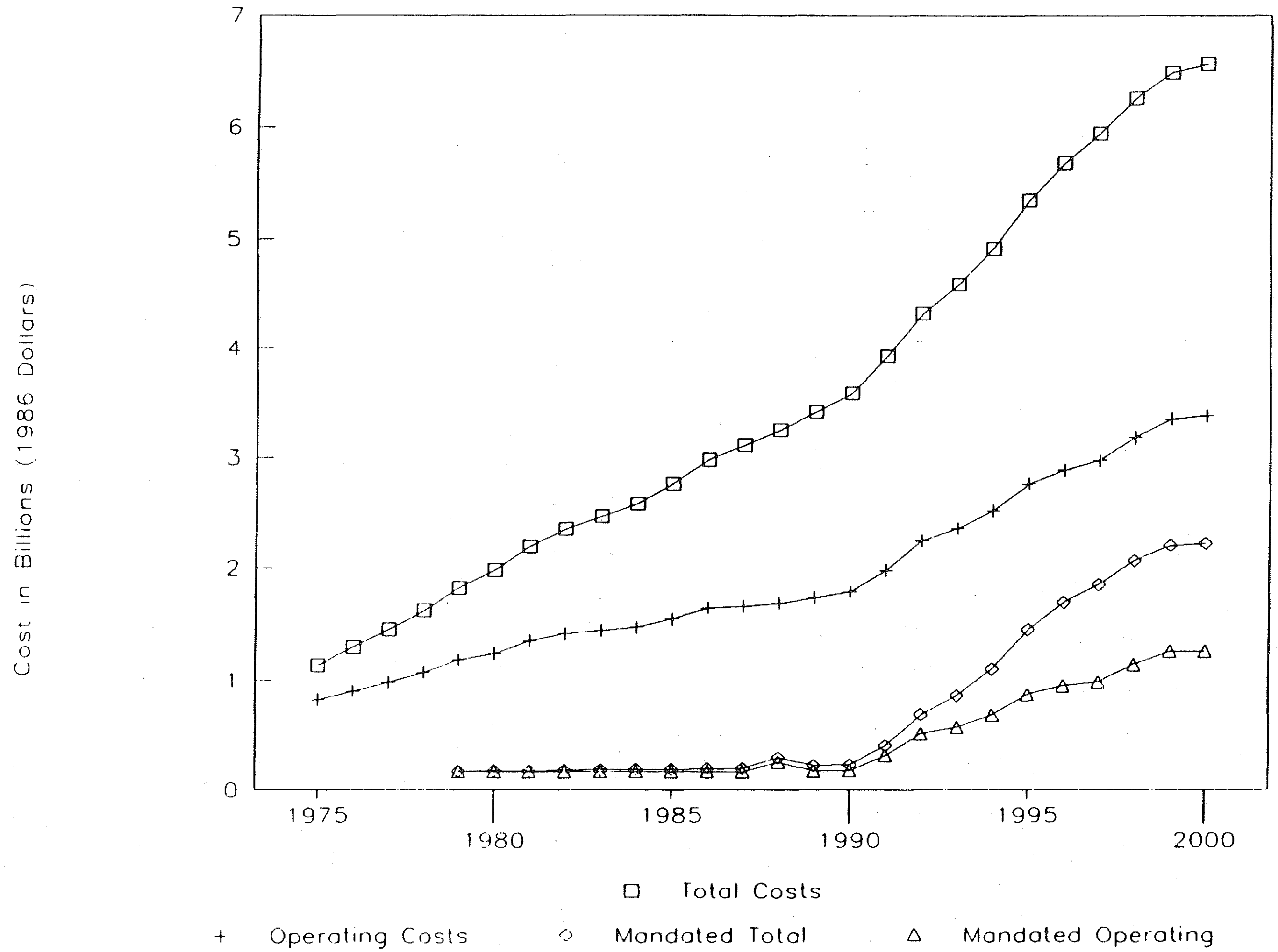

Figure 2-1. Trends in Total and Mandated Water Treatment Costs, 1975 to 2000.

Source: U.S. Environmental Protection Agency, *Environmental Investments: The Cost of a Clean Environment* (Washington, DC: U.S. Environmental Protection Agency, 1990), 4-16 to 4-23. These estimates assume a twenty-year capital life at a 7 percent interest rate.

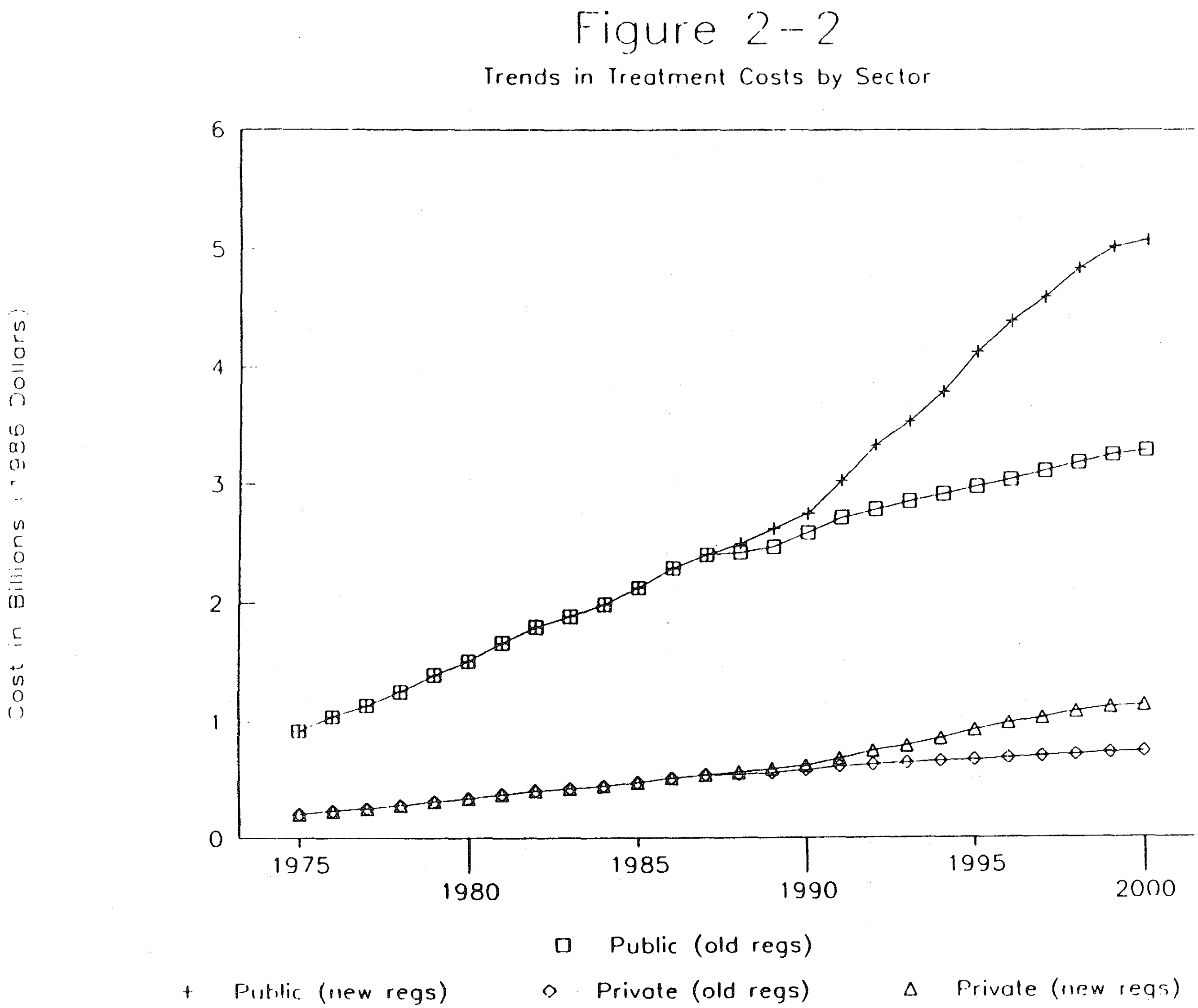

Figure 2-2. Trends in Total Water Treatment Costs by Sector, 1975 to 2000.

Source: U.S. Environmental Protection Agency, *Environmental Investments: The Cost of a Clean Environment* (Washington, DC: U.S. Environmental Protection Agency, 1990), 4-16 to 4-23. These estimates assume a twenty-year capital life at a 7 percent interest rate.

A variety of processes are used by utilities to treat water: conventional filtration, package filtration, direct filtration, diatomaceous earth filtration, slow sand filters, biological detoxification (degradation), aeration treatment, synthetic resins, powder activated carbon (PAC), granular activated carbon (GAC), and advanced oxidation processes (AOPs).[25] SDWA regulations will force some utilities to adopt new treatment processes involving significant capital and operating costs. In addition, utilities can meet compliance standards through techniques other than treatment, namely blending water from two or more sources to reduce the concentration of contaminants, finding an alternate source of supply, and storage for groundwater systems using wells for peak pumping. In some cases, a utility may be forced to abandon a well if the water cannot be brought into compliance with standards. For utilities using very deep wells (that is, very expensive wells), abandonment would constitute a particularly serious SDWA cost impact.

Under the SDWA, almost all water utilities will be forced to devote increased attention and resources to water quality monitoring, which in turn will help determine the type of treatment methods required. As indicated earlier, estimated monitoring costs under the finalized SDWA rules total $253 million. Laboratory fees range from only a few dollars for some tests (such as turbidity) to hundreds of dollars for other tests (such as those for organic contaminants or asbestos).[26] For some SDWA rules, the infrequent occurrence of contamination will make monitoring the only significant cost impact:

> [O]ccurrence studies indicate that the common inorganic and organic chemical contaminants on the SDWA list of 83 are not present in most public water systems at concentrations above proposed MCLs. As for this list of 25 (mostly other inorganics and organics) to be

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[25] New York Department of Public Service, *Committee Reports, Volume II, Safe Drinking Water Act Committee,* Case 88-W-221, Proceeding on Motion of the Commission to Examine the Impact of Environmental Protection, Water Supply and Conservation Issues on Jurisdictional Water Utilities and to Investigate the Problems of Small Water Companies (October 2, 1989), II-1.

[26] Ibid.

> regulated at three-year intervals, the occurrence of these contaminants is expected to be even less extensive, with the major exception being disinfection by-products.
>
> For the majority of water systems, the most significant financial impact of complying with regulations for chemical contaminants will be the costs associated with periodic monitoring to document their absence or presence in supplies at low concentrations.[27]

Implementation of the SDWA in its entirety will affect the entire water supply industry, but impacts will not necessarily fall evenly across the nation's nearly 60,000 water systems, many of which are very small.[28] Many of the community water systems in violation of SDWA monitoring/reporting and contaminant regulations are small systems; however, this is mainly a function of the large number of small systems. The percentage of small systems in violation is not dramatically different from the percentage of large systems in violation.[29] The real issue is that small water utilities, with their small customer base and the associated lack of economies of scale, will tend to experience higher cost (and rate) increases than larger water utilities. By one estimate, over 60 percent of SDWA expenditures will be incurred by water systems serving communities with less than 10,000 population.[30] It is further estimated that 50 percent of the compliance investment will be incurred by systems serving less than 3,300 persons, that is, systems having a capacity of less than 0.5 millon gallons daily (MGD). Yet these

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[27] G. Wade Miller, John E. Cromwell, III, and Frederick A. Marrocco, "The Role of the States in Solving the Small System Dilemma," *American Water Works Association Journal* 80 (August 1988): 34.

[28] See Mann and Beecher, *Cost Impact.*

[29] U.S. Environmental Protection Agency, *Technical and Economic Capacity,* 113.

[30] James P. McFarland, John E. Cromwell, and Elizabeth L. Tam, "Assessment of the Total National Cost of Implementing the 1986 SDWA Amendments," in *Proceedings of the Seventh Biennial Regulatory Information Conference* (Columbus, Ohio: The National Regulatory Research Institute, 1990), 281-302.

systems serve only about 11 percent of the population served by community water systems.[31] Monitoring and treatment costs will hit small water utilities especially hard.

Economies of scale in water treatment can be substantial. As indicated in table 2-6, the unit cost of chemicals, electricity, and total operation and maintenance declines significantly with system size. Data on specific treatment technologies demonstrate these economies as well.[32] According to one study, the capital cost of conventional filtration for a system serving a population of 10,000 would cost about $282 per capita, compared to $130 per capita for a system serving a population of one million.[33] Another study has estimated that the cost per one thousand gallons for a technology such as a gravity carbon contractor system for a small water utility may be ten times that for a large water utility.[34] Similarly, the unit cost for packed tower aeration for small water utilities may be more than ten times that for large water utilities. In response to this problem, the EPA has begun to provide detailed cost data for small system BAT processes.[35]

Despite these apparent economies of scale, some loud complaints about SDWA impacts on large water utilities have been voiced. Even metropolitan areas with very large customer bases and access to a variety of financing alternatives are balking at certain SDWA requirements. New York City is distressed about building a filtration

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[31] Federal Reporting Data System (FRDS), August 31, 1993, as reported in U.S. Environmental Protection Agency, *Technical and Economic Capacity of States and Public Water Systems to Implement Drinking Water Regulations: Report to Congress* (Washington, DC: U.S. Environmental Protection Agency, 1993), 6-7.

[32] A detailed presentation of the capital and operating costs associated with alternative treatment technologies according to water system size can be found in appendix A (table A-11).

[33] New York Department of Public Service, *Committee Reports,* tables A and B.

[34] William E. Cox, Joseph H. Sherrard, and Christopher D. Gaw, *The 1986 Amendments to the Safe Drinking Water Act: Impacts on Virginia's Water Supply Industry,* Bulletin 170 (Blacksburg, VA: Water Resources Center, Virginia Polytechnic Institute and State University, October 1991).

[35] U.S. Environmental Protection Agency, *Technical and Economic Capacity.*

TABLE 2-6
ECONOMIES OF SCALE IN WATER UTILITY
OPERATION AND MAINTENANCE

Community Size (Population Served)	Cost Per 1,000 Gallons Delivered (Systems Surveyed) Chemicals	Electricity	Total Operation and Maintenance (a)
10,000-25,000	$.05 (275)	$.12 (316)	$1.00 (326)
25,000-50,000	.04 (181)	.11 (201)	.86 (205)
50,000-100,000	.04 (168)	.09 (181)	.81 (194)
100,000 and Over	.03 (221)	.07 (224)	.64 (230)

Source: American Water Works Association, *Water Industry Data Base: Utility Profiles* (Denver, CO: American Water Works Association, 1992), 108-110.

(a) Included are operations, maintenance, and administration.

plant that could cost $2 to $6 billion; the Massachusetts Water Resources Authority would like to postpone or avoid building a $360 million filtration plant for water delivered in Boston.[36]

Household Impacts

The practical effect of economies of scale is perhaps best seen with household data. As indicated in table 2-7, average annual monitoring costs per household for the finalized SDWA rules amount to pennies for systems serving populations of 25,000 or

[36] "To Filter or Not to Filter," *Waterweek* 2 (February 1, 1993), 1; and "Massachusetts Leaders Seek Rate-Shock Relief," *Waterweek* 2 (March 15, 1993), 1.

TABLE 2-7
AVERAGE ANNUAL MONITORING AND TREATMENT COSTS PER HOUSEHOLD FOR AFFECTED SYSTEMS UNDER FINALIZED SDWA RULES (a)
(In 1991 Dollars)

Community Size (Population Served)	Monitoring Cost per Household (b)	Drinking Water Treatment Costs (c) Groundwater Systems	Surface Water Systems
25-100	$171.43	$233.15	$691.84
101-500	45.31	69.19	316.15
501-1,000	17.80	29.06	133.15
1,001-3,300	8.45	18.02	73.31
3,301-10,000	4.25	14.57	57.94
10,001-25,000	1.85	12.99	34.60
25,001-50,000	0.86	7.84	21.77
50,001-75,000	0.78	3.90	14.43
75,001-100,000	0.67	3.60	15.94
100,001-500,000	0.43	3.30	18.73
500,001-1 Million	0.15	3.00	5.79
Over 1 Million	0.12	0.00	5.01

Source: U.S. Environmental Protection Agency, *Technical and Economic Capacity of States and Public Water Systems to Implement Drinking Water Regulations: Report to Congress* (Washington, DC: U.S. Environmental Protection Agency, 1993), 43.

(a) Costs are for the following SDWA rules: Fluoride, Phase I (VOCs), Total Coliform, Surface Water Treatment, Phase II (SOCs and IOCs), Lead and Copper, and Phase V (SOCs and IOCs).
(b) Based on a simple eighteen-year cost average (two nine-year compliance cycles).
(c) These cost estimates are averages based on systems installing the appropriate treatment technologies as estimated by the EPA. Unweighted average household impacts in each size category are considerably lower. The estimates assume flows of 100,000 gallons of water annually per household.

more. Thus, most customers of community water systems are unlikely to notice any impact associated with monitoring. However, the cost impact of monitoring on small systems is enormous. Systems serving twenty-five to one hundred customers are expected to pay $171.43 annually *for monitoring alone.* Monitoring requirements under the surface water treatment rule account for $76.72 of the total expense. It is clear why monitoring cost impacts will play a role in future SDWA legislative debates.

Table 2-7 also reports household effects of water treatment as required under the finalized rules. Only systems that are expected to implement specified treatment technologies are included in the analysis. Thus, the cost impact is not averaged across *all* systems within each size category but across *affected* systems only. Including all water systems lower the estimated costs. Annual treatment cost impacts for groundwater systems (ranging from $0 to $233 per household) generally are lower than annual cost impacts for surface water systems (ranging from $5 to $692 per household). This finding reflects the effect of the surface water treatment rule; implementation of the groundwater disinfection requirements will affect this differential. However, for both types of systems, the implications for small systems are clear. Particularly for the two or three smallest size categories cost, SDWA cost impacts will raise serious financial viability and affordability issues. For these reasons, strategies to improve economies of scale through system consolidation are becoming more essential than ever.[37]

Table 2-8 reports the average household impact of the finalized SDWA rules. In this case, all affected and unaffected water systems are included. Using a weighted average, based on population served, the finalized rules are estimated to increase costs over baseline levels by only 7 percent (ranging from an average of 2 percent for very large systems to an average of 55 percent for very small systems). As indicated in the previous table, however, customers of affected systems will see more dramatic increases.

Prior to SDWA cost impacts, average water utility expenses still compared favorably to other utility expenses relative to average household income. As of 1991, the average *combined* water and wastewater bill consumed for about .6 percent of pretax

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[37] See chapter 7.

TABLE 2-8
AVERAGE ANNUAL COST IMPACTS ON ALL HOUSEHOLDS FOR FINALIZED SDWA RULES (a)
(1991 Dollars)

Community Size (Population)	Baseline Costs	SDWA Incremental Costs	Total Projected Costs	Percent Increase
25-100	$264	$145	$409	55 %
101-500	314	53	367	17
501-1,000	198	30	228	15
1,001-3,300	256	20	276	8
3,301-10,000	282	22	304	8
10,001-25,000	201	13	214	6
25,001-50,000	192	9	201	5
50,001-75,000	186	11	197	6
75,001-100,000	157	10	167	6
100,001-500,000	176	12	188	7
500,001-1 Million	169	4	173	2
Over 1 Million	142	3	145	2
Weighted Average (b)	**$190**	**$14**	**$204**	**7 %**

Source: U.S. Environmental Protection Agency, *Technical and Economic Capacity of States and Public Water Systems to Implement Drinking Water Regulations: Report to Congress* (Washington, DC: U.S. Environmental Protection Agency, 1993), 66.

(a) These estimates are based on averages for all water systems, including affected and unaffected systems.
(b) Averages are weighted according to population served.

household income, compared with .9 percent for natural gas, 1.8 percent for telephone services, and 2.2 percent for electricity. These estimates *do not* include the projected impact of the SDWA on water costs or the projected impact of the Clean Water Act (CWA) on wastewater costs.

The SDWA in Context

Despite the millions and billions of dollars associated with implementing the SDWA, these costs should be kept in perspective. Although heavy investments in water supply over the next few decades can be expected, a relatively small portion of each investment dollar will be devoted to SDWA compliance. As emphasized in chapter 1, the SDWA is only one of the factors contributing to the rising cost of water. The *Report on Water Supply* attributed only 8 to 13 percent of the water supply industry's total projected annual costs to meeting SDWA requirements.[38] Revised cost estimates would not necessarily change these percentages. Using the Schnare and Cromwell data, 12 percent could be a reasonable estimate of the proportion of expected capital costs attributable directly to the SDWA.[39]

According to Schnare and Cromwell, the SDWA *in its entirety* (that is, with all rules implemented) will account for an average 15 percent increase over baseline capital expenditures, with many "peaks and valleys" along the way.[40] Another 15 percent in indirect, SDWA-induced infrastructure costs also can be anticipated. According to a related analysis, SDWA compliance costs may require a 100 to 200 percent increase in

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[38] Wade Miller Associates, Inc., *The Nation's Public Works: Report on Water Supply* (Washington, DC: National Council on Public Works Improvement, 1987), 42.

[39] Schnare and Cromwell, "Capital Requirements." The 12 percent estimate is based on capital expenditures of $20 billion divided by a total investment of $160 to $190 billion for a twenty-year period. The total investment includes $20 billion for SDWA costs and $20 billion for SDWA-induced infrastructure costs.

[40] Ibid. The 15 percent estimate is based on capital expenditures of $20 billion over a baseline of $120 to $150 billion for a twenty-year period. The $150 billion baseline is a trended estimate.

capital expenditures for water treatment, but these expenditures account for only a 20 to 30 percent increase in total capital outlays for the industry.[41] Similarly, the 65 percent increase in SDWA-related operation and maintenance expenditures for water treatment constitutes only a 10 percent increase in total operation and maintenance expenditures.

As the EPA noted in its *Cost of Clean* report:

> [T]he bulk of expenditures made by water suppliers are unrelated to compliance with EPA contaminant limits or other measures to improve drinking water quality. Most drinking water costs are associated with supplying water to users, including expenditures for water acquisition, transport, and distribution.[42]

Financial data compiled by the National Association of Water Companies (NAWC), provided in table 2-9, reveal that purification is the smallest category of operation and maintenance expenses for the NAWC's reporting members. Purification accounts for only approximately 11 percent of total expenses.[43] A selective analysis of company-specific data confirms this estimate.[44] For at least one investor-owned company, as reported in table 2-10, the 11 percent devoted to water treatment applies not only to operation and maintenance but also to investment in utility plant.[45] Although much emphasis is placed on SDWA capital expenditures related to treatment, it has been estimated that "only about 20 percent of treatment plant construction

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[41] McFarland, Cromwell, Tam, and Schnare, "Assessment of the Total National Cost."

[42] U.S. Environmental Protection Agency, *Environmental Investments,* 4-7.

[43] *National Association of Water Companies Financial Data for 1991* (diskette version). Calculations were made by authors. The database represents 167 larger investor-owned water systems.

[44] The authors examined the annual financial reports of about a half dozen NAWC companies, which produced similar results.

[45] Only total utility plant is available in the NAWC database. However, similar findings were made for other individual utilities.

TABLE 2-9
AVERAGE OPERATION AND MAINTENANCE EXPENDITURES FOR NAWC INVESTOR-OWNED WATER SYSTEMS FOR 1991

Type of Expense	Average Expense	Percent
Production	$3,738,930	31.2%
Administrative and general	3,377,746	28.2
Transmission and distribution	2,254,609	18.8
Customer accounting	1,397,040	11.7
Purification	**1,290,213**	**10.8**
Total	**$11,972,771**	**100.0%**

Source: Authors' calculations based on *National Association of Water Companies Financial Data for 1991* (diskette version).

expenditure is devoted to the actual treatment equipment."[46] These findings make the point that SDWA impacts, though substantial, are focused on only a portion of the water utility enterprise. Even after the cost impact of the SDWA is fully realized, treatment costs probably will remain secondary to other costs associated with the water delivery system that also are on the rise. The implication is that SDWA costs alone might not justify some of the advocated changes in economic regulation.

Even after the cost impact of the SDWA is fully realized, treatment costs probably will remain secondary to other costs associated with water supply that also are on the rise. Water source costs can be expected to increase as low-cost supply alternatives become more and more difficult to acquire. Yet, as these experts explain, SDWA costs will have a lasting effect on the configuration of water utility costs:

[46] Schnare and Cromwell, "Capital Requirements," 2.

TABLE 2-10

WATER TREATMENT RELATIVE TO OTHER EXPENSES AND INVESTMENTS FOR ONE WATER UTILITY FOR 1992

Utility Function	Amount	Percent
Operation and Maintenance Expenses		
Administrative and general	$1,677,658	27.34%
Source of supply	1,358,759	22.15
Transmission and distribution	950,781	15.50
Pumping	913,372	14.89
Water treatment	**679,132**	**11.07**
Customer accounts	555,458	9.05
Total	**$6,135,160**	**100.00%**
Utility Plant		
Transmission and distribution	$38,580,388	75.65%
Water treatment	**5,682,132**	**11.14**
Pumping plant	2,932,922	5.75
General plant	3,104,848	6.09
Source of supply	673,334	1.32
Intangible plant	24,892	.05
Total	**$50,998,516**	**100.00%**

Source: *Annual Report of the Wilmington Suburban Water Corporation to the Delaware Public Service Commission for the Year Ended December 31, 1992.*

> It is important to recognize that the overwhelming majority of the capital cost of water supply is incurred in the effort to keep pressure in the pipes--in other words to provide the quantity attribute, rather than the quality attribute. It is primarily as a result of unseen assets--the pipes in the ground--that water supply has the highest asset to revenue ratio of any public utility service. Compliance with SDWA requirements will shift significantly more emphasis in capital spending towards the quality attribute (i.e., water treatment). Although quantity related expenditures will still predominate, the cost structure of the water industry will be forever changed in both large and small water systems.[47]

A potential cause of concern for water utility regulators is the potential for the SDWA to crowd out other much needed investments in water systems, namely investments in the rehabilitation and improvement of the water delivery infrastructure. The temptation to continue postponing infrastructure investments will be great.

Infrastructure Improvement

The cost impact of the SDWA cannot be divorced entirely from another water sector issue--the aging water utility infrastructure. Survey results confirm that SDWA compliance triggers wide-ranging infrastructure improvements.[48] By one rule of thumb, for every dollar spent on SDWA compliance, another dollar will be spent on infrastructure rehabilitation.[49] According to Schnare and Cromwell, "Deferred

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[47] Ibid., 1.

[48] "Over $2.7 Billion Needed for SDWA Infrastructure This Year," *ASDWA Update* 8 (February 1993), 1 and 4.

[49] U.S. Environmental Protection Agency handout dated January 8, 1991; and Schnare and Cromwell, "Capital Requirements."

infrastructure needs are a 'sleeping' capital demand that could be awakened at any time."[50] The SDWA may sound the alarm that ends the sleep.

In reality, for many systems, the backlog of basic infrastructure needs is the primary causal factor in determining capital requirements, and the SDWA is a secondary factor. For some newer water systems, improvements can be made at the margin to meet SDWA standards. However, many water system facilities are old and/or obsolete and in need of either repair or replacement. Marginal upgrades cannot bring these systems into compliance. Many water systems have aging infrastructures that are incapable of satisfying either present demands or present water quality requirements, let alone future demands and future quality requirements. For these systems, rehabilitation and replacement expenditures, along with SDWA compliance expenditures, reinforce the upward pressure on water rates.

Importantly, not all infrastructure improvements are driven by drinking water treatment requirements. According to Schnare and Cromwell, SDWA-induced capital improvements costing $1 billion annually (for twenty years) would resolve only one-third to one-half of all unmet infrastructure needs, meaning that total capital costs would be in the range of $2 to $3 billion annually.[51] Because this estimate does not include operation and maintenance costs, it implies that total infrastructure costs will be much greater than projected in the *Report on Water Supply.*[52]

Other estimates of municipal water supply infrastructure needs, for roughly the middle 1980s to the year 2000, have been advanced from various vantage points:[53]

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[50] Schnare and Cromwell, "Capital Requirements," 5.

[51] Ibid., 7.

[52] Wade Miller Associates, Inc., *Report on Water Supply,* 42. Deferred maintenance and replacement for the treatment and distributions systems were expected to cost $1.8 to $3.5 billion annually (37 to 49 percent of total annual costs).

[53] Grigg, *Water Resources Planning,* 55. Importantly, these estimates were made prior to passage of the 1986 amendments to the SDWA.

- Associated General Contractors ($139 billion)
- U.S. News ($125 billion)
- Business Week ($110 billion)
- America in Ruins ($75-110 billion)
- American Water Works Association ($30 billion)
- Congressional Budget Office ($6-9 billion)[54]

Some U.S. cities have particularly pressing infrastructure needs. According to a study of New York City's water and sewer infrastructure by the Cooper Union Infrastructure Institute:[55]

> - Approximately 6 percent of the water-main system and 7 percent of the sewer system is over 100 years old. By the year 2002, both percentages will climb to over 25 percent.
>
> - The current cycle of replacement for water mains [would require] 150 years; sewers [would require] 255 years.
>
> - The current median age of water mains is 63 years while the median age for sewers is 62 years. At current rates of replacement, the median age of water mains will increase to 75 years by the year 2020 and sewers will increase to 80 years by the year 2010.
>
> - The annual number of water-main breaks average approximately 500 per year in the early 1980s but in 1989 surpassed 700 per year. The number of breaks per mile is expected to double between 1990 and 2030, from one break per 10 miles to one break for every 5 miles of water main.

Though not every water (or wastewater) system in the U.S. has the same pressing infrastructure needs as New York, much can be learned from the city's experience. Many water systems, both large and small, will face similar needs. Without an adequate plan for rehabilitation, water main breakage may force the issue.

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[54] This last estimate is for 756 large cities only.

[55] Cooper Union Infrastructure Institute (1991) as reported in David Haarmeyer, *Privatizing Infrastructure: Options for Municipal Water-Supply Systems* (Los Angeles, CA: Reason Foundation, 1992), 15.

The deferred maintenance and aging infrastructure problems have partly resulted from water prices tending to be below that dictated by most relevant pricing standards.[56] The underpricing of water service has resulted in the postponement of both system maintenance and capital replacement. The deterioration of water supply facilities, as well as other infrastructure facilities, is a serious problem in the United States, particularly in the older industrialized regions. One important measure of deterioration is water leakage. Anecdotal evidence suggests that publicly owned systems, like New York's, are in worse shape than many major investor-owned systems. Undercosting and underpricing of water service are caused by multiple factors, including the use of historical accounting (rather than present or near-term future) costs in the rate setting process, the use of average (rather than incremental) cost as the primary regulatory pricing standard, and consumer pressures combined with the political orientation of water rate setting.

In brief, many water utilities postponed system maintenance in order to keep operating costs as low as possible; water utilities also postponed the replacement of antiquated equipment and facilities in order to defer the relatively expensive replacement of the aging facilities as long as possible. Moreover, the managers of many small, investor-owned water systems prefer to postpone routine maintenance rather than subject themselves to the regulatory process. The deferral of both maintenance and capital replacement produced lower rates in the short term but will translate into higher rates (and possibly rate shock) in the long term. The deferral of maintenance actually may result in higher repair and rehabilitation costs for specific water utilities. In addition, postponement can create intergenerational inequities because costs that could have been appropriately charged to customers in past time periods were instead shifted forward to present and future water customers.

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[56] Patrick C. Mann, "Urban Water Supply: The Divergence between Theory and Practice," in *Public Utility Regulation,* edited by Kenneth Nowotny, David B. Smith, and Harry M. Trebing (Boston, MA: Kluwer Academic Publishers, 1989), 163-177.

Demand Growth

In some respects, the cost impact of SDWA compliance is short term in nature and the cost impact of infrastructure improvements is middle term in nature. Capital costs related to the SDWA are expected to peak in 1996. Given proper attention, infrastructure needs should stabilize as well. Over the long term, it can be predicted that attention will again shift to the *quantity* dimension of water supply. In many parts of the country, concern about supply adequacy for meeting demand growth already is at the forefront. Yet despite the fact that demand-driven costs account for a rather substantial component of projected capital and operating needs, these costs probably receive the least attention.

The *Report on Water Supply* estimated that meeting demand growth could cost $2.6 to $2.7 billion (constituting 39 to 55 percent of total annual water supply costs).[57] Like the other cost estimates, demand growth costs may have been underestimated. However, these costs are at least as difficult to predict as SDWA and infrastructure costs. A safe assumption would be that demand growth will account for *at least* a third of total water supply costs in the near term, even with increased costs in the other areas. In the future, demand growth may account for an increasingly large proportion of total water supply costs.

Growth in water demand affects all facets of the water utility system--source of supply, transmission, treatment, storage, and distribution. Usage-related capital investments can involve either the expansion of existing plant or the construction of new facilities to satisfy increasing average and maximum consumer demands. New sources of supply will be especially costly because most of the inexpensive sources of water already have been exhausted. Future water withdrawals will be constrained by economic, political, and environmental protection considerations. Operation and maintenance expenses also are affected by demand growth. Demand management, for example, may require operational expenditures to help water systems avoid capital investments.

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[57] Wade Miller Associates, Inc., *Report on Water Supply,* 42.

Trends in U.S. water withdrawals, based on data from the U.S. Geological Survey, are provided in figure 2-3. Between 1950 and 1990, total withdrawals grew from about 180 billion gallons daily to 408 billion gallons daily, an average increase of 11.4 percent for each five-year period (approximately 2.3 percent annually). Withdrawals peaked at 440 billion gallons in 1980. The decline in the decade since can be attributed to conservation efforts in agricultural irrigation and industrial water use (including thermoelectric use). Withdrawals for public water supplies increased from 14 to 38.5 billion gallons daily, representing an average increase of 13.65 percent for each five-year period (approximately 2.7 percent annually).

Thus, nationally, water withdrawals generally are stable with moderate but steady growth in the rate of public withdrawals associated with population growth and economic development. Demand growth as a source of pressure on costs still is somewhat a local or regional issue, although more and more localities and regions are experiencing this pressure. Some utilities may experience no growth or even a decline in demand due to demographic changes or increased efficiency in water use. Other utilities, particularly metropolitan areas, may experience steep demand growth caused by a rapidly expanding customer base. Cost impacts in demand growth areas have the potential to be highly disruptive from a total water system perspective. While consolidation or privatization of water systems in growth areas might promise improved economies in the long term, these forms of restructuring might add to demand-related (and other) costs in the short term.

Like electricity demand, water demand varies seasonally.[58] A unique feature of water, however, is that both demand and supply are affected by weather patterns, with the unfortunate reality that drought can create supply shortages at the same time customers demand more water, especially for lawn watering. Because water is storable, seasonal variations in demand (driven by outdoor use) are more relevant than daily or

[58] See Janice A. Beecher, *Integrated Water Resource Planning: Discussion Paper,* a report prepared for the Water Industry Technical Action Fund (Columbus, OH: The National Regulatory Research Institute, 1993).

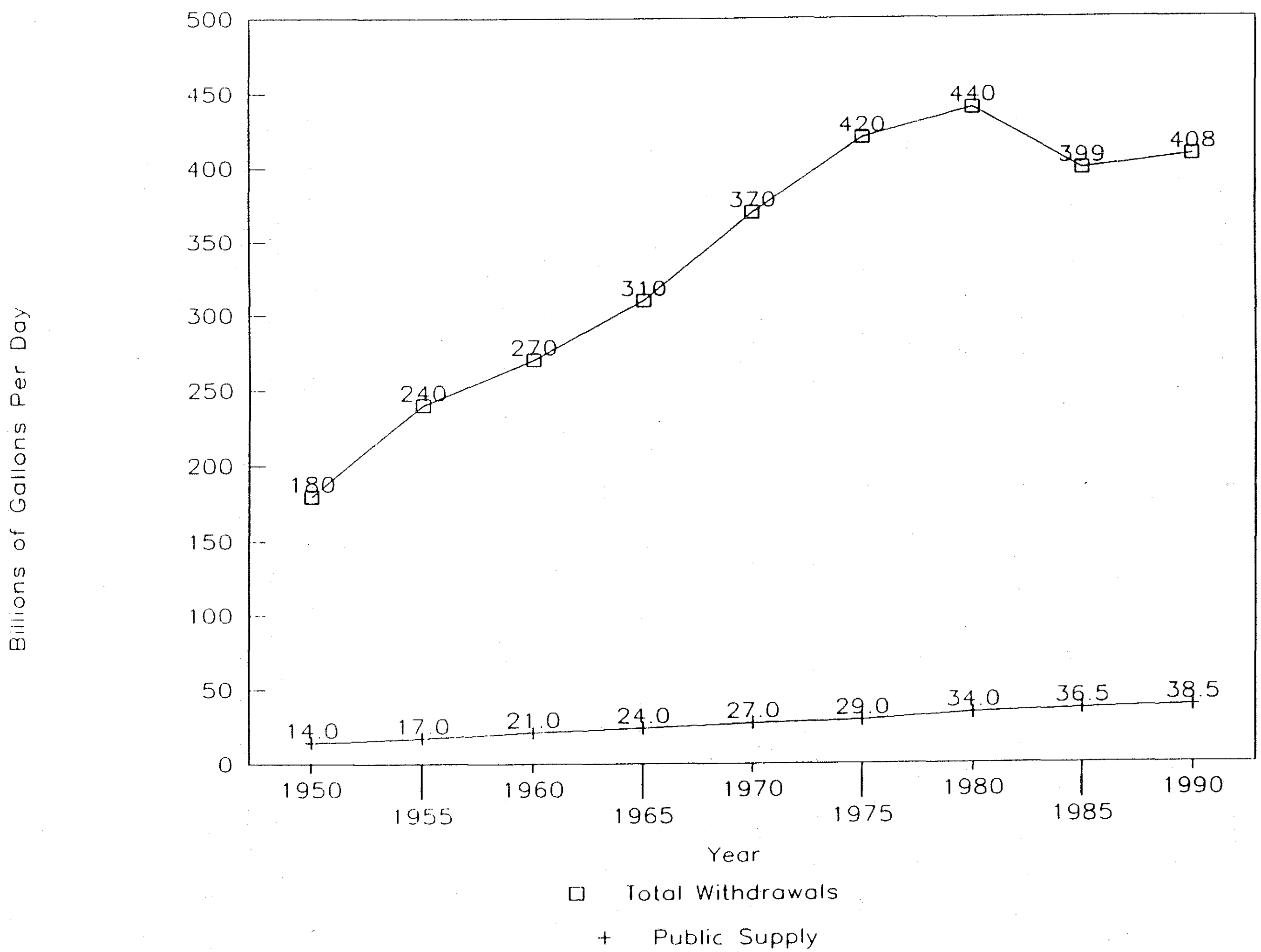

Figure 2-3. Trends in U.S. Water Withdrawals, 1950-1990.

Source: U.S. Geological Survey, *Estimated Use of Water In the United States in 1990,* USGS Circular 1080 (Washington, DC: Geological Survey, 1993), 65.

hourly variations. Thus, some load-management techniques used in electricity are not transferable to water.

Because of the stability in per-capita water demand, efficiency technologies (or demand-side management) have the potential to lower demand for sustained periods. For the past several decades, per-capita water demand has been stable in part because not many new uses for water have been established. In addition, consumer markets for water-using fixtures and appliances (such as dish and clothes washers) are well saturated.[59] Absent per-capita demand growth, therefore, net gains from water conservation can be significant not only for water utilities but also for wastewater utilities.[60] Water conservation can be implemented on the supply side, as well as the demand side. Reducing waste on the supply side (for example, eliminating excessive leaks in the distribution system) can be cost-effective even for areas with abundant supplies since the water saved is an increasingly valuable (or value-added) commodity because of SDWA compliance. Efficiency can help reduce certain operating costs and, in some cases, may result in the downsizing of replaced water plant.[61]

Conservation practices can help consumers exert control over rising water bills. However, consumers may not perceive any short-term savings from reduced usage since water rates still are likely to rise. In other words, SDWA compliance and the replacement of aging facilities will result in higher costs to the water utility, regardless of usage and regardless of conservation efforts. In this context, consumers need to understand that conservation is not necessarily a means of reducing *water rates,* but it can

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[59] Landscaping irrigation might be cited as a relatively recent source of urban water-demand growth, although it hardly can be considered an essential use. Many modern landscape architects emphasize growing regionally appropriate plants and using water-conserving design and maintenance practices.

[60] In some communities, concern about wastewater-system capacity outweigh immediate concern about water-system capacity.

[61] Ahmed Kaloko, "Economic Impact of the Safe Drinking Water Act," in *Proceedings of the Seventh Biennial Regulatory Information Conference* (Columbus, OH: The National Regulatory Research Institute, 1990), 303-318.

be a means of reducing *water bills* in the long term. However, in the case of system capacity expansion driven by growth in consumer usage and demand, conservation is a potentially powerful tool for limiting both rate and bill increases for consumers. Both voluntary conservation and price-motivated conservation can result in the postponement of costly source development and treatment facilities. In some cases, the deferral of these capacity increments can be indefinite.

Conservation may become more important in the future than it has been in the past. Integrated resource planning (IRP) for water utilities is an appropriate vehicle for weighing demand-side management alternatives against supply-side alternatives for meeting demand growth.[62] Utility interest in conservation and planning is clearly on the rise. In the past decade, for example, Denver's utility managers have gone from dismissing conservation as impractical to implementing a variety of demand-management programs. Denver's strategies, which include changing the rate structure and providing customers with incentives to install water conserving fixtures and appliances, are anticipated to reduce demand by as much as 15 percent.[63] More recently, Denver's water planners have expressed an interest in IRP. The change in attitudes toward conservation is driven by fiscal factors (for example, conservation is a means of postponing costly source-of-supply facilities), a strengthening conservation ethic, and growing concerns about the environmental impacts of major water supply projects.

In the long term, demand growth may be the most significant source of cost pressure on the water supply industry, but it also may be somewhat more manageable. If demand and demand growth are viewed as partially controllable, efficiency gains have the potential to offset the capital costs that are more difficult to hold down.

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[62] Janice A. Beecher, James R. Landers, and Patrick C. Mann, *Integrated Resource Planning for Water Utilities* (Columbus, OH: The National Regulatory Research Institute, 1991).

[63] John R. Morris, "Water Conservation Programs in Denver," *Contemporary Policy Issues* 9 (July 1991): 33-45.

Cost-Mitigating Factors

Not all forces affecting the water supply industry contribute to the upward pressure on costs and revenue requirements. Some forces have the potential to exert significant downward pressure on costs. First, *technological innovations* in water treatment and other aspects of utility operations can be expected. Second, water utilities can adopt *efficiency improvements* to reduce waste, conserve resources, and lower production costs (such as energy costs for pumping). Third, water system consolidation can facilitate the achievement of *economies of scale* in source development, water treatment, and utility management and operations. Fourth, *market forces* can lower costs by fostering competition for contracts and services among vendors. In any sector of the economy where millions or even billions of investment dollars are at stake, the rivalry for those dollars is likely to be intense. Fifth, *strategic management* by water utilities can yield savings in such areas as financing, administration, and purchasing.[64] Finally, *integrated resource planning* by water utilities, including a balanced consideration of supply-management and demand-management options, can promote least-cost solutions to a wide range of issues.

Although daunting, rising water utility costs can be mitigated. Water utilities should take full advantage of the forces that can help lower costs. In addition, regulators will want to do everything appropriate within their power to impose downward pressure on water utility revenue requirements. Several strategies for doing so are addressed in subsequent chapters.

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[64] For example, in the summer of 1993, Columbus was able to take advantage of a market opportunity to convert from a soda ash and lime treatment process to a caustic soda and lime treatment process at two of its water treatment facilities, saving nearly a half million dollars annually (City of Columbus Press Release, August 17, 1993).

