PROCEEDINGS OF THE EIGHTH NARUC BIENNIAL REGULATORY INFORMATION CONFERENCE

Volume IV: Water

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FOREWORD

The objectives of the Eighth NARUC Biennial Regulatory Information Conference were to promote the sharing of knowledge and experience among the staff of NARUC member agencies and to introduce new concepts and techniques of regulatory analysis. With the participation of most NARUC staff subcommittees and the attendance of nearly 400 persons from 40 states and one foreign nation, the Conference, which was held in Columbus, Ohio, September 9-11, 1992, easily accomplished those objectives. The papers presented at the BRIC-VIII Conference are reproduced here in four volumes.

Volume I: Electric and Gas
Volume II: Telecommunications
Volume III: Multi-Utility
Volume IV: Water

Within each volume, papers are arranged by Conference session. I believe that you will find these papers to be of high quality and of great use to the regulatory community.

The success of the Eighth NARUC Biennial Regulatory Information Conference was due in good measure to the work of the co-sponsors which are, in addition to the NRRI, NARUC, the NARUC Committee on Finance and Technology, the Ohio Public Utilities Commission, and the NARUC Staff Subcommittees. Special thanks should be extended to Chairman Lawrence Ingram of the New Mexico PSC (the representative of the NARUC Committee on Finance and Technology), Chairman Craig Glazer of the Ohio Public Utilities Commission (the host commission), the chairpersons of the NARUC staff subcommittees who suggested the topics for sessions, the session chairpersons who selected papers, organized sessions, and provided on-site session management.

We would like to express our appreciation to Joseph Swidler and Chairman Steven Fetter of the Michigan PSC, who provided luncheon remarks. Our thanks for a job well-done are extended to Wendy Windle, Debbie Daugherty, Mike Milush, Julie Nicolosi, Brett Bergefurd, and Joan Marino of the NRRI staff. Without the support of these dedicated individuals, the conference would not have been possible.

David W. Wirick
The National Regulatory Research Institute

TABLE OF CONTENTS

1. WATER UTILITY REGULATORY POLICY FORUM (RATEMAKING)

Chairperson: Patrick C. Mann

West Virginia University

PRICING WATER SERVICE TO FOSTER EFFICIENT CONSUMPTION: RHETORIC, SUBSTANCE AND POLITICS

BY

TOM U. U. OKURE, Ph.D.[1]

Introduction and Background

The rising cost of water and the issue of water scarcity is increasing public concern about the efficient use of water. In many fast-growing communities, the worry over water shortage has become very real because good water supply is essential to human existence and because, increasingly, water has not always been available where and when we need it. The supply of good sources of water is impaired by both natural and man-made causes. Many water companies serving large urban communities are faced with the bitter reality of annual (summer) short-term water shortages and the need to augment peak capacity and a potential long-term need to add base supply capacity to accommodate growth in demand. The per capita growth in water usage, coupled with the growing public concerns over environmental quality and the scarcity of future potential supply options for surface water sources, is further complicating the provision of water service.

Traditionally, water companies responded to water supply problems by simply expanding and augmenting their sources of supply. However, the costs of adding new base supply capacity is increasingly becoming very expensive, and many companies are forced to experiment with unconventional approaches to reduce water use. Suddenly, there is a resurgence of interest in water conservation, recycling programs, and the use of innovative rate design strategies. Many contemporary rate design and pricing strategies are now available and are being tried by water companies. This paper discusses two competing rate design strategies, seasonal differential rates and uniform seasonal rates, both espoused by their advocates to be superior for conveying efficient price signals to customers about their use of water. The questions to be addressed in this paper are (1) Can efficient water rates be designed and sustained under the current regulatory environment? and (2) What factors are preventing regulators from implementing efficiently determined rates capable of dealing with the short and potential long-term water shortages many communities are experiencing?

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Cost of Service, Cost Allocation and Rate Design

Rate of return regulation is a widely regarded tradition in utility regulation which is used to place limits on a utility's profits as a substitute for the downward pressure on prices that exists in competitive markets. Utility rates are generally set to reflect the cost of service plus an allowed rate of return on equity. But, times are changing and many commissions are departing from cost-of-service (rate-of-return) regulation in favor of "incentive regulation." There are also inherent limitations related to cost-of-service regulation which include "gold-plating" or the over-investing of capital by regulated utilities in order to inflate the rate base, etc.[2]

Three processes are involved in the setting of rates. The first step involves the determination of the utility's total revenue requirement or cost of service and the determination of whether a revenue increase (or decrease) is warranted. Forecasting the revenue requirement for state regulated privately-owned utilities is complicated and involves the use of a standard known as "rate base" or "rate of return."

The second step in the process of setting utility rates requires a cost-of-service study (analysis) to determine how to distribute the increase in revenues among the various customer classes. Two types of cost studies are frequently performed. They are fully allocated or embedded cost study and a marginal (incremental) cost study. These studies are performed for several reasons, including the need to show how each customer class contributes towards total utility system costs and involves a procedure known as "interclass revenue allocation." Revenue allocation is the process whereby the utilities' revenue requirement is allocated to the various customer classes. The process focuses on how best to apportion the revenues needed to be generated among the service classes in order to obtain the appropriate level of rates. The increase or decrease of rates to each customer class is determined in a manner to produce rates of return that are in a reasonable range of the system average return and that complies with the rate of return on each customer class based on the results of a cost-of-service study. In the third and final step, each class rate level is modified to produce a reasonable rate of return. Individual class tariffs relate to the cost-of-service studies in a manner that each customer's rate tracks, to a large extent possible, how much it cost the utility to provide that service.

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[2] See for example, United States of America, Federal Energy Regulatory Commission "Notice of Proposed Policy Statement On Incentive Regulation" Docket No. PL92-1-000, March 13, 1992.

Cost-of-service studies also allow regulators to examine the appropriateness of existing tariffs in light of current cost trends. In the end, individual tariffs are designed to produce from each customer class, the desired amount of revenues based supposedly on the cost associated with serving customers within the class (inter-class rate design).

The use of marginal cost pricing has become a widely accepted approach to the design of water rate structures. The increased acceptance of marginal cost-based water rate structures lies in the large water saving potential that can be achieved from basing rates on marginal costs.[3] But, as this paper will demonstrate, the acceptance of marginal cost pricing has not guaranteed the reflection of full marginal cost price signals in rates. Despite advances in marginal cost pricing, costing analysis in general remains an inexact science. Its primary limitations being the unavoidable subjective judgments that analysts must make and the great potential to make arbitrary costs assignments with no definitive or scientific basis.

In sum, the process of rate making is highly subjective and political involving the balancing of many principles and the interests of those groups who are active in rate proceedings. In the context of setting water rates, state commissions may want to emphasize certain objectives, such as economic efficiency and encouragement of water conservation, but may have to balance these objectives with other considerations, such as fairness (equity), rate stability, revenue sufficiency or stability (from the perspective of the utility), and gradualism (to avoid customer rate shock). Whatever the principles embodied in the final rates adopted, the point to note is that the best solution may never be implemented because of the lack of political will as a result of sensitivity to consumer interests and pressure from outside groups who seek some degree of influence in the outcome of a rate case. In the end, what one finds may be a water rate structure reflecting a compromise between the views of different competing interest groups.

The Efficient Pricing of Water Service

Economic efficiency requires that price be set at marginal cost. Within the context of water utility pricing, this may require the determination of the marginal cost of access, usage-related costs to serving both new and existing customers. The marginal cost of

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[3] Brent Blackwelder and Peter Carlson, Survey of the Water Conservation Programs in the Fifty States (Washington, DC: Bureau of Reclamation, U.S. Department of the Interior, 1982), p. 4.

usage is the addition (reduction) to total cost in expanding (reducing) the output of water by one unit. As supplies of safe and inexpensive water sources become scarce and public concern heightens, many economists (efficiency advocates) argue that the price charged for water should reflect the marginal (incremental) cost for water in order to send consumers accurate signals about the cost of water and discourage wasteful consumption.

The reasoning in favor of marginal cost pricing generally pertains to the notion of economic efficiency and sending correct price signals to customers. Marginal cost pricing enables society to attain a higher level of efficient allocation of resources, since the price signals that consumers receive allow them to make appropriate decisions regarding the valuation, consumption, and conservation of resources. The rationale is that the best proxy for the value placed by customers on additional units of water service is price, and marginal cost is the best proxy of the value placed by society on the natural resources used to provide additional units of water.[4] Marginal cost-based prices send signals to customers about the resource cost consequences of their consumption decisions and, conversely, reflect the cost savings if consumers forego the consumption of additional units of water service.[5] When water rates are set inefficiently, consumers either overconsume or underconsume water. Water prices that reflect the immediate and short-term future costs of water used (saved) also convey an economic sense of equity regarding which customers are responsible for the costs and therefore who should pay for the costs. In contrast to marginal cost pricing, basing water rates on average historical costs tends to create the false illusion that resources used (saved) at present or in the immediate future cost as much or about as little as in the past.[6] Marginal costs can be conceptualized in different ways, including avoided costs, product-specific costs, total service costs, and average incremental costs. Marginal cost and incremental costs are similar concepts, except that incremental costs refer to larger changes in output (for example, a million gallons of water) in

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[4] Patrick C. Mann, Water Service: Regulation and Rate Reform (Columbus Ohio: The National Regulatory Research Institute, November 1981), Occasional Paper No. 4 (81-13) p. 69.

[5] Janice A. Beecher, Patrick C. Mann and James R. Landers, Cost Allocation and Rate Design for Water Utilities (Columbus Ohio: The National Regulatory Research Institute, December 1990), p. 65.

[6] Ibid.

contrast to unit (marginal) changes in output, such as a gallon of water. Marginal costs can be estimated using either engineering process models, econometric models, or optimization simulation models.

Table 1 below shows the appropriate costing and rate elements needed for the efficient pricing of water service.

Table 1
Summary of Costing and Appropriate Rate Elements
For Economically Efficient Pricing.

Cost Name	Alternative Name	Causal and Avoidable Feature	Appropriate Rate Element	Relevant Cost
Access	Customer	Varies with number of customers: recoverable and nonrecoverable.	One-time up-front fee for nonrecoverable costs: recurring monthly charge for recoverable costs.	For nonrecoverable costs: costs at time of connection for recoverable costs: current costs.
Capacity (Usage)	Demand	Varies with both system peak and average-day usage.	Usage charge during both peak months and off-peak months.	Current marginal capacity costs for both peak and off-peak system components.
Operating (Usage)	Commodity	Varies with volume of usage only.	Usage charge during all months.	Current marginal operating costs.
Common	Overhead	Do not vary with any of the above.	Adjustment of recurring access charge to meet revenue requirement.	Current overhead costs.

Source: Steve H. Hank and John T. Wenders "Costing and Pricing for Old and New Customers" in Public Utilities Fortnightly, April 29, 1982, p. 46.

For costing purposes, the price of water consists of two parts: fixed and variable or operating costs. Operating costs can further be distinguished according to their causal avoidable or noncausal nature. Two major components comprise causal avoidable costs elements: access and usage costs; and one non-causal element: common cost. In order to provide customers access to the water system, a water company incurs two categories of access costs: recoverable and non-recoverable.

Recoverable access costs are made up of the cost of equipment and services to the customer, which can be transferred to other customers if a customer decides to leave the water system. These costs, which include the cost of meters, can be collected through a monthly (or quarterly) charge based on current costs. Non-recoverable costs, on the other hand, are comprised of the installation cost of meters. For example, the labor cost associated with installing a meter cannot be recovered and transferred to another customer since it is customer specific and, therefore, is economically a sunk cost. But even so, the most economically efficient way to collect such costs is to charge a one-time, front-end charge based on the cost incurred at the time of connection.[7] However, this is rarely done in practice for regulated firms.

Usage costs refer to capacity and operating costs that vary with various dimensions of a customer's usage. To illustrate the point, the capacity of certain components of the water system are designed to meet the demand at various times of the year. In most companies, peak use occurs during the summer months, and this determines the design perimeters used for sizing many of the system components, for example, water treatment facilities, etc. The marginal capacity costs for these components can be used in estimating the commodity charge per gallon of water used during the summer months. For those components of the water system that are designed to meet average day use levels (i.e., annual volumes), it is these annual volumes that are responsible for determining design perimeters and, consequently, responsible for the commodity charge that is levied per gallon of water used during all months.[8] An important point to note is the fact that the size of most water distribution mains is driven by fire service needs, and is therefore not marginal to usage by customers other than fire service customers.

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[7] Steve H. Hanke and John T. Wenders "Costing and Pricing for Old and New Customers" in <u>Public Utilities Fortnightly</u>, April 29, 1982, p. 46.

[8] <u>Ibid</u>.

The second component of usage cost element is "operating costs," which are recurring costs related to the delivery of a certain volume of water. In many water systems, this may include the recurring cost of pumping, lifting, and treating the water. For pricing purposes, marginal operating costs for the delivery of water can be determined and charged to customers for each gallon of water used during all months. In systems with differing altitudes or other characteristics that may affect operating costs, the charge to reflect operating costs could be differentiated by region.

The one noncausal element referred to earlier as "common costs" relates to accounting overheads which are not causal and avoidable as the term has been used here. Shortfalls in revenue requirements can be recovered by adjusting recurring monthly charges, which are common costs, and spread equally over new and old customers. However, the main point to note is that for pricing purposes, the only legitimate cost distinction that the analyst can make between old and new customers is on the basis of recoverable and non-recoverable access costs.

The Rationale for Seasonal Water Rates

Seasonal rates are a natural extension of marginal cost pricing. There are a variety of types, including "seasonal differential rates and uniform seasonal rates." The rationale for these rates are that many utilities experience marked differences in seasonal peaks for water demand with the summer peak being, by far, the largest. Efficiency advocates argue that the "best economic solution" to short-term water shortages,[9] lies in the establishment of seasonal rates based on marginal cost, which reflect the scarcity of water in the price that is charged for water service.

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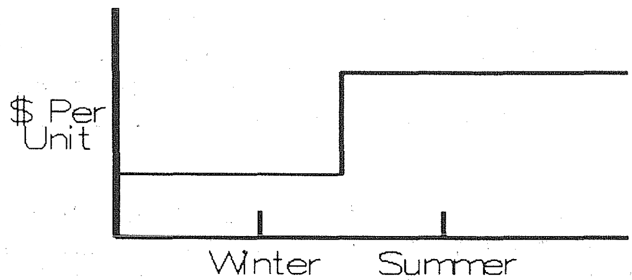
[9] In Spring Valley Water Company (SVWC), a New York State-based investor-owned water utility, the water shortage occurs in the summer and is not a season-long problem but a short-term one lasting between two to three days. During this period, the company's water treatment plant(s) cannot treat enough water to meet the two to three day needs of its customers, even with the available storage tanks.

Figure 1
SEASONAL RATE STRUCTURE



Seasonal water rates (illustrated in figure 1) are defined as rate structures which incorporate different prices for water service for different days or seasons of the year. The seasonal differential rate variety incorporates different prices for an increasing block of consumption during a particular season while the uniform seasonal rate variety may charge one price for all levels of consumption during a season, to a particular class of customers. Irrespective of the type of rate structure, seasonal rates all recognize the fact that it costs the utility more per gallon to provide water service in peak than in off-peak days. Seasonal rates are highly recommended by efficiency advocates because these rates conform with the economic premise that water rates should track costs by making those responsible for the cost pay for it. For example, where utility capacity requirements are determined by peak demands, seasonal pricing reflects peak users responsibility for the future capacity needed to serve system peak demands, while off-peak users bear little responsibility.[10] By assigning higher costs to periods of peak demand and lower costs to off-peak usage days, seasonal rates create incentives for water users to alter their consumption patterns, while at the same time the rates are tracking user cost responsibility. If implemented successfully, a reduced maximum demand may occur during the peak season, and a general improvement in the annual load factor of the water company may be achieved. In short, seasonal rates can be employed as an important part of a company's integrated water resource planning tool. Not only will it help the water company attain an efficient utilization of its water system capacity, it can also help the utility plan more efficiently for future capacity-related investments.

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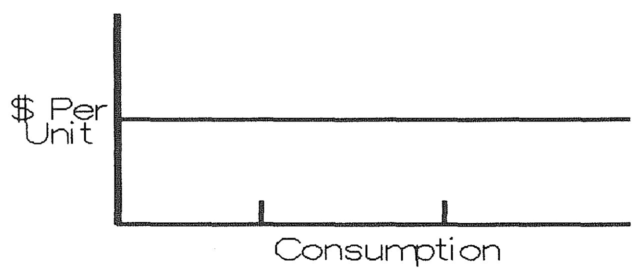
[10] Mann, Water Service: Regulation and Rate Reform, p. 67.

Certain conditions must exist in order to successfully use seasonal rates. There are those who say that there must exist a significant variation in peak and off-peak demand for water; that the peak demands confronting the water system must be primary in determining the need for new capacity; that peak demands must occur consistently during the same season for the water system; and finally, the water company must have the capability of estimating the cost differences associated with meeting the peak and off-peak demands.[11]

Seasonal rates have certain potential benefits to the company, including production efficiency and reduction in peak demands which may help improve the financial position of the water company. When based on incremental costs, seasonal rates provide compensation to the company at every level of demand with growth in demand being self-financed. Where consumers modify their usage patterns, they all reap benefits through decreases in their water bills.

Figure 2

UNIFORM METERED RATE STRUCTURE



The uniform metered rate (illustrated in figure 2) sets rates at less than the cost of peak usage during the summer season and greater than the cost of off-peak usage during the winter (base consumption) period. The benefit of this seasonal cross-subsidization is supposed to suppress customer complaints and rate shock. This is achieved by moderating the impact of a steep seasonal summer rate by charging a uniform summer price to customers for all units of consumption. Critics say that these types of uniform rates over time result in allocative inefficiency and the involuntary subsidy of peak users by off-peak users. Used over time, it can encourage water system expansion beyond an efficient size because of the inducement

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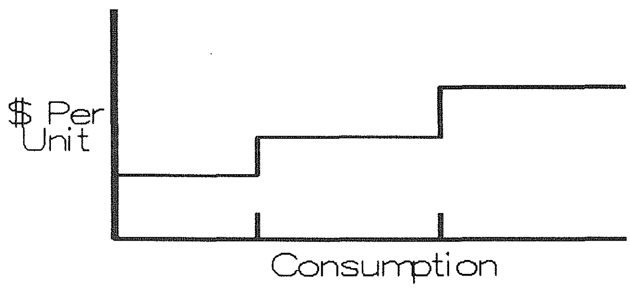
[11] Ibid., p. 68.

caused by the cross-subsidization to increase system capacity to meet the peak demands caused by peak water users.

To sum up, regulatory commissions as well as water companies are realizing that rate structure design is a potentially powerful demand management tool which they can use to encourage customers to conserve their use of water. Even so, one must note that the effectiveness of any conservation pricing structure is highly dependent on the responsiveness of customers to price. Figure 3 shows another variation of a conservation rate structure.

Figure 3

INCREASING BLOCK RATE STRUCTURE



The Political Dimension of Water Rate Making

Given the premise that marginal cost pricing and, hence, seasonal rates represent the best solution to overcoming short-term water shortages, one wonders why the urging of the experts to adopt marginal cost pricing has in many instances been ignored. Water rates more than any other type of utility rates continue to inadequately reflect the costs of providing water service.[12] The inefficient pricing of water may result in the inadequate generation of utility revenues which may adversely affect its operations, including the deferring of water system maintenance. Even more dysfunctional to the health of the water system may be the postponement of capital replacement of obsolete and aging system facilities. What potential explanations can be given for the persistent inefficient underpricing of water service? The answer to this question requires a discussion on the political dimension of water rate making.

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[12] Beecher, Mann and landers, Cost Allocation and Rate Design for Water Utilities, p. 7.

Some experts say the problem can be traced to the lack of more refined cost-of-service standards; the use of historical accounting costs instead of economic costs in the rate-making process; the use of average embedded costs rather than incremental costs as the primary pricing standard in the context of increasing real unit costs of water provision; the inadequate provision for depreciation, maintenance, and other expenses; and consumer pressure to keep rates low.[13] Among these explanations, one is less obvious and is inadequately discussed in the regulatory literature, that is, the political nature of rate making. One may recall that the final tariff adopted by a regulatory commission tends to reflect a compromise (the outcome of deliberations and accommodations on policy issues during a rate proceeding) among the principal active groups involved in a rate case.

A point worth calling attention to is this: the system of internal politics within the regulatory agency does as much to shape the outcome of the rate structure as the interaction between the regulatory agency and the outside intervener groups and organizations. This point needs to be emphasized. Many regulatory agencies are functionally organized with various units comprised of different professional groups such as accountants, economists, and engineers, etc. These professions tend to have a distinctive ideology with respect to regulatory policy in their own area of concern that springs from a deeply rooted tradition of looking at problems in a certain way. Perhaps this explains why economists in general have a profound commitment to the importance of basing (water) rates on marginal cost. There are also those outside interveners and experts (both private and public which may include other state agencies) who are active in rate cases, and who want to see their positions prevail in any rate restructuring proposal.

In much of the regulatory literature and folklore, the internal image that emerges from a discussion of the rate-making process is frequently that of rationality, unity of structure, and uniformity in agency perspective, but this is rarely the case. There are a variety of points of view (internally and externally) relative to a rate restructuring proposal that are brought to bear in a rate proceeding which produces diversity in perspectives between agency insiders (the economists, the accountants, the engineers, etc.) and outsiders (the consumer advocate groups representing various perspectives, including those of low income customers, large industrial and commercial customers, etc.). There also may exist sharp differences in the role, attitude and perspective of political appointees (the commissioners) at the top of the regulatory pyramid who have to

[13] Ibid, p. 2.

make the final decisions on rates and that of the career administrators beneath them.

The above discussions highlight an important point, that is, that bargaining, or the adjustment of conflicting interests, is a constant feature of the rate-making process within state regulatory commissions. While the view of experts such as those of economists are highly respected, in the end, the commission (composed of political appointees) has to make the decision regarding which rate structure to adopt. Most regulatory commissions have to consider various competing regulatory objectives of which efficiency is only a part. Also, the positions of all the participants in the rate proceeding are taken into consideration and balanced against certain priority policy aims.

All this shows that utility regulation is a complex process, and water rates are affected by many factors, including cost of service, regulatory precedents or tradition, value of service, legal constraints, and political considerations, etc. Like their counterparts in other government agencies, regulatory commissions are influenced by political pressures. Like other policymakers, regulatory policymakers are generally wary of sweeping innovations that are dramatic, promise too much and appear to disturb existing ways of thinking embodied in programs or rates. As one may recall, in government, policy changes are rarely dramatic, but incremental in character. Regulatory commissions are always faced with the tough challenge of setting rates that are in the public interest. They have to balance the interests of ratepayers against those of utility shareholders, given the views of their own technical regulatory staff, and the views of interveners. All this has to be done while maintaining the appearance of impartiality and fairness and demonstrating that the decision is technically grounded.

To sum up, many initial views, principles, and sound technical advice from professional experts are compromised in the rate-making process in order to reach agreement on values among the participants. This paper argues that under these circumstances, one cannot reasonably expect pricing efficiency as a principle to prevail over all other principles in the regulatory decision-making process.

Practical Application Problems: The Case of Spring Valley Water Company (SVWC) in the State of New York:

Marginal cost-based pricing strategies face practical implementation problems for a number of reasons, including those associated with cost calculation, revenue instability, customer acceptance, the lack of political will on the part of state commissions to implement the rates, etc. Drawing from the implementation experience of Spring Valley Water Company, Inc. (SVWC), which is a New York State based investor-owned water utility, this section will demonstrate that even when a sound technical solution exists, it may still be impossible to introduce full marginal cost-based rates.

Spring Valley Water Company is a water utility serving approximately 56,000 customers in the "bedroom" communities of Rockland County adjacent to New York City. The Water Company has only one main source of future additional capacity called the Ambrey Pond Reservoir which is a very expensive source of base supply. In 1979, the utility company requested permission concurrently from the New York Public Service Commission (NYPSC) and the New York Department of Environmental Conservation (NYDEC) to build and recover the costs associated with a proposed new reservoir and water treatment plant works called the "Ambrey Pond." In the company's request to the NYPSC, the utility justified the necessity to build the Ambrey Pond Reservoir on the immediate need to increase peak summer supply capacity and to resolve the potential long-term requirement for new base supply capacity.

Responding to the request of the company, the NYPSC ordered SVWC to conduct marginal cost and rate design studies in order to examine the potential for implementing rates which recognize marginal costs. At the time, it was hoped that the introduction of marginal cost-based seasonal rates would help to ameliorate the then-anticipated growth in demand during the coming decade. In a Commission order issued May 30, 1980, the NYPSC directed the company to institute a marginal cost-based and seasonally differentiated rate structure with approximately a 3:1 summer/winter rate differential.[14] The directive was based on the results of a marginal cost-of-service study conducted by both the company and Commission staff. That study determined that there was a need to dampen peak summer demands which were straining the company's existing capacity and pushing it toward developing the Ambrey Pond Reservoir to satisfy those demands. Concerned about the anticipated high cost for the construction of Ambrey Pond, the Commission found the innovative seasonal rate design structure recommended by the Commission staff study to be impressive and the right technical solution to curtail the inefficient consumption of water at peak. At the time, the Commission thought it was necessary to take "a more drastic first step in the direction of cost based rates" than it normally would

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[14] See Public Service Commission, State of New York: Opinion No. 80-22 related to Case No. 27567 - Spring Valley Water Company, Incorporated - issued May 30, 1980.

take.[15] Under the initial rate structure that the Commission approved, customers were expected to pay three times more for all water used during the summer (a period designated to be between May 1 and August 31 of each year) than they do for water used during the rest of the year. The consequences of such a drastic change in rate structure were not readily apparent. One thing seems clear, the Commission felt that such a drastic step was needed if rates were to affect consumption patterns soon enough to obviate, or at least delay, the costly construction of Ambrey Pond Reservoir.

No sooner than the rates were put into effect, the Commission and company began receiving complaints from ratepayers about the new summer/winter rates. Even after a decade of experimenting with seasonal rates, the active parties--regulatory and company staff and intervener groups--remain polarized regarding the value of the seasonal rate structure. The major issue that the Commission will have to resolve soon is whether the capacity constraint situation for SVWC has improved significantly from what it used to be in the 1980's to warrant a discontinuation of the summer/winter rate differential for some customers and for some specific water uses. Many potential explanations have been given for the continuous controversy over the seasonal rates. There is evidence that many residential customers did not understand the seasonal rate structure and many remain dissatisfied about the significant increase in their summer water bills. Many small businesses, for example, owners of restaurants who use a steady amount of water annually, also are discontented because seasonal rates impose an excessive financial burden on them during the summer season by cutting into their profits. There is also the persistent allegation that the lag between usage and customer billings sends the wrong cost signals to ratepayers. Finally, there is the very real threat by large industrial and commercial customers to bypass the water system and self-supply their needs. SVWC is concerned about such threats since its base load may be seriously affected with adverse financial consequences on the health of the utility.

The immediate response of the NYPSC to the public opposition regarding the new rates in 1980 was to issue another directive on April 28, 1981 ordering SVWC to modify the summer/winter rates by reducing the seasonal rate differential from 3:1 to 1.5:1. There appears to have been no substantial and quantifiable basis for the sudden change in Commission position except perhaps that it was politically expedient. In addition to reducing the seasonal rate differential, the Commission ordered the utility to offer

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[15] See Public Service Commission, State of New York: Case No. 27567 - Spring Valley Water Company, Incorporated - Phase II - Marginal Cost Study and Rate Design, "Order Modifying Rate Structure" issued April 28, 1981, p. 5.

its customers budget billings and to begin an interim meter reading program. One suspects that these measures were intended to reduce customer rate shock while upholding the semblance of rationality embodied in the seasonal rate structure. In the Commission order modifying the marginal cost-based rate structure,[16] the Commission justified the change in policy on the need "to adhere more closely to our general policy of introducing cost based seasonal rate differentials gradually so that dislocating effects on the customer may be mitigated."[17] The actions the Commission took have been explained in various ways, but the most plausible one appears to be the lack of political will on the part of the Commission to fully implement such an unpopular rate structure no matter how rational it may be. As was pointed out earlier, as political appointees, state commissions have to be sensitive to public expressions of concern. At the time, many customers were complaining and political pressure mounted on the company and the Commission. This may have provided the Commission the signal that it was politically unacceptable to continue implementing the rate. Under the circumstances something had to be done to placate discontented ratepayers.

One important point should be mentioned here. The value of sustaining the debate on the merits of peak marginal cost-based pricing lies not in its immediate achievement, but rather in its symbolic aspects, that is, of maintaining the semblance of rationality in the rate-making process. One therefore can argue that the Commission took the politically correct decision to sustain the seasonal rate structure at least in form. The present tariff for Spring Valley Water Company continues to reflect a 1.5:1 summer/winter rate differential which is still far from marginal cost based.

In a more recent case[18] the NYPSC once again ordered SVWC to conduct another set of cost-of-service and rate design studies. The Commission intends to review the appropriateness of the existing tariff in light of current marginal and embedded cost trends in combination with other primary rate-making objectives. The results of the current study reveal a marginal capacity cost finding of 2.8:1 summer to base cost ratio, and a long-run incremental cost finding of 2.5:1 summer to winter cost ratio. The current marginal cost findings indicate lower ratios than the

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[16] Ibid.

[17] Ibid.

[18] See Public Service Commission, State of New York: Case No. 89-W-1151 - Spring Valley Water Company, Incorporated - Opinion and Order No. 90-23 dated September 17, 1990.

ratios incorporated in the original summer/winter rate structure, but is still a much higher ratio than the present 1.5:1 summer/winter differential which is reflected in the present tariff. While the utility admits that seasonal rates have had a positive impact in reshaping consumer water demands in its service territory over the past decade, the company has expressed dissatisfaction with the present seasonal rate structure and now desires to experiment with other rate mechanisms. Perhaps the company wants to appease discontented customers, especially the high steady load factor customers who threaten to bypass the water system.[19]

The difference in views between the company and Commission staff can be illustrated in the residential rate design proposals presented by the parties in the current case noted earlier. Under the company's current rate design structure, all single-family residential customers (as well as some others that the company and staff now propose be served under separate service classes) are served under S.C. 1 usage rates as shown in Table 2 below.[20]

Table 2

	Rate Per Thousand Cubic Feet(TCF)	
Quantity Used Per Quarter	Winter	Summer
	$	$
First 9 TCF	26.37	40.53
Next 90 TCF	20.16	31.03
Over 99 TCF	9.35	14.34

To different degrees, the company and regulatory staff now want to change the existing usage rate design for single-family residential customers. Both company and staff agree that there should be some minimum level of usage designated for "sanitary purposes," for which rates would not reflect and summer/winter marginal cost differential. The company wants to replace the existing seasonally differentiated declining block rate structure as represented in Table 2 with a non-seasonally differentiated

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[19] This is curious, since it is steady load factor customers who get the greatest benefit from seasonal rates, both in lower annual bills (i.e, the winter discount is applied to a large amount of usage) and in terms of forestalling a large rate increase that would be necessitated by the need for the expensive Ambrey Pond.

[20] See Public Service Commission, State of New York: - Spring Valley Water Company, Incorporated - Tariff, P.S.C. No. 4, Original leaf No. 89.

"inverted" or "inclining block" two block rate structure (see Table 3) under which the first "basic usage" block would be priced at $16.60 per 1,000 cubic feet up to 2,400 cubic feet per quarter. Once the basic usage block is exceeded each billing period, the customer would pay $35.61 per 1,000 cubic feet.

Table 3

Quantity Used Per Quarter	Rate Per TCF
	$
First 2.4 TCF	16.60
Over 2.4 TCF	35.61

Commission staff disagree with company's rate design proposals for various reasons, including the fact that SVWC did not adequately reflect the sharp summer/winter marginal cost differentials which still exist and are revealed in the recent marginal cost study. To correct this major deficiency in the residential rate design, staff supports the usage rates illustrated in Table 4 below which can be compared with the company's proposals.

Table 4

	Staff		Company
Quantity Used Per Quarter	Winter	Summer	
	$	$	
First 2.4 TCF	20.50	20.50	16.60
Over 2.4 TCF	20.50	43.98	35.61

For non-residential customers the company proposes to introduce a "uniform volume rate" for all but two or three of the company's very largest customers. The company argues that for this customer class, the uniform rate will be more effective than the current summer/winter pricing structure in encouraging them to undertake conservation measures (like low flow fixtures and leak detection) available to them. Considering the high level of customer confusion and opposition to the current summer/winter rate structure, SVWC believes that its proposal is superior to staff's proposal. Moreover, SVWC contends that its rate structure should be adopted because it will achieve a balance between it's concerns regarding large customer system by-pass and other Commission rate-making objectives such as "simplicity, understandability and public acceptability" without compromising the continued importance of peak-use pricing. The problem that the company faces is the opposition of commission staff to any changes that undo the present seasonal rate differentials. Staff insist that the present summer/winter rate structure be maintained for all classes of customers including the large non-residential customers.

Conclusion: The concept of peak-use pricing and the goal of marginal cost-based revenue allocation continues to be endorsed by the New York Public Service Commission, even though both embedded and marginal cost values are generally considered in revenue allocation. The evidence suggests that any shift in favor of marginal cost-based rates cannot come easily or dramatically, but may come about only after a lengthy period of debate and deliberations through a series of relatively small increments in policy changes in favor of economic efficiency.

WATER AND SEWER RATES –
THE EMERGING CRISIS FOR THE POOR

by
Margot Saunders
National Consumer Law Center

The 1990s have presented a new problem to low-income households: the increasing difficulty to afford affordable, clean, running water and functioning sewage systems in many areas of the United States. These escalating costs will further burden poor households which have in the past two decades experienced spiraling energy costs without concurrent increases in income. Unless special attention is paid to the dramatic effect that escalating water and sewer rates will have on the budgets of poor households, clean and safe drinking water will be another factor in the spread of homelessness in this nation.

Across the nation residential ratepayers' water and sewer bills are being driven up by the costs of compliance with the Clean Water Act[1] (CWA) and the Safe Drinking Water Act[2] (SDWA), federal mandates designed to improve the water quality of navigable water ways and the safety of drinking water supplies. Compliance with CWA and SDWA frequently necessitates construction of multi-billion dollar treatment facilities, the costs of which are being shouldered almost completely by ratepayers.[3]

Rates charged directly to ratepayors will increase the specific cost of water and sewer service, often to the point of unaffordability. However, households for which water and sewer bills are included in rents will face dramatically increased rents which will result in further inability to meet basic needs and increased homelessness. According to a report released by the National Consumer Law Center in December 1991,[4] over 100,000 households in eastern Massachusetts are *currently unable to afford* their water and sewer bills.

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1 33 U.S.C.A. §§1251 et seq. (PL 92-500).

2 PL 93-523, PL 99-339.

3 The costs and impact on rates of the SDWA will vary with the size, the type and the complexity of the treatment required to bring the system into compliance. Each water utility will be unique. Patrick C. Mann and Janice A. Beecher, Cost Impact of Safe Drinking Water Act Compliance for Commission-Regulated Water Utilities (Columbus, Ohio: The National Regulatory Research Institute, January, 1989) at 2.

4 National Consumer Law Center, The Impact of Rising Water and Sewer Rates on The Poor; The Case of Eastern Massachusetts, December 1991.

This paper examines why ratepayers are footing the bill for these federal mandates, the impact of these costs on low-income households, and outlines various models developed by municipalities to address the increasing unaffordability of clean, running water and functioning sewage systems.

I. THE EVAPORATION OF FEDERAL DOLLARS

When the Clean Water Act was originally passed in 1972, $18 billion in federal grant money was provided to enable states and municipalities to pay for the costly treatment plants necessary to comply with the mandates of the Act.[5] Grant money to states was cut over the years and has since been completely eliminated. In 1987, Congress required states to set aside matching funds to receive federal funding which could only be used to create state loan funds to finance treatment projects. In recent years the appropriations for the State Revolving Loan Funds (SRF) have also been cut with the federal contribution scheduled to end in 1994. The issue of funding for the CWA, and the SDWA as well, is particularly pertinent at this time, since reauthorization of both Acts will be considered in Congress this year.

Unlike the CWA, the Safe Drinking Water Act has never had any funding attached. The SDWA regulates drinking water sources and legislates acceptable levels of contaminants in drinking water supplies. Compliance with the SDWA will necessitate that many communities construct water treatment facilities or make other capital improvements. The EPA estimates that it will take $80.4 billion to satisfy the documented needs of facilities around the country.[6] Further, some preliminary analyses conclude that these EPA cost impact estimates to be unreliably low.[7]

The absence of federal funding for the CWA and the SDWA and the inability of states to absorb costs for these projects, leaves only one option: ratepayers fund the costs of compliance.[8] While the costs and impacts on rates of the SDWA will vary with

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5 United States General Accounting Office, Water Pollution, State Revolving Loan Funds Insufficient to Meet Wastewater Treatment Needs(GAO/RCED-92-35), January 1992, 2.

6 Of this amount, $65 billion is needed to satisfy the needs of the current population, the balance of $15.4 billion is necessary to construct facilities to serve population growth anticipated in the 20 year life of the projects. U.S. Environmental Protection Agency, Office of Water, 1990 Needs Survey - Report to Congress, (EPA 430/09-91-024, November, 1991) at 8.

7 Patrick C. Mann and Janice A. Beecher, supra, at 1.

8 As many public water and wastewater operations are organizationally within county or municipal government, there is often cross-subsidization of costs. The local government may provide administrative services which benefit water operations. "If the general fund does not recover sufficient administrative costs from water or sewer operations, a subsidy to water or sewer operations could result. On the other hand, over-recovery of administrative costs from water and wastewater operations could result in a subsidy to the general fund. The subsidy concept could be

system size and treatment complexity, the greatest cost impacts will be borne by the small water utilities, particularly those serving less than 1,000 in population.[9] These increased expenses will have an especially harsh effect on the residents of smaller communities where ratepayers cannot benefit from the economies of scale and large construction costs will be borne by a small number of ratepayers.[10] According to the GAO, by the year 2000, in communities of 500 or less these environmental clean ups will cost 5.6% of an average households' annual income.[11]

In Eastern Massachusetts, for example, in the Massachusetts Water Resources Authority district, ratepayers are shouldering 91% of the $6.2 billion dollar construction projects.[12] Nationwide, the cost of environmental protection lays claim to a larger and larger percentage of household income. According to the United States General Accounting Office:

> The gap between wastewater treatment needs and the resources available to meet them is tremendous. Governments at all levels will spend approximately $5 billion per year over the next decade to deal with an $83.5 billion problem.[13]

II. LOW-INCOME HOUSEHOLDS DROWNING IN HIGH WATER AND SEWER BILLS

Who Are the Poor. The poverty level is defined by the Department of Census to be those households who live at or below Federal Poverty Guidelines.[14] These

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extended to include subsidizing more than administrative costs." George A. Raftelis, The Arthur Young Guide to Water and Wastewater Finance and Pricing, (Lewis Publishers, 1989). There may continue to be some cross-subsidization from municipal and county tax bases, but that is expected to decrease as direct water and sewer costs increase.

9 Patrick C. Mann and Janice A. Beecher, supra, at 2.

10 U.S. General Accounting Office, Water Pollution; State Revolving Funds Insufficient to Meet Wastewater Treatment Needs (GAO/RCED-92-35), January 1992, 42.

11 Ibid.

12 MWRA Advisory Board, Special Report to the Director of the MWRA, March 1992.

13 U.S. General Accounting Office, supra. at 47.

14 The Federal Poverty Income Guidelines are set by the Department of Health and Human Services. In 1992 the figures were set out in 57 Fed. Reg. 5455-57 (Feb.14, 1992).

guidelines have been criticized repeatedly for their depressed amounts:[15] the federal poverty level for a family of four in 1990 was $12,700.[16] Yet in 1989 there were 31.5 million people living below the poverty level in the United States - 12.8% of the general population.[17] The majority of the poor in this country were white (65.5 percent). Blacks constituted 29.5 percent of all persons below the poverty level, and the remaining 4.6 were persons of "other" races.[18] About one-third of families maintained by women had incomes below the poverty level, and *one-half of the Nation's poor in 1989 were elderly or children.*[19]

The Higher Costs of Home Energy. The crisis of escalating water and sewer costs will be particularly felt by low-income households. Poor households have already suffered rising energy costs,[20] and decreasing benefits from the federal Low Income Home Energy Assistance Program ("LIHEAP).[21] According to a 1989 study, after heating their homes in the winter, on average, LIHEAP households had only $75 or less to spend weekly on food, housing, medical care and all other household necessities.[22] Households which depend on AFDC, SSI and Social Security as their primary source of income spend an even greater percentage of their income on energy.[23] The average

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15 See, for example, testimony provided by Professor Michael Stone, Professor of Community Planning and Social Policy at the University of Massachusetts, Boston, in Coalition for the Homeless, et al. v. Dukakis, et al., 400 Mass. 806 (1987). Dr. Stone criticized the use of the 100% of the Federal Poverty Level ("FPL") as a definition of the level of income adequate for basic necessities, noting that (1) the food cost estimate used as the basis of the calculation, the U.S. Department of Agriculture "Economy Food Plan," is intended for emergency or temporary use, and does not define the amount needed for a minimally nutritious diet on an ongoing basis, and (2) the FPL does not take into account regional differences in cost (except in the case of Alaska and Hawaii), instead specifying one national FPL standard.

16 55 Fed. Reg. 5665 (Feb. 16, 1990).

17 Current Population Reports, Population Profile of the United States 1991, (U.S. Department of Commerce; July, 1991) at 18.

18 Ibid.

19 Ibid, at 18, 19.

20 National Consumer Law Center, Energy and The Poor - The Forgotten Crisis, (June, 1989_ at 13. Also see Low Income Home Energy Assistance Program, Report to Congress for Fiscal Year 1990, U.S. Department of Health and Human Services, (September 11, 1991) at 17.

21 Ibid at 125.

22 Energy and the Poor: The Forgotten Crisis, supra. Specific state by state data is available in this publication.

23 Nevertheless, one cannot solely rely upon population averages in analysis. By their nature, averages mask the extremes.

AFDC household of three spends roughly 20 percent of its income on home energy, while an elderly individual receiving SSI would spend 22 percent of her income on home energy and have an average of $77 per week left after paying her winter home heating bills. Although lower income households tend to spend less per month on energy than those with higher income, the burden of the energy bills, expressed as a percent of income, are considerably greater on the lower income.[24]

The effect of these payment difficulties has undoubtedly been more late payments of utility bills, an increased number of disconnect notices and more actual energy terminations. But, low-income households are not the only ones who suffer from these payment difficulties; the utility companies see higher expenses incurred for increased credit and collection activity, bad debt and the need for more working capital.

Payment problems with utility bills have been found to be a catalyst towards homelessness. According to recent research in Philadelphia: utility terminations are "clearly a precipitating factor in housing abandonment." A joint study by the Philadelphia Energy Coordinating Agency and Temple University's Institute for Public Policy Studies (ECA/IPPS), over five years, found that an average of 32 percent of the homes of residential electric customers in that city became abandoned within one year following termination of electric service. (The average percentage was found to be slightly lower for gas terminations: 22.4 percent.)

Similar Repercussions To Be Expected from Water and Sewer Bills. Low-income households will face a similar drain on their annual incomes from escalating water and sewer prices. According to the Massachusetts Water Resources Authority (MWRA) which serves 60 communities in eastern Massachusetts, the low-income residents in one of the poorest cities in the district were paying 2.04% of the annual income for water and sewer bills in 1987.[25] Since average bills are scheduled to rise by 305%, to over $1600 a year by the year 2000, the percentage of annual income spent on water and sewer bills in the MWRA service area will skyrocket over the next few years.[26] To put the amount of these bills in perspective, the cost of water and sewer service in the MWRA area will be equal to 94% of the cost of home heating by the year 2000.[27]

Massachusetts residents are by no means alone with these problems. The state of Washington also anticipates multiplication of costs by as much as $1100 per household

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24 National Consumer Law Center, ***The Percentage of Income Payment Plan in Jefferson County, Kentucky: One Alternative to Distributing LIHEAP Benefits***, at 11 - 12 (March 1991).

25 The Impact of Rising Water and Sewer Costs on the Poor, 70.

26 Ibid, 18.

27 Ibid, 53.

a year for small surface water systems.[28] In South Carolina, a water utility which made several improvements to comply with the SWDA saw average water bills increasing by approximately 75%.[29] A mobile home park with thirteen service connections in Pennsylvania was required by the state Department of Environmental Resources to make improvements which will add $23 a month to residents water bills.[30]

Low-income households who are directly billed for water and sewer charges will face having to forego other basic necessities or be disconnected from clean, running water. This year in the City of Boston, alone, water shutoffs were up three-fold as the first dramatic rate increase was put into effect. For low-income households who are not billed directly for water and sewer bills, these households will experience sharp rent increases, as landlords pass increased water and sewer rates along through the rent. Studies show that rent is the priority bill for households.[31] As a result of struggling to pay rising rents, households will have less to spend on food, clothing and medical care.[32]

Additionally, housing units occupied by low-income families tend to be older, resulting in leaky or faulty fixtures. This excessive water use will likely cause disproportionately higher water bills for low-income households and exacerbate their inability to pay water and sewer bills.

III. LESSONS FROM THE ENERGY FRONT

Recognizing that human beings cannot live without heat and that energy is a necessity in extreme weather, public utility commissions around the nation have mandated a number of customer protections against termination for non-payment. These include a series of notices before disconnection, special payment arrangements, budget billings, lifeline rates, service limiters, budget counseling and the like. (See attached Table[33]) Some utility providers have taken a further step and instituted Percentage of Income Payment Plans ("PIPPs") or Energy Assurance Plans. These programs, targeted

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[28] Washington State Department of Health, Environmental Health Division of Drinking Water, Small Water Systems: Problems and Proposed Solutions - A Report to the Legislature, (January, 1991) at 4.

[29] Patrick C. Mann and Janice A. Beecher, supra, at 58.

[30] Ibid.

[31] The Impact of Rising Water and Sewer Costs on the Poor, 58.

[32] Ibid.

[33] Low Income Home Energy Assistance Program, Report to Congress for Fiscal Year 1990, U.S. Department of Health and Human Services, (September 11, 1991) Table K-2 at 145.

to low-income households, are designed to make energy payments affordable, and thus actually to increase *revenues* to the utility.[34]

In the past, collections issues were incidental to the administration of water and sewer projects. The coming decade promises to make these concerns of much more importance to private and municipal water and sewer providers. Many of these programs limiting disconnections of energy service or facilitating payments by low-income households should prove useful when transferred to the water and sewer context.

IV. MUNICIPAL LIFELINES

Because many communities are just beginning to experience rate shock due to compliance with the CWA and SDWA, there are few models for programs designed to lessen the impact of increasing water and sewer rates on low-income households. But the importance of designing programs to deal with the effect of rate increases on the poor, as well as phasing in increased rates over a number of years, cannot be understated.[35] One simple means of mitigating some rate shock is to substitute monthly for quarterly billing. While this method reduces the water and sewer *bills,* it does not have any effect on a utility's *income.*[36] This rudimentary technique of softening the impact of ballooning rates is especially necessary for low-income households who live month to month, and whose lack of disposable income makes it difficult to save from one month's income for expenses expected a few months later.

Within states, rates can vary widely depending upon which water and sewer districts are being required to construct treatment facilities or other expensive water and sewer system infrastructure repairs. As a result, most water and sewer rate relief programs have been instituted by municipalities, particularly municipalities that have recently been faced with substantial rate increases. A handful of municipalities have

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34 The basic attribute of an energy oriented Percentage of Income Payment Plan (PIPP) is that if a household makes its designated monthly payment, LIHEAP will pay the difference between that household payment and the actual home energy bill. As the program name implies, the household payment is set at a pre-determined percentage of the household's annual income, to be paid in regular equal monthly installments. Under a PIPP, once a household makes its monthly payment, the obligation arises on the part of the state to provide the requisite LIHEAP benefit for that month. If the household payment is not made, no LIHEAP benefit is provided. Through this household/LIHEAP payment process, LIHEAP benefits are distributed so that, if the copayments are kept at an affordable level, a household's entire energy bill is paid each month, even though the *household's* payment is set at a percentage of income that may not cover the entire current bill.

35 See Patrick C. Mann and Janice A. Beecher, supra, at 59 to 66 for a full discussion of phase in options.

36 Ibid.

instituted water and sewer rate relief programs which meet the needs of low-income residents in these communities.

It is important to bear in mind that low-income families are disproportionately renters and that in many communities renters do not directly receive a water or sewer bill. These households experience rate increases indirectly in the form of increased rents. Consequently, a solution targeted directly at water and sewer ratepayers will bypass a large portion of low-income households. Therefore, the water and sewer rate relief programs which most effectively reduce the impact of escalating rates on all low-income households are those that have found a way to extend rate relief to renters.

Currently, the most common model for rate relief is a discount for low-income elderly and disabled ratepayers. Boston, Massachusetts and Toledo, Ohio are among the communities that offer a discount on water and sewer bills to elderly and disabled ratepayers. These programs are modest in scope in that only households that directly pay a water and sewer bill and have a low-income elderly or disabled household member are eligible.

A. Seattle, WA: Low-Income Elderly and Disabled Discount for Ratepayers and Renters

A more far-reaching program is offered by the City of Seattle, Washington. Seattle offers discounts to both homeowners and renters in a number of forms, made possible by the fact that the city owns both the water and the power companies. Elderly and disabled households which meet certain income guidelines (less than 70% of the state median income) and who pay their water bill directly, receive a monthly credit on their water bill.[37] For those households that meet the eligibility requirements but do not pay their water bill directly, they receive a bi-monthly credit on their electric bill ranging from $16 to $44 depending upon the size of the apartment complex in which they reside.[38] Households that neither receive a water bill, nor an electric bill are given a voucher which can be applied to their rent.[39] It should be noted that landlord participation in the voucher program is voluntary and that the voucher program has been met with great resistance.[40]

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[37] The monthly credit for a 3/4" meter is $3.97 a month while the discount for a 1" meter is $2.97 per month.

[38] Telephone conversation with the Seattle Water Department, April 13, 1992.

[39] Ibid.

[40] Ibid.

B. Burlington, VT Proposal: The Utility Stamp Model

Similar to the Seattle program is a proposal under consideration by the Burlington, Vermont City Council. The City Council, in conjunction with the Public Works Department, is taking the type of discount offered by Seattle a step farther by offering the discount to all low-income households in the city, not just those who are elderly or disabled.

The low-income lifeline rate would be available to ratepayers whose incomes are no higher than HUD's very low-income classification for the Burlington area (50% of the median income).[41] A percent discount (the amount of the discount has yet to be decided) will be applied toward a base volume of water. Usage above this base amount will be billed at the normal residential rates. The Burlington Public Works Department has determined that the average person uses 55 gallons of water per day, so that the base volume to which the discount would be applied is 55 gallons per day for each person in the income eligible household.[42]

The discount would be administered to both renters and property owners in the form of water/wastewater "utility stamps".[43] Renters would use the utility stamps to pay a portion of their rent and individual home owners and landlords would use the utility stamps to pay a portion of their water/wastewater bills. Because the program is not yet in place it is difficult to know whether Burlington's utility stamps will meet with as much resistance as does Seattle's voucher program. In contrast to Seattle however, Burlington is considering a city ordinance which would require landlords to accept the utility script.

Certain modifications could be made to the Seattle and Burlington models to potentially increase their effectiveness. To overcome landlord's resistance to accepting the vouchers, landlords could be given incentives to participate, such as a discount on their water & sewer bill to cover the "administrative costs" of accepting the vouchers or script.

One possibility which needs further exploration would be to issue "discount coupons," rather than vouchers or utility stamps. The discount coupon would entitle the holder to a rental discount equal to the face value of the coupon. The landlord would then include the coupon with his/her monthly water and sewer bill subtracting from the total bill the amount of the coupon. Again, an incentive such as a set discount on the total bill would need to be provided for the landlords. Additionally, safeguards would

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41 Burlington Public Works Commission, Low-Income Discount Report for Water and Wastewater Rates, August 13, 1991.

42 Ibid.

43 Ibid.

need to be put in place to insure that the tenants are actually receiving the discount to which they are entitled. One possibility is that the landlord could be required to set the tenant's rent at the fair market value of rent in that zip code area minus the amount of the discount coupon.

C. Philadelphia, PA: Grants + Arrearage Forgiveness

Though not directly targeted toward low-income customers, the City of Philadelphia Water Department is one of the few municipal water departments that offers arrearage forgiveness or grants to reduce water and sewer bills for customers who receive these benefits based on demonstrated need.[44] Income is only one of the categories which can be used to demonstrate need and thereby qualify a household for the Water Revenue Assistance Program (WRAP). Presently, the income eligibility is 150% of the federal poverty level. Other extenuating circumstances, such as excessive medical bills, which in effect would bring a household's income down to 150% of the federal poverty level, also can be used to demonstrate need.

WRAP is administered by the Water Revenue Bureau. A ratepayer may receive assistance if his/her bill is delinquent by one cycle. The intent of the WRAP program is to zero out the past due bill, or arrange for a long term payment agreement. Grants from a combination of sources: the City; LIHEAP; and private charities are used to reduce or eliminate arrearage. If the ratepayer's income is deemed insufficient to meet future bills, grant money may be applied toward future bills to bring water rates down to an affordable level.

Philadelphia is also unique in that renters can request that the water bill be put in their name in order to receive the rate relief offered by the Water Department. When a renter requests that the bill be put in his/her own name, the renter begins with a zero balance, with the landlord still held responsible for past bills. Though protected from future large rent increases resulting from high water and sewer bills, the renter does not necessarily receive an immediate benefit, unless an arrangement has been made with the landlord.

D. Winter Shutoff Moratorium

Boston and Philadelphia both employ winter shutoff moratoriums for water service. The grounds for this policy are that many heating systems are dependent on water to function properly. Shutting off water for many households during the winter would be tantamount to shutting off gas or electricity, leaving the household unable to heat their homes. Though a winter shutoff moratorium for water is not a solution to unaffordable

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44 Letter from the Philadelphia Water Revenue Bureau, March 13, 1992.

water or sewer bills, it is a protection which may save lives while at the same time guaranteeing water service for six months of the year.