CHAPTER 3

DETERMINING REVENUE REQUIREMENTS

In the context of state public utility regulation, rising utility costs translate into rising revenue requirements. A revenue requirements perspective can assist regulators in assessing the effects of alternative ratemaking and financing mechanisms on water utilities and their customers.[1] This chapter presents a conceptual framework of the regulatory process and the dynamic relationships at work in the determination of revenue requirements. Also considered is the relationship between rising costs and regulatory risk for jurisdictional water utilities. Readers who are very familiar with the basic concepts of the chapter may want to proceed to the section on the effects of rising costs on revenue requirements.

Dynamics of the Regulatory Process

The traditional method of setting public utility rates equal to a previously observed unit (or average) cost tends to generate a cyclical pattern of relationships. As depicted in figure 3-1, this cyclical pattern involves changes in demand, which induce changes in system capacity design, which induce changes in costs, which induce changes in prices, which lead to further changes in demand, and so on. Of course, this conceptual framework does not constitute a closed system of relationships. Many additional factors influence and complicate the cycle at various points.

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[1] Eugene M. Lerner and Joseph S. Moag, "Toward an Improved Decision Framework for Public Utility Regulation," *Land Economics* 44 (August 1968): 403-409.

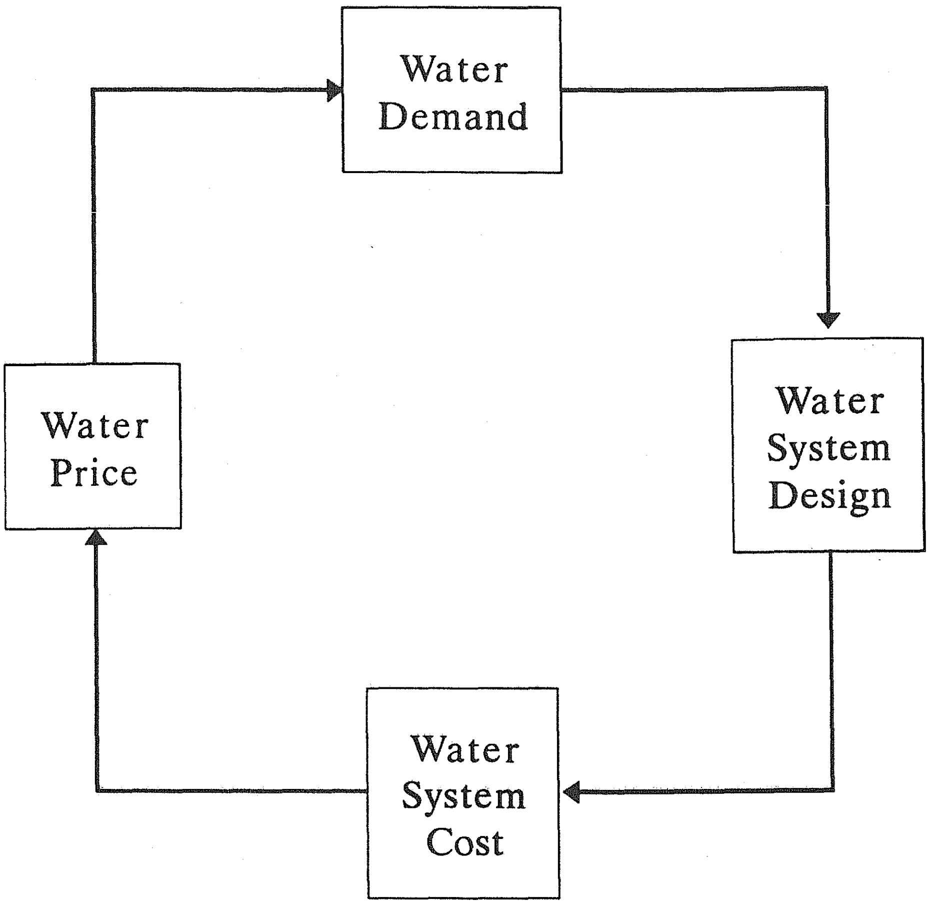

Figure 3-1. The circularity of water system design, cost, price, and demand.

The dynamics of the regulatory process are no less intricate for water utilities than for other public utilities.[2] Some specific relationships can be highlighted. First, the average price or rate level for a regulated water utility is influenced by variables such as operating costs, capacity costs, method of rate-base valuation, and permitted or allowed rate of return. In specific cases, other variables may have substantial influence on the rate level. Second, the rate structure for a water utility is influenced by the authorized rate level, the price elasticities of the various demands for water service, and the costs of providing those services. Third, via price elasticity of demand, the quantity demanded of water service is influenced by both the rate level and the rate structure.[3] Fourth, both the level and the timing of usage influence system capacity requirements. Treatment facilities, for example, generally are designed to meet maximum-day demand while distribution plant is generally designed to meet maximum-hour demand plus fire-protection flows. Fifth, the two important cost components, operating costs and capacity costs, are influenced by usage or output. The linkage of water system costs and output is complex. For example, the unit-cost implications of increasing service within the constraint of existing capacity differ from the unit-cost implications of increasing service by expanding system capacity. The behavior of unit costs varies with the water system component. Economies of scale in water treatment, for example, may be offset by diseconomies in water distribution. The behavior of unit costs also tends to vary with the source of output expansion; that is, an increase in per-capita usage has a different impact on unit costs than do either an increase in consumer density or an expansion in the system service area. In sum, different cost outcomes can occur varying with the time horizon, water system component, and the nature of the demand change. Finally, the quality of water service is influenced by several variables including rate levels, quantity

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[2] Patrick C. Mann, "The Dynamics of Traditional Rate Regulation," in *Research in Law and Economics,* edited by Richard O. Zerbe, Jr. (Greenwich, CT: JAI Press, 1979), 195-212.

[3] Indoor water demand is considered fairly price-inelastic; outdoor water demand (for lawn irrigation, swimming pools, car washing, and other uses) is considered more price-elastic.

demanded relative to system capacity, and supply sources. In turn, the water quality attribute affects both water utility costs and rates.

Obviously, the numerous linkages among these variables can pose problems for water utilities and regulators in establishing rate levels and rate structures. In addition, the information requirements pertaining to these variable relationships are substantial.[4] However, to prevent either excessive or inadequate earnings, to minimize rate discrimination and cross-subsidization, and to stimulate cost efficiency, regulators make use of the dynamic properties of the regulatory process.

Determining revenue requirements, financing capital expenditures, allocating costs, and designing rates are separate but intrinsically related processes. Pricing focuses on sending appropriate signals to consumers. In an economic regulatory context, pricing for water utilities involves determining revenue requirements, capital financing, cost allocation, and tariff design.[5] Regardless of ownership and regulation, most water utilities are guided in these endeavors by certain basic principles. A sampling of these principles appears in the policy statement of the American Water Works Association (AWWA):[6]

- Every water utility should receive sufficient revenues from water service and user charges to enable it to finance all operating and maintenance expenses and all capital costs.

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[4] Eugene M. Lerner and Joseph S. Moag, "Information Requirements for Regulatory Decisions," in *Rate of Return Under Regulation: New Directions and Perspectives,* edited by Harry M. Trebing and R. Hayden Howard (East Lansing, MI: Institute of Public Utilities, Michigan State University, 1969), 195-204.

[5] Beecher and Mann, *Cost Allocation and Rate Design for Water Utilities,* (Columbus, OH: The National Regulatory Research Institute, 1990).

[6] "Board Approves Revisions to Four Policy Statements," *AWWA MainStream* 36 (April 1992): 11.

- Water utilities should maintain their funds in separate accounts. Such funds should not be diverted to uses unrelated to water utilities. Reasonable payment in lieu of taxes or for services rendered may be considered after taking into account the contribution for fire protection and other services furnished by the utility.

- Every water utility should adopt a uniform system of accounts based on generally accepted accounting practices. The system of accounts should follow the accounting procedures outlined in the water utility accounting textbook published by AWWA. Modifications may be made to satisfy the financial needs of the utility and to meet the requirements of regulatory bodies.

- Water rate schedules should distribute the cost of water service equitably among all classes of customers, to the customers within a class, and for each type of service.

Revenue Requirements Methodologies

Determining utility revenue requirements involves an examination of aggregate annual costs, including operating as well as capital costs. This determination of the aggregate annual required revenues thus involves the prudent investment standard and the least-cost principle. Financing capital or capacity expenditures involves an examination of alternative funding mechanisms. This selection of the funding mechanism impacts on revenue requirements and also involves the prudent investment standard and the least-cost principle.

Cost allocation assigns the required aggregate revenues across customers and involves the principles of cost causation, cost traceability, cost avoidability, and cost variability. The purpose of analyzing costs is to provide a basis for rates. Thus, the selection of the rate design and related charges uses the cost allocation outcome as a benchmark and involves the standard of cost causation, as well as such criteria as equity, affordability, stability, and consumer understanding.

The following paragraphs provide a general overview of the conventional processes used to determine revenue requirements, allocate costs, and design rates, followed by a brief discussion of evaluation criteria for use in considering alternatives to the conventional approaches.

Two methods for determining a water utility's total revenue requirements generally are accepted. The choice of approach tends to vary with ownership form.[7] Under the "utility" approach, the total cost of service for investor-owned or privately owned water utilities is the sum of operation and maintenance expenses, taxes, depreciation, and rate of return on rate base. Under the "cash-needs" approach, the total cost of service for publicly owned or municipally owned water utilities is the sum of operation and maintenance expenses, tax equivalents, debt-service payments (including both interest charges and repayment of principal), contributions to specified reserves, and capital expenditures not financed either by debt capital or contributions. The utility approach may be mandated for those publicly owned water utilities under state commission jurisdiction.

The basic revenue requirement formula for investor-owned water utilities is:

$$R = O + D + T + rB.$$

where:

R = revenue requirements,
O = operation and maintenance expenses,
D = annual depreciation charges,
T = taxes,
r = permitted rate of return (cost of capital), and
B = rate base = (V - d) = book value of assets.

where:

V = rate base valuation, and
d = accumulated depreciation.

[7] American Water Works Association, *Revenue Requirements,* AWWA Manual M35 (Denver, CO: American Water Works Association, 1990); and American Water Works Association, *Water Rates,* AWWA Manual M1 (Denver, CO: American Water Works Association, 1991).

Rate of return equals the weighted sum of the cost of debt capital and the cost of equity capital; therefore, its formulation is:

$$r = k(E/C) + i(I/C).$$

where:

k = cost of equity capital,
E = total equity capital,
i = cost of debt capital (a weighted average),
I = total debt capital, and
C = total equity and debt capital.

In contrast, the basic revenue requirement formula for publicly owned water utilities is:

$$R = O + T + D + C.$$

where:

R = revenue requirements,
O = operation and maintenance expenses,
T = tax equivalents,
D = debt-service payments (interest charges and principal), and
C = capital expenditures not financed by debt.

The essential difference between the two revenue requirements approaches is in their coverage of capital expenditures. With the utility approach, capital expenditures are covered in the depreciation and rate-of-return components. The latter component provides for both interest payments on debt capital and a rate of return on equity capital. With the cash-needs approach, capital expenditures essentially are covered in the debt-service cost and direct capital expenditures components.

Revenue requirements are generally expressed in terms of a test year; that is, the relevant financial data are expressed on an annualized basis.[8] The test year is either historical, current, or future. A historical test year is defined as a prior twelve-month period for which actual utility cost data are available. A current test year is defined as a twelve-month period that includes both historical and projected utility cost data. A future test year is defined as a twelve-month period commencing after the rate changes are to be implemented.

The concept of a future test year can be expanded to a longer, forward-looking rate period. This approach would involve developing revenue requirement projections for the period for which the new rates are to be effective (for example, five years). In this approach, historical or actual cost data would provide the basis for projecting future revenue requirements. This approach merges revenue requirement determination into financial planning.[9] The financial planning exercise can either be short-term (for example, one to three years) or long-term (for example, three to five years).

Cost Allocation

Only about two-thirds of the state public utility commissions regulating water utilities require cost-of-service studies.[10] Most of the commissions seem to prefer fully allocated or fully distributed cost analyses for the water sector.[11] Two distinct average

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[8] American Water Works Association, in *AWWA Seminar Proceedings: Revenue Requirements* (Denver, CO: American Water Works Association, 1989).

[9] American Water Works Association, in *AWWA Seminar Proceedings: Water Utility Financial Planning* (Denver, CO: American Water Works Association, 1988).

[10] Janice A. Beecher and Nancy Zearfoss, *1992 Survey on Commission Ratemaking Practices for Water Utilities* (Columbus, OH: The National Regulatory Research Institute, 1992).

[11] Beecher and Mann, *Cost Allocation.*

cost (or embedded cost) approaches are used in the water sector.[12] One approach involves the use of the commodity-demand method; this costing method is essentially a noncoincidental peak responsibility approach that considers the level of peak demand but does not incorporate either the timing of peak demand or the level of average demand in the allocation of capacity costs. The commodity-demand approach, by ignoring direct responsibility for water system peak demands, allocates some system capacity costs to all user classes. Another embedded-cost approach involves the use of the base-extra capacity method; this costing method essentially is an average-and-excess demand approach that considers peak demand and average demand but does not incorporate the timing of peak demand in the allocation of capacity costs. The base-extra capacity method, by allocating capacity costs between base and excess categories, apportions some capacity costs on the basis of usage, rather than on the basis of class maximum demands.

Factors that can cause the cost of service to vary across customer classes include demand characteristics and the location of customers.[13] Demand characteristics or patterns include the level of usage (that is, average-hour demand, average-day demand), timing of usage (that is, maximum-hour demand, maximum-day demand), as well as customer daily load factors (that is, average-hour demand/maximum-hour demand) and customer annual load factors (that is, average-day demand/maximum-day demand). Customers with lower load factors tend to cause higher unit costs (average costs) than do customers with higher load factors. The location of customers involves the distance that a customer is located from source-of-supply and treatment facilities. The distance from the potable water supply can cause a difference in the cost of delivering water to specific customers and thus can be a basis for establishing pressure zones and geographical divisions for rate setting purposes.

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[12] American Water Works Association, *Water Rates*.

[13] George A. Raftelis, *Water and Wastewater Financing and Pricing* (Chelsea, MI: Lewis Publishers, 1989).

In addition, cost differences can be caused by differences in service characteristics.[14] Service characteristics or service requirements include quality of service, level of service, and the nature of water service provision (that is, the type of facilities used to serve customers). The type of facilities serving customers involves cases in which larger transmission mains are used to serve large customers, such as industrial firms and institutions. It is possible to allocate to these customers only the operating and capital costs of larger transmission mains and not the costs related to smaller distribution lines serving only residential and commercial users.

Demand patterns, customer location, and service characteristics are cost-causing characteristics. The implication of these factors is that customers with, for example, similar service requirements and patterns of usage can be placed in the same class of service for rate design purposes. The intent of customer classification is to separate customers into groups with similar load and service characteristics. If all customer usage patterns and service requirements were similar, there would be little reason to segment customers. In reality, customer annual use, peak usage patterns, and service characteristics do vary to some degree. These variances can be the basis for the construction of a limited number of customer classes.

Cost allocation for water utilities, like cost allocation for other utilities, is based on the concept of averages (such as average load factor, average maximum-hour demand, and average maximum-day demand). The process of designing customer classes extends the averaging concept to customers within customer groups (implying that the average customer differs across customer classes). However, many customers in any specific class are not average; their load factors and maximum demands vary. Thus, whether the water utility has one general class of customers or has several classes of customers, the end result will be some degree of price discrimination. In other words, rates will never perfectly match the cost of providing service to specific customers within the general

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[14] Frank B. Constanza, "Considerations in Distributing Costs of Service to Customer Classes," in *AWWA Seminar Proceedings: Water Rates--An Equitability Challenge* (Denver, CO: American Water Works Association, 1983), 40-51.

class of customers or within the specific customer classes. Price discrimination is an inevitable result of the averaging process in water rate design.

Water utility costing and subsequent rate design generally involve four types of costs.[15] These cost categories are customer, capacity, operating, and common costs. The use of these cost categories incorporate the concepts of cost causation and cost avoidance. Certain actions cause specific water system costs and avoidance of these actions eliminates these system costs.

Customer (or access) costs include those costs (for example, billing, meter reading, and metering equipment) associated with having a customer connected to the system and vary with the number of customers. Customer costs can be recovered either via a one-time front-end charge or via a periodic service charge. Capacity (demand) costs include those costs (for example, depreciation of system capacity) that vary with both system maximum demands and average demands. Capacity costs can be recovered via a commodity or usage charge, possibly varying with seasons.

Operating (or commodity) costs include those costs (for example, treatment chemicals, and pumping) that vary with volume of usage. Operating costs can be recovered via a usage or volumetric charge. Finally, common (overhead) costs include those costs (for example, administrative and general) that are generally independent of the number of customers, maximum demand, average demand, and volume of usage. Common costs can be recovered via a periodic service charge.

Rate Design

Cost allocation is intrinsically related to utility rate design, or how the revenue requirement will be collected from customers. Rates send an important economic signal to ratepayers, which is why they should reflect the full cost of water service. Proper pricing of water service in some circumstances may help postpone or reduce the need for

[15] Steve H. Hanke and John T. Wenders, "Costing and Pricing for Old and New Customers," *Public Utilities Fortnightly* 111 (April 29, 1982): 43-47.

water system expansion. In this instance, rates are a financial tool, not because of their relation to revenues but because of their role in determining consumption levels and hence capacity needs.

The conventional approach to water utility rate design is to employ a single rate structure that applies to all retail customers. In theory, the rate structure recovers the costs of service for different user classes by correct design of the consumption blocks. For instance, the first usage block can be designed to incorporate the bulk of small residential usage, the second usage block can be designed to incorporate the bulk of large residential usage, the third usage block can be designed to incorporate commercial usage, and the final block(s) can cover the usage of large industrial or institutional users. In designing water rates, many water utilities continue to use a decreasing-block (or declining-block) rate schedule. However, two rate structures that are gaining wider application in the industry are uniform commodity rates and increasing-block (or inverted) rates.

With a decreasing-block rate the incremental unit price declines with higher usage blocks. In effect, customers who purchase larger quantities of water pay a lower price per gallon (or cubic foot) than customers who purchase smaller quantities. Conceptually, this rate form is cost justified when the underlying cost structure is one of decreasing unit costs with increasing usage (that is, economies of scale associated with system capacity expansion and improved capacity or load factors associated with increased capacity utilization rates). Under the decreasing-block schedule, these cost savings are passed on to water consumers. In a uniform commodity rate structure, one rate applies to all usage (thus the incremental unit price equals the average unit price). Compared with decreasing-block rates, uniform rates can encourage conservation behavior. A less common rate structure, which is gaining acceptance in part because of conservation goals, is the increasing-block rate in which the applicable incremental price increases with higher usage blocks. The increasing-block rate structure has been advocated as a form of conservation pricing on the basis of increasing unit (or average) capacity costs associated with system expansion.

When considering rate structure alternatives, utilities place a premium on revenue stability.[16] Many water utilities prefer decreasing-block rates because they are least sensitive to demand fluctuations associated with customer conservation. However, in a forced choice, water utilities also seem to prefer uniform rates over increasing-block rates for the same reason. Utilities can be very comfortable with uniform rates if per customer demand is growing, but this typically is not the case for water demand. A brief summary of some of the advantages and disadvantages associated with the three basic rate structures is provided in table 3-1.

Water rate structures are changing in response to changing economic and regulatory conditions. In particular, conservation-oriented pricing structures are increasingly used in many parts of the country. In a comprehensive survey of 1992 water rates, Ernst & Young analysts observe:[17]

- In the West, where water resources tend to be more scarce, conservation rates are commonplace among the survey group [of utilities].
- In the Midwest, where water resources tend to be plentiful and heavy, water consuming industry is key to the local economy, conservation rates are not popular. Between 1986 and 1992, the percentage of conservation rate structures have remained relatively constant.
- In the Northeast there has been a substantial increase in the number of conservation rate structures. Currently, about 50 percent of the rate structures have conservation characteristics.
- Slightly higher than 50 percent of the South's rate structures have conservation characteristics.

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[16] Christopher P.N. Woodcock, "National Trends in Water Pricing," a paper presented at the annual conference of the American Water Works Association, San Antonio, Texas, June 6-10, 1993.

[17] *Ernst & Young's 1992 National Water and Wastewater Rate Survey* (Charlotte, NC: Ernst & Young, 1992), 17.

Many variations of the three basic approaches to rate design for water utilities can be found. In chapter 6, consideration is given to some alternative and less commonly used rate structures that may enhance the ability of water utilities to meet revenue requirements under certain circumstances.

TABLE 3-1

EVALUATING THREE BASIC WATER UTILITY RATE STRUCTURES

DECREASING-BLOCK RATE STRUCTURE

Advantages

- Certain costs of water provision are fixed in nature (for example, depreciation of distribution mains) and thus automatically decline with increasing water consumption. These savings are passed along.
- Some users with relatively price-elastic demand (such as industrial customers) may require lower rates to induce them to remain on the system. The lower tail-block rates can prevent large user withdrawal from the system (or bypass), which causes the remaining users to bear a larger portion of total system costs.
- Some large industrial users have better load factors than residential users; thus, the short-term unit capacity cost of supplying these large users is lower.
- Local economic development and retention of existing industry can be introduced as a factor in designing rates.

Disadvantages

- It can be difficult to track costs with precision, given that some unit costs (such as those for pumping) tend to increase with an increasing volume of service and other unit costs (such as those for treatment) tend to remain relatively constant with an increasing volume of service.
- Volume discounts (or intrablock rate differentials) may not be cost justified; that is, they may not be defensible on the basis of cost causation principles.
- It can give the appearance of encouraging consumption over conservation.

(continued)

TABLE 3-1 (continued)

UNIFORM RATE STRUCTURE

Advantages

- Certain unit costs of water supply (for example, treatment) remain relatively constant with increasing volume of service.
- Utilities benefit from revenue stability.
- Prevailing notions of fairness and equity are satisfied.
- Volume discounts, which can discourage conservation, are not provided.
- The rate structure is relatively simple, involves low administrative and implementation costs, and is easy for consumers to understand.

Disadvantages

- It can be difficult to track unit costs of water supply with precision. Some water supply costs (such as administrative and general costs) are fixed; thus, per-unit costs automatically decline with increasing volumes of service.
- Without a volume discount or low tail-block rate, large users with price-elastic demand (such as industrial customers) may bypass the utility in favor of self-supply, resulting in revenue instability and possibly stranded utility investment.

INCREASING-BLOCK RATE STRUCTURE

Advantages

- Certain unit capacity costs (such as those for source development) increase with growing demand and system expansion; thus, the rate structure can be consistent with marginal-cost pricing principles.
- Through higher prices, customers are sent a strong conservation signal.

Disadvantages

- Decreasing average demands, without an accompanying decrease in peak or maximum demands, reduce load factors and contribute to utility revenue erosion.
- Facing higher tail-block rates, large users with price-elastic demand (such as industrial customers) may bypass the utility in favor of self-supply, resulting in revenue instability and possibly stranded utility investment.

Source: Authors' construct.

Rising Costs and Revenue Requirements

Complying with the Safe Drinking Water Act (SDWA), improving the water-supply infrastructure, and meeting demand growth will affect many aspects of water utility operating and capital costs, and hence revenue requirements and rates. The convergence of these forces presents a distinct challenge to the state public utility commissions, especially in terms of segregating and evaluating costs and cost impacts.

Regulation has long dealt with infrastructure and demand growth costs. SDWA costs may take regulators into somewhat less familiar territory, although the basic principles of economic regulation still apply. Regulators must apply the prudence standard to capital investments in compliance technology and the reasonableness standard to operating costs associated with compliance.[18] That is, the public utility commissions must ensure that the most efficient means of compliance are adopted, including least-cost financing of capital expenditures. The resulting rates must then satisfy the reasonableness standard and send clear economic signals to customers. Regulators can use a revenue requirements analysis to evaluate financing and ratemaking alternatives to deal with SDWA and other costs.[19]

Given that many large water systems will not be substantially affected by the amended SDWA and given that small systems may be able to postpone compliance (and its associated costs), medium-sized water utilities may emerge as the primary ones making substantial capital investment, incurring additional operating costs, and thus seeking rate recovery for these compliance costs. In brief, the medium-sized utilities will neither be exempted from the SDWA nor be able to avoid the higher rates associated

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[18] Nancy M. Norling, Thomas E. Stephens, and Vivian Witkind Davis, "Safer Water at a Higher Price: Anticipating the Impact of the Safe Drinking Water Act," *Public Utilities Fortnightly* 122 (December 22, 1988): 11-17.

[19] See Benjamin J. Ewers and Kelly E. Wheaton, "The Revenue Requirement Approach to the Analysis of Financing Alternatives," *Public Utilities Fortnightly* 114 (July 19, 1984): 23-29.

with compliance. Prudent and reasonable costs will be passed on to ratepayers who, absent mitigative measures, may experience rate shock.

Rate shock occurs when the incremental increase in utility rates (or customer bills) is great enough to potentially affect customer demand. Rate shock usually is accompanied by ratepayer outcry against both the utility and rate regulators. Some large customers may threaten to leave the utility system altogether, in favor of self-supply or some other form of bypass. If this occurs, the problem of stranded utility investment contributes further to the financial woes of the utility and its captive ratepayers, who must continue to cover the utility's fixed costs.

Some rate shock in the water supply sector seems inevitable. As seen in table 3-2, monthly charges for water service are on the upswing today as cost impacts are beginning to be felt. In only five years, between 1986 and 1992, rates increased between 31 and 63 percent. Understandably, the highest increase was for the lowest tier of rates. For these

TABLE 3-2
NATIONAL SURVEY OF MONTHLY WATER CHARGES, 1986 TO 1992 (a)

	1986	1988	1990	1992	Increase 1986 to 1992	Percent Change
Low	$2.84	$3.02	$3.66	$4.63	+$1.79	+63%
Average	9.41	9.95	11.16	12.35	+2.94	+31%
High	21.95	21.30	22.95	32.17	+10.22	+47%

Source: Ellen M. Duke and Angela C. Montoya, "Trends in Water Pricing: Results of Ernst & Young's National Rate Surveys," *American Water Works Association Journal* 85 (May 1993): 56.

(a) The monthly charges reported are for residential customers at 1,000 cubic feet (7,480 gallons); the average is based on summer rates where seasonal rates apply. The low, average, and high groupings are those of the study's authors.

systems, rates may have been inadequate for meeting revenue requirements even before the impact of additional costs was felt. Interestingly, even the highest tier of rates is still experiencing substantial increases. Some analysts project that rising costs will cause water rates in the 1990s to double (at a minimum), with a continued trend toward increasing-block rates, more uniform rates, and more seasonal rates.[20] Although they can be economically justified, these rate structures can have the appearance of adding to rising consumer prices for water on top of rising costs.

Affordability is emerging as an issue for water utility customers in much the same way it did for energy utilities in the 1970s and 1980s. Because water is a basic human necessity, emotions tend to run high over the issue of affordable water service. Unaffordability creates problems for utilities, as well as their customers. The potential exists for many water utilities to experience uncollectible accounts and shutoffs for nonpayment on a much larger scale than before. Regulatory rules on these issues generally apply only to electric and natural gas utilities and may have to be extended to water utilities and their ratepayers. Low-income consumer advocates will want relief for their constituencies in the form of affordable rate structures (for example, lifeline rates).

As water utility costs rise, rate hearings at the state public utility commissions (and in city council chambers for municipal systems) will become more comprehensive, complex, and controversial. Table 3-3 reports a sampling of regulatory issues for the period 1986-1992, based on commission proceedings involving water utilities reported in the NRRI *Quarterly Bulletin*. Most of the proceedings reported were rate cases. Many of the rate cases, including the general rate requests, were driven by capital improvements projects. The emergence of proceedings concerning utility transactions, such as loan approvals, also might be indicative of the industry's changing cost profile. As commissions explore ratemaking and financing alternatives for water utilities, the number and scope of rate cases and other proceedings is expected to expand.

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[20] David F. Russell and Christopher P.N. Woodcock, "What Will Water Rates be Like in the 1990s," *American Water Works Association Journal* 84 (September 1992): 68-72.

TABLE 3-3

SURVEY OF COMMISSION PROCEEDINGS ON WATER UTILITIES, 1986 TO 1992

Topic	1986	1987	1988	1989	1990	1991	1992	Total
Rate Cases (n=116)								
General rate request	-	-	5	9	22	28	6	70
Capital improvements	1	2	4	2	2	4	1	16
Expenses/cost of service	3	3	-	3	4	-	-	13
Rate structure	1	1	1	6	2	-	-	11
Equity/efficiency	-	2	1	-	2	-	-	5
Rate reduction	-	-	-	-	-	1	-	1
Transactions (n=9)								
Ownership	-	-	1	-	2	1	1	5
Loan request	-	-	2	-	-	-	-	2
Receivership	-	-	-	1	-	-	-	1
Land transfer	-	-	-	-	-	1	-	1
Service Fees (n=5)								
Taps/connections	-	-	2	-	-	-	-	2
Fire protection	-	-	-	1	-	-	1	2
Administrative expenses	-	-	1	-	-	-	-	1
Miscellaneous (n=18)								
Rules/policy	2	-	3	1	-	1	3	10
Jurisdiction	-	-	-	-	-	-	2	2
Mismanagement	-	2	2	-	2	-	-	6
Total	**7**	**10**	**22**	**23**	**36**	**36**	**14**	**148**

Source: Based on a nonrandom sample of 148 water utility cases reported in the NRRI *Quarterly Bulletin* (Columbus, OH: The National Regulatory Research Institute).

Staff at several state commissions have prepared extensive analyses of cost and rate impacts of SDWA compliance on their jurisdictional utilities. Appendix A of this report presents an analysis of SDWA rate impacts prepared in late 1989 for the New York Department of Public Service.[21] This analysis is especially useful in setting forth basic assumptions and segmenting the analysis according to utilities of different size. For small water systems (serving 50 to 500 customers), a surcharge mechanism and loan financing are considered. For medium-sized systems (700-3,000 customers) and large systems (10,000-110,000 customers), loan financing is considered for treatment projects scaled to the size of these systems. Again, the economies of scale in water treatment are readily apparent. The rate impact on small systems, with so few customers over which to spread costs, is far greater than the rate impact on larger systems. However, a somewhat striking finding is that the annual rate impact could be affordable for many water customers. For the largest systems, the impact is virtually undetectable. A drawback of the analysis, of course, is that it is limited to capital costs and does not consider operation and maintenance costs (including costs for monitoring water quality).

Two revenue requirements studies of SDWA costs are presented in tables 3-4 and 3-5. The first is an analysis of impacts on a small system in Pennsylvania; the second is an analysis of impacts on a medium-sized utility in Delaware. The small system case considers traditional and alternative financing for a packed tower aeration system costing \$156,000.[22] The rate impact ranges from 7.37 to 11.43 percent. This analysis also considers future water bills as a percentage of median family income (approximately 1.5

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[21] New York Department of Public Service, *Committee Reports, Volume II, Safe Drinking Water Act Committee,* Case 88-W-221, Proceeding on Motion of the Commission to Examine the Impact of Environmental Protection, Water Supply and Conservation Issues on Jurisdictional Water Utilities and to Investigate the Problems of Small Water Companies, October 2, 1989.

[22] The alternative financing arrangement in this case is a PENNVEST loan, which has depreciation and income-tax effects. Financing alternatives, including the PENNVEST program, are addressed in chapter 4.

TABLE 3-4
REVENUE REQUIREMENTS ANALYSIS OF SDWA COSTS FOR A SMALL WATER UTILITY

Capital Costs for Packed Tower Aeration		
Land	$15,000	
Equipment	26,000	
Installation	100,000	
Capitalized overheads	2,820	
AFUDC	12,225	
Total capital costs	**$156,045**	
	Traditional Financing	**Alternative Financing (a)**
Return on rate base		
Rate base cost	156,045	156,045
Rate of return	10.85 %	2.0 %
Return on rate base	**$16,931**	**$3,121**
Expenses		
Operation and maintenance	14,044	14,044
Depreciation	3,121	0
Amortization	0	7,802
Taxes other than income	1,560	1,560
Income taxes	5,504	0
Total expenses	**$24,229**	**$23,407**
Total incremental revenue requirement	**$41,160**	**$26,528**
Existing revenue requirement	**$360,065**	**$360,065**
Impact on rates (percentage)	**11.43 %**	**7.37 %**
Customer impact analysis		
Number of customers	958	958
Current customer bill	$386	$386
Future customer bill	$429	$414
Future bill as a percent of median income	1.57 %	1.52 %

Source: Correspondence dated January 10, 1991, from Robert A. Rosenthal, Pennsylvania Public Utility Commission.

(a) The alternative financing arrangement is a PENNVEST loan.

TABLE 3-5

REVENUE REQUIREMENTS ANALYSIS OF SDWA COSTS
FOR A MEDIUM-SIZED WATER UTILITY

	Total Expenditures (000)	Annualized Revenues (000)	Percent Increase in Revenues
Proforma Revenue Per Rate Filing	---	$11,779	---
Test Year 12/31/92			
Impact of pilot study and phase 1	$3,775	550	4.67%
Subtotal		12,329	
Test Year 12/31/94			
Impact of contract 2 (phase 1)	11,000	1,600	12.98
Subtotal		13,929	
Test Year 12/31/95			
Impact of contract 2 (phase 2)	7,100	1,050	7.54
Subtotal		14,979	
Test Year 12/31/96			
Impact of contract 3	7,300	1,100	7.34
Total Annualized Revenues	---	**$16,079**	---
Annualized Impact			
Total additional revenue impact (000)		$4,300	36.5%
Customers served (as of May 31, 1993)		29,838	---
Additional revenue impact per customer		$144	---
Total revenues per customer		$539	---

Source: Correspondence dated July 29, 1993, from Kathleen Pape, General Water Works Corporation. This analysis considers only the cost of complying with the surface water treatment rule of the SDWA. Revenue requirements do not reflect inflation, other operating expenses, or other utility plant increases.

percent).[23] The second analysis considers the phased impact of a capital project to comply with the surface water treatment rule. The revenue impact represents an increase of $4.3 million (a 36.5 percent increase) and the annual impact is about $144 per customer.

Although these analyses are anecdotal, they are suggestive of the impact of SDWA costs from a revenue requirements perspective. The basic methodologies can be replicated not only for SDWA cost impacts but for other cost issues as well, such as a source of supply option. The SDWA and other cost pressures will not affect any two utilities alike. Nor will each regulatory agency deal with these costs in exactly the same ways. These and other variables are key determinants of utility risk.

Rising Costs and Regulatory Risk

The increasing capital and operating requirements of the water utility industry pose the question of whether the industry is becoming more risky and whether increased risk will be translated into higher costs of equity capital for investor-owned water utilities and higher costs of debt capital for government-owned water utilities. In the context of utility regulation, the perception of higher risk translates into higher authorized rates of return. When surveyed, thirty-seven of the forty-five commissions with water utility jurisdiction indicated that they consider the relative risk of the water supply industry when determining the allowed return on equity.[24]

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[23] Two percent of median income is sometimes used as a gauge of affordability.

[24] Beecher and Zearfoss, *1992 Survey.* The commissions also reported that they consider: the quality of service (twenty-two commissions), the quality of management (nineteen commissions), attrition adjustments (four commissions), and a variety of other issues (such as local economic conditions).

As a general rule, public utilities face three principal sources of risk:[25]

- *Business risk* includes uncertainties resulting from competition and the economy. Potential costs to meet new environmental regulations are generally considered a form of risk imposed on all businesses, whether or not subject to monopoly regulation.

- *Financial risk* reflects the utility's capital structure and generally increases as the utility's debt ratio increases. The idea of an "optimal" capital structure for rate regulation is an outgrowth of recognition of the costs imposed on utilities as a result of this form of risk.

- *Regulatory risk* includes unforeseen actions that might be taken by rate regulators, such as disallowance of operating expenses or rate-base additions. New rate mechanisms, such as price caps or incentive plans, may also create risk for investors.

Understandably, representatives of investor-owned water utilities believe that their industry is becoming more risky. The argument for increased business and financial risk for the industry flows from several factors associated with the three major cost pressures on the industry. First, much uncertainty continues to surround implementation of the SDWA, as well as other federal and state environmental mandates; the ultimate compliance cost impacts still are unknown. Not all of the required SDWA rules have been promulgated, and it is possible that Congress will reconsider some provisions of the legislation. Second, even more uncertainty exists over the actual condition of the water supply infrastructure and what improvements will be necessary to bring it up to standards. Third, considerable uncertainty regarding future demand exists given the potential for demand elasticity effects from large rate increases. Other inducements for conservation also will affect water demand.[26] Uncertainty also surrounds the availability

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[25] *Re Pacific Gas & Electric Company* (California PUC, 1991) as reported in Phillip S. Cross, "Equity Returns and Risk Evaluation: Recent Cases," *Public Utilities Fortnightly* 129 (February 15, 1992): 45.

[26] These inducements, which may be price related, include newly enacted plumbing efficiency standards, improved landscaping practices, and an evolving consumer conservation ethic. Water conservation also will be affected by utility efforts in supply

and reliability of water supplies for meeting demand growth. All of these factors can complicate forecasting and planning.

The water utility industry also faces regulatory risk, which indeed may be the kind of risk that concerns its representatives the most. Like most forms of risk, regulatory risk is about uncertainty, in this case the uncertainty associated with the treatment of costs by regulatory agencies. Regulatory risk accompanies not only SDWA costs but *all* water utility costs, including those associated with infrastructure improvement and demand growth. Regulatory risk is manifested in various approval processes, prudence and reasonableness reviews, and general regulatory lag and delays. The prospect of rate-base exclusions and revenue-requirement disallowances during periods of rising costs is especially disconcerting to utility managers. The water supply industry openly strives to reduce regulatory risk through the establishment of certain and expeditious cost recovery mechanisms.

As a source of risk to the water supply industry, the SDWA seems to receive the most publicity. Indeed, at least one commission concluded that the SDWA increased business risk for regulated water utilities and awarded higher returns on equity based on this finding.[27] Yet, in general, the riskiness associated with SDWA has not been completely established, except for the smaller water utilities whose financial viability was precarious even before more stringent drinking water regulations were enacted. The emotional turmoil surrounding the SDWA may be disproportionate to the actual impact of federal drinking water standards on water utility risk.

From an economic regulatory standpoint, the SDWA may not be the source of risk it sometimes is portrayed to be. In essence, the states are preempted by federal drinking water regulations. The implications of preemption for economic regulators are significant. To the extent that utility investments are prudently made for projects that

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and demand management.

[27] *Re Indiana Cities Water Corp.*, 115 PUR4th 470 (Ind. U.R.C., 1990) and *Re Indianapolis Water Co.*, 112 PUR4th 52 (Ind. U.R.C., 1990), as reported in Cross, "Equity Returns and Risk Evaluation," 45.

will bring utilities in compliance with federal (and state) regulations, it would be hard for regulators to disallow them. The same holds for reasonable operating expenditures associated with compliance. In other words, regulatory risk does not seem to be comparatively large in this context. In fact, investments so mandated are in some ways *less* risky than other expenditures in the context of utility regulation. It might even be asserted that the SDWA actually provides water utilities with a unique opportunity to expand the rate base with relatively little regulatory risk. Moreover, the cost impacts associated with the initial scope of the SDWA are gradually becoming more known and predictable. The argument that these costs pose special regulatory risks should be viewed with caution. By contrast, in the long term, infrastructure improvement and meeting demand growth may prove to be far riskier for the water supply industry.

CHAPTER 4

FINANCING ALTERNATIVES

Regardless of the driving force behind costs--the Safe Drinking Water Act, infrastructure improvements, or meeting demand growth--the capital needs of the water industry over the next few decades will be substantial enough to cause utilities and the governments that own or regulate them to explore alternative financing approaches. According to James Groff of the National Association of Water Companies (NAWC), water utilities in the past decade have increasingly directed their energies to designing creative financial strategies to pay for the capital investment needed for compliance with environmental regulations.[1] For some water systems, innovative alternatives may provide the only way to keep up with growing financial needs. For others, constraints on access to financial resources may threaten their viability and force the consideration of structural alternatives for providing water service, such as consolidation or privatization. For all water utilities, long-range strategic capital-requirements planning and strategic financial planning are becoming a fundamental necessities.[2]

According to the American Water Works Association (AWWA), "With each capital expenditure, utility management should ensure that the system is receiving the most value for the money spent and that total costs to utility customers are kept as low as possible."[3] Approving financial arrangements for major capital projects is within the jurisdiction of many state public utility commissions. Regulatory concerns encompass both the cost of financing and its impact on rates for water service.

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[1] James B. Groff, "The Water Supply Industry Faces the Impact of New Federal Rules," *Public Utilities Fortnightly* 123 (January 19, 1989): 18-21.

[2] American Water Works Association, *Water Utility Capital Financing,* AWWA Manual M29 (Denver, CO: American Water Works Association, 1988).

[3] Ibid., 1.

This chapter provides a descriptive overview of water utility financing. Differences between privately and publicly owned utilities, and the government role in financing are highlighted. As noted earlier, the water industry is similar to other public utilities in that it is highly capital-intensive. The scope of the chapter is limited mainly to major, "lumpy" capital investments, such as those required for source-of-supply development and water treatment plants, which typically require financing over a period of time.[4] A glossary of financing terms appears in appendix D.

Debt Profile of the Water Utility Industry

For publicly owned or municipally owned water utilities, the conventional capital financing techniques are the issuance of long-term bonds, including both general obligation and revenue bonds (debt financing), and the generation of system revenues (internal financing).[5] For investor-owned water utilities, the conventional capital financing techniques are the issuance of common and preferred stock (equity financing), the issuance of long-term bonds (debt financing), and the generation of system revenues (internal financing). All types of water systems make substantial use of debt financing; publicly owned systems rely more heavily on tax-exempt municipal bonds and privately owned utilities make use of industrial revenue bonds, taxable bonds, and bank loans.[6]

Some common patterns in water system financing can be discerned.[7] Capital investment in reservoirs, transmission, and treatment generally are financed by debt (for

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[4] A feature of most public utilities is their reliance on large increments or lumps of capacity to provide a service.

[5] See Ronald L. Coy, "Financing Capital Requirements," in *AWWA Seminar Proceedings: Developing Financial Programs in the 80's* (Denver, CO: American Water Works Association, 1984).

[6] Wade Miller Associates, Inc., *The Nation's Public Works: Report on Water Supply* (Washington, DC: National Council on Public Works Improvement, 1987).

[7] Patrick C. Mann, *Water Service: Regulation and Rate Reform* (Columbus, OH: The National Regulatory Research Institute, 1981), 7.

investor-owned and publicly owned systems) and equity borrowing (for investor-owned systems only). Distribution system expansion is generally financed by developer and user hook-up charges with some reliance on borrowing. Operating costs and minor system improvements are generally financed by commodity rates; however, in the case of municipally owned systems, rate revenues are occasionally supplemented by subsidies from the local government. Sometimes the subsidy might go the other way, with utility revenues in excess of costs flowing to the municipality.[8]

The nation's many small water utilities, which typically are investor-owned, pose special financing issues. Small water systems have considerable financial needs, epitomized by lacking economies of scale. Their condition is aggravated by lacking access to capital through the usual debt and equity routes that large systems can use. Equity financing is virtually nonexistent and loans are extremely difficult to secure partly because of the limited value of small system assets. Traditional sources of financing for small water utilities are: direct loans from local financial institutions; small tax-exempt bond issues placed in local bond markets; Farmers Home Administration loans, grants, and revenue bond purchases; and state-sponsored local loan programs.[9] Even for small water systems, financing options are gradually expanding through public and private sector initiatives. For example, the 1990 farm bill authorized the National Bank of Cooperatives (CoBank) to expand its loan program to water and wastewater systems serving communities of 20,000 or less in population.[10] An increasing awareness of the financial needs of small water utilities has helped attract some private lenders to help fill the void.[11]

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[8] As utility costs rise, this form of subsidy will become less plausible.