E. Massachusetts: Stipulations Placed on Use of State and Federal Funds

Astronomical water and sewer rates are a regional, rather than municipal problem in Massachusetts, since sixty communities are paying for the cost of the Boston Harbor clean up. Realizing the detrimental impact of rising water and sewer costs on low-income families, low-income advocates working with state lawmakers were able to link a community's receipt of state and federal funds to the presence of a low-income rate relief program. Chapter 275 of the Massachusetts Acts of 1989 requires that communities receiving money from the State Revolving Loan Fund "shall have adopted a pricing system... which provides for assurance of service to households who by reason of low income are unable to pay the charge for service."[45] This act also mandated that the Massachusetts Secretary of Administration and Finance and the Secretary of Environmental Affairs prepare a report, which among other things, would examine how this provision could be extended to renters.[46] Since the law applies to communities requesting funds in Fiscal Year 1992, the effectiveness of this mandate is yet to be seen. Shrinking federal dollars for the State Revolving Loan Funds, also jeopardizes the existence and effectiveness of any programs.

F. Effect of Special Programs on Receipt of Other Benefits.

When designing programs intended to help low-income households, it is essential to be cognizant of the effect that some forms of direct assistance or "in kind" income can have on other programs providing assistance to low-income households. If care is not taken, then the vouchers, or "stamps" might be counted as income under the program requirements, which affect not only the amount of benefits received under the program, but also basic eligibility. Otherwise, low-income households would have gained nothing, since other benefits would be reduced. Recipients of AFDC (Aid to Families with Dependent Children), SSI (Supplemental Security Income - paid to very low-income disabled or elderly persons), and Food Stamps are the very poorest people in our society, and those most in need of assistance with their water and sewer bills.

The effect of *energy* assistance benefits on income for most programs (AFDC, SSI, Food Stamps, etc.) has been specifically addressed in the LIHEAP law, and litigated in

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45 Chapter 275 of the Massachusetts Acts of 1989, Section 15.

46 Ibid.

a number of circuits around the nation.[47] Preliminary analysis indicates that water vouchers should not influence Food Stamps.[48] The question of whether AFDC benefits would be affected would be up to each state.[49] It seems more likely, however, that SSI benefits would be affected, and potentially reduced dollar for dollar by the amount of benefit a water voucher provided to a low-income family.[50]

D. Conservation

A first step toward reducing water and sewer bills on the local level should be conservation. All low-income households should be retrofitted and inspected to uncover leaks which cause excessive water use. The purpose of this would be to ensure that low-income households are not paying a disproportionate share of the costs of these construction projects because of higher than average water usage. Ultimately, however, water conservation will yield only limited benefits, as it is construction and compliance costs which are driving rates up for many communities, not usage. As more and more households within a particular water and sewer district decrease their usage, the rate per gallon of water will have to be increased in order to cover the expenses resulting from the cost of constructing the required treatment facilities. Nonetheless, successful conservation programs will reduce the demand for water and the volume of water being discharged through the sewage system which may eliminate the need for future construction projects.

IV. CONCLUSION

As the deadlines for compliance with the CWA and the SDWA draw near, many more communities will be compelled to raise water and sewer rates to fund the costs of compliance. The crisis of the unaffordability of water and sewer services for low-income households will swell even more. The water and sewer rate relief programs, discussed above, offer a variety of approaches to mitigating the impact of rising water and sewer

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47 42 U.S.C. §8624(f); DeAllaume, et al., v. Perales, et al., 701 F.Supp. 49 (S.D.N.Y. 1988) (LIHEAP benefits cannot be figured in New York's calculation of additional fuel for state heating benefits program to welfare recipients. Held violative of 42 U.S.C. §8624(f) - the income disregard provision designed to ensure the supplemental nature of LIHEAP benefits which states that assistance "under the statute, whether directly or indirectly received, shall not be considered income or resources for any purposes under any Federal or State law, including any law relating to taxation, food stamps, public assistance, or welfare programs." Also see, Dept. of Health and Welfare, State of Idaho, et al., v. Block, 784 F.2d 895 (9th Cir. 1986); and Schmiege v. Secretary of Agriculture of U.S., 693 F.2d 55 (8th Cir. 1982).

48 See, 24 C.F.R. § 273.9(c) on "Income exclusions."

49 See, 42 U.S.C. § 602(a)(36), regarding exclusions from income.

50 See 20 C.F.R. § 416.1104(g).

rates on low-income households. Because municipalities do not have the financial resources which are available at the federal or state level, successful rate relief programs may require federal or state support. An advantage to a community based program is that municipalities have the flexibility to design programs which address the strengths and distinctive characteristics of individual communities.

As a growing number of water and sewer rate relief programs are developed, the National Consumer Law Center would like to hear about them, so that we can be a resource for advocates and communities seeking to address the problem of water and sewer unaffordability. Over the past few years, the Center has been tracking low-income water and sewer rate relief programs and discussions throughout the country. If you are familiar with a water or sewer rate relief program or have ideas for a model program, the Center would like to hear from you. Please contact Margot Saunders at (202) 986-6060 or Nancy Brockway at (617) 523-8010.

Designing Rates For Small Water Companies

by
Allen J. Girdner
New Mexico Public Service Commission[1]

In New Mexico there are numerous small water companies with less than 1,000 customers. Typically these water companies have but one customer class, small annual revenues and little or no technical expertise in designing rates, let alone money to hire consultants. With this in mind, the New Mexico Public Service Commission Staff has employed a rate design technique that is simple to use, is cost effective and results in reasonable rate designs.

This rate design technique for small water companies is an adaptation of the American Water Works Association (AWWA) methodology as outlined in AWWA's Water Rates Manual M1, Third Edition, Chapter 5, Rate Design for Small Utilities. As defined in the manual, a small water company is one that has fewer than about 5,000 customers. In New Mexico, by that definition, all but a handful of water companies regulated by the NMPSC are small water companies. However, the difficulty with using the methodology outlined in the manual is that the method described is too difficult to perform for the owners of small water companies as it requires more data than is available to them and requires expensive studies.

Therefore, in the alternative, the NMPSC Staff has developed a methodology which permits the use of data that is readily available to small water companies and at minimal cost to the utility. This method utilizes a Customer Charge and a Commodity Charge rate structure, with the demand-related cost components distributed between the Customer Charge and the Commodity Charge.

TRADITIONAL RATE DESIGN THEORY: Before describing the Staff's methodology, it is necessary to outline the traditional rate making process as described in the AWWA Water Rates manual, Chapter 5. Since the purpose of this paper is to describe Staff's particular method, only a general overview will be given of the traditional methodology. For a graphical comparison of

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[1] The views and opinions of the author do not necessarily state or reflect the views, opinions or policies of the New Mexico Public Service Commission.

the two methods, see Figure 1, a diagram of traditional ratemaking methodology and Figure 2, a diagram of the small water ratemaking methodology.

The cost to serve must be determined before rates can be designed. The Cost of Service or the Revenue Requirement of a company consists of return on rate base, operation and maintenance expenses, depreciation and taxes. Following the suggested methodology for small water companies in the AWWA Water Rates manual, these costs are separated into specific operational areas or cost centers for the utility such as source of supply, pumping, storage, treatment, transmission, distribution, customer metering, billing, and collection, and general administration. The next step in traditional rate making for small water companies is to classify these functionalized costs into customer-related costs, demand-related costs and commodity-related costs.

Customer-related costs are costs incurred by the utility to serve the customer without regard to the amount of water used or the rate at which it is used. Examples of these costs are meter reading, customer billing and collection.

Demand-related costs are costs that are incurred in providing the facilities such as transmission and distribution system, pumping, and storage, all of which are sized to meet peak demands.

Commodity-related cost are cost that vary with the quantity of water produced such as the cost of purchased water, chemicals and electric power.

The main objective of any rate design is to establish rates which reflect the cost of providing water service to the customer. In other words, rate design should, as close as possible, link cost payment with cost causation. Ideally, since each customer uses the water system differently, individual rates for each customer would theoretically insure that the cost causer is the cost payer. However, such a rate design is not economically practical or even possible. Therefore, customers are grouped together into classes for which the cost of providing service can be determined. Members of the same class will have similar usage patterns and place similar demands on the system.

A Class Cost of Service is prepared by assigning the aforementioned costs to the customer classes using numerous allocators which are based in part on demand usage patterns. Once this is done, the rates may be designed. Rates for small water companies, according to the AWWA manual, usually take the form of a single-block rate with a monthly customer charge. In such a design the demand cost component is included in the commodity charge and not charged to the customer as a separate item.

SMALL WATER COMPANY METHODOLOGY--Customer Charge: The first step in the **small water methodology** is to establish all of the expenses that are related to the customer, that is, those costs which result from meter reading, customer accounting, monthly customer billing, bill collection, maintenance on meters and services, and depreciation and return on meters and services. General administration and office space costs for customer-related activities can be included if the amounts are significant. The allocation of general administration and office space costs can be problematical. One allocator of these costs is the percentage of net investment in meter and services to total net plant in service (Net Meters & Services / Net Plant = General Administration and Office Space Allocator).

After the total customer-related costs are determined, they are subtracted from the total Cost of Service to make a rough determination of the Customer Charge and Commodity Charge break-out.

In large water systems a detailed study is often performed to determine what portion of demand-related costs should be placed into the Customer Charge. These "minimum system" studies attempt to determine the size of the smallest possible system required to connect all the customers and deliver a minimum amount of demand. Such studies are very costly and require a high level of engineering expertise.

In the **small water methodology**, a portion of the demand-related costs are allocated to the customer charge in recognition of minimum system demand. The amount allocated is, to some extent, estimated under this methodology. When developing this method, Staff reviewed small water company rate designs spanning several years. Under previously employed methodologies, the New Mexico Commission had approved rate designs that provided for recovery of between 1/4 and 1/3 of the revenue requirement through the Customer Charge. With that range as a benchmark, a portion of the non-customer related revenue requirement is assigned to the Customer Charge until that charge falls in the target range.

It must be remembered that when developing a rate design, attention must be given to balancing the stability of the revenue stream to the water company with the control a customer has over his or her bill. The larger the customer charge the more stable the revenue stream is for a company. When more of the revenue is to be collected through the commodity charge, the customer has more control over his or her bill, because, if a smaller bill is desired, all that has to be done is cut back on usage. Therefore, a balance must be found for these two opposites. This is then, an area where the art of rate design comes into play.

Once the total amount to be collected through the Customer Charge is determined it must be allocated to the customers. The **small water methodology** allocates the two components identified above, the customer-related costs and the demand-related costs, separately. The customer-related costs are allocated by the number of billings per year. The total number of yearly billings is determined by multiplying the number of customers for the test year by 12 months. The customer-related cost component is then divided by the total number of yearly billings. The result is the dollar amount to be recovered each month from each customer for customer-related costs.

The demand-related costs are allocated based on the equivalent meter concept. The theory behind using equivalent meters is that the size of the meter controls or restricts the amount of demand a customer can place on the water system. Therefore, to allocate the minimum size system demand, equivalent meters should be used.

The equivalent ratios are developed by using the maximum capacity AWWA flow figures as presented in the AWWA Manual M22. Once a particular meter size is selected as the base size, equivalent ratios are developed. This is done by using the flow rates from AWWA's M22. The flow rate of the base meter is taken as the denominator in the ratio and the various other flow rates are taken as the numerator (ie. for a 5/8" base meter, a 3/4" meter's ratio is calculated: 30 / 20 = 1.5). The following table was calculated using the information from M22 with a 5/8" meter taken as the base meter size:

Equivalent Meters	Meter Size	Gallons per Minute
1.0	5/8"	20
1.5	3/4"	30
2.5	1"	50
5.0	1-1/2"	100
8.0	2"	160
15.0	3"	300

To use the equivalent meter concept, the number of equivalent meters must be determined. This is accomplished by determining how many meters of each size are on the system and multiplying the number of each size meter by the corresponding equivalent meter ratio. For example, if a system had 10 5/8" meters and 5 3/4" meters the total number of equivalent meters would be 17.5 (10 x 1.0 + 5 x 1.5 = 17.5). The total number of equivalent meters is then multiplied by 12 to get the total yearly equivalent meters.

The total demand-related cost is then divided by the total yearly number of equivalent meters with the result being the monthly equivalent meter charge. With more than one meter size on the system, the monthly equivalent meter charge is multiplied by the equivalent meter ratio for each size meter on the system. For example, again using 10 5/8" and 5 3/4" meters and a yearly minimum demand cost of $1,260.00, the monthly demand-related component charges would be $6.00 for the 5/8" meter and $9.00 for the 3/4" meter (17.5 x 12 = 210; $1,260 / 210 = $6.00; $6.00 x 1.0 = $6.00; $6.00 x 1.5 = $9.00).

The two components of the Customer Charge are then added to derive the total Customer Charge for each customer by meter size. Using this method with small water companies eliminates the need for multiple customer classes in rate design because minimum demand costs are allocated on the customers' ability to place demand on the system.

The resulting new Customer Charge must be compared with the current Customer Charge to see if it will cause rate shock and to see if it is out of line, in general, with Customer Charges in the water company's immediate area and in the state as a whole.

SMALL WATER COMPANY METHODOLOGY--Commodity Charge: The revenue to be collected through the Commodity Charge is calculated by subtracting the total amount of revenue to be collected by the Customer Charge from the total Revenue Requirement. The actual rate to be charge per thousand gallons is then computed by dividing this total commodity charge revenue requirement by the yearly annualized number of thousand gallons sold.

AN EXAMPLE: For the example the following was taken as given:

Annualized Number of customers	696
Total revenue requirement	$266,267
Total 5/8" meters	684
Total 1" meters	7
Total 1-1/2" meters	5
Annualized gallons sold in thousands	60,868

There is a total of $74,111 which can be allocated to the monthly customer charge. These costs include expenses related to services, meters, and customer accounting and collecting as well as the capital-related costs of customer-related plant including depreciation expense, income and property taxes and return on rate base. The breakdown of these costs is as follows:

General O&M Expense	$66,784[2]
Depreciation Expense	1,209[3]
Taxes Other Than Income	600
Income Taxes	1,039
Revenue Related Taxes	70
Return	4,408
TOTAL CUSTOMER RELATED COSTS	$74,111

To the $74,111 of customer-related costs, $16,597 of demand-related costs were included for a total of $90,708 to be recovered through the monthly customer charge. As a result, approximately 34% of the revenue requirement being collected through the customer charge.

The equivalent meter calculations are performed as shown below:

Meter Size	Number of Meters		Equiv. Ratio		Number of Equiv. Meters
5/8"	684	x	1.0	=	684.0
1"	7	x	2.5	=	17.5
1-1/2"	5	x	5.0	=	25.0
TOTAL EQUIVALENT METERS					726.5

The monthly demand-related portion of the customer charge is calculated as follows:

$16,597 / (726.5 x 12) = $1.90

And the monthly demand-related portion is calculated for each meter size as seen below:

Meter Size	Equivalent Ratio		Demand Costs		Monthly Demand Costs
5/8"	1.0	x	$1.90	=	$1.90
1"	2.5	x	$1.90	=	$4.75
1-1/2"	5.0	x	$1.90	=	$9.50

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[2] Meter & Service Maintenance $47,692; Meter Reading $10,174; Billing, Customer Accounting & Collection $8,918.

[3] Items were allocated on percentage of customer-related plant to total plant. Customer-related plant was determined to be 19.3% of rate base from the water company's rate case filing.

The monthly pure customer-related portion of the customer charge is then calculated as follows:

$74,111 / (696 x 12) = $8.87

The two components are then combined to give the total customer charge by meter size:

Meter Size	Demand Component		Customer Component		Total Monthly Customer Charge
5/8"	$1.90	+	$8.87	=	$10.77
1"	$4.75	+	$8.87	=	$13.62
1-1/2"	$9.50		$8.87	=	$18.37

The commodity charge is determined by subtracting the total costs to be recovered by the customer charge, $90,708, from Staff's recommended revenue requirement of $266,267, which results in $175,559 to be collected by the commodity charge. This dollar amount is then divided by the annualized gallons sold of 60,868 thousand gallons to yield the $2.88 per thousand gallons rate.

Therefore the final rate design is:

Monthly Customer Charge:	5/8" meter	$10.77
	1" meter	$13.62
	1-1/2" meter	$18.37
Commodity Charge: (per thousand gallons)		$2.88

<u>**CONCLUSION:**</u> By using the **small water methodology** for rate design it is possible to design reasonable rates with minimum data and at a minimum of effort and cost. As with any rate design methodology, it is important to remember that rate design is more art than science and that judgement must be applied rather than merely running numbers through a model.

TRADITIONAL RATE DESIGN

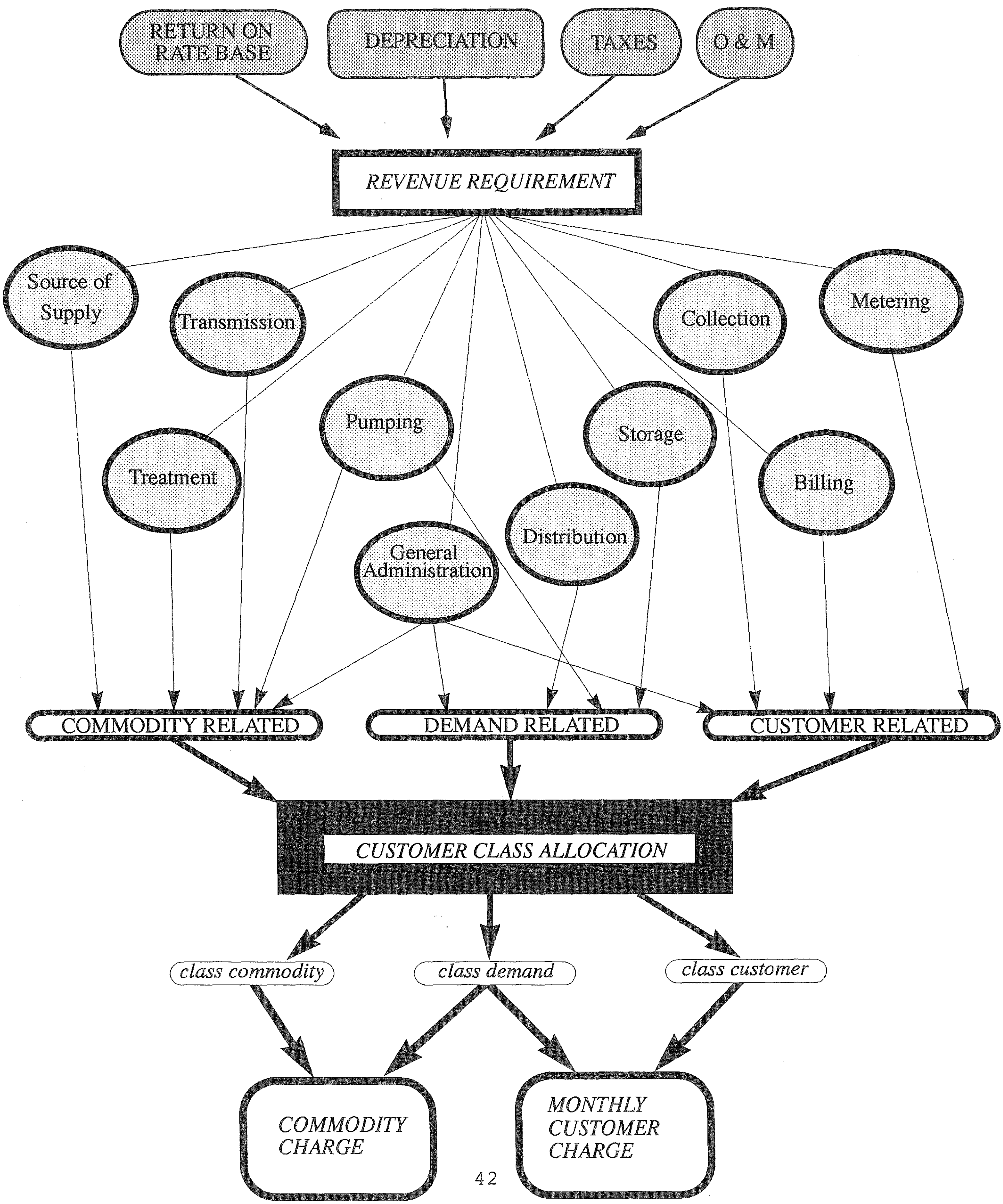
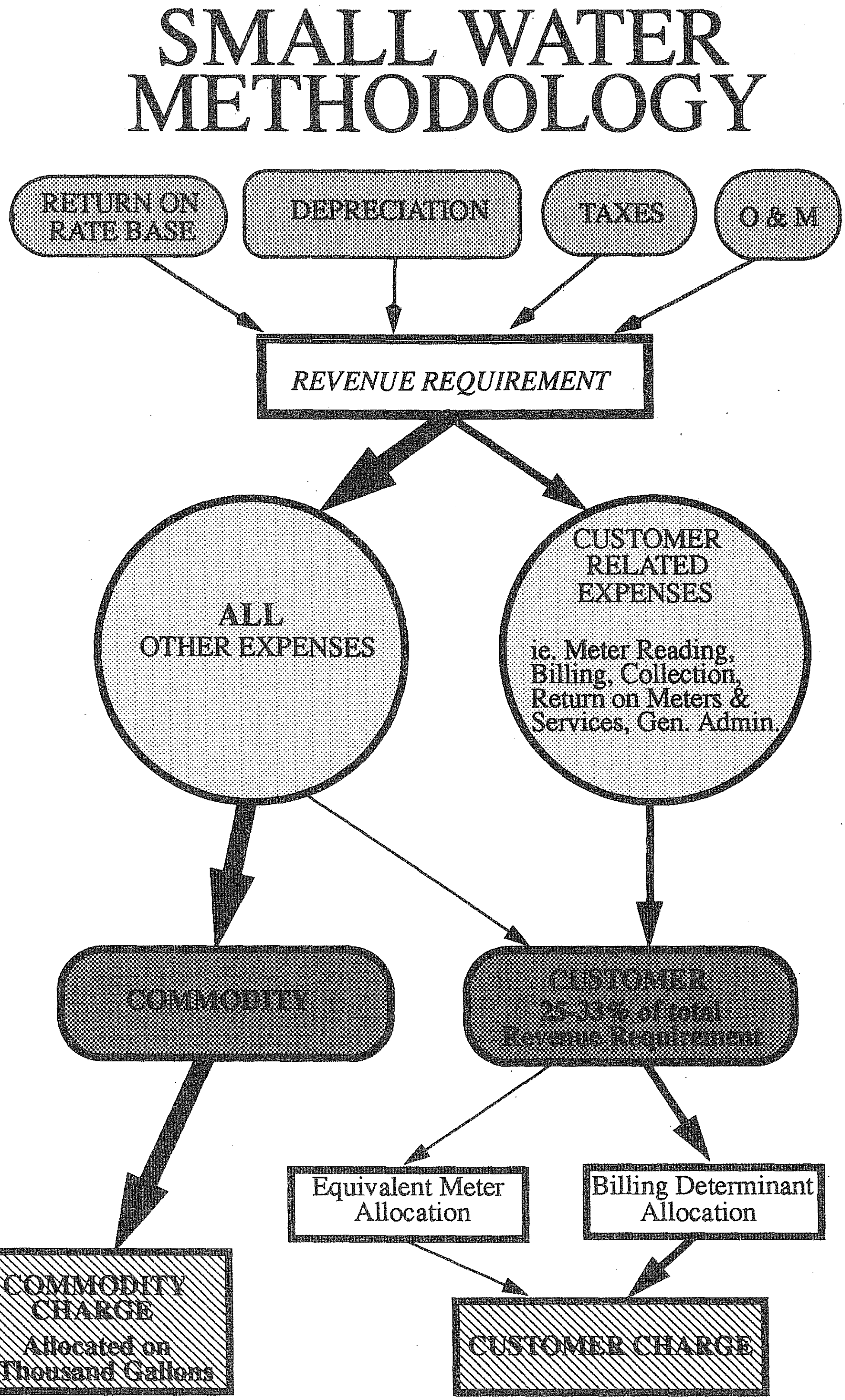


FIGURE 2


SMALL WATER METHODOLOGY
RETURN ON RATE BASE
DEPRECIATION
TAXES
O & M
REVENUE REQUIREMENT
ALL OTHER EXPENSES
CUSTOMER RELATED EXPENSES
ie. Meter Reading, Billing, Collection, Return on Meters & Services, Gen. Admin.
COMMODITY
CUSTOMER 25-33% of total Revenue Requirement
Equivalent Meter Allocation
Billing Determinant Allocation
COMMODITY CHARGE
Allocated on Thousand Gallons
CUSTOMER CHARGE

POTENTIAL CONSEQUENCES OF ABANDONING COST-BASED DECLINING-BLOCK RATES

BY
THOMAS R. STACK
ILLINOIS COMMERCE COMMISSION[1]

I. INTRODUCTION

This paper examines a declining-block rate structure that was adopted for a large investor-owned water utility regulated by the Illinois Commerce Commission. The current rates for that utility (developed after examining an embedded cost-of-service study utilizing the Base-Extra Capacity Method set forth in the American Water Works Association (AWWA) Manual M1[2]) are compared with rates resulting from application of both a single-block rate structure and an inverted-block rate structure. Bills for water service for various customer classes are then compared using the cost-based declining-block rates currently in effect and rates that would result if the rate blocks were eliminated or inverted. Finally, the potential reactions of large customers are considered if rates were to be modified in such a manner.

II. CHANGES IN RATE DESIGN IN THE WATER INDUSTRY

When the water supply industry first began in this country, customers were charged for water service based not directly on water usage but on various criteria serving as proxies for water usage including the number of people in the building, the width of the house, the size of the yard and the number of water using devices. Viewed today many of those old rate schedules appear almost comical. However, the lack of inexpensive, accurate meters required such rates in an attempt to recover costs fairly from customers.

With the introduction of meters that could accurately measure the volume of water usage in the late 1800s[3], charges began to be based directly on water usage. As meters became more economical, the vast majority of systems installed meters and

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[1] The views and opinions of the author do not necessarily state or reflect the views, opinions or policies of the Illinois Commerce Commission, individual Commissioners or other members of the Staff of the Commission.

[2] American Water Works Association, *Water Rates* - Manual M1 (Denver, Co: American Water Works Association, Fourth Edition, 1991).

[3] American Water Works Association, *Water Meters- Selection, Installation, Testing, and Maintenance* - Manual M6 (Denver, Co: American Water Works Association, Second Edition, 1972), Chapter 1.

changed to usage-based rates. In 1917, the noted water authority Allen Hazen wrote, "In the last sixteen years the increase in the use of meters has been rapid and the number of completely metered systems at the present time is much greater."[4]

As rate design became more sophisticated, declining-block rates together with a minimum bill or service charge were utilized in recovering the cost to provide water utility service. Over time, the declining-block rate structure became common and "for many years, a single schedule of declining-block rates applicable to all customers classes was the predominant water rate form in the United States."[5]

In 1954, the American Water Works Association (AWWA) published the report "Determination of Water Rate Schedules" which subsequently was issued as Manual M1.[6] Beginning with that report and subsequent revisions to the Manual, the recommended size of the rate blocks became more defined. The current version of Manual M1 (Fourth Edition) uses a rate structure consisting of three rate blocks as an example.[7]

Recently, due primarily to conservation considerations,[8] there has been some movement toward reducing the number of blocks in declining-block rate structures or even eliminating the declining-block rate structure entirely and moving to a single-block rate structure.[9] In some instances, inverted-block rates have been advocated and adopted. A survey of large water systems found that 51% of those systems utilized declining-block rates, 32% had a uniform (single-block) rate, and 17% had inverted-block

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[4] Allen Hazen, *Meter Rates For Water Works* (New York, NY: John Wiley & Sons, 1918), 10.

[5] American Water Works Association, *Alternative Rates* - Manual M35 (Denver, CO: American Water Works Association, First Addition, 1992), iv.

[6] American Water Works Association, *Water Rates* - Manual M1 (Denver, Co: American Water Works Association, Fourth Edition, 1991), 1.

[7] ibid, 41.

[8] American Water Works Association, *Alternative Rates* - Manual M35 (Denver Co: American Water Works Association, First Edition, 1992), 3.

[9] Massachusetts & California

rates.[10] Of water systems in the midwest, 22 out of 28 had declining-block rates while in the west only 2 out of 20 had declining block rates.[11]

III. ANALYSIS OF AN ILLINOIS UTILITY

A. DESCRIPTION OF THE EXAMPLE UTILITY

The utility[12] used in the example provides water service to some 65,000 customers -- including 57,200 residential, 7,600 commercial, 280 industrial, and 38 sale-for-resale customers. Public and private fire protection services are also provided.

This is one of older water systems in Illinois; the initial water system was constructed in 1885. The source of raw water supply is the Mississippi River. Extensive treatment of the water is provided before it is pumped into the distribution system. The service area consists of some 500 square miles and includes 927 miles of transmission and distribution mains and numerous storage tanks and booster stations. Much of the service area is in the valley lowlands of the Mississippi River and overlays extensive sand and gravel water bearing formations.[13] This area contains numerous industrial firms including divisions of a number of the nation's large corporations. Actual revenues for the water company for 1990 were approximately $23,300,000, based on sales of 18.541 billion gallons of water.

B. CURRENT WATER RATES FOR THE EXAMPLE UTILITY.

The rates used as an example for this paper are on file with the Illinois Commerce Commission as a result of a formal rate case.[14] During the course of that case the Utility presented its testimony and exhibits. Witnesses for the Utility were

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[10] George A. Raftellis, *The Arthur Young Guide To Water And Wastewater Financing And Pricing* (Chelsea, MI: Lewis Publishers, Inc., 1989), 168.

[11] ibid, 167.

[12] Illinois-American Water Company, Interurban Division, a wholly owned subsidiary of the American Water Works Company,Inc.

[13] G.E. Reitz, Illinois State Water Survey, Groundwater Levels and Pumpage In The East St. Louis Area, Illinois 1962-1966 (Urbana, Il: State of Illinois, Department of Regulation and Education), 1.

[14] Illinois-American Water Company, Proposed General Increase In Water Rates, Docket 90-0100, order entered by the Illinois Commerce Commission on November 20, 1990.

cross-examined by parties to the case which included the Commission Staff, a number of municipalities served by the utility, and a group of industrial intervenors. Witnesses for Staff and the industrial water users presented testimony and were cross-examined by the utility and other interested parties. Rebuttal testimony was filed by the utility and subsequently by the Staff. At the conclusion of the evidentiary portion of the case, a stipulation was reached whereby all active parties accepted Staff's position in its Rebuttal testimony with one minor modification with which Staff acquiesced.

The utility presented a full cost-of-service study utilizing the Base-Extra Capacity Method contained in AWWA Manual M1. Staff also presented a full cost-of-service study which utilized the Base-Extra Capacity Method. The rates adopted by the Commission's Order were stipulated to by all of the parties and were based on Staff's cost of service study. (It should be noted that the Utility's and Staff's studies resulted in very similar rates.)

The rates filed pursuant to the Commission's Order, usages by class, and the number of service connections by meter size are set forth in Table 1.[15]

As can be seen, the rates for general service consist of a service charge based on meter size and a charge for usage consisting of a declining-block rate structure. In addition, revenue results from public and private fire protection and miscellaneous services.

The quantity of water allowed in each rate block was determined in a previous rate case and was not changed as a result of this case. The quantity of water contained in the first block (usage of the first 3,000 cubic feet or 22,500 gallons per month) was selected so that virtually all the residential usage (97%) would be billed in that rate block. The second block (57,000 cu ft or 427,500 gal) was chosen so that it includes substantial commercial usage along with small industrial usage. The third block (1,240,000 cu ft or 9,300,000 gal) includes substantial usage from smaller industrial customers and some very large commercial customers. The fourth block (usage in excess of 1,300,000 cu ft or 9,750,000 gal) was selected so that it includes usage by very large industrial and resale customers.

C. RESULTING SINGLE-BLOCK RATE AND AN INVERTED-BLOCK RATE

Table 2 sets forth the declining block rates adopted by the Commission's Order in 91-0100. Also set forth on Table 2 is the

[15] ICC Staff Exhibit No. OPP 1.02 sponsored by the author in Illinois Commerce Commission, Docket No 90-0100.

REVENUES WITH COST-BASED RATES
BASE-EXTRA CAPACITY METHOD
AWWA MANUAL M1

TABLE 1

ITEM	RATES	RESIDENTIAL Bills	RESIDENTIAL Revenue	COMMERCIAL Bills	COMMERCIAL Revenue	INDUSTRIAL Bills	INDUSTRIAL Revenue	PUBLIC AUTHORITY Bills	PUBLIC AUTHORITY Revenue	SALES FOR RESALE Bills	SALES FOR RESALE Revenue	TOTAL
SERVICE CHARGES, MONTHLY METER SIZE												
5/8"	$6.50	685,971	$4,458,812	75,921	493,487	747	4,856	1,068	6,942	0	0	
3/4"	12.00	264	3,168	1,469	17,628	72	864	132	1,584	0	0	
1"	20.00	414	8,280	5,808	116,160	396	7,920	981	19,620	12	240	
1 1/2"	45.00	48	2,160	861	38,745	61	2,745	192	8,640	0	0	
2"	70.00	24	1,680	3,180	222,600	1,188	83,160	1,584	110,880	96	6,720	
3"	135.00	0	0	59	7,965	168	22,680	24	3,240	36	4,860	
4"	225.00	0	0	108	24,300	672	151,200	36	8,100	204	45,900	
6"	445.00	0	0	0	0	72	32,040	0	0	84	37,380	
8"	710.00	0	0	0	0	36	25,560	0	0	24	17,040	
TOTAL			$4,474,100		$920,885		$331,025		$159,006		$112,140	$5,997,155
USAGE CHARGES	Rate Per 100 Cu Ft.	Usage	Revenue	Usage	Revenue	Usage	Revenue	Usage	Revenue	Usage	Revenue	
First 3,000 Cu Ft/Mo	1.450	4,709,034	$6,828,099	953,011	$1,381,866	51,701	$74,966	72,830	$105,604	4,637	$6,724	
Next 57,000 "	0.989	116,311	115,032	890,973	881,172	442,179	437,315	334,418	330,739	88,864	87,886	
Next 1,240,000 "	0.851	8,306	7,068	386,125	328,592	2,093,569	1,781,627	203,476	173,158	1,606,668	1,367,274	
Over 1,300,000 "	0.611	0	0	0	0	3,723,388	2,274,990	0	0	2,856,919	1,745,578	
			$6,950,199		$2,591,631		$4,568,899		$609,501		$3,207,462	$17,927,692
TOTAL REVENUE BY CLASS			$11,424,299		$3,512,515		$4,899,923		$768,507		$3,319,602	$23,924,846

OTHER REVENUE		
PRIVATE FIRE PROTECTION	$84,888	
PUBLIC FIRE PROTECTION	$1,237,598	
OTHER OPERATING REVENUE	$31,936	
		$1,354,422
TOTAL REVENUE		$25,279,268

COMPARISON OF USAGE REVENUE UNDER VARIOUS RATE STRUCTURES
Keeping Service Charge And All Other Rates Constant

TABLE 2

	RATES	-----RESIDENTIAL----- Usage	Revenue	-----COMMERCIAL----- Usage	Revenue	-----INDUSTRIAL----- Usage	Revenue	--PUBLIC AUTHORITY-- Usage	Revenue	--SALES FOR RESALE-- Usage	Revenue	TOTAL
COST-BASED RATES - From Table 1												
First Block	$1.450	4,709,034	$6,828,099	953,011	$1,381,866	51,701	$74,966	72,830	$105,604	4,637	$6,724	
Second Block	0.989	116,311	115,032	890,973	881,172	442,179	437,315	334,418	330,739	88,864	87,886	
Third Block	0.851	8,306	7,068	386,125	328,592	2,093,569	1,781,627	203,476	173,158	1,606,668	1,367,274	
Fourth Block	0.611	0	0	0	0	3,723,388	2,274,990	0	0	2,856,919	1,745,578	
			$6,950,199		$2,591,631		$4,568,899		$609,501		$3,207,462	$17,927,692
SINGLE-BLOCK RATE												
First Block	$0.9668	4,709,034	$4,552,694	953,011	$921,371	51,701	$49,985	72,830	$70,412	4,637	$4,483	
Second Block	0.9668	116,311	112,449	890,973	861,393	442,179	427,499	334,418	323,315	88,864	85,914	
Third Block	0.9668	8,306	8,030	386,125	373,306	2,093,569	2,024,063	203,476	196,721	1,606,668	1,553,327	
Fourth Block	0.9668	0	0	0	0	3,723,388	3,599,772	0	0	2,856,919	2,762,069	
			$4,673,174		$2,156,069		$6,101,317		$590,448		$4,405,793	$17,926,801
DIFFERENCE FROM COST-BASED RATES			(2,277,025)		(435,561)		1,532,418		(19,053)		1,198,331	($891)
INVERTED-BLOCK RATES												
First Block	$0.788	4,709,034	$3,710,719	953,011	$750,973	51,701	$40,740	72,830	$57,390	4,637	$3,654	
Second Block	$1.048	116,311	121,894	890,973	933,740	442,179	463,404	334,418	350,470	88,864	93,129	
Third Block	$1.048	8,306	8,705	386,125	404,659	2,093,569	2,194,060	203,476	213,243	1,606,668	1,683,788	
Fourth Block	$1.048	0	0	0	0	3,723,388	3,902,111	0	0	2,856,919	2,994,051	
			$3,841,317		$2,089,371		$6,600,315		$621,103		$4,774,623	$17,926,729
DIFFERENCE FROM COST-BASED RATES			(3,108,882)		(502,259)		2,031,416		11,602		1,567,160	($963)

resulting single block usage rate, assuming the same revenue requirement and maintaining all other rates at the same level as found appropriate in the Commission's Rate Order. Finally, an example of an inverted-block rate is included. The inverted-block rate assumes a first block of 3,000 cubic feet which is probably higher than would normally be used but was chosen as an example for this paper since the usage information is available. Information needed to calculate the usage units for a rate block of 700 cubic feet per month which would be more typical of a lifeline usage that might be chosen for the first block of an inverted-block rate structure is no longer available to the author.

D. COMPARISONS OF BILLS WITH VARIOUS RATES

To understand the effect of eliminating rate blocks or inverting the rates, it is necessary to compare water bills at various levels of usage for each class of customer. Table 3 compares the bills (excluding add-on-taxes and public fire protection charges[16]) for residential customers using the currently effective rates, the single block rate, and an inverted-block rate. For this utility, the average residential usage is 700 cubic feet (5,250 gallons). Table 4 contains a comparison of bills for commercial customers, while bills for industrial customers are compared in Table 5.

E. DISCUSSION OF BILL IMPACTS WITH THE VARIOUS RATES

1. Residential Customers

If a single-block rate were to be utilized for this utility, the resulting usage rate would be $0.9668 or $0.4832 (33.3%) less than the current $1.45 rate in the first block of the cost-based rate design. Although the elasticity of water use may not be high for relatively small changes in water bills, especially for water use inside the home, decreasing the usage rate by one-third and the bills by 20% or more sends a rather clear price signal to the residential class that additional usage is appropriate. A usage rate of $.97/100 cu. ft. could encourage customers to water lawns when they might not have watered at a rate of $1.45 per 100 cu. ft. While a particular utility may have sufficient supply

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[16] In Illinois, municipal taxes, franchise fees, and the Public Utility Fund tax are added to the customer's bills as separate line items. Also, by law municipalities have the ability to choose the amount they are willing to pay for public fire protection. Any public fire protection costs not paid by a municipality are added to the bills of customers within that particular municipality. Since the taxes and fire protection charges vary by municipality they are not included in the bill comparison.

TABLE 3

MONTHLY BILL COMPARISONS
RESIDENTIAL CUSTOMERS

Usage Level (CCF)	Cost-Based Rates	Single-Block Bill	Single-Block $ Diff	Single-Block % Diff	Inverted-Block Bill	Inverted-Block $ Diff	Inverted-Block % Diff
300	$10.85	$9.40	($1.45)	-13.4%	$8.86	($1.99)	-18.3%
500	$13.75	$11.33	($2.42)	-17.6%	$10.44	($3.31)	-24.1%
700	$16.65	$13.27	($3.38)	-20.3%	$12.02	($4.63)	-27.8%
1,000	$21.00	$16.17	($4.83)	-23.0%	$14.38	($6.62)	-31.5%
2,000	$35.50	$25.84	($9.66)	-27.2%	$22.26	($13.24)	-37.3%
3,000	$50.00	$35.50	($14.50)	-29.0%	$30.14	($19.86)	-39.7%

Assumption:
5/8" meter for all usage levels

TABLE 4

MONTHLY BILL COMPARISONS
COMMERCIAL CUSTOMERS

Usage Level (CCF)	Cost-Based Rates	Single-Block Bill	Single-Block $ Diff	Single-Block % Diff	Inverted-Block Bill	Inverted-Block $ Diff	Inverted-Block % Diff
1,000	$21.00	$16.17	($4.83)	-23.0%	$14.38	($6.62)	-31.5%
3,000	$50.00	$35.50	($14.50)	-29.0%	$30.14	($19.86)	-39.7%
5,000	$69.78	$54.84	($14.94)	-21.4%	$51.10	($18.68)	-26.8%
10,000	$132.73	$116.68	($16.05)	-12.1%	$117.00	($15.73)	-11.9%
50,000	$528.33	$503.40	($24.93)	-4.7%	$536.20	$7.87	1.5%
100,000	$967.63	$986.80	$19.17	2.0%	$1,060.20	$92.57	9.6%

Assumption:
5/8" meter for usage to 5,000 ccf.
1" meter for usages in excess of 5,000 ccf.

TABLE 5

MONTHLY BILL COMPARISONS
INDUSTRIAL CUSTOMERS

Usage Level (CCF)	Cost-Based Rates	Single-Block Bill	Single-Block $ Diff	Single-Block % Diff	Inverted-Block Bill	Inverted-Block $ Diff	Inverted-Block % Diff
100,000	$1,017.63	$1,036.80	$19.17	1.9%	$1,110.20	$92.57	9.1%
500,000	$4,421.63	$4,904.00	$482.37	10.9%	$5,302.20	$880.57	19.9%
1,000,000	$8,831.63	$9,893.00	$1,061.37	12.0%	$10,697.20	$1,865.57	21.1%
3,000,000	$21,991.63	$29,449.00	$7,457.37	33.9%	$31,877.20	$9,885.57	45.0%
5,000,000	$34,476.63	$49,050.00	$14,573.37	42.3%	$53,102.20	$18,625.57	54.0%
10,000,000	$65,736.63	$98,100.00	$32,363.37	49.2%	$106,212.20	$40,475.57	61.6%

Assumption:
2" meter for 100,000 and 500,000 ccf
4" meter for 1,000,000 ccf
6" meter for 3,000,000 ccf
8" meter for 5,000,000 ccf
(2) 8" meter for 10,000,000 ccf

and treatment capacity to support a reasonable amount of lawn watering, such watering, unrestricted by price considerations, can cause low pressure conditions during peak periods due to the inability of the distribution system to deliver sufficient quantities to meet watering demands beyond what is typically contemplated.

Inverting the rate for the entire residential class, as in the example, would aggravate the price signal even further. Even if the rate were inverted for all usage beyond 600 or 700 cubic feet, there might be a signal to residential customers to use water wisely, but the rate would still be less than the rate currently in effect. Thus, there would be at least an initial price signal to use more water.

2. Commercial Customers

Small commercial customers will receive the same price signal that residential customers receive since they purchase in the same block. The effect on usage for most commercial customers would not be expected to be as great as on residential customers since many small commercial customers simply don't have the ability to use considerable amounts of outside water. Also, commercial customers view water as a business expense, and, in an attempt to maximize profits, can be expected to restrict usage.

Larger commercial customers presumably would be fairly neutral since their bills would change very little under either a single-block rate or the inverted-block rate used in the example.

3. Industrial Customers

Recovery of the revenue requirement of a utility can be thought of as a teeter-totter in a horizontal position with a large number of small use customers on one end and a small number of large use customers on the other end. If one end of the teeter totter is pushed downward, the other end must rise. If declining-block rates are eliminated, rates to residential and small commercial customers have been pushed downward. The rates to large users rates must then go up to maintain the same overall revenue from the usage charges. This is exactly what happens in our example. Industrial customers will experience a substantial rate increase if a single-block or inverted-block rate structure is adopted.

In moving from a cost-based declining rate structure to a single block rate structure, the resulting increase to industrial customers would be in the range of 33 to 49% depending on usage. This sends a very clear signal to reduce usage. This is especially true for an industrial firm that is competing with firms located in different parts of the country and throughout the world. For a firm using 10,000,000 cubic feet (75,000,000 gallons) of water a month, the elimination of declining-block rates would cost that customer an additional $32,000 per month for its water use. Presumably, that customer has already installed water reuse equipment in an effort to reduce costs to compete with other firms in other locations. However, an increase of this magnitude will send a strong price signal to take further action.

The situation is aggravated if inverted-block rates are employed. While the exact impact will depend on how low a rate is established in the initial block and the quantity of water included in block, the large user always will be effected more by inverted-block rates than by a single-block rate.

F. EXPECTED RESPONSE TO SINGLE-BLOCK OR INVERTED-BLOCK RATES

1. Residential Customers

With a usage rate reduction of one-third, if a single block rate were to be adopted, residential customers can be expected to be less concerned about the cost implications of watering their lawns. Accordingly, it is reasonable to expect that residential customers will have less incentive to restrict outside water use and therefore outside use will continue at the same or higher level than experienced with cost based rates.

2. Commercial Customers

Small commercial customers would see the same price incentive as residential customers so they can be expected to remain at the same usage level with perhaps some increased usage. However, the increase can be expanded to be less than that for residential customers since the price decrease will allow increased profits and therefore commercial customers can be expected to take advantage of the decreased price.

3. Industrial Customers

What type of response can be expected from industrial customers? For a very large customer a rather severe response can be expected. Assuming that a large firm has already taken actions to reduce water usage thorough recycling and similar activities, that firm will look at additional ways to reduce usage which were not economical with cost based rates.

Firms can also be expected to consider developing their own supply. Most industries are reluctant to commit their scarce capital resources to water production equipment. However, several industries have clearly indicated to Commission Staff that they will install their own water systems if the incentive is sufficiently high.

For this utility as well as for a number of other utilities in Illinois, large industries have an alternative to receiving water service from the utility. They can drill wells to obtain water. In some instances, they can obtain water from the same river from which the utility takes its supply. Also, many utilities do not require as high a level of water quality as must be provided by a public water supply. These industries may be using the water primarily for cooling purposes and potable quality is not required. Industries also have the option of purchasing their domestic water from the utility while obtaining process water from their own supply. In areas with plentiful groundwater, the threat by an industrial customer to develop its own supply must be seriously considered.

One Illinois water utility was faced with just such a threat from a large industrial firm. That firm was a steel company facing considerable foreign competition. Although the Commission is always concerned by the threat of the loss of a customer, when a firm purchases 25% of the water sold by a utility any threat to discontinue service gets considerable Staff attention. In this particular case, representatives of the steel company came to a meeting armed with construction plans and cost estimates. The utility was convinced that they were serious. After examining the plans and cost estimates, the staff was also convinced that the threat was real and the steel company should be taken seriously.

A special contract rate was developed to retain that firm as a customer of the utility because of the substantial contribution to fixed cost that would be made even at the reduced rates. With that contribution to fixed costs, the other customers were in a much better position than if that firm ceased being a customer altogether. The utility filed a special contract rate for that one customer and staff recommended that it be approved. The Commission allowed the rate to become effective -- thus keeping that firm as a customer of the utility.

A similar threat was made by a major industrial concern of another water utility. That firm used 13% of the total water sold by the utility. Again the firm was able to convince the utility that it was serious about developing its own water supply and would do so if some rate reduction was not made. The utility and the firm reached an agreed rate and after reviewing the specifies of the calculations, staff supported the rate. The rate order entered by the Commission approved the lower rate in an effort to retain the firm as a customer. Those rates were approved since the other customers would benefit from the retention of the firm, even though that firm would pay rates somewhat lower than those at full cost of service.

Depending on how much water is used and how much the cost of water impacts the bottom line of the particular business, industrial firms sometimes have another option. If the firm is a part of a national corporation, the national corporation can sometimes shift production to another less costly site. The corporation can even cease production at a particular site. In extreme cases, a firm can simply be driven out of business by the high cost of water.

G. POTENTIAL UNDESIRED RESULTS OF THE ELIMINATION OF COST-BASED RATES

The reason given for the elimination of a declining-block rate structure is that it promotes usage and therefore is anti-conservation. However, in the short run, the elimination of declining-block rates in instances where major industrial customers are served will initially reduce the rates to the residential customers, the very group that is most likely to use vast quantities of water for discretionary outside uses. In the long run, elimination of declining-block rates may severely reduce overall sales of a utility that has adequate supply and treatment capacity by encouraging the industrial users to develop their own supply or to transfer production to other plants.

The utility's sales may be reduced as contemplated by the new rate design. However, overall water usage for the area could remain at the same level due to industrial firms drilling their own wells, thus defeating the intended goal of the rate design. In addition, there are potentially dire consequences for the utility and the remaining customers since costs will be reduced relatively little (typically in the range of 10¢ to 25¢ /1000 gal due to reduced electrical and chemical use) while revenues will be substantially reduced (approximately 70¢ /1000 gal. for the example utility). This leaves the residential, commercial, and smaller industrial customers to bear a much higher percentage of the fixed costs that were formally spread over a much larger base.

IV. CONCLUSION

For the utility used as an example in this paper, replacing the declining-block rate structure with a single-block or inverted-block rate structure is not in anyone's best interest. It is not in the best interest of the industrial customers who will incur additional costs and consume precious capital to develop their own supply. It is not in the best interest of the remaining residential and commercial customers since they will have to bear a much larger percentage of the fixed costs and may be without a job if the industrial customer shifts production or closes the plant.

Elimination of the declining-block rate structure is most definitely not in the best interest of the utility who will see sales shrink and who must absorb reduced earnings until rate case proceedings can be concluded. Even then, complete recovery is not assured since intervenors and perhaps Staff could argue that plant is now under-utilized and therefore a portion of the utility's investment in plant should be deducted from rate base. If such an argument were to be successful, there is a potential for a financially ailing utility with bankruptcy as a real possibility.

The old saying, "If it ain't busted don't fix it," certainly seems to fit in this instance. The elimination of declining-block rates may be appropriate in some instances, but for the example utility and in much of the water-rich midwest, "fixing" the currently used cost-based declining-block rates will lead the utility and all of its customers down a very uncertain path.

WATER COSTING, PRICING, AND CONSERVATION

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I. INTRODUCTION

Water utility regulation by state and local agencies has traditionally employed average or embedded costing in rate design. Our premise is that although there exist numerous obstacles to employing incremental costing in rate design, incremental costs can be used as a basis for determining rate differentials as well for setting specific rates. If regulators are to give serious consideration to integrating incremental and average cost in rate design, one must examine the feasibility of such integration.

First, the merits and demerits of average cost and marginal cost pricing are reviewed. Second, several approaches for calculating marginal operating cost (MOC) are analysed. Third, two approaches for estimating marginal capacity costs (MCC) are examined, the Turvey method and the Average Incremental Cost method.

An important part of the paper is an extension of the MCC calculations. This extension involves the calculation of a conservation surcharge. This extension identifies excess or discretionary usage and estimates the incremental cost of consumers continuing long-term usage habits at levels inclusive of discretionary usage. The conservation surcharge can be viewed as providing a strong conservation signal and complements least-cost planning.

Conventional Water Utility Costing

A survey of state commissions regarding cost of service analysis in water rate cases indicates that a majority of commissions employ fully allocated cost approaches [Beecher and Mann, 1990]. Generally, one of two average cost approaches are used in water rate cases [American Water Works Association, 1991]. In some cases, the embedded cost approach is the commodity-demand method; this costing method is in essence a noncoincidental peak responsibility approach which 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 maximum demands, allocates some capacity costs to all user classes. In other cases, the embedded cost approach is the base-extra capacity method; this costing method is essentially an average and excess demand approach which considers both 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 causing costs of service to vary across customer classes include demand characteristics and the location of customers [Raftelis, 1989]. Demand characteristics include the level of usage (i.e., average day demand), timing of usage (i.e., maximum day demand), as well as customer annual load factors (i.e., average day demand/maximum day demand). For example, customers with lower load factors tend to cause higher unit 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 delivery costs to customers and thus can be a basis for establishing geographical zones for rate setting purposes.

In addition, cost differences can be caused by differences in service characteristics [Constanza, 1983]. Service characteristics include service quality and the type of service.

Conventional Water Rate Design

Demand patterns, customer location, and service characteristics are cost-causing characteristics. The implication is that customers with, for example, similar service requirements and similar patterns of usage should be placed in the same class of service for rate design purposes. If all customer usage patterns and service requirements were similar, there would be little reason to segment customers. In reality, customer average use, peak usage, and service characteristics vary to some degree. The variances are the basis for the design of a limited number of customer classes.

However, the conventional approach in the water utility sector has been 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 the proper design of the consumption blocks. For example, 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 large industrial or institutional users.

The most common water rate structure is the declining or decreasing block rate, in which the applicable (incremental) unit price declines with higher usage blocks. Conceptually, this rate form is cost-justified when the underlying cost structure is one of decreasing unit costs with increasing usage (i.e., economies of scale associated with capacity expansion and higher load factors associated with improved capacity utilization rates).

Regarding the declining block rate structure, its strengths are several. One, the rate form recognizes that certain costs of water provision are fixed in nature (e.g., depreciation of distribution mains) and thus automatically decline with increasing water consumption. Two, the rate form provides recognition that certain users (e.g., industrial customers) with relatively more price-elastic demands than other users require lower rates to induce them to remain in the system. The lower tail block rates can prevent large user withdrawal which can force the remaining users to bear a larger portion of total system costs. Three, the rate form provides recognition that 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.

The declining block rate structure also has several weaknesses. One, the rate form may not track costs with precision, given that some unit costs (e.g., pumping) tend to increase with increasing volume and given that some unit costs (e.g., treatment) tend to remain relatively constant with increasing volumes of service. Two, the rate form ignores the possibility that the volume discounts (intrablock rate differentials) are not cost-justified, i.e., not defensible on cost-causation principles.

A less common rate structure, but a form that is gaining in acceptance, is the uniform commodity rate in which one rate applies to all usage (thus the incremental unit price equals the average unit price).

Regarding the uniform rate, its strengths are several. One, the rate form involves low administrative costs and is easy for consumers to understand. Two, the rate form is generally compatible with prevailing notions of fairness and equity. Three, the rate form involves an absence of volume discounts that may discourage conservation. Four, the rate form recognizes that certain unit costs of water provision (e.g., treatment) can remain relatively constant with increasing volumes of service.

The uniform rate has several weaknesses. One, the rate form may not track unit costs of water supply with precision. That is, some water costs are fixed in nature (e.g., administrative and general) and thus automatically decline with increasing volumes of service. Two, the rate form fails to recognize that certain users (e.g., industrial consumers) with more price-elastic demands than other users may resort to self-supply in the absence of a low tail block rate, thus creating the regulatory problem of stranded water system investment.