[9] Barry R. Sagraves, John H. Peterson, and Paul C. Williams, "Financial Strategies for Small Systems," *American Water Works Association Journal* 80 (August 1988): 42.

[10] J. B. Trew, "CoBank Loans to Small Investor Owned Water Systems," *NAWC Water* 33 (Fall 1992): 39.

[11] See "Small Company Loans," *NAWC Water* 32 (Fall 1991): 41.

A survey of 766 water utilities, published by the AWWA in 1992, revealed that these utilities incurred a total amount of debt exceeding $20 billion.[12] Most of the debt was classified as long term (96 percent was payable in more than one year). Revenue bonds accounted for two-thirds of the total debt and general obligation bonds accounted for about one-fourth. The remainder (about 8 percent) involved other funding devices.

Although both publicly and privately owned water utilities face considerable capital needs, each also has a distinct debt structure. Table 4-1 reports sources of financial capital used by water utilities according to ownership structure. The data suggest that municipal water utilities are somewhat more likely to use bond markets (an external source of capital), while investor-owned systems are somewhat more likely to use retained earnings (an internal source of capital). The distinctive debt profiles of the publicly and privately owned water utility industries receive ongoing attention, in part because of implications for meeting additional financing needs.

Capital Financing and Ownership Structure

A detailed comparison of conventional capital financing options for privately owned and publicly owned water utilities is presented in table 4-2. Most funding sources are available to systems with either ownership form. Privately owned systems can generate funds internally through retained earnings and tax credits, while municipalities can use operating surpluses as an internal source of capital. Both types of systems have a fairly wide range of external capital financing options, with some mechanisms (such as stock sales) limited to private systems and other mechanisms (such as general-obligation bonds) limited to public systems. Customer sources of capital financing are available to both types of systems, as are most forms of government funding. In short, ownership

[12] American Water Works Association, *Water Industry Data Base: Utility Profiles* (Denver, CO: American Water Works Association, 1992), 60. The database represents 1,097 water utilities; 766 utilities (70 percent) provided debt information.

TABLE 4-1

SOURCES OF FINANCIAL CAPITAL USED BY PUBLICLY AND PRIVATELY OWNED WATER UTILITIES

Source	Percent of Total
Publicly Owned Systems	
Tax-exempt municipal bond market	60%
Retained earnings	20-30
Intergovernmental aid	5-10
Other sources	5-10
Bank loans	
Special tax assessments	
Developers contributions, etc.	
Privately Owned Systems	
Retained earnings	40-50%
Stocks and taxable bonds	20-30
Industrial revenue bonds	10-20
Other sources	20-30
Bank loans	
Developer contributions, etc.	

Source: U.S. Congressional Budget Office, *Financing Municipal Water Supply Systems* (Washington, DC: U.S. Congressional Budget Office, 1986), 50.

form does not necessarily establish mutually exclusive modes of capital financing. Publicly owned and privately owned water utilities may have more in common in this area than generally is believed.

Municipalities use various types of fund accounts to track city revenues and expenditures.[13] Enterprise funds, for example, can be used to finance projects in

[13] Edward S. Lynn and Robert J. Freeman, *Fund Accounting: Theory and Practice* (Englewood Cliffs, NJ: Prentice-Hall, Inc., 1974), 31.

TABLE 4-2
CONVENTIONAL CAPITAL FINANCING MECHANISMS FOR WATER UTILITIES

SOURCES OF FINANCING	PRIVATELY OWNED UTILITIES	PUBLICLY OWNED UTILITIES
INTERNAL REVENUE SOURCES OF CAPITAL FINANCING		
1. Expensing of capital improvements	Yes	Yes
2. Retained earnings	Yes	No
3. Depreciation	Yes	Yes
4. Tax credits	Yes	No
5. Operating surpluses	No	Yes
EXTERNAL SOURCES OF CAPITAL FINANCING		
1. Common-stock sales	Yes	No
2. Capital payments from affiliates		
a. Debt advances	Yes	No
b. Equity contributions	Yes	No
3. Debt sales		
a. Mortgage bonds	Yes	No
b. Debentures	Yes	No
c. Commercial paper	Yes	Yes
d. Demand notes	Yes	Yes
e. Demand bonds	Yes	Yes
f. Short-term notes	Yes	No
g. General-obligation bonds	No	Yes
h. Revenue bonds	No	Yes
i. Revenue-anticipation notes	No	Yes
j. Bond-anticipation notes	No	Yes
4. Bank and institutional loans		
a. Lines of credit		
(1) Construction	Yes	Yes
(2) Working capital	Yes	Yes
b. Collateral and property loans	Yes	Yes
CUSTOMER SOURCES OF CAPITAL FINANCING		
1. Construction advances	Yes	Yes
2. Construction contributions	Yes	Yes
3. Connection charges	Yes	Yes
4. Property assessments	Yes	Yes
5. Special rate structure for new connections	Yes	Yes
GOVERNMENT SOURCES OF CAPITAL FINANCING		
1. Federal loan programs	Yes	Yes
2. State infrastructure bank loans and grants	Yes	Yes
3. Economic-development programs	Yes	Yes
4. Joint-venture authorities or syndicates for construction	Yes	Yes
5. Conversion of municipal departments to authorities	No	Yes

Source: Adapted from Ronald L. Coy, "Financing Capital Requirements," in *Proceedings: AWWA Seminar on Developing Financial Programs in the 80's* (Denver, CO: American Water Works Association, 1984), 56-7.

municipal service areas (such as utility services) where costs can be recovered from the users or beneficiaries of the service. This approach is consistent with basic principles of utility regulation, namely cost allocation according to cost causation. Subsidization of municipal water service from other types of funds is an ongoing source of concern, particularly from the standpoint of economic efficiency and potential inequities. Cost pressure on the industry, however, may create a perceived need to subsidize water utilities, at least in the short term. Pressure to comply with drinking water regulations or face enforcement action or litigation is perhaps most likely to induce municipal governments to consider financial options that would create a subsidization. However, municipal funds may be legally restricted to use for specific purposes. Also, most cities are under pressure to meet a wide range of budgetary obligations (beyond water service) while not raising taxes. To the extent that these forms of legal and political pressure are present, municipalities may be limited in the financial options they can pursue for their water systems.

Evaluations of some of the typical financing instruments used by water utilities to raise capital externally are presented in table 4-3. The analysis provides the potential advantages and disadvantages associated with each instrument. The menu of options includes short-term instruments (fixed-rate notes, tax-exempt commercial paper, and variable-rate demand notes), conventional long-term instruments (general-obligation bonds, revenue bonds, double-barrel bonds, and moral-obligation bonds), and other long-term instruments (variable-rate demand bonds, adjustable-rate bonds, and zero-coupon bonds). Choosing the option best suited to a particular water utility depends on its overall debt profile and, of course, the amount of risk it is willing and able to absorb. The choice of a financing mechanism also will be affected by federal and state tax laws and regulations. For example, some states disallow the use of variable-rate demand bonds or adjustable-rate bonds. As the market for financing options matures, the interest in innovative approaches will grow.

TABLE 4-3

ADVANTAGES AND DISADVANTAGES OF SELECT DEBT INSTRUMENTS FOR WATER UTILITIES

Short-Term Financing Instruments

FIXED-RATE NOTES

Advantages
- No risks exist for potentially higher rates
- Less security is required than with other short-term instruments.
- Issuance period can be up to five years.
- Notes can be issued in lower denominations ($5,000).

Disadvantages
- Interest rates typically are higher than for other short-term financing techniques.
- Specific maturity dates may not coincide directly with a long-term financing schedule.

TAX-EXEMPT COMMERCIAL PAPER (TECP)

Advantages
- TECP usually has the lowest available interest rates in the debt market.
- TECP can be issued with specified maturity date to coincide with long-term financing schedule.
- There is no "put" requirement, interest-rate adjustment period, conversion features, or redemption features.
- Only the amount needed is borrowed initially.

Disadvantages
- Letter of credit is typically required.
- Issuer can be prone to "roll over" debt, creating some instability to the financing worthiness of the issuer.
- There is no ability to convert to a fixed mode.
- Maturing time frame is short (1 to 270 days).
- Administrative time and overview can be more extensive than other short-term financing instruments.
- Minimum size is $50 million.

VARIABLE-RATE DEMAND NOTES

Advantages
- Interest rate is typically lower than fixed rate notes.
- Notes can be issued for periods greater than TECP.
- Notes can be converted to a fixed mode or called without penalty.
- Minimal, if any, program administration is required.

Disadvantages
- Letter of credit is typically required.
- Rates are normally somewhat higher than TECP.
- Notes have a "put" feature within a specified call period.
- Interest-rate adjustment period can be frequent.

(continued)

TABLE 4-3 (continued)

Conventional Long-Term Financing Instruments

GENERAL-OBLIGATION BONDS

Advantages
- Bonds typically have lowest interest rates available on a long-term fixed rate bond.
- Reserve funds are not typically required.
- Administration issuance of bonds is relatively simple, and issuance costs are typically less than other types of debt.
- Bonds provide additional security during the construction stage when operating revenues are not provided.

Disadvantages
- Voter approval is usually required for bonds; as a result, long delays before issuance could result and there is no guarantee that voters will approve the issue.
- Bonds dilute debt capacity of issuing entity.

REVENUE BONDS

Advantages
- Bonds do not affect the debt capacity of the issuing agency.
- Bonds can be used in certain situations where general obligation debt is unavailable.
- Voter approval is not normally required.
- Market timing and structuring are more flexible.
- Bonds can be presold by underwriter to reduce risk and hedge against market volatility.
- Full-cost pricing of utility services is encouraged.
- Bonds allow portfolio diversification, which improves market access for issuer.
- Essential services of community are protected from bankruptcy.

Disadvantages
- Issuance costs tend to be higher than with general obligation debt.
- Investors require higher interest rates with revenue bond issues.
- Bonds carry greater risk of default due to the uncertainty of the revenue stream.
- Restrictive indentures require special reserve funds to be established.
- Coverage requirements on debt service and additional bond tests are typically a part of the bond indenture.
- Since these bonds usually require additional financial restrictions that translate into higher debt service, they usually have a greater impact on the user charges.

DOUBLE-BARRELLED BONDS

Advantages
- Bonds have same advantages as general obligation bonds except debt service payments are secured first by project revenues and second by the taxing power of the issuing agency.

Disadvantages
- Bonds have same disadvantages as general obligation bonds except that issuance of the bonds may not have as much of a negative impact on bond capacity and credit rating as general obligation bonds.

MORAL-OBLIGATION BONDS

Advantages
- Interest rates typically are better than with revenue bonds.
- Bonds do not require voter approval.
- Moral obligation feature can improve marketability of bonds.
- Bonds do not dilute general obligation pledge but can enjoy the strength of its security pledge.

Disadvantages
- Pledge is not legally binding by agency pledging its moral obligation.
- Interest rates typically are above general obligation rates.
- Moral obligation pledge must be approved through the political process.

(continued)

TABLE 4-3 (continued)

Other Long-Term Financing Instruments

VARIABLE-RATE DEMAND BONDS/OBLIGATIONS (VRDBS/VRDOS)

Advantages	• Bonds provide one of the lowest interest rates available in the long-term financing market. • Financing is available for extended periods (up to 35 years). • Bonds can be converted to fixed rates or other short-term notes.
Disadvantages	• Bonds can usually be put back to the issuer on interest rate adjustment dates. • Interest-rate adjustment period is frequent (anywhere from 1 to 30 days). • Line or letter of credit is typically required. • Some states do not permit the use of VRDBs.

ADJUSTABLE-RATE BONDS (ARBS)

Advantages	• Interest rates typically are lower than long-term fixed rate bonds. • Interest-rate adjustment period and "put" period are typically longer than with VRDBs. • Bonds can be issued in small denominations ($5,000).
Disadvantages	• Interest rates are higher than VRDBs. • Line of credit is normally required. • Some states do not permit the use of ARBs.

ZERO-COUPON BONDS

Advantages	• Debt service (interest and principal) can be deferred until maturity. • Tax-free capital gains for the investor can be accumulated and used at maturity.
Disadvantages	• Interest rate may be higher than other long-term debt instruments. • In a declining interest-rate environment, rates may be unfavorable for an extended period. • Failure to set up appropriate sinking fund could require a large outlay by issuer at maturity.

Source: George A. Raftelis, *Water and Wastewater Finance and Pricing* (Chelsea, MI: Lewis Publishers, 1993), 46, 58-59, and 62.

Alternative Financing Mechanisms

At the federal level, considerable attention has been paid to the issue of funding water projects and programs, including funding for state agencies responsible for SDWA implementation.[14] The term "alternative financing mechanism" (AFM) has been used by the U.S. Environmental Protection Agency (EPA), both in the context of funding governmental regulatory programs, as well as for the purpose of raising utility revenues to pay for compliance with environmental mandates. In fact, similar evaluation criteria have been proposed for these different types of AFM applications (that is, revenue stability, administrative feasibility, equity, and so on), regardless of whether they apply to regulatory agencies or utilities. Additionally, reports focusing on alternative financing for drinking water systems have been prepared for many states.[15]

In 1992, the EPA published a compendium on AFMs for environmental programs, including drinking water supply.[16] This compilation encompasses mechanisms to recover capital and operating costs, as well as short-term and long-term mechanisms. As summarized in table 4-4, the EPA identified a total of eighty-two financing alternatives in the following general areas: fees, bonds, loans, grants, credit enhancements, public-private partnerships, economic incentives, taxes (general and sales), special districts, environmental finance centers, and miscellaneous. Appendix B, which is derived from the EPA publication, provides a description of each of general type of AFM, a summary

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[14] U.S. Environmental Protection Agency, *Paying for Safe Water: Alternative Financing Mechanisms for State Drinking Water Programs* (Washington, DC: U.S. Environmental Protection Agency, 1990). See also Office of Ground Water and Drinking Water, *Obtaining Drinking Water Funding: A Review of Eight State Capacity Efforts* (Washington, DC: U.S. Environmental Protection Agency, 1992).

[15] See, for example, Charles A. George and Jason L. Gray, *Alternative Financing: Finding New Ways of Meeting Virginia's Water/Wastewater Needs* (Roanoke, VA: Virginia Water Project, Inc., 1989).

[16] U.S. Environmental Protection Agency, *Alternative Financing Mechanisms for Environmental Programs* (Washington, DC: U.S. Environmental Protection Agency, 1992).

TABLE 4-4
EPA'S ALTERNATIVE FINANCING MECHANISMS

FEES
Utility charges
Connection fees
Facility permit fees or monitoring fees
Application or processing fees
Inspection or certification fees
Emissions or discharge based fees
Disposal fees
Product registration and inspection fees
Recreational fees
Wetlands permit fees
Septic tank fees
Hazardous waste transporter fees
License fees
Impact fees

BONDS
General-obligation bonds
Revenue bonds
Moral-obligation bonds
Double-barrel bonds
Mandate bonds
Certificates of participation
Anticipation notes

LOANS
Commercial loans
Water pollution control state revolving funds (SRFs)
State loan programs
CoBank (National Bank for Cooperatives) loan program

GRANTS
Rural Development Administration Water and Waste Disposal Grant Program
Economic Development Administration Public Works and Development Facilities Grant Program
Department of Housing and Urban Development Community Development Block Grants (CDBG)
Appalachian Regional Commission (ARC) supplemental grants
EPA grants
State grant programs

CREDIT ENHANCEMENTS
State bond banks
Rural Development Administration loan guarantees
Commercial credit enhancements
Collateral arrangements

PUBLIC-PRIVATE PARTNERSHIPS
Private-sector operation
Turnkey arrangements
Build-operate-transfer or build-transfer-operate

PUBLIC-PRIVATE PARTNERSHIPS (continued)
Lease-purchase or operating lease
Lease-develop-operate or build-develop-operate
Sale-leaseback
Tax-exempt lease

ECONOMIC INCENTIVES
Liability assignment
Transferable development rights
Fines and penalties
Assurance or performance bonding
Wetlands mitigation banking
Point-source or nonpoint-source trading
Emissions trading
Land trusts

GENERAL TAXES
Individual income tax
Corporate income tax
Corporate gross receipts tax
Death and gift taxes
Ad valorem property taxes
Personal property taxes
Sales and use taxes

SELECTIVE SALES TAXES
Alcoholic-beverage taxes
Amusement taxes
Feedstock taxes
Fertilizer taxes
Hard-to-dispose taxes
Hotel taxes
Insurance-premium taxes
Litter control taxes
Marine-fuel taxes
Motor-fuel taxes
Real-estate transfer taxes
Rental-car taxes
Severance taxes
Special assessments
Tobacco taxes
Waste-end taxes
Watercraft sales taxes

SPECIAL DISTRICTS

ENVIRONMENTAL FINANCE CENTERS

MISCELLANEOUS
Exactions
Trust funds
Water and sewer access rights
Voluntary mechanisms
Private guarantee mechanisms

Source: U.S. Environmental Protection Agency, *Alternative Financing Mechanisms for Environmental Programs* (Washington, DC: U.S. Environmental Protection Agency, 1992), 17. For a discussion of each general type of AFM, see appendix B.

of advantages and disadvantages, and a discussion of pertinent implementation issues. Again, not all AFMs are available for use by all types of water utilities. However, an increasing array of options is emerging in every category. Perhaps of special interest to the water industry and ancillary industries is the emergence of public-private partnerships (including privatization), which is discussed further in chapter 7.

The EPA also has designed a straightforward evaluation system for alternative financing mechanisms, which appears in table 4-5. However, it does not provide an absolute evaluation that will apply in every circumstance. That is, the system can only be used to assess the potential impact of a mechanism in a given situation, perhaps as a prescreening device. The criteria for evaluation fall into eight areas: capital costs, operating costs, state programs, local programs, revenue stability, administrative feasibility, equity, and incentives. Although no mechanism is likely to satisfy all the criteria, decisionmakers can use an evaluation scheme to identify tradeoffs and narrow the financing options.

Large or small and regardless of ownership structure, many water systems continue to look to government for assistance, particularly with respect to funding government-imposed environmental mandates.[17] While government grants and loans are not likely to emerge as the principal means of funding for the industry, the government role in water utility financing remains important.

The Government Role in Water Utility Financing

Historically, government funding for water and wastewater infrastructure has been more readily available to government agencies. The wastewater industry has relied more heavily on government funding for capital projects than the water supply industry. The legacy of federal funding for wastewater treatment, in fact, has presented a barrier to the use of privatization as a financing option for many municipal wastewater systems (as discussed in chapter 7).

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[17] A somewhat compelling argument can be made in favor of private funding for private enterprise, meaning that investor-owned utilities should not seek or be eligible for government financing.

TABLE 4-5
EVALUATING ALTERNATIVE FINANCING MECHANISMS

Criteria	Interpretation
Capital Costs	*Applicable, partially applicable, not applicable.* Indicates whether the AFM can easily be used to finance capital expenditures. Generally, this will depend on whether revenues can be raised in an amount sufficient to finance capital expenditures.
Operating Costs	*Applicable, partially applicable, not applicable.* Indicates whether the AFM provides ongoing revenues that can be used to meet annually-recurring costs such as salaries.
State Programs	*Applicable, partially applicable, not applicable.* Indicates whether the AFM can be used by state programs.
Local Programs	*Applicable, partially applicable, not applicable.* Specifies whether the AFM can be used by local programs.
Revenue Stability	*Stable, partially stable, unstable.* Provides a general assessment of the potential revenue stability of the AFM, based on the volatility of the revenue base, methods of collection, and the experience of state and local programs with the AFM.
Administrative Feasibility	*Easy, moderate, difficult.* Provides a general evaluation of administrative feasibility of each AFM, based primarily on whether the implementing government can take advantage of existing administrative structures.
Equity	*Who pays? Polluter, beneficiary, general public.* Evaluates whether the burden of payment falls on parties that contribute to the environmental problem (i.e., the polluter), on parties that benefit from cleanup of an environmental problem (i.e., the beneficiary) or upon the general public.
Incentive Effects	*Yes, uncertain, no.* Indicates whether the AFM provides any pollution reduction incentive effects.

Source: U.S. Environmental Protection Agency, *Alternative Financing Mechanisms for Environmental Programs* (Washington, DC: U.S. Environmental Protection Agency, 1992), 15-6.

Recognizing increasing costs and the often limited availability of capital, several states have begun to provide loans or grants to water systems for infrastructure improvements. Most, but not all, of these programs target funds to water systems operated by governmental authorities (municipalities, counties, water districts, and other public authorities). Representatives of the private water industry frequently cite the availability of government funding as one of several key disparities between it and the publicly owned sector. Today, however, eligibility for some government assistance programs has been extended to the private sector.

The thirty-three states that have loan, revolving-fund, or bond-bank programs to finance drinking water capital projects are reported in table 4-6.[18] Another state, Wisconsin, has a grant but not a loan program; sixteen states apparently do not have programs in place to fund drinking water projects. A recent survey by the EPA focused on twelve state assistance programs and reported the following key observations:[19]

- Program capitalization varies from state to state. Legislative appropriations are commonly used to initiate programs and subsidize a lower interest rate on loans. Bonding authority often is extended to these programs to allow capitalization through the issuance of general obligation and/or revenue bonds. In several programs, dedicated revenues from a portion of the state sewer and water, excise, real estate, and mineral severance taxes also are used.

- Several of the programs are designed to be self-sustaining, using loan repayments for additional loans and for the retirement of outstanding bonds. Others receive periodic infusions of capital from legislative appropriations, revenues, or state bond proceeds.

- Eligible entities for the majority of the surveyed programs include political subdivisions such as: municipalities, towns, counties, cities, public authorities, or public service districts. However, three state programs (in California, Pennsylvania, and Texas) have authority to finance drinking water development projects within the private sector.

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[18] U.S. Environmental Protection Agency, *Alternative Financing Mechanisms.* See also, American Water Works Association, *Water Utility Capital Financing.*

[19] U.S Environmental Protection Agency, *An Overview of Existing State Alternative Financing Programs: Financing Drinking Water System Capital Needs in the 1990s* (Washington, DC: U.S. Environmental Protection Agency, 1992), introduction.

TABLE 4-6

STATES WITH LOAN, REVOLVING-FUND, OR BOND-BANK PROGRAMS TO FINANCE DRINKING WATER CAPITAL PROJECTS

Alabama (a)	New York
Alaska	Nevada (b)
Arkansas	North Carolina
California	North Dakota (c)
Colorado	Ohio
Florida	Oklahoma
Georgia	Oregon (a)
Indiana	Pennsylvania
Kentucky	Tennessee
Maine	Texas
Maryland	Utah
Massachusetts	Vermont
Michigan	Virginia
Montana	Washington
New Hampshire	West Virginia
New Jersey	Wisconsin (d)
New Mexico	Wyoming

Source: U.S. Environmental Protection Agency, "States with Loan/Bond Bank Programs to Finance Capital Projects for Drinking Water Systems" (handout dated May 25, 1993).

(a) Infrastructure legislation passed during the 1991 legislative season.
(b) Infrastructure legislation passed during the 1992 legislative season.
(c) Infrastructure legislation passed during the 1993 legislative season.
(d) Wisconsin has a grant program only to fund drinking water needs.

- Several hardship loan and grant programs have been designed to aid small or economically disadvantaged communities. State funding programs, in some cases, offer refinancing loans for existing indebtedness related to water development projects and systems. Other innovative programs include financing for emergency grants, planning loans, capital improvement planning loans, and research and development grants.

- Five of the surveyed state assistance programs are administered jointly by two or more separate agencies within each state. Responsibilities for each step of the loan and grant process are delegated among the state agencies according to expertise, with a few performing only an advisory role to the funding agency. However, the final approval of loan and grant applications usually is done in conjunction.

At the time of the EPA survey, three states (California, Pennsylvania, and Texas) extended funds to investor-owned systems, as well as to government-owned systems. The key provisions of these programs are summarized in table 4-7. The Pennsylvania Infrastructure Investment Authority (PENNVEST) is considered by many as an exemplary state loan program and a potential prototype for any federal effort to expand the state revolving loan fund (SRF).[20] PENNVEST was begun in 1988 and has provided over $1 billion in funding for 650 water and wastewater projects. Ultimately, funding for the state's water and wastewater infrastructure through the authority is expected to be $2.5 billion.

PENNVEST eligibility and priority criteria appear in table 4-8. The cost-effectiveness of a project is a key ingredient in determining both its eligibility for funding and its priority in the funding queue. The application process for financial assistance under the PENNVEST program requires involvement with state drinking water quality regulators.[21] Consultation and coordination with an engineer from the Department of Environmental Regulation (DER) are required. Applicants are required to prepare a planning and feasibility report, which must be reviewed by the DER prior to submission

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[20] "SRF Has Its PA Pattern," *U.S. Water News* 9 (June 1993): 1.

[21] Wade Miller Associates, Inc., *State Initiatives to Address Non-viable Small Water Systems in Pennsylvania* (Arlington, VA: Wade Miller Associates, Inc., 1991), 9-3.

TABLE 4-7
HIGHLIGHTS OF SELECTED STATE FINANCING PROGRAMS

California

Agency	California Department of Water Resources (DWR).
Purpose and status	Established in 1976 to administer the California Safe Drinking Water Bond Law for state financing of domestic water service.
Staff and budget	The Bond Financing & Administration Office in DWR is staffed by 12 full-time equivalent employees. Operating expenses are limited to 3% to 5% of bond proceeds of most recent issue.
Forms of assistance	Loans and grants. Interest rates on loans are set at 50% of the market rate.
Capitalization	Funded solely through the sale of state general obligation bonds. There has been a total of $425 million from four bond issues available for loans and grants since the program's inception.
Eligibility	Eligible entities must own or operate a public or private domestic water system and be subject to state and county enforcement.
Maximum amounts	Loans: $5 million limit. Grants: $400,000 limit.
Special features	Private domestic water systems are eligible for funding.

Pennsylvania

Agency	Pennsylvania Infrastructure Investment Authority (PENNVEST).
Purpose and status	Established in 1988. PENNVEST provides financial assistance to the state's publicly and privately owned drinking water systems.
Staff and budget	19 staff members. Operating budget is approximately $4 million.
Forms of assistance	Loans and grants. Interest rates on loans are determined by the borrowing entity's unemployment rate.
Capitalization	State appropriation: $25 million. 1990 revenue bond issue: $60 million. 1988 general obligation bond issue: $300 million.
Eligibility	Any owner or operator of a drinking water system, public or private.
Maximum amounts	Loans: $11 million per project or $20 million per project with joint applicants. Grants: $500,000 or 50% of project costs, whichever is lower.
Special features	Private sector participation in 63 drinking water and water distribution projects.

Texas

Agency	Texas Water Development Board (TWDB).
Purpose and status	Established in 1957, the TWDB funds the planning, design, and construction of water supply and regional water facilities.
Staff and budget	260 staff members. 1991 operating budget was $11,400,018 from state appropriations.
Forms of assistance	50% grant funding for the research and planning of regional water facilities. Low-interest loans.
Capitalization	Since 1957, seven bond issuances have provided funding totaling $2.48 billion.
Eligibility	All applicants must be political subdivisions or non-profit water supply corporations.
Maximum amounts	Loans: 100% of eligible costs. Grants: 50% local match for project.
Special features	Set up hardship fund, the Economically Distressed Areas Program.

Source: Adapted from U.S Environmental Protection Agency, *An Overview of Existing State Alternative Financing Programs: Financing Drinking Water System Capital Needs in the 1990's* (Washington, DC: U.S. Environmental Protection Agency, 1992).

TABLE 4-8

PENNVEST ELIGIBILITY AND PRIORITY CRITERIA

(a) **Criteria for obtaining assistance.** In reviewing applications for financial assistance, the authority shall consider:

(1) Whether the project will improve the health, safety, welfare or economic well-being of the people of this Commonwealth.

(2) Whether the proposed project will lead to an effective or complete solution to the problems experienced with the water supply or sewage treatment system to be aided, including compliance with State and Federal laws, regulations or standards.

(3) The cost-effectiveness of the proposed project in comparison with other alternatives, including other institution, financial and physical alternatives.

(4) The consistency of the proposed project with other State and regional resources management and economic development plans.

(5) Whether the applicant has demonstrated its ability to operate and maintain the project in a proper manner.

(6) Whether the project encourages consideration of water or sewer systems, where such consolidation would enable the customers of the systems to be effectively and efficiently served.

(7) The availability of other sources of funds at reasonable rates to finance all or a portion of the project and the need for authority assistance to finance the project or to attract the other sources of funding.

(b) **Financing priorities.** In assigning priorities for projects, the board shall consult with the Department of Commerce and the department. In addition to any requirements of Federal law imposed on the use of federal funds, the board shall determine priorities based on factors which include, but are not limited to:

(1) Benefits to public health.

(2) The contribution to and impact of the project on economic development as well as social and environmental values.

(3) Benefits to public safety or welfare.

(4) Improvement in the ability of an applicant to come into compliance with State and Federal statutes, regulations and standards.

(5) Improvement in the adequacy or efficiency of the water supply or sewage treatment system.

(6) The cost-effectiveness of the project.

(7) Whether the governmental unit to be served by a sewage treatment system is subject to construction or connection limitations issued by the department and the date that any such limitation was issued.

(8) Whether the project encourages consolidation of water or sewer systems, where such consolidation would enable the customers of the systems to be more effectively and efficiently served.

Source: "Eligibility and Priority Criteria from Section 10 of the Pennsylvania Infrastructure Investment Authority Act," as reported in Wade Miller Associates, Inc., *State Initiatives to Address Non-Viable Small Water Systems in Pennsylvania* (Arlington, VA: Wade Miller Associates, Inc., 1991), 9-5 and 9-6.

to PENNVEST. The Pennsylvania Public Utilities Commission has provided for special ratemaking treatment of PENNVEST surcharges (see chapter 5).

Presently, the prospects for expanding the federal-state funding effort for drinking water seem good. In the summer of 1993, the EPA put forth draft legislation known as the "Drinking Water Infrastructure Financing Act of 1993," the stated purpose of which is to provide for capitalization of state revolving funds to assist public water systems in complying with the SDWA. The draft bill would:[22]

- Authorize appropriations of $559 million in fiscal year 1994 and $1 billion for each of the next four fiscal years.

- Require states to maintain primary enforcement responsibility under the SDWA to receive capitalization grants.

- Authorize loans to publicly and privately owned community water systems and public and non-profit noncommunity systems existing as of the date of enactment.

- Require EPA to conduct a survey of the capital investments needed to comply with the SDWA within two years of enactment so that loans are used to fund the highest priority projects.

- Limit the type of financial assistance to low-interest and no-interest loans (rather than negative-interest loans or grants) to ensure the integrity of the corpus of each state's fund.

- Target funds to projects where consolidation of the water system with another eligible system is not possible or not cost effective. The EPA is to establish consolidation criteria for eligible systems.

By highlighting the consolidation issue, the EPA clearly has linked its proposed funding policies to the issue of water system viability, which has emerged as a priority concern for the agency. Federal regulators presumably want to avoid using public funds to sustain systems that will not be viable in the long term. Ideally, assistance will flow to

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[22] Correspondence from U.S. Environmental Protection Agency Administrator Carol M. Browner to Senator Max Baucus, dated July 7, 1993, and attachment, "Section-by-Section Analysis of the Proposed Administration Bill, The 'Drinking Water Infrastructure Financing Act of 1993'" (not dated). See also, "State Revolving Fund for Drinking Water Proposed," *U.S. Water News* 10 (October 1993), 1.

systems that eventually can be sustained through rates that recover the full cost of providing water service. Indeed, the EPA also is encouraging the states to more explicitly incorporate viability policies in their regulatory programs.

Wishful thinking might add expanded federal assistance, namely grants, to the list of ways to mitigate against SDWA costs. Low-income consumer advocates emphasize the need for federal funding:

> How can poor people be protected from the impact of rising water and sewer rates? There are no programs or funds now available on the federal level. . . to address the looming burden on poor families, although the magnitude of the problem is such that only the federal government has the resources to absorb the costs and protect low income families from the impact of higher water and wastewater bills. Thus the first logical step would be to restore the federal funding for meeting Clean Water Act requirements, and begin significant federal funding of investments needed to comply with the federal Safe Drinking Water Act requirements.[23]

The problem of customer affordability makes it even more important that utilities strive for least-cost alternatives for meeting revenue requirements. Realistically, however, the prospects for substantial federal funding are dim. A principal feature of modern federalism is state and local funding of federal mandates, much to the frustration of state and local officials. Ideological issues aside, federal funding would not necessarily be desirable from the standpoint of utility economics. The ideal of self-supporting community water systems is a credible policy goal, as supported by the literature on the industry's viability.[24] Subsidies can mask diseconomies and other financial and managerial weaknesses, and may even postpone the inevitable in terms of structural alternatives, such as consolidation of nonviable systems with viable ones.

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[23] National Consumer Law Center as reported in National Water Education Council, *Cause for Concern: America's Clean Water Funding Crisis* (Boston, MA: National Water Education Council, 1992), 35.

[24] See Janice A. Beecher, G. Richard Dreese, and James R. Landers, *Viability Policies and Assessment Methods for Small Water Utilities* (Columbus, OH: The National Regulatory Research Institute, 1992).

Assessing Financial Capability

According to the EPA, the issue of whether or not financial capital markets can accommodate water utility needs may be secondary to the issue of servicing the capital, that is, whether communities and their citizens (or ratepayers) can afford capital costs. Cities must contend with both expanding public policy responsibilities and increasingly scarce resources. The political pressure to be responsive to changing needs while controlling costs can be intense.[25] To fulfill their environmental protection responsibilities, municipalities must be able to support capital formation for a variety of functions. Yet, as public entities, they may be seriously constrained in this endeavor:

> Whereas private companies often pass along the costs of capital to consumers by adjusting the price of goods and services, local governments are more limited in their ability to meet capital needs. Frequently, elected officials face political difficulties in raising taxes or fees, or legal constraints on their authority to raise revenues imposed by statutes, regulations, or state constitutions. In other cases, local resources may be inadequate to support large amounts of debt. This is often true for small municipalities having relatively high fixed costs of issuing bonds, limited revenue bases and no economies of scale. If capital-intensive facilities are forced on these and other cities, the cost of increased capital formation could crowd out other investments.[26]

Although the EPA seems to imply that publicly owned water systems are more constrained than their private counterparts in raising capital, a countervailing view is that cities are less constrained. As government entities, municipal utilities benefit from income-tax exemptions, revenue subsidies, assistance through government grants and

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[25] Privately owned utilities, of course, are not immune to political pressure, but they are less affected by electoral politics.

[26] U.S. Environmental Protection Agency, *A Preliminary Analysis of the Public Costs of Environmental Protection: 1981-2000* (Washington, DC: U.S. Environmental Protection Agency, 1990), 22.

loans, and the use of tax-exempt bonds as a financing instrument.[27] Moreover, investor-owned utilities cannot simply "pass along" a rise in the cost of service; costs and rates must be scrutinized by state regulators. Realistically, neither ownership form offers a clear advantage in terms of financing. As financial needs expand and certain forms of subsidies and assistance are curtailed, all types of water utilities will consider alternative financing mechanisms. In doing so, these utilities must continually evaluate the impact of the financing arrangement on their own viability and that of the community in which they operate.

Investor-owned water systems have a variety of evaluation tools at their disposal to assess financial viability. Table 4-9 provides the basic financial ratios that these systems can use to assess their overall viability, as well as assess the impact of alternative financial strategies on their financial status. A previous report of the NRRI advanced a method for combining the first seven indicators to produce a general index.[28] A key financial indicator is leverage, which can be measured in several ways. One basic measure is the ratio of debt to total assets. Taking on additional debt may create a problem of overleveraging for some utilities. Similarly, excessive reliance on retained earnings can disrupt the balance between debt and equity. What is most important is that utilities assess the potential impact of a financing option on the individual indicators and on total viability. Although some strategies may adversely affect certain indicators, these effects might be offset by good performance, as measured by other indicators, so that the overall financial health of the utility is maintained. Although designed for analyzing financial data for investor-owned utilities, it is possible to adapt these indicators for evaluating the financial viability of publicly owned utilities.

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[27] Views differ sharply on the implications of tax-exempt bonds for the structure of financial capital markets and the competition for capital.

[28] Beecher, Dreese, and Landers, *Viability Policies*. In the *Viability* report, the indicators are presented negatively in terms of their relation to failure because the purpose of the exercise was failure prediction. For ease of interpretation, the ratios are presented positively here in terms of their relation to water system viability.

TABLE 4-9

KEY FINANCIAL INDICATORS FOR ASSESSING A PRIVATELY OWNED WATER UTILITY'S FINANCIAL VIABILITY

Indicator	Ratio	Relation to Viability
Profitability	Cash flow/sales	Positive
Liquidity	Current assets/current liabilities	Positive
Leverage	Book common equity/total assets	Positive
Profitability trend	Retained earnings/common equity	Positive
Growth and efficiency	Sales/total assets	Positive
Efficiency and profit	Operating revenues/operating expenses	Positive
Profitability	Net income/sales	Positive
Leverage	Total debt/total assets	Negative
Liquidity	Net fixed assets/total assets	Negative
Leverage	Current liabilities/total debt	Negative

Source: Janice A. Beecher, G. Richard Dreese, and James R. Landers, *Viability Policies and Assessment Methods for Small Water Utilities* (Columbus, OH: The National Regulatory Research Institute, 1992), 155.

Table 4-10 provides an assessment method for evaluating the financial viability of publicly owned water systems, although many of these indicators also are relevant for investor-owned utilities. These indicators address the community's ability to financially support water system costs. General ranges are provided to indicate whether a community's financial status is weak, average, or strong. Any single indicator is not necessarily definitive, but together these measures can be used to construct a viability profile for the community. This profile will influence the community's ability to secure capital financing and repay debt without extreme hardship.

TABLE 4-10

KEY FINANCIAL INDICATORS FOR ASSESSING A PUBLICLY OWNED WATER UTILITY'S FINANCIAL VIABILITY

Indicator	Weak	Average	Strong
Annual rate of change in population	Below -1%	-1% to 1%	Above 1%
Current surplus as a percent of current expenditures	Below 0%	0% to 5%	Above 5%
Real property tax collection rate	Below 96%	96% to 98%	Above 98%
Property tax revenues as a percent of full market value of real property	Above 4%	2% to 4%	Below 2%
Overall net debt as a percent of full market value of real property	Above 5%	3% to 5%	Below 3%
Overall net debt outstanding as a percent of personal income	Above 12%	4% to 12%	Below 4%
Direct net debt per capita	Above $750	$250-$750	Below $250
Overall net debt per capita	Above $1,000	$450-$1,000	Below $450
Percent direct net debt outstanding due	Below 10%	10%-30%	Above 30%
Operating ratio	Below 100%	100%-120%	Above 120%
Coverage ratio	Below 120%	120%-170%	Above 170%

Source: U.S. Environmental Protection Agency, *Financial Capability Guidebook* (Washington, DC: U.S. Environmental Protection Agency, 1984), 52. A five-year assessment period can be used.

When the prospects for traditional financing are grim or when the least-cost financing option is a very high-cost option, it is advisable to explore innovative alternatives. These include not only loans and grants but also structural alternatives, such as a change in utility ownership. For nonviable water systems that are small in size, consolidation with a neighboring system should be considered, especially if the resulting financial profile for the consolidated system is a healthier one than for the individual systems. For many publicly owned water systems, privatization is a structural alternative worth considering. While privatizing all or some utility operations might foreclose some financing opportunities (such as grants), it expands others (such as lease financing). In any case, the search for least-cost financing options should extend beyond the conventional options.

Implications

The problem of water utility financing is not necessarily one of limited choices, but one of closing the gap between potential options and those actually used. As Ronald Coy explains:

> [A]n investor-owned or a publicly owned water and/or sewer utility has a myriad of sources of capital financing. The sources available at any one particular time to any particular utility can be limited or wide. Variations of the basic sources of capital financing constantly evolve and dissolve. . . . [W]ater and sewer utility managers must earnestly search for the most cost-efficient means of financing capital improvements.[29]

The important caveat, of course, is that not all financing options will be available to a given utility at a given time. Access to specific financing alternatives will be affected by a variety of factors. The principal influences are: tax codes, rules, and regulations; prevailing interest rates; the utility's credit rating; and decisions by governing bodies, regulatory agencies, and, in some instances, voters.[30]

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[29] Coy, "Financing Capital Requirements," 61-2.

[30] American Water Works Association, *Water Utility Capital Financing,* vii.

Economic theory dictates that, for a price, capital markets will support the financial requirements of the water supply industry. The real question is whether that price will be affordable to utility customers. The key to water utility financing seems to be keeping options open for systems of all sizes and ownership forms so that capital costs can be made as affordable as possible. The scope of innovative alternative financing mechanisms is ever expanding. The only source of funding that seems to be seriously constrained is government grants.

The growing diversity of financing options has several positive effects. First, it serves the varying needs and circumstances of water utilities. Second, it spreads capital demands across a wide base rather than overburdening a few financing sources. Finally, it provides a basis for a financial market for water systems and a form of competition among capital providers, which in the long term should help lower capital costs.[31] Thus, diversity in financing options is desirable for the water industry and should be encouraged. Likewise, utilities should be encouraged to compare funding alternatives and pursue least-cost options. In addition, regulators may want to consider ratemaking options that reduce perceived risk and enhance the ability of some water utilities to qualify for certain financing options.

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[31] Perceptions of investment risks and rewards, of course, will remain the principal determinants of the cost of capital.

CHAPTER 5

RATEMAKING ALTERNATIVES

A critical determinant of revenue requirements, in the case of investor-owned utilities, is the regulatory treatment of costs by the state public utility commissions. Cooperation between utilities and regulators can help lower regulatory risk.[1] However, ratemaking methods must balance investor and ratepayer interests while also comporting with public interest goals and regulatory standards. Utility investments are held to the standards of prudence and used and useful, and the rate structures designed to pay for them must be just and reasonable. Cost-of-service principles dictate that the burden of compensating the utility should correspond to the benefits bestowed by the investment. In achieving these goals, equity among customer classes and equity over time (intergenerational equity) are emphasized. Responsibility for these matters rests on the shoulders of state utility regulators. The water utility industry, like other regulated industries, has pressed hard for the use of ratemaking methods designed to reduce risks and enhance financial stability. Some of the methods have been implemented in some jurisdictions. The ten ratemaking approaches reviewed here are:

- Construction-work-in-progress
- Phase-in plans
- Accelerated depreciation
- Depreciation expense for contributions and advances
- Automatic adjustments and pass throughs
- Special-purpose surcharges
- Expedited proceedings
- Future test year
- Preapproval of expenditures
- Incentive regulation

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[1] See, for example, Donald L. Correll, Stephen B. Genzer, and Anthony J. Zarillo, "Financing a Major Water Supply Facility: A Case Study in Cooperation," *Public Utilities Fortnightly* 117 (June 26, 1986): 21-25.

A brief discussion of each method is followed by a summary of advantages, disadvantages, and special considerations for water utilities and water utility regulation. These evaluations reflect long-held arguments by academics and regulatory practitioners who have addressed these concerns in the context of the electric and natural gas sectors, and are beginning to consider their applications to the water sector.[2]

Construction-Work-in-Progress

Under traditional ratemaking, utility plant generally is not included in the rate base until it is complete, in service, and deemed "used and useful" by regulators. In other words, investors do not earn a return on their investment until a capital project is essentially complete *and* regulatory review (in the form of a rate case) has taken place. An allowance for funds used during construction (AFUDC) is typically used to address the effects of regulatory lag in these instances. AFUDC is "the computation of utilities' costs of funds used for construction and the inclusion of those costs in plant, along with the more direct plant expenditures."[3] The utility still does not begin recovering costs until the plant is placed in service. A variation on AFUDC is the capitalization of postclosing interest, that is, the cost of capital that accrues between the time a capital project becomes used and useful and the occurrence of a rate case.[4]

Construction-work-in-progress (CWIP) is a method for capitalizing capacity costs into the rate base on an incremental basis: "CWIP in rate base implies that the

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[2] The analysis benefits considerably from the collective expertise of state commission staff members, which is reflected in discussion papers addressing several of the alternative ratemaking approaches. See, National Association of Regulatory Utility Commissioners, Water Committee and Staff Subcommittee on Water, *Discussion Papers of Selected Regulatory Issues* (Washington, DC: National Association of Regulatory Utility Commissioners, 1992).