Another less common rate structure, but also a form that is gaining in acceptance, is the increasing or inverted block rate in which the applicable incremental price increases with higher usage blocks. The inverted block rate structure has been advocated as a form of conservation pricing. Its advocacy has generally been on the presumption of increasing unit capacity costs with system expansion.

The strengths of the inverted block rate are several. One, the rate form provides recognition that certain unit capacity costs (e.g., source development) may increase with increasing demand and system expansion. Two, the rate form sends a strong conservation signal.

The inverted block rate has several weaknesses. One, the rate form can cause decreasing average demands without decreases in peak or maximum demands thus causing decreased load factors and revenue erosion. Two, the rate form, by not recognizing that large users with price-elastic demands may resort to self-supply, may generate revenue instability.

Water rate design is based on the concept of averages, e.g., an average customer with an average load factor and average maximum day demand. The process of designing customer classes extend the averaging concept to customers within the classes (implying that the average customer differs across customer classes). Thus, whether the water utility has one general class of customers or has several classes of customers, the end result of averaging will be some degree of price discrimination, i.e., rates will never perfectly match the cost of providing service to specific customers within the general class of customers or to specific customers within the customer classes.

Marginal Versus Average Costing

Both marginal and embedded costs can provide regulators with standards or benchmarks for rate design. In choosing between costing approaches, one must consider the merits and demerits of each [Malko and Nicolai, 1985].

The advantages of using embedded or average costs as the basis for water rates include: (1) the generation of revenues that match the revenue requirements of the water utility, (2) the allocation of costs actually incurred which is perceived by many as an equitable allocation, and (3) the use of a "traditional" measure of costs for designing rates.

The disadvantages of using embedded costs as the basis for water rates include: (1) the use of costs that are backward-looking, (2) the use of costs that are not relevant for long-term capacity planning, and (3) the use of costs that do not generate efficient price signals.

The advantages of using marginal or incremental costs as the basis for water rates include: (1) the use of costs that are forward-looking, (2) the use of costs that are relevant for long-term system planning, and (3) the use of costs that provide efficient price signals.

The disadvantages of using marginal costs as the standard for water rates include: (1) the generation of revenues that generally do not match utility revenue requirements, (2) the necessity in many cases to scale down cost estimates thus reducing the efficiency advantage, and (3) the use of costs that are viewed by many as highly abstract, and thus inappropriate bases for rates.

II. THE ESTIMATION OF MARGINAL COST

Short-run marginal cost is defined as the change in operating cost caused by varying the utilization rate of existing capacity. Short-run marginal cost is also known as marginal operating cost (MOC). There are alternative approaches that can be considered in estimating MOC for a water system; these approaches vary in complexity and in data requirements.

Long-run marginal cost is defined as the change in capacity cost and the change in operating cost caused by varying system capacity. Long-run marginal cost thus includes both the operating and capacity cost associated with capacity increments. However, the primary component of long-run marginal cost is marginal capacity cost (MCC). There are alternative approaches that can be considered in estimating MCC for a water system; these approaches vary in sophistication and in data requirements.

The selection of an estimation method for MOC and the selection of an estimation method for MCC involves judgment as well as tradeoffs across efficiency, rate stability, revenue adequacy, consumer understanding, and administrative feasibility.

Marginal Operating Cost

One option in estimating MOC is to employ the forecasted annual operating costs for the first year that the capacity increment is anticipated to become operational and then dividing that cost by the forecasted annual output for the same time period [Hanke, 1981]. The merits of this approach include simplicity, modest data requirements, and the generation of realistic (and thus acceptable) MOC estimations. The disadvantage of this approach is that it deviates from theoretical MOC, i.e., it essentially estimates an average MOC.

A second option is to employ the forecasted increment in operating costs over the entire planning period in which the capacity increment is anticipated to become operational and then dividing that cost by the forecasted increment in output for the same time period [Hanke, 1978]. The merit of this approach is that it generates average MOC estimates without substantial data requirements. The demerit of this approach it that it may generate unrealistic (and thus unacceptable) MOC estimates.

A third option is to employ the estimated annual operating costs (i.e., the operating cost increment) for the first year in which the capacity increment is to be operational and then dividing that cost by the planned firm yield (i.e., the output increment) associated with the project. The disadvantage of this approach is that it may be difficult for system design engineers to accurately estimate the initial operating costs associated with the capacity increment.

The Turvey Method

The Turvey method for estimating MCC expresses incremental cost as the cost imposed on the water system by consumers maintaining a specified growth rate in demand, as opposed to these consumers either accelerating or decelerating their usage growth [Turvey, 1976; Hanke, 1981]. The merits of this approach include its compatibility with economic efficiency and its modest data requirements. The disadvantage of this approach is that it may be viewed as a somewhat esoteric approach to apply in a regulatory context.

The Turvey approach can express MCC in one of two ways: (a) the cost imposed on the system by consumers accelerating their growth rate in permanent demand, from that previously forecasted; or (b) the cost savings to the water utility by consumers decelerating their growth rate in permanent demand, from that previously specified. Therefore, the choice in selecting the cost numerator is between (a) the incremental cost incurred by consumers accelerating their usage rates, and (b) the cost avoided by consumers decelerating their usage rates (i.e., engaging in conservation). The cost numerator is measured by the changes in the present value of capacity expenditures by either (a) shifting the capacity construction one year backward to the present (i.e., accelerating the capacity increment) or (b) shifting the capacity construction one year forward to the future (i.e., delaying the capacity increment).

In theory, the MCC estimations under either demand acceleration or demand deceleration should be identical. However, in practice, the cost increments caused by demand acceleration will tend to differ from the cost decrements caused by demand deceleration, i.e., the cost numerators will not necessarily be identical. Similarly, the demand increment denominators will not be identical under the two different demand conditions. In the Turvey approach, as well as in other MCC estimation techniques, the cost outcome is highly sensitive to both the cost numerator and the output denominator.

The calculation of MCC by the Turvey method employs a denominator that measures a change in permanent demand for one year, i.e., the Turvey estimate reflects the cost of adding capacity as measured by a single year change in permanent demand. Thus, the Turvey MCC estimates are not directly compatible with rate design, unless they are employed as a basis for fixed demand charges, similar to KW charges in electricity. That is, the Turvey estimates reflect the cost of increments to system capacity; these MCC estimates, by definition, can not be directly used as a basis for commodity rates, which are applicable to the output being produced by that capacity. The Turvey calculations reflect the cost of capacity increments; commodity rates apply to the output from that capacity. In brief, the Turvey estimates may have to be scaled before they can be employed as the basis for commodity rates. The scaling of the Turvey MCC estimates can be achieved by either an adjustment of the cost numerator (e.g., substituting annualized capital expenditures), an adjustment of the output denominator (e.g., substituting the planned firm yield of the new capacity), or by an arbitrary but expedient proportional scaling.

The Average Incremental Cost Method

The Average Incremental Cost (AIC) method for estimating MCC is a technique in which the cost numerator (total incremental cost) is defined as the annual payment, over the useful life of the capital expenditure, necessary to pay financing costs and fully recover the incremental capacity costs [Hanke, 1978; Mann, Saunders, and Warford, 1980; Beecher and Mann, 1990]. The AIC method incorporates both the service life of the capacity increment and an appropriate financing rate. The merits of this approach include its capability to produce MCC estimations which approach theoretical MCC and its acceptability to regulators. The disadvantage of this approach is its substantial data requirements.

A cost numerator can be computed for each of the functional areas being expanded in the system, i.e., source development, transmission, treatment and distribution. This allocation is necessary since the service lives (consumer payback periods) vary across the system components.

The critical step in the AIC approach, as in other MCC approaches, is the selection of the appropriate ouptut denominator to arrive at an estimate of average incremental cost (AIC), i.e., the conversion of total incremental cost into a cost per unit. One alternative is to divide the cost numerator by a measure of designed capacity. However, the use of designed capacity as the output denominator may underestimate AIC since it does not recognize differences between designed and utilized capacity and and does not recognize the magnitude of non-revenue producing water. Thus, alternative denominators are designed capacity adjusted for the anticipated utilization of the new capacity or anticipated revenue producing output.

III. MARGINAL COST AND THE REGULATORY PROCESS

In a regulatory context, an important difference between embedded and marginal cost approaches is the sequence of procedures. With embedded cost methods, revenue requirement determination is followed by cost functionalization, cost classification, interclass cost allocation, unit cost calculation, and finally rate design. The process starts with the premise of revenue-cost equality followed by an interclass cost allocation that achieves the matching of costs and revenues.

In contrast, marginal or incremental cost methods do not emphasize the equality of revenues and costs. With marginal cost methods, the selection of a planning horizon is followed by the estimation of marginal unit costs, cost classification, and then rate design incorporating a reconciliation of costs and revenues. The process starts with the premise of the equality of price and marginal cost followed by adjustments to insure that rates are compatible with revenue requirements. Since unit costs are directly calculated as the bases for rate structure, marginal cost methods generally do not involve interclass cost allocations.

Another important difference is that embedded approaches focus on historical costs and usage while marginal cost approaches focus on future costs and usage. However, this difference between the cost approaches tends to be overstated. For example, average cost is often used to approximate both incremental distribution cost and incremental customer cost since incremental cost calculations for these components tend to be less precise than for the production of utility services.

The Integration of Marginal and Average Cost

Few attempts have been made to integrate fully allocated or average costs with marginal or incremental costs. Melody [1971] can be considered a pioneer in initially examining the possible integration of average and marginal cost approaches. He advocated that average cost methods be employed in allocating revenue requirements to specific classes and services, that is, embedded cost would determine the rate levels for individual customer classes and services. He advocated that marginal cost estimations be employed for designing rates for customer classes and services, that is, incremental cost would assist in the structuring of prices. In his scheme, average cost is the rate level standard while marginal cost plays an important role in rate design.

We suggest that serious consideration be given to the integration of the average and marginal cost approaches. For example, seasonal (summer and winter) estimates of MOC can be important inputs in developing seasonal water rate structures. In addition, the MOC estimates can be employed as components in the design of various rate structures including inverted block rates. Finally, the MOC estimates provide a minimum standard below which no rate (for example, a wholesale rate) should be set.

Seasonal estimates of MCC can be important inputs in developing seasonal rate structures or in establishing the differential between the initial and second block rates in an inverted block rate structure. The MCC estimates from the AIC approach can be a basis for a uniform commodity rate. Without scaling, the MCC results from the Turvey approach can be the basis for demand or capacity charges.

The Calculation of a Conservation Surcharge

An example of the integration of marginal cost and average cost in water rate design is the development of a conservation surcharge. The conservation surcharge focuses on the cost savings from conservation (the elimination of discretionary usage). The end result is a commodity charge reflecting the costs that would be avoided if consumers decreased their levels of peak demand. The conservation surcharge identifies discretionary usage and then estimates the cost consequences of consumers continuing long-term usage patterns inclusive of this discretionary usage.

The first step in calculating the conservation surcharge is to identify discretionary usage. The estimation of the usage denominator involves judgment since discretionary usage levels vary across customers. For single-family residential customers, a portion of lawn sprinkling and other external usage can be identified as discretionary. For non-residential customers, a greater variety of uses must be considered in determining discretionary usage. The discretionary usage of all customers is then summed for the forecast period, i.e., the present upto the new trigger date for the capacity increment. The end result is an usage denominator that measures the cumulative level of discretionary usage.

The second step is the determination of the avoided cost numerator, which can be viewed as the capital expenditures required to supply the discretionary usage, if the latter is not eliminated by conservation. Using the Turvey method, the cost numerator measures the present value of the savings associated with delaying the capacity increment, if the excess usage is eliminated, or conversely, the capital expenditures required to meet the excess demand, if the latter were not eliminated by conservation.

Several steps are involved in constructing a conservation surcharge:

1. Identification of Planning Parameters. Water systems must engage in planning to ensure that adequate service is available upon demand. Future demand increases may require costly capacity increments. The underlying factors influencing the planning process must be assessed in determining the validity of implementing

conservation pricing to address that element of demand most impacting capacity planning.

2. Determination of Discretionary Demand. Implementation of effective conservation pricing will alter usage patterns during peak demand periods. The determination of discretionary usage requires an evaluation of seasonal demand characteristics by customer class. Residential lawn sprinkling and other external uses typically constitute the greatest portion of seasonal peak demand. For example, maximum day/average winter day demand ratios of 2:1 are indicative of service areas having substantial amounts of discretionary usage. In contrast, nonresidential discretionary usage is more variable and must be examined by type of business activity. Analyses of historical bill frequency distributions by type and size of customer provide a reliable basis for estimating discretionary usage. The estimates of discretionary usage by customer type and size can be then used for extrapolating the cumulative discretionary or marginal consumption for the forecast period. This usage estimate is the denominator in calculating the unit cost to be avoided by conservation.

3. Calculation of Inflation-Adjusted Costs Absent Conservation. The capacity costs that would be incurred in the forecast period, absent conservation, must be quantified in nominal dollars. The cost and timing of capacity increments would be extended through to their initial service year. The trigger date for construction is based on the construction time required to have the capacity increment available in the year of need. A present value analysis is conducted assuming the capital additions program absent conservation, and the program modifications required if conservation of the discretionary usage was attained over the forecast period. Assumptions as to inflation and discount rates are necessary to conduct the present value analysis.

4. Determination of the Conservation Surcharge. The difference between the present value of both capital programs, with and without conservation, is termed a capacity deferral benefit, i.e., the savings achieved through conservation. The conservation surcharge is then determined by dividing the capacity deferral benefit by the cumulative marginal usage expected to be conserved over the forecast period.

To illustrate the determination of the conservation surcharge, we have structured an example of a suburban water utility needing to add capacity in the year 2001. The utility is currently experiencing a maxiumum day/average day demadn ratio of approximately 1.65:1. The need for additional capacity is driven by the maximum day demands being experienced during the summer.

The water utility is experiencing a demand growth rate of 2.5 percent per annum. Figure 1 shows projected demand versus system capacity through the year 2010. The maximum day demand (projected at current usage trends) triggers the need for additional capacity by the year 2001. Average day demand can be met with present capacity. Exhibited in Figure 1 is the adjusted maximum day demand reflecting conservation of discretionary usage which results in the postponement of the needed capacity until 2004.

The service area is characterized by single-family residences on 1/4 to 1/2 acre lots and a mix of commercial, institutional, and light manufacturing accounts. Billing data indicate that the average single-family residence uses approximately 6,000 gallons per month for sanitary purposes; an average of 7,500 per month is consumed during the winter season. A judgment was made that an allowance of twice the winter average use be made for external water uses and varying family sizes. Thus, discretionary usage was defined as that in excess of 15,000 gallons per month during the summer season.

The calculation of the conservation surcharge involved several assumptions including: percentage of residential usage discretionary (5 percent), percentage of non-residential usage discretionary (1 percent), percentage of composite usage discretionary (4.5 percent), annual inflation rate (3.5 percent), discount rate (8.5 percent), trigger date for capacity increment without conservation (2001), trigger date for capacity increment with conservation pricing (2004), projected discretionary usage or marginal consumption (750 million gallons), and construction lead-time (5 years).

Figure 2 shows the nominal and present value capacity expenditures, with and without conservation. Figure 3 shows, under varying trigger dates, the inflation-adjusted construction costs. Under demand forecast #1, a continuation of present usage combined with demand growth requires construction to begin in 1997 resulting in nominal costs of $124,048,000 (present value of $74,342,000). Under demand forecast #2, conservation postpones the capacity increment; construction does not start until 2000. The utility experiences nominal construction costs of $137,533,000 (present value of $64,530,000). The conservation results in a capacity deferral benefit of $9,812,000, yielding a conservation surcharge of $13.08 per

1,000 gallons (when divided by the marginal usage of 750 million gallons).

In brief, the calculation of the conservation surcharge can be accomplished by identifying the avoided cost associated with discretionary usage over the forecast period. The application of the Turvey method in here produces a unit cost that is directly applicable to a commodity charge. The conservation surcharge unbundles the usage in excess of normal levels and identifies the incremental cost associated with that usage.

The conservation surcharge can 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 utility in implementing conservation programs. In essence, the conservation surcharge would not be a part of the revenue requirements of the utility. By being external to revenue requirements, the conservation surcharge provides an efficient and forward looking price signal without creating revenue instability.

The merits of the conservation surcharge are multiple. One, it can be integrated with the embedded cost approach. Two, it transmits an efficient and forward-looking price signal. Three, it complements least-cost planning if the accumlumlated funds from the conservation surcharge are used to finance conservation programs, i.e., it substitutes demand-side expenditures for supply-side capital investment. Four, it complements incentive regulation, i.e., permitting funding of conservation programs provides an incentive for the utility to implement these programs. Finally, the approach is compatible with the cost-causation standard as the charge is levied on consumers causing the triggering of the capacity increment. Consumers who elect to conserve avoid paying the surcharge; consumers who elect not to conserve fund the capacity that is ultimately necessary to meet the excess demand.

The problems associated with the conservation surcharge are primarily ones of implementation. For example, the billing system must be amenable to both the calculation of average usage in the prior winter quarter and the tracking of summer usage to provide for both the identification of discretionary usage and the application of the surcharge in the summer period. In addition, it may be difficult for regulators to permit a rate mechanism external to the revenue requirement process. This external funding mechanism could produce substantial amounts of revenue if consumers elect not to alter their present usage or consumption habits.

An Overview

The divergent results generally associated with the embedded and marginal cost approaches raises the issue of whether it is feasible to integrate the two costing approaches, in any meaningful sense, in water rate design. The integration difficulties, flowing in large part from embedded cost approaches focusing on historical costs and marginal cost approaches focusing on future costs explain the past limited application of marginal costs in water rate design. Given the potential divergence between historical and future costs, some may view any attempt at integrating the two costing approaches as the mixing of water and oil.

Despite the numerous difficulties, our conclusion is that there is much potential for the integration of average and marginal cost in water rate design. The conservation surcharge is provided as an example.

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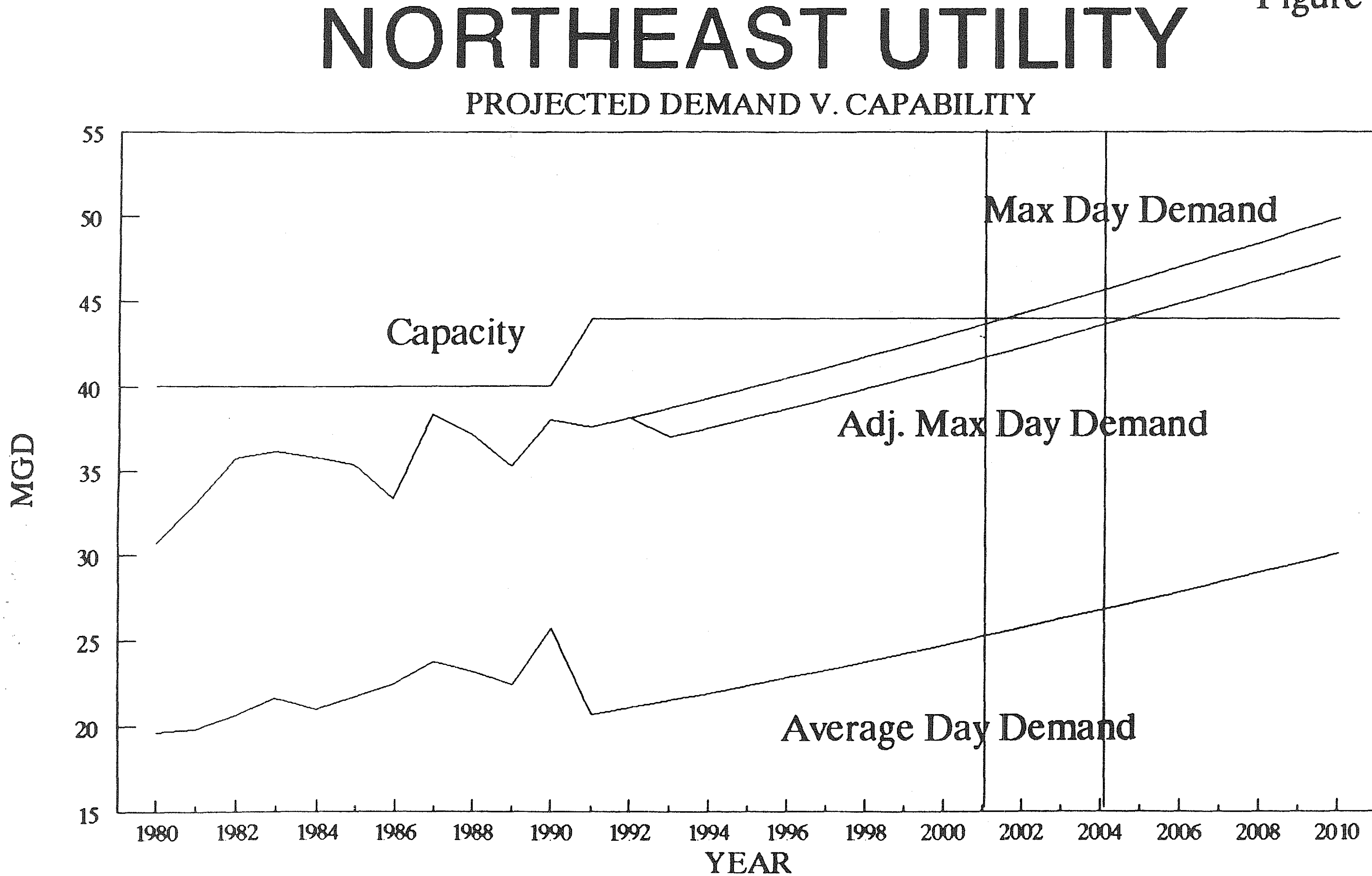
Figure 1


NORTHEAST UTILITY
PROJECTED DEMAND V. CAPABILITY
Max Day Demand
Capacity
Adj. Max Day Demand
Average Day Demand
MGD
YEAR
55
50
45
40
35
30
25
20
15
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010

Northeast Utility

Figure 2

Example Calculation of a Conservation Surcharge
($000's)

Discount Rate: 8.50%

Demand Forecast #1 [1]

Trigger Date: 2001	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Construction Costs [2]	0	0	0	0	3,181	12,723	63,614	31,807	12,723	0	0	0	0	0	0	0	0	0
x Present Value Factor	1.0000	0.9217	0.8495	0.7829	0.7216	0.6650	0.6129	0.5649	0.5207	0.4799	0.4423	0.4076	0.3757	0.3463	0.3191	0.2941	0.2711	0.2499
= Present Value	0	0	0	0	2,295	8,461	38,992	17,969	6,624	0	0	0	0	0	0	0	0	0

Nominal Construction Costs $124,048

Net Present Value 74,342

Demand Forecast #2 [3]

Trigger Date: 2004	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Construction Costs [2]	0	0	0	0	0	0	0	3,526	14,106	70,530	35,265	14,106	0	0	0	0	0	0
x Present Value Factor	1.000	0.922	0.849	0.783	0.722	0.665	0.613	0.565	0.521	0.480	0.442	0.408	0.376	0.346	0.319	0.294	0.271	0.250
= Present Value	0	0	0	0	0	0	0	1,992	7,345	33,846	15,597	5,750	0	0	0	0	0	0

Nominal Construction Costs $137,533

Net Present Value 64,530

Capacity Deferral Benefit [4] $9,812

/ Marginal Consumption [5] 750,000 Thousand Gallons

= Conservation Surcharge $13.08 per Thousand Gallons

(1) Demand Forecast #1 represents the flow of construction dollars in response to consumption in the absence of domestic water conservation.
(2) See Inflation Adjusted Construction Costs per Figure 2.
(3) Demand Forecast #2 represents the flow of construction dollars in response to consumption if all residential customers use water at the level of a "model consumer."
(4) The Capacity Deferral Benefit is the difference between the Net Present Value of construction costs of Forecast #1 and Forecast #2.
(5) Marginal consumption is the accumulated discretionary usage between effective date of rate increase and Trigger Date of Demand Forecast #2.

Northeast Utility

Figure 3

Calculation of Inflation Adjusted Construction Costs
($000's)

Annual Inflation Assumed 3.50%

Nominal Expend-itures	Trigger Date	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
97,500	1994	2,500	10,000	50,000	25,000	10,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100,913	1995	0	2,588	10,350	51,750	25,875	10,350	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
104,444	1996	0	0	2,678	10,712	53,561	26,781	10,712	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
108,100	1997	0	0	0	2,772	11,087	55,436	27,718	11,087	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
111,883	1998	0	0	0	0	2,869	11,475	57,376	28,688	11,475	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115,799	1999	0	0	0	0	0	2,969	11,877	59,384	29,692	11,877	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
119,853	2000	0	0	0	0	0	0	3,073	12,293	61,463	30,731	12,293	0	0	0	0	0	0	0	0	0	0	0	0	0	0
124,048	2001	0	0	0	0	0	0	0	3,181	12,723	63,614	31,807	12,723	0	0	0	0	0	0	0	0	0	0	0	0	0
128,388	2002	0	0	0	0	0	0	0	0	3,292	13,168	65,840	32,920	13,168	0	0	0	0	0	0	0	0	0	0	0	0
132,882	2003	0	0	0	0	0	0	0	0	0	3,407	13,629	68,145	34,072	13,629	0	0	0	0	0	0	0	0	0	0	0
137,533	2004	0	0	0	0	0	0	0	0	0	0	3,526	14,106	70,530	35,265	14,106	0	0	0	0	0	0	0	0	0	0
142,347	2005	0	0	0	0	0	0	0	0	0	0	0	3,650	14,600	72,998	36,499	14,600	0	0	0	0	0	0	0	0	0
147,330	2006	0	0	0	0	0	0	0	0	0	0	0	0	3,778	15,111	75,553	37,777	15,111	0	0	0	0	0	0	0	0
152,487	2007	0	0	0	0	0	0	0	0	0	0	0	0	0	3,910	15,640	78,198	39,099	15,640	0	0	0	0	0	0	0
157,823	2008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,047	16,187	80,935	40,467	16,187	0	0	0	0	0	0
163,345	2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,188	16,753	83,767	41,884	16,753	0	0	0	0	0
160,134	2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,335	15,640	80,935	41,884	17,340	0	0	0	0
174,982	2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,487	17,947	89,734	44,867	17,947	0	0	0
181,105	2012	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,644	18,575	92,874	46,437	18,575	0	0
187,444	2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,806	19,225	96,125	48,063	19,225	0
194,004	2014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,974	19,898	99,489	49,745	19,898

2. WATER UTILITY REGULATORY POLICY FORUM (VIABILITY)

Chairperson: G. Richard Dreese

Ohio Dominican College

A Quantitative Assessment of the Viability of Small Water Systems in Pennsylvania

Scott J. Rubin and Sean P. O'Neal[1]

I. Introduction

The problems of small water systems are well-documented and widespread. For example, a Pennsylvania study described small systems as "often hav[ing] deteriorated capital facilities to offer as security, and difficulties in making firm revenue guarantees."[2] Similarly, a Washington State study found that small systems were characterized by ineffective management, poor design, inadequate financing, and an inability to meet regulatory requirements.[3] Many small systems are not in compliance with requirements imposed by the Safe Drinking Water Act[4] and are not expected to be able to comply with those requirements.[5] Further, small systems often are unable to finance needed system improvements.[6] Indeed, in a review of significant non-complying water systems (SNCs), the General Accounting Office found that over 60 percent of the systems that were chronically out of compliance with drinking water regulations had fewer than 500 customers, and that fully 87 percent of the SNCs it reviewed had fewer than 3,300 customers.[7] The GAO also found that this "reflect[s] the makeup of the SNC universe overall."[8] Further, it found that "[t]he small size of these water systems affects their ability to finance corrective actions and, to some extent, compete for grants

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[2]Wade Miller Associates, Inc., *State Initiatives to Address Non-Viable Small Water Systems in Pennsylvania* (August 1991), p. 4-2; hereafter cited as Wade Miller, *State Initiatives*.

[3]Washington State Department of Health, Environmental Health Programs, Division of Drinking Water, *Small Water Systems: Problems and Proposed Solutions, A Report to the Legislature* (January 1991); hereafter cited as *Washington State Study*.

[4]42 U.S.C. §§ 300f, *et seq.*

[5]*See generally*, G. Wade Miller, John E. Cromwell III, and Frederick A. Marrocco, "The Role of the States in Solving the Small System Dilemma," *Journal American Water Works Association* (August 1988), pp. 32-37.

[6]Barry R. Sagraves, John H. Peterson, and Paul C. Williams, "Financing Strategies for Small Systems," *Journal American Water Works Association* (August 1988), pp. 40-43.

[7]U.S. General Accounting Office, *Drinking Water: Compliance Problems Undermine EPA Program as New Challenges Emerge*, No. GAO/RCED-90-127 (June 1990), p. 46.

[8]*Id.*

and loans."[9] Recently, the Public Utilities Commission of California found that this problem was reaching crisis proportions, stating: "The approximately 200 investor-owned small water utilities in California face a growing economic crisis that threatens their ability to deliver clean, safe drinking water to their customers."[10]

Generally, this problem has been referred to as the need to ensure small water system "viability."[11] EPA has defined viability simply with the following question: "Does the system have the capacity to be helped?"[12] The principal authors of the Wade Miller study (Cromwell, *et al.*) provide the following, more rigorous, definition of a viable water system: "A viable water system is one that is self-sustaining and that has the commitment as well as the financial, managerial, and technical capabilities to reliably meet performance requirements on a long-term basis."[13] Importantly, those authors emphasized that "viability is not a narrow concept of financial capability. It is instead a much broader concept of institutional capability that encompasses the ability to make and keep financial and managerial commitments on a long-term basis."[14]

It has been recognized that there is a need to be able to screen a large number of water systems for their viability. John Mannion, the Executive Director of the American Water Works Association, has stated the problem which the AWWA and EPA are studying: "The object is to establish criteria by which a water system can be classified viable or nonviable. Essentially, the criteria define whether or not the system has the capacity (water supply, technical, financial) to serve its customers water that meets safety standards, at an affordable price."[15]

To date, most studies which examine the viability of small water systems have followed the models employed by the GAO or by Wade Miller; that is, either an examination of a large number of systems based on one specific factor (in the case of the GAO study, Safe Drinking Water Act non-compliance), or a detailed, site-specific examination of a few systems. Neither of these methods is conducive to accurately screening a large number of systems for viability in a short period of time and at minimal cost. Site-specific examinations are time-consuming

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[9]*Id.*

[10]*Investigation on the Commission's own motion into financial and operational risks of Commission regulated water utilities, and whether current ratemaking procedures and policies require revision*, Decision 92-03-093 (Cal. PUC March 31, 1992), p. 1.

[11]*See, e.g.*, U.S. Environmental Protection Agency Office of Drinking Water, "Focus on Small System Viability," *Meeting the Challenge* (February 1991).

[12]*Id.*

[13]John E. Cromwell III, Walter L. Harner, Jay C. Africa, and J. Stephen Schmidt, "Small Water Systems at a Crossroads," *Journal American Water Works Association* (May 1992), pp. 40-48, at p. 42.

[14]*Id.*; *see also* Wade Miller, *State Initiatives*, p. 2-6.

[15]John B. Mannion, "Getting Ready for Bad Weather," *Journal American Water Works Association* (May 1992), p. 10.

and expensive. They simply cannot be conducted on hundreds of systems without a major commitment of resources. In contrast, looking at only one factor does not capture the multi-faceted nature of the viability problem. Any one factor may indicate only a short-term problem, may be a symptom of deeper problems, or may give a false sense of security.

State Public Utility Commissions (PUC) and Consumer Advocates generally concentrate their efforts on the overall quality of water service and the affordability of that service. In addition, rate regulators in many instances have tools which can be used to encourage regional consolidation of water systems where that appears to be feasible. In order to do so, though, rate regulators must have a relatively easy, accurate way to assess the viability of a large number of small water systems. For example, in Pennsylvania there were 260 privately owned water companies at year-end 1990. Of these, 239 (about 92%) had annual revenues of less than $500,000. Importantly, though, in terms of determining the resources which can be devoted to these smaller systems, *92% of the water companies accounted for less than 5% of the water revenue* from private water companies. Table 1 briefly summarizes the population of privately owned water companies in Pennsylvania. As that table shows, Pennsylvania has a large population of small water systems. However, these systems cannot be characterized as "viable" or "nonviable" just based on their size.[16]

Table 1: Privately Owned Water Companies in Pennsylvania

Size (Annual revenue)	Number of Companies	Percent of Companies	Revenue ($ million)	Percent of Total Revenue
> $10,000,000	4	1.54%	258.55	83.77%
$1,000,000 to $10,000,000	13	5.00%	33.44	10.83%
$500,000 to $1,000,000	4	1.54%	2.89	0.94%
$100,000 to $500,000	39	15.00%	9.21	2.98%
$50,000 to $100,000	27	10.38%	1.94	0.63%
< $50,000	173	66.54%	2.62	0.85%
Total	**260**	**100.00%**	**308.65**	**100.00%**

In an attempt to prioritize and focus our work on small water systems, we set out to develop a relatively simple, quantitative assessment of the viability of small water systems using information already on file with the Pennsylvania PUC. The resulting index of viability, the Small Utility Ranking Formula (SMURF), is based on an examination of 20 indicators of viability; five each in the areas of size, rates, management, and finance. The index results in an overall viability score on a scale of 0 (nonviable) to 100 (viable), as well as sub-rankings on a scale of 0 to 25 in each of the four major areas (size, rates, management, and finance).

[16]U.S. Environmental Protection Agency, *Restructuring Manual*, No. EPA/570-9-91-035 (December 1991), p. 9 ("This is not to say that *all* small systems are non-viable; some small systems are non-viable and most non-viable systems are small.") (emphasis in original).

Section II of this paper briefly characterizes the population of small water systems in Pennsylvania. It is followed in Section III by a complete description of the 20 factors which comprise the SMURF index. Section IV of the paper then describes the resulting SMURF scores for 139 utilities in Pennsylvania. This section also contains a comparison of SMURF scores for several companies to on-site reviews and other company-specific information. Section V presents an analysis of these companies which places them into six major categories. Finally, Section VI contains a series of recommendations for the use of these categories and for future activities and research.

II. Small Water Systems in Pennsylvania

For purposes of our work with small utilities, we have classified 239 of Pennsylvania's 260 privately owned water systems as small water companies. These companies have less than $1,000,000 in annual gross revenue and share other characteristics relating to customer base, affiliated companies, and their history of interaction with our Office. Using annual reports, company tariffs, and rate case data on file at the Pennsylvania PUC, we obtained the information required to perform our analysis for 139 of the small water companies. The remaining 100 companies did not have current annual report data available. Their failure to comply with the filing requirements of the PUC suggests poor management and/or insufficient size. Although these companies have not been included in our analysis, they are likely candidates for viability problems and should be addressed separately. Excluding these 100 companies, our analysis is based upon a population of 139 small water companies.

The distribution of company size in our data group is similar to the distribution of all privately owned water systems in Pennsylvania. As detailed in Table 2, the majority (57%) of companies in our data group have annual gross revenues less than $50,000. This percentage would be higher if not for the significant number of companies with less than $50,000 in revenues for which annual report information was not available.

Table 2: Small Water Companies Included in Study

Size (Annual Revenue)	Number of Companies	Percent of Companies
$500,000 to $1,000,000	1	0.72%
$100,000 to $500,000	34	24.46%
$50,000 to $100,000	25	17.99%
< $50,000	79	56.83%
Total	**139**	**100.00%**

Some of the characteristics of the companies that comprise our data group are summarized in Table 3. In each case the data range is large, but the average approaches the lower end of the range. Some statistics of the data reveal significant shortcomings of Pennsylvania's small water systems. For instance, only 74 of the 139 companies (53%) were profitable. Additionally, an average net plant per customer of $722 and average annual gross revenue per customer of $231 could signify widespread problems among Pennsylvania's small water systems. These figures are significantly lower than the nationwide averages for larger water companies which are $1,290 of net plant per customer and $378 of annual revenue per customer.[17]

Table 3: Small Water Company Characteristics

	Minimum	Maximum	Average
Annual Gross Revenues	$1,920	$718,679	$85,537
Number of Customers	5	2,129	357
Net Income	($135,643)	$559,855	$61
Net Plant per Customer	$4	$7,224	$722
Annual Gross Revenues per Customer	$42	$1,364	$231

These data confirm what our experience had indicated. On an overall basis, Pennsylvania's small water companies are deficient in every major area: size, profitability, capitalization, and revenues.

III. The SMURF Index

In order to help assess the viability of these water systems individually, we developed an index of small water system viability based on 20 criteria. Five criteria each were chosen in the areas of size, management, rates, and finance. These criteria were chosen for two reasons. First, they were indicative of an important factor related to the ability of a water system to operate as one would expect a public utility to operate. Second, they were able to be quantified from information on file with the Pennsylvania PUC. Table 4 shows the 20 factors which comprise the SMURF index.

Each of these factors was scored on a scale of 0 to 5, with 0 being poor and 5 being good. The reasons for choosing, and the method of scoring, each factor are discussed below.

[17]Calculated from National Association of Water Companies, *Financial and Operating Data 1990* (1991).

Table 4: SMURF Variables

Variable	Description	Ranking (Low to High)
Size Variables		
NO_CUST	Total number of customers	< 200 to ≥ 1000
GR_PLANT	Gross utility plant in service	< 100,000 to ≥ 1,000,000
REVENUE	Gross utility operating revenue	< 75,000 to ≥ 375,000
GALLONS	Million gallons delivered	< 10 to ≥ 70
NON_RESID	Percent non-residential customers	0 to ≥ 20%
Rates Variables		
RATE	Typical annual residential rate	< 100 or ≥ 650 to ≥300 and < 450
RATETYPE	Flat, fixture count, or metered rate	FLAT=0, FIXTURE=2, METER=5
STANDBY	Charge stand-by fee for vacant lots	YES=0, NO=5
MINIMUM	Minimum bill as % of typical rate	< 20% to ≥ 60%
PUC_EXAM	PUC examination in last 5 years	NO=0, YES=5
Management Variables		
REPORT	Quality of annual report	POOR (1) to GOOD (5)
NO_CASES	Number of rate cases in last 10 years	0 to ≥ 5
RATE_AGE	Age of current rates	≥ 10 to < 2
PLANTAGE	Depreciation reserve as % of gross plant	≥ 50% to < 10%
AFFIL	Number of affiliated companies	0 to > 8
Finance Variables		
INCOME	Net income	≤ 0 to ≥ 75,000
EQUITY	Shareholder's equity	≤ 0 to ≥ 400,000
EQ_RATIO	Equity as percent of total capital	≤ 0 to ≥ 40%
CASHFLOW	Net income plus depreciation	≤ 0 to ≥ 75,000
DEBT	Debt as percent of net plant	≥ 70% to < 30%

A. Size Variables

The size variables are designed to measure the raw size of the company. They are not meant to indicate the quality of management or overall financial capability of the company. Thus, while some of the factors were designed based on good management principles (for example, the average plant investment per customer), they do not directly measure the quality of management. The raw size of the system is important, though, in determining the system's ability to respond to system emergencies, its ability to hire professional personnel, and its ability to spread costs of improvements among customers without causing large rate increases, to name a few. All of the size data were obtained from annual reports which all water utilities are required to file with the PUC.

Number of Customers. The number of customers served by a water system is one of the first indicators that a system may not be viable. We classified systems with 1,000 customers or more as being good (score of 5). A customer count of 1,000 roughly corresponds to a population of 3,300 which is EPA's small system cut-off point.[18] In addition, 1,000 customers was used in the *Washington State Study* to separate small systems from large systems.[19] On the low end of the scale, we defined a system with fewer than 200 customers as having a poor size (score of 0). The lower end of the scale is somewhat arbitrary; however, it was felt that with fewer than 200 customers, the system was unlikely to be able to afford a professional operator, to finance system improvements, or to deal with emergencies. Between 200 and 1,000 customers, we scored one point for each 200 customers or fraction thereof (200 to 400 scored 1 point, etc.).

Gross Plant. From our work with several water systems, it appeared that a system which has been reasonably maintained would have an investment in gross utility plant approximating $1,000 per customer. This was confirmed by examining data compiled by the National Association of Water Companies (NAWC) for investor-owned water utilities with annual revenues above $1 million.[20] From the NAWC data for 94 companies, we calculated an average investment of approximately $1,600 per customer. Applying this standard to our 1,000 customer utility, we used $1 million gross plant investment as an indication of good size (score of 5). On the low end of the scale, we used a gross plant investment of less than $100,000 as an indication of either poor size, poor plant replacement policies, or both (score of 0). This would equate either to a very small system or to a larger system which is undercapitalized. Between these extremes, one point was scored for each additional $225,000 of plant investment, or fraction thereof.

Total Revenue. For total revenue, we considered a good size to be more than $375,000 in annual revenue. This would indicate average revenue of approximately $375 per customer. While this would be higher than we would expect to see for residential customers, we consider a viable small system to also have a base of commercial customers. Once again, this was confirmed by analyzing the large company data from NAWC. Those data show average gross revenue per customer of approximately $378 per year. Overall, then, we consider revenue in this range to be an indicator that the company is adequately sized to remain viable. On the opposite end of the scale, we consider total revenue of less than $75,000 per year to be an indicator of poor size. This would indicate either a low amount of revenue per customer, a small number of customers, or a combination of the two. Again, a low revenue base affects the company's ability to respond to emergencies, make needed improvements, and so on. In between, we scored one point for each additional $75,000 in annual revenue, or fraction thereof.

Gallons Delivered. We based the upper end of the range for gallons delivered on a system which had 1,000 residential customers with average use of 15,000 gallons per quarter. We also allowed 20% lost or unaccounted for water. The result of this calculation would be

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[18]40 C.F.R. § 141.2.

[19]*Washington State Study*, p. 9.

[20]National Association of Water Companies, *Financial and Operating Data 1990* (1991).

annual water deliveries of approximately 72 million gallons.[21] We rounded this down to 70 million gallons as indicating a good size. Obviously, a system with fewer customers and greater usage per customer (due to commercial customers, for example) would be able to meet this standard. On the low end of the scale, we estimated that a system which delivers less than 10 million gallons per year was poorly sized. It also should be noted that systems which failed to report gallons sold or delivered were automatically given a zero, since this indicates a lack of adequate knowledge about system operations. Indeed, in our experience, this often indicates a total lack of metering, even at the production level. Between 10 million and 70 million gallons, we allowed 1 point for each 15 million gallons or fraction thereof.

Percent Non-Residential Customers. The last size variable is an indication of the diversity of the customer base. Generally, having a diverse customer base (that is, having commercial and industrial customers) helps to ensure a more stable revenue base and generally provides a larger amount of revenue per customer. We set 20% non-residential customers as an indication of good diversity. While this figure is relatively high, we believe that in order to ensure viability, the percentage of non-residential customers should go up as the number of customers goes down. Thus, we would expect to see a smaller percentage of non-residential customers as the number of customers increases. This is borne out in the NAWC data for larger companies, from which we calculated an average of approximately 10% non-residential customers. On the low end of the scale, we gave 0 points for companies with no non-residential customers. Between 0 and 20%, we awarded 1 point for each 5% or fraction thereof.

B. Rates Variables

Typical Annual Residential Rate. Rates which are either too high or too low are an indication that the utility may not be viable. Rates which are too low can often jeopardize the system's ability to generate sufficient revenue to operate reliably, respond to emergencies, make needed improvements, and so on. Rates which are too high can indicate a system which is on the verge of collapse (spreading costs over fewer customers), one which is poorly managed (for example, by not refinancing high-cost debt), and one where customers are more likely to by-pass the system by drilling private wells. To measure this effect, we used the utility's tariffs on file with the PUC to calculate the annual water bill for a typical residential customer. We define a typical residential customer as one who uses 15,000 gallons per quarter. For systems which have rates based on a fixture count, we used a customer with the fixtures shown in Table 5. We considered a rate level between $300 and $450 per year to be within a range that would help ensure the viability of a water system, and gave those systems 5 points. If the rates are below $100 or above $650 per year, we considered that to be an indication of serious problems and awarded no points. In between, we scaled these values by $50 per year (between $100 and $150 per year or between $600 and $650 per year was 1 point, etc.).

[21] 15,000 gallons/quarter x 4 quarters x 1.2 (UFW factor) x 1,000 customers = 72 million gallons.

Type of Rate. Three types of rates are prevalent in the water industry: flat rates, fixture rates, and metered rates.[22] The type of rate which a system charges has been linked to the viability of the water system. Specifically, the Wade Miller study found: "The type of rate structure is also a good indicator of whether or not a system will be able to meet existing and future financial needs. A rate based on consumption is encouraged .... A rate based on the number of fixtures a customer maintains ... is inadequate."[23] Unquestionably, metered rates are preferred because of their ability to provide accurate price signals based on the quantity of water actually used.[24] As the Wade Miller study stated: "The rate structure employed for any water system must reflect the actual scarcity value of water in order to ensure an adequate flow of revenues to cover current and future expenses of the system."[25] Beecher and Mann agree and further state that fixture rates are generally preferred to flat rates, since fixture rates are more closely related to the cost of service than are flat rates.[26] They also found that "fixture rates may be justified in instances where the cost of metering outweighs its benefits."[27] Consequently, we awarded 5 points for metered rates, 2 points for fixture rates, and 0 points for flat rates.

Presence of Stand-by Charge for Vacant Lots. In Pennsylvania, the PUC allows water systems serving vacation home developments to charge a stand-by rate for undeveloped lots. In this way, the water system is allowed to recover the fixed costs of having installed a water system which is ready to serve new construction. In practice, though, many lot owners do not pay the stand-by charge. They may allow a large arrearage to build up, which they do not pay until they are ready to build a house. The utility is essentially powerless to enforce payment of a stand-by charge (it cannot terminate service to a vacant lot). Thus, we have found that the presence of a stand-by charge can indicate serious cash-flow problems. It also could indicate future problems with an inadequately sized system (either too large because the expected number of homes were not built, or too small because building takes place more rapidly than anticipated). We therefore awarded 5 points if the system does not have a stand-by charge and 0 points if it does.

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[22]Janice C. Beecher and Patrick C. Mann, *Cost Allocation and Rate Design for Water Utilities*, National Regulatory Research Institute, Inc. (December 1990), p. 107; hereafter cited as Beecher and Mann, *Cost Allocation*. These authors define flat rates as "a periodic fixed charge for water service that is unrelated to the amount of water consumed" and fixture rates as "a periodic fixed charge for water service related to water-using fixtures on the customer's premises."

[23]Wade Miller, *State Initiatives*, p. A-19.

[24]Beecher and Mann, *Cost Allocation*, p. 106.

[25]Wade Miller, *State Initiatives*, p. A-19. *See also* American Water Works Association, *Water Rates* (Manual M1, 3rd Edition 1983), p. 69.

[26]Beecher and Mann, *Cost Allocation*, p. 111.

[27]*Id.*

Table 5: Typical Residential Fixtures

● Kitchen sink (or first faucet)
● Outside spigot/hose
● First bathtub
● First water closet
● Extra water closet
● First lavatory (sink)
● Extra lavatory (sink)
● Automatic clothes washer

Minimum Bill as Percent of Typical Annual Rate. An important element of the rate structure is its ability to provide a relatively stable stream of revenues to the utility. For purposes of assessing the viability of a water system, we believe that the more regular the revenue stream, the better. We would caution that this is *not* meant to suggest that very stable rates are desirable for other purposes (such as encouraging conservation).[28] The initial focus, though, must be on the ability of the rates to provide revenues to the utility as the revenues are needed. Consequently, we awarded 5 points if the minimum bill was at least 60% of the typical bill. If the minimum bill was less than 20% of the typical bill, we awarded 0 points. In between, we awarded 1 point for each additional 10 percentage points or portion thereof. Obviously, there is a relationship between the type of rate and this variable. A flat rate will automatically receive a total of 5 points between the two variables (0 for rate type and 5 for minimum bill); a fixture rate will receive 7 points; while a metered rate will score between 5 and 10 points, depending on the variability of revenues.

Whether PUC Has Examined Rates in Past 5 Years. We have found that another important indication of small system viability is whether the PUC has closely examined the company's rates. Typically, a rate case review will entail an examination of the quality of service, financial management, and other important issues. Thus, we awarded 5 points if the PUC had conducted a detailed rate review during the past 5 years and 0 points if it had not. We also should note that we defined a detailed rate review as one where the PUC actually suspends a proposed rate increase for a full investigation. Often these cases are settled, but not until after the Commission staff and other parties have obtained a significant amount of information about the company's operations. Where companies received rate increases without the PUC conducting a full investigation (which often happens), they were not counted as a PUC examination of the company.

[28]Beecher and Mann stated: "Flat fees ... insulate utilities from fluctuations in use caused by weather and other factors. However, most analysts reject the idea of flat fees because they send a poor price signal to customers about the cost of water service, nor do they provide an incentive to conserve. Flat fees, in fact, tend to encourage waste." Beecher and Mann, *Cost Allocation*, p. 106.

C. Management Variables

The management variables are measures of the quality of management of the utility. We looked for simple factors which would indicate whether the system was being operated as one would expect a public utility to operate.

Quality of Annual Report. This is a subjective assessment of the quality of the annual report filed with the PUC. It is based on factors such as whether entries were made in the proper location, whether numbers were added properly, whether all applicable information was provided, and so on. In order for this factor to be assessed properly, it is important that no more than 2 or 3 people actually examine the annual reports and that they agree on the relevant criteria. The reports were scored on a scale of 1 to 5, with 1 being poor and 5 being good.

Number of Rate Cases in Past 10 Years. During the 1980's, we would expect most well-managed water utilities to have requested a rate increase approximately once every two years. Several of the larger water companies in Pennsylvania requested rate relief on 12- to 18-month cycles during this time period. Further, at least one study has indicated that while customers' consumption will fall with a large rate increase, there may not be a measurable response to a series of smaller increases.[29] Thus, it appears that regular, moderate rate increases may help assure the viability of a water system. To assess this variable, we simply counted the number of rate cases filed during the past 10 years. We awarded 1 point for each rate case, up to a maximum of 5 points.

Years Since Rates Changed. Another important indicator of management's attentiveness to its finances is the age of the current rates. Obviously, if the rates have not changed in many years, one would seriously question the quality of the company's management. If the rates were less than 2 years old, we awarded 5 points (consistent with our belief that a rate case should have been filed roughly every 2 years during the past decade). If the rates were 10 years old or older, we awarded 0 points. In between, we took away 1 point for each 2 years or fraction thereof.

Average Age of Plant. For a water system to remain viable, it must adopt a reasonable plant replacement policy. A good indicator of viability, then, is the age of the currently installed plant. Rather than attempting to measure the age of plant directly (which is not possible from records routinely filed with the PUC), we examined the depreciation reserve as a percentage of the gross plant in service. This provides a rough measure of the age of the plant. Most small systems use a standard 40- or 50-year life for most of their utility plant. Thus, if the depreciation reserve equals 25% of gross plant, the plant would have an average age of 10 to 12.5 years. To assess the age of plant, we allowed 0 points if the depreciation reserve was 50% or more of the gross plant amount, and 5 points if the reserve was less than 10% of gross plant. We allowed 1 point for each 10% change in the ratio (between 40 and 50% was 1 point, etc.).

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[29]Jack A. Weber, "Forecasting Demand and Measuring Price Elasticity," *Journal American Water Works Association* (May 1989), pp. 57-65.

Number of Affiliated Companies. This variable is a simple measure of the likely level of expertise of the utility's management. If the utility is affiliated with several other utilities, it is more likely to have professional management, sound financial policies, and so on. We allowed 1 point for each 2 affiliated companies, up to a maximum of 5 points (for more than 8 affiliated companies).

D. Finance Variables

We chose five fairly standard measures of financial integrity to assess the financial viability of the water system. In examining the financial health of the companies, we were looking as much for an ability to cope with emergencies as we were with providing a certain level of profits to the owners of the company. Thus, a company making a small profit but with no debt might score better than a highly leveraged company with higher net income. In our view, this is justified because the system with a small amount of debt might be better positioned to obtain an emergency loan than a highly leveraged company would be. Importantly, though, we evaluated debt based on the capability to obtain new debt (that is, debt as a percentage of net plant), rather than on an absolute basis. Consequently, a system with no debt and fully depreciated plant would receive 0 points for debt; while one with no debt and fairly new plant would score much higher. We scored the variables according to the rankings shown in Table 4, with points being awarded in equal increments (for example, the shareholders' equity range is $0 to $400,000, so $0 to $100,000 would score 1 point; $100-200,000 would score 2 points, etc.). The only exceptions to these were net operating income and cash flow where 1 point was awarded for the first $10,000, then 1 point for each additional $15,000 or fraction thereof. The finance variables that were assessed, and how they were calculated from data in utilities' annual reports, are shown in Table 6.

Table 6: Finance Variables

$$\text{Net Operating Income} = \mathit{Revenues} - \mathit{Expenses}$$

$$\text{Shareholders Equity} = \mathit{Retained\ Earnings} + \mathit{Paid\text{-}in\ Capital}$$

$$\text{Equity Ratio} = \frac{\mathit{Equity}}{\mathit{Equity} + \mathit{Debt}}$$

$$\text{Net Cash Flow} = \mathit{Net\ Income} + \mathit{Depreciation\ Expense}$$

$$\text{Plant Age} = \frac{\mathit{Debt}}{\mathit{Gross\ Plant} - \mathit{Depreciation\ Reserve}}$$

IV. Applying SMURF to Pennsylvania's Small Water Systems

The SMURF index was calculated for the 139 small water companies in our study group. The resulting scores followed an approximate normal distribution about the mean score of 40.87

(see Figure 1). The scores were diverse, ranging from a low of 13 to a high score of 83. Despite the large range, the majority of scores were concentrated around the mean. Nearly 72% of the data fell within the range of one standard deviation (13.24) from the mean.

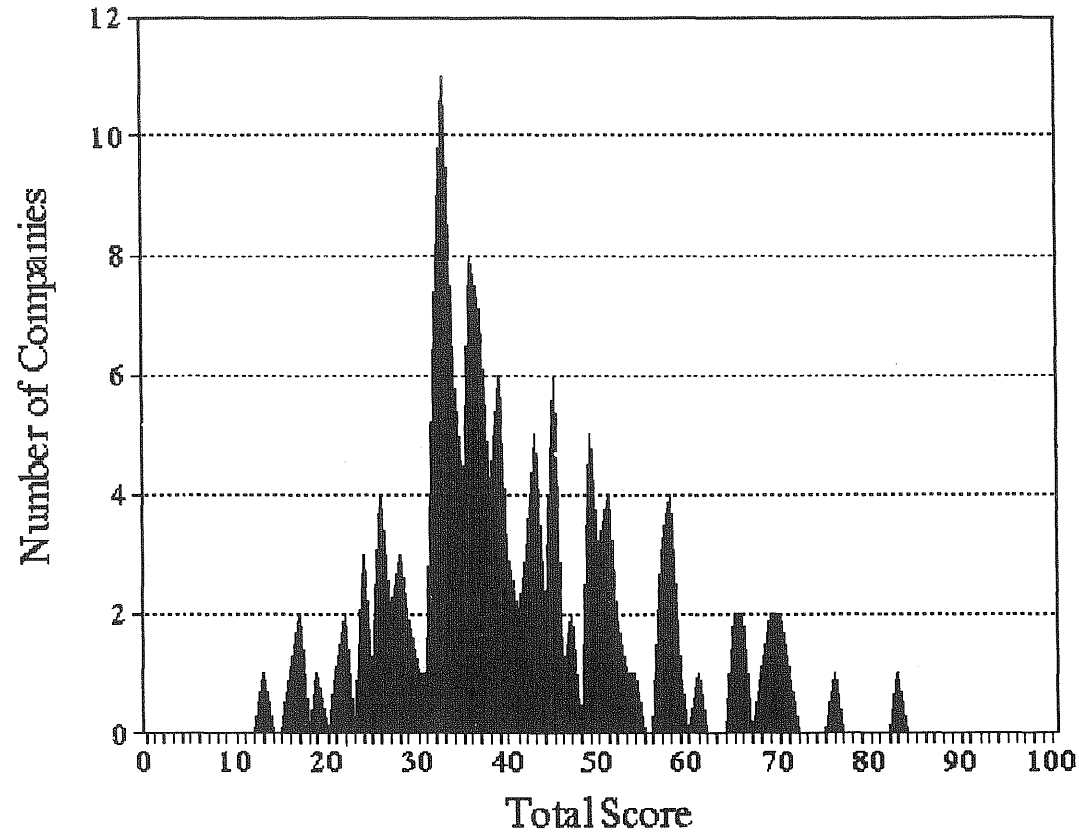

Figure 1: Distribution of SMURF Scores

The scores of the four major areas that form the SMURF index are summarized in Table 7. As expected, the lowest scores were obtained in the Size category. The average Size score for our study group was 5.22 with a median of 2. The large discrepancy between the mean and median is due to the skewness of the data resulting from the significant number of companies (32) receiving a zero for size. Not surprisingly, the Size scores were also the most variable, with a standard deviation of 6.11. Our study group fared best in the Rates category, where the scores averaged 14.94. More moderate scores were earned in the remaining areas of Finance and Management, averaging 9.41 and 11.30 respectively.

To test the accuracy of the SMURF index, we compared the SMURF scores for several utilities to detailed knowledge which we had about those companies. Following is a brief summary of four of the companies for which we had detailed, personal knowledge. Our comparisons for other companies showed similar results.

Table 7: Summary of SMURF Scores

	Mean	Median	Minimum	Maximum	Standard Deviation
Size	5.22	2	0	25	6.11
Rates	14.94	15	5	25	4.09
Management	11.30	12	1	21	4.47
Finance	9.41	10	0	25	5.47
Total	**40.87**	**38**	**13**	**83**	**13.24**

Our first comparison company has 27 customers and is owned by a holding company that owns and operates about 30 small water companies. The holding company has acquired several very troubled companies and typically makes some improvements in their operations. However, the companies tend to be poorly financed and often have capital needs which go unfilled. Generally, we consider this particular company to be in poor condition. Its rates are fairly high ($388 per year), but the company is losing money and has no equity. Little money has been put into the physical plant and the quality of service ranges from poor to completely inadequate. The company needs a major infusion of capital which is not available under the current corporate structure. We consider this company to be in serious trouble. However, it is potentially viable, if it were to be financed in concert with a larger company. This company's SMURF scores were: Size: 2, Rates: 20, Management: 15, Finance: 5, Total: 42. These scores are consistent with our assessment of the company. There are major deficiencies in size and finance; however, the management of the company is reasonably competent.

Our second test company serves a housing development and a neighboring commercial district, including a shopping mall and motel. Overall, the company has 231 customers, about 29% of which are commercial. The company is still owned by the developer of the housing development. The company made a small profit ($1600) on revenues of $63,000, and is highly leveraged (an equity ratio of just 14%, with debt equal to 92% of net plant). Generally, the management is marginal, having hired a part-time operator and usually keeping up with routine maintenance. In some ways, the company could be characterized as lucky, since the system is fairly new (less than 20 years old) and not yet needing major maintenance or repair. In short, we would characterize this to be a fairly typical developer-built water system, with the advantage of having a significant base of commercial customers. While the system is not in trouble today, we consider this system to be a potential problem system in several years, unless it is acquired by a larger, more professional operation (or unless management's commitment to the system changes). This system's SMURF scores were: Size: 10, Rates: 19, Management: 12, Finance: 6, Total: 47. These scores also are consistent with our personal assessment of the company. The company's finances are weak and its size is marginal. While its rates score is above-average, its management score is average. Overall, the company is slightly above average, but cannot be considered to be viable on a long-term basis.

Our third example is a water company which serves 411 customers, one of which is a large summer camp. The company is owned by a holding company which owns and operates six water systems. Generally, the holding company's operations are held in high regard, providing adequate financing and operational support for their systems. This water system recently had a substantial rate increase which resulted in nearly 10% of the customers drilling private wells and leaving the water system. This has raised questions about the long-term financial viability of the company. In the year before the increase, the company lost almost $14,000 on revenues of $160,000. However, its overall financial health is sound, with a 50% equity ratio. Generally, though, we believe that this system is viable and will be able to continue to provide adequate service through a well-maintained water system. The SMURF scores for this company coincide with our assessment of the company: Size: 13, Rates: 20, Management: 19, Finance: 13, Total 65.

Our final sample company is a subsidiary of a very large, multi-state utility holding company. The subsidiary has 532 customers and earned over $30,000 on revenues of $210,000. The system is very well maintained and financed and is professionally operated by well-qualified personnel. Even though the system is small, it is backed up by a large, professional support operation. We do not perceive any significant reasons why this company will not remain viable. Its SMURF scores bear this out. This company attained the second highest overall score: Size: 13, Rates: 21, Management: 20, Finance: 22, Total: 76. As expected, the only major deficiency was in the area of size. However, even though the company is small, its size score was still well above average. In all other areas, this company's scores were among the highest recorded.

Based on sampling these companies, and several others with various characteristics, we concluded that the SMURF scores were providing useful, generally accurate information from which we could characterize small water systems. We then proceeded to use the SMURF scores to categorize the small water companies into meaningful groups.

V. Categorizing Pennsylvania's Small Water Systems Using SMURF Scores

In order to be a useful tool in assessing small water system viability, the SMURF index must indicate some characteristics of the company and provide some guidance to regulators and advocates about the appropriate treatment for that company. Based upon the SMURF scores, we have categorized the study population into six groups. These groups were developed by identifying similar traits among the SMURF scores, which in turn, may signify common approaches to handling these small water systems. The six groups and their corresponding criteria are detailed in Table 8.

Group 1: Viable Systems. These companies have the financial and managerial stability to provide reliable water service on a long-term basis. The criteria for this group were developed by review of the distribution of SMURF Scores, which showed a group of 12 companies that scored significantly higher than the rest of the study group. The cut-off for these companies was a score of 65.

Table 8: SMURF Index Categories

1.	**Viable Systems** Total Score ≥ 65
2.	**Well Managed - Too Small - Capacity to Borrow** $31 <$ Total Score < 65, Management+Rates > 31, Size ≤ 8, Equity Ratio+Debt > 6
3.	**Well Managed - Too Small - Little Capacity to Borrow** $31 <$ Total Score < 65, Management+Rates > 31, Size ≤ 8, Equity Ratio+Debt ≤ 6
4.	**Fair Size - Poor Management** $31 <$ Total Score < 65, Size > 8, Management+Rates < 27
5.	**Non-Viable Systems** $31 <$ Total Score < 65, Do not meet criteria of 2, 3 & 4
6.	**Basket Cases** Total Score ≤ 31

Group 2: Well Managed - Too Small - Capacity to Borrow. Based upon their Management and Rates scores, these companies are well managed. However, low Size scores are preventing them from being categorized as viable systems. In addition, these systems have the borrowing capacity to facilitate expansion. The criteria for this category were developed using the individual SMURF scores for the four major areas. These companies scored in the upper quartile for the sum of their Management and Rates scores, but scored poorly in size. Borrowing capacity was based upon the companies' Equity Ratios and Debt/Net Plant Ratios. These companies scored above the study group average for these ratios. Eight companies fit into this category. These companies are considered to be good "magnet" companies. That is, they should be encouraged to acquire near-by water systems or otherwise expand to improve their size. The SMURF scores indicate that these companies have the requisite management and financial resources to expand their operations, thereby improving their viability and that of neighboring water systems.

Group 3: Well Managed - Too Small - Little Capacity to Borrow. By the same criteria used for Group 2, these companies are well managed, but too small. However, these systems lack sufficient borrowing capacity to facilitate expansion (insufficient Equity Ratio and Debt/Net Plant Ratio). A total of 17 companies fit the criteria of this category. Water systems in this group would be considered to be good candidates for regional support operations, by which they could provide management and operational support to other water systems. This would enable these companies to use their superior management expertise to assist other water systems and to raise additional revenue (thereby improving their own financial viability). These companies are not yet good candidates to acquire other water systems.

Group 4: Fair Size - Poor Management. These companies are large enough to qualify as viable systems, but cannot be characterized as viable because of low Management and Rates scores. The standards for this category are Size scores in the upper quartile (≥ 8), and below average Management+Rates scores (<27). There are nine systems that meet these criteria. Generally, Group 4 companies should be strongly encouraged to improve the quality of their management. These companies have the potential to be viable, but are failing to do so because of poor management practices. In addition, if these companies fail to improve their management practices, they should be good companies to be taken over by a Group 1 or Group 2 company. Alternatively, a near-by Group 3 company could be brought in to provide management services.

Group 5: Non-Viable Systems. These companies are characterized by mediocre scores for all major areas. This group includes all companies with a Total Score greater than 31 that do not fit into any of the above categories. A total of 68 systems fit into this category. Generally, these systems need help, but in many cases the need will not be acute. These systems probably are good candidates to be acquired by other water systems or to participate in a shared management program. With active management and financial assistance, many of these systems could become viable. Without a significant change in their operations, though, these companies risk becoming seriously deficient and incapable of providing adequate service.

Group 6: Basket Cases. These are non-viable systems that, due to their acute distress, are given a category of their own. These systems, which have a Total Score ≤ 31, were identified by a review of the Total Score distribution. These 25 systems scored noticeably lower than the rest of the study group. These systems require immediate assistance. They are likely to be unable to meet current regulatory requirements, provide adequate service, or otherwise meet current obligations. Regulators and advocates should use their resources to find help for these companies, whether through take-overs, management agreements, financial assistance, or other tools which may be available.

VI. Conclusions and Recommendations

We originally set out to use our limited resources to develop a better understanding of the viability of privately owned small water systems in Pennsylvania. We developed the SMURF index, a quantitative index of viability for small water systems, which appears to provide accurate information about small water system viability. This index was then used to construct six categories of water system viability. We believe that these categories will greatly facilitate our actions in dealing with small water systems.

Our examination of specific information for 139 small water companies has reinforced many opinions that we held about small water systems in general. The systems typically are poorly capitalized, have inadequate financial and managerial resources, and are generally less viable than larger water utilities. Importantly, though, we also found many exceptions to this general trend. We identified small systems which appear to have the financial and managerial expertise to remain viable and to assist, or take over, neighboring small systems. Examining the data from our analysis has made it very clear that size alone cannot be used to determine the viability of small water systems. In short, small water systems can be viable. Further, we believe that the SMURF index provides a mechanism to help identify which systems are likely to remain viable and which are not.

To illustrate this point, we looked at all companies which were roughly the same size (based on number of customers) as the second highest scoring company, which has 532 customers (the highest scoring company had over 1,500 customers and there are few companies comparable in size within our sample). We had data for 15 companies with between 430 and 630 customers. The differences among these companies are striking, as the summary of data in Table 9 demonstrates. As that Table shows, these companies range anywhere from one of the best of those we examined (an overall score of 76) to being in serious trouble (an overall score of 27). Within this group of similar-sized companies, there is an enormous disparity in virtually every major category. Thus, we conclude that we cannot simply develop judgments about water companies based on their size, or any other single characteristic. Overall, two of these companies were placed in Group 1; one each in Groups 2, 4, and 6; and five each in Groups 3 and 5. As discussed above, the way in which regulators and advocates should deal with these companies is markedly different.

Table 9: Summary of Companies With 430 to 630 Customers

	Average	High	Low
Number of Customers	508	597	437
Gross Plant	$579,958	$1,484,633	$156,034
Revenue	$118,340	$ 269,938	$ 27,555
% Non-residential	3.93%	24.00%	0.00%
Typical Rate	$225.00	$357.80	$48.00
Number of Cases	2	5	0
Age of Rates	4.1	26.6	0.6
Age of Plant	37.13%	83.00%	12.00%
Income	$ 1,408	$ 48,996	($92,308)
Equity	$129,994	$ 582,527	($227,681)
Equity Ratio	57.00%	100.00%	0.00%
Cash Flow	$ 19,287	$ 87,940	($ 80,598)
Debt as % of Plant	45.00%	183.00%	0.00%
Size Score	8	13	3
Management Score	17	22	10
Rates Score	14	20	3
Finance Score	12	23	0
Total Score	52	76	27

We must caution that this type of data collection and synthesis is just a small, first step in actually attempting to resolve small water system viability problems. Armed with this type of general information, we believe that regulators and advocates can make more informed decisions about specific actions which should be taken. For example, by examining this type of data, it should be possible to identify a region where it appears that there are several troubled water systems and near-by viable water systems. It would then be necessary to gather much more specific information about the water systems (perhaps including engineering evaluations, more detailed reviews of financial information, investigations into the adequacy of service, and so on). It is hoped, though, that this initial screen will enable regulators and advocates to target their scarce resources more effectively.

Finally, we encourage other states to tailor this type of index to their specific needs and to the specific type of information which is readily available at their PUCs. For example, if rate levels or typical residential usage levels in your state are much higher than those which we have used, those factors should be adjusted. Similarly, if a PUC requires every utility to file a rate case periodically (Pennsylvania does not), it would not be meaningful to examine the frequency of rate case filings or the age of rates. We also welcome any critiques of our methodology and any suggested refinements in this process.

THE IMPACT OF INCREASING REGULATION
ON SMALL WATER UTILITIES
BY
BRUCE H. BURCAT[1]

Introduction

There is little dispute that the requirements of the Safe Drinking Water Act and stricter regulatory standards related to the quality of service provided by water utilities have and will significantly increase the costs for all water utilities. Small water utilities will feel the impact to a much greater degree than their larger counterparts. Quantifying these costs to small water utilities is not an easy task. However, considering system size, insufficient customer base, limited funding availability and in some instances lack of skilled management, the toll of increased regulation on small water utilities could be devastating to these entities. This impact may cause small water utilities to abandon service, relinquish their operations to more viable water utilities through sale or languish, destined to no or low returns and the inability to provide quality service. Ultimately ratepayers of small water utilities will suffer, either by paying disproportionately higher rates than ratepayers of larger water utilities or by receiving inadequate service from a failing company unable to meet the more stringent regulatory demands.

This paper will address the toll of the Safe Drinking Water Act and enhanced quality of service requirements on the small water utility. Various approaches available to regulators to either soften the economic impact of this increased regulation on small water utilities or to force or facilitate the sale of small troubled water utilities to larger and more financially sound water utilities will be identified and analyzed. This paper will also address the linkage between quality of service and rates, where failure to meet heightened service standards could be basis alone for a commission to deny rate relief to a water utility.

What Is a "Small Water Utility?"

One commentator in Pennsylvania noted that the largest water utility in Pennsylvania is smaller than the smallest electric

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[1] Bruce H. Burcat is a Rate Attorney for General Waterworks Management and Service Company, which is a subsidiary of General Waterworks Corporation.

utility in the same state.[2] This may indicate that all water utilities are small when compared to other types of utilities. Nevertheless, there are vast differences between the largest and smallest water systems, which bring to light the substantial risk factor of size. There appears to be a consensus among commentators who have written on the subject, that the smaller the size of any type of firm, the greater the risk involved to investors. This has been described as the "small firm effect."[3] The small firm effect can even be more pronounced in the fixed utility industry, where economies of scale play such a large part in the rates charged to customers. For example, the cost of constructing a filtration system serving a water system of 20,000 customers, would be substantially less expensive per customer, than a filtration system built to serve a water system with 500 customers.

The largest water utility in the country has nearly 400,000 customers. This paper, however, focuses on water utilities having fewer than 2,000 customers, which make up the vast majority of investor owned water systems in the country. By any standard, these systems are small and are most affected because of their limited customer bases making them susceptible to industry wide changes which raise the price of doing business to a greater degree than larger systems more able to absorb the added cost.

Implementation of the 1986 Amendments to the 1974 Safe Drinking Water Act.

In 1986, Congress amended the Safe Drinking Water Act ("SDWA") of 1974. The amendments have significantly increased the water quality standards which must be met by all water systems. Not only is additional capital required to fund plant to meet the minimum requirements of the SDWA, but substantial increases in expenses will be necessary to comply with mandated testing to determine whether water supplies meet the new standards. In addition, added expense may be required to treat certain substances which have been found to be in excess of maximum SDWA

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[2] Ahmed Kaloko, Ph.D., "Economic Efficiency vs. Law - Can the Water Utilities Survive Under the Obligation to Serve?" *NAWC Water*, Summer 1991, p. 12.

[3] Steven E. Bolten and Scott Besley, "Are Small Utilities Undercompensated by Regulators?" *Public Utilities Fortnightly*, May 2, 1985, pp. 37-38; Marc R. Reinganum, "A Direct Test of Roll's Conjecture on the Firm Size Effect," *The Journal of Finance*, March 1982, pp. 27-35; and Thomas J. Cook and Michael S. Rozell, "Size and Earnings/Price Ratio Anomalies: One Effect or Two?" *Journal of Financial and Quantitative Analysis*, December 1984, pp. 449-465.

levels allowed for those substances. It has been estimated that the cost of implementation of the Safe Drinking Water Act amendments to be between $5 Billion and $15 Billion nationwide.[4] Dr. Ahmed Kaloko, Director of the Bureau of Conservation, Economics and Planning, for the Pennsylvania Public Utility Commission estimated that water utility rates in Pennsylvania would have to be increased up to $100 per month per customer to comply with the Safe Drinking Water Act and related regulations.[5]

Relative to other public utilities, water utilities require greater capital investment per revenue dollar received because of their substantial fixed plant requirements. To put this in more perspective, the public utility industry when compared to other industries has greater capital investment requirements, placing water utilities in a difficult economic position even before considering the impact of the SDWA.[6]

The added capital requirements of the SDWA have analysts concerned about the risks to the entire water utility industry, not just the plight of small water utilities. Standard and Poor's, the credit rating service, recently recognized the escalating credit risk of the water utility industry in recent years due in large part to the requirements imposed on the industry by the SDWA:

> Unlike the Clean Air Act's impact on a select number of electric utilities, SDWA requires virtually the entire industry to improve existing treatment and related facilities. This will result in significant capital additions on top of already escalating spending on distribution infrastructure. Financing these large rate-base additions--which are nonrevenue-producing assets--will be difficult. Internal cash generation is weak, with low depreciation rates (usually about 2%

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[4] *Investigation on the Commission's Own Motion Into the Financial and Operation Risks of Commission Regulated Water Utilities, and Whether Current Ratemaking Procedures and Policies Require Revision; and Related Matters*, Decision No. 92-03-093, 1992 Cal. PUC Lexis 237 (California Public Utilities Commission - March 31, 1992) pp. 1-86, 25 (Lexis); and 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*, December 22, 1988, p. 11.

[5] Ahmed Kaloko, Ph.D., "Economic Impact of the Safe Drinking Water Act," *NAWC Water*, Fall 1990, p. 23.

[6] Paul J. Garfield and Wallace F. Lovejoy, *Public Utility Economics*, Prentice-Hall, Inc. (Englewood Cliffs, New Jersey 1964), pp. 22-24.

> versus around 3% for electric utilities), and low authorized return on equity. As a result, dependence on external financing and rate relief requirements will intensify.
>
> Moreover, low authorized returns may affect the industry's ability to attract necessary capital to develop new water supplies and upgrade the quality of existing supplies.[7]

The additional investment necessitated by the SDWA is especially troublesome for small water utilities, many of which are underfunded, have limited capability, if any, to attract capital sufficient to meet the new demands, and are already operating at a loss. Because of their lack of a sufficient customer base, the additional plant necessary to comply with the SDWA makes it an investment that is prohibitive for many of the owners of small water utilities. At a minimum, such investment may be impractical, if there are other options available to provide the ratepayers with water that meets the standards of the SDWA, such as system acquisitions by contiguous water utilities already in a better position to meet these standards.

Quality of Service

Traditionally, quality of a utility's service was not considered by many commissions as part of the ratemaking process. Quality of service was dealt with during separate complaint or investigation proceedings. More recently, however, a linkage between rates and service has been endorsed by most commissions.[8] These state regulators have included quality of service as an important consideration when determining the reasonableness of a public utility's rate increase request. A utility must be able to establish that it provides safe and adequate service to obtain rate relief, or it could be denied, solely based on a finding of service inadequacy, part or all of its requested increase. While the intent behind the efforts of regulators to ensure adequate service may be worthy and beneficial to the ratepayers of the affected systems, the added cost of this more stringent regulation must be weighed when considering the viability of small water utilities. This recent trend has had substantial repercussions on smaller water utilities for the same reasons described with regard to the SDWA.

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[7] "Water Utility Benchmarks Revised," *Standard & Poor's Credit Review*, June 15, 1992, pp. 35-36.

[8] Janice A. Beecher, Ph.D. and Nancy N. Zearfoss, *1992 NRRI Survey on Commission Ratemaking Practices for Water Utilities* (1992).

In addition to the linkage between service and rates, water utilities must concern themselves with more demanding standards imposed on them by commissions as to the quality of the water they provide. Not only must a water company ensure that it is meeting standards addressing the potability of its water, it must also discern whether it is meeting new standards relating to the palatability of the water. While it is extremely difficult to quantify the cost associated with increased efforts by commissions to improve quality of service, several specific examples of the effect of the added regulation warrant discussion.

In Pennsylvania during the 1980s, significant concerns were raised over the quality of water supplied by the Pennsylvania Gas and Water Company ("PG&W") to its customers. In fact, the Pennsylvania Public Utility Commission denied two rate increase requests in total because the Commission determined that PG&W was not providing "adequate, efficient, safe and reasonable service." The Commission found that "the majority of ratepayers" were "not receiving adequate service, most of the time."[9]

In response to concern over quality of service, soon after the Pennsylvania Commission's first denial of a rate increase request by PG&W, the Pennsylvania Legislature enacted legislation specifically providing that "[t]he Commission may reject, in whole or in part" a rate increase requested by a public utility if it is determined that the service rendered by the public utility is inadequate as to quantity or quality.[10] This power should not be minimized. The Commission may in effect have the power to put an entity not meeting the standard out of business or in a "Catch 22" position of not having sufficient revenues to invest in service improvements.

In the case of PG&W, it had a substantial customer base and it was still able to operate even without the additional revenue. Nevertheless, the financial consequences were severe enough to cause investment rating companies to adjust downward PG&W's bond ratings. The consequences can be even more dramatic for smaller water utilities. Two small Pennsylvania water companies with long histories of service problems were essentially forced to relinquish their operations. In the case of the Beaver Brook Water Company, in lieu of paying fines over service inadequacies, the company agreed to transfer its assets to an unregulated

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[9] *Pennsylvania Public Utility Commission v. Pennsylvania Gas and Water Company*, 74 PUR 4th 238, 255 (1986); and *Pennsylvania Public Utility Commission v. Pennsylvania Gas and Water Company*, 68 Pa. PUC 191, 196-197 (1988).

[10] Section 526 of the Pennsylvania Public Utility Code, 66 Pa. C.S.A. §526.

association made up of its former customers.[11] In the case of Lake Latonka Water Company, because of its inability to provide adequate service (it was not permitted for nearly seven years an increase in rates) and the deteriorating condition of its water system, it ultimately succumbed to the pressure and the Company was eventually sold.[12]

Both the Beaver Brook and Lake Latonka cases are examples of systems with severe service problems and the extreme consequences that may follow. The more difficult issue is a small water utility finding itself in the gray area between adequate service and inadequate service. Service standards are not altogether clear. Prior standards primarily dealt with the potability of water served to customers. Today, commission standards often include the palatability of the water served. A water utility must continually strive to meet real and perceived standards of regulators. What does a water utility do if it is experiencing increased customer complaints in the area of quality of service? Is a small utility properly providing adequate service if it forgoes certain improvements because of the high cost? Is a small utility acting in a prudent manner if it invests in costly plant to benefit several customers experiencing service difficulties? At what level do customer complaints regarding the taste or smell of the water reflect service inadequacy? These questions show the quandary many water utilities find themselves in today.

The answer to many of the service problems that arise can be cured by investment in additional plant. In the current regulatory climate, where service legitimately is of significant concern, many companies will opt to make the improvements. This increases the cost to all water utilities and ultimately ratepayers, because water utilities in general must consider meeting real and perceived standards, or risk the loss of needed revenues. Again, such investment is more problematic, the smaller the water utility.

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[11] *Pennsylvania Public Utility Commission v. Beaver Brook Water Company*, Docket Nos. C-881662 and M-880185 (October 27, 1988); and *Application of Beaver Brook Water Company for Approval of the Abandonment of All Water Service to the Public in Hazle Township, Luzerne County*, Docket No. A-24554 F.200 (November 10, 1988).

[12] *Pennsylvania Public Utility Commission v. Lake Latonka Water Company*, Docket No. R-891251 (March 19, 1990); and *Application of Lake Latonka Water Company and Western Utilities, Inc.*, Docket No. A-210017, 1991 Pa. PUC Lexis 87 (April 11, 1991).

Small Water Utilities - Are They Destined for Failure?

One recently concluded investigation conducted by the California Public Utilities Commission, reported that small water utilities in California serving 500 or fewer connections were 10 times more likely to fail than larger companies serving 2000 or more connections.[13] This study also indicated that average annual operating expense per customer of the small water utility, was $273, while the less riskier larger utility serving over 2000 customers had an average operating expense per customer of $163; the operating expense per customer of the smaller water utilities being 67 percent greater than the larger water utilities.[14] These statistics are without measuring the full impact of the cost of amendments to the Safe Drinking Water Act which will not be felt by small utilities until the mid 1990's. Ratepayers already paying rates that they may consider high could opt to drill wells and leave systems. Customer departures would serve to compound the difficulties small systems already have, because these systems would be less able to absorb the added expense due to the reduction in size of their customer base.

During the 1980's many small water utilities ceased operations, either through abandonment or by being acquired by larger utilities or public authorities. In California, for instance, between 1979 and 1992, the number of investor owned water utilities regulated by the California Commissions dropped nearly a third, from 323 to 223.[15] From 1986 to 1990 many other Commissions reported significant decreases in water utilities they regulated; the decrease caused to a large degree by financially sound water utilities or municipal systems acquiring small troubled water companies. The number of regulated water utilities in North Carolina in 1990, for instance, was 231, which represented a reduction of 78 from the number of companies reported to have been regulated by the North Carolina Commission in 1986. Pennsylvania had 18 fewer regulated investor owned water utilities in 1990 than it had in 1986.[16] This trend appears to be continuing today.

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[13] *Supra*, note 4 (Decision No. 92-03-093), p. 9.

[14] *Ibid*, p. 9.

[15] *Ibid*, p. 69.

[16] Data derived from the report of Patrick C. Mann, G. Richard Dreese and Miriam A. Tucker for The National Regulatory Research Institute, *Commission Regulation of Small Water Utilities: Mergers and Acquisitions*, (October 1986), p. 17; and the National Association of Regulatory Utility Commissioners, *1990 Annual Report on Utility and Carrier Regulation* (December 31, 1990), p. 792.

Legislative And Commission Reaction

There are two schools of thought with regard to dealing with the problems of small troubled water companies. One course of action dealing with this problem is the enactment of legislation in several states encouraging or requiring acquisition of small troubled water companies by larger more financially sound water companies.

Some Commissions have also encouraged takeovers by allowing the acquiring company to place into rate base the unamortized balance of the excess of the purchase price of the acquired company over its depreciated original cost. The Pennsylvania Commission has this authority directly by statute.[17] If certain standards are met, the Commission can permit a water utility, which acquires at a premium another water utility with 1,200 or fewer customers a positive acquisition adjustment to be included in its rate base.

Pennsylvania, Connecticut, and New Jersey have legislation which provides the Public Utility Commission in Pennsylvania,[18] the Department of Public Utility Control ("DPUC") in Connecticut[19] and the Board of Regulatory Commissioners ("BRC") in New Jersey[20] with the authority to require a takeover of a troubled water utility under certain situations as a last resort after other options have been explored. The DPUC can only exercise its authority jointly with the Connecticut Department of Health Services after a water company fails to comply with an order issued concerning water quality. A takeover under the New Jersey Legislation must also be approved by the New Jersey Department of Environmental Protection ("NJDEP") and only after a water company has failed to comply with a NJDEP order related to water quality. The New Jersey Legislation can only be enforced against a water company serving fewer than 1,000 customers.

The legislation giving the Pennsylvania Commission the authority to require a takeover was recently enacted and only went into effect on June 15, 1992. It remains to be seen what kind of teeth this legislation will have; how it will be utilized by the Commission; and whether the legislation will pass a constitutional challenge, since it may be perceived by either the acquired or acquiring utility that a required takeover is an

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[17] Section 1327 of the Pennsylvania Public Utility Code, 66 Pa. C.S.A. §1327.

[18] Section 529 of the Pennsylvania Code, 66 Pa. C.S.A. §529;

[19] New Jersey Statutes Annotated §58:11-59, et seq.

[20] Connecticut General Statutes Annotated §16-262n.

unfair confiscation of either utility's property. The New Jersey takeover procedures have never been tested in a fully litigated proceeding. However, the Connecticut DPUC has utilized its takeover procedures numerous times.[21] It has forced the takeover of small water utilities which were not in compliance with water quality orders.

The second course of action dealing with small troubled water utilities is remedial in nature. This approach is commission or legislative action that attempts to enable capable small water companies to cope with the increasing costs either from implementation of the Safe Drinking Water Act or other regulatory requirements. For instance, the Connecticut Division of Public Utility Control pursuant to regulation is permitted to allow CWIP (construction work in progress) in rate base for facilities necessary to comply with the Safe Drinking Water Act.[22] The Connecticut approach is a streamlined procedure which allows water utilities to collect the CWIP associated with the Safe Drinking Water Act through a surcharge. The amounts collected through the surcharge are then reconciled on a quarterly basis and the surcharge is then revised based on the reconciliation.

Another example of remedial legislation is an approach taken in Pennsylvania. In Pennsylvania, certain bond offerings authorized by Statute, through the Pennsylvania Infrastructure Investment Authority ("PennVest") and its predecessor, the Water Facilities Loan Board, have permitted small financially strapped water and sewer utilities and public authorities, low interest financing, for which the debt service can be collected through a surcharge implemented with Commission approval without the necessity of a full blown rate case.[23] Unfortunately, a great deal of this financing has dried up for investor owned utilities because of changes in the tax laws requiring that a much greater portion of the funding go to tax exempt municipal systems or otherwise the bond offering needed to fund the program would lose its tax exempt status and therefore its appeal to investors.[24]

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[21] For example, see *Joint Investigation of the Departments Into the Adequacy of Service Provided by Hill-N-Dale Acres*, Docket No. 88-07-27 (Connecticut Department of Public Utility Control 1989).

[22] Connecticut Department of Public Utility Control Regulations §16-1-59B.

[23] Section 751.1, et seq. of the Pennsylvania Infrastructure Investment Authority Act, 35 Pa. C.S.A. §751.1, et seq.

[24] Internal Revenue Code §141, et seq.

Through its investigation into the financial condition of small water utilities which was addressed earlier, the California Commission concluded that operators of small water utilities for a variety of reasons were significantly less likely to seek rate relief on a timely basis than operators of larger water utilities. The Commission found that water utilities with fewer than 500 connections wait on average of eight years prior to seeking rate relief and that systems with 500 to 2,000 connections wait on average six years, while systems serving over 2,000 connections file on average every four years. The reasons given by operators of the small water companies for the differences in time intervals include the length, complexity and lack of fairness of the formal rate process.[25]

In response to these concerns raised by the operators, the California Commission has implemented streamlined procedures for small water utilities (2,000 or less connections) to collect necessary, additional revenues based on the Consumer Price Index without resorting to a full blown rate case. In addition, certain unanticipated costs incurred by these entities may be recovered through a surcharge with Commission approval. Other measures, such as a substantial increase to the generic rate of return for small water utilities have been adopted in recognition of the serious financial condition of these companies and the risks that they face. Procedures allowing for an informal hearing process were also implemented to address small water utilities' concerns over fairness during the rate case review stage.[26]

Although two seemingly diverse approaches taken by various authorities dealing with small troubled water companies have been delineated in this paper, it is important to point out that Commissions have not always chosen one approach over another. Some Commissions have implemented a combination of programs, so as to offer assistance to marginal water companies which may have reasonable prospects for recovery, while at the same time implementing programs facilitating acquisition to attempt to eliminate the problems of small water companies which have gone over the edge, having limited or no prospects of recovery.

When assessing the state of the water utility industry, Standard and Poor's ("S&P") suggests that it will be necessary for regulators to take a more active role to ensure the financial stability of the industry. S&P observed that regulators need to "implement innovative regulatory policy" for the purpose of halting further "financial erosion" of the industry. Adoption of future test years, allowing CWIP in rate base, higher earned

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25 *Supra*, note 4 (Decision No. 92-03-093), pp. 9-17.

26 *Ibid*, pp. 80-86.

returns, increased depreciation rates and automatic adjustment clauses were mentioned as techniques that should be considered by Commissions to accomplish this.[27]

Conclusion

Most of the measures taken by the state legislatures and commissions to deal with the disproportionate economic impact of the SDWA and increasing quality of service regulation on small water utilities, such as the California approach, have recently been implemented and it is too early to discern what impact these measures will have on the viability of small water utilities. The jury is still out as to whether small water systems can survive as a class. There is a definite trend towards a reduction in the number of small water utilities, and without substantial Commission assistance the general outlook looks bleak for small independently operated, investor owned systems.

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[27] *Supra*, note 7, p. 36.

MANAGING A TURN-AROUND
BY
JOHN S. TOMAC, BRIDGEPORT HYDRAULIC COMPANY
LEENDERT T. DEJONG, AQUARION MANAGEMENT SERVICES

(For reasons of confidentiality, the recipient of contract management services discussed in the following presentation prefers to remain anonymous. In respecting that request, we will use the terms "the Company" and "the client" interchangeably.)

While 1988 was a good year for Bordeaux wine, it was, to say the least, a problematic one for the Company.

The client, like many investor-owned water utilities of its size, faced a crisis. The Company was plagued by frequent management turnover, mounting capital intensive infrastructure requirements, Federal Safe Drinking Water Act (SDWA) compliance issues, and increasing regulatory dissatisfaction. The Company had neither a strategic plan to deal with these and other operations issues, nor the internal resources to both grapple with operational issues and plan comprehensively at the same time.

<u>System Description</u>: The client is a medium-sized investor-owned water system located in Connecticut. Its service area is a mix of rural and urban population. In 1988 the Company had approximately 5,600 customers and an average daily demand of 2.86 mgd, supplied from the Company's two well fields. System safe daily yield was estimated to be 3.30 mgd supported by interconnects with neighboring purveyors. Total storage capacity was 1.2 mg. The labor force consisted of seven full-time personnel.

The 1988 financial structure of the Company included a rate base of $1,399,600 with an operating revenue of $1,277,150 and net income of $63,880. The financial statements reflected profits, but the Company faced problems of serious proportions.

<u>Study Evaluation and Findings</u>: Recognizing this situation, the Company's Board of Directors commissioned Aquarion Company (formerly The Hydraulic Company) to undertake a comprehensive review of the organization and evaluate various elements that included:

- Executive and General Management
- Financial Management
- Planning
- Engineering and Construction Management
- Operations Management
- Customer Service and Data Processing
- Facilities Management and Real Estate
- Human Resources Management

The evaluation concluded that, among other items, the Company lacked a comprehensive strategic plan; it had inadequate management control systems in place; it had lost regulatory credibility because of its inability to make necessary system improvements and respond to other regulatory orders; it faced a five-year capital investment program of $5-7 million dollars; it was at the end of its existing credit limit; it faced significant revenue shortfalls, since it had not requested timely rate relief; it was suffering from a deteriorating infrastructure; and it had significant community and customer relations issues that were not being addressed. These problems are not uncommon to water systems suffering from the strains of increased regulatory compliance and a decreasing customer service base. The client's problems were exacerbated by the weakened financial condition of banks, which limited its ability to borrow funds.

The study concluded that the Company's Board had three alternatives to correct these issues: the Company could be sold to a qualified investor or municipal purveyor; it could search for a superintendent capable of leading the organization; or the Company could hire a contract manager with the qualifications to provide interim solutions.

Contract Management: The Board felt strongly that sale of the Company was not in the best interest of its stockholders and ratepayers. The client had been unsuccessful in four prior attempts to hire an executive as a successor to a well qualified superintendent who retired in 1982 and felt that the myriad of issues the Company faced could overwhelm one individual. With these issues in mind, the Board decided to employ a contract manager. Although the Board was concerned that this option would result in the loss of corporate and financial control, these issues were addressed in the agreement by requiring that the Board be kept fully apprised of the Company's operations.

In January 1989, Bridgeport Hydraulic Company (BHC), a subsidiary of Aquarion Company, executed a three-year contract with the Company to provide for operations, engineering and financial management services. BHC, a large investor-owned water utility with 100,000 customers in nineteen (19) Connecticut communities, was selected because of its familiarity with the issues, its in-house staff capabilities, and its ability to respond quickly to the requirements of the agreement.

BHC provided the Company with an on-site general manager who, in addition to managing the daily operations, coordinated BHC employees who provided operations, engineering and financial services. Operations support services included the development of staffing levels; hiring and discharging of personnel; directing employee operations duties; and serving as liaison with town officials, regulatory agency personnel, neighboring utilities and the Company's Board of Directors. BHC's engineering support services included evaluation of the Company's distribution system; identification of Safe Drinking Water Act projects; system design and specification preparation; bid evaluation and contractor selection; and oversight of construction management. Financial support services included rate relief management together with application for Construction-Work-In-Progress funding; short-term and Connecticut Development Authority (CDA) financial planning and financial institution negotiations; and improvements to financial record-keeping that included installing a general ledger system.

DPUC Review: In November 1988, the Company and BHC requested Connecticut Department of Public Utility Control (DPUC) approval to proceed with the three-year agreement. These were new grounds for both Company and regulatory officials, and there existed the long-standing issues of the client's credibility. As such, a detailed and lengthy review was conducted with testimony provided by parties and intervenors including the Company, BHC, our client's principal service town, the Connecticut Department of Health Services and the Connecticut Office of Consumer Counsel. The initial schedule for the proceedings anticipated a final decision within 150 days of filing. A frequently revised schedule reflected the DPUC's intense study of the agreement. The media closely covered the hearings. The Office of Consumer Counsel argued that the contract was not in the best interest of the client's ratepayers and that the Company should be offered for merger or acquisition. Proponents countered that contract management provided a cost-effective solution to the major issues that faced this troubled water system. After months of discussions and decision deferments, DPUC officials reversed an earlier draft decision that rejected the contract and on November 9, 1989, approved the agreement.

During the docket review period, BHC provided management services to the Company but at a reduced level of service. Both BHC and the client were concerned that the cost of BHC's services would not be allowed in the Company rates in the event the agreement was rejected by the DPUC. In addition, the docket review process took considerably more time and effort than BHC's contract management team had anticipated.

Operations and Engineering Management Services: BHC's first thirty days as the Company's contract manager required aggressive application of crisis management principles. Significant events included the following: deactivation of one of two wells at a Company well field for TCE contamination, which required the subsequent regulatory approval to permit the remaining well to serve as a source of supply; detailed aquifer protection and distribution system modeling required to protect the Company's other well field from the construction of a major regional shopping mall and to provide that facility with adequate fire protection and domestic supply; and an immediate effort to reduce the twenty-one percent non-revenue water.

Over the term of the agreement, operation, engineering and financial management services provided by BHC assisted the Board in re-establishing a new direction for the Company. When the initial crises passed, the Company was able to develop a five-year capital improvement plan that responded to the elements of the 1988 evaluation report.

While not all goals and objectives were met, contract management did address significant regulatory and customer service issues. In summary, operations and engineering management services provided for the:

- Enhancement of community and customer service relations through improved corporate communications and timely customer inquiry response

- Improvement in regulatory credibility issues

- Planning and design coordination to satisfy state and local regulatory permitting requirements for a volatile organic compound treatment facility

- Development and initiation of an eight-year water main replacement program for aging cement and steel (CLCC) pipe

- Completion of Level B mapping for aquifer protection purposes

- Completion of a distribution system hydraulic model

- Reduction of non-revenue water through system-wide leak detection and minimum night rate studies

- Management of numerous customer expansion projects including a proposed regional mall and industrial park

- Initiation of up-front developers' deposits

- Administration of an employee wage equity study and the development of staff job descriptions along with routine employee meetings, and

- The creation of a procurement policy and improvements in record-keeping

These successes were supported by a strong financial service management effort that included aggressive CDA and bank negotiations along with two rate relief applications required to offset a significant declining industrial customer base and implement an aggressive capital improvement program.

Financial Management Services: The engineering and operations expertise needed to manage a water company is quite different from the financial management of the same company. However, the financial managers of a water utility -- a monopoly controlled by regulation should understand that reliability of service, delivery of product and the long-term satisfaction of the customer are ultimately the driving forces of financial success.

In a 1992 Decision of the Company's Application to Increase Its Rates, the DPUC stated, *"In evaluating an appropriate return on equity for the Company, the authority has had to consider the problems this Company has had in the past in providing its customers with a reasonable level of service, the difficulty the Company has had in developing and adhering to capital improvement plans designed to maintain its physical infrastructure and to improve the quality of water and balance those concerns against the efforts which have been made to solve these problems."*

Regulators have the obligation to protect the customer's interest, and most utility managers would agree that the above statement is, in all likelihood, the sentiment of commissioners across the country. What troubles many contract management operators is the timing of such a statement. As noted, it appeared in the DPUC docket in 1992, which was subsequent to the successful turn-around of the Company. A history of poor performance is not soon forgotten and is potentially problematic for the contract manager that his utility client can look forward to instant gratification after a turn-around. The Company's successful turn-around suggests that an interim financial manager of a troubled water utility must learn to balance his clients' prospects against the weight of operational baggage.

<u>Financial Objectives/Contract Costs</u>: The financial services proposed for the client in the initial contract were limited to the following:

- Help the Company file for rate relief
- File for a Construction-Work-In-Progress ("CWIP") treatment for SDWA related projects
- Negotiate with banks for financing
- Investigate availability of long-term tax exempt financing
- Install new general ledger system for Company

It quickly became clear these proposed services needed to be prioritized to make the contract cost effective. The financial statements indicated an immediate need for rate relief, the extension of the existing lines of credit, and the placement of permanent financing sources including the use of tax exempt financing from the Connecticut Development Authority, to meet past and future construction obligations. It also was determined through review of SDWA construction projects that CWIP filings would not be helpful due to the relatively short duration of such construction. Installation of a new general ledger system was to be dependent upon favorable ratemaking treatment.

Contract costs were calculated using fees based on the hourly rate of BHC personnel providing service, multiplied by direct and indirect overhead factor of 2.0, plus a 10 percent profit. Out-of-pocket expenses for travel, meals, lodging and mileage billed at $.35 per mile were in addition to the fee structure. The 2.0 overhead factor was based on BHC's internal overhead costs. Fully grossed-up hourly rates compared favorably to other consultants providing similar professional services. Total charges to the client in 1989, 1990 and 1991 amounted to $62,768, $93,593 and $98,397 respectively.

<u>Financial Summary</u>: Soon after the management contract started, the financial condition of the Company began to deteriorate rapidly primarily due to the depressed economy in Connecticut. Beginning in 1989 and into 1991, the Company lost in excess of $200,000 or 17 percent of its revenue base as a result of lost sales from two major industrial customers. Despite the granting of rate relief in 1990 and an extremely dry summer in 1991, revenue levels in 1991 failed to reach the allowed amount. Both income and the return on rate base dropped to unacceptable levels.

The granting of rate relief in 1990 should have been the start of good news for the Company. In that decision, a reopening mechanism to incorporate the addition of a large treatment plant was granted. However, a further loss of revenues as a result of declining industrial consumption, almost immediately after the 1990 decision and a downturn in the banking industry in Connecticut, left the Company again in a precarious financial situation.

The Company's Board could have chosen to view the inability to achieve adequate earnings levels or to obtain permanent financing for the treatment facility two years into the contract as a failure on the part of the contract manager. A more viable explanation, however, was presented by certain external uncontrollable economic factors. Obviously, unfavorable fiscal events not only exacerbate the financial condition, but they also require management to spend unplanned time and dollars in dealing with these developments. Adequate staffing levels at the managing entity must be in place to deal with such contingencies even though caused by events well beyond a contract manager's control.

Regulators also need to address and streamline the steps necessary for financially troubled small utilities to achieve an adequate return. At a time of the Company's most pressing revenue problems, which developed rapidly, Connecticut regulatory practice did not provide for an appropriately rapid and efficient response. The time and cost of regulatory proceedings can be formidable and can slow a troubled utilities turn-around, thus exposing it to increased customer dissatisfaction. In this situation, the loss of a major customer on the heels of a rate increase would have nearly eliminated the Company's earnings potential and the ability to raise capital, and the filing of yet another rate application in 1991 became necessary.

Commissions must realize that although a utility can achieve small operational and engineering successes during a period of earnings uncertainty, such successes have limits, since the financial strength of the utility drives the turn-around. The Connecticut Commission is presently streamlining its process in order to address similar encountered situations, and this is a positive step for customers and managers of a troubled utility.

<u>Debt/Equity Financing</u>: The health of the banking industry in Connecticut during 1989-1991 steadily declined. Many local banks in existence for decades became insolvent and were merged with large out-of-state banks unfamiliar with small water utility operations. Other Connecticut banks also suffering from the economic climate were not interested in extending credit. Funding, critical to the future success of the Company and to comply with all directives set forth from the DPUC, was difficult to obtain. A summary of the banking difficulties encountered by the Company is best described by Janet M. Hansen, Chief Financial Officer of BHC, as part of written testimony in the 1991 rate relief application. *Subsequent to the last rate decision, the Finance Committee and I met with several banks in an effort to develop permanent banking and lending arrangements. In addition, Bridgeport Hydraulic approached its banks including Citytrust, usually a willing lender to small utilities, in a second effort to develop banking relationships with the Company. Lastly, the Finance Committee drew on their personal banking relationships. All of these contacts and meetings were to no avail. The banks, due to their current economic conditions, were not interested in acquiring any new customers or any new loans. It was extremely difficult just to convince the Bank of Boston to convert the demand notes they already held to long-term notes. They even refused to make a line of credit available to the Company. I do not know of any utility that can operate without a line of credit. This has been an extremely difficult period for the Company, through no fault of their own.*

Customers and regulators alike seem to expect a quick turn-around when an outside entity is engaged to manage a troubled utility. Although compliance with many of the orders in the previous rate case, the first rate case under the client's management contract, would have addressed many of the Company's critical needs, cash outlays were required to make the many utility plant improvements and to fund a future construction program. The unfavorable banking environment, coupled with a deterioration in the Company's earnings, which limited debt coverage resulted in financing delays which in turn lengthened the turn-around.

As the banking environment somewhat improved in 1991, the Company was able to nurture the banking relationship with the Bank of Boston. The Company converted all short-term credit arrangements to long-term instruments. The Company also was extended long-term loan arrangements by two construction firms completing work for mandated construction projects. Additional funds were obtained by the Company from a common stock offering to existing shareholders. The client negotiated a revolving credit agreement with the Bank of Boston for construction of the treatment facility. This revolver has a one-year term of which three-fourths is convertible to a five-year term loan with principal and interest payments based on a fifteen-year amortization schedule. This arrangement was contingent upon the Company securing a $250,000, twenty-year loan commitment from the Connecticut Development Authority (CDA), which occurred successfully.

The revolving credit arrangement contains covenants which limit debt capitalization and requires cash flow minimums as a percent of debt service. This loan, along with all other financing arrangements, required DPUC approval.

Rate Case Issues: When the management contract began at the end of 1988, the filing of a rate case should have been at the top of the agenda. In view of the close scrutiny the DPUC was giving the arrangement, BHC and the client both thought it prudent to wait until final approval was received before proceeding with a rate application. The Company's case was filed early in 1990 requesting a 31.5 percent increase. As part of the rate filing, the Company requested interim rate relief of 9.7 percent, principally to recover the drop in revenues from the loss of two major customers. It should be noted that the Company's water rates were among the lowest in Connecticut. Interim rate relief is available in Connecticut, although seldom used or granted. The DPUC concluded that since the Company had a reasonable level of test year net income, a capital structure that was well balanced and the ability to access up to $100,000 of additional funds under a short-term loan agreement, the immediate need for interim rate relief was not apparent. Although interim relief was denied, the DPUC expedited the rate proceeding and granted a 12 percent increase on June 27, 1990. The request was reduced principally by the disallowance of projected utility plant expenditures and related O&M expenses associated with the treatment plant, a reduced return on equity and a disallowance of a revenue adjustment to account for estimated residential consumption declines in conjunction with the state-mandated conservation program.

With the loss of additional revenues in 1991 and with the culmination of financing arrangements for the treatment facility, the Company considered filing for additional rate relief in November, 1991. Since the last rate decision was only slightly more than a year old, and all expense levels were essentially on target with the allowed amount in that decision, the Company inquired as to the appropriateness of filing for a re-opener of its last decision to recoup the lost revenues. The DPUC informed the Company that the filing of an entire application was necessary. The DPUC, however, promised an expedited proceeding, and for the first time conducted an "Orientation Meeting" to familiarize all parties with the procedure. The original request for an increase of 42 percent, ($519,000) was reduced to 27 percent, ($336,000) as a result of decreasing property taxes and interest cost reductions not anticipated in the original filing.

In the interest of streamlining the application, the client and contract management determined that it would be prudent to include one-half of the estimated construction costs for the treatment facility. As stated in the testimony as part of this application, *One-half of the estimated construction costs of the treatment plant, $500,000 is included in this case as construction is to begin well before rates go into effect and completed only a few months after the anticipated Decision date. The Company hopes that the Department recognizes the magnitude of this project as it impacts the Company and allows the Company to recover one-half of the construction costs before it is placed into service. Since the construction of this plant is mandated by the Safe Drinking Water Act, the Company would have available the option to file for a Construction-Work-In-Progress surcharge. The Company, however, feels that because of the duration of the construction project and the overlapping of this case with actual construction, it would seem prudent to address this issue in one docket.At the time construction is complete, a reopening of this case would be necessary to fully include the entire project in rate base.*

The Department denied this methodology but provided for a reopener mechanism for the treatment facility. The Department granted a 13 percent revenue increase, down from the revised request of 27 percent. The reduced request was principally due to the removal of the treatment facility from rate base and a reduction in the requested ROE. The final decision also eliminated the alternative of purchasing the Company's entire supply from a neighboring water utility which would have caused increased rates and banking complications.

Benefits and Conclusion: Although the income that accrued to BHC ratepayers and shareholders under this contract was minor, the intrinsic benefits to both BHC and the Company, their customers and the regulators were significant. BHC's parent company received a 10 percent profit over contract costs, while its ratepayers were given credit for the cost plus contract price. The ratepayers of the Company benefitted as they were charged less than that which would have been charged by an assortment of outside professional services.

Utility regulators might understandably find it burdensome to solve the many problems that face small and medium-sized water systems. These problems, however, can be solved when seasoned utility professionals are used in contract management and if utility managers work with regulators in the spirit of cooperation, many of the issues facing the water industry as a whole can be addressed. The employees who serve as the contract manager of a successful turn-around gain valuable experience as they solve a broader array of problems they are unlikely to experience at their own utility. The ultimate objective, of course, is benefit to the customer of the troubled utility. Water utilities usually become troubled because they are not satisfying customer needs. This dissatisfaction can drive legislative and regulatory dissatisfaction. If smaller systems are to survive, this dissatisfaction must be addressed and diminished by focusing the synergies and energies of partnership on delivering a safe, reliable product at a reasonable cost. Contract management is a cost-effective way to achieve these objectives.

INNOVATIVE FINANCING FOR WATER AND SEWER COMPANIES

By

BILL SANKPILL, P. E.
Manager, Water & Sewer Department
Missouri Public Service Commission

I consider your invitation to speak today as an honor, and have looked forward to letting you know about some of the ways we have been able to assist small water and sewer companies to respond to their financing needs.

Before I go further, let me say that these comments and opinions are mine and do not necessarily reflect the views of the Missouri Public Service Commission (PSC).

People in the water industry have been talking about ways to solve small water and sewer company problems for years. An example of one type of problem is the result of a failure to implement preventive maintenance programs which eventually leads to major system failures. When these failures occur, then the Company is often in need of funds to make repairs and improvement. But financing is difficult to secure in many cases for small water and sewer companies. Usually the problems can be corrected if loan funds are available.

I manage the Water and Sewer Department for the Missouri Public Service Commission (PSC) and have been dealing with these problems since 1971. I have said to people in state government and in the federal government that it isn't right for municipally-owned water systems to receive loans from both the state and federal governments, while investor-owned companies cannot. I had always been told that's the way the law is written. Being a stubborn (and some have said hard-headed) engineer, I decided the law should be changed.

Senate Bill No. 8, introduced in the Missouri General Assembly in 1985 sought authority for the Missouri Department of Economic Development (DED) to make loans to municipalities. Loan proceeds were to be used for infrastructure improvements which included water and sewer systems. I went to my boss and suggested we consider writing an amendment to the bill to allow infrastructure loans to small water and sewer companies. He understood how infrastructure improvement in many small water and sewer companies would solve a lot of problems, so he agreed. The legal staff drafted an amendment and it was presented to the Commission. When you present an idea to solve some of the problems with small water and sewer companies, most Commissioners are ready to listen and this was true of my Commission. Since the bill involved the DED, the umbrella agency under which we are housed for administrative purposes, we contacted DED. The amendment was explained and what it could do for the customers of these small water and sewer companies. They agreed with the amendment and the Senator sponsoring the bill agreed to allow it. The bill went to Committee in the Senate and was moving along rather nicely. The National Association of Water Companies (NAWC) Mo-ILL chapter supported the bill and we appreciated this support. I was excited to see that finally there might be a way to give these small water and sewer companies some help in solving their financial problems.