[3] NARUC Water Committee, *Discussion Papers,* 5.

[4] Andrew M. Chapman, "Achieving Authorized Rate of Return: Wishful Thinking for Water Utilities?" *Public Utilities Fortnightly* 127 (February 15, 1991): 39-43.

ratesetting body allows a utility to include in its rate base for ratesetting purposes not only that plant which is currently used and useful, but also amounts the utility has invested in plant that is under construction but not yet completed during the test period."[5]

Advocates of CWIP view it as a way to maintain financially healthy utilities, which in turn benefits ratepayers. CWIP in rate base can help utilities reduce debt and equity costs and attract investors, but it also can increase revenue requirements and rates, cause intergenerational inequity, shift risk from investors to ratepayers, induce more construction than might be needed (particularly as compared with efficiency alternatives), and limit opportunities to review the prudence of the investment decision. However, any incentive that CWIP provides for making unnecessary investments may be offset by attrition and regulatory lag, which can prevent utilities from earning their allowed return.[6] Also, CWIP does not guarantee that the total asset will remain in the rate base.

In 1991, 167 members of the National Association of Water Companies reported construction work in progress amounting to $224 million (about 2.6 percent of assets), for an average of about $1.3 million per reporting company.[7] Industry representatives, using Safe Drinking Water Act (SDWA) requirements as the rationale, have declared that the state regulatory commissions "can and must do away with any construction-work-in-progress (CWIP) rule that hinders water utilities."[8]

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[5] NARUC Water Committee, *Discussion Papers,* 5.

[6] Paul Rogers, J. Edward Smith, Jr., and Russell J. Profozich, *Current Issues in Electric Utility Rate Setting* (Washington, DC: The National Association of Regulatory Utility Commissioners, 1976), 72.

[7] National Association of Water Companies, *1991 Financial Summary for Investor-Owned Water Utilities* (Washington, DC: National Association of Water Companies, 1991).

[8] Frederick H. Elwell, "Economic and Financial Impacts of SDWA Regulation," *Water* 34 (Summer 1993): 13.

In Connecticut, CWIP for SDWA-related costs is used along with a surcharge mechanism to expedite cost recovery. The commission rules governing this method appear in appendix C. Other states, like New Hampshire, have anti-CWIP legislation that presents a barrier to using this approach:

> All costs of construction work in progress, including, but not limited to, any costs associated with constructing, owning, maintaining or financing construction work in progress, shall not be included in a utility's rate base nor be allowed as an expense for rate making purposes until, and not before, said construction project is actually providing service to customers.[9]

The state public utility commissions that allow CWIP in rate base for water utilities appear in table 5-1. The key advantages and disadvantages associated with CWIP are presented in table 5-2.

TABLE 5-1
COMMISSIONS ALLOWING CWIP IN RATE BASE FOR WATER UTILITIES

CWIP Allowed in Rate Base	
Alabama	Nevada
Arizona	New Jersey
California	New Mexico
Colorado	New York
Connecticut	North Carolina
Delaware	Oklahoma
Florida	Pennsylvania
Illinois	Tennessee
Kentucky	Texas
Louisiana	Virginia
Michigan	Washington

Source: *1992 NRRI Survey on Commission Ratemaking Practices for Water Utilities.* Most of the commissions indicated that they allow CWIP "sometimes."

[9] New Hampshire Statutes, *Public Utilities 378: 30-a.*

TABLE 5-2

EVALUATING CONSTRUCTION-WORK-IN-PROGRESS (CWIP)

Advantages of CWIP

- It can help support needed investment in capital-intensive facilities.
- It has a positive cash flow impact.
- It can lower the cost of capital.
- It promotes reinvestment of early cash returns into facilities.
- It produces cash flow sooner than AFUDC and at a lower cost.
- It is easier to administer than AFUDC.
- In the long term, it results in a lower rate base.
- It lessens the need for large rate increases, reducing rate shock.
- It lowers regulatory and economic risks.
- It provides a more accurate incremental-cost signal to customers.

Disadvantages of CWIP

- It is a form of preapproval; ratepayers pay for plant not yet used and useful.
- It has a purely inflationary effect of raising prices, without customer benefit.
- Investors are compensated at the expense of ratepayers.
- It creates an intergenerational income transfer from present to future consumers.
- It does not address the issue of minimizing capacity costs.
- It may encourage unnecessary investments or unnecessarily large investments.
- It promotes construction-cost inflation to enhance investor returns.
- The mismatch of cost and service inhibits competition.
- It favors capital-intensive supply-side management investments over demand-side management investments.
- It may disadvantage wholesale customers and possibly induce them to invest directly in production and transmission facilities.
- It may constrain regulatory oversight and prudence reviews of capital projects.
- Due-process rights of ratepayers may be compromised.

Special Considerations

- It generally applies only to new construction, such as new treatment plants, and may not be appropriate or allowed for other improvement projects.
- Its use may not be appropriate for all types or all sizes of water systems.
- Legislative and regulatory policies may limit its use.

Source: Authors' construct.

Phase-In Plans

The purpose of phase-in plans is to defer cost recovery for expensive capital additions to utility plant. Phase-in options include decelerated depreciation, deferral of operating cost recovery, increasing the service life of the plant, and delayed inclusion of capacity into the rate base. Very large capital projects, where distinct increments of capacity are completed in phases, may be suitable for phase-in plans that guide their inclusion in the rate base.

The principal objective of phase-in plans is to avoid rate shock caused by large front-end charges, which is achieved by realigning prices and revenue requirements over time.[10] In theory, at least, the customer benefits from phase-in plans because a sharp price increase for a vital utility service is avoided. Utilities benefit, too, because revenue and earnings levels are maintained. Without phase-in, and depending on price elasticities, higher prices may dampen the demand for a utility's service, making it necessary to recover costs over fewer units of production. This adverse effect is compounded if a utility must seek additional rate increases to cover a revenue shortfall.

Phase-in plans do not, in the long term, eliminate the need for substantial rate hikes; they merely spread increases out over a longer period of time, thus cushioning the impact of rising costs on ratepayers. Although many phase-in options exist, they can be placed in two general categories. Some levelize rates by altering the timing for including capital costs into rate. Others either adjust the depreciation method or defer recovery of operating costs. Phase-in plans often are linked to the use of CWIP.

When evaluating phase-in plans, regulators should consider the financial effects on investors, the intergenerational equity effects on consumers, and overall economic consequences. A summary of advantages and disadvantages associated with phase-in plans appears in table 5-3.

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[10] Patrick C. Mann and Janice A. Beecher, *Cost Impact of Safe Drinking Water Act Compliance for Commission-Regulated Water Utilities* (Columbus, OH: The National Regulatory Research Institute, 1989), 59.

TABLE 5-3

EVALUATING PHASE-IN PLANS

Advantages of Phase-In Plans

- They address rate shock and related revenue effects caused by large front-end charges.
- They enhance revenue and earnings stability.
- They can be well justified if the capacity meets least-cost standards for both capital and operating expenses.
- Rate increases may not require a comprehensive rate case, reducing regulatory costs.
- Rates can be designed to satisfy cost-of-service principles.
- Customers may support phase-in as a means of reducing rate shock.
- When used in conjunction with very large capital projects, they can spread costs over time, so that present customers do not pay for more than the capacity that actually will benefit them.

Disadvantages of Phase-In Plans

- The total cost of a capital project may be greater in the long term.
- They may create cash flow problems for the utility.
- They may cause utilities to delay filing for necessary rate proceedings.
- They require the use of a prudence review or a rate case prior to implementation.
- They may not be legal in all jurisdictions.
- They may require special accounting procedures.
- Not all customers will be enthusiastic about this approach.
- If the capacity is used and useful, they can cause an intergenerational inequity that benefits current ratepayers at the expense of future ratepayers.
- When used in conjunction with very large capital projects, they do not assure that each new phased increment of capacity will meet prudence and least-cost criteria.

Special Considerations

- They may mask inefficient water rates that do not adequately reflect costs.
- Rate shock may be a necessary trigger for economic reform in the water industry from the standpoint of both production and consumption.
- Commission experience in electricity phase-in may not directly transfer to water.

Source: Authors' construct.

Accelerated Depreciation

The purpose of depreciation is to match capital recovery with capital consumption or usage; the better the match, the lesser the likelihood that one generation of customers will benefit at the expense of another. Thus, depreciation is the allocation of costs over the useful service life of plant or capacity. The useful life of investments in the water utility sector tend to be long, often fifty to seventy-five years or more. Such life spans are particularly long in comparison to utility sectors experiencing rapid technological change, such as telecommunications, where assets can soon become obsolete.

Because water utility plant assets are long lasting, composite depreciation rates of one to two percent are not uncommon. Accelerated depreciation would increase cash flow during part of an asset's life and reduce the need for external financing for other purposes. With modern accounting and data-processing techniques, it is possible to vary depreciation rates for different assets, as compared to using a composite rate. For example, the expected life of a treatment facility might be different than that for a distribution main, which could warrant different depreciation rates.

However, accelerating rates of depreciation for ratemaking purposes may violate basic regulatory principles and methods, particularly with regard to recovering the cost of service from the ratepayers who benefit from that service. For this reason, most public utility commissions are unlikely to view it favorably.[11] Nonetheless, subject to regulatory approval, water utilities might be able to increase depreciation rates over the 1 to 2 percent rates used in the past by preparing remaining-life depreciation studies and adopting separate depreciation rates for different plant accounts or revising composite depreciation rates.

Accelerated depreciation raises other policy issues as well. For instance, federal tax policy requires that tax savings due to the use of accelerated depreciation must be normalized or the utility will lose the benefits of those tax savings. This makes the use of accelerated depreciation for ratemaking very problematic because any tax savings

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[11] NARUC Water Committee, *Discussion Papers,* 5.

cannot flow to ratepayers. Table 5-4 presents some of the other advantages and disadvantages of accelerated depreciation as a ratemaking method.

TABLE 5-4
EVALUATING ACCELERATED DEPRECIATION

Advantages of Accelerated Depreciation

- It improves cash flow to the utility during the early years of a capacity addition.
- It provides an internal source of financing.
- Investors are better protected from the effects of inflation than they are with the use of longer depreciation periods.
- It can be used to compensate for technological obsolescence, which is distinct from physical deterioration.
- It can give utilities a technological edge, and therefore a competitive advantage.
- It may help reconcile the regulatory treatment of actual taxes paid and normalized taxes charged to consumers for ratemaking purposes.

Disadvantages of Accelerated Depreciation

- It is contrary to traditional regulatory and accounting methods.
- It can violate cost-of-service and other ratemaking principles.
- It can increase revenue requirements and contribute to rate shock.
- If the capacity remains useful after depreciation, it can cause an intergenerational inequity that benefits future ratepayers at the expense of current ratepayers.
- Rapid reduction of the rate base will reduce opportunities to earn a return.
- It may skew investment decisions in favor of options for which acceleration is allowed.
- The Internal Revenue Service (IRS) requires associated tax savings to be normalized.

Special Considerations

- Regulators must carefully evaluate the expected life spans of utility investments; longer life spans increase the uncertainty of life-span forecasts.
- It may be a short-term fix to the long-term problem of inevitably increasing costs.
- It may obscure least-cost alternatives.
- Some water utility plant investments may have a negative salvage value after being fully depreciated; their disposal requires additional and unexpected costs.
- Modern depreciation studies for water utilities could be invaluable to regulators.

Source: Authors' construct.

Depreciation Expense for Advances and Contributions

Small water utilities often are referred to as developer systems because they emerged as part of a real-estate development. Many of these systems rely heavily on customer advances or contributions-in-aid-of-construction (CIAC). Without this source of funding, some systems may not be able to provide service to new customers. A large amount of contributed capital can cause problems for an investor-owned system because it does not expand the value of the rate base on which the utility earns a return. Typically, the water utility owner-operator has few funds to reinvest and little incentive to optimize performance. Over time, the lack of depreciation expense can leave the utility without adequate cash flow or a reserve fund for emergencies, improvements, or replacements.

For many water utilities that use CIAC, alternative financing methods are not readily available. According to a report by the staff of the Florida Public Service Commission, "regulatory policies do not cause the industry to rely on CIAC," but absent CIAC, "the alternatives are for utility owners to charge the first customers exorbitant rates or absorb all investment and operating costs until a full customer base exists."[12] The 1986 Tax Reform Act made contributions taxable as income, a policy the water industry has worked hard to overturn because it undermines the use of CIAC as a financing mechanism.

Not all commissions allow depreciation on advances or contributions as an expense. The Florida staff report recommends "letting utilities bear full responsibility for obtaining financing to replace old plant" because when replacements are needed, the utility's customer base should be large enough to offset the need for CIAC cash flows.[13] In other words, the system should be financially viable and able to satisfy traditional

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[12] Florida Public Service Commission, Division of Research, *Report on Contributions-in-Aid-of-Construction* (June 1988) as reported in NRRI's *Quarterly Bulletin* 9 (October 1988): 494.

[13] Ibid., 495.

regulatory standards. If the system is not viable, structural alternatives (such as consolidation with another water system) should be considered.

As reported in table 5-5, some state commissions allow depreciation as an expense for customer advances or contributions in aid of construction. Advantages and disadvantages of this ratemaking mechanism appear in table 5-6.

TABLE 5-5
COMMISSIONS ALLOWING
DEPRECIATION AS AN EXPENSE FOR ADVANCES OR CONTRIBUTIONS

Customer Advances	
Arizona	Kentucky
Arkansas	Maryland
California	Massachusetts
Connecticut	New Hampshire
Hawaii	New Jersey
Illinois	New York
Indiana	Pennsylvania
Iowa	Utah

Contributions-in-Aid-of-Construction (CIAC)	
Arizona	New Jersey (c)
Arkansas	Oregon
Connecticut (a)	Tennessee (b)
Indiana	Texas
Michigan	Utah (a)
Montana	Wisconsin
New Hampshire (b)	

Source: *1992 NRRI Survey on Commission Ratemaking Practices for Water Utilities.*

(a) Sometimes.
(b) Offset by amortization.
(c) Eliminated by stipulations.

TABLE 5-6

EVALUATING DEPRECIATION EXPENSE FOR ADVANCES AND CONTRIBUTIONS

Advantages of Depreciation Expense for Advances and Contributions

- It increases cash flow to the utility, thereby enhancing financial viability.
- It can help utilities build a depreciation reserve or escrow account for improvements.
- It can bring rates closer to marginal costs.
- It can provide a temporary bridge for utilities with long-term prospects for viability.
- It can help ensure that funds will be available for needed improvements.

Disadvantages of Depreciation Expense for Advances and Contributions

- It violates traditional cost-of-service and other ratemaking standards.
- It forces ratepayers to pay twice for the same asset.
- It shifts risks from utility investors to ratepayers.
- It can result in a negative rate base.
- In the short term, it results in higher rates than justifiable on cost-of-service principles.
- It does not address further erosion of the utility's rate base.
- Without special provisions, it does not provide assurances that funds will be available for system improvements.
- It provides no incentives for expanding the rate base and taking other measures to assure long-term viability.
- It may require special accounting and oversight procedures.

Special Considerations

- It may mask or postpone attention to serious viability problems, so a viability assessment is warranted prior to approval.
- It improves the financial viability of small utilities but should not preclude consideration of structural options, such as consolidation.
- An escrow account or bonding procedure may be needed to assure that funds are used for approved purposes (somewhat like nuclear decommissioning funds).

Source: Authors' construct.

Automatic Adjustments and Pass Throughs

Automatic adjustment clauses operate such that changes in a selected utility expense item are reflected automatically in rates without a rate-case proceeding, although for major expenses, a reconciliation proceeding often is used later. Automatic adjustments can be accomplished through a method of indexing. As the American Water Works Association (AWWA) explains: "The primary objective of indexing is to bypass extended, formal rate hearings [or political oversight] and/or reflected changes in uncontrollable costs by changing rates on an automatic [but preestablished] basis."[14] Pass throughs work similarly, although this mechanism typically concerns items that fall outside of normal utility operations, such as special fees or taxes. Such mechanisms have been used for decades in the electricity and natural gas sectors for fuel costs.[15] However, not all regulatory jurisdictions allow their use and many condition their implementation in a variety of ways.[16]

For an expense item to be considered for treatment through an automatic adjustment clause, it typically must meet three essential criteria. First, relative to other expenses, it must be *substantial,* that is, a very large expense. Second, it must be highly *volatile,* that is, subject to significant variation. Finally, it must be *unpredictable,* that is, unknown to utility managers and outside of their control. Generally, an expense should satisfy all three criteria for an adjustment clause to be considered. Typically, meeting only one of the criteria or even two does not justify use of an adjustment clause. In these instances, the traditional regulatory process should be adequate.

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[14] American Water Works Association, *Water Utility Capital Financing,* AWWA Manual M29 (Denver, CO: American Water Works Association, 1988), 60, 65.

[15] New Jersey once implemented a very comprehensive adjustment clause covering tax, labor, interest, and fuel expenditures but later abandoned it.

[16] See Rogers, Smith, and Profozich, "Current Issues"; and Kevin A. Kelly, Timothy M. Pryor, and Nat Simons, Jr., *Electric Fuel Adjustment Clause Design* (Columbus, OH: The National Regulatory Research Institute, 1979).

According to a recent NRRI report, the increasingly competitive environment for public utilities in the electricity and gas sectors has created a need to revisit automatic adjustment clauses, the rationale for their use, and implications for utility performance.[17] In addition, adjustment clauses today should meet an additional criterion in that they should provide appropriate incentives for efficient performance by utilities in a more open market environment. Commissions are encouraged to explore options for redesigning their adjustment clauses, including a "fixed-weight method" that would encourage least-cost procurement decisions in more competitive circumstances.[18]

Applying a fixed-weight model to water utilities could be complex, so complex that the administrative and transaction costs of implementation would outweigh the benefits of improved performance incentives. Water markets are far less established than those for natural gas or fuel. Inputs for water, especially when defined in terms of peak and off-peak generation, are not analogous to the electricity industry. Neither water utilities nor regulatory commissions have the information necessary to establish accurate weights for such expenses as treatment chemicals. It is possible to devise an alternative weighting scheme for the water supply industry. An industrywide database could be used to develop general weights that could be used in developing adjustment clauses for major expense categories. Commissions with large numbers of jurisdictional utilities also might consider developing a data base for this purpose. Individual utility performance could be compared with that for comparable water utilities.

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[17] Robert E. Burns, Mark Eifert, and Peter A. Nagler, *Current PGA and FAC Practices: Implications for Ratemaking in Competitive Markets* (Columbus, OH: The National Regulatory Research Institute, 1991), iv.

[18] Fixed weights can be applied to alternative supplies and alternative markets (in the case of natural gas) or alternative inputs (in the case of electricity) that make up a utility's supply portfolio. For natural gas, alternative markets consist of long-term, spot, forward, and futures markets. For electricity, input weights can be determined for peak and off-peak generation. The utility's performance target is the weighted cost of its portfolio as approved by regulators. However, the utility can choose to deviate from the weights to try to "beat" the target, in which case savings are shared with ratepayers. Reconciliation reviews are used primarily to share information and update portfolio weights.

Some state commissions have implemented distinctive adjustment methods for the water sector.[19] In New York, water utilities can use a revenue adjustment clause to mitigate revenue volatility during rate design changes. The state's "phase II" policy allows utilities to use a secondary filing, one year after a major rate case, to recover increased costs in wages, power, taxes, and capital investments. Florida uses a price indexing approach to expedite general rate increases or decreases related to historical price indices (see appendix C). Indiana uses a tracking system for purchased water so that increases in costs can be passed along to customers without a hearing. California uses a tracking system along with offset rate adjustments for unanticipated expenses over which the utility has no control. North Carolina uses a pass-through policy for certain laboratory testing required by the SDWA (see appendix C).

Expanded use of adjustment clauses in the water sector has been suggested, for energy expenses related to pumping and for chemical and other SDWA-related expenses. It is unclear, however, that typical water supply expenses are at once substantial, volatile, and unpredictable (see table 5-7). By comparison, purchased gas cost constitutes more than 70 percent of operating expenses for a gas distribution system.[20] Natural gas is a commodity for which market prices also are volatile and unpredictable. For electric utilities, fuel cost is nearly 30 percent of total expenses, and also can be volatile and unpredictable.[21] Even so, the use of automatic adjustments in the energy sector is being revisited because of the implications these mechanisms for efficiency.

One of the chief drawbacks of automatic adjustments and pass throughs in the energy sector, and the water sector as well, is the potential to thwart competition. For example, in the water sector, a competitive market for laboratories could help lower

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[19] NARUC Water Committee, *Discussion Papers.*

[20] American Gas Association, *1991 Gas Facts* (Arlington, VA: American Gas Association, 1992).

[21] Energy Information Administration, *Financial Statistics of Major Investor-Owned Electric Utilities, 1991* (Washington, DC: Energy Information Administration, U.S. Department of Energy, 1993).

SDWA compliance costs. If laboratory fees simply are passed along to consumers, water utilities may not be motivated to shop around or bargain for the best terms. In extreme cases, the potential exists for cost-inflation and unscrupulous affiliate transactions. One way to avoid these problems is to use a partial adjustment mechanism. A base amount of an expense (such as half) could be recovered in the context of a rate case, and the remainder could be recovered automatically, subject to a reconciliation procedure.

Table 5-8 provides a listing of states that allow adjustments, pass throughs, or surcharges for purchased water, purchased power, franchise fees, user fees, special taxes, and other items. (Surcharges are discussed in the next section.) Advantages and disadvantages for automatic adjustments and pass throughs are reported in table 5-9. In sum, any consideration of adjustment clauses should include an assessment of whether the item under consideration meets the evaluation criteria described above. Without protective features, including a reconciliation proceeding, automatic adjustments and pass throughs may be inferior to traditional ratemaking methods in terms of providing utilities with incentives to minimize costs.

TABLE 5-7
SELECTED OPERATION AND MAINTENANCE EXPENSES FOR WATER UTILITIES

Expense	Utilities Sampled	Percent of Total O&M
Annual payroll	918	39.3%
Total energy (including electricity)	886	12.9
Electricity only	886	11.3
Outside services (such as laboratories)	622	6.2
Chemicals	769	4.1

Source: American Water Works Association, *Water Industry Data Base: Utility Profiles* (Denver, CO: American Water Works Association, 1992), 103-107. Total O&M includes operation, maintenance, and administration. These findings are based on a total sample of 1,097 water utilities (of which 144 were investor-owned.)

TABLE 5-8
COMMISSIONS USING
AUTOMATIC ADJUSTMENTS, PASS THROUGHS, AND SURCHARGES
FOR WATER UTILITIES

Commission	Purch. Water	Purch. Power	Fran. Fees	User Fees	Special Taxes	Other
Alabama	No	No	Yes	No	No	No
Alaska	Yes	Yes	No	No	No	No
Arizona	Yes	Yes	Yes	No	Yes	No
Arkansas	Yes	Yes	No	No	No	No
California	Yes	Yes	Yes	Yes	Yes	No
Colorado	Yes	No	No	No	No	No
Connecticut	No	No	No	No	No	No
Delaware	No	No	No	No	No	No
Florida	Yes	Yes	No	No	Yes	Yes(a)
Hawaii	Yes	Yes	Yes	Yes	Yes	No
Idaho	Yes	Yes	Yes	Yes	Yes	Yes
Illinois	Yes	No	Yes(b)	No	Yes	No
Indiana	Yes	No	No	No	No	No
Iowa	No	No	Yes	Yes	No	No
Kansas	No	No	Yes	No	No	No
Kentucky	Yes	No	No	No	No	No
Louisiana	Yes	No	Yes	No	Yes	No
Maine	No	No	No	No	No	No
Maryland	No	No	No	No	No	No(c)
Massachusetts	No	No	No	No	No	No(d)
Michigan	No	Yes	No	No	No	No
Mississippi	No	No	No	No	No	No
Missouri	Yes	No	No	No	No	No
Montana	No	No	No	No	No	No
Nevada	No	Yes	Yes	No	No	No
New Hampshire	No	No	No	No	No	No
New Jersey	Yes(e)	No	No	No	No	No
New Mexico	Yes	Yes	No	No	No	No
New York	Yes	Yes	Yes	No	Yes	No
North Carolina	Yes	No	No	No	No	Yes(f)
Ohio	Yes	No	No	No	No	No
Oklahoma	No	Yes	Yes	No	No	No
Oregon	No	No	No	No	No	No
Pennsylvania	Yes	Yes	No	No	Yes	Yes(g)
Rhode Island	Yes	No	No	No	No	No
South Carolina	No	No	No	No	No	No
Tennessee	Yes	No	No	No	No	No
Texas	Yes	No	No	No	No	No
Utah	No	No	No	No	No	No
Vermont	No	No	No	No	No	No
Virginia	Yes(h)	No	No	No	Yes	No
Washington	No	No	No	No	No	Yes(a)
West Virginia	Yes	No	No	No	No	No
Wisconsin	Yes(i)	No	No	No	No	Yes(j)
Wyoming	Yes	Yes	Yes	No	No	No
Total	26	14	13	4	10	6

Source: *1992 NRRI Survey on Commission Ratemaking Practices for Water Utilities.*

(a) Water testing.
(b) If on customer bills separately.
(c) Usually none.
(d) Anticipated as an issue.
(e) Regulations were recently enacted at the time of the survey.
(f) VOC testing fees after application to the commission.
(g) PENNVEST loans.
(h) Virginia American Company only (a large utility).
(i) For about 18 of 544 municipal utilities.
(j) Fire protection outside of municipal boundaries.

TABLE 5-9
EVALUATING AUTOMATIC ADJUSTMENTS AND PASS THROUGHS

Advantages of Automatic Adjustments and Pass Throughs

- They reduce the time lag, risks, costs, and workload associated with regulation.
- They provide utilities with revenue stability, even during periods of substantial economic fluctuation.
- Revenue stability helps lower the utility's risk and hence the cost of capital.
- They can help lower costs to consumers, by lowering regulatory and other costs.
- They send consumers appropriate price signals.
- Conceptually, a partial expense recovery clause could promote efficient procurement and use of supplies.

Disadvantages of Automatic Adjustments and Pass Throughs

- They may induce inefficiency by reducing incentives to minimize operating costs or to try innovative production techniques that might lower costs.
- Some excessive or inappropriate costs may simply be passed along to consumers.
- The potential exists for the utility to earn excessive profits.
- Utility managers have little incentive to shop around or bargain with suppliers.
- The potential exists for unscrupulous affiliate transactions.
- If services or supplies are purchased from a subsidiary, the potential for excessive subsidiary profits exists.
- They may require special monitoring by regulators and reconciliation proceedings, both of which can be costly and add to regulatory workload.
- Reconciliation proceedings can be as contentious as rate proceedings, meaning that the adjustment clause may offer no real regulatory advantage.
- Due-process rights of ratepayers may be compromised.
- They create instability in rates and may contribute to rate shock.
- Consumers may perceive that the utility is free from oversight.

Special Considerations

- Water utility expenses are not necessarily substantial, volatile, or unpredictable
- The water sector is not as competitive as the energy sector.
- Commissions may lack the resources to provide effective oversight of adjustment clauses in the water sector (for example, accounting and auditing).
- Adjustment clauses may further complicate regulatory oversight at a time when managerial prudence and operational efficiency are critically important.

Source: Authors' construct.

Special-Purpose Surcharges

A surcharge is a mechanism for collecting funds from ratepayers for a designated purpose (such as a capital improvements project) over a fixed period of time. It typically is calculated outside of the utility's basic revenue requirement. Surcharges are very similar to automatic adjustments and pass throughs; some of the items reported in table 5-8 are surcharges. A leading example is the use of surcharges in conjunction with PENNVEST loans, which helps assure repayment of loan amounts to the state. In Pennsylvania, an abbreviated rate filing can be used for such costs.[22] The Washington legislature has provided for the establishment of an emergency reserve account funded through a surcharge. Expenditures from the account require approval from the state's drinking water quality administrator and are treated as customer contributions (see appendix C).

Surcharges can be used by water utilities to raise capital for SDWA compliance and other infrastructure needs, or to retire an acquired system's debt.[23] As discussed in chapter 6, conservation surcharges can provide incentives for demand-side management, although surcharges typically are proposed in conjunction with supply-side investments. In many respects, surcharges are simple to implement and easy to understand. As noted above, a surcharge can be used in conjunction with construction-work-in-progress (CWIP). In Connecticut, this approach is limited to new treatment plants for meeting SDWA requirements. Water industry representatives have argued for expanding the use of CWIP-like surcharges. According to James McInerney, "A surcharge mechanism, similar to the existing CWIP surcharge for SDWA-related projects, also should be implemented at least semi-annually to include in rate base capital additions for approved non-SDWA infrastructure expenditures."[24]

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[22] NARUC Water Committee, *Discussion Papers.*

[23] Ibid.

[24] James S. McInerney, "Alternative Methods of Public Utility Regulation," *NAWC Water* 34 (Spring 1993): 13.

However, the rationale for the CWIP surcharge in relation to the SDWA, where investments are regulatory-driven, is far different from the rationale for its application to other infrastructure investments. As noted before, infrastructure costs will be far more substantial than SDWA compliance costs for many water systems. It is obvious why the industry would advocate expeditious recovery of as many costs as possible, but surcharges for capital projects can greatly reduce performance incentives and limit opportunities for regulatory oversight. Table 5-10 reports advantages and disadvantages of surcharges.

TABLE 5-10
EVALUATING SPECIAL-PURPOSE SURCHARGES

Advantages of Special-Purpose Surcharges

- They reduce regulatory expense to the water utility and the regulatory agency.
- In conjunction with used and useful requirements, they can satisfy regulatory criteria.
- They mitigate against rate shock for capital projects.
- They can be used to promote specific policies, such as a demand-side management.
- Special costs or fees are recovered with minimum delay.
- They segregate costs and send customers a clear rate signal about special needs.

Disadvantages of Special-Purpose Surcharges

- They may stretch commissions resources for oversight and coordination.
- They may lessen incentives for cost control.
- Their use may be limited by statute or policy to specific kinds of expenditures.
- Surcharges may be viewed as external to the revenue requirement process and give the perception of cost-plus ratemaking.

Special Considerations

- Use in conjunction with SDWA costs requires coordination with state drinking water quality administrators, for which a memorandum of understanding may be essential.
- They may be implemented on a case-by-base basis, although this raises equity issues.
- They may be appropriate in conjunction with special financing opportunities for water utilities, such as government loans or grants.

Source: Authors' construct.

Expedited Proceedings

To address regulatory lag, the lapse between the time a capital project is completed and the time it is entered into the rate base, many water utilities would like to see more use of expedited proceedings. Estimates of the time lag associated with regulation are provided in table 5-11. The state commissions have expedited the regulatory process for water utilities, especially small water utilities, through simplification of rate case filings, proceedings, and reporting. As reported in table 5-12. a number of commissions also provide procedures to clarify and narrow issues in rate cases. Methods to expedite regulatory processes save resources for the regulatory agencies, as well as the utilities they regulate. A separate rationale for expedited proceedings is to speed up cost recovery.

Simplification recognizes that small utilities are fundamentally different than large utilities and that it may be appropriate to differentiate between the two in the course of regulation. Simplification often is applied by the states selectively; that is, only some utilities can take advantage of these approaches, usually on the basis of size measure in terms of customers, connections, or revenues.[25] Lacking financial and managerial resources, many small utilities find it difficult to comply with regulations. A substantial portion of the revenue requirement they request may needed to cover the analysis and litigation costs of the rate case itself, although as costs rise, the proportional cost of regulation will probably decline.

In addition to general simplification, a number of other alternatives to traditional regulation are emerging. These include stipulations, settlements, negotiated processes, and possibly generic proceedings for certain issues. In some jurisdictions, rates are allowed to increase under bond pending the outcome of a rate case. A focused proceeding also might be used to narrow issues, for example, by limiting the scope to

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[25] Janice A. Beecher and Ann P. Laubach, *1989 NRRI Survey on Commission Regulation of Water Utilities* (Columbus, OH: The National Regulatory Research Institute, 1989).

additions to rate base. Still another approach is to use another proceeding, such as a certification hearing or integrated planning process, to help establish the prudence of investments prior to a rate case. Not all of the emerging approaches, however, reduce regulatory lag or the cost of regulation to utilities or the state public utility commissions. Negotiated settlements, for example, may produce good decision outcomes but they can require a substantial commitment of time and resources by participating parties.

Although a strong case can be made for developing special procedures for *all small* utilities, the case for special procedures for *all water* utilities is not so easily made. The proportionately large capital investment anticipated in water supply may present a case for more, not less, opportunities for regulatory oversight. A summary of advantages and disadvantages of expedited proceedings appears in table 5-13.

TABLE 5-11
TIME ALLOWED AND TIME TAKEN FOR WATER UTILITY RATE CASES

Statutory time limit allowed for water utility rate cases	Number of Commissions
3 to 6 months	6
7 to 9 months	21
10 to 12 months	12
Other	6

Approximate average time required for water utility rate cases	Number of Commissions: Small Systems <3,300 population	Number of Commissions: Large Systems >3,300 population
1 to 4 months	15	5
4 to 6 months	16	14
6 to 9 months	6	14
9 to 12 months	3	9
Not applicable/not available	5	3

Source: *1992 NRRI Survey on Commission Ratemaking Practices for Water Utilities.*

TABLE 5-12

COMMISSION POLICIES TO EXPEDITE OR SIMPLIFY WATER CASES

COMMISSIONS WITH PROCEDURES TO CLARIFY AND NARROW ISSUES IN RATE CASES	COMMISSIONS WITH SIMPLIFIED RATE FILING	COMMISSIONS WITH SIMPLIFIED HEARINGS OR PROCEEDINGS	COMMISSIONS WITH SIMPLIFIED REPORTING	COMMISSIONS WITH OTHER FORMS OF ASSISTANCE OR SIMPLIFICATION
Alabama	Arizona	Connecticut	Colorado	Arizona
Alaska	California	Idaho	Connecticut	Florida
Arkansas	Colorado	Indiana	Idaho	Missouri
California	Connecticut	Maryland	Illinois	New Hampshire
Florida	Florida	Mississippi	Maine	Oklahoma
Idaho	Idaho	Missouri	Missouri	Oregon
Indiana	Illinois	New York	New Mexico	Pennsylvania
Iowa	Kentucky	North Carolina	New York	Rhode Island
Kansas	Maryland	Oklahoma	North Carolina	Vermont
Kentucky	Missouri	Oregon	Oklahoma	Washington
Louisiana	Nevada	Pennsylvania	Pennsylvania	
Maine	New Mexico	Rhode Island	Texas	10 COMMISSIONS
Maryland	New York	Texas	Wisconsin	
Massachusetts	Ohio			
Michigan	Oklahoma	13 COMMISSIONS	13 COMMISSIONS	
Mississippi	Oregon			
Montana	Pennsylvania			
Nevada	Rhode Island			
New Jersey	Texas			
New York	Virginia			
North Carolina	Washington			
Oklahoma	West Virginia			
Oregon				
Pennsylvania	22 COMMISSIONS			
South Carolina				
South Dakota				
Tennessee				
Texas				
Vermont				
Virginia				
Washington				
West Virginia				
Wisconsin				
Wyoming				
34 COMMISSIONS				

Source: *1989 NRRI Survey on Commission Regulation of Water Utilities* (revised for Pennsylvania) and National Association of Regulatory Utility Commissions *1989 NARUC Annual Report on Utility and Carrier Regulation* (Washington, DC: National Association of Regulatory Utility Commissioners, 1990), table 209.

TABLE 5-13

EVALUATING EXPEDITED PROCEEDINGS

Advantages of Expedited Proceedings

- They reduce the time lag, risks, costs, and workload associated with regulation.
- They focus attention on the most critical issues.
- They accelerate revenue recovery, thereby enhancing the utility's viability.
- Negotiated processes may help facilitate consensus building, and avoid costly and unnecessary litigation.

Disadvantages of Expedited Proceedings

- They may require nontraditional skills on the part of regulatory staff.
- A focused process may not recognize the intrinsic interrelationships among capital and operating expenses.
- Some expedited proceedings may raise due-process considerations for affected parties.
- Not all expedited processes will hold up to judicial review.
- Without adequate opportunities for oversight, management imprudence and other problems may go undetected by regulators.
- They may make it harder to achieve least-cost and other long-term policy goals.

Special Considerations

- The diversity of the industry makes it difficult to establish policies and procedures that apply fairly to both very large and very small systems.
- They may be especially appropriate for small systems, where regulatory costs are high.
- The growing complexity of water utility regulation may make implementation difficult.
- Even small water utilities still occupy a monopoly position vis-a-vis their customers.
- The cost of regulation, even for smaller utilities, is a legitimate and necessary expense that yields benefits to ratepayers.
- Expedited processes may preclude input from drinking water quality regulators.

Source: Authors' construct.

Future Test Year

Revenue requirements generally are expressed in terms of a representative test year; that is, the relevant financial data are expressed on an annualized basis. A historical test year is defined as a prior twelve-month period for which actual utility data are available. A current or mixed test year is defined as a twelve-month period that includes both historical and projected cost data. A future test year is defined as a twelve-month period commencing subsequent to the implementation of the rate change. Government-owned utilities generally use a future test year.[26]

The rationale for using a future test year is that it provides utilities an opportunity to present evidence on anticipated expenses for the coming period. This might include soon-to-be completed or acquired facilities. The water industry has lobbied for the use of a future test year in Ohio and other states:

> Among the many advantages cited on behalf of future or forecast test years, three stand out as the most important. First, this methodology allows rates to be determined so that they more closely reflect current utility operating factors and general economic conditions. Second, the enhanced ability of utility management to more fully and expeditiously recover current costs will result in lower rates to consumers. Third, current cost recovery via projected data will reduce rate case filings and thereby mitigate the administrative burdens on regulatory agencies.[27]

Yet using a future test year runs contrary to the traditional regulatory approach, which relies on evidence of investments and expenses. As noted in the NARUC report, use of a future test year can exact a toll, particularly in that "the utility may be

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[26] American Water Works Association, *Revenue Requirements,* AWWA Manual M35 (Denver, CO: American Water Works Association, 1990), 6.

[27] Ohio-American Water Company, *1991 Legislative Briefing for the State of Ohio* (handout).

indifferent to or encourage excessive costs or may attempt to represent a high level of annual costs."[28]

The state commissions using a future or mixed test year are reported in table 5-14. The advantages and disadvantages of the future test year are reported in table 5-15.

TABLE 5-14
COMMISSIONS USING A FUTURE TEST YEAR OR MIXED TEST YEAR FOR WATER UTILITIES

Future Test Year	
California	New York
Florida	Pennsylvania
Hawaii	Tennessee
Illinois	Utah
Michigan	Wisconsin
New Mexico	
Mixed Test Year	
Arkansas	New Jersey
Delaware	Ohio
Florida	Pennsylvania
Illinois	Utah
Maryland	Vermont
Mississippi	West Virginia

Source: *1992 NRRI Survey on Commission Ratemaking Practices for Water Utilities.* Commissions do not necessarily use the same type of test year for every case.

[28] NARUC Water Committee, *Discussion Papers,* 4.

TABLE 5-15

EVALUATING THE FUTURE TEST YEAR

Advantages

- By focusing on future costs, it is a forward-looking technique compatible with incremental-cost pricing.
- It matches costs with the time period rates will be in effect.
- It can incorporate highly probable cost changes in the rate signal.
- It avoids the problem of setting rates for the future based on past costs.
- It does not presume that past cost relationships will continue forever.
- It can help mitigate against the erosion of utility earnings during inflationary periods.

Disadvantages

- It runs contrary to many traditions of utility ratemaking.
- It relies heavily on uncertain information that is harder to obtain and verify.
- It reduces incentives for cost control, including operational innovations.
- It sometimes employs a much longer time horizon than justified.
- It creates the potential for intergenerational inequities.
- Without reconciliation procedures, it can result in imprudence or excess earnings.

Special Considerations

- Very small utilities may lack the analytical resources to make the forecasts necessary for a future test year.
- Anticipated costs in connection with the SDWA may justify using a future test year on a case-by-case basis.
- The use of a future test year could be linked to forward-looking improvements in rate design (such as marginal-cost pricing) and utility planning (such as integrated resource planning).

Source: Authors' construct.

Preapproval of Expenditures

Preapproval is a mechanism for expediting the recovery of capital expenditures. It involves an agreement between the utility and the state regulatory commission specifying the ratemaking treatment of expenditures prior to actual construction.[29] The quest for preapproval by electricity utilities was a direct response to retrospective prudence reviews and cost disallowances by the commissions. Preapproval also has been a prominent issue in the debate over Clean Air Act implementation.[30] Preapproval has been won by a few water utilities, but advocates would like to see its use extended.[31]

Allowing pro forma plant in rate base or using a projected test year can be considered forms of preapproval. However, as a matter of policy, preapproval generally goes further in predetermining regulatory treatment of expenditures. One approach is to preset a surcharge that takes effect on the in-service date of the capital facility (when it becomes used and useful), thereby reducing regulatory lag and uncertainty about cost recovery. Preapproval can make it easier to get financing, particularly for smaller utilities, when lenders require clear assurance that loans will be repaid. It also might be used to provide positive incentives to utilities for acquiring nonviable systems, investing in demand-side management, or meeting other policy goals.

Preapproval can conflict with many regulatory standards and unfairly attempt to tie the hands of future regulators who occupy the commission when construction projects are actually completed. As an alternative to preapproval, least-cost or integrated

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[29] Keith W. Bossung, "The Pre-Approval Approach to Ratemaking: The Massachusetts Experience," *New England Water Works Association Journal* 105 (September 1991): 165-68.

[30] For an excellent overview, see Kenneth Rose, Robert E. Burns, Jay S. Coggins, Mohammed Harunuzzaman, and Timothy W. Vieser, *Public Utility Commission Implementation of the Clean Air Act's Allowance Trading Program* (Columbus, OH: The National Regulatory Research Institute, 1992).

[31] Bossung, "The Pre-Approval Approach." The author cites a meter installation program as an example of preapproval in the water sector.

resource planning (IRP) may be preferable because a planning framework allows for a continued sharing of risks and rewards by investors and ratepayers. Advantages and disadvantages of preapproval of utility investments are presented in table 5-16.

TABLE 5-16
EVALUATING PREAPPROVAL OF EXPENDITURES

Advantages of Preapproval

- Regulatory lag and uncertainty to utilities are greatly reduced.
- It may help lower capital costs and enhance the likelihood of getting financing.
- It helps guarantee that reasonable and prudent investments will be pursued.
- It can be used to build consensus and public support for capital projects.
- It can promote consolidation of the industry through system acquisitions.
- It can be used as a positive incentive system for a variety of policy goals.
- It can provide incentives for demand-side as well as supply-side investments.

Disadvantages of Preapproval

- It undermines the regulatory standards of prudence and used and useful.
- It can pose problems in reconciling preapproved and actual costs.
- Certificates of convenience and necessity and integrated planning are sufficient to guide and oversee utility investment decisions.
- Regulators may be coopted by utilities, or vice versa.
- Financial risks are shifted from ratepayers to investors.
- The utility has fewer incentives to minimize costs or complete projects as planned.
- It requires substantial regulatory resources, expertise, and involvement.
- Utilities may believe they are locked into plans, regardless of changing circumstances.
- The ability of the commission to expose management imprudence is reduced.
- Irrevocable contracts unfairly attempt to tie the hands of future regulators

Special Considerations

- Utilities may use the SDWA to rationalize the need for preapproval of many investments that are not SDWA-driven.
- Commissions may want to coordinate any preapproval process they use with drinking water quality regulators in the case of SDWA projects.
- Commissions may want to consider preapproval policies based on utility size because of the special financing needs of small water systems.

Source: Authors' construct.

Incentive Regulation

To the extent that costs can be passed along to ratepayers, traditional rate regulation provides public utilities with disincentives to control costs and incentives to inflate costs. The public utility is provided with minimal direct incentives to be efficient. Incentive regulation has substantial potential for eliminating the cost inefficiencies associated with water rate regulation. Incentive regulation incorporates regulatory approaches that could provide water utilities with incentives to operate more efficiently.[32] Incentives for performance can be positive (carrots) or negative (sticks).

Incentive regulation can take many forms, each of which incorporates a mechanism for inducing utilities to improve efficiency via a system of rewards and/or penalties. One form is a price cap, in which the utility provides basic services at rates not to exceed a specified level for a specific time period, in exchange for rate-of-return deregulation. Price-cap regulation provides utilities with incentives to reduce costs and thus increase its rate of return. A second form, cost indexing, allows automatic rate increases based on a specified cost index. Utilities will strive to keep actual costs lower than indexed costs, because they are allowed to retain the cost savings. Conversely, if actual costs increase more than indexed costs, the utility absorbs the overrun in costs. A third form, incentive rates of return, allows the investor-owned utility to earn a premium return on investment if it is deemed to be efficient by certain standards. Conversely, an inefficient water utility would be penalized by being constrained to earning a lower rate of return on investment. A fourth form, construction-cost incentive programs, involves regulators setting cost targets that the utility is permitted to recover on new capacity. The water utility would be provided the incentive to examine alternatives including both new owned facilities, as well as new, unowned facilities (for example, leasing). A fifth form is profit-sharing between investors and ratepayers, which would allow utilities to be profitable without the risk of earning excessive profits at the expense of ratepayers.

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[32] Harry M. Trebing, "Toward an Incentive System of Regulation," *Public Utilities Fortnightly* 72 (July 18, 1963): 22-39.

Traditional rate regulation can provide disincentives for public utilities to invest in demand-side management.[33] Even when conservation investment is more efficient than either producing or purchasing incremental supplies, cost recovery is easier for the supply-side investment. The utility bias against demand-side investment is simple. Conservation translates into decreased utility revenues with the real savings from conservation generally flowing to the ratepayer.[34] Several incentive mechanisms are available to offset the bias toward supply-side investment in public water supply.[35] One incentive is comparable regulatory treatment of supply-side and demand-side investment. Many state commissions permit both capital recovery and a rate of return on supply-side investment, but allow the recovery of demand-side management investments only as an operating expense. In addition, commissions could permit water utilities to share in the savings from conservation investments.

Incentive regulation has many potential uses, although in many respects it is an unproven method. Incentives can be linked to broad policy goals (such as efficiency and integrated planning), or specific endeavors (such as acquisitions of nonviable water systems). Incentive regulation can be used in conjunction with other regulatory tools, such as management audits, to ensure that utility performance is prudent as well as efficient. As a general rule, regulatory commissions should consider the incentives and disincentives associated with various ratemaking approaches. Incentive regulation can be used in conjunction with other methods, such as automatic adjustments, to encourage efficiency and protect ratepayers from potential abuses. Some general advantages and disadvantages of incentive regulation are reported in table 5-17.

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[33] Charles J. Cicchetti and William Hogan, "Including Demand Side Options in Electric Utility Bidding Programs," *Public Utilities Fortnightly* 123 (June 8, 1989): 9-20.

[34] M. Curtis Whittaker, "Conservation and Unregulated Utility Profits: Redefining the Conservation Market," *Public Utilities Fortnightly* 122 (July 7, 1988): 18-22.

[35] Stephen Weil, "Making Electric Efficiency Profitable," *Public Utilities Fortnightly* 124 (July 6, 1989): 9-16.

TABLE 5-17

EVALUATING INCENTIVE REGULATION

Advantages of Incentive Regulation

- Incentives can be used for a broad spectrum of purposes, including cost control, innovative rate design, quality-of-service improvements, and demand-side management.
- Utilities can be rewarded for efficient behavior and penalized for inefficient behavior.
- Utilities can be rewarded for innovation in management and operations.
- It allows utilities to respond to market forces.
- It shifts some risks to utility managers and investors.
- It can reduce regulatory costs and the need for extensive oversight.

Disadvantages of Incentive Regulation

- Utilities can earn excessive profits.
- It requires regulators to give up some aspects of oversight.
- It can introduce considerable uncertainty for both utilities and their customers.
- Implementation can be complex in terms of developing quantitative performance standards, equitable incentives, a flexible implementation process.
- It may not be administratively simple and may actually increase regulatory costs.
- Customers may be confused or sense that the utility is not being closely regulated.
- Regulators and utilities have little experience with it.

Special Considerations

- It may be less appropriate for smaller water systems because of persistent viability problems and the need for comprehensive regulatory oversight.
- Regulators may have to establish a size threshold for implementation, and maintain two regulatory regimes for their jurisdictional water utilities.
- Experience in its application in other utility sectors, such as telecommunications, is not transferable because of fundamental differences among the utility industries.
- Competitive opportunities in the water sector today are still limited.
- Regulators may need to become more aware of water utility performance incentives.
- Changing the rules of the game in the midst of other major changes for the industry may add to the confusion over performance standards.

Source: Authors' construct.

Overview

As this review suggests, a wide variety of methods exist to alter the ratemaking process in response to the revenue requirements needs of regulated industries. The advantages and disadvantages associated with each approach are significant. To varying degrees, each method can help utilities achieve revenue stability but not without exacting a price on ratepayers. Many of the methods shift risk from investors to ratepayers. Most of the methods reflect a potential conflict between the rapid recovery of costs and thorough regulatory oversight. Most of the methods have implications for performance incentives and disincentives. Most of the methods also have serious implications for small water system viability. In fact, a viability assessment of affected water systems prior to implementing any changes in ratemaking approach would probably be a sound investment of regulatory resources. Finally, all ratemaking approaches have short-term and long-term implications.

Whether or not a particular method is appropriate in a given regulatory jurisdiction may depend on the circumstances of a particular utility or policy considerations that are best made by the individual state commissions. In other words, no generic ratemaking solution exists for the commissions. Nor is a generic solution appropriate for any one kind of utility cost. Still, some methods might be more generally palatable than others. Carefully implemented, for example, a future test year might be more acceptable than a pass through or surcharge because of more reasonable implications for performance incentives and risks.

Commissions should be especially wary of the wholesale adoption of ratemaking methods that have been used in other utility areas. Some methods will be ineffective when applied to water utilities, unless appropriate modifications are made. Certain approaches to incentive regulation, for example, will not transfer readily from the telecommunications sector to the water sector because of fundamental technological, structural, competitive, and regulatory differences between the industries. The same holds true for automatic adjustment clauses as applied to natural gas utilities and preapproval as applied to electricity utilities.

Regulators should be flexible and open-minded, but informed and cautious in their consideration of ratemaking alternatives. Extra caution is warranted when considering the application of ratemaking alternatives to a rising-cost industry. The commissions must choose methods appropriate to their jurisdiction and the resources they want to devote to water utility regulation. In essence, the goal of utility ratemaking should be the expeditious recovery of costs prudently incurred by an efficient utility. Experimentation with alternative approaches should enhance, not undermine, this fundamental purpose.

CHAPTER 6

RATE DESIGN ALTERNATIVES

Meeting revenue requirements in a rising-cost industry calls for the design of rate structures or tariffs to ensure an adequate flow of revenues.[1] The method of pricing also is important to ensure that rates track the cost of serving various classes of customers. Thus in rate design, as in so many other aspects of utility regulation, the goals of financial viability and economic efficiency are joined.

Examined here are several emerging rate-design techniques, all of which might be considered alternatives to the conventional techniques used by water utilities (introduced in chapter 3). Their use can be linked to a variety of public policy goals, including the need to enhance the financial viability of the water industry under the current cost pressures it faces. The first two, dedicated-capacity charges and system-development charges, directly concern the issue of increasing revenue requirements associated with demand growth. The next four are alternative rate structures that address the allocation or reallocation of costs in response to changing conditions and policies. They are contract rates, conservation surcharges, seasonal (or time-differentiated) rates, and zonal (or spatially-differentiated) rates. All of these alternative rate structures can be implemented by either investor-owned or publicly owned water utilities. A utility's ownership or regulatory structure, in other words, should not necessarily constrain the use of these techniques.

[1] George A. Raftelis, *Water and Wastewater Financing and Pricing* (Chelsea, MI: Lewis Publishers, 1993).

Dedicated-Capacity Charges

In some cases, water utility costs cannot be equitably distributed by charging only existing or present consumers. In these cases, a dedicated-capacity charge may be appropriate. Dedicated-capacity charges involve a relatively new technique for financing water system capacity. The general purpose of dedicated-capacity charges is to recover costs from certain customers for capacity primarily constructed for providing water service to these customers. Two types of dedicated-capacity charges are the availability charge and the demand charge.

The availability or readiness-to-serve charge is a charge designed to recover capacity and associated operating costs incurred by a water system in constructing facilities for the benefit of both existing and future customers.[2] The availability charge, which is generally incorporated in the rate structure of the water utility, is imposed only between the time water service is made available to the potential customer and the time actual service is commenced. When water service actually is received, then the availability charge is terminated.

The availability charge is particularly appropriate in cases where the base of connected customers is very small and the water utility requires a specified minimum level of revenues to make capacity expansion feasible. When a water utility constructs water supply facilities to serve a new housing development, the initial costs will tend to exceed the level of revenues that realistically can be recovered from the limited initial customer base. Thus, it is appropriate that lot owners be charged for having water service available, even though they are not actually receiving service.

The availability charge is an access charge reflecting the cost of providing consumer access or entry to the water system. Access charges are payments for system access regardless of usage and should be used to recover only the usage-insensitive costs incurred when consumers join the system. The justification for the availability charge is

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[2] American Water Works Association, *Water Rates and Related Charges,* AWWA Manual M26 (Denver, CO: American Water Works Association, 1986).

that a water utility incurs certain costs regardless of whether or not the consumer is receiving direct water service.

An advantage of the availability charge is that it promotes the sharing of costs between existing customers and unconnected property owners who may eventually derive benefits from the water system facilities. It adheres to the standard of assigning costs according to cost-causation in cases where the water utility has made significant capital investment in facilities to serve both existing and future customers. In these cases, it is appropriate for existing and future customers to share costs. In addition, the availability charge provides a stable cash or revenue flow to the water utility. The availability charge, by targeting unconnected customers, may provide a more stable revenue flow than system-development charges, since the latter rely on the number of new connections. If the cost of fire protection is incorporated into the general rate structure, then the availability charge permits the recovery of these costs from unconnected property owners who benefit from the availability of fire-protection service.[3]

One problem associated with the availability charge (in the case of developer systems) is the difficulty of identifying future customers, who are not known until the lot is sold and service is initiated.[4] Another problem is that in some cases it may not have a rational costing basis; for example, the availability charge may include costs that are usage-sensitive. In addition, legal constraints may affect the use of availability charges. Finally, both regulators and consumers may question the equity implications of a charge for a service not being directly rendered.

Demand charges, demand contracts, or take-or-pay contracts provide a mechanism by which the consumer pays the fixed costs associated with a specified portion of the

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[3] Vito F. Pennachio, "Demand and Availability Charges," in *AWWA Seminar Proceedings: The Rate Making Process* (Denver, CO: American Water Works Association, 1986), 3-10.

[4] One remedy for this problem, used in Florida, is to accumulate charges and bill a lump sum to customers upon connection.

capacity of a water system.[5] Demand contracts may be appropriate when a large customer requires a firm water supply that accounts for a substantial portion of the total capacity of the water utility. In some cases, the water utility may dedicate existing capacity to meet this firm demand; in other cases, the water utility may be forced to expand system capacity for this purpose. In either situation, customers agree to pay the direct capacity costs in addition to paying a commodity charge for the actual amount of water used. Fire-protection charges are an example of demand charges since customers pay for having a service available and the charges cover the cost associated with the specific demands imposed on the water system. Minimum-meter charges also are a variation of demand charges, particularly if the meter charges cover only usage-insensitive costs.

The advantages of demand contracts or charges are several. Demand contracts comply with the cost-causation standard since customers cover the capacity cost associated with providing a firm supply of water. The water utility is provided a stable revenue source regardless of water usage. This revenue stability enhances the ability of the water utility to attract capital and tends to decrease equity and debt financing costs.

The demand contract has the disadvantage of requiring the water utility to engage in capacity expansion. If the customer under the demand contract leaves the system for any reason, then the remaining customers may be forced to absorb the cost associated with the dedicated capacity. The possibility that large customers served under demand contracts could leave the system may force water utilities to incorporate demand-contract provisions to ensure the future recovery of the specified costs. The problem of large customer loss may be aggravated by regional competition for industrial and commercial firms. The use of guaranteed water service as a tool of economic development must be balanced against the cost and financial requirements of the water utility.[6]

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[5] American Water Works Association, *Water Rates and Related Charges.*

[6] How to strike this balance is a salient public policy issue but one that is beyond the scope of this investigation.

System-Development Charges

Periodically, water utilities must incur expenditures for system improvements. These system improvements require the water utility to develop financing programs for the construction expenditures. Water utility managers must decide which costs are more appropriately recovered by increasing water rates and which costs are more appropriately recovered by capital charges. If the capital improvement expenditure is oriented toward serving demand growth via the addition of new customers rather than toward benefiting existing customers, it may be inequitable or inappropriate to recover these capital costs from the existing customers. A financing option in this particular case is the use of a front-end capital payment (or capital contribution).[7] The payment is provided by the new customer to recover a portion of the capital investment required to provide service to the new customer. The rationale for such a front-end charge is to require new customers to finance system improvements that directly benefit them and are largely a result of the demand growth caused by the new customers.

One form of a front-end charge is the system-development charge, which is a one-time charge to new customers when they are connected to the water system. These charges also are known as system-capacity charges, system buy-in charges, connection charges, or facilities charges. The system-development charge is generally limited to recovering capital expenditures for back-up or support facilities required by projected demands of new customers.[8] The system-development charge is not appropriate for recovering operating costs. The back-up facilities, in many cases, are built by a developer and their cost is passed on to the customer in the purchase price of the lot. The primary purpose of the system-development charge is to finance the capital expenditures for the back-up facilities; however, a secondary purpose may be to require new customers to provide a capital payment equal to that already provided by existing

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[7] American Water Works Association, *Water Rates and Related Charges.*

[8] Ibid.

customers. A system-development charge also may be used to ensure that water rates for existing customers need not be adjusted to recover the costs of facilities that primarily are for providing service to new customers.

In using these charges, a clear linkage generally must exist between the need for the new water facilities and the creation of new housing, and the revenues generated should not exceed the cost of the facilities necessary to provide service to the housing development.[9] When capital investment needs are incremental and smooth, fees from developers (new customers) can be justified only for rapidly growing communities or when the real costs of supply facilities are increasing. When capital investment needs are large and lumpy, fees from developers can be justified on equity and efficiency grounds in almost all growth and cost cases.

The method of calculating the system-development charge will be driven largely by the purpose of the front-end charge. If the purpose of the system-development charge is to require new customers to contribute capital funds equal to that previously provided by existing customers, then a method known as the system buy-in method can be employed. The system buy-in method is based on the concept that new customers are entitled to the same commodity rates as existing customers. Thus, since the present customers have provided funds (via commodity rates and/or capital contributions) for past system improvements, debt retirement, and so on, then the new customers should provide an equivalent amount of capital.

In contrast, if the objective of the system-development charge is to require new customers to pay for the system expansion caused by their connection to the water system, then a method known as the incremental-cost method can be employed. Under the incremental-cost method, new customers can be charged for the cost of the last increment of system facilities and/or the cost of the next anticipated increment of planned capacity or system facilities. Obviously, this approach requires a cost analysis of recently constructed capacity or anticipated planned capacity. The incremental-cost

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[9] David H. Moreau and Thomas P. Snyder, "Financing Burdens and Economic Costs in Expanding Urban Water Systems," *Water Resources Research* 23 (July 1989): 1139-44.

method has several purposes. One purpose is to ensure that the costs of system expansion do not have to be recovered via the general water rate structure. Another purpose is to generate revenues from new customers for system facilities directly benefiting the new customers, thus reducing the need for future commodity rate increases.

The merits of the system-development charge are several. First, the system-development charge can preclude existing customers from having to pay for the capital investment caused by the addition of new customers. Second, by requiring the customers who have caused the system growth to pay for that growth, the system-development charge preserves a singular or common rate schedule for both existing (old) and new customers; that is, it precludes consideration of vintage rates. Third, the system-development charge reduces the need for other sources of capital financing and increases in water rates to accommodate system growth.

Several limitations are associated with the system-development charge. First, reliance on the charge to satisfy current revenue requirements creates a potential for revenue instability since these front-end charges are tied to water system growth and this growth will fluctuate depending upon both local and national economic conditions. Second, the system-development charge may discourage system growth under certain conditions, particularly if it creates rate shock for new customers. Third, calculating a system-development charge via the incremental-cost method is somewhat complex and involves more than modest data requirements. The incremental-cost method, for example, requires cost forecasting and computing the present values of these forecast costs. Fourth, the use of system-development charges is constrained by Internal Revenue Service guidelines. Most customer-contributed capital is considered taxable income. Unless this tax impact is factored into the calculation of the charge, the revenue advantage of using the charge will be seriously diluted. Also, the use of taxable contributions affects various utility accounting categories, such as depreciation, tax credits, and deferred taxes. Fifth, there can be regulatory and judicial opposition to system-development charges that are forward-looking, that is, based on incremental costs. Sixth, system-development charges can be somewhat arbitrary; for example, they may be based on present debt service levels or they may simply be equivalent to those in place at adjacent water utilities.[10] In brief, given these several problems and the potential for rate shock to new customers, judgment and careful analysis must be exercised in constructing a system-development charge that will be acceptable to regulators, the judiciary, and new customers.[11]

Contract Rates

A contract rate is a specialized water rate for serving a single large customer or a small group of large customers.[12] The purpose of the contract rate is to provide the large user with a relatively stable monthly charge for water service while simultaneously permitting the water utility to fully recover the cost of serving the large user. A customer-specific tariff may be used alone or in conjunction with a contractual agreement to achieve this purpose.

A typical form of contract rate is the commodity-demand rate. The commodity-demand contract rate has three components.[13] The first component is a *customer charge* that recovers metering, billing, and administrative costs. The second component is a *demand charge* that recovers demand-related capacity costs associated with providing service at peak (maximum-day and maximum-hour) periods. The third component is a *commodity charge* that recovers the costs directly related to volume of usage. Thus, the

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[10] Drew S. Barden and Russell J. Stepp, "Computing Water System Development Charges" *American Water Works Association Journal* 76 (September 1984): 42-46.

[11] Robert F. Banker, "Front End Responsibility for Capital Investment," in *AWWA Seminar Proceedings: The Rate Making Process* (Denver, CO: American Water Works Association, 1986), 43-51.

[12] American Water Works Association, *Alternative Rates,* AWWA Manual M34 (Denver, CO: American Water Works Association, 1992).

[13] Ronald A. Smith, "Long-Term Contracts for Large Users: An Industry Viewpoint," *American Water Works Association Journal* 81 (May 1989): 53-6.

commodity-demand approach results in a rate structure that has two fixed charges (that is, customer charge and demand charge) and a commodity rate.

Several advantages to contract rates can be identified. A negotiated contract rate provides the water utility with an adequate, stable, and guaranteed flow of revenues. The revenue stability provided by contract rates may allow the water utility to engage in system expansion, if and when it becomes necessary. At the same time, the large user benefits from the assurance of an adequate quantity and adequate quality of service at a guaranteed price. Contract rates adhere to the standard of cost causation as they recover only the cost of service to the specified customer or customers, for example, the cost of special facilities applicable to the large customer.

A chief disadvantage of contract rates is the potential for noncontract customers to subsidize contract customers. Large utility customers may have the option of bypassing the water system, and thus can exert leverage for a rate that does not fully cover the actual cost of service. Some large customers, for example, may be able to bypass the utility through self-supply for certain industrial processes. Another form of bypass occurs when large customers implement aggressive conservation practices (including reduced water usage and recycling). The result of bypass is higher rates for the remaining customers. In addition, a negotiated contract rate for a large user may not be conducive to conservation. Another potential disadvantage of rates established through contracts is the somewhat complex process needed to stipulate conditions of service, contract duration, early termination provisions, take-or-pay requirements, dispute resolution procedures, rate-design methodology, and other terms.[14]

A variation of the contract rate is the economic-development rate. The economic-development rate involves setting rates for certain customers below actual costs of service. This type of contract rate has the objective of stimulating economic development in the service area of the water utility. Because the economic-development

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[14] Gary S. Saleba, "Large Water Users: Wholesale Contracts for Other Water Utilities," in *AWWA Seminar Proceedings: The Rate Making Process* (Denver, CO: American Water Works Association, 1986), 39-42.

rate generally does not produce revenues sufficient to recover the actual cost of providing service to the specified customer or customers, it results in subsidization from other customers. The rationale for this type of rate is that it will help expand existing customer usage or attracting new customers. The overall intent is to provide economic benefits to the community or region in terms of increased employment and increased tax revenues.[15] Generally, economic-development rates apply only to large commercial or industrial users. Sometimes, only a single large user will qualify for the rate. However, these rates also may be extended to smaller customers, such as hospitals, that provide critical services to the community.

The primary advantage of the economic-development rate is that it can provide long-term benefits to a community in the form of employment and tax revenues. The water utility benefits from the revenue enhancement a large customer provides. The economic-development rate also can be a technique for decreasing excess system capacity. In addition, the economic-development rate is relatively simple to implement and administer.

The disadvantages of the economic-development rate are similar to those associated with the contract rate. Because an economic-development rate does not fully recover the cost of serving the customers on the rate, the result is cross-subsidization from the customers ineligible for the rate. In other words, the subsidy to a small group of users is borne by the remaining customers in the form of higher water rates. The customers who compensate the utility for lost revenues are captive customers whose demand for water service generally is more price-inelastic. Thus, economic-development rates raise serious issues of equity and the appropriate role of public utility rates as a tool of development. In many cases, the use of tax incentives or grants from the local governing body may be more suitable than the use of utility rates for the purpose of stimulating local economic activity.

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[15] American Water Works Association, *Alternative Rates*.

Conservation Surcharges

An example of the potential integration of marginal cost and average cost in water utility rate design is the conservation surcharge or capacity deferral benefit.[16] Calculating the conservation surcharge involves one of several methods for estimating marginal cost in water supply.[17] The conservation surcharge focuses on cost savings associated with conservation--the costs avoided by eliminating excess or discretionary usage. The end result is a commodity charge reflecting the costs that would be avoided if consumers lowered their level of demand. Determining the appropriate value for the conservation surcharge involves two steps: (1) identifying discretionary water consumption and (2) estimating the cost consequences of having consumers continue their long-term usage patterns at levels that include this discretionary usage.

The first and most critical step in calculating the conservation surcharge is to identify discretionary usage for water consumers. Estimating the usage denominator involves judgment on the part of the policymaker or rate analyst. Some jurisdictions that mandate water conservation may decree discretionary usage. The level of water usage that can be considered discretionary varies across customer classes. For single-family residential customers, a portion of lawn sprinkling and other external usage can be identified as discretionary. In regions with seasonal variations in demand and summer peaks, for example, a threshold of twice the winter (domestic or in-house) usage could be established for single-family residential consumers. In this case, usage amounts in excess of twice the level of winter consumption could be considered discretionary. Other standards would have to be developed for multifamily residential dwellings. For nonresidential customers, a greater variety of water uses can be considered in

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[16] Patrick C. Mann and Don M. Clark, "Water Costing, Pricing and Conservation," in *Proceedings of the Eighth Biennial Regulatory Information Conference* (Columbus, OH: The National Regulatory Research Institute, 1992).

[17] Janice A. Beecher and Patrick C. Mann, *Cost Allocation and Rate Design for Water Utilities* (Columbus, OH: The National Regulatory Research Institute, 1990).

determining discretionary demand. Discretionary usage for residential and nonresidential consumers can be combined and summed for the forecast period. The forecast period is the period from the present up to the new trigger date for the capacity increment that would be necessary if discretionary usage is not eliminated. The end result is a usage denominator that measures the cumulative level of discretionary usage for the entire forecast period.

The second step in calculating the conservation surcharge is determining the avoided-cost numerator. The numerator represents the capital expenditures required to satisfy discretionary usage, if this usage cannot be eliminated by conservation. The numerator can be calculated by one of several methods for estimating marginal-capacity cost. The cost numerator represents the savings associated with delaying the capacity increment, if the excess usage is eliminated, or conversely, the cost of the capital investment that would be required to satisfy the excess demand, if the latter were not eliminated by conservation. Dividing the avoided cost by the accumulated discretionary usage produces a unit cost that can be translated into a commodity charge applicable to the identified excess usage.

The conservation surcharge unbundles water usage in excess of average or normal levels and identifies the incremental cost associated with that usage. The conservation surcharge signals the opportunity cost associated with the consumer's decision to continue discretionary usage.

The conservation surcharge can stand alone and thus be appended to a variety of rate designs based on either embedded or marginal cost. Revenues from the conservation surcharge could be placed in a dedicated deferred credit account to offset future costs incurred by the water utility in implementing conservation programs. In essence, the conservation surcharge could be separate from the revenue requirements of the water utility. The conservation surcharge provides a forward-looking conservation signal and complements least-cost planning, particularly if the accumulated funds from the conservation surcharge are used to finance conservation programs. Because the conservation surcharge is external to basic revenue requirements, it provides an efficient price signal without creating revenue deficiency. In other words, basic utility revenue requirements are covered and only the revenues associated with the surcharge are potentially unstable.

The merits of the conservation surcharge are several. First, the conservation surcharge can be integrated with the embedded or average-cost approach traditionally used in water rate regulation. Second, it transmits a forward-looking and efficient price signal. Third, it complements least-cost planning as conservation expenditures are substituted for capacity construction. Fourth, surcharges can play a role in incentive regulation. By providing a means of funding conservation programs, utilities can be motivated to aggressively pursue conservation as a resource option. Finally, the conservation surcharge approach is compatible with the standard of cost causation as the commodity charge is levied directly on the specific consumers triggering the capacity increment. Consumers who elect to conserve avoid paying for the capacity that is linked to excess usage; consumers who elect not to conserve directly fund the capacity that ultimately will be necessary to meet the excess demand. In either case, consumer choice is maintained.[18]

The problems associated with the conservation surcharge are primarily ones of implementation and administration. Surcharges require monitoring, collection, and disbursement on the part of utilities. The billing system (including the billing cycle) must be conducive to tracking water demand, identifying discretionary usage, and applying the surcharge. Another problem is that it may be difficult for regulators to permit a rate mechanism that is external to traditional revenue requirement determination and oversee its implementation. This external funding mechanism could result in substantial amounts of excess utility revenue if consumers cannot conserve or they elect not to conserve or alter their existing water consumption habits. Finally, as mentioned above, revenues associated with surcharges can be unstable. This instability may undermine the programs that the surcharge was designed to promote.

[18] By contrast, consumer choices are limited when mandatory user restrictions are imposed.

Seasonal Rates

Most water systems experience distinct seasonal peaks, due to weather-sensitive demands. Seasonal pricing recognizes the cost variance between serving peak and off-peak demands. Water utility capacity requirements are determined by peak demand. Under seasonal rates, peak users are held responsible for the capacity required to serve those maximum demands, while off-peak users bear little responsibility for this capacity. Seasonal water rates provide price signals to consumers as to the actual cost savings that could result from changing temporal usage patterns, or conversely, the costs incurred by consumers not changing consumption patterns. Seasonal rates avoid the potential adverse results generally associated with voluntary conservation. Voluntary conservation can lower *average* demand without lowering *maximum* demand, which can result in lower capacity utilization factors, increased unit costs, and revenue erosion for the water utility.

The benefits of seasonal rates include increased operational efficiency (through load factor improvements) and reduced peak demands, both of which can enhance the financial condition of the water utility. Reducing peak or maximum demands can extend available water supplies and postpone (or possibly eliminate) the need for capacity expansion. For water consumers who are both willing and capable of modifying consumption usage patterns, seasonal rates provide a means of reducing water bills.

In contrast, uniform rates over time may induce unnecessary capacity expansion. Water rates not differentiated by time are set less than the unit costs of meeting maximum demands and set in excess of the unit costs of meeting off-peak demands. This cross-subsidization provides an inducement to expand system capacity in order to provide water service to the peak users. In brief, the averaging of peak and off-peak costs provides an involuntary subsidy to peak users from off-peak users. Thus, seasonal rates reduce temporal cross-subsidization among classes of customers.[19]

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[19] Beecher and Mann, *Cost Allocation and Rate Design*.

The emphasis on seasonal, rather than on time-of-day, pricing in water service is essentially a function of system design.[20] Much more variation is seen in the incremental cost associated with annual or seasonal demand cycles than with daily demand cycles. Source-of-supply and treatment facilities are generally designed to meet maximum day or seasonal demand variations. Distribution systems are generally designed to meet the maximum flows anticipated from fire protection; that is, maximum-hour demand is not an important parameter in distribution system design. In addition, maximum-hour demand is not a critical factor in the design of transmission facilities since the daily demand cycle is partially accommodated by elevated storage facilities.

Although seasonal pricing logically flows from marginal costing, most seasonal rates in place in the United States have been based on average cost rather than on marginal cost. For example, the seasonal rates in place in Tucson, Arizona, and Spring Valley, New York, do not directly incorporate marginal costs. Although these seasonal rate designs are in the direction of more efficient pricing, the use of embedded costs precludes truly efficient water rates. The use of embedded rather than incremental cost in the design of seasonal rates sometimes is cited as an example of the imperfect nature of rate innovation in the water sector.[21]

Seasonal pricing presents a number of implementation problems.[22] If water demand is price-insensitive, seasonal pricing may have only minimal effects on usage patterns. Thus, the anticipated benefit of deferred capacity expansion may not materialize, despite the fact that water prices more accurately reflect costs. Seasonal rates will tend to produce the anticipated efficiency benefits for price-sensitive customers.

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[20] Steve H. Hanke, "A Method for Integrating Engineering and Economic Planning," *American Water Works Association Journal* 71 (September 1978): 487-491.

[21] This is not to say that perfection in rate design is achievable in any utility sector.

[22] Patrick C. Mann and Donald L. Schlenger, "Marginal Cost and Seasonal Pricing of Water Service," *American Water Works Association Journal* 74 (January 1982): 6-11.

Implementing seasonal pricing may mandate modification of metering practices and billing.[23] Any rate structure that incorporates rate differentials based on time of use requires usage data by specific time period, or in this case, by season. Generally, these rate structures require a measurement of usage at the beginning and at the end of the peak period; that is, at least two meter readings are required at predetermined dates. A seasonal rate structure can be no more sophisticated than the capability of the water utility to measure water usage to which the seasonal rate structure is to be applied. Aside from sophisticated remote telemetry, no metering system in existence satisfies the strict requirements of seasonal pricing.

In practice, water meters in many parts of the country are not read with sufficient frequency to permit rates to conform precisely with true-peak and off-peak pricing.[24] The practice of quarterly meter reading creates the problem of billing periods that begin and end at different times during the specified peak and off-peak periods. This problem is compounded by the occasional practice of estimated meter readings. Estimated bills tend to distort the cause-and-effect principles of seasonal pricing. In essence, metering practices must be compatible with rate design if water customers are to receive correct price signals.

Several prerequisites to effective seasonal pricing exist. First, the peak demands must occur consistently during the same season. Second, there must be substantial demand variations between peak and off-peak periods. Third, installed capacity must be determined largely by the maximum demands on the system. Fourth, the water utility must be capable of estimating the cost differences between meeting peak and off-peak

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[23] Ibid.

[24] Water systems with higher rates seem to use more frequent meter reading and billing cycles (that is, monthly). As costs rise and the interest in rate design alternatives increases, many systems may reconsider their cycles.

demands. These several prerequisites indicate that seasonal rates may not be appropriate for all water systems.[25]

Two forms of seasonal rates can be implemented. The conventional form involves two rate structures; one applies to the off-peak period (usually the winter) and the other applies to the peak period (usually the summer).[26] These separate rates can involve decreasing-block, increasing-block, or uniform rates. A popular variation of seasonal rates involves a summer surcharge or summer excess-use charge. The summer surcharge can be appended either to increasing-block or uniform rates. The excess-use rate is applied only to summer usage in excess of average winter usage (or in some cases, adjusted average winter usage).

Zonal Rates

Efficient water pricing cannot be accomplished solely by reliance on seasonal or time-differentiated rates. Seasonal rates may need to be complemented by spatially-differentiated or zonal rates. In some cases, a uniform rate for the entire service area of the water utility can generate inefficiencies and can involve cross-subsidization. Zonal pricing recognizes that the location of consumers within the service area of the water utility, particularly relative to source-of-supply and treatment facilities, can affect the cost of providing water service to these consumers.

Employing the cost-causation standard, if water provision costs vary substantially across areas within the total service territory, then it is possible for the water rate structure to incorporate zonal rates. One zonal pricing model, for example, incorporates

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[25] John D. Russell, "Seasonal and Time of Day Pricing," in *AWWA Seminar Proceedings: Water Rates--An Equitability Challenge* (Denver, CO: American Water Works Association, 1983), 90-96.

[26] Notable exceptions to this peaking pattern exist. Water systems in Florida, for example, experience winter peaks. Winter peaks can occur in any climate where winter vacation homes are prevalent.

rates that vary according to pumping districts within the service area.[27] Customer location is a cost-causation factor that primarily involves pumping costs. However, these locational differences also are influenced by differences in per-capita consumption, consumer or population served density, load factors, capacity-utilization rates, and maximum or peak water demand.

Many municipalities employ a simple form of zonal pricing involving rate differentials between internal (within-city) and external (outside-city) consumers. However, these particular rate variances generally have been motivated by political purposes such as taxing nonvoters and inducing annexation, rather than motivated by efficiency considerations. In general, zonal rates now in place in the United States have not been justified by actual operating and capacity cost differences.

In theory, the further the customer is located from the production facilities, the greater the cost in providing service to that customer. Thus, conceptually, one can justify zonal pricing based on the customer's distance from treatment and source-of-supply facilities. Evidence suggests that regionalization and system consolidation produce economies of scale in treatment, but these savings can be offset by increasing unit delivery costs.[28] Thus, costing models for the water sector have been developed to address the tradeoffs between treatment economies and distribution diseconomies.[29] This type of cost analysis is essential to the evaluation of any spatially-differentiated pricing scheme.

Therefore, the key issue in implementing zonal rates is one of cost justification. If substantial cost differences exist within the service area, then zonal rates may be an

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[27] Donald L. Schlenger, "Developing Water Utility Cost Estimates Incorporating Spatial Factors," in *Proceedings of the Symposium on Costing for Water Supply,* edited by Thomas M. Walski (Washington, DC: U.S. Army Corps of Engineers, 1983), 40-55.

[28] Robert M. Clark, "Water Supply Regionalization: A Critical Evaluation," *Journal of the Water Resources Planning and Management Division, ASCE* 105 (September 1979): 89-100.

[29] Robert M. Clark and Richard G. Stevie, "A Water Supply Cost Model Incorporating Cost Variables," *Land Economics* 57 (February 1981): 18-32.

appropriate form of rate unbundling that attains more efficient water rates (that is, an unbundling that would occur in a competitive market). In contrast, zonal rates that are arbitrary (for example, those that are political in nature) introduce inefficiencies. Moreover, virtually all utility rate design is based on some form of averaging; zonal pricing may constitute an undesirable form of price discrimination.

Economic and engineering arguments against zonal pricing also can be made. Capital-intensive utility systems are supposed to be designed for optimal performance of all utility functions (supply, treatment, distribution, and so on) within a service territory. Spatial differentiation within the service territory may subvert this general optimum. Another potential disadvantage of zonal pricing is that it can accentuate the problem of localized cost and rate shock associated with infrastructure replacements. By broadening the customer base, a uniform or average rate would cushion the shock and temper its adverse effects (such as revenue instability). Other problems associated with implementing zonal rates include substantial administrative and implementation costs, as well as resistance from the consumers asked to pay higher water rates. The expense of developing zonal cost data probably has limited the application of zonal pricing. Thus, the major prerequisite to efficient zonal pricing is the capability to accurately calculate the cost differences associated with providing service to different zones within a utility's service territory.

Regulatory and Implementation Issues

Each of the alternative revenue enhancement techniques discussed in this chapter has advantages and disadvantages, as summarized in table 6-1. Each also can be examined in terms of some specific implementation issues that state and local regulators must address prior to any experimentation with rate structures.

Revenue stability is a high priority for water utilities, perhaps particularly for investor-owned utilities because their options for dealing with revenue instability are more constrained than the options for publicly owned utilities. Both seasonal and increasing-block rates have the potential for destabilizing utility revenues. Under the

TABLE 6-1
EVALUATING REVENUE-ENHANCING RATE STRUCTURES

DEDICATED-CAPACITY CHARGES

Advantages

- Both availability charges and demand charges promote cost sharing, adhere to the cost-causation standard, and provide revenue stability.

Disadvantages

- Availability charges may have problems associated with usage-sensitive costs, legal constraints, and equity.
- Demand charges may require utilities to expand capacity and customer losses may result in stranded utility investment.

SYSTEM-DEVELOPMENT CHARGES

Advantages

- They protect existing customers, preclude consideration of vintage rates, and reduce capital financing needs.

Disadvantages

- They can create revenue instability, discourage growth, and introduce forecasting error into cost estimation.
- Their use can be constrained for tax, regulatory, and public policy reasons.

CONTRACT RATES

Advantages

- They provide utilities with adequate, stable, and guaranteed revenues, adhere to the cost-causation standard, and stimulate economic activity.
- Large users benefit from assured water service at a guaranteed price.

Disadvantages

- They can create cross-subsidization and result in higher rates for other customers.
- They can impede conservation, equity, and other regulatory and public policy goals.

(continued)

TABLE 6-1 (continued)

CONSERVATION SURCHARGES

Advantages

- They can be used in conjunction with different costing approaches, least-cost planning, and incentive regulation.
- They unbundle rates, and transmit a forward-looking and efficient pricing signal.

Disadvantages

- Implementation and administration can be difficult.
- They raise revenues outside of traditional revenue requirement determination.

SEASONAL RATES

Advantages

- They can increase operational efficiency and reduce peak demands.
- They can help utilities eliminate or postpone the need for capacity.

Disadvantages

- They make sense only for systems with seasonally variable demand.
- Implementation can be difficult and may require changes in metering and billing.
- Anticipated benefits do not always materialize.

ZONAL RATES

Advantages

- They may be consistent with the cost-causation standard, particularly with respect to costs driven by customer distance from supply and treatment facilities.
- They unbundle rates and promote efficiency, as might occur in a competitive market.

Disadvantages

- They may subvert optimum system performance.
- They may accentuate, rather than mitigate, localized cost and rate shock.
- They can be arbitrary, discriminatory, and used for political purposes.
- Their use requires a careful analysis of tradeoffs among economies and diseconomies.

Source: Authors' construct.

decreasing-block rate structure, for example, the more price-sensitive and weather-sensitive units of usage are placed in the tail block. If the utility experiences a cool, wet summer and the forecast usage does not materialize, revenue losses are minimized. In contrast, seasonal and increasing-block rates allocate a relatively higher proportion of annual revenue requirements to the more volatile seasonal demand (usually summer usage). The result is a high potential for revenue instability associated with weather changes and/or conservation practices. Again, implementing seasonal and increasing-block rates may pose less risk for publicly owned water systems than for investor-owned systems.

In sum, any prescription for a change in rate design policy should be examined carefully prior to implementation in either the public or private water utility sectors. Attaining more efficient water rates requires action on the part of both water utility management and regulators. Water utility management must overcome past inertia and must be willing to innovate. Just as important, regulators can provide incentives for rate innovation, as well as provide a regulatory environment in which the potential adverse effects of rate innovation are dealt with swiftly and equitably.

Some rate design methods can provide utilities with incentives for performance in certain areas. Conservation surcharges in particular can complement incentive regulation. By permitting the funding of demand-side investment or conservation programs, these surcharges provide direct incentives for utility investments in demand-side management. Conservation surcharges also provide a forward-looking pricing signal and complement least-cost planning, particularly if the accumulated funds from the conservation surcharge are used to finance conservation programs. That is, the conservation surcharge complements least-cost planning as conservation or demand-side expenditures are substituted for new capacity construction.

Water utilities tend to prefer rate structures that maximize revenue stability, namely decreasing-block rates and uniform rates. However, innovations in financing and ratemaking are likely to be connected to rate-design innovations. As cost issues in the water utility sector rise in importance, the importance of pricing signals rises too.

CHAPTER 7

STRUCTURAL ALTERNATIVES

As noted in previous chapters, one approach to meeting water utility revenue requirements is to make structural changes. Any institutional approach promoting economies of scale or scope for existing water utilities can be considered a structural strategy.[1] Structural change is aimed at improving the efficiency of water utilities and the viability of the water industry, but it also constitutes a financing mechanism.[2] The environmental finance literature has begun to recognize that structural change can be used to expand financing options. The implication is that for many water systems, the least-cost means of providing service is not achievable through special financing or ratemaking arrangements but through structural change.

Structural change can be understood in terms of two major dimensions, consolidation and ownership. As a general strategy, consolidation (or regionalization) of water supply utilities is a frequently advocated solution to the problem of financially nonviable water systems. Consolidation can be accomplished through aggressive merger and acquisition strategies, which government can induce through incentives for acquisitions, as well as through mandatory takeover policies. Consolidated utilities can be publicly or privately owned, but for purposes of viability, utility ownership is a secondary consideration. In other words, the fact that a nonviable water utility is acquired is far more important to most policymakers than who acquires it.[3]

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[1] Janice A. Beecher, G. Richard Dreese, and James R. Landers, *Viability Policies and Assessment Methods for Small Water Utilities* (Columbus, OH: The National Regulatory Research Institute, 1992), chapter 4.

[2] See U.S. Environmental Protection Agency, *Helping Small Systems Comply with the Safe Drinking Water Act: The Role of Restructuring* (Washington, DC: U.S. Environmental Protection Agency, Office of Water, September 1992).

[3] Beecher, Dreese, and Landers, *Viability Policies.*

Ownership is an important dimension of industry structure in other respects. Indeed, ownership can often be the focal point in debates over how utility costs will be met. Ownership structure affects utility performance largely because the incentive systems that guide performance vary according to ownership. Also, as mentioned throughout this report, publicly and privately owned utilities have different tools at their disposal to finance water utility systems. Each ownership form, then, offers certain advantages or disadvantages in a given situation.

The interest in structural alternatives for the water supply sector seems to be closely related to the frustration associated with rising water costs. In a classic case of "the grass always looks greener," it is not unusual for rate increases to trigger movements to privatize a municipal system or "municipalize" an investor-owned one. Frustrated consumers perceive that a change in ownership will lower their rates. Of course, this will not always be the case. Costs are rising for all types of water utilities.[4]

From a less parochial viewpoint, the interest in privatization seems to be growing at a faster pace than the interest in expanding public ownership. This is understandable given the financial situation of many U.S. cities as they contend with the contemporary realities of fiscal federalism. Nonetheless, public ownership should not be entirely ruled out as a structural option to improve the financial viability of some water utilities.