I was sitting at my desk one day when I got a call that some people wanted to come and talk to me about the Senate bill. Much to my surprise, it was a group of investment bankers. Remember, I said I'd been asking for years why investor-owned water and sewer companies could not get loans from the government. These people told me about the Environmental Improvement and Energy Resources Authority (EIERA) law, authorized by Section 260.005 to

Section 260.125 of our statutes, and said that it contained a provision to allow loans to investor-owned water and sewer companies which was great news to me. I was told they would help the Commission develop a loan program for investor-owned water and sewer companies. I agreed that was a great idea but asked where had they been for the past several years. What they wanted was to have the Commission withdraw the amendment because it put two state agencies in the loan business for water and sewer utilities. The PSC ultimately did ask the Senator to drop the amendment.

I told you all this to show that if you just keep asking questions and searching, there is probably an agency and a law in your state that will allow a loan program to be developed for investor-owned water and sewer companies.

Since that first meeting in my office, with the investment bankers in 1985, through a cooperative effort of the PSC, EIERA, and the investment bankers, two loan programs have been developed and work is being done on another program.

This started out, as I said, as an attempt to develop a loan program for the small companies. The first program developed was a bond program for larger water companies such as the St. Louis County Water Company which has 260,000 customers, and Missouri Cities Water Company which has 30,000 customers. It was called the EIERA bond program and because the interest is tax-free, there has been a savings of 2% annually on the issue amount.

This program has allowed St. Louis County Water Company to obtain financing for plant additions and infrastructure improvement. There have been two bond issues each for $25,000,000 and it is fair to say that these issues, under the EIERA bond program, have saved the ratepayers of St. Louis County Water Company approximately $1,000,000 a year, and this will continue for thirty years. The Missouri Cities Water Company has funded plant additions at a cost of $4,500,000 and because of this bond program its ratepayers have saved approximately $90,000 per year and will for the next thirty years. This bond program has helped ease the rate impact of the Safe Drinking Water Act and for making needed infrastructure improvements.

The second program attempted was a pooled financing program but, so far, nothing has developed. An attempt was made to identify five to ten companies together which were ready to borrow funds to pay for needed plant improvements, and to find a financial institution that was willing to do the financing. Several ideas were explored. I wrote the State Regulatory Commissions in New York, Pennsylvania and California...all of which either had a loan program, or were considering one. They were very helpful and provided much information.

I haven't given up on the idea, but maybe that will be the subject of another paper later on.

The third program I want to discuss today involves development in our state of a revolving loan program for small water and sewer companies. Although the development of these loan programs took a great deal of cooperation of many of our staff members' part, it took the work of a special team to complete the task. The team members in our office are Bill Haas, a PSC Staff Attorney, Jay Moore, the PSC Manager of Financial Analysis and myself. We worked very closely with Steve Mahfood, Director of EIERA and Angela Braly, an attorney retained by EIERA.

In 1990 we sent surveys to all the water and sewer utilities in the state, a total of about 160 at that time. The survey requested budgeted information for the next five years for capital improvements. The purpose of the survey was to find out two important matters:

(1), how much money might be needed, and,
(2), whether or not the project would qualify for tax-exempt status for bonds to be sold to finance the projects.

The survey provided the needed information for the EIERA bond program and, from the survey, it was determined that the small companies could not qualify because they were just too small for a bond sale. However in a discussion with the staff of EIERA, we discovered there were some funds available to EIERA that it was willing to commit to the development of a revolving loan program for small water and sewer companies.

Since I was the one who was promoting the program, I was given the task of writing the details of a proposed cooperative loan program agreement between EIERA and the Missouri Public Service Commission.

A cooperative agreement was written which outlined the duties of the PSC and EIERA (1). On May 31, 1990 EIERA passed a resolution which expressed its intent to establish a water and sewer funding program to provide low interest rate, long-term loans to qualifying private water and sewer companies regulated by our Commission. Then in August, 1991, the EIERA passed a resolution to enter into an Administrative Agreement with my Commission, and with an appropriate entity, to act as Custodian of the funds in connection with the administration and operation of the Small Water and Sewer Company Revolving Loan Program (Program).

The agreement cited the laws which empowered the PSC and the EIERA to perform their function and also to contract with each other. Then it was discovered that the PSC law did not have statutory authority to contract with the EIERA. This caused a one year delay in starting the Program. The PSC realized the value of the program, to both the utilities and their customers, so we acted quickly to have a bill introduced in the Missouri legislature to enable us to contract with EIERA. The Missouri legislature was given the facts about the need for the legislation and what the program could do for the people of Missouri. The bill was placed on a "fast track" and an emergency clause was added which allowed the bill to become effective as soon as the Governor signed it in July, 1992.

Although there was a delay because of the need for legislation, the time was well spent. It allowed the PSC team and the EIERA staff more time to develop the various documents necessary to implement the program. The following are the duties of the PSC and EIERA:

The PSC is to be responsible for:
1. The distribution, review and investigation of all program applications and loans paid;
2. The review of all quarterly reports from the Custodian, and any financial or other reports from the participating small water and sewer companies; and,
3. In cooperation with the EIERA, the collection activities relating to the loans.

The EIERA is responsible for:
1. Approving the loans and directing the Custodian to make the requisite distribution of loan funds; and,
2. In cooperation with the PSC, the collection activities relating to the loans.

A draft of the program and cooperative agreement was discussed with the PSC, and it agreed the team should move ahead and develop the program. The same draft was discussed with the EIERA by its staff. EIERA voted to fund the program with approximately $250,000. Because total funding limited the scope of the program, it was decided that participation must be limited, at least initially, to companies with less than 500 customers. Also, the funds could only be used to improve an existing plant or add plant, such as a storage tank or well, but could not be used for plant for future customer growth.

The PSC team and the EIERA attorney developed a request for proposal (RFP) for the selection of a Custodian of the fund. It was decided the Custodian would take care of the bookkeeping, distribution of funds, and the investment of unused funds.

I have attached a copy of the operating procedure we developed (2). I would like to share with you some of the thinking that went into developing the document. We knew very well that a company filing for one of these loans would most likely need rate relief, so we made a provision for that. Also, being aware that we were limited on funds, we limited the loans to a maximum of $80,000 and a minimum of $2,500. We also required that the loan, principal and interest, should be paid back in at least five (5) years. Obviously, there would be advantages to a longer term loan, such as strengthening the company and reducing the rate impact, but funds were not available.

As I said, we limited the size of the company eligible for a loan to no more than 500 customers. We have found through our experience that companies having more than 500 customers are more likely to be able to obtain a loan elsewhere. If more funds were available for loans, I would have recommended moving the customer limit to 1000 customers. In our state so-called small water companies have a lot less than 1000 customers. Also, we observed that companies with more than 1000 customers are much less likely to need help.

The owner(s) of the Company would be expected to establish and maintain at least a 30-35% equity position in the Company, or the equity position would be expected to grow to that amount within a relatively short period of time (generally less than 5 years). This was done to make loan funds available to more companies and to encourage the company or owner to have some vested interest.

The Company will be required to submit bills for payment for equipment or contractors to the PSC Water and Sewer Department. My staff will review the documentation and forward the documents to the custodian within two weeks. This means that loan proceeds may be drawn down. We did this to make sure the funds were not used to pay operating and ordinary maintenance costs and to assure that a contractor or vendor is paid. Therefore, the checks that are issued by the Custodian will be two-party checks; that is, made out to the vendor or contractor and the company. This will allow the company control for record-keeping purposes and monitoring of bills for accuracy.

There were two other requirements placed on a potential borrower. First, the company should be current with all payments of taxes or governmental assessments. Secondly, because this program, with its limited funds, is designed for a company most in need of financial help, the company will be required to demonstrate (based on its own credit) that it cannot borrow funds by any other means at a reasonable interest rate. A company in receivership is exempted from these two requirements.

The Missouri legislature passed a bill in 1991, and the Governor signed it, to allow the PSC to seek court permission to establish a receivership which would actually take over and operate a company that has less than 1000 customers if it is proven that the company has been abandoned, has defaulted on a loan issued or guaranteed by a unit of State government, or whose owner is unable or unwilling to provide safe and adequate service. The PSC promoted the passage of this legislation.

In order for the receivership law to be beneficial, a source of funds was needed. The Loan Program has provided that source.

There was a small water company in trouble and it appeared very likely that the PSC would petition the Court to appoint a receiver, and in fact, did. However, primarily, because of this loan program, a larger, professionally operated company proposed to purchase the troubled company and the receivership was delayed until the purchase case is decided.

To illustrate how this procedure works, I have attached copies of the Note and Loan Agreement (3), and the Supplemental Application form (4). You will observe that the requirements found in the operating procedures are also contained in these documents.

In summary, the PSC has developed a revolving loan program for small water and sewer companies and the PSC team is excited about the program. Although we have limited funds and have had to place restrictions on eligibility of companies wanting to borrow funds, the program will be a useful regulatory tool and will be a source of loan funds at reasonable rates and conditions that will benefit both the Companies and their customers.

Attachments:

(1) Cooperative Agreement
(2) Operating Procedures
(3) Note and Loan Agreement
(4) Supplemental Application

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Records
Public Service Commission

COOPERATION AGREEMENT

This Cooperation Agreement (the "Agreement") is made and entered into as of the 1st day of September, 1992, by the Missouri Public Service Commission (the "PSC"), an agency of the State of Missouri, and the State Environmental Improvement and Energy Resources Authority (the "Authority"), a body corporate and politic and a governmental instrumentality of the State of Missouri.

WITNESSETH:

WHEREAS, the Authority is authorized under the laws of the State of Missouri and in particular Chapter 260 R.S.Mo. and Appendix B(1) thereto (the "Act"), to make, purchase or participate in the purchase of loans or municipal obligations and to guarantee loans to finance the acquisition, construction, reconstruction, enlargement, improvement, furnishing, equipping, maintaining, repairing, operating or leasing of any facility, including land, disposal areas, incinerators, buildings, fixtures, machinery and equipment acquired or constructed, or to be acquired or constructed for the purpose of developing energy resources or preventing or reducing pollution or the disposal of solid waste or sewage or providing water facilities or resource recovery facilities; and

WHEREAS, the Authority adopted a resolution on May 31, 1990, which expressed its intent to establish a Water and Sewer Funding Program to provide low interest rate long-term loans to qualifying private water and sewer utilities in the State of Missouri to enable such utilities, with the approval of the PSC, to acquire, construct, reconstruct, enlarge, improve, furnish and equip their respective water facilities or sewage facilities within their respective service areas which will result in lower cost to the users thereof all for the benefit of the citizens of the State of Missouri; and

WHEREAS, the Authority, by a resolution dated August 8, 1991, authorized the Authority to enter into an Agreement with the PSC which provides for the cooperation of the parties in connection with the establishment of the Program and the rights, duties and obligations of the parties regarding the administration and operation thereof; and

WHEREAS, the Authority, also by resolution dated August 8, 1991, authorized the Authority, to enter into an Administration Agreement together with the PSC, and with an appropriate person or entity with whom the Revolving Loan Funds shall be deposited and who shall act as custodian of the funds in connection with the administration and operation of the Program; and

WHEREAS, the Authority is empowered pursuant to Section 260.035(19) R.S.Mo., to enter into agreements with any state agency to carry out the provisions of Section 260.005 to 260.125 R.S.Mo.; and

WHEREAS, the PSC is empowered pursuant to Section 393.200 R.S.Mo. to authorize a water corporation or sewer corporation incorporated under the laws of the State of Missouri to issue bonds, notes or other evidences of indebtedness; and

WHEREAS, the PSC is empowered pursuant to Section 393.147 R.S.Mo. to enter into cooperative agreements or contracts with the

Authority for the purpose of establishing and administering loan programs for water and sewer corporations having 1,000 or fewer customers; and

WHEREAS, the PSC, by authorization dated August 11, 1992, authorized the execution and delivery of this Cooperation Agreement; and

WHEREAS, it is now the desire of the Authority and the PSC to enter into this Cooperation Agreement.

NOW THEREFORE, the parties to this Cooperation Agreement mutually agree as follows:

1. Definitions. The following terms used in this Agreement shall have the following meanings unless the context clearly indicates another intention:

"Authority" shall mean the State Environmental Improvement and Energy Resources Authority, established pursuant to Chapter 260 R.S.Mo., as amended, and Appendix B(1) thereto.

"Custodian" shall mean a bank or trust company in good standing in the State of Missouri, as shall be appointed by the Authority, with advice of the PSC, to act as Custodian on behalf of the Authority in connection with the operation and administration of the Revolving Loan Fund.

"Program" shall mean the Small Water and Sewer Company Revolving Loan Program established to make loans through a custodial bank to small water and sewer companies under the jurisdiction of the PSC.

"PSC" shall mean the Missouri Public Service Commission established pursuant to Chapter 386, R.S.Mo., as amended.

"Revolving Loan Fund" shall mean that fund established by the Authority and in the custody of the custodial bank selected by the Authority, for the purpose of making loans to small water and sewer companies as approved by the PSC.

"Small Water or Sewer Company" shall mean a water or sewer utility company regulated by the PSC pursuant to Chapters 386 and 393 R.S.Mo., providing water or sewer service within the State, with fewer than 500 customers.

"State" shall mean the State of Missouri.

2. <u>Purpose of the Program</u>. The purpose of the Program shall be to provide financing to Small Water and Sewer Companies for the cost of engineering, purchase of equipment and construction of needed facilities, improvements and additions to their existing water and sewer systems in compliance with applicable Federal and State laws and regulations, in order that they may provide safe and adequate service to their current customers.

3. <u>Development of the Program</u>. The PSC and the Authority hereby agree to undertake the establishment of the Program as follows:

(a) The Authority, with the cooperation of the PSC, shall prepare application and loan document forms for the loans from the Revolving Loan Fund to the participating Small Water and Sewer Companies;

(b) The Authority, with the advice of the PSC, shall through a Request For Proposals process, select and appoint a Custodian and enter into an Administration Agreement providing for said Custodian's duties in connection with the administration and operation of the Revolving Loan Fund;

(c) The Administration Agreement between the Authority and the Custodian shall include but not be limited to the following terms:

(i) the deposit by the Authority of approximately $250,000 (the "Revolving Loan Fund") with the Custodian;

(ii) the delivery by the Custodian of quarterly reports (due January 15, April 15, July 15 and October 15) to the Authority and the PSC regarding all distributions, loan repayments, receipts, interest income and expenses relating to the Revolving Loan Fund and all loans made therefrom;

(iii) disbursement of loan amounts to the participating Small Water and Sewer Companies as directed;

(iv) maintenance of records of loan disbursements, loan repayments, receipts, interest income and expenses incurred in connection with the Revolving Loan Fund;

(v) notification to the PSC if a payment is not received from a participating Company within ten (10) days following the due date; and

(vi) investment of, and payment of interest on, amounts held in the Revolving Loan Fund; and

(vii) instructions on the types and liquidity of investments made by the Custodian.

4. Operation of the Program. The PSC and the Authority hereby agree to operate the Program pursuant to the Operating Procedures set forth on Appendix A hereto, and hereby agree as follows:

(a) With respect to the continued operation of the Program, the PSC shall be responsible for the following:

(i) the distribution, review, and investigation of all Program applications and loans;

(ii) the review of all quarterly reports from the Custodian, and any financial or other reports from the participating Small Water and Sewer Companies; and

(iii) in cooperation with the Authority, the collection activities relating to the loans.

(b) With respect to the continued operation of the Program, the Authority, shall be responsible for the following:

(i) approving the loans and directing the Custodian to make the requisite distributions of loan funds; and

(ii) in cooperation with the PSC, the collection activities relating to the loans.

5. Representations and Warranties.

(a) The PSC hereby represents and warrants that it is authorized under Chapters 386 and 393 R.S.Mo. to perform all of its responsibilities and duties hereunder.

(b) The Authority hereby represents and warrants that it is authorized under Chapter 260 R.S.Mo. to perform all of its responsibilities and duties hereunder.

6. Reservation and Limitation of Rights. None of the rights conferred upon or reserved to the parties to this Agreement shall be exclusive of any other rights available to such parties but such rights shall be in addition to every other right such parties may have by law. The provisions of this Agreement are intended to be and are for the sole and exclusive benefit of the parties hereto. Nothing expressed or mentioned in or to be implied from this Agreement shall be construed to give any person other than the parties hereto any legal or equitable right, remedy or power of claim under this Agreement.

7. Severability. Any provision of this Agreement which is prohibited, unenforceable or not authorized in any jurisdiction shall, as to such jurisdiction, be ineffective to the extent of such prohibition, unenforceability or nonauthorization without invalidating the remaining provisions hereto or affecting the validity, enforceability or legality of such provisions in any other jurisdiction.

8. Counterparts. This Agreement may be executed in counterparts each of which shall be deemed to be an original.

9. Amendments. This Agreement may only be amended, changed, modified, altered or terminated by an instrument in writing agreed to by the parties hereto.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be duly executed and delivered by their respective officers thereunto duly authorized.

STATE ENVIRONMENTAL IMPROVEMENT AND
ENERGY RESOURCES AUTHORITY

By______________________________
Chairman

ATTEST:

____
Secretary

PUBLIC SERVICE COMMISSION

By______________________________
Chairman

ATTEST:

Brent Stewart
____
Executive Secretary

APPENDIX A
OPERATING PROCEDURES
FOR THE
SMALL WATER AND SEWER COMPANY REVOLVING LOAN PROGRAM

1. Small Water and Sewer Companies seeking to participate in the Program shall submit a financing application to the PSC in accordance with 4 C.S.R. 240-2.060 together with the Program's Supplemental Application. If required, a Rate Filing shall be filed with the PSC to support the financing.

2. The PSC's staff shall assign the submitted applications for investigation within two weeks of receipt thereof.

3. If rate relief is requested by the applicant, the PSC staff will make a recommendation for approval or disapproval of such rate relief within 150 days of the date of the Application. Such rate relief will be adequate to provide for the payment of expenses, including debt repayments.

4. The PSC shall submit a recommendation for approval or disapproval of the loan to the Authority and the Custodian. The criteria for recommending such approval or disapproval shall be as follows:

a. The Company must have fewer than 500 Customers.

b. The loan must be used for improvements in the water or sewer system facilities that are necessary for the Company to provide safe and adequate service, and must be limited to replacing or improving facilities to meet the needs of the Company's customers at the time the loan application is made.

c. Loans will not be available for expansion of facilities for growth because limited funds are available.

d. The owner(s) of the Company would be expected to establish and maintain at least a 30-35% equity position in the Company, or the equity position would be expected to grow to the previously indicated percentage within a relatively short period of time (generally less than 5 years).

e. The loan will be for a period of five years with principal and interest being repaid monthly or quarterly unless the Company desires to pay off the loan earlier. There will be no prepayment penalties.

f. The Company will agree to submit bills for payments for equipment or contractors to the PSC Water and Sewer Department which will review and forward the same within two weeks to the Custodian so that funds from the loan may be drawn down.

g. The Company must receive PSC approval for its finance application regarding this revolving loan fund.

h. The Company must have rates approved by the PSC that will provide revenues sufficient to demonstrate an ability to make loan payments. If the Company does not have sufficient rates to provide sufficient revenue, then the Company must file for the necessary rates.

i. The minimum and maximum amount of a loan will be $2,500 and $80,000, respectively.

j. Except for Companies in receivership, the Company must demonstrate (based on its own credit) that it cannot borrow funds by any other means at a reasonable interest rate.

k. The Company should be current with all payments of taxes or governmental assessments except in the case of receivership.

5. The Authority and the PSC shall review the loans on a first-come first-serve basis, provided however, a priority may be granted to, and amounts in the Revolving Loan Fund may be reserved for, Companies in receivership, and Companies who apply for a loan on an emergency basis. All loans must be approved by the Authority, provided however, if a company applies for a loan on an emergency basis, the Director of the Authority, after receiving a recommendation of approval from the PSC, may authorize and approve the disbursement of up to $5,000 for such emergency loans.

6. The Company shall provide to the PSC, the Authority and the Custodian a certificate stating that the proceeds of the loan shall be used to finance costs of engineering, purchase of equipment and construction of needed facilities, improvements and additions to their existing water and sewer systems in compliance with applicable Federal and State laws.

7. The Authority shall, following receipt of all requisite recommendations regarding the loan and copies of executed loan documents, either approve or disapprove the loan and authorize the Custodian to disburse fund to the borrower in accordance with the Loan Documents.

8. The Custodian will within Five (5) business days following the receipt of the notice from the Authority, disburse funds to the Borrower in accordance with the Loan Documents.

9. The Custodian will pay interest on funds in the Revolving Loan Fund and credit such amount to the Fund balance.

Small Private Water and Sewer Company
Revolving Loan Fund Program

NOTE AND LOAN AGREEMENT

$______________ ______________, Missouri

____________, 199__

For value received, ____, [a Missouri corporation] [a sole proprietorship], ("Borrower") promises to pay to the order of the State Environmental Improvement and Energy Resources Authority of the State of Missouri ("Lender"), a body corporate and politic and a governmental instrumentality of the State of Missouri, the principal sum of ________________________________ ___________________________________ Dollars ($___________) (or such lesser amount as shall have been disbursed by Lender under the terms hereof), together with interest, as hereinafter set forth.

Until the full principal amount has been disbursed as provided herein, Borrower shall pay interest on the from time to time outstanding principal amounts [monthly] [quarterly] commencing on the tenth day of the first full [month] [quarter] after the disbursement of any principal hereunder.

Following disbursement of the full principal amount hereunder, payments of principal and interest hereunder shall be made in consecutive payments paid (check one):

☐ Monthly Payments Monthly commencing on the tenth day of the first full month following the last such distribution of the principal amount hereof, and on the tenth day of each calendar month thereafter through and including __________, _______ with a final installment in the amount of the remaining outstanding principal balance and all accrued interest thereon being due on _________________, ______.

☐ Quarterly Payments Quarterly commencing on the tenth day of the first full calendar quarter following the last such distribution of the principal amount hereof, and on the tenth day of each January, April, July or October, inclusive, thereafter through and including __________, _____, with a final installment in the amount of the remaining outstanding principal balance and all accrued interest thereon being due on _________________, ______.

Following such full disbursement of principal, the amount of principal and interest payments shall be as follows (check one):

☐ Equal Principal Payments and Accrued Interest. The first _________ (__) principal payments shall each be in the aggregate amount of ____ Dollars ($________) and the next ______ (__) principal payment(s) shall each be in the aggregate amount of ____________________________ Dollars ($________). Accrued interest calculated as set forth below shall be payable on the date of each scheduled principal payment, so long as there is any principal amount outstanding hereunder.

☐ Equal Amortizing Payments of Principal and Interest. Borrower shall pay principal and interest in _______ (__) payments in equal installments of _____________ _____________________________ Dollars ($________), with the final payment of principal and interest then outstanding on the maturity date hereof.

Interest payable hereunder shall be calculated from the date hereof on the balance of said principal from time to time outstanding at a per annum rate equal to _________ percent (____%). Such interest shall be computed on the basis of a year deemed to consist of 360 days of twelve 30 day months and paid for the number of days elapsed.

Both principal and interest are payable to Lender in care of the bank or other institution from time to time designated by Lender as the Custodian (the "Custodian") for the Small Private Water and Sewer Company Revolving Loan Fund Program described herein. The Custodian and its address on the date hereof is set forth below in the paragraph hereof pertaining to notices. Lender will notify Borrower upon any change of the Custodian and its address. After receipt of such notice, all payments by Borrower hereunder shall be made to such new Custodian.

This Note and Loan Agreement (this "Agreement") is issued as contemplated pursuant to the Small Private Water and Sewer Company Revolving Loan Fund Program (the "Program") of Lender and the Missouri Public Service Commission (the "PSC"), an agency of the State of Missouri. In accordance with the requirements of the Program, Borrower hereby agrees that the proceeds of the loan evidenced by this Agreement shall be used solely to acquire, construct, reconstruct, enlarge, improve, furnish and equip Borrower's water facilities or sewage facilities within its service area, and for the purposes specified in the PSC order authorizing the Borrower to enter into this Agreement. Borrower hereby represents and warrants to Lender and the PSC that, as of the date hereof, Borrower is a water or sewer utility company regulated by the PSC pursuant to Chapters 386 and 393 R.S. Mo., providing service within Missouri and having fewer than 500 customers.

Borrower agrees that all disbursements of principal evidenced by this Agreement shall be made to the order of both the Borrower and the Vendor or Contractor for the Borrower as designated on the Requisition to be provided by the Borrower, as described herein, and shall be subject to the approval of the PSC Water and Sewer Department. Borrower agrees to submit a Requisition for Disbursement to the PSC Water and Sewer Department in the form attached hereto as Exhibit A (at the address provided in such Requisition), which Requisition shall include a certification by Borrower that:

(i) all representations and warranties made hereunder remain true and correct in all material respects;

(ii) there have been no material adverse changes in Borrower's business, operations or financial condition since the date hereof;

(iii) there exists no Default hereunder;

(iv) no receiver has been appointed for Borrower, and Borrower is not insolvent (however evidenced), and Borrower has not commenced nor had commenced against it any proceeding in bankruptcy or any proceeding relating to any reorganization, arrangement, readjustment of debt, dissolution or liquidation law or statute;

(v) Borrower's project financed hereunder is in compliance with all statutes, regulations, ordinances, rules and laws relating thereto.

Each such Requisition shall be accompanied by such supporting materials as the PSC Water and Sewer Department may reasonably request, including without limitation:

(i) a written request by Borrower requesting approval of any necessary changes in the project; (ii) all relevant invoices; (iii) copies of subcontracts, reports and other documents relating to construction of the project not previously delivered; and (iv) any other documents, certificates or reports requested by Lender. Disbursements shall be made not more frequently than monthly for costs that will be incurred by Borrower in connection with the construction and operation of the project and Lender shall not be obligated to make disbursements hereunder until the PSC Water and Sewer Department shall have notified Lender (or Lender's designated disbursement agent) of the amount of the disbursement which has been requested and that the PSC Water and Sewer Department has approved such request.

Borrower may prepay the outstanding principal amount under this Agreement in whole or in part from time to time without penalty, provided that Borrower first pays on such prepayment date all accrued and unpaid interest. Partial prepayments shall be applied to principal payments due hereunder in the inverse order of their maturity, and no partial prepayment shall reduce the aggregate amount of any amortizing payment (other than the final such payment) if repayment is being made hereunder by equal payments of principal and interest.

The date and amount of all disbursements and receipts representing principal and receipts of interest by Lender with respect to this Agreement shall be recorded by the Custodian in the records it maintains with respect thereto. The failure to record, or any error in recording, any of the foregoing shall not, however, affect the obligations of Borrower under this Agreement to repay the principal amount advanced hereunder together with all interest accruing thereon.

Upon the occurrence of any Default hereunder, the principal hereof and all accrued interest thereon, at the option of Lender, shall become and be immediately due and payable. As used herein, the term "Default" shall mean: (i) the failure of Borrower to pay when due any payment of principal or interest as provided hereunder, or (ii) any representation or warranty made hereunder having been untrue when made, or (iii) the failure of Borrower to comply with any covenant or agreement made hereunder.

Upon the occurrence of a Default hereunder, Borrower agrees to cooperate fully with Lender and the PSC in the event the PSC takes action under Section 393.145 R.S. Mo. Supp. 1991.

If any amounts owing under this Agreement shall not be paid as herein provided and this Agreement shall be placed in the hands of an attorney for collection, Borrower hereby promises to pay the reasonable fees and expenses of such attorney in addition to the full amount due hereon, whether or not litigation should be commenced.

Demand for payment, protest, notice of dishonor, and all other notices and demands under this Agreement and any and all lack of diligence in the enforcement of this Agreement are hereby waived by all who are or shall become parties to this Agreement and the same hereby assent to each and every extension or postponement of the time of payment, at or after demand, or other indulgence, and hereby waive any and all notice thereof.

No amendment, modification or waiver of any provision of this Agreement, nor consent to any departure by Borrower herefrom, shall be effective unless the same shall be in writing signed by an authorized officer of Lender, and then only in the specific instance and for the purpose for which given. No failure on the part of Lender to exercise, and no delay in exercising, any right under this Agreement shall operate as a waiver thereof, nor shall any single or partial exercise by Lender of any right under this Agreement preclude any other or further exercise thereof, or the exercise of any other right. Each and every right granted to Lender under this Agreement or allowed to it at law or in equity shall be deemed cumulative and such remedies may be exercised from time to time concurrently or consecutively at Lender's option.

All notices and other communications required or permitted under this Agreement shall be in writing and either mailed (certified or registered), or sent by courier:

If to Borrower:

____

____

____

Attention: ________________

If to Lender:

Custodian, Small Private Water and Sewer Company Revolving Loan Fund Program

____

____

____

____

Attention: ________________

with a copy to:

Missouri PSC Water and Sewer Department

____

____

____

____

Attention: ________________

or, as to each party, at such other address as shall be designated by such party in a written notice given to the other party as provided herein. All such notices and communications shall be deemed given at the time when actually received at the address of the party to whom directed as specified in this Section.

This Agreement is governed by and shall be interpreted in accordance with the laws of the State of Missouri.

____
Borrower

By: ______________________________
Name: ______________________________
Title: ______________________________

STATE ENVIRONMENTAL IMPROVEMENT AND ENERGY RESOURCES AUTHORITY

By______________________________
Chairman

ATTEST:

____
Secretary

STATE ENVIRONMENTAL IMPROVEMENT AND ENERGY RESOURCES AUTHORITY
AND THE PUBLIC SERVICE COMMISSION
SMALL PRIVATE WATER AND SEWER COMPANY REVOLVING LOAN FUND PROGRAM

SUPPLEMENTAL APPLICATION

PLEASE COMPLETE THIS SUPPLEMENTAL APPLICATION ACCURATELY AND IN FULL, AND FILE IT TOGETHER WITH THE APPLICATION TO BE SUBMITTED TO THE PUBLIC SERVICE COMMISSION IN ACCORDANCE WITH 4 C.S.R. 240-2.060. INCOMPLETE APPLICATIONS WILL NOT BE CONSIDERED.

IF POSSIBLE, CONFINE ANSWERS TO THE SPACE ALLOTTED. IF ADDITIONAL SPACE IS REQUIRED, USE THE BACK OF THE PAGE. DO NOT RETYPE, DETACH, OR SUBMIT THIS SUPPLEMENTAL APPLICATION IN ANY OTHER FORM.

Applicant Name Telephone

Street Address

City State Zip

Name of Chief Financial Officer Telephone

Street Address

City State Zip

Name & Title of Responsible Officer Telephone

Street Address

City State Zip

AFB SEIERA. 23543 SUP APPLICATION V1

I. PROJECT SUMMARY

A. Amount of loan sought $ ______________________

B. What is the target date:

1. to receive the loan money? ______________________

2. to begin the project? ______________________

3. to complete the project? ______________________

C. Describe in as much detail as necessary to explain what engineering, construction of facilities, purchase of equipment, improvements and additions are contemplated by the funding of the project. ______________________

D. Will the project be completed at one time or in stages?

E. Briefly describe why financing is necessary for this project. ______________________

F. Describe efforts to obtain other financing.

G. Will the project be supplemented from any other source of funds? ____________ If yes, please state the amount and source of funds. ______________________

H. In conjunction with the application for this loan, is the Applicant seeking a rate increase from the Public Service Commission? ______________________

I. Summary Project Cost and Source of Funds

Project Cost:

1. construction . . . . $________
2. machinery and equipment . . . . $________
3. incidental expenses . . . . . . $________
4. Total (1+2+3) * . . . . $________

Source of Funds:

5. proceeds of Program loan. . . . $________
6. Other funds . . . . $________
7. Total funds (6+7) * . . . . . $________

* Note: These totals should be equal.

J. Attach hereto as Exhibit A a list by agency and type of approval all local, regional, state and federal permits, including applicable, building, operation and pollution control permits required in connection with the construction of the project.

II. OWNERSHIP, MANAGEMENT, AND FINANCIAL RESPONSIBILITY

A. How many years has the Applicant or the Applicant's firm been in business? ______________________

B. Is the Applicant an individual, proprietorship, partnership or corporation? (Please specify)

____

C. If the Applicant is a corporation, list the names and affiliations of the Corporation's board of directors.

____
____
____
____

D. If the Applicant is a proprietorship, partnership or closed corporation, list the name of owners and percentage owned.

____
____
____
____

E. If the Applicant is publicly owned, is it registered under the Securities Exchange Act of 1934? __________

F. Give the name of the Applicant's auditors. __________
____

G. Attach hereto as Exhibit B financial statements for the most recent fiscal year and any interim reports since the end of the most recent fiscal year, and a proforma balance sheet and income statement reflecting adjustments for the financing requested. Include balance sheets, income statements, changes in stockholders equity, statement of changes in financial position, and related notes.

III. <u>NATURE OF APPLICANT'S BUSINESS AND FACILITY USAGE</u>

A. State the general nature of the Applicant's business.

____
____
____

B. State the number of customers served by Applicant's facility? ____

C. Does the Applicant have single or multiple plant operations? ____
State the location, employment, and nature of operations of such facilities. ____________________
____
____
____
____

D. Is the project site now either owned, leased, or under option or contract to purchase by the Applicant? (Please specify) ______________________________
____
____

IV. COST DESCRIPTION OF THE PROJECT

A. Construction

1. Name and address of contractor, if any: ____

2. Name and address of engineer or architect, if any: ____

3. Will a construction performance bond be required? ____

4. Attach hereto as Exhibit C an itemized list of all construction costs. Please be sure to separate labor from materials.

5. Total anticipated construction cost $____________

B. Machinery and Equipment

1. Attach hereto as Exhibit D an itemized list of all machinery and equipment to be purchased. Please include actual and estimated individual item costs.

2. Total cost of equipment and machinery $____________

C. Incidental Expenses

1. Attach hereto as Exhibit E an itemized list of all anticipated expenses incidental to the project, including but not confined to professional fees.

2. Total cost of incidental expenses associated with the project $______________________________

V. MEASURE OF NEED FOR PROJECT

A. Is this project required by reason of any Federal or State law or regulation and/or requirement of any Federal or State Agency? ____________ If yes, identify said law or regulation and/or agency. ____

1. State the time limit or deadline, if any, within or by which the requirements must be met. ________

____

2. State the measure of compliance to be achieved by this project. ________________________________

____

THE UNDERSIGNED HEREBY STATES AND CERTIFIES THAT THIS SUPPLEMENTAL APPLICATION INCLUDING ALL EXHIBITS OR ATTACHMENTS HERETO ARE TRUE AND CORRECT.

Dated ______________________________, 19____.

____
(Firm Name)

____
(Name and Title)

The PUC Role in Assuring Viable Water Service In Small Communities

John E. Cromwell, III
Richard F. Albani
Wade Miller Associates, Inc.

Introduction/Overview

Regulation of water systems in small communities has been a long-standing problem for both state public utility commissions and state public health regulators. Though many potential solutions have been suggested, progress has been very slow due to a lack of stimulus. The inertia of the status quo may finally be broken by the catalytic effect of tougher new compliance requirements under the Safe Drinking Water Act (SDWA). However, a significant restructuring of the small community segment of the water supply industry is needed if SDWA compliance requirements are to be met in a manner which is sustainable.

The inherent incrementalism of the SDWA regulatory program could introduce tremendous inefficiencies into the restructuring process. Restructuring should be approached within the context of a long-term planning horizon. A process resembling ***integrated resource planning*** is required in order to provide assurance that the restructuring process will reflect ***least cost*** principles. If the motive force provided by near-term SDWA compliance pressures is allowed to be the only force at work, the result will most certainly not be ***least cost*** and the problem of assuring reliable water service to small communities will grow worse.

The threat runs deeper than a mere concern for economic efficiency. The concern for ***viability*** stems from a growing concern over ***non-viable*** small water systems. There are presently many thousands of small water systems that are regarded by regulators as "basket cases." These are cases where the institution responsible for providing water service is essentially in default; where the utility management has effectively failed, as manifest in violations of current SDWA standards which represent very genuine public health problems. These are systems which cannot respond to an order. They are unable to cope with problems such as pollution of wells, maintenance and replacement of deteriorated infrastructure and equipment, inadequate pumping, poor water quality, and even breakdowns and wells running dry.

The threat is that there are many thousands of additional "marginal systems" that will become "basket cases" under pressure of SDWA compliance. In addition, many potentially viable solutions may be by-passed due to SDWA-induced incremental decisionmaking, undertaken in the absence of a long-term planning process.

Ultimately, state government will have to intervene to impose a planning discipline and promote efficient restructuring, or to take over and direct restructuring after failure has occurred. The issue is not SDWA compliance; the issue is the long-term reliability and cost of the water supply infrastructure systems serving small communities. If the broader public interest is to be served, there is a clear mandate here for broader forms of intervention by state public utility commissions (PUCs).

Several states have begun to lead the way. This paper draws examples from the experiences in Pennsylvania[1] and Connecticut[2] where the authors have had substantial experience in the development of coordinated interagency strategies to once-and-for-all confront the small water system problem. The Pennsylvania example is more modest, illustrating key first steps towards broader intervention. Connecticut is an example of sweeping reform. The paper uses these two examples to define and characterize the generic components of a coordinated state strategy to enhance the viability of water service in small communities and to highlight the major elements of the PUC role.

The Need for Restructuring

Although large urban water systems serve 90 percent of the population, they account for only 10 percent of the total number of community water supplies. The overwhelming majority of water systems nation-wide are very small systems serving less than 3300 persons.

These proportions result in some very unfavorable economics. While having only 10 percent of the total customer base, small water systems will account for roughly half of the total capital demands imposed by the SDWA and over half of the total annualized cost of compliance.[3] Moreover, infrastructure rehabilitation and replacement requirements exposed by tougher SDWA performance levels will likely entail a comparable level of capital investment needs merely to maintain the existing facilities serving small systems.

Historically, the major cost element in water system construction was the distribution system. Source development and treatment costs were trivially small; all that was required in many circumstances was a well, a pump, a tank, and a chlorinator. The result was a vast proliferation of small independent water systems, often operated by a developer or by a homeowner's association. This configuration evolved in the historical cost environment in-part because it was the *least cost* solution within that environment.

Small water systems are thus a product of the low-cost environment in which they were created. With the capital and operating costs of water service being historically very low, and the effects of inadequate maintenance and replacement being so lagged as to be invisible in the short run, there were no significant cost pressures in the environment in which many small systems were formed. In the absence of significant cost pressures, the institutions originally devised for the purpose of running small water systems evolved without the types of management and financial mechanisms needed to cope with more demanding economic realities becoming apparent today. In the face of the SDWA-induced changes in the cost environment, it is becoming clear that the current configuration involving thousands of small systems is no longer the *least cost* solution.

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1 Cromwell, J., Harner, W. Africa, J. and Schmidt, J.S., "Small Water Systems At A Crossroads," *Journal of The American Water Works Association*, May 1992.

2 Albani, R., "Connecticut Legislation And Experience In Acquiring Small Systems," Annual Conference of the American Water Works Association, Philadelphia, PA, 1991.

3 Schnare, D. and Cromwell, J., "Capital Requirements for Drinking Water Infrastructure," Sunday Seminar on Capital Financing, Annual Conference of the American Water Works Association, Cincinnati, OH, June 1990.

The small system problem has been described for much of the past two decades. A fundamental theme repeated in many of the prescriptions that have been written is the simple notion that small communities will have to adapt to paying much higher water rates. While it is true that higher rates will have to be a part of any solution, a more fundamental requirement is that institutional mechanisms be put in place that are capable of responding more broadly to the challenges of today's cost environment in the water supply industry -- capable, for example, of raising additional capital, of prudent husbandry of the capital stock over the long term, and of sustaining a much more demanding O&M regime on a daily basis. Raising rates is an insufficient solution if it is unaccompanied by other institutional reforms.

The Imperative Need for Planning

SDWA regulatory requirements are a source of significant change in the small system segment of the water supply industry just as they are for the industry as a whole. But the resulting changes in financial risk characteristics could have much more ominous consequences for some small systems, involving more pain than that embodied in a higher water bill.

Without deliberate efforts to the contrary, a well-intentioned approach to meeting SDWA compliance requirements could become a trap for some systems. SDWA regulations will be phased-in incrementally the next decade. As a result, systems may be lured into thinking they are capable of meeting all the new performance requirements when they, in fact, are not. The realization of the true extent of SDWA compliance and infrastructure rehabilitation liabilities could become apparent only after taking on substantial new debt and passing up better options. Satisfaction of SDWA capital demands could also result in further deferral of infrastructure maintenance and rehabilitation needs, creating additional liabilities.

Ironically, as a "break" to small systems, they are allowed more time to comply than larger systems. As a result, however, the larger systems that might be the keystone of a regionalization strategy are making commitments, sizing facilities, and putting concrete in the ground already. Many logical opportunities may be lost forever (e.g., main extension possibilities for the 50 percent of small systems located within suburban areas).

The financial risks involved extend past the owners of the water system to the individual residential customers. If the water system serving a residence becomes incapable of meeting either its financial or its SDWA compliance liabilities, the default could have a negative effect on the values of properties connected to the system. Thus, there is an imperative need for risk management through a planning process.

The fact that there is risk which could convey to individual homeowners provides a potentially strong motivation that can be used to build support for a planning process and for plan recommendations. Under the status quo, there may be no desire to become entangled in a purchased water arrangement with the town down the road, for example. But, a planning process may reveal that doing business with the town down the road is the least objectionable alternative available.

Another equally compelling reason to plan is that there are many thousands of situations where the results will be quite positive. Water supplies are not, for the most part, heavily contaminated; SDWA compliance burdens will therefore be relatively light in many instances. Documentation of compliance liabilities in a plan can help a small system obtain more attractive financing by distinguishing such relatively light burdens from those of other riskier systems. Moreover, a planning process provides a means of assuring that even more attractive possibilities are not missed. For example, it may be advantageous to expand the customer base by becoming "the town down the road" and selling water to the neighbors.

Viability and Restructuring

In nature, environmental change induces animal and plant species to adapt in order to survive. A parallel exists in economic institutions. Changes in the business environment must be met with appropriate ***restructuring*** of economic institutions in order to assure the long-term ***viability*** of the enterprise.

A viable water system is one which has a sustainable ability to meet performance requirements over the long-term. An alternative, and simpler, definition of viability is: ***the ability to cope with change.***

There are many different strategies that can be adopted in approaching the restructuring of institutional arrangements for providing water service. They are classified here into two categories: external and internal.

- ***External*** strategies involve active collaboration with other adjacent water systems to attain the advantages of operating at a larger scale-- this amounts to various different forms of regionalization.

- ***Hard*** **regionalization** implies structural consolidation -- extending a main to enable hooking up to, or purchasing water from, the town down the road. This is often infeasible in remote rural areas, but approximately half of all small water systems are within the Census Bureau's Standard Metropolitan Statistical Areas; i.e., within suburban rings of major metropolitan areas.

- ***Soft*** **regionalization** encompasses an array of strategies for obtaining large scale economies in management, operations, and finance through various sharing arrangements. A popular model is contract provision of operation and maintenance services on a rotating, circuit-rider basis. Another successful example is formation of a county or regional authority to provide not only circuit-rider operation and maintenance services, but also centralized management and pooled access to the capital markets. Finally, there is also an array of *"soft" soft* regionalization strategies, involving such loose linkages as equipment sharing and joint procurement to pool buying power.

- ***Internal*** restructuring strategies involve changes in management and finance sufficient to produce a "turnaround" in the likely fate of the small system. Not all small systems are basket cases. There are many that may be able to handle the changes ahead if they make the right management and financial adjustments. In some cases, such changes might be accomplished through a simple change of ownership.

There will always be some areas where remoteness or other aspects of geography dictate the provision of water service independently at small scale. It may not be possible to involve every small system in *hard* or *soft* regionalization schemes. Moreover, there are many small systems that are presently viable, and that can continue to be viable. There is, however, a danger that in undertaking measures to assist small systems in maintaining their independence, the state would inevitably become involved, to some degree, in supporting, or propping up, systems that would not be viable in the absence of state assistance. Neither forcing regionalization and consolidation nor sustaining non-viable systems through subsidies should be objectives of state viability policy. Rather, the objective of state viability policy should be to help owners and customers of small water systems identify the most viable strategies for provision of water service while, at the same time, adjusting state-controlled barriers and incentives in a manner that will promote the widest possible range of choices.

Framework for A State Viability Initiative

The comprehensive state viability initiatives launched in Pennsylvania and Connecticut have two major parts. The first part is a systematic ***viability screening process*** to generate and review the information needed to assess the viability status of both newly proposed and existing small water systems. The screening process is intended to directly involve water system owners, managers, customers, homeowners, tenants, creditors, and local public officials in confronting the issue of institutional capability in the context of two main strategic questions: 1) is the present system configuration viable over the long-term; and 2) are there any better options available for providing service at larger scale?

To enable individual water systems to make a complete assessment of the most viable strategies for provision of water service, there must be complementary state action to adjust barriers and incentives that affect the range of options available. The existing legal and regulatory setting at the state level has co-evolved with small water system institutions in the historical low-cost environment. There are, as a result, many types of inadvertent barriers to efficient restructuring which have developed over time in the absence of any opposing influences. The objective of the second half of a state viability program, therefore, is the launching of a number of ***sympathetic initiatives*** designed to remove barriers to viability enhancement and/or provide additional incentives and assistance to systems striving to attain viability, including provision of a safety net to handle restructuring of failed systems.

Viability Screening Processes

In its simplest form a viability screening process consists of measures to get small systems engaged in taking ***The viability test***. ***The viability test*** is intended to promote a grass-roots awareness of the changes that are coming and of the full range of options that may be available for coping with change. In the viability test, the intent is to engage small system owners, managers, and customers in confronting the facts of their situation in enough depth to answer these three questions:

1. Is the current system configuration viable?
2. Are there better options available at larger scale?
3. What is the best option?

The hope is that by confronting the realities of the situation and making comparisons to the obvious alternatives, the potential benefits of either internal or external restructuring will become evident. Where these options make sense to people, they will be more likely to pursue them.

In applying ***the viability test***, it is important to address the three questions in the proper context -- with a focus on the long-term prospects of the water system. Focusing on the immediate situation is likely to lead to an incorrect conclusion. There are many small systems who would rate themselves as viable, given the operating conditions they are faced with today. But the real question, as implied by our definition of viability, is can they cope as well with the changes that will be upon them over the next few years? If a system bases decisions about the future on the conditions that exist today, it not only runs the risk of selecting an option that will turn out to be non-viable, but it may also be foreclosing opportunities to adopt other, more viable options.

A common conclusion in the states that have pushed forward with viability screening initiatives is that strategies for intervention can be most effective when they are viewed as a coordinated, interagency effort undertaken on a statewide basis. Several state agencies have means of administering ***the viability test*** through their unique channels of access to small systems. Implementation of many potential solutions requires legal authority that lies outside the reach of the SDWA, but within (or, conceivably within) the reach of other agencies such as, especially, the PUC.

There are three different types of planning initiatives that have been conceived as means of administering ***the viability test.*** These are;

1) new system viability screening -- controlling the growth in the number of potentially non-viable small systems by making them pass a version of ***the viability test*** as a condition of getting a permit.

2) development of system-level business plans -- applying ***the viability test*** directly to existing small systems through various means.

3) comprehensive regional water supply planning -- incorporating ***the viability test*** into broader comprehensive planning processes.

Viability Screening of New Small Systems

Viability screening of new small systems is an attempt to thrust back upon real estate developers the responsibility for demonstrating that the system will be viable over the long-term before granting the permit to the system. Viability research performed in Pennsylvania produced a useful tool for conducting this type of analysis called, PAWATER.[4] PAWATER is a user-friendly, menu-driven PC-program that enables the user to develop a rough estimate of the ***full cost*** of building and properly operating and maintaining a water system. It also summarizes results in terms of the capital cost per dwelling unit and the annual household water bill to give the developer a realistic picture of the true cost that will have to be borne.

An additional approach to new system screening is to require financially-backed assurances or guarantees of viability. The concepts being considered include: escrow accounts, an irrevocable letter of credit from a bank, reputable co-signers, and a contract with a reputable contract O&M organization.

Both viability screening tests and assurances and guarantees require specific legal authority which does not always exist. There are a number of different strategies for implementing these measures.

Some states have successfully modified their state SDWA statutes to enable both viability screening of new systems and requiring assurances. Authority for viability screening can be accomplished by simply inserting the word viability at the right place in the law. Viability screening can then be further

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[4] Gannett Fleming, Inc. and Wade Miller Associates, Inc., PAWATER: Financial Planning Model for New Small Community Water Systems, Prepared for the Pennsylvania Department of Environmental Resources, July, 1992.

defined through rulemaking. Authority to require assurances might have to be more specifically defined in the statute, but the details can still be left to the rulemaking process. The major drawback of modifying the state SDWA statute to provide authority for viability screening or assurances is that state SDWA primacy agencies are staffed with engineers who are not equipped to implement such authority.

In many places state Public Utility Commissions may already have sufficient authority to perform viability screening and to require assurances for companies within their jurisdiction. However, the exercise of such authority by PUCs tends to promote formation of non-profit cooperative homeowners associations as a means of escaping PUC scrutiny. The California PUC adopted strict screening criteria over a decade ago. They have not approved a single new system since, but the number of cooperatives has mushroomed.

Connecticut has solved this problem by expanding the reach of the PUC's certification authority to include all types of water systems, regardless of ownership. In applying for a certificate, the proposed owners/operators must pass thirty discrete viability tests to the satisfaction of the state health department and the PUC. Notably, the permitting and certification authorities of the two agencies were formally fused by statutory changes. Joint approval is required. This integration of regulatory authority affords the advantages of the health department's engineering expertise and the PUCs financial expertise. Pennsylvania is attempting to achieve some of the same benefits through closer coordination of SDWA permitting and PUC certification authority, as documented in a formal Memorandum of Understanding (MOU).

The wish of many state regulators is to transfer the responsibility for assuring viability of new systems to the local level. It is reasoned the local authorities responsible for land use decisions should be made to accept the responsibility for taking over any new systems they approve if these systems should later prove to be non-viable. While there is a ring of justice in this idea, it is difficult to accomplish politically. Connecticut has done it by passing a law that holds the municipality responsible if a water system is allowed to be constructed without first being certified by the PUC and the health department.[5]

A final means of accomplishing new system viability screening is to incorporate it into a comprehensive water supply planning process. The essence of such a process is that it attempts to define logical service area boundaries, including logical main extensions to serve new development. This may provide a less threatening way of enlisting the cooperation of local governments responsible for land use decisions.

A non-regulatory means of disciplining developers of new water systems is through education of the home-buying public. If, through newspaper stories or other means, it is possible to elevate SDWA compliance status to the same level of visibility as testing of indoor air for radon, a market pressure to assure viability might be established.

Viability Screening for Existing Small Systems

The development of system-level ***business plans*** for existing systems is the grass-roots approach to applying ***the viability test***. Developing a business plan may sound too sophisticated for many small systems, especially for the basket cases, but the components of the system-level business plan can be quite simple. The key is a simple comparison of the costs of different alternatives. The business plan covers three areas.

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[5] Section 8-25a of the General Statutes of Connecticut.

The facilities plan is developed on the basis of a comprehensive assessment of all the likely improvement needs of the existing system. This should encompass present and future SDWA compliance needs as well as the backlog of unmet infrastructure repair and replacement needs. The bottom line is a realistic estimate of the costs of making these improvements and the required schedule of expenditures.

At the same time, a parallel analysis is performed to develop estimates of the costs of all conceivable alternative schemes for providing water service, including all plausible *hard* and *soft* regionalization strategies.

The combination of these two cost analyses permits a small system to squarely confront the facts of their situation and evaluate the available choices in terms of a clear cost criteria. Obviously, there are many small systems who will need help in developing even so simple a plan as this. That is where various state officials and various members of the army of technical assistance providers can play an important role.

The hope, of course, is that by confronting the facts, many systems will discover more viable options at this grass roots level, resulting in greater acceptance of regionalized solutions. However, if the numbers suggest a stand-alone operation is still the best choice, then the other two components of the business plan provide a means of assuring the same type of grass roots recognition of what it takes to maintain a viable operation.

The management plan is a simple idea that is an important missing piece in many small systems presently. The idea involves nothing more than writing a few things down on paper to make it clear who is responsible for different operating functions and what those functions are. The act of writing these things down makes the need for specific management commitments more clear.

The financial plan is intended to assure sufficient revenue to meet the ***full costs***. This is accomplished by simply acknowledging on paper the amount and timing of capital investment required in the system over a multi-year forecast and the annual cost per household, or annual water bill. By committing to these key cost figures on paper, there is an implicit financial commitment to viability.

There is an important side issue to this financial aspect of the business plan as it relates to the integration of SDWA and PUC authority. It has often been suggested that SDWA primacy agencies should be able to develop financial criteria for deciding whether or not a system is viable, as a means of forcing regionalization alternatives. There are many defects in that approach. Primary among them is the fact that only a state public utility commission or municipal government can set water rates. There is also the fact that SDWA primacy agencies are staffed with engineers, not financial analysts. However, if the level of capital and annual revenue needed to operate effectively is defined by the facilities plan, then it can be argued that a system must be willing to commit to that level -- by whatever rate structure they choose, or can get approved -- in order to document their ability to remain viable: to sustain SDWA compliance over the long-term.

Thus, the willingness to make the necessary financial commitment in a business plan can be interpreted in terms of SDWA compliance without invading the rate-making authority of other entities. To the SDWA primacy agency, it is immaterial how high the water rates are, or how they are structured, all that matters is that they reflect a commitment to carry the ***full costs*** of a sustainable operation. In a state where the word "viability" can be inserted into the state SDWA, this full cost test could conceivably be incorporated into the SDWA regulations in the form of a business plan requirement without contradiction of other rate-making authorities and without the primacy agency having to become involved in any type of financial analysis; all that is involved is an assessment of the ***full costs*** of operation on the basis of engineering cost analysis.

In Pennsylvania, a viability criterion was included in the state SDWA regulations implementing the filtration requirement for surface water systems. This provided the state SDWA primacy agency with authority to require the essential elements of a business plan. In Connecticut, the integrated exercise of authority between the PUC and the health department was mandated in the context of a deliberate viability initiative, providing complete authority to require and evaluate a complete range of information. In another expansion of the PUC domain, this process in Connecticut provides a requirement for annual reports from all water systems, regardless of ownership status.