Public Ownership

As of August 31, 1993, a population of 241 million people in the United States (80 million households) were served by 57,477 community water systems.[5] A

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[4] If they lose subsidies, grants, or low-cost loans, costs actually may rise faster for publicly owned water utilities. See chapter 2 for a comparison of Safe Drinking Water Act (SDWA) cost impacts on public and private water systems.

[5] Federal Reporting Data System (FRDS) as reported in U.S. Environmental Protection Agency, *Technical and Economic Capacity of States and Public Water Systems to Implement Drinking Water Regulations: Report to Congress* (Washington, DC: U.S. Environmental Protection Agency, 1993).

fundamental structural characteristic of the water supply industry is that a large number of small systems serve a small percentage of the population, and a small number of large systems serve a large percentage of the population. Numerically, utilities serving 3,300 or fewer customers account for 87 percent of the water systems but these systems serve only 11 percent of the population served. Utilities serving communities of 100,000 or more in population account for only .5 percent of the water systems but 44 percent of the population served.

A detailed survey of the nation's water systems characterized 45.5 percent as publicly owned (local or municipal government, federal government, and on native American land), 28.0 percent as privately owned (investor-owned, homeowners' association or subdivision, and other forms), and 26.5 percent as ancillary (mobile home parks, institutions, schools, hospitals, and other forms).[6] Most of the larger water systems (about 84 percent of systems serving more than 3,300 population) are publicly owned. The distribution of smaller systems is a relatively even mixture of ownership forms (public, private, and ancillary).

The focus of this report on the regulatory process and cost impacts on investor-owned water utilities may at times obscure the fact that municipalities are most affected by the cost pressures of environmental mandates, infrastructure needs, and demand growth. In the larger scheme of things, the bill for the nation's environmental mandates falls mainly on state and local governments, whose outlays for maintaining environmental quality are expected to exceed $55 billion annually by the year 2000 (an increase of $15 billion over 1987 levels).[7]

Expanding public ownership may have less academic appeal than privatization, but it can help water systems achieve economies of scale and broaden the customer base

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[6] Frederick W. Immerman, *Final Descriptive Summary: 1986 Survey of Community Water Systems* (Washington, DC: Office of Drinking Water, U.S. Environmental Protection Agency, 1987), table 2-2.

[7] U.S. Environmental Protection Agency, *Public-Private Partnership Case Studies: Profiles of Success in Providing Environmental Services* (Washington, DC: U.S. Environmental Protection Agency, 1989), 3.

that must support rising costs. Public ownership through annexation involves extending a publicly owned utility's service territory to include outlying areas, which sometimes occurs with changes in service boundaries or corporate limits.[8] The Fairfax County Water Authority is a regionalized system in Virginia that, through a series of acquisitions around the original Alexandria Water Company, achieved significant economies of scale.[9] Local geopolitical circumstances may determine the feasibility of annexation. Loss of autonomy is a chief concern of communities whose water service might be taken over by the larger public entity. The establishment of a regional public authority for drinking water supply may be met with mixed emotions.

Technical and economic factors are critically important to the evaluation of regionalization options, regardless of whether the regionalized system is publicly or privately owned and operated. The magnitude of achievable economies of scale in water treatment may depend on the feasibility of physically interconnecting water systems. Distribution diseconomies may offset these savings to some degree. Scale economies in other areas of utility operations (such as management) can be realized without physical interconnection. Regional water supply also raises rate design issues. A spatially differentiated rate structure (or zonal pricing, discussed in chapter 6) recognizes locational variations in the cost of service, but its use also can be politically motivated. Uniform (average) rates for the entire regional territory may help mitigate against cost and rate shock, be easier to administer, and be perceived by some as more equitable.

The institutional result of annexation by municipalities is a net increase in public ownership. Many of the regionalization case studies in the water sector involve publicly owned utilities.[10] According to a study by the U.S. Environmental Protection Agency

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[8] David W. Prasifka, *Current Trends in Water-Supply Planning: Issues, Concepts, and Risks* (New York: Van Nostrand Reinhold Company, 1988), 17-20.

[9] Robert M. Clark, "Minimizing Water Supply Costs: Regional and Management Options," in *AWWA Seminar Proceedings: Small Water System Problems* (Denver, CO: American Water Works Association, 1982), 65-82.

[10] SMC Martin, Inc., *Regionalization Options for Small Water Systems* (Washington, DC: U.S. Environmental Protection Agency, 1983), II-2.

(EPA), acquisitions resulting in larger publicly owned systems could be considered attractive for a number of reasons:[11]

- Counties or municipalities with established water utilities frequently expand to meet new demands within or adjacent to their jurisdictions. In many states, county water districts are willing to provide service when small water systems within their borders become nonviable.

- Some states require publicly owned water systems to take over privately owned water service if a small system is failing.

- Grants and loans frequently are available to publicly owned water systems, but usually are not available to privately owned water systems.

- Some publicly owned systems have the authority to raise revenues through taxes. These revenues can be used to fund system expansion and improvement.

- Most publicly owned systems can issue tax-exempt revenue bonds, giving them access to low-cost funds for expansion or system upgrades.[12]

- Many publicly owned systems have the power of eminent domain in their operating areas.

From an institutional perspective, public ownership may offer certain advantages. It may be easier for the federal government and the states to provide acquisition incentives to local governments, as compared to privately owned utilities. Public

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[11] U.S. Environmental Protection Agency, *Improving the Viability of Existing Small Drinking Water Systems* (Washington, DC: U.S. Environmental Protection Agency, 1990), 16-7.

[12] The 1986 tax code amendments restricted the use of tax-exempt state bonds for industrial purposes. However, bonds still can be used for drinking water projects undertaken by public or private utilities, subject to a state volume cap.

ownership also may promote more comprehensive water resource planning. California, for example, has used special water districts for planning and coordination.[13]

Despite its appeal, annexation may not be purely beneficial to the acquiring utility or its customers. The acquired utility often has more to gain from the acquisition. Adopting a nonviable water system, in particular, can strain the parent's financial resources and managerial capability. Many municipalities do not have the capital to acquire water systems or to purchase and operate a privately owned system that serves their constituency. Indeed, cities are exploring alternative financing mechanisms for their utility infrastructures, including privatization. As indicated in figure 7-1, "private involvement" is among the principal options a city has for dealing with environmental compliance, as well as other demands on municipalities.

Privatization

A prominent spokesperson for the private water utility industry has asserted that "government has absolutely no place in the water utility business. . . The process of government encroachment beyond its purpose must be halted."[14] Specific directives for meeting this objective were advanced: (1) end government grants to publicly owned water systems, (2) remove subsidies to and from publicly owned water systems, (3) impose comparable taxation policies on all water systems, and (4) require full-cost pricing by all water systems, and (5) subject all water systems, regardless of ownership, to rate regulation (presumably by the state public utility commissions).

Privatization is the process by which a private firm finances, designs, constructs, and/or operates a facility that has the singular purpose of providing public services. The literature on privatization emphasizes that many governmental services can be efficiently

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[13] William R. Smith, "Regional Allocation of Water Resources," *American Water Works Association Journal* 73 (May 1981): 226-31.

[14] "Remarks by J. James Barr," *NAWC Water* (Summer 1989): 14-15.

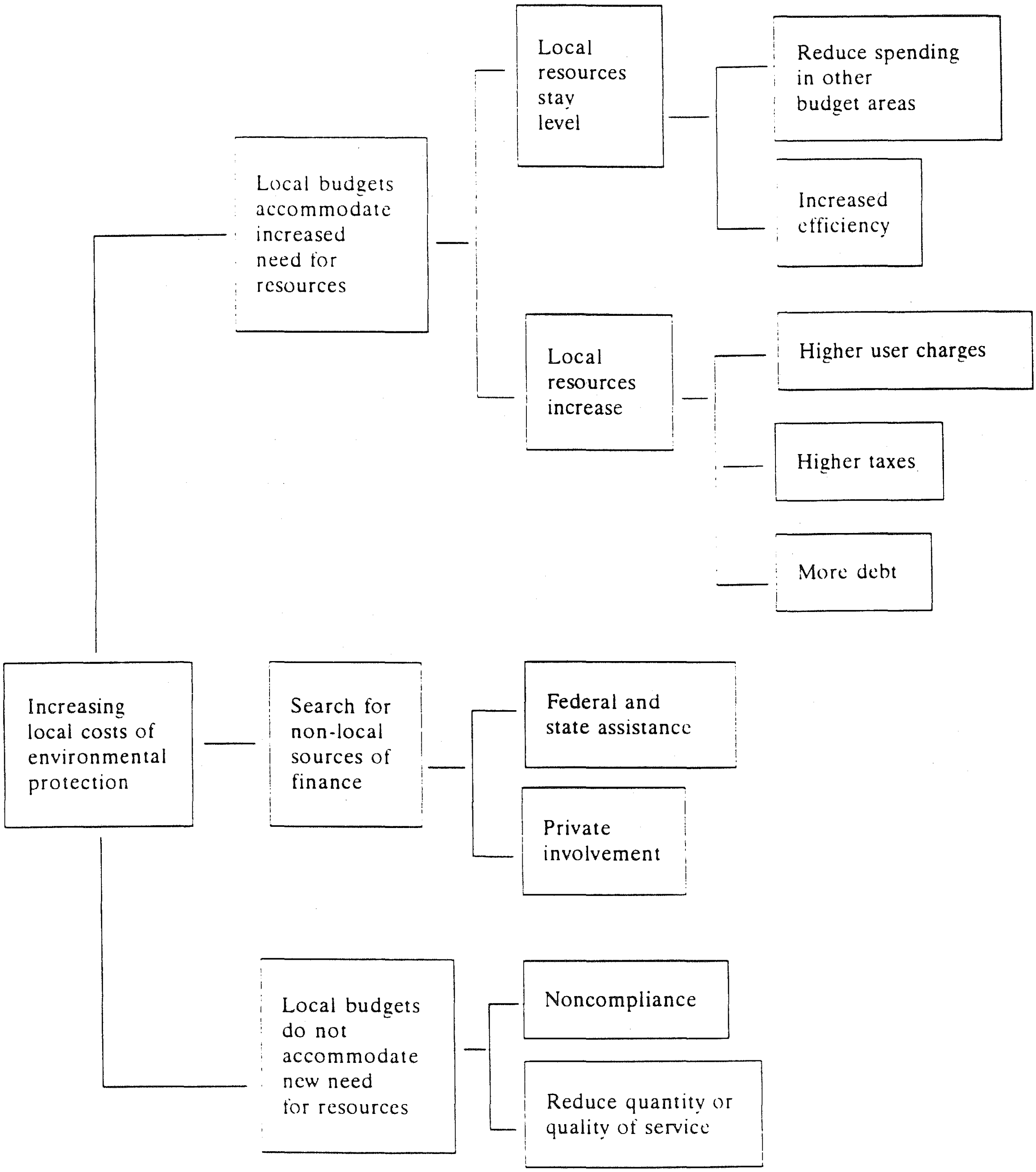

Figure 7-1. Local governmental responses to increasing costs of environmental protection.

Source: U.S. Environmental Protection Agency, A Preliminary Analysis of the Public Costs of Environmental Protection: 1981-2000 (Washington, DC: U.S. Environmental Protection Agency, 1990), 28.

and effectively provided by private firms.[15] In effect, privatization involves a partnership between the public and private sectors in which there is private ownership and/or operation of facilities for providing public services.[16] Under a privatization arrangement, the private firm has the potentially profitable opportunity of owning and operating a water system while the local government has the opportunity of having cost-effective delivery of an essential service.[17] The basic advantages of privatization are construction savings, improved procurement and scheduling, risk reduction, operational savings, tax benefits, debt-capacity benefits, and access to private capital. Frequently cited disadvantages of privatization are a loss of local control and the potential for rate, revenue, and financial instability for the community. (Additional problems and barriers to privatization are discussed later in this chapter.)

Comparative studies of privatization assert that public entities: adopt cost-saving devices and innovation more slowly, if at all; provide managers longer periods of tenure; realize lower and more variable rates of return; set prices less close to imputable costs and with less regard to peak-capacity problems; favor voters over nonvoters, business over residential users, and organized over nonorganized political groups; systematically overcapitalize (even more than regulated private firms); and incur higher production costs (largely due to competitive forces in the private sector).[18] Another problem with public entities is that they use long bureaucratic procurement practices, so that products

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[15] See E. S. Savas, *Privatization: The Key to Better Government* (Chatham, NJ: Chatham House Publishers, Inc., 1987).

[16] American Water Works Association, *Water Utility Capital Financing,* AWWA Manual M29 (Denver, CO: American Water Works Association, 1988).

[17] George A. Raftelis, "Legal Issues for States Related to Privatization" a paper presented at the U.S. Environmental Protection Agency's National Workshop on Financing Strong State Water Programs, Denver, Colorado, April 1989.

[18] "Comparing the Efficiency of Private and Public Production: The Evidence from Five Countries" (1982) as reported in *NAWC Water* 30 (Summer 1989): 35.

may be obsolete by the time they are delivered to the utility.[19] These practices may become more obviously problematic as technologies and regulatory requirements change more rapidly.

Privatization also has many institutional advantages. Some of the advantages are generic in nature, applying to all forms of privatization; others are applicable only to public water supply. The primary generic advantage, and the driving force behind the increasing popularity of privatization, is that tax benefits flow to the private firm. The privatization agreement allows for the sharing of these tax benefits with the government agency. Other advantages of privatization include the bypassing of governmental procurement constraints in the construction of the facility, savings in operation costs, savings in construction costs, the bypassing of debt constraints placed on public agencies, increased operational efficiency, and reduced risk in design, construction, and operation for the public agency. Privatization provides an alternative method of financing for water supply facilities requiring capital expenditures in excess of the financing capability of the municipality.

As these results suggest, privatization is a potentially important financing strategy. Indeed, the need for capital financing is the force behind the privatization movement in Europe. According to David Haarmeyer, an advocate of privatization:

> The significant financial capital tied up in the municipal water-supply assets suggest that many financially constrained cities may want to transform their physical capital to financial capital. By waking up this "sleeping equity," and wisely investing the proceeds, municipalities could achieve both improved water services and much-needed cash to fund essential public services.[20]

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[19] This problem also has received national attention with the "reinventing government" endeavors of the Clinton administration.

[20] David Haarmeyer, *Privatizing Infrastructure: Options for Municipal Water-Supply Systems* (Los Angeles, CA: The Reason Foundation, 1992), 33.

Of course, Haarmeyer is making several assumptions that might be challenged. First, he may be overestimating the equity value of an aging infrastructure that is subject to increasingly stringent regulations and regulatory risk. Second, he assumes a much larger market for water systems than probably exists. Third, the transaction he describes potentially results in cross-subsidization and taxpayer inequity. The taxpayers who funded the municipal water system will not necessarily benefit from the sale of the system; if the system truly is deteriorated, these same taxpayers will probably face a water rate increase. Finally, some might argue that municipal utility assets already reflect a wise investment that should not be sold off for a one-time windfall. This is not to say that privatization is not a viable or beneficial option. However, as a matter of public policy, it requires an objective and critical evaluation prior to implementation.

Public-Private Partnerships

In 1992, President Bush signed an Executive Order on Privatization to initiate regulatory and policy changes that have a significant potential to increase investment in environmental facilities.[21] The purpose and scope of the Executive Order is to:[22]

- Assist local privatization initiatives.
- Remove federal regulatory impediments to private sector involvement.
- Increase state and local governments' proceeds from privatization arrangements by relaxing federal repayment requirements.
- Protect the public interest by ensuring that privatized assets continue to be used for original purposes and that user charges will remain consistent with current federal conditions that protect users and the public.

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[21] Executive Order No. 12803 (May 4, 1992).

[22] Source: U.S. Environmental Protection Agency, *Alternative Financing Mechanisms for Environmental Programs* (Washington, DC: U.S. Environmental Protection Agency, 1992), 65.

Despite a change in presidential administrations, privatization continues (so far) to be a relatively prominent theme for the federal government. The EPA recognizes the need to mitigate against the rising costs of environmental regulation and suggests various strategies for doing so: pollution prevention, alternative financing, technology development, technology transfer, and public-private partnerships.[23] Public-private partnerships are promoted because the EPA believes their use will help reduce costs, speed project completion, guarantee performance, and preserve jobs.[24] The agency describes the following public-private partnership arrangements, in increasing order of private involvement (or decreasing order of public involvement):[25]

- *Contract services.* The private sector is contracted to provide a specific municipal service, such as garbage collection, or to maintain and operate a facility such as a waste treatment plant. The facility is owned by the public sector.

- *Turnkey facility.* The private sector designs, constructs, and operates an environmental facility that is owned by the public sector. The public sector generally assumes the financing risk, while the performance risk for minimum levels of service and/or compliance usually is assumed by the private partner.

- *Developer financing.* The private sector (usually private developers) finances the construction or expansion of an environmental facility in return for the right to build houses, stores, or industrial facilities.

- *Privatization.* The private sector owns, builds, and operates a facility. It also partially or totally finances the facility.

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[23] U.S. Environmental Protection Agency, *A Preliminary Analysis of the Public Costs of Environmental Protection* (Washington, DC: U.S. Environmental Protection Agency, 1990), 36-7.

[24] U.S. Environmental Protection Agency, *Public-Private Partnership Case Studies,* 6.

[25] U.S. Environmental Protection Agency, *Public-Private Partnerships for Environmental Facilities: A Self-Help Guide for Local Governments* (Washington, DC: U.S. Environmental Protection Agency, 1990), 4.

Merchant facility. The private sector owns and operates the facility, as in privatization, but private interests also make the decision to provide an environmental service to a community (as they do in the case of other privately provided goods and services).

A summary of the basic characteristics associated with each type is presented in table 7-1. Table 7-2 provides a sample of partnerships for water and wastewater projects. Additional recent case studies of successful partnerships, compiled by the EPA, include Mt. Vernon, Illinois (construction and operation of a wastewater treatment plant); Scottsdale, Arizona (creative financing for drinking water supply); Dowingtown, Pennsylvania (regionalization for upgrading and expanding wastewater treatment facilities); Kerrville, Texas (competitive negotiation for financing wastewater treatment facilities); and Western Carolina Sewer Authority (two-step competitive bidding for wastewater treatment plant construction and operation).[26]

Despite their potential benefits, several substantial constraints on the use of public-private partnerships can be identified. Many communities do not know that partnerships can be a viable option for their water or wastewater projects; many others have neither the technical expertise nor the financial resources needed to conduct a sound analysis of public-private financing options.[27] Public policies, too, have presented barriers to establishing partnerships.

As of 1986, nineteen states had passed comprehensive statutes on privatization, generally making it easier for communities to enter into public-private partnerships.[28] These statutes include provisions that allow local governments to enter into long-term service contracts with private firms, streamline the procurement process and permit negotiated contracts, provide exemptions from local taxes or licensing and recording

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[26] U.S. Environmental Protection Agency, *Public-Private Partnerships: A Self-Help Guide,* 5-23.

[27] Adapted from Cathy A. Compton, "Lack of Incentives and Understanding Constrain P3s," and "Federal Barriers Inhibit Public-Private Partnerships," *Small Flows* 6 (January 1992): 6, 7.

[28] U.S. EPA, *Public Private Partnerships for Environmental Facilities,* 12.

TABLE 7-1

CHARACTERISTICS OF PUBLIC-PRIVATE PARTNERSHIPS

	Contract Services	**Turnkey Facility**	**Developer Financing**	**Privatization**	**Merchant Facility**
Decision to provide service	Public	Public	Public	Public	*Private*
Design	Public	*Private*	**Either**	*Private*	*Private*
Financing	Public	Public	*Private*	*Private*	*Private*
Construction	Public	*Private*	**Either**	*Private*	*Private*
Ownership	Public	Public	**Either**	*Private*	*Private*
Operation and maintenance	*Private*	*Private*	**Either**	*Private*	*Private*

Source: U.S. Environmental Protection Agency, *Public-Private Partnerships for Environmental Facilities: A Self-Help Guide for Local Governments* (Washington, DC: U.S. Environmental Protection Agency, 1990), 4.

TABLE 7-2

PUBLIC-PRIVATE PARTNERSHIPS FOR WATER AND WASTEWATER SERVICES

LOCATION	POPULATION	PROJECT INITIATED	TYPE OF PARTNERSHIP	TYPE OF SERVICE
WATER SUPPLY				
Sabine Parish, LA	1,600	1987	Contract services	Public water systems
Belen, NM	327	1987	Developer financing	Private water systems
Irving, TX	130,200	1978	Contract services	Private development of wells
York County, PA	9,344	1976	Privatization	Small system acquisitions
Littiz, PA	7,590	1988	Contract services	Public water systems
Westmoreland County, PA	90,683	1943	Contract services	Public water system
Myrtle Beach, SC	27,800	1985	Turnkey contract	Public water system
WASTEWATER TREATMENT				
Auburn, AL	29,760	1984	Privatization	Wastewater treatment plant
Chandler, AZ	68,220	1983	Privatization	Wastewater reclamation plant
Escondido, FL	83,550	1982	Developer financing	Sewer access rights
Orlando, FL	160,408	1984	Developer financing	Impact fees
Mount Vernon, IL	17,470	1987	Turnkey contract	Wastewater treatment plant
Clinton, KY	1,600	1987	Turnkey contract	Wastewater treatment plant
Edgewater, NJ	4,674	1986	Turnkey contract	Wastewater treatment plant
Hood River, OR	4,480	1983	Contract services	Wastewater treatment plant

Source: U.S. Environmental Protection Agency, *Public-Private Partnership Case Studies: Profiles of Success in Providing Environmental Services* (Washington, DC: U.S. Environmental Protection Agency, 1989), vi.

fees, provide authorization to enter into take-or-pay agreements, grant power for the creation of special authorities to issue debt secured by project revenue or enter into lease and sell agreements, authorize private parties to collect service charges, and create private investment tax credits.[29]

Proper design of the privatization agreement is essential for the success of the implementation process. With a poorly designed contract, any efficiency gains could be more than offset by administrative and other costs. Thus, parties to a privatization agreement must resolve several important issues. First, in a turnkey or developer financing arrangement, they must resolve whether the private firm will have an option to eventually purchase the facility. Second, the privatization agreement must address whether the private firm will be affected by the jurisdiction of the state public utilities commission. Third, parties must agree to the specific magnitude and level of service to be provided by the facility. Finally, parties must agree to adhere to all applicable environmental regulations and standards. Privatization is not a device for bypassing state or federal environmental regulation, and the assignment of various responsibilities for meeting regulatory requirements should be clear.

Privatization agreements vary in terms of financing arrangements. Generally, the private firm will consult with the water utility regarding financing. A common form of financing in privatization contracts involves industrial development bonds.[30] The bonds are issued only by municipalities, but via privatization agreements, the bonds become the responsibility of the private firm.

Privatization agreements also vary in terms of the scope of the private firm's role.[31] One type of agreement is the traditional full-service contract in which the private firm is involved in all aspects of the operation of the facility. The private firm designs, constructs, and operates the water facility and then sells the water to the

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[29] Ibid.

[30] Ibid.

[31] Michael M. Stump, "Private Operation of U.S. Water Utilities," *American Water Works Association Journal* 78 (February 1986): 49-51. See also, Raftelis, "Legal Issues."

municipal utility at a contracted wholesale rate. An alternative approach is a sale with an operating contract. In this case, the municipal water utility sells a previously constructed facility to the private firm, which then operates the facility as in a full-service agreement. A third option is a basic-service contract (or contract operations), in which the private firm only operates the facility. In this case, cost savings are limited to operating costs.

When determining which type of arrangement is best for them, municipalities considering privatization should perform several analyses to evaluate water system needs, review current technologies, assess vendor interest, compare risks and benefits, inventory financing alternatives, and appraise the legal and regulatory considerations.[32]

Privatization Applications

The Wade Miller report on water supply infrastructure identifies four areas where privatization has great potential: distribution system maintenance, rehabilitation, and general enhancements; privatization of individual system components (for example, wells or other supplies); service contracts for operation and maintenance services; and full scale ownership and operation.[33] In general, the most amenable candidates for privatization in water supply, aside from entire operations, are stand-alone facilities, such as source of supply and treatment. Privatization can help water utilities with the two fundamental types of utility costs, capital and operating, as discussed below.

Capital Improvements

Water utilities can enter into privatization agreements at three separate stages of the development of a capital facility: (1) prior to the design of the project, (2) after completing the preliminary design, and (3) after completing the final design (but prior to

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[32] Raftelis, "Legal Issues," 95.

[33] Wade Miller Associates, Inc., *The Nation's Public Works: Report on Water Supply* (Washington, DC: National Council on Public Works Improvement, 1987), 141.

construction).[34] Each approach has unique advantages and disadvantages. For example, the first approach provides the private firm with the opportunity to construct a facility that it views as the most cost-efficient. The second approach can facilitate joint development of the project, so that the interests of both parties are well served. The third approach provides the water utility with maximum control over the design of the project before the private firm begins construction.

Another area where privatization can be used is in the development of joint water projects among two or more utilities.[35] The utilities can enter into an agreement with a private firm to develop source of supply, treatment facilities, and possibly distribution networks. By serving more than one community, joint projects can help the utilities share costs and realize economies of scale. Joint projects also facilitate regional water supply planning and environmental management of water resources.

For utilities willing to surrender some elements of control, especially ownership, leasing has emerged as an alternative technique for financing equipment and facilities for water utilities. For investor-owned utilities, leasing is a means of reducing equipment costs and eliminating construction expenditures. For municipally owned utilities, leasing is a form of privatization, as well as a means of compensating for the reduced availability of federal and state government construction grants. Leasing can be complex, with tax consequences for the lessee (the water utility) and tax benefits for the lessor (the private firm providing the leased good or the lender).

The simplest form of leasing is the direct lease.[36] With a direct lease, the lessee specifies the construction, designed capacity, associated services, and any unique aspects of the leased equipment or facility. The lessor purchases and finances the equipment or

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[34] Garret P. Westerhoff, "An Engineer's View of Privatization: The Chandler Experience," *American Water Works Association Journal* 78 (February 1986): 41-46.

[35] See Ronald D. Hardten, "Developing Joint Water Projects," *American Water Works Association Journal* 76 (April 1984): 131-33.

[36] American Water Works Association, *Water Rates and Related Charges* (Denver, CO: American Water Works Association, 1986).

constructs the facility per these specifications and then receives income in the form of leasing or rental charges. The operation and maintenance of the equipment or facility are the responsibility of the lessee. Upon completing the initial term of the lease, the lessee generally has the option either to renew the lease, purchase the equipment or facility, or return the equipment or facility to the lessor. The tax and accounting treatment of the lease and lease charges are determined by the options available to the lessee upon completing the lease term.

A leveraged lease is a more complicated three-party lease in which the lessor (the owner) acquires financing from a third party (the lender) for the bulk of the cost of the equipment or facility. The proportion borrowed under the leveraged lease is generally 80 percent, which is the maximum allowed under federal tax law. The allocation of 80 percent debt and 20 percent equity, in essence, permits the three parties to maximize the tax benefits of leveraged leasing. Specifically, the lessor is still eligible for tax benefits based on the full cost of the equipment or facility, including the deduction for depreciation and interest paid on the borrowed funds. In a leveraged lease, the lender holds a first mortgage on the asset and also holds a lien on the lease. The lease payments service the debt, and the difference between the debt-service costs (interest charges plus payment of principal) and the lease charge is retained by the lessor.[37] Again, the lessee is responsible for the operation and maintenance of the equipment or facility. The leveraged lease generally involves a sale and leaseback arrangement in which the utility sells the asset to the lessor and then leases the facility.

A third form of leasing involves certificates of participation. In this leasing variation, the lessor issues certificates to a third-party financing the equipment or facility. These certificates incorporate various restrictions and thus provide collateral, as well as the flow of tax-exempt lease charges (interest payments), to the lender or holder of the certificates.[38]

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[37] Richard Klein, "Utility Leveraged Leasing: Strengths and Weaknesses," *Public Utilities Fortnightly* 124 (August 31, 1989): 22-28.

[38] American Water Works Association, *Water Rates and Related Charges.*

Leasing provides several advantages for the various parties involved. The primary advantage for the lessee (the water utility) is the capability to have equipment or facilities in place more quickly due to fewer obstacles than with conventional financing. In other words, private financing translates into less regulatory oversight, fewer delays in bringing the equipment or facilities on-line, and lower aggregate project costs. The leveraged lease has certain unique advantages. For tax purposes, the lessor owns the equipment or facility and thus qualifies for federal tax benefits based on the total equipment or facility cost. The third-party lender receives interest payments that generally exceed those associated with comparable loans. The lessee receives the benefits of lower equipment and facility costs. By transferring a portion of the tax savings linked to equipment purchases and facility construction, the water utility is able to obtain external financing thus saving water customers substantial capital costs.

David Crane discusses some additional justifications for lease financing. One justification is the freeing of funds to be used for other purposes.[39] In a sale-and-lease-back arrangement, the utility recovers its capital investment and can use these funds for preventive maintenance, the retirement of debt, or possibly financing leases in other public utility sectors. Other justifications include the reduced risk of obsolescence associated with not owning the equipment and the elimination of capital costs. Of course, capital costs are not really eliminated but replaced (by operating expenses associated with lease payments).

In a regulatory context, lease financing can be viewed as a technique for coping with rate shock, because it alters the capital recovery pattern for the investment. Lease financing permits expense treatment rather than rate-base treatment of the equipment or facility. With rate-basing, capital recovery begins with high front-end costs that decline over time with depreciation; with leasing, levelized payments are made indefinitely. Leasing can reduce revenue requirements and lower rates, although ratepayers actually may pay more for equipment or facilities in the long term. The reduction of rate shock

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[39] David G. Crane, "The Increasing Use of Lease Financing by Utilities," *Public Utilities Fortnightly* 119 (February 19, 1987): 24-28.

through leasing lessens the possibility of regulators disallowing the leasing costs on the basis of the prudence standard. In contrast, rate-base treatment increases the possibility of cost disallowances based on management imprudence.

Disadvantages to lease financing also exist. In all leasing arrangements, insurance costs can be substantial since the lessor will require that the lessee be fully insured. In a leveraged lease, the transaction costs are substantial given the number of parties involved and various tax and legal complexities. With certificates of participation, the use of purchase options requires that interest-rate protection be provided to the investors. Finally, lease financing means that the water utility cannot earn a rate of return on the leased asset.

If the water utility, at the completion of the lease term, does not want the facility, the lessor is left with an unwanted facility and the risk of being regulated by the regulatory commission. Changes in tax rates may result in lessors not receiving the anticipated tax savings. Lenders face the risk of defaults on payments of interest and principal. The problems with lease financing result primarily from each party having a different view of the arrangement's advantages and disadvantages. The lender seeks a high return on borrowed funds, the lessor is concerned about the repayment of capital and tax benefits, and the lessee is concerned about the impact on costs, revenue requirements, and fulfilling the obligation to serve should something go wrong.[40]

Leasing is a financing method that can help some water utilities reduce both capital and operating costs. It may be an especially important option for small utilities that find it difficult to finance capital projects. However, because leasing does not provide a means of building the rate base on which utilities earn a return, it may not help resolve the long-term viability of these systems under rate-of-return regulation. In general, leasing can help some utilities become more cost-efficient, which is consistent with the goals of both incentive regulation and integrated resource planning.

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[40] A bankruptcy by the lessor, for example, could force a sale of facilities which may not be in the best interest of a utility or its customers.

Operation and Maintenance

Operation and maintenance contracts between private operators and cities total about three hundred in the United States.[41] Under contract operations, the water utility benefits from the efficient operation and maintenance of the facility and the private firm earns a profit for providing these services. The profit motives of private firms create the potential for better management, better training of personnel, and possibly lower personnel needs.[42] In brief, the potential exists for the private firms to operate more efficiently than the public firms, which is why contract operations can be attractive. The EPA prepared a quiz for municipalities considering contracting operations and maintenance for a wastewater facility, as reported in table 7-3.

If properly designed, full-contract operations can provide utilities with a variety of potential benefits. According to the EPA, in the context of wastewater service, full-contract operations firms usually:[43]

- Put great stock in good management and staff motivation and training.
- Install computerized management systems.
- Provide corrective and preventive maintenance.
- Deliver the experience and specialized knowledge needed to implement these approaches.
- Provide for full-cost disclosure and end-of-year reckoning, with any budget underrun returned to the client. Some categories of cost savings are shared.
- Keep "open books" and report regularly so the city can see what's being done and what it costs.

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[41] Haarmeyer, *Privatizing Infrastructure.*

[42] Westerhoff, "An Engineer's View of Privatization."

[43] U.S. Environmental Protection Agency, "Contracting for O&M," *Waterworld Review* 9 (July/August 1993): 11-12.

TABLE 7-3

EPA'S QUIZ ON CONTRACTING OPERATIONS AND MAINTENANCE FOR A WASTEWATER UTILITY

If your answer to most of the following questions is "yes," then you may want to seriously consider using contract operations and maintenance.

Design problems? Has the plant had trouble meeting design specifications from the beginning? Have increasing design problems come to light as the plant has aged? Has staff had to jerry-rig solutions to design problems too often? Is the plant being run to design parameters?

Excessive costs? Has the wastewater budget been increasing disproportionately as the plant has aged? Are replacement costs high? Are the same items being replaced too frequently?

Personnel problems? Is morale low? Is staff overworked, but poorly utilized? Is staffing out of synch with workload and shift requirements? Are there labor-management disputes? Is salary not commensurate with performance? Is staff hard to acquire and keep?

Public-image issues? Do citizens complain about overflow and backup problems? Odors? Appearance? Higher user charges? Water-quality problems?

Operating inefficiencies? Do plant managers fail to take advantage of opportunities for cost savings or economies of scale? Are certain operating units underused? Have chemical or energy costs risen excessively?

Compliance difficulties? Has plant effluent frequently been in violation of standards? Has the plant experienced enforcement actions? Is compliance regularly marginal? Are periodic problems from industrial loads frustrating compliance?

Training issues? Do plant managers fail to provide training in a consistent, effective manner? Is staff inadequately prepared to deal with sophisticated equipment? Are there too many specialists and not enough generalists on staff? Does the plant have above average safety problems or lost-time accidents?

Source: U.S. Environmental Protection Agency, "Contracting for O&M," *Waterworld Review* 9 (July/August 1993), 12.

- Ask for five-year contracts so that they can establish a track record with the client, prove their effectiveness, and spread their front-end costs over several years.
- Assume most utility-management headaches.
- Help pay the cost of capital improvements.
- Pay fines for violated effluent limits, as an indication of their confidence in turning around a poorly performing plant.

Full-contract operations firms accomplish operational benefits and costs savings by being energy efficient, smart, purchasing proficient, staffing and training oriented, economically positioned, technically deep process-control versed, automation knowledgeable, and improvement astute.[44] Another factor is that these firms, unlike many utility monopolies, may face competition from other firms. Competitive bidding for operation and maintenance services is an essential part of this alternative. To promote competition, contracts should not be extended for long periods of time. A very long contract may have the effect of simply shifting responsibility without necessarily achieving important operational improvements.

A recent success story in the area of contracts comes from Farmington, New Mexico (population 34,000), which competitively bid operation and maintenance of its water and wastewater systems beginning in January 1992.[45] The $2.6 million annual contract (increasing every year by 75 percent of the Consumer Price Index) was awarded to JMM, which is jointly owned by James M. Montgomery Consulting Services, Inc., and General Waterworks Corporation. Wastewater rates were reduced by 15 percent and the contract was expected to save the city $1.1 million per year or 30 percent in costs. The savings were attributed to consolidating the maintenance groups of the different facilities,

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[44] Ibid.

[45] David Haarmeyer, "Farmington Turns Over Entire Water System: Big Savings for a Small Town," *Privatization Watch,* no. 190 (October 1992): 1.

installing management control systems to save on power and chemicals, and making changes in physical facilities to promote more efficient utilization of utility plant.

Barriers to Privatization

Comprehensive privatization of water service is unlikely given the monopoly characteristics of water supply, limits on competition, and the technology of water delivery, not to mention ideological and political barriers to the divestiture of government-owned assets. Privatization faces many of the obstacles associated with regionalization through public annexation discussed above, especially the local community's sense of losing control. Many objections to privatization are based on perceptions that may or may not be realized in every circumstance:[46]

- Public employee unions, in particular, are concerned that privatization threatens employment rights, pension rights, and loss of employment.
- Privatization may mean loss of grant money or tax exempt financing that provide for lower capital costs for system improvements.
- Rates of privately owned water utilities are perceived to be higher because private firms must pay taxes and earn a profit.
- Communities are concerned that privatization means giving up control not only of the day-to-day operations of the water system and such issues as quality and reliability, but the very destiny of the community it serves.
- Communities also may be concerned about surrendering control over ratemaking and other financial issues to state public utility commissions.

According to one critique of privatization as applied in the wastewater sector, actual experience does not necessarily yield the results promised by privatization

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[46] Adapted in part from Edward W. Limbach, "Privatization of America's Water Infrastructure: A Century of Progress," a paper presented at the Annual Conference of the American Water Works Association, San Antonio, Texas, June 9, 1993, 2.

advocates.[47] First, in some cases, efficiencies and cost savings from privatization have not been substantial. Second, the privatization contract may allow the private firm to shift many costs to the municipality, thus eliminating the incentive effects generally expected. Third, privatization can result in profits to the private firm, while much of the normal risk of operations remains with the municipality to which the service is provided.

Two key barriers to effective privatization are: (1) municipalities may lack incentives to improve operational efficiency, and (2) municipalities may lack expertise to design a privatization contract that protects their interests.[48] Municipalities must build expertise in the area of contract design and negotiation to offset the strategic advantages now held by private firms. This final point applies to all forms of privatization and cannot be overemphasized. Other significant barriers to privatization discussed below are cost and rate impacts, financial disincentives, and the prospect of economic regulation by the state.

Cost and Rate Impacts

A major barrier to privatization is that it often cannot promise lower costs to customers. Improved efficiency does not necessarily result in lower rates. Removing subsidies usually has the opposite effect of raising rates.

A recent dissertation comparing revenues of public and private water utilities found that mean revenues for publicly owned water utilities were $1.16 per 1,000 gallons (compared with $1.61 per 1,000 gallons for privately owned water utilities).[49] Both interest payments and ownership structure were statistically significant in explaining the difference. Privately owned utilities were more likely to charge for the full cost of

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[47] Randall G. Holcombe, "Privatization of Municipal Wastewater Treatment," *Public Budgeting and Finance* 11 (Fall 1991): 28-42.

[48] Ibid.

[49] S. Chibot Onyeji, *Economic Effects of Ownership in the Water Supply Industry: A Quantitative Analysis* (Ph.D. dissertation for the Urban and Regional Planning Department, Texas A&M University, 1990).

service (capital expenditures, depreciation, billing, administration, and other services), while publicly owned utilities were more likely to set rates according to average costs. Naturally, rates generally are higher for utilities that recover capital costs through rates. The author concluded that public utilities have lower rates partly because of the prevailing influence of political and administrative factors.

Financial Disincentives

Despite the Executive Order on privatization and the EPA's interest in public-private partnerships, not all federal policy makes privatization an attractive option. According to one estimate, the 1986 Tax Reform Act reduced the magnitude of tax benefits from privatization agreements by as much as 40 percent.[50] Private investors also may have lost the incentive to negotiate partnership projects because of reductions in the availability of tax-exempt financing of private-sector investments. Also, in the past, low-cost financing available through sources like State Revolving Funds (SRFs) has made it very difficult for the private sector to compete with public financing programs, although emerging policies may address this barrier.[51]

Another federal concern presents a significant barrier to privatization.[52] Federal policy dictates that the title of a federally funded facility cannot be encumbered by a private party. This means that partnership options (including privatization) cannot be used without reimbursement of construction grants and other funds to the federal government. This barrier is especially significant in the wastewater sector. The implication is that many municipalities simply cannot afford to privatize because they cannot afford to repay the federal government's investment in their infrastructure.

Finally, traditional regulatory policies imposed by the state public utility commissions can present a financial barrier to privatization involving acquisitions of

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[50] Ronald D. Doctor, "Private Sector Financing for Water Systems," *American Water Works Association Journal* 78 (February 1986): 47-48.

[51] Compton, "Lack of Incentives," 6, 7. See chapter 4.

[52] Ibid.

investor-owned systems. Many states value utility assets at their original cost--the cost of facilities at the time they were devoted to public use. Assets of many older utilities may be fully depreciated. As a result, these systems may not be attractive to potential buyers. Buying a system with little or no value in assets would not add to the rate base of the acquiring utility, thereby limiting the utility's chance to earn a return on its investment. Acquisition adjustments sometimes are recommended to remedy this dilemma and provide an additional incentive for acquisitions by investor-owned water systems.[53] Also recommended, in some cases, are regionally uniform rate structures that use averaging to mitigate against the cost and rate shock associated with upgrading acquired systems.

Economic Regulation

Continued government involvement, specifically commission regulation of investor-owned utilities, is sometimes regarded as a barrier to privatization. For one thing, establishing an investor-owned utility usually requires certification by the state public utilities commission (in addition to the approval of drinking water quality regulators). For another, regulatory approval generally is required for any transaction involving a transfer of utility assets. But perhaps most important, investor-owned water utilities usually are subject to revenue requirements regulation.

In their analysis of economic perspectives on privatization, Oxford professors John Vickers and George Yarrow observe that any form of ownership is imperfect and that "privatization can be viewed as a means of reducing the impact of government failure, albeit at the risk of increasing market failure, and of changing monitoring arrangements."[54] However, the authors also assert that (1) government intervention after privatization provides continued opportunities for government influence, (2) commitments by the government to not intervene may not be credible (particularly for monopolies), and (3) privatization itself is a governmental activity with potentially

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[53] Pennsylvania passed an acquisition policy for this purpose in 1990.

[54] John Vickers and George Yarrow, "Economic Perspectives on Privatization," *Journal of Economic Perspectives* 5 (Spring 1991): 130.

substantial distributional and political consequences. Vickers and Yarrow conclude that, "The effects of privatization in any particular context will, therefore, be highly dependent upon the wider market, regulatory and institutional environments in which it is implemented."[55]

Typically, a privatized utility will be regulated by a state public utility commission, although the specific authority of the commissions varies substantially from state to state. Many analysts view economic regulation of utility revenues and rates as a potential barrier to privatization because regulation constrains profitability and does not provide the performance incentives of competitive markets.[56] Many also believe that regulation provides disincentives (or inadequate incentives) to investor-owned utilities for furthering privatization through mergers and acquisitions.

However, it also can be argued that even in the context of regulation, privatization is a step in the right direction, particularly in establishing self-supporting water systems that use cost-of-service principles in setting rates and are inclined to operate more efficiently. Regulation also removes the ratemaking process from the local setting, in theory making the process less subject to parochial political forces. Moreover, modern public utility regulation encourages utilities to meet least-cost and efficiency goals. The regulatory process provides policymakers with various tools and incentives for guiding utility performance in these areas. In fact, it may be easier to reward investor-owned utilities for implementing least-cost solutions than it is to reward publicly owned utilities for achieving this goal. In theory, regulation also could become an agent of privatization by providing positive incentives to regulated utilities in this area.

Of course, not everyone agrees that rate-of-return regulation is the best form of utility regulation. One suggestion for implementing privatization is to transform *all* municipal water systems to private systems (so that all water systems would be subject to the same taxation and regulatory policies), and replace rate-of-return regulation with

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[55] Ibid., 130.

[56] Haarmeyer, *Privatizing Infrastructure*; and Raftelis, "Legal Issues."

price-cap regulation.[57] Advocates of this approach contend that it would help the water industry take full advantage of market forces. In general, the joint consideration of privatization and incentive regulation is appropriate.

Future Directions

As George Raftelis concluded in his analysis, "Privatization is not an all-encompassing panacea for water and wastewater facility financing and construction. Rather, it is one of several approaches to solve the infrastructural problems facing local government utilities."[58]

No public utility ownership form is perfect. Municipal ownership shields utilities from market forces. Investor-owned utilities may not always be sensitive to or able to respond to changing community needs. To some extent, the coexistence of these alternative ownership arrangements provides a healthy form of competition for the water utility industry. Consolidation, whether by public or private firms, is a positive course of action for the industry. In the long term, privatization may yield additional efficiencies.

Certainly, the interest both in studying and promoting privatization in the global political economy will continue to be strong.[59] The implications of foreign investment in U.S. water supply is an emerging issue. The World Bank and other international organizations, however, place an appropriate emphasis on the goals of efficiency over profitability and the importance of having regulatory oversight mechanisms in place for privatized monopolies. As in the global phenomenon, a privatization movement within the U.S. political economy would have sweeping implications for water utilities and water utility regulation.

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[57] Haarmeyer, *Privatizing Infrastructure,* 33.

[58] Raftelis, "Legal Issues," 95.

[59] Sunita Kikeri, John Nellis, and Mary Shirley, *Privatization: The Lessons of Experience* (Washington, DC: The World Bank, 1992).

CHAPTER 8

EVALUATING ALTERNATIVES

A wide variety of financing and ratemaking alternatives for water utilities was described here. Each approach has different implications for water utilities and the regulatory processes that apply to them. Some alternatives, such as the future test year, might be considered a mere adjustment to the existing regulatory process. Others, such as privatization, could change the character of the water supply industry.

An evaluation system can help utilities and regulators make informed choices among the many available options. Water utilities, regardless of their ownership, need to evaluate alternatives in order to provide an informed rationale for seeking a change in approach. Financing and ratemaking options can have vastly different implications for water system viability. In the case of investor-owned systems, the state commissions need to closely evaluate changes affecting the regulatory process and their principal methods of oversight.

Because not all consequences are ever known, it is advisable to approach changes experimentally whenever possible. Evaluation before a measure is adopted can prepare decisionmakers for the potential consequences. An ongoing evaluation process can be used to assess impacts and help decisionmakers make necessary adjustments.

Evaluation Criteria

Numerous criteria are available for evaluating conventional and alternative approaches to financing and ratemaking. Most of these criteria are expressed in very general terms but can be adapted for a variety of specific evaluation purposes.

Prominent within the general utility regulation literature is a set of evaluation criteria provided by Bonbright, Danielsen, and Kamerschen.[1] With regard to revenue requirement methods, their criteria are efficiency, stability, and acceptability. With regard to costing and rate design methods, their criteria are static efficiency, dynamic efficiency, cost tracking, avoidance of discrimination, and acceptability. These criteria can be used to help regulators anticipate the consequences of a change in regulatory policy.

For the water sector specifically, the newly revised American Water Works Association manual, *Alternative Rates,* proposed the following set of criteria for evaluating rate design alternatives: legality, financial sufficiency, equity, customer impact, simplicity, implementation ease, and conservation.[2] Another set of criteria was proposed for the purpose of evaluating regionalization choices in the water sector, such as consolidation through mergers and acquisitions. These four criteria are economic efficiency, fiscal equity, political acceptance, and administrative feasibility.[3]

Drawing from these and other perspectives, table 8-1 presents a comprehensive set of evaluation criteria organized into the broad categories of efficiency criteria, fiscal criteria, customer-impact criteria, regulatory-policy criteria, and institutional criteria. Within each category, three specific means of operationalization are provided. While this listing may not be exhaustive, it does cover the major themes of the literature and the issues they encompass.

Importantly, the evaluation criteria are posed in terms of a continuum of possibilities ("how well does the alternative. . ."), rather than in terms of simple dichotomies ("does the alternative. . ."). In other words, a simple pass-or-fail test

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[1] James C. Bonbright, Albert L. Danielsen, and David R. Kamerschen, *Principles of Public Utility Rates* (Arlington, VA: Public Utilities Reports, Inc., 1988).

[2] American Water Works Association, *Alternative Rates* (Denver, CO: American Water Works Association, 1992), 73.

[3] SMC Martin, Inc., *Regionalization Options for Small Water Systems* (Washington, D.C.: U.S. Environmental Protection Agency, 1983).

TABLE 8-1

EVALUATING FINANCING AND RATEMAKING ALTERNATIVES

Efficiency Criteria

Allocative efficiency. How well does the alternative promote the optimal allocation and use of resources?

Cost efficiency. How well does the alternative promote the goal of cost minimization or least-cost utility service?

Dynamic efficiency. How well does the alternative stimulate technological and operational innovation, while being sensitive to changes in demand and supply patterns?

Financial Criteria

Financial viability. How well does the alternative assure financial viability by providing adequate revenues in response to changing utility costs?

Revenue stability. How well does the alternative provide revenue stability and predictability?

Cost recovery. How well does the alternative provide for the assignment and recovery of costs in a timely manner?

Customer-Impact Criteria

Service quality. How does the alternative affect the nature and quality of service to customers or customer classes upon implementation?

Rate continuity. How well does the alternative provide rate structure and rate continuity over time?

Simplicity. How understandable is the alternative to customers?

(continued)

TABLE 8-1 (continued)

Regulatory-Policy Criteria

Equity. How well does the alternative minimize rate discrimination, cross-subsidization, and intergenerational inequity?

Performance. How well does the alternative provide performance incentives to prevent overcapitalization, imprudent investment, maintenance deferrals, poor service quality, and inadequate reliability?

Conservation. How well does the alternative promote wise use, conservation, and resource preservation?

Institutional Criteria

Legality. How well does the alternative provide for compliance and consistency with applicable local, state, and federal laws, regulations, and standards, and applicable judicial precedents?

Feasibility. How difficult is it to implement the alternative with respect to operational, administrative, and regulatory considerations?

Administrative acceptability. How acceptable is the alternative to utility managers, government regulators, and other policymakers who must oversee its implementation?

Source: Authors' construct.

generally will not suffice for evaluation purposes. The implication is that each financing or ratemaking alternative can be evaluated in terms of the *degree* to which it satisfies (or does not satisfy) the various criteria. Thus, an evaluation approach using rankings (for example, from very poor to neutral to very good) would be appropriate. The complexity of the rating system (the range of possible ratings) depends on the amount of resources that can be devoted to the evaluation process.

These evaluation criteria are not without notable limitations. General criteria, such as equity, can be highly ambiguous. Equity, for example, usually is a matter of perspective. Another problem is that some criteria, such as economic efficiency and revenue stability, can be in direct conflict. In addition, some criteria may carry more or less weight than others depending on local circumstances. For example, lacking consumer acceptance may be perceived as an insurmountable barrier to implementing certain alternatives. Finally, many of the evaluation criteria, such as administrative acceptability, are qualitative in nature. A strictly quantitative evaluation methodology is not likely to yield the information necessary to make good choices.

No single financing, ratemaking, rate design, or structural alternative can fully satisfy all evaluation criteria. The use of any particular approach often involves tradeoffs among competing policy goals. Nevertheless, these criteria can be used for general assessment purposes, as a screening device for narrowing the field of options, or as part of the ongoing evaluation of implemented alternatives.

Evaluation and Regulation

Evaluation is important to regulators because of the need to view potential changes with a healthy skepticism. Regulators may want to be cautious about extending such measures as automatic adjustments, pass throughs, or surcharges, too far and too fast because of the risk of sacrificing essential regulatory oversight. The preemptive nature of the Safe Drinking Water Act (SDWA), which again applies only to water treatment, does not apply to other utility investments. Federal regulations, therefore, may not fully justify certain approaches. When alternative ratemaking approaches are used, it may be wise to design them in ways that assure regulators of continued opportunities to evaluate management prudence. Regulators also may need to be selective about the alternatives they use because of potential interactive effects. The combined use, for example, of a future test year and an automatic adjustment clause may provide utilities with too few incentives to control costs. Additionally, some alternatives can have mixed consequences for utilities. Reconciliation proceedings for adjustment clauses, for example, may constitute an evaluation of management prudence. These reviews also can be unexpectedly contentious. Similarly, preapproval of utility expenditures may introduce an evaluation of prospective prudence to the regulatory process. Finally, some forms of incentive regulation may require utilities to share savings or profits, as well as costs, with their ratepayers.

In deciding whether to implement some alternatives, regulators may want to use viability assessment methods to evaluate the financial, managerial, and technical capability of the water utilities under their jurisdiction.[4] As a screening device, viability assessment can help identify utilities that are in serious trouble and for whom risks are very real. The use of some measures, such as special-purpose surcharges, might be conditioned on how a utility fares with respect to viability assessment criteria. Water systems whose viability is well established might not qualify for special regulatory treatment.

Some modifications to the regulatory process, such as those that address regulatory lag, may be essential to ensure the viability of the water utility industry during a period of potentially dramatic change. Other modifications may not be so essential. This latter point is not necessarily a defense of traditional regulation. In fact, one problem associated with many of the regulatory alternatives considered in this report is that they are merely incremental changes when perhaps more fundamental changes in approach may be needed. Advocates of incentive regulation, for example, view incentives as far more effective than traditional utility regulation in motivating utilities to perform efficiently. In other words, tinkering with the existing regulatory regime may satisfy utility interests but it is not necessarily an improvement from other viewpoints.

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[4] See Janice A. Beecher, G. Richard Dreese, and James R. Landers, *Viability Policies and Assessment Methods for Small Water Utilities* (Columbus, OH: The National Regulatory Research Institute, 1992).

Regulated water utilities sometimes rationalize the need for financing and ratemaking alternatives because the costs they face are out of control in general, and out of *their* control in particular. An argument sometimes heard is that the water supply industry did not incur regulatory compliance costs by choice.[5] However, to the extent that water utilities supply a service with public-interest and public-health dimensions, they must be accountable for meeting appropriate standards, even if those standards are viewed as burdensome. Not only must the industry provide safe water, it also must maintain an adequate and reliable water delivery infrastructure. Meeting these standards is a requisite part of providing utility services. While regulatory compliance can be costly, it is not the principal determinant of utility revenue requirements.

Like all enterprises, utilities can take measures to control rising costs. In fact, cost management by water utilities should be a prerequisite to the consideration of any regulatory treatment of increasing revenue requirements. Rather than passively accepting costs and passing them along to consumers, a better approach would be to aggressively seek out ways to control costs or mitigate the effects of costs that are difficult to control. As mentioned earlier, technological innovations, efficiency improvements, economies of scale, market forces, strategic management, and integrated planning are particularly promising ways to exert a downward pressure on revenue requirements. The magnitude of the potential savings associated with these forces, of course, is largely unknown.

Utility regulation alone cannot align these countervailing forces, but it can help provide appropriate incentives to utilities that strive to keep costs down and become more efficient. As an example, when utilities shop around for laboratory and other services, they help create a more competitive market for those services, which can result in lower costs for consumers. Especially during periods of cost escalation, ratepayers depend on regulators to be vigilant about cost control on their behalf.

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[5] By contrast, according to this argument, the electricity industry made a cost consequential choice by investing heavily in nuclear power.

The changing cost profile of the water utility industry marks a "coming of age" for the industry and a new era in water utility regulation. All water utilities, regardless of ownership structure or size, must begin to plan how they will meet additional revenue requirements. Strategic planning, therefore, should become a priority for water utilities and water utility regulators. As costs rise, expanded use of least-cost or integrated resource planning, seems particularly appropriate.

In the context of rising costs, the process of planning provides a framework for regulators to evaluate the prudence of management decisions related to environmental mandates, infrastructure needs, and demand growth. Planning can facilitate the process of bringing a system into regulatory compliance at the least cost. The institutional elements of planning might help provide a forum for state drinking water regulators and utility regulators to coordinate oversight and expedite necessary approvals. Least-cost financial planning also might help justify alternative financing mechanisms for SDWA-driven projects. In the area of infrastructure, planning can help utilities evaluate whether to retire aging or obsolete capacity or upgrade the water distribution system. Strategic planning for improvements over time can help utilities make incremental investments and mitigate cost impacts. Certainly the area to which planning speaks directly is in meeting demand growth. Integrated planning provides utilities with the means to explore the prospects for meeting future demand through a mix of supply and demand-management options. For some water utilities, efficient use of existing resources could help postpone the need for new utility capacity, yielding substantial savings for ratepayers and offsetting other types of costs. In sum, planning can help utilities identify efficient alternatives, justify rate increases, and expedite other regulatory approvals, such as certification. From a regulatory standpoint, as noted earlier, planning may be superior to preapproval of utility investment decisions because it is more flexible and adaptable to changing circumstances.

Realistically, however, even the most comprehensive planning process may not help utilities reduce substantial regulatory uncertainty. Effective utility regulation depends mainly on regulators asking the right questions. Prior to determining the appropriate regulatory treatment of costs, regulators should ask water utilities to demonstrate where the costs originate, what measures are being taken to control costs, and how cost impacts can be mitigated.

When considering various financing and ratemaking alternatives, and the interactions among them, regulators may choose to create a more flexible regulatory environment for water utilities in which the prompt recovery of prudently incurred costs is facilitated. Financing and ratemaking innovations may be particularly essential with respect to small water systems, which are most affected by rising costs. It also may be appropriate, or even necessary, to provide water utilities with better performance incentives to minimize costs and improve efficiency. When regulators can be convinced that aggressive measures are being taken to hold down revenue requirements, utilities may be more likely to attain approval for innovative alternatives that mitigate against the inevitable cost impacts.

APPENDIX A

ANALYSIS OF SAFE DRINKING WATER ACT RATE IMPACTS PREPARED FOR THE NEW YORK DEPARTMENT OF PUBLIC SERVICE

Potential Impact on Rates[1]

A. Introduction

This section presents a general analysis of the impact that Safe Drinking Water Act-related plant facilities may have on the current rates of privately owned water utilities in New York. The utilities are grouped into three separate categories based on the number of customers. This section focuses on the small, medium, and large water companies for which incremental plant costs are assumed, annual payments based on different financing scenarios computed, and finally, a determination of both the cost of water per 1,000 gallons sold (T gallons) and the effect on annual bills of typical use customers is made.

It should be noted at the outset, however, that while the assumptions made for purposes of this analysis are based on experience and/or expectations, the results are generic. Site-specific conditions and information about individual water company operations will dictate the nature and extent of costs, if any, associated with SDWA compliance and its effects on water rates and consequently customers' bills. The actual costs of the treatment facilities will depend, for the most part, on the extent of the contamination problem and the degree of discretion water companies will have in choosing the treatment process. Since those costs are unknown, a generic incremental cost approach was followed for this analysis.

B. General Assumptions

In order to properly address the potential rate effect on all water companies of complying with the new State and Federal regulations, the water companies were broken into three groups. Small water companies are those with 50-500 customers, medium water companies are those with 501-3,000 customers, and large water companies are those with more than 3,000 customers. For ease of performing the analysis, however, a range of 10,000-110,000 customers was used for large water companies.

It was generally assumed that each customer would be billed for 100,000 gallons of water a year, regardless of the size water company providing the service. This figure was used to develop the unit cost of water ($/thousand gallons) associated with the incremental cost of the treatment facility. It was also assumed that typical customers would fall into discrete levels of usage (for example, 36,000 gallons, 50,000 gallons, 100,000 gallons, and 150,000 gallons). The unit cost was then applied to each category of typical use customers in order to determine its effect on their annual bills.

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[1] This analysis was extracted from New York Department of Public Service, *Committee Reports, Volume II, Safe Drinking Water Act Committee,* Case 88-W-221, Proceeding on Motion of the Commission to Examine the Impact of Environmental Protection, Water Supply and Conservation Issues on Jurisdictional Water Utilities and to Investigate the Problems of Small Water Companies, October 2, 1989, chapter IV.

Additionally, the analysis is predicated on the assumption that small water companies will require treatment facilities which cost somewhat less than those facilities required by medium and large water companies. Therefore, the analysis reflects an incremental treatment plant cost of $10,000 for small companies, $50,000 for medium companies, and $100,000 for large companies. Since the results of the analysis are based on incremental cost figures, one can obtain a fairly accurate representation of results based on other capital cost figures.

C. Source of Funds

Like other businesses, water companies finance major construction projects with investor capital such as common stock, preferred stock, and long-term debt. These different securities, their relative costs, and varied amounts make up a company's capital structure and dictate its cost of capital. Since most improvements that may be required to comply with the requirements of the SDWA and state regulations are capital-intensive, the cost of capital is an important component in the rate impact study.

Experience has demonstrated that most small water companies generally resort to a customer surcharge in order to meet their capital construction needs, because they cannot readily obtain loans. Many medium water companies can generally obtain a loan and have their annual loan payments reflected in rates. However, interest rates on the loan are often high (2-3 percent above prime). Large water companies, in general, can issue a variety of securities. Thus, the financing cost is the overall pretax cost of capital.

This analysis is based on the assumption that small water companies will resort to a surcharge mechanism, or that they will be allowed to reflect in rates an annual loan payment required to finance a debt instrument over a period of five years. It is assumed medium water companies will finance required improvements with debt over five years or ten years, and large companies will finance projects through traditional means and that their projects will receive rate base treatment in setting rates.

A pretax cost of capital of 13.8 percent was used for the large companies with a debt cost of 13 percent used for small and medium size water companies.[2] The allocation of capital costs reflects the fact that large companies have access to a variety of funds and can finance across their capital structures, while the smaller companies have no realistic equity market and must rely on debt exclusively.

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[2] The pretax cost of capital of 13.8% was derived from two recently litigated rate cases: Jamaica Water and New Rochelle Water. The average equity ratio for these companies was 48% and the average cost of equity was 11.9%. Both companies have access to equity capital and maintain balanced capital structures in order to sustain flexible financing alternatives.

TABLE A-1
EFFECT OF SURCHARGE ON RATES FOR A RANGE OF SMALL WATER COMPANIES (a)

		Surcharge Period and Amount (b)				
		1 yr. $12,255	2 yrs. $6,128	3 yrs $4,085	4 yrs. $3,064	5 yrs. $2,451
Number of Customers	Total Usage (c) (000)	Incremental Rates ($/thousand gallons)				
50	5,000	$2.45	$1.23	$0.82	$0.62	$0.50
100	10,000	1.23	0.62	0.41	0.31	0.25
200	20,000	0.62	0.31	0.21	0.16	0.13
300	30,000	0.41	0.21	0.14	0.11	0.09
400	40,000	0.31	0.16	0.11	0.08	0.07
500	50,000	0.25	0.13	0.09	0.07	0.05

(a) Plant cost of $10,000 requiring $12,255 surcharge.
(b) Excludes operating expense based on 5 percent of plant cost to be charged upon placing plant in service ($521); the effect on rates ranges from $0.104 per thousand gallons for 50 customers to $0.011 per thousand gallons for five hundred customers.
(c) Based on one-hundred thousand gallons per customer (in thousands).

TABLE A-2
EFFECT OF A TWO-YEAR SURCHARGE ON ANNUAL BILLS OF TYPICAL CUSTOMERS FOR A RANGE OF SMALL WATER COMPANIES

Number of Customers	Annual Consumption (Gallons) and Increment to Annual Bill			
	36,000	50,000	100,000	150,000
50	$44.28	$61.50	$123.00	$184.50
100	22.32	31.00	62.00	93.00
200	11.16	15.50	31.00	46.50
300	7.56	10.50	21.00	31.50
400	5.76	8.00	16.00	24.00
500	4.68	6.50	13.00	19.50

TABLE A-3

EFFECT OF FIVE-YEAR LOAN FINANCING ON RATES FOR A RANGE OF SMALL WATER COMPANIES (a)

Number of Customers	Total Usage (b) (000)	$Amount	/	Usage	=	Incremental Rate ($/T)
50	5,000	$3,702	/	5,000	=	$0.74
100	10,000	3,702	/	10,000	=	0.37
200	20,000	3,702	/	20,000	=	0.19
300	30,000	3,702	/	30,000	=	0.12
400	40,000	3,702	/	40,000	=	0.09
500	50,000	3,702	/	50,000	=	0.07

(a) Plant cost of $10,000 requiring $3,072 annual amount to be recouped in rates.
(b) Based on one-hundred thousand gallons per customer (in thousands).

TABLE A-4

EFFECT OF FIVE-YEAR LOAN FINANCING ON ANNUAL BILLS OF TYPICAL CUSTOMERS FOR A RANGE OF SMALL WATER COMPANIES

Number of Customers	Annual Consumption (Gallons) and Increment to Annual Bill			
	36,000	50,000	100,000	150,000
50	$26.64	$37.00	$74.00	$111.00
100	13.32	18.50	37.00	55.50
200	6.84	9.50	19.00	28.50
300	4.32	6.00	12.00	18.00
400	3.24	4.50	9.00	13.50
500	2.52	3.50	7.00	10.50

TABLE A-5

EFFECT OF FIVE-YEAR LOAN FINANCING ON RATES FOR A RANGE OF MEDIUM WATER COMPANIES (a)

Number of Customers	Total Usage (b) (000)	$Amount	/	Usage	=	Incremental Rate ($/T)
700	70,000	$18,510	/	70,000	=	$0.27
1,000	100,000	18,510	/	100,000	=	0.19
1,500	150,000	18,510	/	150,000	=	0.13
2,000	200,000	18,510	/	200,000	=	0.10
2,500	250,000	18,510	/	250,000	=	0.07
3,000	300,000	18.510	/	300,000	=	0.06

(a) Plant cost of $50,000 requiring $18,510 annual amount to be recouped in rates.
(b) Based on one-hundred thousand gallons per customer (in thousands).

TABLE A-6

EFFECT OF FIVE-YEAR LOAN FINANCING ON ANNUAL BILLS OF TYPICAL CUSTOMERS FOR A RANGE OF MEDIUM WATER COMPANIES

Number of Customers	Annual Consumption (Gallons) and Increment to Annual Bill			
	36,000	50,000	100,000	150,000
700	$9.72	$13.50	$27.00	$40.50
1,000	6.84	9.50	19.00	28.50
1,500	4.68	6.50	13.00	19.50
2,000	3.60	5.00	10.00	15.00
2,500	2.52	3.50	7.00	10.50
3,000	2.16	3.00	6.00	9.00

TABLE A-7

EFFECT OF TEN-YEAR LOAN FINANCING ON RATES FOR A RANGE OF MEDIUM WATER COMPANIES (a)

Number of Customers	Total Usage (b) (000)	$Amount	/	Usage	=	Incremental Rate ($/T)
700	70,000	$12,755	/	70,000	=	$0.18
1,000	100,000	12,755	/	100,000	=	0.13
1,500	150,000	12,755	/	150,000	=	0.09
2,000	200,000	12,755	/	200,000	=	0.06
2,500	250,000	12,755	/	250,000	=	0.05
3,000	300,000	12,755	/	300,000	=	0.04

(a) Plant cost of $50,000 requiring $12,755 annual amount to be recouped in rates. This includes the annual loan payment of $8,863; operating expense, $2,500; estimated federal income tax, $882; and revenue taxes, $510.
(b) Based on one-hundred thousand gallons per customer (in thousands).

TABLE A-8

EFFECT OF TEN-YEAR LOAN FINANCING ON ANNUAL BILLS OF TYPICAL CUSTOMERS FOR A RANGE OF MEDIUM WATER COMPANIES

Number of Customers	Annual Consumption (Gallons) and Increment to Annual Bill			
	36,000	50,000	100,000	150,000
700	$6.48	$9.50	$18.00	$27.00
1,000	4.68	6.50	13.00	19.50
1,500	3.24	4.50	9.00	13.50
2,000	2.16	3.00	6.00	9.00
2,500	1.80	2.50	5.00	7.50
3,000	1.44	2.00	4.00	6.00

TABLE A-9

EFFECT OF PLANT INVESTMENT ON RATES FOR A RANGE OF LARGE WATER COMPANIES (a)

Number of Customers	Total Usage (b) (000)	$Amount	/	Usage	=	Incremental Rate ($/T)
10,000	1,000	$22,000	/	1,000	=	$0.0220
30,000	3,000	22,000	/	3,000	=	0.0073
50,000	5,000	22,000	/	5,000	=	0.0044
70,000	7,000	22,000	/	7,000	=	0.0031
90,000	9,000	22,000	/	9,000	=	0.0024
110,000	11,000	22,000	/	11,000	=	0.0020

(a) Plant cost of $100,000 requiring $22,000 annual amount to be recouped in rates.
(b) Based on one-hundred thousand gallons per customer (in millions).

TABLE A-10

EFFECT OF PLANT INVESTMENT ON ANNUAL BILLS OF TYPICAL CUSTOMERS FOR A RANGE OF LARGE WATER COMPANIES

Number of Customers	Annual Consumption (Gallons) and Increment to Annual Bill			
	36,000	50,000	100,000	150,000
10,000	$0.79	$1.10	$2.20	$3.30
30,000	0.26	0.37	0.73	1.10
50,000	0.16	0.22	0.44	0.66
70,000	0.11	0.16	0.31	0.47
90,000	0.09	0.12	0.24	0.36
110,000	0.07	0.10	0.20	0.30

TABLE A-11
CAPITAL AND OPERATING COSTS FOR SELECTED WATER TREATMENT TECHNOLOGIES
(In Thousands of Dollars)

SYSTEM CHARACTERISTICS POPULATION RANGE	25-100	101-500	500-1K	1K-3.3K	3.3K-10K	10-25K	25-50K	50-75K	75-100K	100-500K	500-1,000K
DESIGN FLOW (GPM)	17	54	151	399	1,493	3,698	7,844	14,188	22,806	55,868	213,195
AVERAGE FLOW (GPM)	6	24	76	219	694	1,858	4,800	7,049	11,458	28,646	112,847
FILTRATION											
CONVENTIONAL											
Capital	--	--	--	--	$2,819	$4,768	$8,254	$15,533	$22,393	$47,920	$129,726
O&M	--	--	--	--	163	274	475	773	1,294	2,778	8,714
DIRECT											
Capital	--	--	$896	$1,266	2,440	3,855	6,190	12,244	16,142	34,235	88,196
O&M	--	--	48	71	143	240	425	680	1,014	2,289	7,151
PACKAGE PLANTS											
Capital	$278	$295	428	773	1,770	2,952	--	--	--	--	--
O&M	12	16	42	75	137	274	--	--	--	--	--
SLOW SAND											
Capital	145	273	508	603	1,213	2,573	4,782	--	--	--	--
O&M	1	2	5	9	21	38	62	--	--	--	--
DIATOMACEOUS EARTH											
Capital	221	285	374	570	1,573	2,538	4,433	10,713	15,982	37,733	--
O&M	6	8	20	30	128	214	369	762	1,165	2,730	--
GRANULAR ACTIVATED CARBON											
PACKAGE											
Capital	87	140	220	370	--	--	--	--	--	--	--
O&M	6	18	62	160	--	--	--	--	--	--	--
STEEL PRESSURE											
Capital	--	--	--	--	2,700	5,500	8,000	--	--	--	--
O&M	--	--	--	--	210	380	810	--	--	--	--
CONCRETE GRAVITY											
Capital	--	--	--	--	--	--	--	8,300	9,700	14,000	35,000
O&M	--	--	--	--	--	--	--	1,300	1,800	3,600	15,000
AERATION											
PACKED COLUMN											
Capital	67	140	310	600	1,400	3,700	8,300	14,000	19,000	38,000	150,000
O&M	2	6	15	35	97	270	620	1,000	1,500	3,000	13,000

Source: New York Department of Public Service, *Committee Reports, Volume II, Safe Drinking Water Act Committee,* Case 88-W-221, October 2, 1989, tables A and B. The source provides ranges for some entries but only the high estimates are reported here.

APPENDIX B

EXCERPTS FROM THE ENVIRONMENTAL PROTECTION AGENCY'S COMPENDIUM ON ALTERNATIVE FINANCING MECHANISMS

FEES

Description: A fee is generally a charge for services rendered. Fees establish direct links between the demand for services and the cost of providing them. For example, park user fees require park visitors to pay for operating costs; utility charges require customers to pay for the cost of providing water and wastewater services. Permit fees are used to help finance pollution control activities by charging polluters the costs their discharges impose upon society. In this case, the service rendered to the feepayer is pollution control. Inspection and certification fees pay the cost of inspecting or certifying equipment, facilities, or employees for compliance with environmental and other regulations. License and registration fees are intended to finance oversight of the licensed or registered product or service by the state. For example, fishing and hunting license fees pay for game and natural lands protection; motor vehicle registration fees often pay for highway funds and state administrative costs.

Advantages: Well-structured fees can be an equitable means of matching program costs to program beneficiaries or assigning cleanup costs to the parties responsible for the original pollution. In other cases, instituting a fee essentially eliminates a subsidy for the government service, freeing up general revenues that could be used to fund other environmental programs. In many states, fees can be set administratively, meaning no legislative action is required to impose the fee.

Limitations: Since they are targeted to a particular service or group, fees have a narrower revenue base than most taxes. In many states, fees cannot exceed costs of providing a service, although there is often wide latitude in defining what constitutes service. Some states have expressed increasing concern over a growing resistance to fee programs among industry groups, as well as the general public.

Discussion:

- In many states, fees may be administratively imposed without legislative approval, making them a viable option for state and local governments which might face severe political opposition to tax increases.

- Because administrative processes are usually faster than the legislative process, administratively-imposed fees may be particularly well-suited to providing revenues when it is necessary to increase program activities over a short time frame--to implement a new program or to implement new program requirements to administer new mandates. For example, if a program needs to issue new permits, setting a fee to cover costs of permit issuance can cover costs on a pay-as-you-go basis.

- Many states require that fees not exceed the cost of services rendered. Therefore, fees are best suited to covering those administrative and operating costs that can be defined as services rendered to the feepayer.

FEES (continued)

- In communities where fees already exist, officials may wish to examine their rates and ensure that fees are covering the full costs of providing these services.

- Communities in fiscal crisis, facing the choice of whether to cut services or increase taxes, may find that instituting service fees will enable them to maintain services. For example, a county with a budget deficit might enact park user fees rather than eliminate county park and recreation programs.

BONDS

Description: A bond is a written promise to repay borrowed money on a definite schedule and usually at a fixed rate of interest for the life of the bond. Bonds can stretch out payments for new projects over a period of fifteen to thirty years. State and local governments repay this debt with taxes, fees, or other sources of governmental revenue. Since most government bonds are tax-exempt, bondholders are generally willing to accept a correspondingly lower rate of return on their investment than they would expect on a comparable commercial bond. Bond financing, therefore, can provide state and local governments with low-interest capital.

Advantages: Bonds provide financing for immediate capital needs. If the project qualifies, tax-exempt bonds can be a low-interest way of acquiring capital.

Limitations: Certain types of bonds require voter approval. Bonds only spread out costs of a project; an ultimate revenue source still needs to be identified. There may be some competition for debt capacity at the state or local level. Some state and local governments may also have statutory limitations on the dollar amount and/or number of bonds that can be issued.

Discussion:

- Over the years, bonds have been used to finance around 60 percent of environmental infrastructure. Bonds will continue to be a principal source of capital financing. Because bond financing is restricted to capital projects or other large, up-front expenditures, it is not suitable to cover annual operating costs.

- Restrictions implemented by the 1986 Tax Reform Act have generally increased the cost of bond financing for environmental infrastructure.

- Larger local governments may prefer bond financing to loans for capital projects, since the bond market typically offers capital at lower interest rates than the rates for commercial loans. Larger communities may also find it easier to access the financial and legal expertise required to issue bonds.

- Bond financing may be particularly suited to projects where the source of repayment is raised by user charges from the project or facility financed by the bond.

- State and local governments have a large amount of flexibility in structuring bond issues to suit their needs. With advice from financial advisors, repayments can be timed to suit the fiscal needs of a given community.

LOANS

Description: A loan is money that must be repaid in a set amount of time at a negotiated interest rate. State and federal loan programs typically provide capital at subsidized rates for projects that meet their eligibility criteria. Many of these programs have criteria targeted to small and/or rural communities, since such communities often need assistance in acquiring capital.

Advantages: State and federal loan programs sometimes provide loans at lower interest rates than those available for bond financing on the capital markets. Arranging a loan may be a quicker means of acquiring capital than issuing bonds, and involves fewer transaction costs. Loans can also be acquired without voter approval, and do not generally have statutory limitations. Smaller and economically disadvantaged communities may find arranging loans easier than issuing bonds to acquire needed capital.

Limitations: Subsidized loan programs may have significant competition and it may be difficult to meet criteria for low-interest loans. Commercial loan programs will generally have higher interest rates than most states and localities could command for bond issues.

Discussion:

- Generally, two types of loans are available: commercial loans and federal and state loans. Many of the federal and state loan programs provide subsidies. Loans are more suitable for financing capital projects and up-front expenditures than operating costs.

- Except for the state revolving fund (SRF), federal loan programs are typically oriented to small, economically disadvantaged, or rural communities. Overall, federal loan programs fall far short of meeting needs.

- State and local government officials should consider loans as a financing mechanism if the project to be financed meets eligibility criteria for federal or state low-interest loan programs, since acquiring low-interest capital financing can improve the affordability of the project to the community.

- Establishment of loan programs may unintentionally inhibit compliance if communities opt to wait for loan funds.

- Smaller and economically disadvantaged communities may want to consider loans since they may find it easier to acquire loan capital and be able to command lower interest rates than on the bond market. Loans are also a viable option for smaller projects, particularly where the costs of bond issuance would represent too high a percentage of the bond proceeds.

LOANS (continued)

- Unlike bonds, a government generally does not have to state a specific source of repayment in order to arrange a loan. (The SRF Program authorized under the Clean Water Act is an exception). Loans may be a viable option, therefore, when the state or local government has not yet identified the source of repayment, or where multiple revenue sources will be used.

- Loan programs may be preferable to grant programs from state and federal perspectives if repayments are available to provide assistance to other communities on a revolving basis.

- In addition, since loans typically do not require voter approval, they may be suitable for meeting short-term cash needs while the government is identifying the ultimate source of funds.

- Depending on the program, loans may be coupled with a grant for a portion of project costs for certain small or economically disadvantaged communities.

GRANTS

Description: A grant is a sum of money awarded to a state or local government or nonprofit organization. Typically, grants are awarded by the federal government to state or local governments, or by states to local governments, for the purpose of financing a particular activity or facility.

Advantages: The primary advantage of grants is that state and local governments do not have to use their own resources to pay the costs that the grant covers.

Limitations: Applying for grants can be costly and time-consuming. Due to the intense competition at both the state and the local level for a limited pool of funds, state and local governments may find it difficult to acquire funding for most projects. Due to project eligibility limitations, only a percentage of the total project costs may be eligible for project assistance. Alternatively, some grant programs may also specify that the grantee must provide a share of the funds. Even if funding is approved, the grantee may need to seek short-term debt instruments to cover cash shortages while awaiting the arrival of the funds. Finally, grant funds have conditions that affect the scope, intent, nature, or cost of the project or program in question. For example, EPA Section 105 grants are negotiated grant agreements which obligate the state air programs to use the funds to perform certain activities that may or may not coincide with the state's own priorities for its air program. Certain grant conditions, such as mandatory grant reviews and production of detailed reports, may increase the overall cost of the project.

Discussion:

- State and federal grant programs have been and probably will remain a supplementary source of funds for both operating and capital costs of state and local programs. Grant funding, however, is inherently unstable to the extent that it is dependent on the vagaries of an annual appropriations process.

- Establishment of grant programs may unintentionally inhibit compliance for some communities that may opt to wait for grant funds.

- Grant awards are often tied to meeting goals and requirements that may increase overall project costs. On the other hand, grants can provide subsidies that have positive incentive effects.

- State and local governments should explore the possibility of funding specific eligible activities with grants, as opposed to seeking funds for the entire program. For example, an innovative part of a state air quality program may be eligible for an air pollution control research grant from the EPA's Office of Research and Development.

CREDIT ENHANCEMENT MECHANISMS

Description: Essentially, credit enhancement serves as an assurance to lenders and bondholders that they will be repaid if the debtor government should default. By providing additional guarantees for bond and/or loan repayment, credit enhancement mechanisms improve the ability of governments to acquire capital, or to acquire capital at a lower interest cost.

Advantages: State and local governments with poor credit ratings or no credit ratings may be able to gain access to capital markets and/or loan funds through credit enhancements.

Limitations: Commercial credit enhancements involve additional costs that may outweigh the financial advantage from the lower interest rates achieved through the enhancements. There may be intense competition for federal and state credit enhancement programs.

Discussion:

- Credit enhancements are most useful to communities with no credit history or a poor credit history, enabling them to gain access to capital or to acquire capital at lower interest rates than otherwise anticipated.

- Communities with strong credit histories may also find that they can command a lower interest rate on either bonds or loans by using credit enhancements.

- Credit enhancements may be particularly useful to help finance innovative projects, where credit providers may require additional reassurance of debt repayment. For example, credit enhancements may be helpful when issuing a bond to finance stormwater drainage improvement, since bondholders may want added reassurance that the stormwater district will indeed raise the anticipated revenues.

PUBLIC-PRIVATE PARTNERSHIPS

Description: Public-private partnerships involve private participation in the design, financing, construction, ownership, and/or operation of a public purpose facility or service. For example, a wastewater treatment plant might be owned by the public sector and operated by the private sector, or might be both owned and operated by a private company. Public-private arrangements involve a variety of techniques and activities to promote more involvement of the private sector in providing traditional government or public services. It enables each party to do what it does best and can result in a "win-win" solution to providing public services.

In the past, some public-private partnership arrangements, particularly in the area of wastewater treatment, had been hindered by regulations requiring repayment of the federal interest on federal grant-funded property. Recognizing this impediment, the President recently issued an Executive Order (No. 12803, May 4, 1992) directing executive agencies to make policy and regulatory changes to encourage and facilitate private investment in and involvement in local infrastructure.

Advantages: Depending on the nature of the arrangement, a public-private partnership may be able to capitalize on a number of private sector resources. If private sector financing is used, the burden on public debt capacity can be reduced. If private sector operation is used, efficiency savings are generally realized. Private sector procurement and construction methods typically provide significant savings as well. Due to specialized expertise, the private sector can sometimes provide services that would be otherwise unavailable to the public sector, or services at a higher level of quality. Finally, private sector operations can often have a shorter implementation time.

Limitations: The primary concern of governments who turn over services or facility operating and/or ownership to a private partner is loss of control. When the public agency is no longer involved in day-to-day operations, it does not have the same control over quality, including compliance with state and federal environmental standards and permits. The public partner may also have no control over the private partner's inability to uphold the terms of the contract, such as unscheduled service interruptions or bankruptcy, or over the quality of the service provided. If the partnership involves operation of a facility which charges fees, the public partner may be concerned about losing control over rate increases.

Discussion:

- Public-private partnerships are typically suited to financing activities that involve the provision of services such as wastewater treatment, drinking water provision, and solid waste collection and disposal.

PUBLIC-PRIVATE PARTNERSHIPS (continued)

- The President's Executive Order on Privatization (No. 12803, May 4, 1992) will cause regulatory and policy changes that have a significant potential to increase investment in environmental facilities. States should inform local governments of this potential and may want to consider participating in the rulemaking process. In addition, as the order removes federal regulatory impediments to public-private partnerships, states may wish to examine their own laws and regulations and consider removing state legal and regulatory impediments to public-private partnerships.

- Through lease-purchase arrangements, where a private partner leases and operates a public facility, paying debt service on publicly issued bonds with annual lease payments, state and local governments can gain the benefit of private sector efficiency while retaining the low interest cost of public capital.

- Public-private partnerships could also be applied in less traditional areas, such as enforcement and monitoring of environmental regulations.

- Public-private partnerships might be particularly well-suited to small communities that can benefit from a private partner's size and specialized experience. For example, due to economies of scale, a small community requiring solid waste disposal services might benefit from a partnership with a company that operated a large solid waste disposal facility for a number of communities. The community may also benefit from the private partner's specialized experience in solid waste management. However, without such economies of scale, most small communities might find the transaction costs (e.g., attorney and financial advisor fees) prohibitive.

ECONOMIC INCENTIVES

Description: Economic incentive programs use market-based tools to encourage reductions in polluting behavior. For example, the financial burden of fines and penalties serves as an economic disincentive for polluters who might otherwise violate environmental laws or regulations. Many incentive programs incorporate a market element, allowing participants to trade "rights" for emissions or discharges among themselves. For example, a number of water quality management programs have adopted or are considering adopting point source/nonpoint source nutrient trading programs. Under such programs, point source discharges of nutrient-laden effluent can receive credits for financing nonpoint source pollution reduction.

Advantages: The primary advantage of incentive-based programs is the reduction in polluting behavior that they are designed to produce. The economic incentive mechanism encourages the private sector to develop innovative techniques for pollution reduction, including selection of manufacturing processes that generate less pollution, development of new technologies for waste reduction, and improved best management practices.

Limitations: Although well-structured economic incentive programs generally achieve pollution reduction, and thereby reduce program costs, they typically are not a good source of cash revenues for program operations. Some incentive-based programs, such as fines and penalties, rely on polluting behavior to generate revenues. As this behavior changes, revenues will fall. Other incentive-based programs, such as emissions trading, involve transfer of funds among private parties, not the implementing government.

Discussion:

- Economic incentive programs allow state and local governments to capitalize on private sector innovations to achieve environmental quality goals. Although incentive programs do not typically provide significant cash revenues, in the long term they reduce program costs by achieving pollution reduction without direct governmental expenditures.

- Incentive programs also encourage development of innovative pollution reduction technologies and management techniques that may have wider applications to other state and local programs.

- Since incentive programs can sometimes produce pollution reduction, state and local governments facing state or federal deadlines on environmental quality standards may find them particularly useful. For example, state programs needing to meet water quality standards may want to use point source/nonpoint source trading programs as a tool.

TAXES

Description: Most taxes are charged against either personal or corporate income, property, or sales of a commodity. Income taxes are charged on a percentage of the money earned by an individual or corporation. Property taxes are based on a percentage of the value of the property owned. Commodity taxes, or sales and use taxes, are charted at a percentage of the commodity's value, or at a flat rate per transaction. Most states have a general sales and use tax on retail sales of commodities, and local governments often have riders charging an additional surtax to fund local government. In addition to a general sales and use tax, state and local governments sometimes impose selective taxes on the sale of a particular product or service. Severance, or natural resource extraction taxes, are also charged on selected commodities, but usually at the point of extraction rather than the point of sale.

Advantages: Taxes typically have a broader revenue base than fees, and therefore can generate high revenues at relatively low rates. For example, since millions of pounds of fertilizer are sold each year, states can levy fertilizer taxes at a rate of cents per pound and still generate millions of dollars in annual revenue.

Dedicating a surcharge on an existing tax to environmental programs involves little additional administrative costs. Alternatively, local governments can sometimes pass a "piggyback" tax on an existing state tax, generating local revenue without substantial additional administrative cost, although in some states this may require legislative authorization and/or approval. In many states, income, sales, and property data are already reported. This can reduce the administrative costs of implementing taxes with these bases.

Limitations: Imposing or increasing taxes generally requires legislative action, and public opposition to new or increased taxes often hinders passage in the legislature. Unlike fees, most taxes have historically remained undedicated to particular programs. If state and local governments rely primarily on undedicated tax revenues for program finance, the funding will be subject to the yearly budget process, and may be diverted to other uses.

Unless the tax is targeted to a particular type of property or income, there is only an indirect relationship between the tax base and the use of funds. By definition, revenues from taxes are dependent on the base--income, property, or commodity value--on which they are levied. Depending on the market in question, some taxes may be inappropriate financing mechanisms for those pollution control activities that require a predictable amount of revenue every year. Selective taxes in particular may have a negative impact on the market for the product or service singled out for taxation, thereby reducing potential revenues.