State Public Utility Commissions usually have the authority to explore the full range of viability concerns in the course of routine proceedings such as overall rate hearings or advisory ruling hearings required for approval of SDWA-induced treatment expenditures. PUCs generally have a responsibility to assure that the service being provided is least-cost, safe, adequate and reliable. These principles fit squarely within the concept of long-term viability. Historically, PUCs have been unable to pay much attention to water issues due to their preoccupation with other much larger utilities. That situation is changing, however, as SDWA rate cases begin to appear more frequently on the dockett.

A potentially very effective means of administering a business plan requirement is through the application process for attaining financial assistance. This is a remarkably effective strategy that has been employed in-part by the Farmers Home Administration for many years; they have used the quid pro quo of financial assistance in exchange for financial discipline to help turnaround the fate of many many small rural systems. The key to expanding this strategy is to get other lenders to recognize what the Farmers Home Administration has known for many years -- that the long-term viability of the system is critical to determining whether they will be paid back for their loans. Two avenues of expansion of this mechanism are available:

- State revolving loan funds, bond pools, or other financial assistance mechanisms can be encouraged to incorporate elements of the business plan in their application requirements as a means of assessing their own financial risk.

- The local banking community can be educated to better understand the long-term threats to viability, causing them to require the same type of long-term viability planning in their application requirements.

In Pennsylvania, the existence of PENNVEST, a state revolving loan fund which encompasses water supply as well as wastewater, provided an excellent means of focusing this leverage. The SDWA primacy agency and the PUC are presently negotiating a three-way MOU intended to fully coordinate information and analysis relevant to the viability initiative.

A more direct means of encouraging the development of system-level business plans is through the auspices of technical assistance providers who are in continuous contact with the systems, know the situation, and have the trust of small system owners, managers, and customers. This may present a dilemma for technical asistance providers. If the system may be better off as part of a consolidation or regionalization scheme, technical assistance providers could view this as working themselves out of a job. But, in the final analysis, technical assistance providers must confront this issue and ask whether they are really helping to find long-term solutions, or are they just propping the system up to last a little longer. All their hard work is to no ones' benefit if the system is not viable over the long term.

A final strategy for encouraging the type of system level business planning that is needed to assure viability over the long term is to create a pressure for such planning by educating homeowners/customers regarding the implicit risks to the value of their properties if the system is not viable. The wrong decisions regarding viability choices could result in much higher water bills than might have been possible under potentially available alternative arrangements. At worst, a default on SDWA compliance could become a negative factor in real property transactions. There are cases where this worst case scenario has indeed happened.

Comprehensive Water Supply Planning

All of the strategies discussed above for applying ***the viability test*** have been based on taking a case-by-case approach, developing individual business plans for one water system at a time. An obvious shortcoming of that approach is that these individual planning efforts may or may not be optimally synchronized with those of neighboring systems, presenting an obstacle to consideration of potential strategies for collaboration within the region.

This disjointedness is made worse by the staggered implementation pattern of SDWA regulations. A large or medium-size system that might be the logical hub of a *hard* or *soft* regionalization scheme may be faced with the need to make compliance decisions several years sooner than the surrounding small systems. Similarly, a surface water system may have to make tough decisions regarding compliance with the Surface Water Treatment Rule years before a neighboring groundwater system will have to face decisions under the Groundwater Disinfection Rule.

Without some process for bringing things together within a region, many opportunities to improve the viability of water service through regionalization may be passed by. Human nature suggests that once individual water systems begin to sink money into compliance expenditures, there will be ever greater resistance to giving up on the old system, even if it is not the most rational alternative. Thus, not only will opportunities be lost, but new barriers will be created.

Happily, there is a cure for this that has been demonstrated in a few states that have put regional Comprehensive Water Supply Planning programs in place. Washington and Connecticut have implemented a program of comprehensive planning through the authority of explicit new statutory mandates requiring such planning. The comprehensive planning process achieves considerable economies in that *hard* and *soft* regionalization alternatives can be assessed jointly for all systems within the planning region. The planning process promotes the same type of grass-roots understanding as the business plan process because it implicitly involves all the same steps as the business plan. Moreover, it convenes a formal consensus building process among the systems in the region through which the feasibility of alternatives is jointly discussed and evaluated.

The regional comprehensive planning process is particularly valuable because -- by virtue of its regional scope -- it inherently catches the basket cases that might otherwise have difficulty mounting a planning effort and it automatically encompasses the issue of new system development within the region. The Comprehensive Planning Framework is also ideal for incorporating significant collateral issues such as questions of water allocation and water rights. Water quantity issues were in fact the primary impetus behind the statutory mandates for comprehensive planning in both Washington and Connecticut. With the quantity issue included, the planning framework is essentially identical to that defined in the utility field as ***integrated resource planning***.

There are two major obstacles to establishing a regional comprehensive planning approach: 1) politics, and 2) money.

There are many places where planning is either regarded as an exclusively local responsibility or as nobody's business. It is typical to expect lots of resistance to any type of planning mandate handed down from the state level. In both the Washington and the Connecticut programs, final plan approval authority rests with the state and both states intend to use the process in unpopular ways, such as making local officials responsible for guaranteeing the viability of new small systems. In Washington, the establishment of such a strong state planning mandate required persistent, repeated assaults on the legislature over a period of many years. In Connecticut, the unique experience of a severe drought provided the uncommon political momentum sufficient to implement such a program.

The best approach to sweetening the appeal of a planning initiative is to allow significant local control of the planning process and to provide funding to cover the costs of planning. In deference to political and budgetary realities, Pennsylvania has adopted an incentive-based approach. Three demonstration programs have been launched. One offers regionalization feasibility planning grants to any group of two or more municipalities in rural areas. Another provides demonstration grant funding to study the feasibility of establishing county-wide authorities. The third provides demonstration grants to counties interested in launching comprehensive water supply planning initiatives. Such a voluntary approach to initiating comprehensive water supply planning will probably not provide coverage to all parts of the state, but it will encourage planning to go forward in areas where this approach is acceptable and where there is a demonstrated interest expressed by local officials, as manifest by their interest in obtaining the grant funds. These may be just the areas where a planning approach has the greatest chances of succes in any case.

Sympathetic Initiatives to Facilitate Restructuring

As stated above, it is not enough to get small systems involved in long-run planning -- in seriously looking at all their options. The second part of a state viability initiative has to consist of a wide range of what have been called, ***sympathetic initiatives***. These are coordinated efforts by different state agencies intended to make the widest possible range of choices available to small systems. This is accomplished by taking a sweeping look at all the ways in which the various agencies of state government can facilitate the possibilities for beneficial restructuring. There are three generic ways in which the state can do this:

1) removing barriers to restructuring solutions;

2) providing incentives to restructuring solutions; and,

3) providing a *last resort* means of accomplishing restructuring under the direction of the state.

Adjusting State Barriers and Incentives to Restructuring

One of the most important things that must be recognized in undertaking measures to promote viability is the need for restructuring not just of small water system institutions, but of various institutions of state government as well.

Just like small system institutions were shaped by the historical low cost environment, institutions of state government are also a product of this historical environment in which small water systems were not a recognized problem. As a result, the pattern of incentives presented by state government programs and policies is in many ways insensitive to concerns over viability and restructuring. There are many instances in which the actions or policies of state agencies present inadvertent barriers to regionalization. There are many ways in which actions or policies of state agencies inadvertently create incentives that work against consideration of long-term viability.

The solution to this problem is to undertake a comprehensive review of barriers and incentives related to the activities of each relevant state agency to explore possibilities for removing barriers and adjusting incentives in a way that will favor the most viable outcomes. The objective is to achieve a coordinated state program wherein all agencies are pulling together in the same direction.[6]

The SDWA primacy agency provides an important incentive in the form of regulatory pressure to comply with SDWA regulations. But it is important to be sensitive to the difference in incentives that may result depending upon how this pressure is applied.

If the primacy agency implements the regulatory program in a strictly incremental -- i.e, one-rule-at-a-time -- fashion, this may encourage incremental thinking rather than long-term planning within the individual water systems. As discussed earlier, this can be combated by finding a means of making systems think through the long-term implications for SDWA compliance before they commit to incremental decisions.

A second area where the SDWA primacy agency has an important role in structuring incentives is in the area of exemption policy. As a general rule, the perception of strong enforcement pressure creates strong incentives to evaluate prospects for long-term viability and to entertain notions of regionalization. The hope of relief through granting of an exemption can take the steam out the enforcement incentive, however. The best approach is to emphasize the temporary nature of exemptions -- that they are merely a time-extension, not a waiver. In keeping with the statutory provisions, the extra time can be granted in exchange for a plan and a schedule to eventually achieve compliance. An acceptable basis for a time extension is time required to pursue regionalization strategies or to obtain financing. This could conceivably be tied into a business plan requirement.

The SDWA primacy agency can also present a barrier to viability and restructuring in the manner in which it approaches the engineering plan review process in considering approval of innovative technologies. In many cases, engineering conservatism and the mere cost of the review process have presented a barrier to the introduction of potential small-scale technological fixes. This area of policy should be reviewed in light of the overall problem of finding lasting solutions to the small system problem. In the operating arena, the SDWA primacy agency determines the stringency of operator certification requirements, within statutory limits. In states where these requirements are strongest, the effect is to create strong market incentives for circuit rider O&M strategies.

Public utility commission procedures and protocols represent another area where the state can exercise its authority in a manner which either helps or hinders progress towards long-term viable solutions. With regard to investor-owned water systems, state public utility commissions can exert regulatory pressure bearing directly on the issue of viability as it relates to the quality of service provided to customers.

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[6] USEPA, Restructuring Manual, EPA570/9-91-085, December 1991.

But, PUCs also have a significant role in structuring barriers and incentives affecting the feasibility of regionalization and restructuring options involving both publicly and privately owned water systems. PUC regulatory involvement is generally invoked in any situation involving a transaction between public and private entities.

When a municipal system extends service to a suburban area outside the city limits, the PUC often intervenes to regulate rates charged to the suburban customers. In many cases, this has been a significant barrier to logical extensions of service to contiguous suburban areas and the creation of regional water systems. In light of the concern for the long-term viability of the approach to providing water service to such suburban customers, this is one area of PUC policy that might be revisited in the context of a broader concept of the public interest that the PUC is attempting to protect.

In many states, there are large investor-owned water companies that own and operate a number of large and small systems throughout the state or within certain regions of the state. In some cases, this takes the form of a privatized approach to regionalization. In some cases, PUCs have approved *single tariff rates* for such situations which allows the company to incorporate systems that might not be economically viable within a regionalized scheme and which also reduces the burden of rate case filings to one unified application for the entire regional operation.

A final significant area of PUC involvement is in regulating any transactions involving the transfer of ownership between two private water companies or between a private company and a publicly owned company. Such ownership transfers may be integral to the success of regionalization schemes. There are many situations, such as the municipal/suburban boundary case that we just discussed, in which publicly owned and privately owned systems exist in a contiguous polka-dot pattern. The difference in ownership status can present one of the most formidable barriers to regionalization. Historically, PUCs have applied a complicated set of iron-clad rules to the evaluation of ownership transfers in an effort to protect the public from being charged too much when depreciated plant and equipment changes hands. This is another area where PUC policies need to be revisited in order to assess whether the benefits of such regulatory protection outweigh the costs of possibly missing the opportunity to put regionalized solutions in-place that will provide a more viable long-term approach to providing quality service. Pennsylvania, Connecticut, and several other states have enacted more liberal ***merger and acquisition adjustment*** laws which enable progress in the right direction. Connecticut has enacted laws which permit the PUC to authorize slightly higher rates of return on investments related to certain acquisitions.[7]

Water resources agencies in states afflicted with chronic water resource shortages, may be an extremely significant factor in the incentive strucutre. A potential regionalization scheme that might make compelling economic sense in light of the burden of SDWA compliance and long-term viability, may be totally pre-empted from consideration due to the ramifications that consolidation may have in causing water allocation formulas to be adjusted. As with PUC regulation, water resource allocation policies need to be revisited in light of the broader objective of providing water supply in a manner that will be sustainable over the long-term.

State technical and financial assistance programs are another category of state initiatives that needs to be revisited. The most important change that is needed is to redirect the focus of these initiatives to the long-term. If technical and financial assistance are provided to small systems on an incremental basis, the effect may be simply to prop them up -- get them by today's SDWA requirement -- and preserve them until some inevitable future day of reckoning. The net effect could be quite perverse (i.e., "Pick 'em

[7] Section 16-262r of the General Statutes of Connecticut.

up, so I can hit 'em again.") in contrast to the original good intentions. This can be especially perverse in the case of state-supported financing, such as from a state revolving loan fund -- once the state has invested in a small system, it has a vested interest that may become a barrier to regionalization.

The simple solution to this dilemma is to redirect all technical and financial assistance initiatives to operate on a "strings-attached" basis. In this approach, the provision of technical and financial assistance is provided in a manner that promotes progress towards viable long-term strategies. In the financial assistance area, a simple measure adopted by some states, for example, is to give funding priority to applications which involve regionalized solutions. In both Pennsylvania and Connecticut, the state financial assistance programs have been fully incorporated in the state viability initiative in order to achieve this strings-attached feature.

State Takeover Authority And Directed Restructuring

The final essential element of a state strategy to facilitate restructuring is takeover authority -- the ability to direct the restructuring of the "basket case" systems that have defaulted under regulatory pressure. This is a very misunderstood concept. In many people's minds, this should be one of the first instruments of policy. Some believe that states should get substantial new authority and begin to mandate restructuring of the small system segment of the water industry from the start. There is also another school of thought which suggests that this should be the last instrument of policy.

Ultimately, the need for state exercise of takeover authority is inescapable. Such authority can be very expensive to exercise, however, and, on general principles, forced restructuring is likely to be much more troublesome than a restructuring process driven by incentives. Under the incentive-driven approach, the number of basket cases that ultimately have to be restructured by the state is minimized through a process of: 1) incentivizing grass-roots long-term planning to identify options, 2) removing barriers and creating incentives to maximize the range of options available, and 3) applying firm SDWA enforcement pressure to drive the process.

Under this approach the takeover authority is used as a means of following through on SDWA enforcement pressure -- when a system defaults and has no option left but to hand over the keys, the state has to be able to move into the driver's seat in order to sustain the credibility of enforcement. Keeping the pressure on, while opening as many doors to viable restructuring options as possible is the surest means of minimizing the number of basket cases that might have to be taken over in the end.

In the end, the exercise of state takeover authority represents an excursion into a much broader area of public policy than that of the SDWA policy arena. This is important to recognize because takeover of basket case systems will inevitably involve a subsidy from the state. In this respect, the takeover mechanism is a ***safety net*** -- a reflection of state policy regarding rural poverty, rural infrastructure, and economic development. Development of an effective takeover mechanism must draw on these broader constituencies.

The unavoidable need for a subsidy to deal with the basket cases provides another over-arching reason for adopting an incentive-based approach to the overall restructuring process; it provides a means of minimizing the total amount of subsidy required and a means of assuring that subsidies are directed to the true basket case situations where this type of assistance is truly needed.

The need for a takeover mechanism also provides another compelling reason for expanded involvement by the PUC. The PUC is the only state agency that is staffed and equipped to provide provide the relevant type of administrative process with protection of rights to due process. The PUC has the staff expertise required to evaluate all aspects of a default situation and a charter to weigh all the broader public interests. In Connecticut, the takeover law permits the commission to order takeovers regardless of the ownership of the utilities involved. This expansion of PUC authority beyond the normal realm results in a very complete mechanism for resolving defaults. By Contrast, the takeover law in Pennsylvania is narrower, enabling the commission only to order takeovers of investor owned companies by investor owned companies.

Conclusions

Researchers of the National Regulatory Research Institute have proposed a framework for consideration of alternative approaches to regulation in the water supply field.[8] It is grounded in the recognition that commission regulation need not be viewed as an all-or-nothing monolith. State public utility commissions typically have six discrete types of authority, as follows:

- issuance of certificates,
- establishment of rates,
- approval of short and long-term financing,
- approval of ownership transfers,
- resolution of customer complaints, and
- establishment of reporting requirements.

The NRRI researchers offer the insight that regulation may be made more efficient through the development of strategies that adjust the degree and form of intervention within these discrete areas. The coordinated state viability initiatives launched in Pennsylvania and Connecticut, discussed in this paper, illustrate a number of ways in which the exercise of commission authority in these six areas can be modified to allow the natural expertise and ability of the PUC to be more fully brought to bear on the development of sustainable solutions to small system problems.

In the area of certification, for example, commissions can probably determine that assessment of new system viability is already under their authority for investor owned systems. The Connecticut program illustrates how PUC certification authority can be expanded to encompass all new systems without expanding the other five dimensions of commission regulation. Only one of the six areas of PUC authority needs to be expanded in order to address this aspect of the small system problem. Certification of public convenience and necessity is a fundamental PUC function performed to protect the public interest in the configuration of utility service areas. Expansion of the PUC role to protect the broader public interest, as in Connecticut, is a logical step.

The natural role of the PUC in certification can also be relied upon as a source of authority to promote stronger forms of intervention when the inevitable need arises for the state to direct the takeover of basket case systems in default. Again, the Connecticut example leads the way in pointing to logical reforms. Rather than leave the PUC hobbled in this area by traditional constraints of jurisdiction, the Connecticut legislature expanded the reach of the PUC to permit it to direct takeovers regardless of the

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[8] Beecher, J. and Mann, P., Deregulation And Regulatory Alternatives for Water Utilities, National Regulatory Research Institute, Columbus, OH, February 1990, NRRI 89-16.

ownership status of the entities involved. Again, the Connecticut PUC is empowered to protect the broader public interest. Over forty takeover orders have been issued so far.

With the right reforms in regulatory practices, the PUC can also play a more active role in promoting healthful forms of restructuring through incentives. In the area of mergers and acquisitions, Pennsylvania and Connecticut have enacted enlightened adjustment mechanisms that can permit variations from rigid accounting rules when the broader public interest favors making some compromises in order to promote efficient restructuring. PUCs can draw on both their certification and rate making authority in this area.

An issue for consideration in the area of rate reform pertains to the rate case treatment of inside-the-city versus outside-the-city transactions. It may be worthwhile to re-evaluate the benefits and costs of traditional regulatory approaches. Is the airtight protection against the evils of monoply worth the social cost it imposes in the resulting balkanization of nearby suburbs into an inefficient and potentially non-viable patchwork of small entities? One approach, adopted in Connecticut, is to expand the reach of PUC reporting requirements to cover municipals. In this strategy there is the implied threat of expanded PUC rate regulation if municipals stray to far from reasonableness. Conceivably, a commission could also determine to keep the complaint window open as a check on municipals. The threat of PUC regulation of municipals may be as effective as the reality.

As also highlighted in recent NRRI research, the PUC can play a significant role in sponsoring a process of integrated resource planning in the water supply field.[9] Such planning processes are an extremely beneficial means of mobilizing support for efficient restructuring. The Connecticut case represents an example where the PUC is actually the lead entity in spearheading such planning efforts. The substance of the planning process goes to the heart of commission responsibilities for certification and encouragement of *least cost* configurations. The Pennsylvania example illustrates an approach to mobilizing a planning process even in a situation where planning is less widely accepted.

We offer the following conclusions regarding the role of the PUC in assuring viable water service to small communities:

1) Without more significant intervention by state government, the restructuring of the small system segment of the water industry will proceed, under SDWA compliance pressure, in a very inefficient manner. The result is likely to be an increase in the number of "basket cases." That situation will ultimately require a different form of state intervention.

2) It must be recognized that the issue is not SDWA compliance. The issue is state infrastructure policy relevant to water supply. The problem calls for a coordinated interagency approach. The problem calls for legislative expansion of the traditional scope of intervention by the participating agencies and for efficient restructuring of certain institutions of state government.

3) Within the six discrete areas of PUC authority defined by NRRI, there is enormous potential for commissions to selectively expand the reach of the state to take control of the restructuring process. Yet, this can be accomplished without expanding commission regulation as an all-or-nothing monolith.

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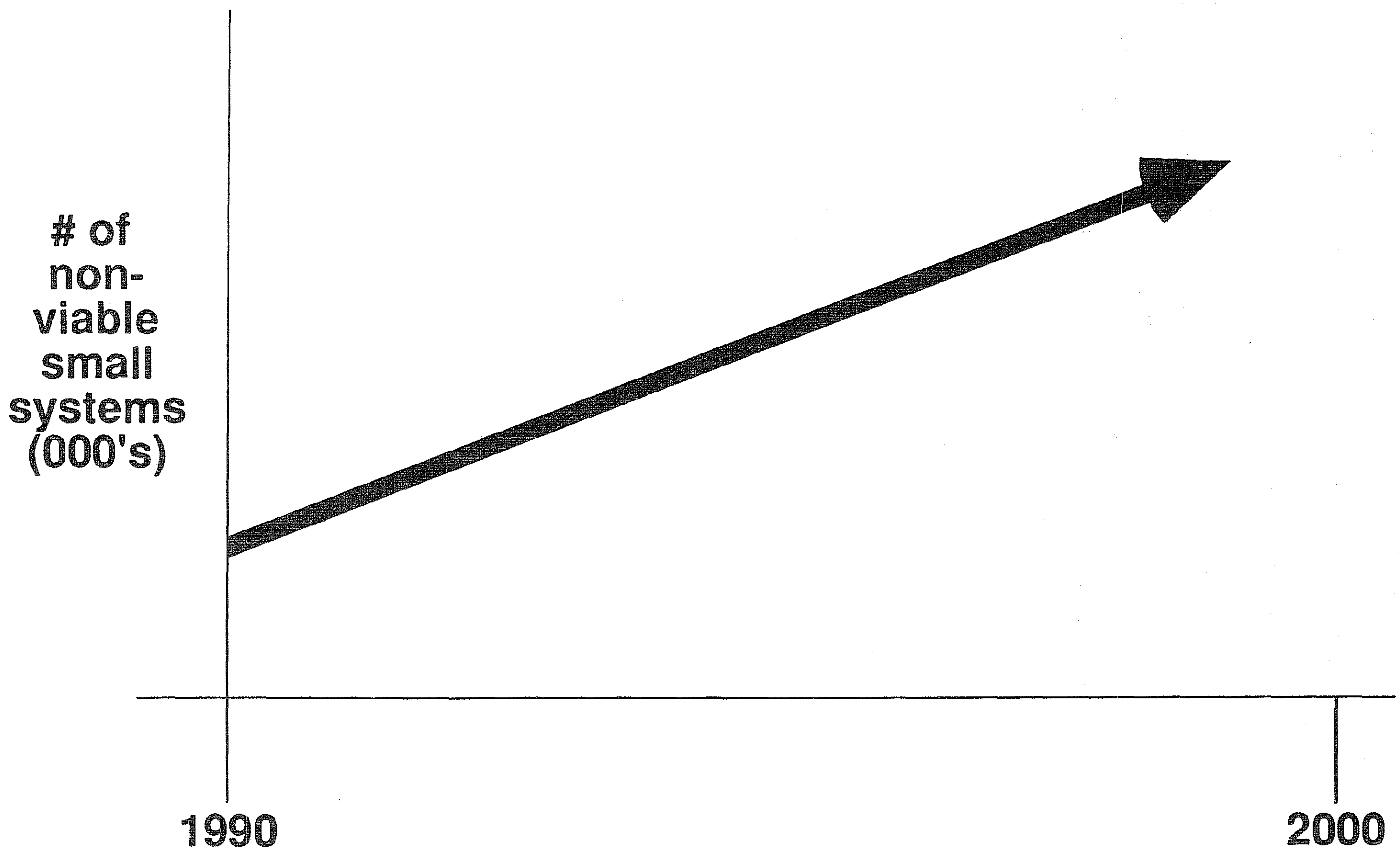
[9] Beecher, J., Landers, J. and Mann, P., Integrated Resource Planning for Water Utilities, National Regulatory Research Institute, Columbus, OH, October 1991, NRRI 91-18.

4) With regard to the broader public interest at stake in the restructuring of this category of infrastructure, the PUC has all the natural types of regulatory authority that are applicable to guiding the process. They require only selective expansion in order to support a very complete framework for attaining sustainable, least cost solutions.

5) The PUC also has the specific expertise and administrative apparatus necessary to the task of restructuring. Unique among state agencies in the water field, commissions have the financial and legal expertise as well as the administrative processes relevant to the types of transactions which may be required. PUCs can usher restructuring solutions into place while maintaining adequate safeguards to assure due process.

6) In sum, there is a clear mandate for broader and more active intervention by state PUCs. PUCs have precisely the forms of authority and the unique expertise that is required. Moreover, without such capable leadership, the outcome will probably be a water supply infrastructure in small communities that is less safe, adequate and reliable. PUCs should not stand by to let this happen, but should seek the legislative authority to fulfill their natural mandate to intervene on behalf of the public interest at stake.

Why Viability Is Important



Historical Low Cost Environment

- Small systems initially appeared viable.
- Abundant supplies
- Minimal treatment requirements
- Weak institutional structures
  - low rates; low capital requirements
  - minimal O&M
  - invisible infrastructure needs

New Cost Environment

- Source of supply constraints
- Broader treatment requirements
- Tougher treatment requirements
- Exposure of infrastructure deficiencies
- Need for higher level of O&M

What Is Viability?

In Nature	In Economic Institutions
Environmental Change	Environmental Change
↓	↓
Adaptation	Restructuring
↓	↓
Survival	Viability

Environmental Change → Restructuring → Viability

Environmental Change

- ❑ SDWA
- ❑ Quantity Constraints
- ❑ Infrastructure Needs

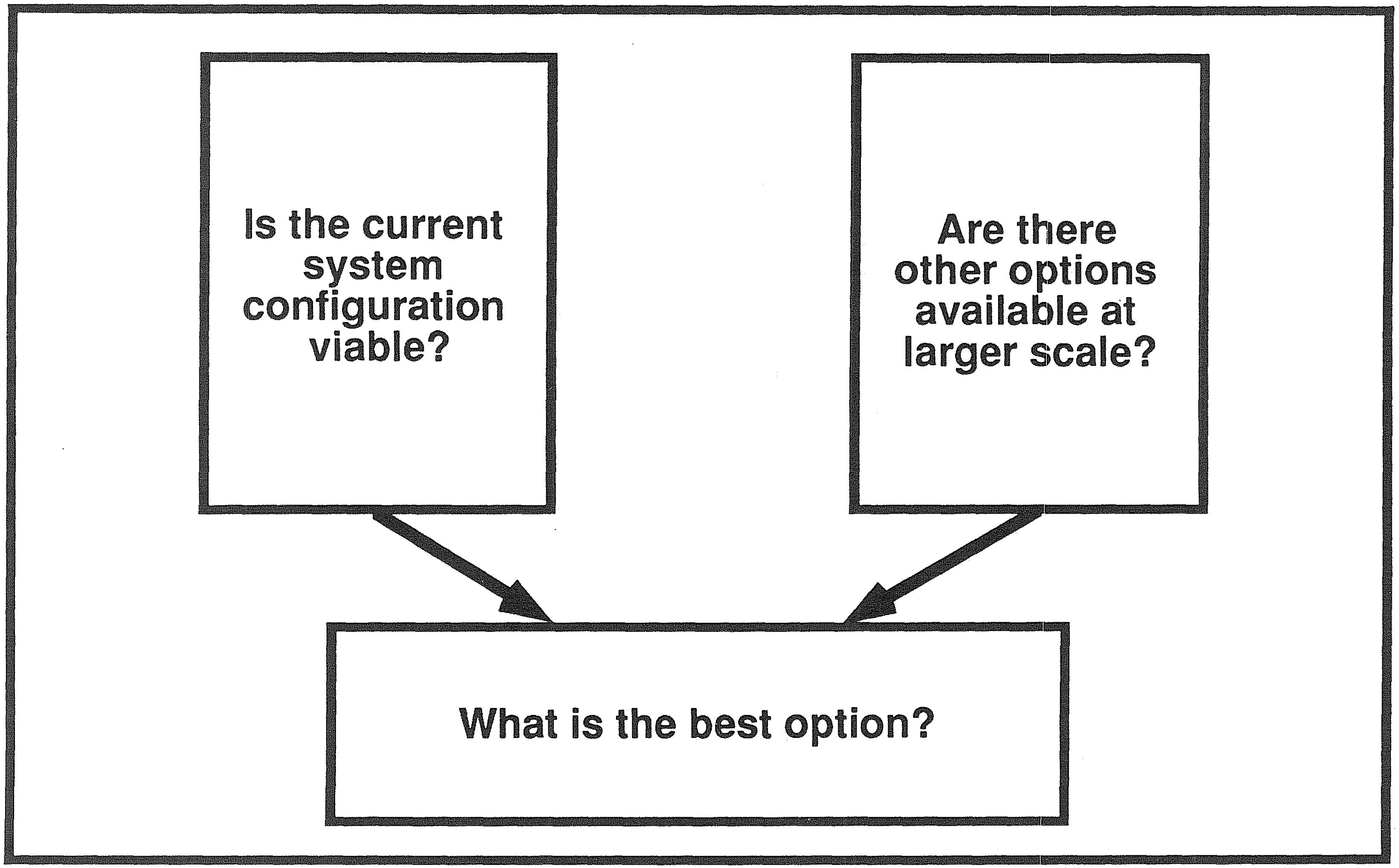
Restructuring

- ❑ External
  - attain large-scale economies through:
    - hard regionalization
    - soft regionalization
- ❑ Internal
  - management & financial turnaround
  - transfer of ownership

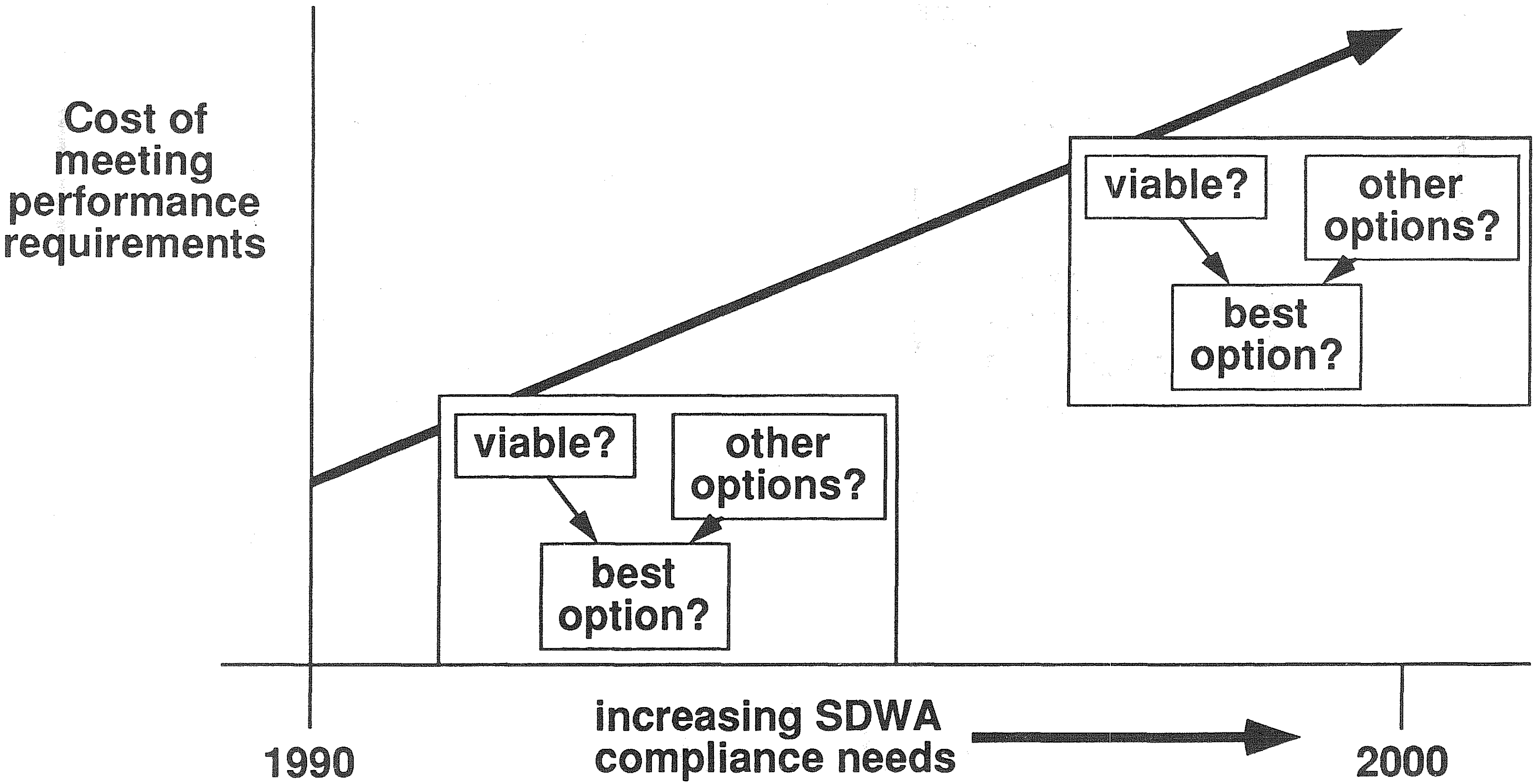
Viability

- ❑ Sustainable ability to meet performance requirements on a long-term basis
- ❑ Ability to cope with change

Viability Test



Correct Context for Viability Test



Strategies for Intervention

Two Components of a Viability Initiative:

- promote long-term planning
- facilitate restructuring

Planning Initiatives

- ❑ New System Viability Screening
- ❑ Development of System-Level Business Plans
- ❑ Comprehensive Water Supply Planning

Sympathetic Initiatives to Facilitate Restructuring

- ❑ Remove Barriers
- ❑ Provide Incentives
- ❑ Direct restructuring of basket cases.

FINANCIAL DISTRESS ASSESSMENT MODELS FOR SMALL WATER UTILITIES[1]

by

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and

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Effective viability policies require assessment methods that can be used by regulators and others for screening utilities and triggering intervention as needed. Because financial performance is so vital to water system viability, a need exists for methods specifically designed to assess the financial health of existing water systems and the expected health of emerging water systems.

Modeling financial failure has emerged almost as a contemporary art form, becoming more important with the recent failure or near failure of numerous banks, savings and loans, and nonregulated companies. The reason for the surge in interest is obvious. Investors, lenders, depositors, legislators, potential merger partners, and so on all are concerned about the potential failure of an institution. Tumultuous economic times, the record number of bankruptcies, and the financial catastrophe in banking are ample reasons to study the causes and prevention of business failure.

Some of the business failure models and the techniques used in them can be used by regulators for diagnosing and monitoring the financial distress of water utilities. Identifying distressed water utilities as early as possible is important since their distress can affect investors, creditors, ratepayers, local government agencies, and regulatory commissions in serious ways. In additional to financial risk, the potential health risk of weak and failing water companies is another reason for regulators to get involved in identifying and taking regulatory action toward distressed systems.

This paper reviews the bankruptcy and failure prediction models that have appeared in the finance literature and develops a distress classification model for water utilities. The methodology can be used as an early warning system to identify potentially bankrupt or financially distressed water utilities, as a screening device applied to systems seeking certification, and as a viability test for evaluating prospective

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[1] This paper is derived from a report recently published by the National Regulatory Research Institute titled *Viability Policies and Assessment Methods for Small Water Utilities* (1992).

structural changes among existing systems. All of these outcomes singly or together should help reduce the future impact of distressed water utilities.

BUSINESS FAILURE RESEARCH

Interest in finding financial models that will predict business failure is widespread among financial institutions such as investment banks, commercial banks, pension funds, insurance companies and other lenders, investors, federal banking agencies, and so on. The rapid development of "leveraged buyouts" (LBOs) in the late 1980s created even greater concern about predicting failure for the issuers of the "junk bonds" used in most leveraged buyouts.[2]

Two types of bankruptcy models have been reported in the literature beginning with the Beaver model in 1966.[3] The major focus of most published research has been on publicly owned firms whose stock is widely traded such as manufacturing, retailing, construction and similar companies. A secondary but smaller focus has been on models to detect financial distress in the banking and savings and loan industries. The bank related models are generically referred to as "early warning" models. While much of the early research was aimed at preventing bank failures, interest in bank related models diminished in the late 1970s as models immediately applicable to large nonregulated firms that were failing were developed.[4]

Part of the shift in interest was due to the realization by some researchers that the federal banking agencies were not likely to adopt their approach because the models lacked a high degree of accuracy in predicting failure more than one year preceding

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[2] Edward I. Altman, *Distressed Securities: Analyzing and Evaluating Market Potential and Investment Risk* (Chicago, IL: Probus Publishing, 1991). The analysis presented in this chapter is an extension of Altman's research on bankruptcy, failure, and default.

[3] William Beaver, "Financial Ratios as Predictors of Failure," *Journal of Accounting Research (Supplement)* 4 (1966): 71-102.

[4] Edward Altman, "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy," *Journal of Finance* 23 (September 1968): 589-609; Joseph F. Sinkey Jr. and D. A. Walker, "Problem Banks: Identification and Characteristics," *Journal of Bank Research* 5 (Winter 1975): 208-217; Joseph F. Sinkey Jr. and D. A. Walker, "Identifying Problem Banks and How Do the Banking Authorities Measure a Bank's Risk Exposure?" *Journal of Money, Credit and Banking* 10 (May 1978): 184-193.

the failure.[5] One type of prediction error in the models (a type I error) would risk predicting the failure of a healthy bank. The potential consequence of such errors was a possible run on the bank (a self-fulfilling failure), something that federal bank regulators want to avoid.

Those engaged in business failure research in the nonregulated sectors seldom refer to the research coming from the banking literature. Likewise, banking studies seldom review or refer to the research in the nonbanking sectors. This is surprising since, as noted earlier, much of the early research in bankruptcy prediction focused on the banking sector.[6] Research begun in the FDIC eventually shifted to the private nonbanking sectors as researchers left the federal bank regulatory agencies.[7]

In developing a model or models that could be made applicable to regulated industries, the banking industry models seem useful. After all, early detection of financial weakness is an on-going part of the federal bank regulatory framework, even though prediction per se is not done by federal banking agencies. Moreover, most early warning bank models are not empirically derived as are the nonbanking models; that is, they are not statistically estimated from a sample of bankrupt firms since banks seldom file for bankruptcy protection.

Early warning banking models may have applicability to water utility regulation for other reasons as well. Banks are chartered by the Comptroller of the Currency (called national banks) and by individual states (called state banks). All banks must apply to the Federal Deposit Insurance Corporation (FDIC) for deposit insurance. The FDIC insurance approval investigation is extremely rigorous since all failed banks must be merged, restructured, or managed by the FDIC (as of 1990 by the newly established Resolution Trust Corporation within the FDIC which was created by Congress in 1989). Thus the interest of the government in assuring the viability of new banks is not unlike its interest in assuring the viability of new water systems. Like the FDIC, government agencies may have ultimate responsibility for managing a failed system (as in Texas), operating it completely (as in Nevada), or forcing its takeover by another entity (as in Connecticut).

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[5] Harlan D. Platt and Marjorie Platt, "Development of a Class of Stable Predictive Variables: The Case of Bankruptcy Prediction," *Journal of Business, Finance and Accounting* 17 (Spring 1990): 31-51.

[6] Altman, "Financial Ratios, Discriminate Analysis and the Prediction of Corporate Bankruptcy," 589-609; Sinkey, "Problem Banks: Identification and Characteristics," 208-217.

[7] For example, Joseph Sinkey and Robert Eisenbeis have left the Federal banking agencies and continue their research in the private sector.

One of the truly significant findings in bank failure research is that management factors, namely poor management, is usually the primary cause of bank failure and closure. The Comptroller of the Currency concluded in its study BANK FAILURE that poor management was the single most important cause of failure.10 These findings should impress utility regulators enough to look seriously at the quality and experience of managers in certifying new water companies.

BASIC FEATURE OF BUSINESS FAILURE MODELS

In recent review articles several authors discuss the major accomplishments and defects of the business failure research and suggest research needs in the field.[8] In his 1987 review article, Frederick Jones identifies fifty-two major articles on bankruptcy prediction since 1966 and there have been many since.[9] Some of the basic features of the predominant models are reviewed here.

Most of the business failure models are empirically derived; that is, there is no theoretical basis for choosing a variable other than the fact that it has been used previously and found to be statistically significant. In fact, there is no widely accepted theory of bankruptcy that determines when or why a firm does or should enter into a Chapter 11 reorganization as opposed to Chapter 7 liquidation, or a merger, or some other option. Nothing about the process seems very predictable and in the banking industry there is accumulating evidence that the agenda and desires of the regulators, political pressures, and other factors may be significant in explaining bankruptcy or closure of banks.[10] Interestingly, these observations may be important for jurisdictional water systems. Water systems, too, can be affected by both regulatory and political pressures.

Much of the business failure research outside of banking is focused on relatively large firms since data are not readily available for models based on small firm failure. This is unfortunate since the bankruptcy rate among small firms (including banks) is

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[8] Frederick L. Jones, "Current Techniques in Bankruptcy Prediction, *Journal of Accounting Literature* 6 (1987): 131-164; Coleen Pantalone and Marjorie Platt, "Predicting Commercial Bank Failure Since Deregulation," *New England Economic Review* 4 (July/August 1987): 37-46; Platt and Platt, "Development of a Class of Stable Predictive Variables: The Case of Bankruptcy Prediction, 31-51; Asli Demirguc-Kunt, "Deposit-Institution Failures: A Review of Empirical Literature," *Economic Review,* Federal Reserve Bank of Cleveland (Quarter 4, 1989): 2-18.

[9] Jones, "Current Techniques."

[10] Demirguc-Kunt, "Deposit-Institution Failures: A Review of Empirical Literature," *Economic Review,* Federal Reserve Bank of Cleveland (Quarter 4, 1989): 2-18.

somewhat greater than among large firms even though the economic impact is probably less severe in the case of a small-firm failure.

In banking, the majority of failures historically have been of small banks. With the rash of recent bankruptcies among large banks this may change. But the large data base needed to empirically estimate a model and replicate it with an out-of-sample group of failed banks makes research difficult in both nonbank and bank modeling. The recent trend of large bank failures partially explains the renewed interest in failure prediction by the Federal Reserve System.[11]

1. Statistical Methods. Early business failure models started with univariate (one-variable) models and progressed to multivariate models.[12] Interestingly, one researcher was able to predict bankruptcy with an 87 percent accuracy with just one ratio, cash flow to total debt.[13] More recent models have used discriminant analysis, probit and logit models, and recursive partitioning models.[14]

Probit and logit models (one of which is applied later in this chapter) avoid some statistical problems of discriminant analysis but the results with classification accuracy seems to be equally as good with any statistical technique.[15] Probit and logit models use cumulative probability functions so as each variable enters the model the cumulative probability of bankruptcy or nonbankruptcy rises, albeit nonproportionally. Finally, many mathematical transformations are used to make models more realistic and statistically legitimate. For example, one research team uses a log transformation on one of the variables--asset size--to normalize its effects on the probability prediction, since there were large differences in the sizes of sample firms.[16] As noted later one of the difficulties of adopting an existing model to water systems is the

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[11] The renewed interest is indicated by the publication of two forthcoming articles on the subject by the Cleveland Federal Reserve Bank (Dr. William Gavin, by phone, March 1991).

[12] On univariate modeling, see Beaver, "Financial Ratios as Predictors of Failure," 71-102; on multivariate modeling, see Edward Altman, *Corporate Financial Distress* (New York: John Wiley & Sons, 1983).

[13] Jones, "Current Techniques in Bankruptcy Prediction," 131-164.

[14] Halina Frydman, E. Altman and Duen-Li Kao, "Introducing Recursive Partitioning for Financial Classification: The Case of Financial Distress," *Journal of Finance* 11 (March 1985): 269-291.

[15] Jones, "Current Techniques in Bankruptcy Prediction," 131-164.

[16] Edward Altman, Robert Haldeman and P. Narayanan, "ZETA Analysis: A New Model to Identify Bankruptcy Risk of Corporations," *Journal of Banking and Finance* 1 (June 1977): 29-54.

model's complexity. Manipulating mathematically complicated models requires time, patience, and expertise; in some cases the data base necessary to use them is not readily available. Many independent variables (or predictors) have been tested for their accuracy in predicting future bankruptcies. Approximately 100 different variables have been tested in bankruptcy studies.[17] The FDIC has used upwards of 250 variables in searching for its ongoing surveillance model (discussed below).

The abundance of potential explanatory variables in this area of research calls for statistical methods that narrow the field to the most important predictors. To develop parsimonious models (fewer variables) as well as avoid the problem of multicollinearity (intercorrelation among the independent variables) a stepwise program is frequently used with discriminant analysis or logit models. Factor analysis is also used to reduce the number of variables to "factors" which are common sets of variables with similar characteristics.

2. Significant Variables. The types of financial ratios that appear to be common to most failure prediction studies are leverage ratios, liquidity ratios, income ratios, and historical earnings ratios. Considerable evidence suggests that as long as each type is represented (for example, liquidity or leverage ratios) specific variables make little difference in the predictive accuracy of the models.[18]

There also is much research centering on cash flow as a key predictor variable, but conflicting notions exist over the best definition of cash flow especially with reference to the accruals versus nonaccrual items used to define cash flow (for example, taxes payable are deducted in accrual models). Cash flow is one of the key ratios in the classification model developed below because it is one of the most consistently significant variables in prediction models. In summary, what appears to be a primary outcome of this research is the substitutability of ratios within the four basic groups. This finding influences the choice of key ratios reported later in this chapter.

As noted earlier, Chen and Shimerda identify 100 variables that have been used in failure prediction research and thirty-one of these have been significant in a statistical sense.[19] Pinches reduced many variables to seven factors similar to the factors of

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[17] K. Chen and T. Shimerda, "An Empirical Analysis of Useful Financial Ratios," *Financial Management* 10 (Spring 1981): 51-60.

[18] M. Hamer, "Failure Prediction: Sensitivity of Classification Accuracy to Alternative Statistical Methods and Variable Sets," *Journal of Accounting and Public Policy* 2 (1983): 289-307.

[19] Chen and Shimerda, "An Empirical Analysis of Useful Financial Ratios," 51-60.

Chen and Shimerda and those used by other researchers.[20] The Pinches factors were used by Platt and Platt, and it is this model that is applied to water utilities in this study.[21] The Pinches factors are: return on investment, capital turnover, leverage, liquidity, cash position, inventory turnover, and receivables turnover. These factors were used by Zavgren in a series of combinations that led her to find three key sets of ratios to be successful predictors of corporate bankruptcy: financial leverage, asset turnover, and liquidity (the best short-term predictor of failure).[22] In an important study, Hamer used four variable "sets" that she derived from several major studies including that by Altman.[23] Each set of variables measured profitability, liquidity, and leverage. For each of the five years studied she found no significant differences in classification results using any set.

Many if not most of the prediction models found in the literature have used quite similar key financial ratios in their construction. In banking studies similar variables also appear consistently as predictors of failure, although some banking related variables are industry specific and have no counterpart in nonbank firms. An example is the loan/deposit ratio, which is commonly used in banking studies. While banking related ratios are somewhat unique the words of Demirguc-Kunt are a useful summary: "all authors find capital adequacy (C), generally proxied by the book value of net worth, to be significant. . . . In addition, earnings (E), usually a measure of net income, are a significant indicator of financial condition."[24] Capital adequacy, though not specifically used in the models below, is reflected in the cumulative profitability variables and essentially affects retained earnings, one of the variables found in many nonbank models.

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[20] G. Pinches, K. Mingo and J. Caruthers, "The Stability of Financial Patterns in Industrial Organizations," *Journal of Finance* 28 (May 1973): 389-396; Chen and Shimerda, "An Empirical Analysis of Useful Financial Ratios," 51-60.

[21] Platt and Platt, "Development of a Class of Stable Predictive Variables: The Case of Bankruptcy Prediction," 31-51.

[22] C. Zavgren, "The Prediction of Corporate Failure: The State of the Art," *Journal of Accounting Literature* 2 (1983): 1-37.

[23] Hamer, "Failure Prediction: Sensitivity of Classification Accuracy to Alternative Statistical Methods and Variable Sets," 269-291; Altman, "Financial Ratios, Discriminate Analysis and the Prediction of Corporate Bankruptcy," 589-609.

[24] Demirguc-Kunt, "Deposit-Institution Failures": A Review of Empirical Literature," 14.

APPLICATION OF THE AVAILABLE MODELS TO WATER UTILITIES

The finance literature clearly emphasizes the idea that a few key financial ratios can be used to predict bankruptcy and distress. The comparability of key variables is illustrated in table 1. To further illustrate this reality the Altman 1968 model, the most widely discussed model in financial textbooks, and the Platt and Platt model were applied to water utility data in our study. Water companies are unique in many ways and therefore no published model fits them perfectly. But the key ratios developed from the literature help identify several that can legitimately be used to detect weak water systems.

Because water systems have similarities both to banking and nonbanking firms the bankruptcy and early warning models can be used to identify variables and ratios applicable to the water sector. None of these models is perfectly adaptable to water systems. Most make use of financial variables and techniques suggestive of what utility regulators could do relatively easily and inexpensively to develop water-industry-specific prediction models. A set of key financial ratios has been successfully used in this line of research and they can be used simply and quickly to detect weaknesses in water systems.

The models performed poorly in terms of measuring financial distress of water utilities, as expected. The reason for the poor showing for both the Altman and Platt and Platt models is simply that utilities are too different for these models to be applied in their current form. However, an important aspect of the Platt and Platt model is the role that industry-specific factors play on firms and their potential for bankruptcy. Industry sales growth and industry output significantly affect firm bankruptcy in this model. Sales growth can be a key determinant of the viability of newly certified water utilities. However, for many distressed systems overall water sales and water sales per capita are not growing so industry-relative factors can severely affect water company profits, especially newly certified water company profits. The ratios used in the model developed below are industry-relative for that reason.

The application of the Altman and Platt and Platt models confirms again that a few key ratios similar to the sets used by other researchers can easily be used in the analysis of financial distress. The development of a model specifically designed to measure distress for water utilities clearly is justified.

NRRI DISTRESS CLASSIFICATION MODEL FOR WATER UTILITIES

Although commercially available failure prediction models are not readily applicable to regulated water utilities, they do shed light on the key ratios that are consistently good failure predictors in a variety of models. A first step in identifying weak water companies as early as possible is to calculate several key financial ratios, such as those used in commercially available prediction models.

TABLE 1

COMPARISON OF KEY FINANCIAL RATIOS USED IN FINANCIAL DISTRESS MODELS

Variable	Altman Model	Platt and Platt Model
Profitability	Operating income / Total assets	Cash flow / Sales
Leverage	Market value equity / Book value debt	Total debt / Total assets
Liquidity	Current assets / Current liabilities	Net fixed assets / Total assets
Profit trend	Retained earnings / Total assets	Sales growth / Industry growth

Source: Edward Altman, "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy," *Journal of Finance* 23 (September 1968): 589-609; Edward Altman, Robert Haldeman and P. Narayanan, "ZETA Analysis: A New Model to Identify Bankruptcy Risk of Corporations," *Journal of Banking and Finance* 1 (June 1977): 29-54; and Harlan D. Platt and Marjorie Platt, "Development of a Class of Stable Predictive Variables: The Case of Bankruptcy Prediction," *Journal of Business, Finance and Accounting* 17 (Spring 1990): 31-51.

The method proposed here follows previous NRRI research on this issue.[25] Table 2 presents the key financial ratios chosen for the analysis. The ratios measure profitability (X1 and X7), liquidity (X2), leverage (X3, X8, and X10), profitability trend (X4), growth (X5), and efficiency (X6). The first seven are expected to vary inversely (negatively) with financial distress, while the last three are expected to vary

[25] Patrick C. Mann, G. Richard Dreese, and Miriam A. Tucker, *Commission Regulation of Small Water Utilities: Mergers and Acquisitions* (Columbus, OH: The National Regulatory Research Institute, 1986).

TABLE 2
KEY FINANCIAL RATIOS USED IN ASSESSING FINANCIAL DISTRESS

Ratio	Measure	Definition	Relation to Failure
X1	Profitability	Cash flow/sales	-
X2	Liquidity	Current assets/current liabilities	-
X3	Leverage	Book common equity/total assets	-
X4	Profitability trend	Retained earnings/common equity	-
X5	Growth and efficiency	Sales/total assets	-
X6	Efficiency and profit	Operating revenues/operating expenses	-
X7	Profitability	Net income/sales	-
X8	Leverage	Total debt/total assets	+
X9	Liquidity	Net fixed assets/total assets	+
X10	Leverage	Current liabilities/total debt	+

Comparison with Other Models		Platt & Platt	Altman
X1	Profitability	X2	X2 & X3
X2	Liquidity	X3	X1
X3	Leverage	X4	X4
X4	Profitability trend	X2	X2
X5	Growth and efficiency	X1	X5
X6	Efficiency and profit	X2	X2 & X3
X7	Profitability	X2	X2 & X3
X8	Leverage	X4	X4
X9	Liquidity	X3	X1
X10	Leverage	X5	X4

Comparison of NAWC Firms		Viable Firms	Distressed Firms	Viable/ Distressed
X1	Profitability	0.258	0.095	2.71
X2	Liquidity	1.702	1.157	1.47
X3	Leverage	0.294	0.226	1.30
X4	Profitability trend	0.500	0.318	1.57
X5	Growth and efficiency	0.275	0.236	1.17
X6	Efficiency and profit	1.321	1.121	1.18
X7	Profitability	0.175	-0.029	-6.03
X8	Leverage	0.699	0.754	0.93
X9	Liquidity	0.823	0.734	1.12
X10	Leverage	0.100	0.181	0.55

Source: Authors' construct.

positively. These ten ratios, standard in that they commonly are part of the variable sets referred to throughout the previous discussion, were calculated for two groups of companies: the fifteen strongest and the fifteen weakest water utilities from the 1989 NAWC *Operating and Financial Data* based on their return on equity (ROE). For the strong firms, ROE averaged 15.4 percent and for the weak firms, it averaged -3.7 percent.[26] It is clear that the ratios in table 2 are quite different between the two groups of water companies. Ratios X7 and X1, both of which measure profitability, show the greatest relative difference in the table.

As also seen in table 2, the ten ratios are similar to those used by Altman and by Platt and Platt. The ratios may be slightly different in construction but they essentially measure the same thing financially. For example, ratio X7 (net income/sales) is a simpler ratio that can be substituted for ratio X1 (cash flow/sales). Cash flow/sales is the most common ratio found in prediction models and is a standard and broad measure of financial health for cash generating companies. Net income/sales is an absolute and narrow measure of distress and can always be used as a preliminary distress test.

Cash flow (measured by net income plus depreciation, which are the two primary sources of funds in a cash flow statement) assigns an important role to depreciation. Depreciation must be added to determine cash flow since it is deducted originally to calculate net income.

Finally, a firm can be considered bankrupt when total liabilities exceed assets and the firm's equity cushion is negative. For water systems, these unfortunate conditions are too often present.