TAXES (continued)

Discussion:

- Since taxes generally provide ongoing revenues, they are most suitable for financing recurring costs, such as employee salaries or annual debt service payments on a bond or loan.

- The use of tax revenues is typically not restricted to covering the costs of a particular program or activity. Under these circumstances, taxes are well-suited to supporting programs where state and local governments require flexibility to use revenues for different activities from year to year. For example, revenues from a tax on watercraft sales could be used for monitoring water quality one year, and purchasing marine oil spill response equipment the next.

- In most jurisdictions, instituting new taxes requires legislative approval. Achieving such approval may be easier if the proposed tax is earmarked or dedicated to fund a particular program that has strong public and/or legislative support.

- Earmarking taxes need not reduce their flexibility; revenues may still be used for a variety of purposes within any given program depending on how specifically the revenues are dedicated.

- Tax surcharges levied on a temporary basis may be used to help raise revenues for specific projects that may not have been anticipated and are not expected to recur with any regular frequency. A tax surcharge on residential sewer bills, for instance, might finance the replacement of stormwater retention basins that were destroyed during a hurricane.

SPECIAL DISTRICTS

Description: A special district is an independent government entity formed to provide and finance governmental services for a specific geographic area. Residents of special districts pay taxes to finance the improvements that they will benefit from. For example, a sewage special district might tax residents to finance extension of wastewater treatment services. At the local level, special districts have been formed for a wide variety of purposes. Examples include sewer districts, water districts, irrigation districts, stormwater management districts, regional solid waste authorities, water resource authorities, regional port authorities, and regional air quality management districts.

Advantages: Costs are borne only by taxpayers who will benefit from improvements. Regional special districts can often provide more specialized services than smaller local governments (e.g., a regional solid waste authority may be better equipped to finance a solid waste facility than any one county). Special districts can also issue bonds, which may reduce some of the debt load on the general purpose government.

Limitations: Special districts are not directly accountable to the electorate--most special district officials are appointed, not elected. It may require special legislation to set up special districts in some areas.

Discussion:

- Special districts are generally formed by local governments or groups of local governments to target costs and benefits of governmental services to a particular population. Since the services provided by the district are paid for only by the recipients, special districts serve as an innovative technique of matching costs to benefits provided. For example, a local government may find that a special wastewater district with taxation powers is the most equitable means of extending municipal wastewater treatment services to a new area.

- Since special districts have the power to issue revenue bonds, districts can finance capital expenditures without straining local debt capacity. Cities or counties with overloaded debt capacity may find special districts a useful tool for meeting their capital financing needs.

- Special districts are a particularly useful technique for financing needs that fail to coincide with traditional political boundaries. For example, a number of states have regional solid waste management districts that coordinate response to solid waste problems on a regional basis.

- By combining the resources of several local governments, regional special districts can often capitalize on economies of scale. For example, a regional solid waste authority can often provide higher quality landfill services at lower cost than individual counties.

ENVIRONMENTAL FINANCE CENTERS

Description: Environmental Finance Centers (EFCs) would be regional centers providing state and local governments with educational, technical, and research assistance in matters of environmental finance. The Universities of Maryland and New Mexico are currently developing EFCs to assist local governments in those regions with environmental finance.

The EFCs could provide technical assistance to states and localities, reducing the costs involved with identifying suitable financing mechanisms. The following are concrete examples of ways in which local governments could call on EFCs for assistance:

- A government facing a solid waste disposal problem could ask an EFC to sponsor an advisory panel made up of local officials, academic experts, finance professionals, state environmental officials, and EPA employees.

- A group of small communities with wastewater treatment problems could ask an EFC to sponsor workshops and forums on regional solutions to wastewater treatment.

- State governments in a particular region implementing mobile source emissions inspection programs mandated by the Clean Air Act Amendments of 1990 could be matched by the EFC, bringing together programs that face similar problems, and allowing them to benefit from an exchange of ideas or sharing of reports created for different states.

- A local government attempting an innovative recycling program could finance initial operations with a pilot project or demonstration grant through the regional EFC.

Advantages: By sharing information and providing a clearinghouse on environmental financial issues, EFCs could help states and localities identify and implement suitable alternative financial mechanisms.

Limitations: Although the EFCs may be able to award grant funds for EPA pilot projects, their primary role will be helping states and localities identify and implement other AFMs, and they will not be a long-term source of capital or operating funds.

MISCELLANEOUS

Exactions: Exactions may be broadly defined as money, land, or construction materials provided by a development to a public jurisdiction. Traditional exactions include mandatory land dedications for rights of way, parks, and the like, and cash payments in lieu of land. Exactions may be offered voluntarily or negotiated individually with each developer.

Trust funds: A trust fund is a special account that is established to receive and disburse revenues from taxes and fees that are dedicated to a particular program or activity. There are two ways that states earmark revenues for handling in trust funds--constitutionally or legislatively. Most constitutionally earmarked funds require no legislative appropriation to release trust fund deposits. Deposits accrue to the trust fund automatically and are generally available only for the purpose named in the state constitution. In other cases, the state legislature dedicates revenues from a funding source and/or sources and creates a trust fund to manage them. Legislative appropriations may or may not be required to release these statutorily earmarked funds.

Water and sewer access rights: To finance expansion or upgrades of water and sewer facilities, some communities have sold water and sewer access rights.

Voluntary mechanisms: Voluntary mechanisms rely on donations or the voluntary purchase of affinity products to raise funds for environmental programs. Examples of voluntary programs include donations (solicited by an associated nonprofit foundation or as a line item on a state or local tax return), lotteries that raise funds from the sale of tickets, and auto license plate programs that generate revenues from the sale of special edition license plates.

Private guarantee mechanisms: The International Committee of the Environmental Financial Advisory Board has proposed the creation of an International Environmental Financial Guaranty Fund to guarantee bond issues for wastewater treatment facilities in U.S./Mexico border areas. The plan is intended to help finance the over $7 billion in environmental needs of border areas from California to Texas.

Source: Adapted from U.S. Environmental Protection Agency, *Alternative Financing Mechanisms for Environmental Programs* (Washington, DC: U.S. Environmental Protection Agency, 1992).

APPENDIX C

SELECTED STATE RATEMAKING POLICIES

CONNECTICUT'S CWIP SURCHARGE

Sec. 16-1-59B. Exception

(a) The Division of Public Utility Control (DPUC) may allow construction work in progress (CWIP) to be included in rate base for facilities necessary to comply with the federal safe drinking water act (SDWA) and to permit affected water companies to implement a rate surcharge based on such CWIP, under the terms and conditions described below.

CWIP that is included in rate base will be subject to the following conditions:

(1) such surcharge will be implemented and revised on a calendar quarterly basis;
(2) Only actual expenditures will be included on a quarterly basis;
(3) The surcharge to be allowed will be based on 90% of the amount of construction expenditures as of the last date of the particular quarterly period, as confirmed on the project work orders;
(4) The rate of return or equivalent computation used in computing the surcharge will be the same as that allowed in the last rate case computed on a simple interest base and not compounded and the surcharge will include a specific revenue adjustment to offset applicable state and federal taxes payable on the revenues collected pursuant to the surcharge;
(5) Ten percent (10%) of said quarterly construction expenditures will be retained in "allowance for funds used during construction" (AFUDC) and the entire project will be reviewed for efficiency of construction at the time the facility is entered into service as being used and useful and any expenses resulting from inefficiency will be disallowed for regulatory purposes;
(6) Charges arising from the inclusion of construction work in progress in rate base will be allocated across the board on a rate structure basis and will appear as a separate item on the customer's bill until the facility is included in rate base; and
(7) No application for the actual implementation of any such surcharge will be accepted, and no such surcharge will be permitted to be collected, until the primary project has been let, started and is progressing to the point of onsite contractor and crew set-up, and full construction has begun on major elements of the subject facility.

(b) Any water company which is required to construct facilities necessary to enable that company to comply with the SDWA may apply to the DPUC for approval of a surcharge to customers based on the foregoing policy. The requirements set out in this section shall apply to proceedings and applications of water companies for an increase in rates based upon such a surcharge.

(c) (1) The provisions of subsection (a) (7) notwithstanding, any water company may apply to the DPUC for an advance determination that the subject facility meets the DPUC general condition for inclusion in rate base for purposes of such a CWIP-based surcharge, namely that such facility is necessary to enable the company to comply with applicable SDWA provisions, the construction of such facility was precipitated by such SDWA provisions, and such facility constitutes the least costly means of compliance, and has been designed in accordance with efficient and adequate engineering standards.

(2) Any water company applying for such an advance determination of facility qualification shall, no later than 60 days prior to the date such determination is required, submit to the DPUC the following:

(a) A letter of approval of the project plans and drawings from the State Health Department stating that such project is necessary, by applicable reference, for compliance with the SDWA along with a time/expenditure projection for the entire project, and

(b) Evidence that the SDWA precipitated the construction of the facility, and evidence preferably in the form of an engineering study that the company has selected the least costly solutions to meet the SDWA requirements and that efficient and adequate engineering standards have been applied to the design specifications.

(3) The DPUC will make any such requested determination within sixty (60) days following the filing contemplated by subdivision (2) of this subsection provided, that if such a determination has not been made within said 60 day period, the affected facility shall be deemed to have met such general conditions for inclusion and to have so qualified for application of the CWIP surcharge.

(d) Any water company applying for a CWIP-based surcharge shall submit to the DPUC the following:

(1) If not previously submitted, the documentation and evidence listed in subsection (c) (2);

(2) Details of the results of open bidding on the project and final bid prices and the basis for the selection of the contractor(s);

(3) A complete description of the project, broken down by appropriate elements of work and cost, to permit demonstration of the percentage of completion as the work progresses, said description to be updated in each quarterly period when a revision in the amount of the surcharge is requested, with extra work, the basis thereof and associated costs also to be separately described for the applicable quarterly period;

(4) A construction schedule for the entire project indicating appropriate construction phases and estimated start/completion dates for each phase, as available;

(5) A summary of construction expenditures covering the applied for quarterly period as shown on the project work order(s), and broken down into corresponding job element(s) of the construction schedule;
(6) A letter from the company's independent accountant which states that the additions to the CWIP plant account for such facility during the affected quarterly period have been reviewed and found to be in accordance with the applicable uniform system of accounts;
(7) The computation of the total amount of the surcharge showing 90% of the amount shown in subdivisions (5) and (6) above, the rate of return allowed in the applicant company's most recent rate case, and the appropriate revenue adjustments for state and federal taxes; and
(8) The schedule of charges arising from the inclusion of CWIP in the rate base as allocated across the board on a rate structure basis, including a full explanation of the basis for allocation between classes of customers, with any background work papers used.

Subdivisions (1) and (2) need be filed only with the initial filing for a particular project.

(e) Any water company initially applying for a CWIP-based surcharge shall submit to the DPUC all documentation and evidence required in subsection (d) no later than the 20th day of the month following the end of the applicable calendar quarter. The DPUC shall hold a public hearing with respect to such application within 30 days of the filing thereof and shall issue a decision on such application within 60 days of the filing of that application unless the DPUC shall have notified the company that the company has failed to comply with the implementation requirements contained herein or that the DPUC otherwise requires a modification of the proposed surcharge.

(f) After initial implementation of a surcharge, any water company applying for a change in the CWIP-based surcharge with respect to any calendar quarter thereafter shall file with the DPUC on or before the 20th day of the month immediately following the end of said calendar quarter, all documentation and evidence described in subdivisions (3) through (8), inclusive, of subsection (d). The DPUC shall hold a consolidated public hearing with respect to all such quarterly applications on or about the 50th day after the end of each such quarter. The DPUC shall issue a decision on or before the 70th day after the end of such calendar quarter unless prior to such day the DPUC shall have notified the company that the company has failed to comply with the implementation requirements contained herein or that the DPUC otherwise requires a modification of the proposed surcharge.

(g) To the extent not specifically required by the provisions of this section, the requirements of sections 16-1-16 through 16-1-59A of the regulations of Connecticut state agencies shall not be applicable to applications and proceedings pursuant to this section.

(Effective September 10, 1979)

FLORIDA'S PRICE INDEX AND ADJUSTMENT MECHANISMS

Florida Statutes 1991, Ch. 367

(4)(a) On or before March 31 of each year, the commission by order shall establish a price increase or decrease index for major categories of operating costs incurred by utilities subject to its jurisdiction reflecting the percentage of increase or decrease in such costs from the most recent 12-month historical data available. The commission by rule shall establish the procedure to be used in determining such indices and a procedure by which a utility, without further action by the commission, or the commission on its own motion, may implement an increase or decrease in its rates based upon the application of the indices to the amount of the major categories of operating costs incurred by the utility during the immediately preceding calendar year, except to the extent of any disallowances or adjustments for those expenses of that utility in its most recent rate proceeding before the commission. The rules shall provide that, upon a finding of good cause, including inadequate service, the commission amy order a utility to refrain from implementing a rate increase hereunder unless implemented under a bond or corporate undertaking in the same manner as interim rates may be implemented under § 367.082. A utility may not use this procedure between the official filing date of the rate proceeding and 1 year thereafter, unless the case is completed or terminated at an earlier date. A utility may not use this procedure to increase any operating cost for which an adjustment has been or could be made under paragraph (b), or to increase its rates by application of a price index other than the most recent price index authorized by the commission at the time of filing.

(b) The approved rates of any utility which receives all or any portion of its utility service from a governmental authority or from a water or wastewater utility regulated by the commission and which redistributes that service to its utility customers shall be automatically increased or decreased without hearing, upon verified notice to the commission 45 days prior to it implementation of the increase or decrease that the rates charged by the governmental authority or other utility have changed. The approved rates of any utility which is subject to an increase or decrease in the rates that it is charged for electric power, the amount of ad valorem taxes assessed against its used and useful property, or the regulatory assessment fees imposed upon it by the commission shall be increased or decreased by the utility, without action by the commission, upon verified notice to the commission 45 days prior to it implementation of the increase or decrease that the rates charged by the supplier of the electric power or the taxes imposed by the governmental authority, or the regulatory assessment fees imposed upon it by the commission have changed. The new rates authorized shall reflect the amount of the change of the ad valorem taxes or rates imposed upon the utility by the governmental authority, other utility, or supplier of electric power, or the regulatory assessment fees imposed upon it by the commission. The approved rates of any utility shall be automatically increased, without hearing, upon verified notice to the commission 45 days prior to implementation of the increase that costs have been incurred for water-quality of wastewater-quality testing required by the Department of Environmental Regulation. The new rates authorized shall reflect, on an amortized basis, the cost of, or the amount of change in the cost of, required water-quality or wastewater-quality testing performed by laboratories approved by the Department of Environmental Regulation for that purpose. The new rates, however, shall not reflect the costs of any required water-quality of wastewater-quality testing already included in a utility's rates. A utility may not use this procedure to increase its rates as a result of water-quality or wastewater-quality testing or an increase in the cost of purchased water services, sewer services, or electric power or in assessed ad valorem taxes, which increase was initiated more than 12 months before the filing by the utility. The provisions of this subsection do not prevent a utility from seeking a change in rates pursuant to the provisions of subsection (2).

(c) Before implementing a change in rates under this subsection, the utility shall file an affirmation under oath as to the accuracy of the figures and calculations upon which the change in rates is based, stating that the change will not cause the utility to exceed the range of its last authorized rate of return on equity. Whoever makes a false statement in the affirmation required hereunder, which statement he does not believe to be true in regard to any material matter, is guilty of a felony of the third degree, punishable as provided in § 775.082, § 775.083, or § 775.084.

(d) If, within 15 months after the filing of a utility's annual report required by § 367.121, the commission finds that the utility exceeded the range of its last authorized rate of return on equity after an adjustment in rates as authorized by this subsection was implemented within the year for which the report was filed or was implemented in the preceding year, the commission may order the utility to refund, with interest, the difference to the ratepayers and adjust rates accordingly. This provision shall not be construed to require a bond or corporate undertaking not otherwise required.

(e) Notwithstanding anything herein to the contrary, a utility may not adjust its rates under this subsection more than two times in any 12-month period. For the purpose of this paragraph, a combined application or simultaneously filed applications that were filed under the provisions of paragraphs (a) and (b) shall be considered one rate adjustment.

(f) The commission may regularly, not less often than once each year, establish by order a leverage formula or formulae that reasonably reflect the range of returns on common equity for an average water or wastewater utility and which, for purpose of this section, shall be used to calculate the last authorized rate of return on equity for any utility which otherwise would have no established rate of return on equity. In any other proceeding in which an authorized rate of return on equity is to be established, a utility, in lieu of presenting evidence on its rate of return on common equity, may move the commission to adopt the range of rates of return on common equity that has been established under this paragraph.

NORTH CAROLINA'S PASS THROUGH FOR VOC TESTING

Docket No. M-100, Sub 120

In the Matter of Recently Implemented Testing Requirements by the Environmental Protection Agency Applicable to Water Companies within North Carolina. Order Establishing Filing Requirements.

BY THE COMMISSION: On March 29, 1990, the Commission issued an Order in the above-captioned matter. Said Order was the result of the recent requirement by the Environmental Protection Agency (EPA) that all water companies begin Volatile Organic Chemicals (VOC) testing and the result of inquiries from several water companies concerning the method of recovering the expense for these tests.

All regulated water companies, the Public Staff, the Attorney General, and any other interested parties were requested to file comments with the Commission addressing several issues set forth in the March 29, 1990, Order. The Commission sought comments from the parties in order to assist the Commission in developing the proper procedures to be followed in addressing the impact of the VOC testing requirements on the water companies and their customers in North Carolina. The parties were requested to file their comments by April 9, 1990.

The Commission has received comments from 22 water companies, the Public Staff, and the Attorney General. Based on its consideration of all comments filed in this matter, the Commission is of the opinion that, as a minimum, all water companies must provide the following information when requesting recovery of the VOC testing expenses:

1. A complete and accurate current annual report, as required by G.S. § 62-36 and Rule R1-32, must be on file with the Commission.
2. The estimated cost of testing each well, identifying the laboratory from which and the date that the estimate was received, and the total cost for these tests for the company;
3. The date the testing must begin and the frequency that the test must be made for each well;
4. The number of wells that are to be tested; and
5. The current number of customers on each water system.

All applications filed for the recovery of the expenses related to the VOC testing requirements will be handled as a complaint proceeding pursuant to G.S. § 62-136; provided, however, a utility may elect to recover such expenses in a general rate case.

Each application seeking recovery of the expenses related to EPA mandated testing requirements will be handled as a complaint proceeding pursuant to G.S. 62-136; provided, however, a utility may elect to recover these expenses in a general rate case. Furthermore, the utility company shall amortize the costs of the tests in question over a one-year period unless the company requests permission from the Commission to amortize the estimated costs of multi-year test cycles over the length of the cycles. The Commission will consider undue hardship in determining whether to approve an amortization period longer than 12 months.

IT IS, THEREFORE, ORDERED as follows:

1. That any water utility which seeks to recover the expenses related to the EPA mandated testing requirements shall file an application with the Commission.

2. That said application shall, at a minimum, include the following information:

    a. A complete and accurate current annual report, as required by G.S. 62-136 and Rule R1-32, must be on file with the Commission.
    b. The estimated cost of testing each well or entry point, identifying the laboratory from which and the date the estimate was received, and the total cost for these tests for the company;
    c. The date the testing must begin and the frequency that the test must be made for each well or entry point;
    d. The number of wells or entry points that are to be tested; and
    e. The current number of customers on each water system.

3. That each application seeking recovery of the expenses related to the EPA mandated testing requirements shall be handled as a complaint proceeding pursuant to G.S. 62-136; provided, however, a utility may elect to recover such expenses in a general rate case. The utility company shall amortize the costs of the tests in question over a one-year period unless the company requests permission from the Commission to amortize the estimated costs of multi-year test cycles over the length of the cycles. The Commission will consider undue hardship in determining whether to approve an amortization period longer than 12 months.

    (Effective August 27, 1993)

WASHINGTON'S RESERVE ACCOUNT

RCW 80.28.022 Water company rates--Reserve account.

In determining the rates to be charged by each water company subject to its jurisdiction, the commission may provide for the funding of a reserve account exclusively for the purpose of making capital improvements approved by the department of health as a part of a long-range plan, or required by the department of ecology to secure safety to life and property under RCW 43.21 A.064(2). Expenditures from the fund shall be subject to prior approval by the commission, and shall be treated for rate-making purposes as customer contributions.

[1991 c 150 sec. 1; 1990 c 132 sec. 6.]

APPENDIX D

GLOSSARY OF FINANCING TERMS

accounts receivable. An asset account reflecting amounts owing on open account from private persons or organizations for goods and services furnished by a government (but not including amounts due from other funds of the same government). Although taxes and special assessments receivable, are covered by this term, they should be recorded and reported separately in Taxes Receivable and Special Assessments Receivable accounts respectively. Amounts due from other funds or from other governments should also be reported separately. (EPA1)

administrative feasibility (of AFM). A measure of the difficulty of administering an alternative financing mechanism (AFM). Factors affecting administrative feasibility include whether the implementing government can take advantage of existing administrative structure, whether any data required are available (for example, for a commodity tax, whether sales of the commodity are easy to track), and the number of employees required to administer the mechanism. (EPA2)

ad valorem tax. A tax based on the assessed value of property. Counties, school districts, and municipalities usually are authorized to levy ad valorem taxes. Special districts can also be authorized to levy ad valorem taxes. (EPA2)

advance refunding bonds. Bonds issued to refund an outstanding bond issue prior to the date on which the outstanding bonds become due or callable. Proceeds of the advance refunding bonds are deposited in escrow with a fiduciary, invested in U.S. Treasury Bonds or other authorized securities, and used to redeem the underlying bonds at maturity of call date and to pay interest on the bonds being refunded or the advance refunding bonds. (EPA1)

alternative financing mechanism (AFM). Refers to any technique used to fund environmental programs or services, including both capital and operating costs, at the state and local level. (EPA2)

annualization. The process of adjusting a utility company's annual historical information to reflect a full 12-month period for known changes reasonably expected to continue into the future. Annualization adjustments are routinely made in the development of a utility company's total cost of service. (NAWC)

arbitrage. The investment of low-interest bond or note proceeds at higher interest rates. Arbitrage earnings are fully taxable with few exceptions. Municipal issuers are allowed to make arbitrage profits under certain restricted conditions, but Section 103(c) of the Internal Revenue Code prohibits the sale of tax-exempt bonds primarily for the purpose of making arbitrage profits. (EPA2)

assurance or performance bonding. Assurance or performance bonding is a requirement that users of environmental resources place in an escrow account a sum of money adequate to cover potential future environmental damages. (EPA2)

banking program. See **economic incentive programs.**

beneficiary pays principle. See **equity.**

betterment. An addition made to, or change made in, a fixed asset that is expected to prolong its life or to increase its efficiency over and above that arising from maintenance, and the cost of which is therefore added to the book value of the asset. The term is sometimes applied to sidewalks, sewers, and highways. (EPA1)

bond. An interest-bearing certificate issued by governments and corporations when they borrow money. The issuer agrees to pay a fixed principal sum on a specified date (the maturity date) and at a specified rate of interest. In measuring municipal-bond volume, a bond is a security maturing more than one year from issuance; shorter-term obligations are usually termed notes or commercial paper. (EPA2)

bond-anticipation note (BAN). A note issued by public agencies to secure temporary (often partial) financing for a project that will eventually be fully financed (and the BAN repaid) through the sale of bonds. (EPA2)

bond bank. A state-chartered organization that purchases the bonds of local governments and secures its own debt with the pool of local bonds. This arrangement cuts borrowing costs for the local issuers because the bond bank's debt usually carries higher ratings than that of the municipalities, whose issues are usually too small to be rated anyway. Credit enhancements, such as bond insurance, are also cheaper when purchased for larger issues. Localities' use of the bond bank is voluntary. (EPA2)

bond discount. The excess of the face value of a bond over the price for which it is acquired or sold. The price does not include accrued interest at the date of acquisition or sale. (EPA1)

bonded debt. That portion of indebtedness represented by outstanding bonds. (EPA1)

bond fund. A fund formerly used to account for the proceeds of general-obligation bond issues. Such proceeds are now accounted for in a capital-projects fund. (EPA1)

bond insurance. Insurance that can be purchased by an issuer for either an entire issue or specific maturities, which guarantees the payment of principal and/or interest. This security usually provides a higher credit rating and thus a lower borrowing cost for an issuer. (EPA2)

bond issued. Bond sold. (EPA1)

bond premium. The excess of the price at which a bond is acquired or sold over its face value. The price does not include accrued interest at the date of acquisition or sale. (EPA1)

bond proceeds. The money the issuer receives from its bond sale. (EPA2)

bonds authorized and unissued. Bonds that have been legally authorized but not issued and which can be issued and sold without further authorization. This term must not be confused with the terms "margin of borrowing power" or "legal debt margin," either one of which represents the difference between the legal debt limit of a government and the debt outstanding against it. (EPA1)

bonds, debenture. See **debentures.**

bonds, mortgage. See **mortgage bonds.**

capital outlay. Expenditures that result in the acquisition of or addition to fixed assets. (EPA1)

capital-projects fund. A fund created to account for financial resources to be used for the acquisition or construction of major capital facilities (other than those financed by proprietary funds, special funds, and trust funds). (EPA1)

certificates of participation (COPS). Certificates of participation are financial instruments backed by physical assets such as wastewater plants or equipment. The assets are held by a trustee, and the issuer pays yearly lease payments to the certificate holders until the debt is repaid. If the certificate issuer should default on the lease payments, the trustee is responsible for selling the physical assets and using the proceeds to reimburse the certificate holders. Certificates of participation resemble bonds in function, but are not legally classified as such, meaning that state and local governments can issue them without affecting their overall bond limits. (EPA2)

commercial loan. A loan from a privately owned bank at market rates. (EPA2)

common stock. Capital stock, other than preferred, which is bought by utility shareholders and becomes part of a utility's equity. Its value is determined in the marketplace, and its return is not a contracted rate as with preferred stock. (NAWC)

conditional sale lease. See **tax-exempt lease.**

connection fee. A charge assessed to new users of a utility system to cover the costs of constructing capacity for their use. (EPA2)

contingent liabilities. Items that may become liabilities as a result of conditions undetermined at a given date, such as guarantees, pending law suits, judgments under appeal, unsettled dispute claims, unfiled purchase orders, and uncompleted contracts. All contingent liabilities should be disclosed within the basic financial statements, including the notes thereto. (EPA1)

coupon rate. The interest rate specified on interest coupons attached to a bond. The term is synonymous with nominal interest rate. (EPA1)

coverage. The ratio of net revenue available for debt service to the average annual debt-service requirements of an issue of revenue bonds. (EPA1)

credit enhancement. Credit enhancements enable a state or local government to improve its credit rating and/or acquire capital by providing additional assurance of repayment. Some forms of credit enhancement are subsidized, such as the Rural Development Administration's loan guarantees. Others, such as commercial bond insurance, require the debtor government to pay a fee for the credit enhancement. (EPA2)

credit risk. The risk of default on a bond or a loan. (EPA2)

CWIP. Construction work in progress; those utility facilities that are under construction but not yet completed to the point they supply service. (NAWC)

debenture bonds. Same as **debentures.** (NAWC)

debentures. A form of long-term loan, included in debt capital, which is secured by the general credit worthiness of the utility. (NAWC)

debt. An obligation resulting from the borrowing of money or from the purchase of goods and services. Debts of governments include bonds, time warrants, and floating debt. (EPA1)

debt limit. The legal maximum debt-incurring power of a state or locality. Can also be called the debt ceiling. Debt limits are often imposed by constitutional, statutory, or local charter provisions. (EPA2)

debt, long-term. See **long-term debt.**

debt per capita. Bonds divided by population. When compared with other jurisdictions, this statistic serves as an indicator of the use of public debt capacity in the area in question. (EPA2)

debt ratio. The ratio of an issuer's debt outstanding to a measure of property value. (EPA2)

debt service. The amount of money necessary to pay interest and principal charges on an outstanding debt. (EPA2)

debt-service fund. A fund established to account for the accumulation of resources for, and the payment of, general long-term debt principal and interest. Formerly called a sinking fund. (EPA1)

debt-service fund requirements. The amount of revenue that must be provided for a debt-service fund so that all principal and interest payments can be made in full on schedule. (EPA1)

debt-service requirements. The amount of money required to pay interest on outstanding debt, serial maturities of principal for serial bonds, and required contributions to accumulate monies for future retirement of term bonds. (EPA1)

debt-service reserve fund. A fund created by a bond indenture and held by the trustee, usually amounting to principal and interest payment for one year, and used only if normal revenues are not sufficient to pay debt service. (EPA2)

debt, short-term. See **short-term debt.**

direct net debt. Gross direct debt less debt that is self-supporting (revenue bonds) and double-barrel bonds (general-obligation bonds secured by earmarked revenues that flow outside the general fund). (EPA1)

double-barrel bond. A bond with two pledged sources of revenue, generally earmarked monies from a specific enterprise or aid payments as well as the general-obligation taxing power of the issuer. (EPA2)

earmarking. Statutory or constitutional dedication of revenues to specific government projects or programs. (EPA2)

economic impact. Refers to the effects of AFM implementation on state and local economies. Some AFMs could have a disproportionate impact on a particular area or population. For example, a tax on watercraft sales might affect the competitiveness of a particular state's shipbuilding industry. Other AFMs can have a diffuse economic impact on a large population. For example, a motor vehicle license fee may have a small impact on a large population. (EPA2)

economic incentive programs. Economic incentive programs use market-based tools to encourage reduction in polluting behavior. The programs can be structured in a variety of ways. "Bubble" programs treat multiple pollution sources as if they were included in an imaginary bubble, allowing existing sources to adjust pollutant levels within the bubble as long as an aggregate limit is not exceeded. "Offset" programs allow new sources to obtain sources within a single plant undergoing modifications to avoid new source review processes if plantwide emissions are reduced. "Banking" programs allow sources to store pollution reduction credits for future use or sale. (EPA2)

elasticity. Elasticity is an economic measure of consumer response to price changes. A product or service has an elastic demand if the demand for the product will decrease very quickly as the price increases. Concert tickets typically have an elastic demand--as prices increase, fewer consumers buy tickets. A product or service has an inelastic demand if the demand for the product is not sensitive to price change. Alcohol and tobacco typically have inelastic demand; consumers will be less sensitive to price changes on these products and are more likely to continue buying them. When considering implementing taxes or fees on products that will be sold, state and local governments need to consider the elasticity of demand, in order to determine whether the tax or fee will reduce sales, and thereby reduce revenues. (EPA2)

enterprise fund. A fund established to account for operations (a) that are financed and operated in a manner similar to private business enterprises--where the intent of the governing body is that the costs (expenses, including depreciation) of providing goods or services to the general public on a continuing basis be financed or recovered primarily through user charges; or (b) where the governing body has decided that periodic determination of revenues earned, expenses incurred, and/or net income is appropriate for capital maintenance, public policy, management control, accountability, or other purposes. Examples of enterprise funds are those for water, gas, electric utilities, swimming pools, airports, parking garages, and transit systems. (EPA1)

equity. Equity reflects the fairness of the distribution of the funding burden for an AFM among individuals. Equity can be approached from two directions--those who create or contribute to environmental programs should bear the funding burden (the polluter pays), or those who benefit from program activities should bear the funding burden (the beneficiary pays). (EPA2)

exactions. Exactions are money, land, or construction services and materials provided by a developer or property owner to a public jurisdiction. Also known as proffers, exactions are sometimes required in order for developers or homeowners to gain public approval for building. Local governments can use exactions to require developers to extend wastewater treatment, solid waste management, and other environmental services to new areas. (EPA2)

fee. A fee is generally a charge for services rendered. Although laws vary widely, many states require that fees be set at rates that will cover only the costs of the services provided. (EPA2)

full faith and credit. A pledge of the general taxing power for the payment of debt obligations. Bonds carrying such pledges are referred to as general-obligation bonds or full-faith-and-credit bonds. (EPA1)

fund. A fiscal and accounting entity with a self-balancing set of accounts recording cash and other financial resources, together with all related liabilities and residual equities or balances, and changes therein, which are segregated for the purpose of carrying on specific activities or attaining certain objectives in accordance with special regulations, restrictions, or limitations. (EPA1)

future test year. A projected twelve-month period selected to demonstrate a utility's need for a rate increase in the future that allows projection of expected cost increases. (NAWC)

general-obligation bond. A security backed by the full faith and credit of a state or locality. In the event of default, the holders of general-obligation bonds have the right to compel a tax levy or legislative appropriation in order to satisfy the debt obligation. (EPA2)

grant. A grant is a sum of money awarded to a state or local government or nonprofit organization that does not need to be repaid. Typically, grants are awarded by the federal government to state or local governments, or by states to local governments, for the purpose of financing a particular activity or facility. (EPA2)

grant application notes (GAN). Notes issued by public agencies to secure temporary financing for projects awaiting the receipt of permanent funding through governmental grants. The GAN is repaid from grant proceeds. (EPA2)

gross direct debt. The total amount of bonded debt of a government (general-obligation bonds plus revenue bonds). (EPA1)

guaranty or guaranty agreement. The agreement of a third party to pay debt service on a debt in the event of default by the issuer. (EPA2)

impact fee. A fee assessed against private developers in compensation for the new capacity requirements their projects impose upon public facilities. (EPA2)

industrial-revenue bonds. Bonds issued by governments, the proceeds of which are used to construct facilities for a private business enterprise. Lease payments made by the business enterprise to the government are used to service the bonds. Such bonds may be in the form of general-obligation bonds, combination bonds, or revenue bonds. (EPA1)

interest. The charge or cost of borrowing money, measured in terms of a percentage per annum of the principal amount. (EPA2)

issuance costs. The costs incurred by bond issuers in connection with bond offerings. These include underwriter spread, feasibility studies, and various professional fees. (EPA2)

lease. A conditional sale agreement under which a municipal government leases equipment, using borrowed funds, that it acquires at the end of the lease period. The loans are backed by the equipment itself and are renegotiated annually. (EPA2)

letter of credit. A contractual obligation by a bank to pay principal and interest in the event of an issuer default. (EPA2)

leveraging. The use of grant or loan funds as reserve funds for the issuance of debt. Leveraging is used by several states participating in the Water Pollution Control State Revolving Fund program to increase the amount of funds available for loans. (EPA2)

liability assignment. Liability assigned through common law or statute, whereby individuals or companies may be held financially responsible for environmental damage resulting from their activities. (EPA2)

line of credit. Lines of credit assure potential lenders that a debtor government will be able to draw on a specified sum of money from another source in the event of default. Unlike letters of credit, lines of credit can be used for any purpose, so debtholders have no guarantee that the debtor will not use the line of credit for other purposes. (EPA2)

long-term debt. Debt that is payable more than one year from the date it was incurred. (EPA2)

mandate bonds (MIFs). A new category of tax-exempt bonds known as Mandates Infrastructure Facility (MIF) Bonds. Under a proposal by the Government Finance Officers Association (GFOA), the bonds could be issued to finance facility construction, acquisition, renovation, or rehabilitation required by federal statutes or regulations. The proposal would essentially allow more private participation in such projects than is currently allowed for tax-exempt bonds. (EPA2)

moral-obligation bond. A state or municipal bond that is not backed by the full faith and credit of the issuer. The issuer of a moral-obligation bond asserts the intent of the legislative body to make appropriations sufficient to cure any deficiency in monies required to meet debt service, but the issuer has no legally enforceable obligation to do so. (EPA2)

mortgage bonds. A form of long-term loan, included in debt capital, which is secured by the utility's property. (NAWC)

municipal improvement certificates. Certificates issued in lieu of bonds for the financing of special improvements. As a rule, these certificates are placed in the contractor's hands for collection from the special assessment payers. (EPA1)

net income (proprietary fund). Proprietary fund excess of operating revenues, nonoperating revenues, and operating transfers-in over operating expenses, nonoperating expenses, and operating transfers-out. (EPA1) Utility's profit of monies available after a utility pays its expenses, taxes and interest on long-term debt, which is available to pay dividends to stockholders who have invested monies into the utility and/or for reinvesting in new utility property. (NAWC)

net revenues available for debt service. Proprietary fund gross operating revenues less operating and maintenance expenses but exclusive of depreciation and bond interest. "Net revenue available for debt service" as thus defined is used to compute "coverage" on revenue-bond issues. Under the laws of some states and the provisions of some revenue-bond indentures, "net revenues available for debt service" for computation of revenue-bond coverage must be computed on a cash basis rather than in conformity with GAAP. (EPA1) See **coverage.**

netting program. See **economic incentive programs.**

nonoperating expenses (proprietary fund). Proprietary-fund expenses that are not directly related to the fund's primary service activities. (EPA1)

nonoperating properties. Properties that are owned by an enterprise fund but which are not used in the provision of the fund's primary service activities. (EPA1)

nonoperating revenues (proprietary fund). Proprietary-fund revenues that are incidental to, or by-products of, the fund's primary service activities. (EPA1)

normalization. The task of making elements within a test year conform to a typical year. It involves eliminating abnormal circumstances (such as nonrecurring costs) when adjusting book figures for a rate case. (NAWC)

notes. Interest-bearing certificates of governments or corporations that come due in a shorter time than bonds. (EPA2)

offset program. See **economic incentive programs.**

operating income (proprietary fund). The excess of proprietary-fund operating revenues over operating expenses. (EPA1)

operating revenues (proprietary fund). Proprietary-fund revenues that are directly related to the fund's primary service activities. They consist primarily of user charges for services. (EPA1)

overall net debt. The sum of direct net debt and overlapping debt. (EPA1)

overlapping debt. The proportionate share of the debts of local governments located wholly or in part within the limits of the reporting government that must be borne by property within each government. Except for special assessment debt, the amount of debt of each unit applicable to the reporting unit is arrived at by (1) determining what percentage of the total assessed value of the overlapping jurisdiction lies within the limits of the reporting unit, and (2) applying this percentage to the total debt of the overlapping jurisdiction. Special assessment debt is allocated on the basis of the ratio of assessments receivable in each jurisdiction that will be used wholly or in part to pay off the debt to total assessments receivable that will be used wholly or in part for this purpose. (EPA1)

performance bonding. See **assurance bonding.**

polluter pays principle. See **equity.**

post-test year addition. Additions to utility plants that are placed in service after the test year. (NAWC)

public-private partnership. Public-private partnerships involve a variety of techniques and activities to promote more involvement of the private sector in providing traditional government services. Partnerships can include involving a private partner in construction, financing, operation, and/or ownership of a facility. (EPA2)

ratings. Credit quality evaluation of bonds and notes made by independent rating services and brokerage firm analysts. Generally, a higher bond rating lowers the interest rate expected by debtors for repayment, and therefore overall capital costs. State and local governments can improve their bond ratings by using credit enhancement mechanisms. (EPA2)

revenue anticipation notes (RANs). Notes issued in anticipation of nontax revenues, generally from other governmental entities (that is, state aid to a school district). (EPA2)

revenue base. The revenue base is the value of the product, income, property, or the number of population against which a fee or tax is charged. For example, the revenue base for a state tax per ton of fertilizer sold would be the tons of fertilizer sold in the state, while the revenue base for a motor vehicle license fee would be the number of vehicles licensed in the state. The size and characteristics of the revenue base, along with the rate of the fee or tax, determine the revenue potential of fee and tax programs. (EPA2)

revenue bonds. Bonds whose principal and interest are payable exclusively from earnings of a public enterprise. (EPA2)

revenue potential. A measure of the amount of money that can be raised by a particular financing mechanism. For fee and tax programs, revenue potential is a function of the rate of the fee or tax and the size of the revenue base. State and local governments need to consider the revenue potential of an AFM in their jurisdiction in order to determine if it meets their financing needs. (EPA2)

revenue stability. Revenue stability refers to the pattern of revenues from a particular revenue source. Some sources provide revenues in stable amounts annually. Other revenue sources are unstable, providing only one-time or erratic revenues from year to year. State and local governments should match ongoing program costs to stable revenue sources, while nonrecurring costs can be matched to less stable revenue sources. (EPA2)

revolving fund. A revolving loan fund program may consist of several accounts or revolving funds that make loans or other types of assistance available for various projects. Typically, the fund is initially capitalized by appropriations, grants, or other monies. After the initial loans are made, future loans are supported by repayments, making the fund "revolving." (EPA2)

serial bonds. Bonds whose principal is repaid in periodic installments over the life of the issue. (EPA1)

severance taxes. Severance taxes are charged for the extraction of natural resources from the land or waters of a state. Examples of severance taxes include water and groundwater withdrawal taxes, oyster and shellfish taxes, timber taxes, and fuel and mineral taxes. (EPA2)

short-term debt. Debt that falls in a period of under a year. (EPA2)

single tariff pricing. A concept applied to allocate revenue requirements on a company-wide basis so that each customer class pays the same water rate regardless of location. (NAWC)

sinking fund. A fund established to account for the accumulation of resources for, and the payment of, the principal and interest of general long-term debt. (EPA1) See **debt-service fund.**

special-annuity bonds. Serial bonds in which the annual installments of bond principal are so arranged that the combined payments for principal and interest are approximately the same each year. (EPA1)

special assessment. A charge imposed against certain properties to defray part or all of the cost of a specific improvement or service deemed to primarily benefit those properties. (EPA2)

special-assessment bonds. Bonds payable from the proceeds of assessments imposed against properties which have been specially benefitted by the construction of public improvements. (EPA2)

special-assessment fund. A fund used to account for the financing of public improvements or services deemed to benefit primarily the properties against which special assessments are levied. (EPA1)

special district. An independent unit of local government organized to perform a single governmental function or a restricted number of related functions. A single purpose or local taxing district can be organized for a special purpose such as a road, sewer, irrigation or fire district. Special districts usually have the power to incur debt and levy taxes; however, certain types of special districts are entirely dependent upon enterprise earnings and cannot impose taxes. Examples of special districts are water districts, drainage districts, flood control districts, hospital districts, fire protection districts, transit authorities, and electric power authorities. (EPA1, EPA2)

special-district bonds. Bonds issued by a special district. (EPA1)

special-tax bond. A bond that is secured by a special tax, such as a liquor tax. (EPA2)

stock, common. See **common stock.**

stock, preferred. See **preferred stock.**

tax anticipation notes (TANs). Short-term debt that will be retired with taxes to be collected at a later date. (EPA2)

tax base. See **revenue base.**

tax-exempt lease. A lease in which the lessee has the option of applying lease payments to the purchase of a facility for a reduced price. The lessee is owner for tax purposes. Also known as a conditional sale lease. (EPA2)

tax increment financing. The dedication of incremental increases in real estate taxes to repay an original investment in improved public facilities that created increased real estate values. (EPA2)

tax limit. The maximum rate of taxation which a local government may levy. (EPA2)

tax rider. A tax rider allows a locality to "piggyback" on an existing state tax by charging an additional levy. State laws vary, but most states require the authorization of the state legislature before a locality is permitted to enact a rider on a state tax. (EPA2)

tax surcharge. An increased percentage or dollar amount charged by a taxing authority on an existing tax. Temporary surcharges can be a good method for financing nonrecurring needs. (EPA2)

test year. A specific twelve-month period selected to demonstrate a utility's need for a rate increase. (NAWC)

trust fund. Trust funds are created by state and local governments to receive revenues generated by a specific tax or other funding mechanism, and disburse funds for the purposes for which the revenues are collected. (EPA2)

turnkey arrangement. A public-private partnership in which a public agency contracts with a private vendor to build a complete facility with specified performance standards agreed to between the agency and the vendor. Since ownership remains with the private partner until construction is complete, generally the private partner will not be bound by public procurement regulations, which often enables the facility to be completed in significantly less time and for less cost than could be accomplished under traditional construction techniques. (EPA2)

used and useful. A phrase used to describe the determining factors in deciding whether a utility property should be included in rate base. (NAWC)

Sources: Authors' contruct based on the following:

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