<u>**1. Developing the Classification Scheme.**</u> As noted, the first seven of the financial ratios presented are inversely related to financial distress, that is, the higher the ratio the lower the probability of distress. For simplicity, and because of the redundance in the variables, values of the seven inversely related ratios can be added together to comprise a distress score. This is illustrated in table 3 for a viable and a distressed water system.

Interpreting these findings requires a classification model using data for comparable firms. Again using the NAWC data, the sum of the seven ratios for the fifteen strong firms was 4.50 (with a standard deviation of .99); for the fifteen weak firms, the sum was 3.10. A statistical probability function as illustrated by the normal curve in figure 1, shows that 82 percent of all NAWC water companies would have values between 3.0 and 6.0 in 1989, using 1.5 standard deviations in each direction. Water companies with values below 3.0 could be considered "distressed" those at 4.5 and above "viable."

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[26] Many of the strong firms were also strong in 1985 and many of the weak firms were weak in 1985. In fact, for the strong firms, ratios were nearly identical for the years compared (1985, 1989, and 1990).

TABLE 3
DISTRESS CLASSIFICATION MODEL WITH ILLUSTRATIVE DATA

	Viable System*		Distressed System*	
Ratio X1: Profitability				
Net income + depreciation / Annual operating revenues	$3.3 + 1.3 / 22.9	= .200	$.240 + 1.6 / 14.3	= .129
Ratio X2: Liquidity				
Current assets / Current liabilities	5.8 / 3.7	= 1.570	3.1 / 5.1	= .607
Ratio X3: Leverage				
Common stock equity / Total assets	16.9 / 51.8	= .326	11.1 / 65.3	= .170
Ratio X4: Profit Trend				
Retained earnings / Common stock equity	11.1 / 16.9	= .657	5.0 / 11.1	= .450
Ratio X5: Growth and Efficiency				
Annual operating revenues / Total assets	22.9 / 51.8	= .442	14.3 / 65.3	= .219
Ratio X6: Efficiency and Profitability				
Annual operating revenues / Annual operating expenses	22.9 / 18.7	= 1.220	14.3 / 12.0	= 1.190
Ratio X7: Profitability				
Net income / Annual operating revenues	3.3 / 22.9	= .144	.240 / 14.3	= .017
Distress Score (sum of the ratios)		**= 4.56**		**= 2.78**

* Dollar values are in millions.

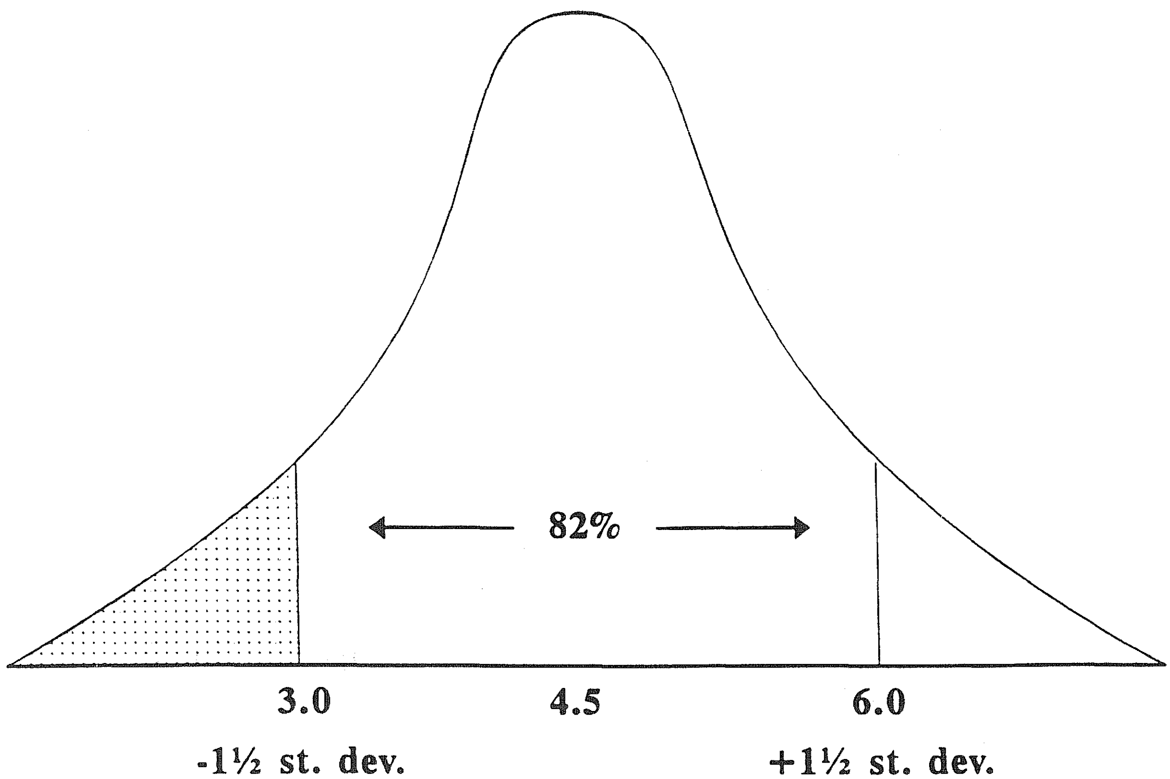

Fig. 1. Normal probability distribution (based on 15 "best" companies).

Using similar logic, those firms with values between 3.0 and 4.5 can be considered "weak" or "marginal."[27]

This technique provides a simple and practical means of classifying water systems. Although not necessarily complete and somewhat limited from a statistical viewpoint, it can provide regulators with a basic tool that may be preferred to no method at all or some purely subjective approach. Moreover, ratio analysis is the most common, simple, and widely used of all financial analysis techniques. The use of the classification model is strengthened by the fact that the total of the seven ratios for the weak firms is 3.1, a figure close to the 3.0 that results under the normal curve discussed above.

Thus, a generalized evaluation system can be developed using these results, whereby water systems can be classified as follows:

If the distress score is:	**The system can be classified as:**
4.0 or more	Good to excellent
3.0 to 3.99	Weak to marginal
3.0 or less	Distressed

Water companies with an overall distress score of 3.0 or below are likely to be in need of immediate attention. Companies with a distress score totaling more than 4.0 are likely to be in good condition. Those in between are weak or marginal depending on whether they are closer to 3.0 (weak) or 4.0 (good). Scores can be calculated for previous years to indicate the direction of distress. Some water companies have been distressed for years and are getting worse as the classification model will indicate.

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[27] Since the statistical technique is based on the fifteen "best" NAWC water companies, the classification system will find about 9 percent of the "best" companies distressed (that is, 9 percent of the normal curve in the left tail as shown in figure 1). The average value for the "worst" fifteen NAWC companies is approximately 3.1 so that about 50 percent of the "worst" companies (that is, 50 percent of the left side of the normal curve) will have values of 3.1 or lower. While there is an overlapping region of "best" and "worst" companies, the value used to classify the truly distressed companies, 3.0, will capture most of them (as various experiments with the model have shown, including the use of 1985 and 1990 data for the strongest and weakest companies in various combinations). The only way to avoid this statistical and classification overlap is to have more than three classification categories. To keep the model and its interpretation simple, three categories were selected for this analysis.

The distress score approach was applied to the fifteen strong NAWC water companies and the fifteen weak ones as a check. Of the strong firms, ten were classified as "good," while five were classified as "marginal." Of the weak firms, two were classified as "good," five were classified as "marginal," and eight were found to be "distressed."

The model did not incorrectly rate any strong firm as distressed. Most weak firms were rated as weak or distressed. The high rating of two weak companies was due to an extremely high value for the indicator of liquidity (X2). This result occurred with two of the fifteen weak water companies in 1989 and in other simulations using data submitted by various commissions and of other randomly selected NAWC firms. In both cases the unusually high liquidity ratio was due to inordinately high accounts receivable or notes receivable. The high level of accounts receivable may in fact be a bad thing if they are old or uncollectible accounts, or note loans made by the firms or their owners that are uncollectible. After all, too much liquidity can be as harmful as too little. An example is when a firm has all of its investments in cash. In one of the two companies where the unusually high liquidity ratio was adjusted downward to a normal 1.5, the high rating of the weak firm disappeared.[28] The other firm had a strong earnings position and a strong liquidity position and is not really distressed, though its return on equity happened to be low in 1989.

Of the forty-five strong and weak firms used in the study (fifteen of each group for the years 1985, 1989, and 1990), the range of return on equity (ROE for 1989) was much greater than for the other years. That is why 1989 was chosen as the preferred model year. In applying the model to the forty-five best companies for the three years, only two of the forty-five were classified as distressed. In both cases, the ROE was not especially low and the companies had strong liquidity and earnings positions, and their operating efficiency (X6) was quite good. It would not be appropriate to consider them financially distressed. This result indicates that the model cannot be interpreted automatically without attention to the individual ratios driving the results, particularly with respect to firms that show a healthy earnings trend and a strong equity cushion.

2. Application of the Model. Commission staff in three states provided financial data for selected small systems to test the proposed methodology. For reasons of confidentiality, the states are identified as A, B, and C and the individual jurisdictional water companies as One and Two. In the judgment of staff members, the utilities in states A and B all could be considered distressed; for state C one utility was considered distressed and one was considered viable. The data are for 1988 and 1989 and the results of the analysis are presented in table 4.

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[28] In deriving the model, the liquidity ratio (X2), was constrained to 3.0 for firms that exceeded 3.0 (three firms). The average liquidity ratio in the model is 1.70, which is close to the normal 1.5 used here.

TABLE 4
VARIATIONS IN DISTRESS CLASSIFICATION SCORES

Company One	1988	1989	Company Two	1988	1989
State A					
X1	.160	.406	X1	.036	.024
X2	.726	.028	X2	.872	.973
X3	.133	-.009	X3	.072	.023
X4	-1.010	-1.040	X4	-.845	-4.440
X5	.709	.191	X5	.728	.741
X6	1.330	1.160	X6	.950	.932
X7	-.155	.076	X7	-.073	-.099
Distress Score	**1.930**	**.808**	**Distress Score**	**1.740**	**-1.840**
Classification: Distressed			**Classification: Distressed**		
State B					
X1	.083	-.045	X1	-.296	-.371
X2	7.640*	1.930	X2	-.028	-.007
X3	-.226	-.278	X3	-.093	-.222
X4	-1.030	-1.026	X4	-10.310	-4.880
X5	.157	.162	X5	1.740	.162
X6	.881	.788	X6	.768	.745
X7	-.135	-.268	X7	-.323	-.401
Distress Score	**1.23**	**1.26**	**Distress Score**	**-8.54**	**-4.97**
Classification: Distressed			**Classification: Distressed**		
State C					
X1	.014	.087	X1	na	.438
X2	.141	.141	X2	na	14.360*
X3	-.293	-.262	X3	na	.738
X4	-4.125	-4.950	X4	na	.244
X5	2.350	2.486	X5	na	.287
X6	1.093	1.192	X6	na	1.970
X7	-.049	.025	X7	na	.315
Distress Score	**-.87**	**-1.281**	**Distress Score**	**na**	**5.49**
Classification: Distressed			**Classification: Good to Excellent**		

Source: Calculated from data provided by state commissions. The identity of the companies is not revealed for confidentiality purposes.

* Liquidity ratio adjusted to normal 1.5.

The seven-ratio classification technique appeared to work well. An exception was the need to adjust the liquidity ratio to the normal 1.5 for two systems, a problem discussed above. It was found that all of the systems, with the exception of the one from state C, were severely distressed from a financial standpoint. These distressed systems would probably file for bankruptcy protection in the nonregulated world; indeed, creditors would force them to do so.

Another test of the model is presented in table 5. Examined here are thirty-five water systems under one state's jurisdiction using data for 1990. The analysis reveals the disconcerting reality of widespread financial distress in the water utility industry. Using the distress classification scheme, only eleven systems could be considered in good to excellent financial health, while another four are marginal. Twenty systems could be classified as distressed and thirteen of these are technically bankrupt, based on the bankruptcy criteria described above. For illustrative purposes, financial data for one of the technically bankrupt firms appears in table 6.

In general, the distress classification model developed here should consistently identify water utilities that are currently distressed and in need of attention by regulators.

The technique is similar to what could be accomplished in a statistically and empirically derived model such as the Altman or Platt and Platt models. The technique presented here is simpler and reasonably accurate for regulatory needs. The method seldom misclassifies strong companies as distressed (only two of forty-five), but more importantly it appears consistently to identify truly weak and distressed water companies. At the very least, the analysis provides an objective initial indication of financial viability. The method can be readily performed using a computer spreadsheet program.

An important aspect of this technique is that it can be adapted to the particular needs and interests of the analysts. It is possible to construct a classification model, for example, based on a fewer number of ratios. If desirable, the ratios could be weighted to reflect the differential importance assigned to particular variables. All ten ratios could be used, as long as the analyst corrects for the fact that some ratios are positively related to failure, while those used in the model above are all inversely related to failure. Although the model developed here is considered generally valid, it may be possible to construct a classification scheme based on a different set of water systems.* The referent group of water systems could be based on geographic considerations (such as all systems within a state or region), utility ownership (such as all investor-owned, municipality-owned, or cooperative systems), or some other criterion. Modifying the model in these ways, however, requires the analyst to recalculate the ranges used to define viable as opposed to distressed systems. In general, the resulting classification scheme should not be dramatically different.

Analyst judgment becomes essential when values for individual ratios fall outside of expected bounds. When this occurs, it is important to check for errors, identify the cause of the deviation, and determine whether it is a temporary anomaly or long term

TABLE 5
DISTRESS SCORES FOR ONE STATE'S WATER UTILITIES, 1990

	Number of Water Systems	
Good to excellent (4.0 or over)	11 (31%)	
Weak to marginal (3.0 to 3.99)	4 (11%)	
Distressed (3.0 or below)	20 (57%)	
Bankrupt (assets < liabilities)		13 (37%)
Total	**35 (100%)**	

Source: Analysis of water system annual reports.

TABLE 6
DISTRESS ANALYSIS OF A TECHNICALLY BANKRUPT WATER SYSTEM

Financial Indicator	Data	Calculation of Key Financial Ratios
Operating revenue	16.5	X1 = 0.024
Depreciation (book)	2.9	X2 = 1.500
Total operating expenses	19.4	X3 = -0.315
Net income	-2.5	X4 = -1.024
Total current assets	3.9	X5 = 0.178
Total assets	92.5	X6 = 0.851
Total current liabilities	0.8	X7 = -0.152
Total liabilities	121.0	
Retained earnings	-29.8	Total = 1.063
Total common equity	-29.1	
Total preferred equity	0.0	
Total equity	-29.1	
Total liabilities and equity	91.8	

Source: Analysis of one water system's annual report.

condition. An "off year" in sales, for example, can produce ratios affecting the entire classification system. A series of "off years" should trigger further investigation. In some cases, as long as the procedure is justified and well documented, it may be desirable to substitute normal values for statistically deviant ones.

In the regulated world, the finding of distress might trigger some other action to try to put an end to the system's persistent financial troubles. For many distressed systems, one or two financial ratios will identify the most serious problem areas. Knowing these problem ratios, specific problem areas can be identified, as illustrated in table 7. Rate relief may be the solution in some cases but not necessarily in others where, for example, an infusion of equity would improve the financial picture. For systems where most or all of the seven individual ratios signal distress, more drastic solutions are worth considering, including the termination of the system's certificate and other means to force a merger, acquisition, or other structural alternatives. In the long term, persistent financial distress cannot be ignored.

It should be noted that the "best" companies in each year analyzed typically experienced an increase in their customer base (that is, economic growth). A significant number of these firms also received rate increases during the current or previous year, meaning their financial health was not affected by regulatory lag (that is, a delay in the recovery of costs or the inclusion of investments in the rate base). Absent economic growth, rate relief (assuming it is cost-based) is essential for the survival of distressed water companies.

One of the goals of this study was to develop a procedure or analytical technique that commissions could use when certifying new water companies to prevent their subsequent failure.

At birth, key ratios do not exist for firms nor for newly certified water companies or newly chartered banks. However, it still makes sense to consider applying the distress classification method or a similar methodology to new systems during the certification process. In other words, new systems could be required to present projected financial ratios for the system's first year of operation, validated by data supporting the system's initial financial and rate structures. Because these projections are only best guesses, regulators must judge their reasonableness as well as rely heavily on judgments about capital adequacy, management experience, demographics of the service territory, and other factors. Trends in the actual ratios for new firms, particularly the profitability trends, could be monitored. Monitoring is especially important during the utility's early years of existence so that remedial measures can be taken if necessary.

There is no way to predict with certainty success or failure of a water system or of any new firm. Still, failure is guaranteed for many new small water systems since the ingredients for success are frequently absent: namely economic growth and management expertise. Operating margins shrink, earnings deteriorate, and the endless cycle of rate increases and negative net worth continues. Hard choices must be made in rejecting new applications for water utility certificates and finding a

TABLE 7

POTENTIAL PROBLEM AREAS RELATED TO FINANCIAL DISTRESS FOR WATER UTILITIES

Ratio Measurement	Potential Problem Areas	
Profitability (X1)	Net income + depreciation / Annual operating revenues	· Rate adequacy · Depreciation rates · Sales trends · Expenses · Financial planning · Management capability
Liquidity (X2)	Current assets / Current liabilities	· Liabilities · Capitalization · Financial planning
Leverage (X3)	Common stock equity / Total assets	· Equity needs · Interest coverage ratios · Indebtedness
Profitability Trend (X4)	Retained earnings / Common stock equity	· Equity needs · Sales trends
Growth and Efficiency (X5)	Annual operating revenues / Total assets	· Rate adequacy · Asset turnovers · Sales trends
Efficiency and Profitability (X6)	Annual operating revenues / Annual operating expenses	· Sales trends · Rate adequacy · Financial planning · Management capability
Profitability (X7)	Net income / Annual operating revenues	· Rate adequacy · Sales trends · Financial planning · Management capability

Source: Authors' construct.

municipal or other nearby water delivery system for the home owners. The onus should be placed on developers to find alternate water supplies as some states are attempting to do. Otherwise proliferation will continue to be a threat and the failure of many small new water utilities will be predictable even without a model.

Another important application of the distress classification methodology is in evaluating structural alternatives for existing water systems, both those under distress and those that might be required to assume responsibility for water service under mandatory takeovers or other circumstances. As discussed in chapter 4, mergers, acquisition, satellite management, and other options for existing systems can be evaluated according to how they pass the least-cost, no-losers, and viability tests. Distress classification provides a means of assessing viability by comparing the current financial condition of systems with the expected outcome of a structural change. Ideally, for example, two weak utilities or a weak and a strong utility can be combined to make a stronger utility. However, if a prospective structural change is not likely to improve distress scores, its implementation should be reevaluated and either modified or abandoned in favor of an alternative that will result in measurable improvement in the well-being of the water utility or utilities involved.

3. WATER UTILITY REGULATORY POLICY FORUM (PLANNING)

Chairperson: Janice A. Beecher

National Regulatory Research Institute

INTEGRATING LEAST COST SUPPLY CONCEPTS WITH WATER SUPPLY ALLOCATION REGIMES IN NORTHERN NEW ENGLAND

By
Philip L. Sussler
Rubin and Rudman

Introduction: The focus of this paper is the structure of rights in and allocation of groundwater supply resources in northern New England. The paper first discusses some of the salient existing institutions of groundwater supply resource management in the northern New England States of Maine, Vermont, New Hampshire and Massachusetts. With that as a backdrop, the paper then evaluates the means by which the regulatory devices used in each state internalize the "real cost" of water consumption and the effect such internalizing has on least cost strategies for water supply. Finally, the paper links the earlier discussion of existing institutional structure to the general question of the design of market-based mechanisms for controlling environmental pollution/resource consumption.

Critical issues of "mechanism design" for such market-based incentives, which provide the context for much of the following discussion, are the determination of: (i) the "environmental space" or resource base within which occurs the impact or effect of an externality, such as the conduct of a polluting activity (or its analogue, consumption of water supply); (ii) the increment of consumption of that resource base which will be permitted; and (iii) the unconsumed increment which will be preserved in order to conserve environmental values; and (iv) the extent to which such consumption can be secured over time and traded between entities and over geographic areas. Items (i) through (iii) are primarily issues of regulatory "allocation"; item (iv) involves definition of the "rights" of market participants in the use of resources made available as a result of the allocation process.[1]

Ideally, market incentive mechanisms internalize the costs of consumption of the resource base. A standard means of doing this is to allow consumers of the resource base to buy and sell rights in consumption for the purpose of minimizing the overall cost of complying with a particular preestablished level of consumption of the resource base. Limiting the amount of consumption coupled with the existence of real costs in avoiding consumption creates scarcity value in the right to consume. The larger the market

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[1] The distinction between "allocation" and "rights definition" is never entirely clear. They can be and frequently are jointly determined, for example. The distinction is made here to facilitate exposition.

space in which resource consumption rights can be traded in this manner, the greater the cost efficiencies, assuming equivalent impact on the resource base. Recently proposed market incentive mechanisms typically involve the creation and trading of rights in the levels of consumption (or in pollution emissions) which remain after the adoption of uniform so-called "command and control" pollution reduction measures and local source impact controls by each polluting source. The level of such consumption rights is established by an allocation rule so as to conserve the environmental "sink" which would otherwise be consumed. The measure of the "resource base," and the level and nature of permissible consumption provide the parameters to the market; how they are defined determines how well cost efficiencies are meshed with achievement of environmental protection goals.[2]

Water management allocation/rights regimes have been grappling with at least a portion of these issues for some time. The extreme heterogeneity of water supply resource management regimes across each of the fifty states can be correlated, at least in part, with differences in the relationship between the resource base and demand. In the relatively dry states of the West, exclusive property right regimes for water (the so-called prior appropriation regime) have predominated. These regimes explicitly attempt to internalize the scarcity costs of water supply, albeit many would argue without adequate recognition of the full range of such costs or other interest or values. Traditionally, relatively humid eastern states have adopted rules of groundwater allocation and definitions of private rights in groundwater which, in major part, lack recognition of scarcity costs (or more precisely assume for groundwater infinite availability of the resource).

As this paper seeks to demonstrate, the evolving institutional structure of groundwater rights in northern New England has at least partially changed the traditional Eastern water groundwater allocation/rights scheme. Some specification of the water allocation/rights regime which either explicitly or implicitly incorporates scarcity costs is inevitable as resource conflicts grow and as more investment is directed to water supply because of greater consumption of the resource or because of regulatory redefinition of the portion of the resource which must be left unconsumed. The design of the allocation/rights regime, however,

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[2] See, e.g., EPA Office of Water and Office of Policy, Planning and Evaluation, Incentive Analysis for Clean Water Act Reauthorization: Point Source/Non-Point Source Trading for Nutrient Discharge Reductions (April, 1992); Project 88 -- Round II, Incentives for Action: Designing Market-Based Environmental Strategies (May, 1991); Project 88, Harnessing Market Forces to Protect Our Environment (December, 1988).

can take many forms. The question of measuring the resource base and matching the market space to the resource base remains particularly difficult with regards to water supply because of the great heterogeneity of the resource, i.e., the many ways in which groundwater is connected to the larger environment and, therefore, in which local impacts are linked to regional and environmental impacts. This makes the issue of creating market-based incentives for water supply a more delicate matter than for what appears, given current science, to be less heterogeneous environmental media such as the air.[3]

Several other prefatory comments are in order. First, focussing on the water supply allocation/rights scheme, in some respects, fails to address the central question facing the water supply industry of cost impacts due to the treatment requirements of the Safe Drinking Water Act (sometimes the "SDWA"). Issues of water allocation/rights may be perceived by some policy-makers as a side-show when compared to the challenges of SDWA compliance. Further, hefty SDWA compliance costs may make it more difficult to implement reform in water allocation, if such reform means even more immediate costs for the provision of water supply. In defense of undertaking water supply allocation/rights reform, it can be said that such additional costs are inevitable as the limits of the resource base are approached (and may be less if incurred up-front as part of a comprehensive allocation/rights scheme rather than on an ad hoc basis as use conflicts arise).

Second, the water supply industry in Northern New England is subject to numerous institutional obstacles to adoption of least cost strategies. These include less than full cost pricing. These obstacles are likely to persist, so a certain amount of humility must accompany any proposal for reform of water allocation/rights regimes styled as "least cost". The lack of rate regulation of municipal operators, who predominate, however, means that the water allocation/rights regime is a significant remaining vehicle for regulators to create incentives for adoption of a least cost strategy by water suppliers.

Finally, regulatory developments in other areas of environmental law, as is noted in passing, are redefining the increment of the "resource base" which can be permissibly consumed. These changes are treated here as "exogenous" to the water supply allocation process. If past is prologue, however, these other changes are, at least in part, likely to be jointly determined by the allocation process itself.

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[3] But see, e.g., National Research Council, Rethinking the Ozone Problem in Urban and Regional Air Pollution (1991)

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<u>Water Management and Regulatory Institutions in Northern New England</u>: Water supply management and regulation in the Northern New England states, as with other resource regulation regimes, reflects a conglomeration of ancient "common" law, which in many cases survives to the present (albeit in the background), and regulatory agency oversight through the structures of the administrative state. The regulatory regimes in the different states reflect certain common themes, e.g., evaluation of the local area of impact of a groundwater withdrawal, and differences, especially in the degree to which regional or basin-wide planning considerations are considered. Each of these regimes in greater or lesser degrees defines the property rights in water supply in each of the respective states. The limitations and contingent natures of the exclusive rights to water development created under each of this regimes is a critical consideration in planning incentive-based mechanisms for least cost development of the resource.

Comparisons among the structures of the regulatory regime in each of the states roughly correlates with the relationship between the resource base and demand and the number of users of the water supply; as the balance gets closer and there are more users (as it is in Massachusetts) there is more regulation of regional and cumulative impacts.[4] This is not a deterministic correlation, but it does reflect in a rough sense the internalizing of environmental impacts as human activity approaches the constraints of the resource. As will be seen, the internalizing of what otherwise would be an environmental externality does not necessarily adhere to the conventional model of exclusive property rights. In many respects, existing institutions such as in Massachusetts can more fairly be characterized as a regulatory allocation scheme which subsumes elements of a property rights regime.

In each of the states, the first layer of regulation focuses on the particular local impacts of a withdrawal of groundwater or

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[4] By way of example, note the following 1990 population densities per square mile in each of the states examined:

Massachusetts	767.6
Maine	39.8
New Hampshire	123.7
Vermont	60.8

U. S. Department of Commerce, Bureau of the Census, <u>State and Metropolitan Area Data Book</u>, (1991), 202. Similar relationships obtain for water consumption densities. <u>Id</u>., 239. Meanwhile, climate and annual rainfall are approximately equivalent over the four states.

1922_1

surface water. This regulation takes two forms: (a) well installation approval and well-head protection regulation, largely mandated for the states by the federal Safe Drinking Water Act; and (b) "common law" rules for determining liability in the event a particular withdrawal has a detrimental impact on another withdrawal of water supply or presence of water.

A second layer of regulation addressing water pollution and wetlands does not typically directly address but has a potential impact on water supply resource use (and is expected to have an increasingly greater impact on such use). In the past, the water pollution and wetlands regulation focussed primarily on "water quality" by regulating what is discharged to a water body or to the ground (water pollution) or actions to fill or physically alter water bodies (wetlands). By contrast, water supply regulation focuses primarily on "water quantity". Because the quantity of water is an important variable in determining the quality of water and in preserving the habitats which the wetlands protection laws, for example, address, increasingly, wetlands and water pollution law are expected to "colonize" water supply resource use regulation.[5]

A final and third layer of regulation involves an attempt to establish regional, river basin-wide planning for limiting the timing and amounts of water withdrawal. This regulation attempts to look beyond the immediate, localized impacts of a particular water withdrawal, to consider such uses in aggregate over the area of their impact and to mesh such uses with overall resource constraints resulting from seasonal variations and droughts. This third layer of regulation has been fully implemented in Massachusetts only. New Hampshire has passed legislation, as yet not fully implemented, which imposes this type of regulation only in designated areas, through general environmental permitting programs which do not address groundwater withdrawals directly. Proposals have surfaced to implement this regulation in Maine, which have not yet been acted upon. Vermont has not proposed such regulation; but is considering (and has applied on a case-by-case basis) a form of such regulation which would be implemented through general environmental permitting regulation.

Massachusetts: From the perspective of complexity, Massachusetts, among the four states examined, has adopted the most elaborate system of groundwater supply regulation. Massachusetts has adopted a new source approval/well-head protection scheme through which new water withdrawals are subject to regulatory approval.[6]

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[5] See for example, EPA, Biological Criteria; National Program Guidance for Surface Waters (April, 1990).

[6] 310 C.M.R. 22.00.

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This regulation is also paralleled in the other northern New England states and is responsive to directives of the SDWA.[7] Capacity limits for particular sources are established as part of the new source approval. These limits generally correlate with the maximum allowed pumping rate over an extended period with permissible maximum limits of drawdown of the ambient groundwater. More detailed and restrictive standards are imposed for wells with greater than 100,000 gallons per day ("gpd") capacity. Differences in the allowed yields of the wells varies depending on whether the withdrawal is from an unconfined, confined or bedrock aquifer. The yield limits on unconfined groundwater sources, because of their more immediate connection to the area's hydrology, is more exacting, involving limits on the permissible drawdown for stabilization of the groundwater level at the permitted maximum pumping rates, seasonally variant safety factor adjustments and limits on the assumed depth of the well (so that withdrawers cannot skew results by pumping from deeper levels).[8]

New source approval also requires the delineation of protection zones around the wells which correlate with the area of groundwater near the well which contributes to the well over specified periods of pumping at maximum rates. The protection zones are subject to land use control requirements to preserve the water quality and are means of resolving local conflicts of use with other nearby water withdrawal sources.

Regional conflicts in uses among sources or between sources and other users or uses of water are regulated by a state-wide water withdrawal regulatory program under the state's Water Management Act enacted in 1985.[9] Under this Act, all new water withdrawals in excess of 100,000 gpd require a permit. Existing withdrawals which register a record of their use during a base period are grandfathered for a ten year period.[10] Permitted withdrawals are

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[7] 42 U.S.C. sections 300f _et seq_. Compliance with federal directives enables the complying state to receive federal funding.

[8] _See generally_, Mass. Department of Environmental Protection, Division of Water Supply, _Guidelines and Policies for Public Water Systems_ (Revised: October, 1991).

[9] Mass. Gen. L. c. 21G; 310 C.M.R. 36.00 _et seq_.

[10] Grandfathered withdrawals are those which were registered before Jan. 1, 1988; the base period use authorized by the registration is the average volume of water withdrawn from a particular source during the five years ending on January 1, 1986. 310 C.M.R. 36.03, 36.04.

capped by the "safe yield" of each "river" basin.[11] Twenty-eight such "river" basins have been delineated for the entire state.

Safe yield is an elastic concept which has undergone rapid evolution over the history of the Act. It entails balancing the cumulative level of withdrawal with the "minimum in-stream flow" ("MISF")[12] for the river basin in which the source is located. The MISF compares the existing stream-flow requirements for spawning/passage of fish; the dilution requirements for water pollution discharges and other uses (recreation, etc) with the historic twenty year river low-flow in drought conditions to establish a minimum annual threshold for determining limits to withdrawal. The MISF analysis posits a single interconnected hydrologic regime within each river basin with groundwater flows ultimately feeding the river. The safe yield analysis also involves an evaluation of localized impacts on surface water bodies and wetlands resulting from drawdown. Safe yield may cap the overall yield and also impose seasonal limits during periods of low river flow.

River basin plans (which establish the MISF and the reasonable in-stream flow [or "RISF"] under the Interbasin Transfer Act described below) and Water Management Act permitting for each river basin have been implemented for portions of the state on a phased basis, with entire coverage of the state slated for 1995. The river basin areas deemed the most "stressed", generally those close to Boston, were addressed first.

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[11] While the terminology "river" basin is frequently used, the more accurate term is water planning area, in that some of the "basins" are coastal plains, islands or peninsulas (e.g., Cape Cod) which are hydrologically connected but are not oriented around a river.

[12] The terminology for stream flow determinations has been undergoing some change. The stream flow criteria used under the Water Management Act is "minimum" in-stream flow, thereby ostensibly intending to reflect a narrower set of criteria than the "reasonable" in-stream flow used by the Water Resources Commission in making determinations under the Interbasin Transfer Act, described below. For purposes of the discussion in text we have adhered to these distinctions, but note that the differences between the concepts employed under the two acts are not always recognized in practice. See Department of Environmental Management, Draft South Coastal Basin Plan (October 3, 1991), 40, 44 (establishing more restrictive reasonable in-stream flow requirement for interbasin transfer act administration, compared to minimum in-stream flow used for water management act approval).

Other than the Cape Cod and certain coastal areas, no river basin safe yield cap has directly limited water withdrawals on a regional basis.[13] On Cape Cod, because of its special characteristics involving a sole source aquifer and surrounding salt water, safe yield limits were set on a more localized basis determined by overall impacts of drawdown on surface water bodies, such as kettle ponds, and salt water infiltration.

While yield limits are not directly recognized through the water management act permit process, new source applications are constrained by several considerations. Permitting a new source under the Water Management Act requires the applicant to demonstrate general adherence to a promulgated set of standards for water conservation (leak detection and maintenance), full cost pricing and other measures.[14] The applicant must also project demand sufficient to justify the requested yield. Demand projections are adjusted downwards for the assumed adoption of conservation measures and other performance standards. The Water Management Act does not require approvals for transfers among suppliers. It does establish a twenty year cycle for the renewal of the terms of the permits.

The policies implemented through the Water Management Act do not explicitly value the consumed resource because of the absence of enforcement as yet of a regional safe-yield cap. They can, however, be characterized as an approximate form of "shadow pricing" in that they add the cost of alternate methods of meeting the level of service demand to the development costs of the incremental resource (other than its "scarcity cost" which would exist if the safe-yield cap were imposed). Implementation of these policies is problematic insofar as the policies apply to water exchanges or transfers between water suppliers. Downward adjustments to demand projections (to match a supplier's own demand with its own production), limiting new source approvals to such adjusted demands and the prospect of the ten year phase-out of registered (i.e., grandfathered) withdrawals combine to put at risk a transferor's continuing entitlement in water supply which

[13] On occasion the Water Management Act permit has imposed a withdrawal limit below the level approved by the new source approval. While presumably the limitation was based on non-localized factors not considered in making the new source approval, no region-wide constraint appears to have been articulated.

[14] See Water Resources Planning Task Force, Draft Water Conservation Standards for Massachusetts (September, 1992).

is transferred and thereby create disincentives for such transfers.[15]

In addition to the Water Management Act, Massachusetts has also enacted an "Interbasin Transfer Act" or IBTA.[16] The IBTA requires regulatory approvals of new interbasin transfers in excess of one million gpd. Regulated transfers are those resulting from the installation of new facility connections or changes in operating rules; not increases in use of previously existing transmission capacity. Regulated transfers are those which require transportation of water from out of one or more of the twenty-eight river basins previously mentioned (other than transfers within a town which straddles two or more basins). Such transfers are also deemed to exist when the receiving sewer system discharges out of the river basin. Thus, for example new water withdrawals from inland locations (exceeding the one million gpd threshold) connected to the Boston metropolitan sewer system are regulated interbasin transfers because the discharge from the Boston metropolitan system treatment plant is to Massachusetts Bay.

The IBTA process typically results in the imposition of conditions on regulated transfers reflecting two primary factors. First, reasonable stream flow determinations as, mentioned previously, are explicitly reflected in the conditions. The RISF, as compared to the MISF, is intended to be a broader indicator (with higher minimum flow thresholds) of "optimum hydrologic conditions, including seasonal variation in flows."[17] The RISF typically is expressed in detailed month-to-month stream flow limits. When the RISF is not met based on real-time measurement of river gauges, the transfer is shut down. Second, as with the MISF the twenty year historic period of record low flows is compared to the RISF. Absolute limits are placed on the transfer during those seasonal periods when the recorded historic low flow as reduced by the proposed withdrawal does not meet the RISF limits. The IBTA approval also typically conditions the

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[15] The Water Resources Commission, the agency which approves interbasin transfers and oversees the Department of Environmental Protection's administration of the Water Management Act, has approved water sharing programs where the net volumes transferred were strictly limited and has been very reluctant to otherwise clarify the permissibility and scope of water supply trading.

[16] Mass. Gen. L. c. 21, sections 8B-8D; 313 C.M.R. 4.00 et seq.

[17] Department of Environmental Management, Draft South Coastal Basin Plan (October 3, 1991), 44.

transfer on the adoption of water conservation measures similar to those enforced through the Water Management Act.[18]

Two other elements of the Massachusetts scheme are worthy of note. First, Massachusetts continues to adhere to the "English Rule" of water rights law which affords absolute rights to ground water withdrawers. This rule affords little planning certainty to water withdrawals and is not adequate to the resolution of conflicts in use where such conflicts involve multiple competing uses. The rule, however, may have given greater scope to the comprehensive regulatory scheme adopted in Massachusetts in that it did not vest property rights in existing ground water users subject to constitutional protections. The current elaborate regulatory scheme has become the source of rights in water use by default. Notably, Massachusetts did not opt for a correlative rights regime in lieu of the comprehensive regime. This may reflect the view that "common law" type rights afford only partial protections between litigants in a court case and fail to accommodate cumulative impacts and environmental values not embodied in the price system. Second, Massachusetts is in the process of implementing through its other environmental programs for permitting water discharges and wetlands activities, ecological and endangered species values which will be tied to water quality and quantity thresholds.[19] These initiatives are in part in response to EPA guidance for the amendment of water quality standards. These developments can be expected to remove some of the available water resource from the allocation process previously described.

Maine: Maine has implemented a new source approval program much like Massachusetts which applies to both surface and groundwater supplies. Legislation has also been proposed in Maine in the last several years which would create a Water Resources Management Board which would regulate any withdrawal and transfer out of a river basin in excess of 500,000 gallons per day or from

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[18] Additional environmental impacts and other factors must also be considered. 313 C.M.R. 4.00 et seq.

[19] See, e.g., Mass. Department of Environmental Protection, Draft Water Quality Certification BRP WP39, T #370, Deerfield River Hydroelectric Project (August 14, 1992) (proposing minimum flows within the by-pass reaches of several hydroelectric facilities which are required to sustain various classes of fish and maintain a "viable biological community" consistent with the use designations of the state water quality standards).

an area designated as an area of limited supply.[20] Such withdrawals would be permitted up to the "safe yield" of the river basin. Under the proposed legislation, permits would have a term of ten years.

Maine by statute has adopted a limited correlative water rights regime, which requires the payment of damages to preexisting beneficial domestic water users when there is a conflict in use with a subsequent withdrawal in excess of the beneficial domestic use for a single family house.[21] Maine has also prohibited the transportation of water, including groundwater, for commercial purposes in containers larger than ten gallons beyond the boundaries of the municipality or town in which the water is naturally located or any bordering municipality or town.[22]

New Hampshire: New Hampshire enacted a river management and protection program in 1989 which has not yet been implemented.[23] The Act establishes a Rivers Coordinator and involves the designation of five categories of protected river segments (which require legislative ratification) with ascending levels of land use protection. The Act mandates for the protected river segments, once ratified by the legislature, the designation of minimum instream flows. The Act also prohibits interbasin transfers. Instream flow protections as established under the Act are enforced through all other state agency environmental permitting processes. Five river segments were initially designated, two were added in 1991. While the Act establishes minimum instream flows and presumably will mandate the adoption of this requirement in all environmental permitting activity (such as for filling wetlands, etc.), there is no direct link between this regulation and new and existing groundwater withdrawals as in Massachusetts.

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[20] Legislative Document No. 2309, 115th Maine Legislature, Second Regular Session, 1992. This legislation followed from the recommendations and extensive studies conducted by the Maine Water Resources Management Board.

[21] 38 M.S.R.A. sections 404.

[22] 22 M.R.S.A. section 2660-A. The Commissioner of Health Services can authorize the transportation of water for periods up to three years provided he/she finds that there is no harm to the public health or welfare, water is not available at the receiving location and a substantial hardship would otherwise result. Section 2660-A(3).

[23] N.H.R.S.A. c. 483, New Hampshire Rivers Management and Protection Program.

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New Hampshire, unlike the other three states, has had a correlative rights regime for groundwater as part of its common law for over 130 years.[24]

Vermont: Vermont has proposed a statewide interim policy for establishing minimum stream flows so as to preserve sufficient stream flows for fish species passage and spawning.[25] This policy is proposed to be implemented through the various state agency environmental and land use permitting programs which do not directly focus on water supply. No separate statewide permitting program as in Massachusetts is proposed. Examples of the affected permitting programs are wetlands, dam construction, water quality certification and Vermont's Act 250 approval (Vermont's comprehensive land use planning law). The policy proposes a presumption of the minimum in-stream flow as the historic median flow during each seasonal period (which, compared to Massachusetts, is a high threshold, in terms of the increment of use protected).

Vermont has also, by statute, enacted a correlative rights regime for ground water reversing the preexisting English rule regime.[26] Under this rule, conflicts in ground water use are decided by the courts based on a standard of reasonable use.

Summary of the Discussion of the Institutions of the Four States: To summarize to this point, Massachusetts has adopted an allocation scheme for water rights that involves: (a) the imposition of a regulatory allocation scheme when the environmental impact is presumed to be large as in an interbasin transfer; (b) the adoption of a state-wide regulatory allocation scheme under the Water Management Act which, although it contains many of the elements of market incentive scheme, does not fully implement this scheme because it has not enforced a safe yield constraint over a river basin. As yet, on Cape Cod limits have been imposed, but the local nature of the supply caps constrains the market.

Maine has proposed a comprehensive scheme and New Hampshire has enacted one but only for designated river bodies. The New Hampshire scheme, it can be argued, by focussing on designated river segments imparts elements of a market structure to those

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[24] Bassett v. Salisbury Manufacturing Co., 43 N.H. 569 (1862).

[25] See Draft Interim Procedure; Agency Procedure for Determining Acceptable Minimum Stream Flows (March 20, 1991).

[26] 10 V.S.A. section 1410. The relatively recent case upholding the "English rule" of groundwater allocation which was overriden by this statute is Drinkwater v. State, 131 Vt. 127 (1973).

areas where scarcity value for consumption of the resource is likely to occur first. All these states require adoption of conservation measures as part of new source approvals under the well-head protection program.

The states have taken different approaches to "common law" actions. Massachusetts has left in place the English rule. The remaining states have different versions of a correlative rights regime, which is the major allocation mechanism in each of these states. It can be argued that the correlative rights regime better suits the legal regimes in the three northern-most states because of the greater availability of resources relative to use in each of these states. The likelihood of fewer conflicts in use resulting from these circumstances suggests that correlative rights adjudications, albeit "partial" in nature, may still be able to impart a measure of predictability so as to facilitate use and investment in use of the water supply.

Finally, while market-based elements exist in each of the institutional schemes adopted in the four states as noted, they exist in "embryo" form. The concept of a safe-yield cap, implicit if not yet enforced in the Massachusetts scheme on a regional basis, imparts scarcity value to the resource as does the requirement that conservation measures be adopted as part of new source permitting. Fully specified market-based incentive schemes, however, in the form most often articulated in the current policy discussion, couple imposing a ceiling on resource use with facilitating trades in the resource which can be permissibly consumed. While a comprehensive survey of water exchanges and sales in Northern New England is beyond the scope of this paper, needless to say substantial formal obstacles exist to the accomplishment of such trades (e.g., Maine's prohibition on transportation of water beyond a municipality's borders and Massachusetts' disincentives to water transfers).

Policy Context for the Design of the Allocation/Rights Regime: As indicated earlier, it is a difficult question to know when the common law regime should be supplemented by a more comprehensive allocation scheme. The problem the institutional framework addresses is the proper method for allocation among conflicting water supply users and between water suppliers and other uses or functions of water in the environment.

A useful yardstick for evaluating this problem from a theoretical perspective is the model formulated by R.H. Coase for addressing production externalities.[27] Coase addressed circumstances where a polluter and a party whose production was injured by the

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[27] Ronald H. Coase, The Problem of Social Cost, Journal of Law and Economics, 3:1-44 (1960).

polluter confronted each other and assumed a smooth, linear relationship between money spent to decrease the polluting activity and reduction in the impact of the pollution on the injured party and an increase in the value of production of the injured party. Assuming zero costs to negotiate between the polluter and the injured party, the polluter and injured party could optimize by agreeing to make equal the marginal cost of the polluting activity and the marginal benefit of the injured party's production. This optimum result would occur irrespective of whether the polluting party bore legal liability for the polluting activity; if liability was not imposed, the injured party would pay the polluter to cut back to the optimum level of pollution with the result that the behavior of the polluter and the injured party would be the same regardless of the liability rule adopted (albeit with a transfer payment from the injured party to the polluter).

Translating the insights from this stylized factual pattern into real-world policy is a delicate matter and requires close analysis of several of the assumptions used by Coase. One cause of variation from the optimum equation of marginal benefit and cost is the existence of transaction costs. If the injured party must expend significant resources in order to curb the polluter at the margin, then the optimum will not be reached. Typically, this might be the case if there are many injured parties so that there is a high cost to negotiate or there are free-riders so that the injured parties who pay for the control of the polluting activity do not capture the full benefits created by such control.

A straightforward way of addressing this objection is to define clearly exclusive property rights in the respective parties and make them fully enforceable. In this case, if the injured party can enjoin the polluter, the polluter will pay the injured party for the right to pollute up to the point where the marginal cost of the payment equals the marginal benefit to the polluter from conducting the polluting activity. Alternatively, if the polluter can pollute with impunity (an alternative specification of the property right), then the injured party will have a clear incentive to pay until its marginal costs equal marginal benefits.

Coase's insight has been extended to use conflicts among polluters or resource consumers (rather than between a polluter and an injured party). It is this context which is the focus of many of the current market-based environmental protection proposals. Assuming the establishment of a cieling amount of rights to pollute or consume a resource, the parties, whose pollution or resource consumption activities would otherwise be in conflict, can either: (i) buy the right to pollute or consume the resource; or (ii) adopt measures to avoid the pollution or consumption of the resource. For individual actors, the choice will be determined by which action is lower cost. For the market as a whole, pollution reduction measures will be adopted up to the point that they equal the cost of purchasing a right to pollute. By permitting trading in the rights to pollute, incentives exist to undertake lower cost measures first and minimize the overall cost of control of a given level of pollution or resource consumption. The market conveys information by revealing the differences in cost of control across actors in the market (otherwise, the cost of any particular control measure is likely to be known only to the individual actor doing the polluting or resource consumption addressed by the measure). This is to be compared with the alternate governance regime, where each actor is required to reduce by the same amount of pollution or resource consumption to meet the same overall target level of reduction. In this latter case, there is no way to prioritize in order of ascending costs which of the different measures to reduce pollution or resource consumption will be undertaken.

The standard specification of property rights which, it is argued, best supports this market structure are well defined entitlements to the right to pollute or consume the resource. It is argued that this specification of property rights minimizes transaction costs. Further, only such straightforward definitions of property rights, it is argued, are adequate to call forth investments in control technology and/or reliance on the purchase of rights to pollute and consume resources. This model for the design of market-based incentives clearly provides a simpler (and, therefore, presumably more predictable) planning framework to call forth efficient pollution control investments and to avoid inefficient investments (which exceed the cost of purchasing consumption rights). However, at least in the context of water supply planning, it may do this at the expense of the environmental goals which the market-based incentive mechanism is designed to foster or by hiding heavy transaction costs associated with fluctuations in the resource base. Similar pitfalls may occur in the design of other such mechanisms established to manage air and water pollution.

Some of this discussion it can be argued does not yet apply to the Massachusetts scheme because a regional cap on supply has not yet been imposed so as to create scarcity value in the resource. This is likely to change over time (e.g., Massachusetts may impose regional safe yield caps given economic growth and increases in the increment of water supply which is unavailable for consumption) but, even as this change occurs, characteristics of the water supply regime make application of the Coasian Model less than straightforward. The water supply resource base experiences significant seasonal fluctuations and stochastically experienced shortage periods (or droughts). In addition, as noted, over time the increment of the resource which is reserved by competing public policies from consumption is increasing. Finally, substantial discontinuities exist in the abilities of resource users to adjust their consumption. Each of these circumstances present serious challenges to the possibility of marginal adjustment to an optimum point of the costs and benefits of an externality and its management as postulated by Coase and employed by many market-based incentive pollution control mechanisms.

Exogenous fluctuations in the resource base, however, can be handled, albeit with great difficulty, through a regime of exclusive property rights which does not directly recognize the possibility of the contingent event (e.g., the rights to pollution are time invariant). For example, during a drought several alternative regimes suggest themselves: (a) let the resource use and consumption occur without enforcing the scarcity limits imposed by regulation; (b) last-in-time users can be cut back in use to the extent of a conflict; and (c) private contractual arrangements conceivably could be worked out to allocate the increment of reduced supply among existing users. These regimes suffer from several objections. Letting the resource use and consumption occur without enforcing the scarcity limit imposed by regulation directly undercuts the environmental protection goal sought to be served. If the regulated parties anticipate this as the likely policy response, then incentives to undertake control expenditures or conservation investments to minimize resource consumption are undercut. Cutting off last-in-time users does not allocate the resource based on the highest and best uses. It would be strictly happenstance that this order of allocation would correlate with the economic rank order of productive uses, although in anticipation of this private arrangements conceivably could be structured to trade senior rights to junior users to better reflect such uses, which gets to our third alternative (i.e., private contractual arrangements). Fully private arrangements, however, are unlikely to be a solution because of very high transaction costs involving the adjustment of contingent use rights by thousand of users across a river basin.[28]

In this context a more evolved specification of rights in water may be warranted to account for this objection; namely to allocate the effects of the contingency to those actors best able (i.e., at lowest cost) to control their level of consumption in

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[28] These objections may explain Massachusetts' apparent unwillingness to establish its Water Management Act as a "strong" property rights regime.

the face of such variability.[29] Identifying such actors in advance is a difficult task and actions by private parties in enforcing the common law regime, for reasons discussed above, is typically not an adequate response because of the lack of predictability.

One approach to identifying such actors is simply to reformulate the exclusive, property rights regime by imposing a second, more restrictive ceiling on resource consumption rights during the contingent event (or multiple such ceilings to address multiple contingencies) and then permitting market-trades to again reveal the least cost means of bringing overall consumption below the newly established cieling(s). The creation of multiple ceilings, and multiple markets to deal with contingent events, of course, is likely to be accompanied by high transaction costs in the face of great uncertainty concerning the timing and duration of the contingent event.

A second approach reflected in the Massachusetts water supply management scheme is to afford entitlements in water supply during "normal periods" which approximate to exclusive property rights (albeit conditioned on possible later redefinition of the increment available for consumption); and, during periods of resource shortage, to allocate resource consumption rights by administrative fiat. This approach avoids the presumably extensive transaction costs associated with market-based allocations during the contingent events, while affording some, albeit not absolute, predictability to the use rights in water so as to encourage investment in water supply facilities and/or conservation, with associated rights in the value of the conserved water supply. The water allocation schemes in the remaining northern New England states incorporate some of these same elements, albeit limited to local impact analysis in the case of Maine and Vermont, and selected river basins, as in New Hampshire under legal authority in the process of being implemented to the extent environmental regulation (not directly focussed on groundwater) applies to new groundwater supply investments.

A critical additional issue in property rights specification and mechanism design for market-based pollution control schemes is the nature of initial endowments in tradeable emissions allowances. One approach is to auction off the allowances, thereby directly translating the scarcity costs induced by the limit imposed on consumption/pollution rights into the cost structure of the suppliers in the industry. A second, less

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[29] See Yoram Barzel, Economic Analysis of Property Rights (1989), 55-88.

radical approach, adopted in Massachusetts under its Water Management Act and, implicitly, at least in part, in the correlative water rights regimes of the other three states, is to endow existing users with property rights (not subject to adjustment for shortage periods), related in some fashion to their level of prior use. New users and increased levels of use are permitted through the employment of a very approximate "shadow price" regime, which requires suppliers to demonstrate that they have adopted conservation measures and other "good practice" measures and subjects the newly authorized use to administrative allocation during shortage periods. This regime, provides rough price signals for the selection of the next resource by suppliers which approximately incorporate the "real" costs of resource consumption/pollution. One reason for adoption of this less radical approach would appear to be reluctance to translate the full cost of real resource consumption directly through to consumers of the resource, with its associated rate impacts. In addition, unlike newly created rights in pollution, water resource consumption (i.e., surface water bodies in all four northern New England states and groundwater in New Hampshire) has been afforded property right status in some cases, so that the radical auction approach may require costly compensation of existing users (i.e., endowment of initial users may already be required by law and not a discretionary policy approach).

Conclusion: The prior discussion has only just touched on certain problems of "mechanism design" for groundwater allocation regimes. Suggestive of the general policy questions involved is an example from New England history mentioned in William Cronon's book Changes in the Land, about the ecological succession which occurred as Native Americans were displaced by Europeans in New England.

As related by Cronon, in 1636, William Pynchon, purchased from the Agawam Native American Village in Central Massachusetts land extending 4-5 miles along the Connecticut River. In the deed of transfer, the Native Americans conveyed to Pynchon the right "for ever to truck and sel at that ground" (sic); the Native Americans, in return, received furs, clothes and other articles and the "right to have and enjoy all that planted ground that is now planted; and have liberty to take Fish and Deer, ground nuts, walnuts and peas." If the terms of the deed are taken seriously as indication of the parties' intent, from the Native American perspective, very specific use rights in the land were divided up between the parties; the rights conveyed involved a complex on-going sharing of use.

The immediate historical lesson, of course, (if the actual subsequent use and conveyances affecting the Pynchon parcel is controlling) is that the right "to trucke and sel" secured by the deed overrides all else and the more complex reciprocal arrangement of the Native Americans does not survive for political and historical reasons.

Another more hopeful (albeit impressionistic) lesson which might be drawn is that the more complex understanding of use of the environment of the Native Americans reflected in the Pynchon deed, if resurrected and adhered to, can help make our society's activities more compatible with preservation of environmental values. The challenge of water supply management is similarly to incorporate complex multiple uses and functions into a workable allocation/rights regime which both encourages efficient investments and satisfies environmental protection goals.

WATER CONSERVATION AND REUSE IN FLORIDA: THE PUBLIC/PRIVATE UTILITY EXPERIENCE

BY

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Florida is one of the nation's leaders in water management and environmental protection, however, we also have intractable problems. I believe the future of Florida depends on how well we take advantage of the opportunities to solve them.[1]

Lawton Chiles, Governor

I. INTRODUCTION.

The history of Florida and its potential for continued growth is tightly intertwined with its water resources. Legend holds that in 1513, Juan Ponce DeLeon travelled to Florida seeking the Fountain of Youth. That legendary fountain was never found and nearly 500 years later there is some concern that maintaining Florida's current potable water supply may prove equally as elusive.[2]

Florida is blessed with the nation's largest underground potable water source through its extensive aquifer system. Virtually the entire state is underlain by aquifers able to produce some volume of potable water.[3] Florida has identified six principal aquifers. The primary aquifer system is the Floridan Aquifer. The remaining surficial and intermediate aquifers overlie the Floridan. These aquifers are accessed for water supply when the quality of the underlying Floridan is non-potable.

Florida suffers from its own success. The state's growth, which has powered its recent political and economic strength, has placed an increasing burden on its water resources - both through demand and through pollution. As Florida's primary potable water source, ground water is consumed through public supplies at an amount

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[1] June 4, 1992 ltr. from Gov. Chiles to K.A. Crooks.

[2] Kerry A. Crooks, "Company Profile: Southern States Utility Services" Water Magazine, Vol. 31, No. 3 (Fall 1990), pp. 50-53.

[3] Institute of Science and Public Affairs, Water Resources Atlas of Florida, Florida State University (1984), p 36.

second only to California.[4] Although Florida's water supply is substantial, it is not limitless. Already there are localized shortages in coastal areas. This is understandable as Florida's coastal regions hold much of the state's population and are served by water sources increasingly influenced by encroaching salt water from either the Atlantic Ocean or Gulf of Mexico.[5]

II. LEGISLATIVE MANDATES.

It has become of paramount importance that Florida's government and utility industries react to this ever-burgeoning threat to the state's water supply. Each has done so, in its own disparate manner.

Florida's legislature has implemented a myriad of legislation during the past two decades which has been aimed at the protection, regulation, and conservation of Florida's water resources. Two of the most notable legislative endeavors in this area have been the adoption of the Florida Safe Drinking Water Act[6] and the Florida Water Resources Act.[7]

A. Florida Safe Drinking Water Act.

The Florida Safe Drinking Water Act, codified under Section 403.850, et seq, Florida Statutes, established a water supply program with the goals of implementing federal water quality standards, providing safe drinking water for all Florida citizens, and engendering cooperation among the various levels of government.[8]

This Act contemplates a combined effort by two state agencies, which have been mandated with responsibility for its administration and implementation. The Florida Department of Environmental Regulation [FDER] is required to adopt and enforce primary and secondary drinking water standards, perform sanitary surveys and inspections, notify public and regulatory agencies of instances of noncompliance, and secure emergency water sources.[9] In turn, the Florida Safe Drinking Water Act authorizes the Florida Department of Health and Rehabilitative Services [FDHRS] to review and

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[4] Ibid.

[5] Ibid pp 37-52.

[6] Chapter 77-337, Laws of Florida (1977).

[7] Chapter 72-299, Laws of Florida (1972).

[8] Section 403.851, Florida Statutes.

[9] Section 403.853(1)(a), Florida Statutes.

evaluate applications for construction, modification or expansion of public water systems, and monitor those systems to ensure compliance with all applicable federal, state, and local regulations.[10]

FDER asserts its jurisdiction over public water systems, whether publicly or privately owned, through enforcement of various rules promulgated by the Department under Chapter 17-550, et seq, Florida Administrative Code. These administrative rules have the force of law, and set forth the specific drinking water standards and permitting procedures administered by the Department.[11]

The Florida Safe Drinking Water Act also provides for FDER and FDHRS to jointly develop a program for certification of water quality testing laboratories which conduct radiological, chemical, and microbiological analyses of periodic water samples from all public water systems.[12] In addition, the Act includes a catch-all provision which permits designated Florida county health departments to perform bacteriological analyses of water samples, and to assume general supervision and control over all private water systems and all public water systems not covered under the Florida Safe Drinking Water Act.[13]

B. Florida Water Resources Act - Water Management Districts.

The concept of including multiple units of government within the scope of water resource regulation has been expanded to the area of water consumption under the Florida Water Resources Act. This Act, which was codified in 1972 as Chapter 373, Florida Statutes, established a comprehensive, state-wide system of consumptive use permitting regulations. Again, primary jurisdiction over water resource regulations has been vested in the Florida Department of Environmental Regulation. Yet, the Act acknowledges that water resource problems in Florida vary from region to region, both in magnitude and complexity.[14] Therefore, the Florida Water Resources Act provides for the delegation of a majority of the responsibilities for regulating water consumption to five regional

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[10] Section 403.862(1)(c), Florida Statutes.

[11] Primary drinking water standards list contaminants which may have an adverse effect on public health. Secondary drinking water standards specify the maximum contaminant levels which are requisite to protect the public welfare. Section 403.852, Florida Statutes.

[12] Section 403.863, Florida Statutes.

[13] Section 403.862(1)(f), Florida Statutes.

[14] Section 373.016(3), Florida Statutes.

water management districts, including the following: Northwest Florida Water Management District; Suwannee River Water Management District, St. Johns River Water Management District; Southwest Florida Water Management District; and South Florida Water Management District.[15] The boundaries of each district are specifically set forth in the Act, and are defined along hydrogeologic basin boundary lines. Under Chapter 373, Florida Statutes, all water management districts are required to implement a consumptive use permitting program. In furtherance of this statutory duty, the districts have adopted procedural and substantive rules. The rules of the districts are found in Chapters 40A through 40E, Florida Administrative Code.

With few exceptions, a consumptive use permit issued by the applicable water management districts is required prior to withdrawing surface or groundwater; constructing, repairing or abandoning a well; doing business as a water well contractor; connecting to or making use of a district project; constructing, operating or altering a stormwater management system; constructing an artificial recharge facility; or intentionally introducing water into any underground formation.[16]

Each water management district is headed by a nine member governing board, the members of which are appointed by the Governor, and confirmed by the Florida Senate.[17] The water management districts are granted wide discretion in the manner in which they implement Chapter 373, Florida Statutes. This discretion provides flexibility, and allows the districts to perform their duties in accordance with their own philosophical tendencies and regional peculiarities. Those standards for the granting of conditional use permits by water management districts which are mandated by the Act are set forth in Section 373.223, Florida Statutes, which places the burden upon the permit applicant to prove to the water management district that the proposed use of water is (1) a reasonable beneficial use; (2) will not interfere with any presently existing legal use of water; and (3) is consistent with the public interest. The decision whether a consumptive use permit applicant has satisfied those statutory standards rests with the water management district's governing board.

The issuance or denial of consumptive use permits is not the only function of the water management districts. Under Section 373.206, et seq, Florida Statutes (1991), the districts regulate artesian

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[15] Section 373.069(1), Florida Statutes.

[16] Section 373.219(1), Florida Statutes.

[17] The Southwest Florida Water Management District has an eleven member governing board, pursuant to Section 373.073(1)(a), Florida Statutes.

wells. Further, the governing boards of the several water management districts have jurisdiction over applications for interdistrict transfer of groundwater from a point within one water management district for use outside the boundaries of that district.[18]

That provision of the Act has become much more controversial as Florida's coastal communities seek additional sources of drinking water to support their phenomenal population growth. The poor quality of the potable water sources for these coastal areas has already induced competition between various users, such as adjacent counties or agricultural versus residential. Water, as a political, social, and economic issue has the potential of becoming Florida's equivalent to the Old West range wars.[19]

In order to assure equitable distribution of available water resources among all water users during times of shortage, Section 373.246, Florida Statutes, authorizes the water management districts to enact water shortage plans.[20] Whenever the district governing board determines that there is insufficient water available to meet present and anticipated requirements of the users in all or part of the district, the governing board may declare that a water shortage exists, and impose such restrictions on water uses as may be necessary to protect the water resources of the area from serious harm, and to restore them to their previous condition.[21]

In the event that a water shortage has been declared by a water management district, restrictions on water use may then be imposed. The extent of imposed restrictions depend upon the classification of water shortage declared by the district. Water shortages are classified under a color-coded scheme, with various levels of concern, from yellow alert (moderate water shortage) to purple alerts (critical water shortage). The district may restrict the total amount of water that may be used, diverted, impounded or withdrawn during any day, month, or year during the declared shortage. Further, the districts may place constraints on the timing of water use during that shortage. The water use restrictions established by the water management district are then enforced by local law enforcement efforts, under ordinances adopted

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[18] Section 373.2295, Florida Statutes.

[19] In <u>Osceola County v. St. Johns River Water Management District</u>, 486 So.2d 616 (Fla. 5th DCA 1986), Brevard County sought unsuccessfully to extract water from wells on the Osceola side of the County line.

[20] Rule 40 C - 21.001, Florida Administrative Code.

[21] Section 373.246(2), Florida Statutes.

by Florida counties and municipalities within the jurisdiction of the district.[22]

Persons who are dissatisfied with decisions made by the water management districts have two appeal options. Under Section 373.114(1), Florida Statutes, permitting decisions of the districts may be reviewed by the Florida Governor and Cabinet, sitting as the Florida Land and Water Adjudicatory Commission [FLAWAC].

Further, final orders issued by the governing boards of the water management districts may be appealed directly to the Florida District Courts of Appeal, pursuant to the provisions of Section 120.68, Florida Statutes. If the appellant chooses the administrative appeal process, that appeal to the Florida Land and Water Adjudicatory Commission must be initiated within twenty days after the district's permit decision, except that the appeal time is extended to thirty days in those situations in which FLAWAC determines that the permit decision has statewide significance.[23] If the appellant decides to take the judicial route, appeals of water management district decisions filed with the Florida District Courts of Appeal must be initiated within thirty days after rendering of the final order.[24]

For those persons (including corporations) who violate any of the provisions of the statutes protecting Florida's water resources, or who fail to comply with water management districts' regulatory mandates, they run the risk of various legal enforcement proceedings and extensive potential liabilities. Those potential liabilities run the gamut from the issuance of "field citations," or other traffic ticket type penalties; administrative fines or noncompliance fees; civil penalties levied against company officers; loss of licenses or permits; denial of the right to continue to engage in the utility business; involuntary dissolution of the corporation; injunctions; declarations of public nuisance; monetary damages; required restitution; and criminal fines against the company; to jail time for corporate officials and forfeiture of real and personal property.[25]

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[22] Rule 40 C - 21.421, Florida Administrative Code.

[23] Section 373.114(1)(a), Florida Statutes.

[24] Rule 9.110(b), Florida Rules of Appellate Procedure.

[25] Section 373.129, et seq, Florida Statutes; Section 120.69, Florida Statutes; Section 775.082, Florida Statutes; and the Florida Rico Act, Chapter 895, Florida Statutes.

Florida's commitment to providing effective protection for its water resources is reflected in the financing mechanisms provided to fund the activities of the water management districts. The water management districts have been granted two of the most powerful tools available to local governments under the Florida Constitution. Part V of Chapter 373, Florida Statutes, authorizes the water management districts to levy ad valorem taxes on all real property located within the district. The maximum millage rates permitted are also set forth in the statute, and vary from district to district.[26] In addition, Florida's water management districts have been authorized to borrow money, and issue bonds, in order to raise funds necessary to execute all of the duties and responsibilities vested in the districts under Chapter 373, Florida Statutes.[27]

C. Governmental Interfacing.

The Florida Department of Environmental Regulation and the water management districts are not the only governmental entities which are involved in regulating Florida's water resources. Under Section 373.0693, Florida Statutes, the water management districts may designate any areas within their district as a subdistrict or basin.[28] Each designated basin is governed by a separate basin board, which is responsible for discharging most of the water management district's functions in their respective basin.

The interfacing between water management districts and Florida counties and municipalities is also key to the effectiveness of Florida's water resources regulatory scheme. The districts are statutorily required to assist local governments in developing their comprehensive plan elements related to water resources issues.[29] In addition, the districts are authorized to enter into interlocal agreements with counties and municipalities, in order to delegate those portions of the districts' responsibilities which would be more prudently exercised at the local level.[30] Local governments have utilized that opportunity to initiate additional water resource regulations. Such local initiatives have taken the form of land use and development regulations, ordinances dealing with the protection of surface water, wetlands, flood-plains and

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[26] Section 373.503, Florida Statutes.

[27] Section 373.563, Florida Statutes.

[28] Except in the St. Johns River Water Management District, which must get State Legislature approval to establish a separate basin in its district.

[29] Section 373.0391, Florida Statutes.

[30] Section 373.103(8), Florida Statutes.

aquifers, and ordinances regulating onsite sewage disposal systems and stormwater management facilities.

III. WATER CONSERVATION AND REUSE EFFORTS.

A. South Brevard Water Authority.

One other aspect of Chapter 373, Florida Statutes, which has had a profound impact upon the manner in which water use is regulated in Florida, is the creation of regional water supply authorities. Under Section 373.1962, Florida Statutes, regional water supply authorities may be established "for the purpose of developing, recovering, storing, and supplying water for county or municipal purposes in such a manner as will give priority to reducing adverse environmental effects of excessive or improper withdrawals of water from concentrated areas." This statutory provision has provided areas which have water supply problems with an effective mechanism by which to attempt to solve those problems. One such regional water supply authority is the South Brevard Water Authority.

The South Brevard Water Authority was created in 1983 by the Florida Legislature. As a regional water supply authority, it is responsible for the potable water supply for southern Brevard County, a county located on the east coast of Florida.[31]

During December 1984, the Governing Board of the Authority adopted a water conservation and reuse program, which was revised August, 1991, as the Water Conservation Plan. The Authority's three-part Water Supply Plan (WSP) emphasizes water conservation, "use of lowest quality of water available for a particular need," and the development of a new source of water for its service area. The Water Conservation Plan addresses the first part of the WSP.[32]

There have been several noteworthy programs initiated by the Authority. The first of these is the "Water Wise" program, which is essentially a water audit/retrofit campaign. In March 1986, the Authority mailed its first notices to its customers to inform them of the free water conservation program and requesting their participation. The Authority established a separate water audit department, under which employee two-person "teams" conduct home water audits and install water conservation devices on a schedule of one audit per one-half hour each work day. During the audit, toilets are checked for leaks, a tank dam is installed and the water level is adjusted if necessary.

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[31] South Brevard Authority Water Conservation Plan, rev. Aug. 27, 1991, p 1.

[32] Ibid, pp 1-2.

Either at the homeowner's request, or if the flow exceeds three gallons per minute, the faucets and shower heads will be replaced with low-flow devices. At the end of the audit, conservation information is left with the homeowner, along with the audit results. As of August 1991, 21,373 homes or businesses have requested this service. Between 1985, the last full year before the program began, and August 1991, the average daily per capita water demand for South Brevard County went from 134 gallons to 120 gallons. The cost of this program during this period was $630,235 or $29.49 per unit. According to Authority figures, 1.6 million gallons of water per day were saved through this program alone.[33]

Another project which has been instituted by the Authority is its "Xeriscape Brevard Program." This program, which began in 1988, was designed to reduce the quantity of water used for outdoor irrigation.[34] "Xeriscape*TM*" is a trademarked term referring to water conservation through creative landscaping.[35] The Authority reviewed available literature on Xeriscape*TM* and developed two informational booklets for use in Brevard County. One booklet contained a description of the "seven steps of Xeriscape*TM*" while the other is a plant guide suitable for the soil and weather conditions of this coastal area. Over 10,000 of each booklet were distributed by August 1991. The Authority also established two Xeriscape*TM* sites at two community parks. The Canova Beach Park site was selected because potable water was being used for irrigation due to its barrier island location. The Wickham Park site featured a solar-powered irrigation system.[36]

B. Southern States Utilities.

Florida's utility industry has attempted to match Florida's governmental efforts in implementation of effective water conservation. These pro-active efforts are exemplified by Southern States Utilities (SSU), Florida's largest investor-owned water utility system, which has developed its water conservation plan as a result of two incentives: the increasing requirements of consumptive use permits[37] and the results of the company's November

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[33] Ibid, pp 5-9.

[34] Ibid, p 17.

[35] Southwest Florida Water Management District Plant Guide, p 3.

[36] South Brevard Water Authority Water Conservation Plan, rev. Aug 27, 1991, pp 17-22.

[37] Section 373.223, Florida Statutes. For an excellent discussion of consumptive use permitting beyond the scope of this paper, see L.M. Blain, "Consumptive Use Permitting: Background and

1990 survey of its customers. That survey, conducted by Cambridge Reports of Massachusetts, indicated that "its utility customers would feel more kindly to utilities who prove a case for conservation and provide information to help them conserve."[38] Addressing both incentives, Southern States created both an award-winning water conservation public information campaign and an aggressive water reclamation program.[39]

The public information program took a multi-media approach. The company would reach its targeted public through presentations to civic and homeowner organizations, youth programs, bill stuffers, open houses, paid advertising, news releases and submitted articles on the subject to local newspapers. In 1991, 41 water conservation presentations were made by the company's personnel using a standardized script and 35mm slides. The company also sponsored "little theatre" presentations to elementary students on water conservation. Southern States initiated a youth-centered water conservation program through the University of Florida Food and Agricultural Sciences' 4H Foundation. The SSU/4H Environmental Landscape Management Program promotes water conservation to the general public through the landscape examples created by the youth and volunteers at the various 4H county extension centers. Southern States has also begun an environmental landscaping program around its facilities at its Marco Island and Venice Gardens water treatment plants. Due to the company's very recent initiation of these programs and variables such as economic conditions, various water restrictions, mid-year acquisitions of water systems, meteorological changes, precise measurement of variations in water consumption directly attributable to the public information system was not attempted by the company. However, extracting demand created by customer growth during 1991, Southern States' 90,000 water customers used 170 million gallons of water less in 1991 than in the previous year.[40]

Policy," 6th Annual Environmental Permitting Summer School, Florida Chamber of Commerce, July 1992.

[38] Customer Attitudes toward SSU Services, Cambridge Reports/ Research International, Jan. 1991.

[39] Lisa A. Spinazzola, "Talking about Water Conservation," Water Magazine, National Association of Water Companies, v 33, no. 2 (Summer 1992), pp 26-27.

[40] Image Award, Southern States Utilities Conservation Program, Central Florida Chapter, Florida Public Relations Association, award nomination.

C. Water Reuse.

The reuse of reclaimed water has become an expanding method of successful water conservation in Florida. Although not always in a consistent manner, the Florida Department of Environmental Regulation and the various water management districts have instituted reuse feasibility study requirements as permit conditions for wastewater treatment facilities. In order to reduce effluent discharges into Florida's surface waters, the water management districts have been moving towards mandatory water reuse. As a result, over 300 million gallons per day of treated wastewater effluent are being reclaimed statewide.[41]

Water reclamation involves the treatment of effluent to a level at which it can be applied onto land surfaces, thereby satisfying increasing regulatory mandates to discontinue surface water discharge and to allow recharging of the underground aquifer system. Further treatment, and the meeting of certain reliability standards as established by the Florida Department of Environmental Regulation, may result in the higher "public accessible reclaimed water" classification.[42]

An early example of Southern States Utilities' public accessible water reclamation program can be found at its University Shores plant near the University of Central Florida in Orlando. There, the company treated its wastewater to within public access standards and provided the reclaimed water for irrigation requirements at a nearby cemetery.[43] The rest of the company's public access effluent is sprayed on more conventional sites, such as golf courses and park grounds. In all, eight of the company's wastewater facilities treat wastewater to public access standards.[44]

Public utilities have also implemented water reuse projects throughout Florida, with more than 200 currently in place. Brevard County is a typical example, in that it currently has five major reuse projects on-line, with two others in the engineering stage.

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[41] Salvatore D'Angelo and Jacqueline Sullivan, "Water Reuse In Florida: No Longer Optional," Florida Water Resources Journal, June, 1992, p. 30.

[42] Chapter 17-610, Florida Administrative Code.

[43] Sheffield, Johnson, Sweat & Robards, "Use of Cemeteries for Treated Effluent," Florida Water Resources Journal, June 1992, pp 38-39.

[44] Charles E. Wood, P.E., Vice President for Engineering, Southern States Utilities, Inc., presentation to the Topeka Board of Directors, March 1992.

Primary recipients of the reclaimed water include two golf courses, several residential developments, and a large sod farm. Brevard County has adopted ordinances which have created several "mandatory reuse areas" throughout the county, in which developers are required to install reuse distribution lines concurrently with the applicable sanitary sewer systems.

During the past 6 years, Brevard County has incurred total capital expenditures in excess of $7,500,000 in implementing water reuse. Current plans for Fiscal Year 1993 include additional expenditures of more than $4,600,000 earmarked for the two major reclamation projects now in the engineering stage.

The five sewer systems in which Brevard County has instituted reuse generate approximately 11.43 mgd of treated effluent, of which 2.97 mgd is reclaimed. Upon completion of the two additional reuse projects currently planned, together with several projects involving the retro-fitting of a number of large residential areas near existing regional wastewater treatment facilities, it is anticipated by Brevard County Utilities that the current 25.9% reuse level will rise to the range of 35% to 40% within the next three years.[45]

IV. CONCLUSION.

Whether initiated as the result of regulatory mandates, or in response to customer input, the above described water conservation programs developed by a Florida local government and a private water utility have met with some success.

Throughout Florida, other local governments and private utilities are also looking for new methods to protect their vital water supplies. As the above quote from Governor Chiles points out, the future of Florida may turn upon their ability to innovate faster than the growth rate of the state's population.

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[45] Brevard County Utility Services Department FY 93 Reuse CIP.

JOINT ELECTRIC AND WATER CONSERVATION PROGRAMS

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INTRODUCTION

State public utility commissions (PUCs) can increase energy and water savings, as well as reduce utility program costs and raise program participation, by encouraging joint water and energy conservation programs with their regulated utilities. Water use reductions can result in less consumer and utility energy used to heat, treat and pump water and wastewater.

A few electric utilities and water suppliers have successfully cooperated on joint conservation programs, and some water conservation programs offer alternative models for electric utilities. But communication between the energy and water fields on conservation programs has been limited. Joint programs undertaken so far have met with institutional and financial obstacles. PUCs can have a role in resolving these differences.

State regulators should seriously consider water conservation efforts that also save energy, including: water efficient showerheads; agricultural water conservation programs; and municipal water conservation programs that reduce energy costs for water pumping, distribution and treatment.[2]

INDUSTRY SIMILARITIES AND DIFFERENCES

PUCs should bear in mind important comparisons between the two industries that affect the outcome of conservation programs. Electric and water utilities share concerns about additional demand for and sources of new supply capacity. Individual utilities in both industries also face short term shortfalls. Both industries share concern for the environmental externalities of utility activities. Successful programs draw on these similarities.

The role of conservation in electric and water utility management is similar, and the leading water utilities have undertaken sophisticated conservation efforts. But the average level of interest and status of conservation programs in water utilities is greater in the electric industry. And water utilities share questions about implementing conservation, including reliability of results and impacts on revenue.

The large number of public water utilities explains why only 20% of water utilities are PUC

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[1] Views and opinions of the author do not necessarily reflect positions or policies of the U.S. Environmental Protection Agency.

[2] Much of this presentation is drawn from a previous effort. See: Dyballa, C. and C. Connelly, "Joint Energy and Water Programs: Building Cooperation and Savings." In <u>Proceedings of American Council for an Energy Efficient Economy Summer Study: Volume 5, Utility Programs</u>. 1992.

regulated. Only 12 PUCs have any authority over public water utilities. While PUCs tend to require conservation planning or demand management programs for electric and gas utilities, this is much less common for water utilities.[3] A smaller average water supply and wastewater service area results in less industry sophistication, on average, about operations, budget, management and planning. Almost no investor owned utilities provide both water and power. But at least 25% of the 2,000 public electric utilities provide water services as well.[4]

Table One
Electric and Water Utilities: Differences

Primary Ownership	Private 75%	Public 80%
PUC-Regulated	Most	20%
Conservation Rules	In 44 states	In 14 states
Utility size	Larger	Smaller
Peak Concern	Hour	Day or Week

WATER CONSERVATION MEASURES THAT SAVE ENERGY

Reductions in water use from municipal, industrial and agricultural water conservation programs all result in less energy used to heat, treat, and pump water. Greatest potential energy savings are from hot water water conservation measures. But savings can be significant for landscaping, water supply pumping and distribution, wastewater treatment, and agricultural water pumping measures.

Residential Water Use

Hot water heating is both the second largest residential energy and water use. Resource efficient showerhead programs can benefit both electric and water utilities and their customers. Conservation programs that affect other hot water uses--faucets, dishwashers, and especially clotheswashers--also offer potential savings. Energy efficiency standards have become commonplace in the electric utility field, and national standards for water efficiency fixtures in new construction will begin in 1994. But retrofit programs still offer opportunity for major energy and water savings.

The Bonneville Power Administration now offers to buy power conserved through residential

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[3] Beecher, J., et al. Integrated Resource Planning for Water Utilities. NRRI, 1991.

[4] American Public Power Association. 1991 Annual Salary Survey. 1991.

showerhead retrofit programs from its member utilities, since water efficiency showerheads were shown to be an order of magnitude less costly than the marginal cost of new power. This buy-back approach offers potential for both water and electricity wholesalers as well as large retail companies.

Table Two
Savings From Efficient Devices

	Electric kWh/hh/yr	Water gal/hh/yr
Showerhead	420-860	4,400-8,000
Faucet	31-41	1,100
Toilet	16-217	8,000-21,000
Dishwasher	935	4,750

Source: author's calculations[5]

Water efficient toilets, while not using hot water, can still yield energy savings. Water conserved reduces energy requirements for pumping, distribution, drinking water and wastewater treatment. For communities whwere any of these electricity requirements are large, joint program savings can be significant.

Water Efficient Landscaping

Joint savings are not limited to indoor water use. Water efficient landscaping can reduce summertime air conditioning loads.[6] Energy savings from water audits, irrigation scheduling, and lawn replacement can be significant in areas with high energy demand for water pumping and distribution, or a coincidence with summer peak electric use in arid areas. A turf rebate program in North Marin CA showed that water efficient residential landscapes use less than half the water, with accompanying energy reductions for pumping, and almost one third the fertilizer of traditional lawns.[7]

Industrial and Institutional Conservation

Combined energy and water savings in the industrial and institutional sectors can be dramatic,

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[5] Reprinted from Dyballa, C. and Connelley, C., op. cit.

[6] Meier, A. "Using Water to Save Energy." Energy Auditor and Retrofitter. Jan-Feb. 1985.

[7] Nelson, J. "Water Conserving Landscapes Show Impressive Savings." Presented at American Water Works Association annual conference. Denver CO, June 1986.

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

Water Supply and Wastewater Treatment

Reduced flows from water conservation programs reduce community energy costs for water supply and, where indoor water use is reduced, reduce wastewater treatment and pumping energy use.

Table Three
Energy Associated with Water Use

Water supply/Wastewater treatment (average)	1.9-5 Wh/gal
Wastewater treatment (average)	2.85 Wh/gal
Wastewater treatment (marginal)	1.1-1.7 Wh/gal
Water supply treatment and distribution (ave.)	2.5 Wh/gal
Long distance water pumping (CA Aqueduct)	9.0 Wh/gal
Long distance water pumping (CO Aqueduct)	4.4 Wh/gal
Elevate 1,000 feet at typical irrigation pump efficiency	6.0 Wh/gal
Elevate 1,000 feet at maximum pump efficiency	4.0 Wh/gal

Sources: Multiple sources;
see Dyballa and Connelley, 1992, op.cit.

Flow dependent energy consumption in wastewater treatment ranges from 24-99% of total energy consumed,[8] the high end representing more energy intensive tertiary wastewater treatment. A number of electric utilities have invested in wastewater treatment plant efficiencies to reduce energy use. Reducing community water use can have a similar effect on energy use.

Energy use to pump and distribute water supply ranges widely across the nation. Where water suppliers pump groundwater from deep aquifers, or import water from another watershed or river basin, electricity use for water supply is much higher. These situations can present untapped conservation potential for electric utilities and PUCs. Besides offering community

[8] Battelle Labs. OWEP Pollution Prevention: Atmospheric Emissions Reductions from a Hypothetical Change in Permitting Strategy. (Draft) U.S. EPA, 1990.

water conservation programs, energy can be significantly reduced by detecting and repairing leaks in water mains.

Pumping Agricultural Water

Several electric utilities have begun to explore the conservation potential of more energy efficient agricultural pumps. But the same result may be achievable, at similar cost, by a focus on on-farm water efficiency measures. Savings may be greatest for agricultural groundwater use.

On-farm water, and thus energy, savings from particular farming practices vary greatly due to variations in soil type, crop, rainfall, and other factors, as well as the cost of the technique employed. LEPA (Low Energy Precise Application) irrigation demonstrations show that it reduces both water and energy use.[9] The California Energy Commission has funded several projects to increase irrigation efficiency, based on the energy cost of moving irrigation water. Pacific Gas and Electric's agricultural pumping program to boost pump efficiencies provides incentives for some measures that save both water and energy.

JOINT PROGRAM EFFORTS

At least a dozen electric utilities across the U.S. have experimented with joint utility programs with water suppliers. Four examples of residential retrofit programs are discussed.[10]

Northeast Utilities

Northeast Utilities (NU) teamed up with three water utilities in its service area to deliver a residential kit including showerheads, faucet aerators, toilet dams, compact fluorescent lamps, and water heater and pipe wraps. A NU/Metropolitan District Commission pilot program visited 1100 homes to install efficient measures. NU paid for energy efficiency devices and the bulk of the labor. Water utilities purchased water efficiency devices; installation costs for hot water measures were paid by NU for electric water heaters and by MDC for gas water heaters. Installation costs for elderly and handicapped were shared.[11]

Bridgeport and New Haven, Connecticut

United Illuminating (UI) has attempted joint program delivery with Southern Connecticut Gas and two water suppliers subject to a state retrofit program requirement: the public Regional

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[9] California State Water Resources Control Board. Demonstration of Emerging Technologies. 1991.

[10] The following discussion is based on nearly 30 interviews with utility and state officials. See Dyballa and Connelley, 1992, op.cit.

[11] Jones, A. and J. Dyer. Water and Energy Utility Partnerhips. Water Efficiency Implementation Report #2. Rocky Mountain Institute. 1992.

Water Authority (RWA) for the New Haven area and investor owned Bridgeport Hydraulic (BH). A private contractor brokered the arrangements between utilities. Program results were mixed.

Cooperation began with Homeworks, a UI direct installation program for low-income homes for low-cost water and energy conservation measures. RWA didn't continue after concluding a 800 home pilot program. But at the end of the first year with BH, over 2,000 homes had been served; this year's goal is 3 1/2 times greater.

UI funded the bulk of the Homeworks program, with water utilities financing the marginal costs of supplying water saving measures. BH's own distribution system (for non-electric, non-low income households) reached over 27,000 households in its first year. But joining forces with UI provides in-home installation for little more cost than delivering kits on request.

Preliminary program water savings from showerheads and faucets: 8.6 gallons per capita day (pre-1980 homes) and 4.8 gpcd (post-1980), depending on the flow rates of fixture being replaced. Predicted energy savings are 625 kWh/showerhead.[12]

Seattle, Washington

The five area energy, water, gas and sewer utilities launched in mid-1992 a $5 million collaborative effort to deliver 300,000 residential retrofit kits in the Seattle area. Program tasks, such as product purchase, marketing, household distribution, and direct installation for some categories of customer, are divided among the utilities. Program funds are pooled, with charges to each utility based on the particular materials and energy use in the home.[13]

The program builds on earlier, separate utility conservation programs. The Water Department and Seattle City Light were both planning multifamily installation programs, and decided to blend the two. The electric utility covers most costs, with the water department paying incremental labor and materials. BPA provided added incentive for electric utilities by offering to cover 75% of their costs, based on the value of the estimated electricity savings to BPA.

Estimated areawide program savings are impressive: over 38,600 mWh, 1.6 billlion gallons, and 338,000 therms per year, and $30/year/household from the installed measures.

Pasadena, California

In Pasadena, where both water and electric services are city owned, the one-year Lite Bill program provided citywide door to door canvasing, residential energy and water audits, and

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[12] DiBona, Peter, Bridgeport Hydraulic, personal communication. A formal savings evaluation is still in process.

[13] Seattle City Light and Water Dept. Report to the City Council: Statement of Legislative Intent, Showerhead Retrofit. March 1992.

installation of water efficient showerheads, compact fluorescent lamps, and toilet dams as well as other items. Perhaps the first joint delivery program, marketing focused on reducing consumer costs. About 35% of all city residents in 4-unit or less buildings (134,000 population) participated.

Pasadena received an economic incentive for this program from its water wholesaler. Metropolitan Water District of Southern California's Conservation Credits program paid an estimated $373,500 to the City, based on its avoided pumping costs for supplying the water conserved. The City expects a four year payback from reduced water purchases, reduced energy costs for pumping water, and reduced electric peak load.[14]

Programs that Didn't Work

In other places, joint programs were discussed but not implemented, illustrating the institutional pitfalls of working together. In one New England case, the city water department, after being approached by the electric IOU about a joint residential retrofit program, decided it would be more cost effective to conserve water by fixing leaking mains. In another New England case, a public water supplier approached the electric IOU about joining in a planned residential retrofit program, but they could not agree on cost distribution or on program timing.

Timing of the existing water and energy retrofit programs, and distribution of costs, were major stumbling blocks in one western city with in-house water and power services. And in Austin, Texas, an attempt to involve the city owned electric retailer was thwarted by the discovery that most residences use gas heated hot water. The private gas company had its own residential energy program; by the time a deal was negotiated to add specific gas-saving items to the water program, most of the city had been serviced.

INNOVATIVE WATER CONSERVATION MODELS

Some water conservation programs may provide alternative program models for saving electricity. A few case examples follow.

Negotiated Best Management Practices

In California, several years of drought and high energy costs for water transport and delivery have spurred interest in water conservation. Major water suppliers and environmental groups in California negotiated a voluntary statewide list of 16 water conservation best management practices, and also negotiated estimated reliable water savings for each practice.[15]

[14] Pape, T. "Water and Energy Conservation for Residential Customers." In Proceedings of Conserv 90: The National Conference and Exposition. August 1990.

[15] "Memorandum of Understanding Regarding Urban Water Conservation in California." Sept. 1991.

To date over 60 water suppliers, including almost all major water utilities, have signed an agreement committing to a timetable for implementing these measures. The measures, if implemented in the Metropolitan Water District of Southern California (a water wholesaler serving 15 million people), can yield an estimated total water savings of 15% over 20 years.[16]

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

Connecticut Integrated State Requirements

Water utilities in Connecticut are motivated to participate in joint programs by state agency policies. All three state agencies regulating the water industry (the PUC, Health Services, and Dept. of Environmental Conservation) require a standardized conservation plan before issuing a permit, approval or rate decision. Future demand analysis, results of water use audits, goals and plans for specific program elements are required.[17]

An innovative, perhaps unique, 1989 state law also requires all water utilities (both investor owned and public) serving at least 250 hookups or 1,000 customers (about 75% of the state's population) to offer water conservation retrofit kits to their residential customers.[18] Some state Residential Conservation Service programs have ordered electric and gas utilities to offer or install energy conservation measures by regulation, but few, if any, programs this sweeping in nature have been legislated.

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

CONCLUSIONS

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[16] Maddaus, W., et al. "Water Savings from Water Conervation Best Management Practices in Southern California. In American Water Works Association 1991 Annual Conference Proceedings. American Water Works Association. 1991.

[17] Dyballa, C. and C. Connelley. "State Programs Incorporating Water Conservation." In American Water Works Association Annual Conference Proceedings. June 1991.

[18] Ruzicka, D. "Recent Water Conservation Initiatives by the State of Connecticut." In Proceedings of Conserv 90: The Conference and Exposition. August 1990.

Joint delivery of water and energy programs has potential to benefit both utilities and their customers, and to reduce resource demand. Showerhead retrofit programs yield particularly large reductions in both energy and water consumption. But, depending on the nature of a utility's demand, other water conservation programs offer substantial savings potential as well. Most programs to date have concentrated on residential savings. An area with great future potential savings is combining water and energy savings for industrial and commercial facilities.

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

Participation is often motivated by actions of state agencies, such as anticipated PUC rulings. But each utility's individual goals and motivations must be served by the program. Different utility goals for program timing are often a stumbling block. The joint delivery system must be able to track progress and savings for each utility, both for billing and for documentation purposes.

Financing a program can be a source of difficulty. While a joint retrofit program is less expensive per household for each utility than an individual utility program, it is more expensive for at least one party than the cost of simply offering kits without installation or home delivery. Agreeing on the split of financing, absent consistent models that identify anticipated energy and water savings, can be difficult as well.

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

DRINKING WATER ISSUES IN THE 21ST CENTURY

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The most distinctive feature of the drinking water industry is the large number of small entities that provide water to the public. This phenomenon is the root of the "small systems problem" that preoccupies drinking water regulators. This problem is not going to be resolved in the near future, and it will shape the issues that face public utility commissioners and staff in the 21st century.

Background

Public utility commissions regulate approximately 14,000 public water systems[2] in the United States. Of these, nearly 5,700, or 40 percent, are "small," i.e., they serve fewer than 3,300 people.[3]

In the water industry as a whole, however, a much larger percentage of systems are small. Nationwide, there are over 200,000 systems, and over 90 percent serve fewer than 3,300 people. Indeed, nearly 123,000 of these 200,000 entities--over 60 percent--serve fewer than 100 individuals. More than 46,000 additional systems serve between 100 and 500 persons. Taken together, this means that over 160,000 separate entities--approximately 85 percent of the total--serve populations of fewer than 500.[4]

Even if we restrict our discussion to "community water systems," i.e., those that serve "year-round" residents, the percentage of small entities still is striking. Thirty-one percent of

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[1]The views expressed in this paper are those of the author and do not necessarily reflect the opinions of The Cadmus Group, Inc.

[2]A "public water system" is defined by Section 1401 of the Safe Drinking Water Act as "a system for the provision to the public of piped water for human consumption, if such system has at least fifteen service connections or regularly serves at least twenty-five individuals."

[3]Source: <u>1991 NRRI Survey of Commission Regulation of Water Systems</u>.

[4]All data on public water supplies are from the USEPA's Federal Reporting Data System (FRDS), 1992.

community systems serve fewer 100 or fewer persons; 63 percent serve populations of fewer than 500; and 87 percent serve 3300 or fewer people.

Since these small entities account for a disproportionate share of violations of Federal and State drinking water regulations, they are of major concern to both the U.S. Environmental Protection Agency (USEPA) and State regulatory agencies.

Two trends have been discussed frequently by speakers during the two days of this Conference: consolidation in the industry, and privatization. Many speakers have argued that small systems cannot survive in the 21st century because of the increased costs of compliance with drinking water regulations. As a result, they suggest that there will be inevitable consolidation. If there also is a trend toward privatization, then one might look forward to a day when public utility commissions regulate only a small number of large public water systems. These large systems would be able to attract capital and professional staff needed to address the problems of the industry. Also, from the standpoint of commissioners and their staff, there are economies of scale in rate regulation. There can be more effective oversight of a smaller number of larger rate cases.

This scenario, however desirable, is not likely to happen. The remainder of this paper will describe the trends that will shape consolidation and privatization in the future.

Consolidation

This was a major theme of the papers on September 9. Bruce Burcat, for example, spoke of the likelihood that small utilities would be forced out of business in the future. Scott Rubin discussed the search for regional options in Pennsylvania.

The most important factor causing this apparent trend toward consolidation is cost. As the number and complexity of drinking water regulations increases, the cost of compliance is increased, and this leads to a search for a least-cost solution. As John Cromwell and Rick Albani explained on September 9, if all of the costs are known, the least-cost solution is generally not to continue operating a very small system. Instead, some form of consolidation is often the least-cost alternative.

Given this basic framework, the following factors will support the trend toward consolidation:

- an increased number of regulations with attendant cost implications;
- uncertainty of supply; and
- increased barriers to entry.

At the same time, however, there are forces working in the opposition direction. These include:

- uncertainty about the pace of regulation;
- population growth leading to new system creation; and
- lack of controls on new system formation.

Each of these factors will be considered below.

Factors Contributing to Consolidation

1. Increased Number of Regulations

The 1986 Amendments to the Safe Drinking Water Act (SDWA) mandated a dramatic increase in the number of regulated contaminants in drinking water: from 26 in 1986 to nearly 100 by 1995. Highlights of these new regulations include disinfection of all public water systems, filtration of all surface water systems, a ban on all materials containing lead, monitoring of dozens of unregulated contaminants, a significant increase in monitoring for non-transient non-community systems, regulation of volatile organic chemicals, lead and copper corrosion control, regulation of inorganic and synthetic organic chemicals, and regulation of radionuclides. These regulations impose costs. While the cost varies by system, the impact is clear. When added to the need to replace aging infrastructure, the total burden may result in substantial increases in household water bills.

2. Uncertainty of Supply

Increased costs will be caused not only by regulation of contaminants, but also by shortages or uncertainty of supply. This phenomenon affects not only the States facing droughts on the East and West Coasts (California, Washington, and Florida) but other States as well. It is caused by the following factors that may lead to controls on withdrawals:

- competition between in-stream uses for fish, wildlife, and recreation versus out of stream uses for industry, agriculture, and households;
- competition among industry and agriculture (which are the largest water users) and households (who face increased uncertainty about supply in many States;
- the revived interest in whole-basin planning that enables regulators to consider the long-term effects of unlimited withdrawals; and
- increased conjunctive management of surface and ground water sources.

Uncertainty about supply creates some interesting dilemmas for the Commissions. As Thomas Stack explained on September 9, promoting conservation by abandoning declining block rates could have important consequences for the rate bases of water systems if it leads to the loss of major industrial customers. Loss of customers, particularly large commercial customers, could lead to a "death spiral" of reduced revenues and increased costs for the remaining customers. Rapidly increasing costs might lead owners to consider regional solutions that include the elimination of some small systems.[5]

3. Increased Barriers to Entry

State drinking water agencies, often working in concert with public utility commissions, are creating statutory barriers to entry in the drinking water industry. These initiatives are generally classified as programs to cope with the problem of "non-viable" water systems.[6] At the same time, States also may be taking steps to control growth and impose minimum state-wide land-use controls. Though not specifically designed to deal with the non-viable system problem, these initiatives may have the effect of imposing barriers to entry.

Factors Limiting the Trend Toward Consolidation

Not all factors are supporting the trend toward consolidation. Indeed, some are going in the opposite direction. These are discussed in the next few paragraphs.

1. Uncertainty about the Pace of Regulation

Cromwell and Albani noted in their paper on September 9, that systems often avoid choosing the least-cost solution to a compliance problem because they cannot see the entire cost of full compliance with all drinking water regulations. The schedule for implementation of the 1986 Amendments to the SDWA has been incremental:

- the VOC rule became final in July 1987,
- TCR and the surface water treatment rule became final in June 1989,
- Phase II for SOCs and IOCs became final for 33 contaminants in January 1991 and for an additional five contaminants in July 1991,
- the lead and copper rule became final in May 1991, and
- Phase V for SOCs and IOCs became final in May 1992.

Equally important, the inevitability of increased regulation has been called into question. Two recent events indicate this uncertainty.

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[5]It is worth noting, however, that measures to promote conservation--such as abandoning declining block rates--may lead to the <u>creation</u> of new systems as industrial and commercial users create new, non-community systems.

[6]See, for example, two reports prepared by The Cadmus Group, Inc. for USEPA: <u>Ensuring the Viability of New, Small Drinking Water Systems: A Study of State Programs</u>, EPA-570/9-89-004, April 1989; and <u>Improving the Viability of Existing Small Drinking Water Systems</u>, EPA 570/9-90-004, June 1990.

First, in August, 1992, Senator Domenici introduced S. 2900, a bill that would impose a moratorium on implementation of SDWA regulations, except for 35 fully implemented by December 31, 1989. Also in August, the National Governors Association (NGA) issued a policy statement that called for a similar freeze on drinking water regulations. Passage of S. 2900 would mean no lead and copper rule, no regulation of radionuclides, no Phase II and Phase V regulation of SOCs and IOCs. For water system owners, the existence of S. 2900 and the NGA policy statement are a vindication of the view that the regulatory agenda has become too costly and complex.

Second, some utilities believe that consumers will rebel when faced with the total cost of all environmental regulations--air, wastewater, solid waste, hazardous waste, and drinking water. On the day this paper was presented to the BRIC, there was a meeting in Washington, D.C. between EPA and mayors concerned with the impact of these regulations on their communities. Representatives from Columbus, Ohio have been leading spokesmen for this group and its concerns.[7]

As a result of this uncertainty, system owners may feel that they can postpone dealing with the problems of compliance. Some will stop plans for new treatment facilities altogether. Others will postpone these plans until the future has become clearer. In either case, the pressures that might cause systems to search for least-cost solutions--pressures that might lead to consolidation
--will lessen.

2. Population Growth and New System Creation

Small systems tend to be created as a result of residential development. Total population in the U.S. will increase from over 250 million to between 300 and 350 million in 2025. The increased population will need housing, and old housing stock will need to be replaced. Since a large percentage of new housing is created in subdivisions in unincorporated areas on the fringes of cities and towns, there is a likelihood that new small water systems will be created. The only constraint on this trend will be creation of new barriers to entry into the water supply industry, as discussed above.

3. Lack of Controls on System Creation

Controlling the creation of new water systems pits regional land use control against the rights of Americans to develop their property. While it might be politically feasible to impose constraints on new systems in Connecticut, or Vermont, of Washington, other States (like Texas or Missouri) clearly are not yet ready for such drastic interference with property rights.

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[7]Environmental Law Review Committee, "Environmental Legislation: The Increasing Costs of Regulatory Compliance to the City of Columbus," May 13, 1991.

Summary

The outcome of this contest between conflicting forces will not be known for many years. What is clear, however, is that we cannot assume that the number of small systems will radically decline or that large numbers of systems will consolidate. Instead, the small system problem seems to be a problem that will persist well into the 21st century.

Privatization

There is a trend toward greater reliance on private industry to perform what had heretofore been considered governmental functions. In the water industry, of course, there had never been a national preference for public sector ownership of water supply. Indeed, there are many States where investor-owned utilities are major purveyors. Thus, if one is searching for a model of privatized water supply, there are plenty of cases to choose from.

The current Administration believes in the benefits of privatization and has expressed these beliefs in official governmental policy. Executive Order 12803, "Infrastructure Privatization," expresses the believe that increased reliance on investor-owned enterprises will lead to increases in efficiency and increased access to capital.

Given this setting, some observers have argued that we are heading toward a situation like that in Great Britain, where the water supplies of England and Wales have been combined in ten large regional water companies.[8] In spite of the favorable treatment of the British experience in the American trade press, it is unlikely that the U.S. could achieve such a dramatic change. The current British system was created in two steps. First, in 1974, ten regional water authorities were created to plan, control and manage all uses of water in each main river catchment. Second, in the late 1980s, these ten regional authorities were converted into private companies. That first step--consolidation--would require a level of central authority in our national government that is inconsistent with our federal structure.

Private ownership is likely to face resistance also. Public ownership of water systems is a strong tradition in many States. Michigan statute, for example, requires public ownership of community water systems wherever possible. There are several States with only a handful of investor-owned water utilities. Furthermore, in spite of the national trend toward privatization, there are ongoing attempts to transfer investor owned utilities to public ownership. An example is the referendum question in Pekin, Illinois for the general election in November 1992 that asked the voters to authorize the city to acquire the investor-owned system currently serving the city's residents.

A more likely scenario, given our political institutions, is the French model of increased contract management co-existing with public ownership. This is a trend that one can already

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[8]Although the popular notion is that there are ten water companies, there actually are ten large regional systems plus 26 additional systems inside the service areas of these ten. See Drinking Water Inspectorate, Drinking Water 1990, July 1991.

observe in the water industry today as large investor-owned water systems increase their activities in the field of contract operations and management. Increased contract management creates its own problems, as explained by John Tomac and Leendert DeJong in their paper on September 9 on "Managing A Turn Around." Since public ownership often exempts systems from commission regulation, there may not be an increase in the number of systems regulated by commissions.

Still, two factors will contribute to an increased commission role. First, to the extent that State commissions regulate publicly owned systems (as they do in many States), there is a PUC role and responsibility to assess contract management expenses as part of the normal rate review process. Second, contract management operations, as ancillary functions of investor owned utilities, may raise questions of cost allocation for those utilities. For the ratepayers of those utilities, for example, commissions will want to know whether the contract management divisions are absorbing their fair share of indirect costs.

Conclusion

The Proceedings of the 1991 NARUC Annual Convention quoted Commissioner Paul Foran of Illinois as stating that "today's 'highly fragmented hodge-podge of thousands of water providers' is inefficient and unable to deal with these new developments [increased regulation and uncertain supply]." Further, Commissioner Foran noted that "'privatization can lead to corporate structures of a size which can transcend local political boundaries, attract necessary capital and achieve operating efficiencies to an extent that exceeds the capabilities of most governmental authorities.'"[9] Mr. Foran also noted, however, that this does not mean that privatization is "inevitable, or even achievable on a broad basis."

Mr. Foran's assessment of the probability of change is realistic. Whatever the merits of increased consolidation and privatization, the political landscape of the United States is hostile to rapid change. For this reason, both consolidation and privatization will continue to be unresolved issues facing regulators in the 21st century.

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[9]NARUC No. 48-1991, page 25.

ENHANCED REGULATORY DECISIONMAKING THROUGH INTEGRATED WATER RESOURCE PLANNING

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INTRODUCTION

It was no accident that the Water Policy Forum of this Biennial Regulatory Information Conference (BRIC) was designed around three basic themes: ratemaking, viability, and planning. At the National Regulatory Research Institute (NRRI), we have concentrated much of our water research effort on these themes. The concept of integrated water resource planning is an obvious choice for pulling together not only our common research and policy interests but also many of the specific observations that have come to light in the exceptional collection of papers presented at this meeting.

In a recent NRRI study we asserted that integrated resource planning as applied to electricity and natural gas utilities was transferable to the case of water. Integrated planning has taken its place in the regulatory toolbox and is at least as applicable to water as to energy utilities. If anything, applying planning to water is made easier by the relatively straightforward technology of water delivery. Moreover, the types of planning issues that prevail in the water sector seem especially suitable to a more integrated approach. The current structure of the water industry presents a limitation to planning in terms of the many small water systems in existence, but even small utilities can benefit from using a planning framework or being considered in the planning processes of others. As planning becomes a higher priority for water utilities and regulators, the interest in planning approaches will grow.

Integrated resource planning encompasses the concept of least-cost planning, with its emphasis on balancing of supply and demand management considerations, establishing a more open and participatory process, and ultimately identifying planning alternatives that meet the test of least cost. But integrated planning goes further to emphasize the integration of competing paradigms and institutions that govern water resources. Integrated planning continues to undergo a distinct evolution, from the issues of **what** and **why** to issues of **how** and **where.** Put another way, this area of inquiry has moved from a protracted debate over definitions and rationales to more analytical and institutional ones. Today more than ever we recognize the need for integrated water resource planning. We simply cannot afford to duplicate efforts or work at cross purposes.

Nothing drives the need for planning more clearly than today's increasingly stringent drinking water regulations and the high cost of their implementation at a time when the water industry also must repair and replace its aging infrastructure and, at least in some areas, strive to meet demand growth. The Safe Drinking Water Act is probably having a more **revolutionary** than **evolutionary** effect on the water industry. But in the past decades all of our utility sectors have experienced their own dramatic changes. In the telecommunications field the divestiture of AT&T brought about technological and competitive transformations that are still underway in its wake. In the electricity and natural gas sectors the energy crisis led to various adjustments to the structure of these utility industries and their regulation, including the advent of least-cost planning. Today the electricity industry faces implementation of an unprecedented emissions trading market under the Clean Air Act. Advocates contend that this approach will help yield least-cost pollution control, but not unless the utilities (and their regulators) make effective use of these markets and adjust their behavior accordingly.

So while most discussions about the water sector these days are rather pessimistic, if not downright cynical, it also is important to not lose sight of the potential benefits that revolutionary change could bring, including both technological and institutional innovations. On the institutional side, integrated resource planning may be among the most important means of innovation.

No doubt, integrated water resource planning is an idea that is still in its infancy. At this stage we are learning to adapt to the water sector some of the basic least-cost energy planning concepts (such as avoided cost) and methodologies (such as the no-losers test) as well as develop water-specific approaches. Equally important in the process is to not lose sight of the application issues or the how and the where of planning.

DECISIONMAKING APPLICATIONS FOR INTEGRATED WATER RESOURCE PLANNING

As a way to bring meaning to the concept of integrated water resource planning I have attempted to identify ten regulatory decisionmaking areas that will both **enhance and be enhanced by** an integrated planning approach. These are ways of operationalizing planning in the water sector with respect to some specific policy issues, many of which we have addressed in our NRRI water research program. Especially in light of these conference proceedings, these areas will be familiar ones. They also overlap considerably, which is in part a function of a more integrated perspective that recognizes the interrelationships among decision areas. Still, these ten issue areas probably are not comprehensive. As the field evolves, the integrated planning framework can be fine tuned, especially with respect to concerns specific to the water sector.

<u>1. Conservation, Efficiency, and Wise Use.</u> A first and somewhat obvious application of integrated water resource planning is conservation. Conservation continues to be a source of philosophical and public policy controversy and a sore subject for those who put great faith in water's natural abundance and equate conservation with the unjustified curtailment of water use. However, the emergence of a conservation or wise-use paradigm in the water sector is partially responsible for our reexamination of traditional water utility planning.

Water is abundant and renewable but not perfectly so. It is not always where we need it when we need it. It requires nonrenewable energy and chemicals to deliver it and a wastewater infrastructure when we're through with it. Sadly, we can pollute our water sources beyond their capacity to renew. Integrated planning can help recognize and hopefully reconcile the alternative perspectives on conservation. Generally, the terms "efficiency" and "wise use" find more acceptance than the term conservation. Reducing waste (for example, excessive leaks in the distribution system) can be cost effective even for areas with abundant supplies because the water saved is becoming an increasingly valuable (or value-added) commodity. Some efficiency programs, such as xeriscaping, can produce sustained benefits in lowering water demand. With more efficient use, some utilities may be able to forestall the need for new capacity, sometimes indefinitely if they are not experiencing demand growth. Per capita water use generally is very stable; we are not finding many new uses for water (especially in comparison to the growing uses for electricity) and markets for water-using fixtures are well saturated (no pun intended). Absent growth, therefore, net gains from conservation can be significant.

Conservation also can be linked to affordability and other policy goals. For example, targeting conservation to low-income consumers can help control consumer costs as well as utility uncollectible accounts. But for consumers in general, efficient use of water should, like recycling, become second nature. Government agencies need to recognize this need through policies that promote efficient use (such as revised plumbing codes) as well as public education about water's value.

2. Cost Allocation and Rate Design. A planning perspective here recognizes that pricing is more than simply the means of meeting revenue requirements. It sends a signal that in turn affects demand that in turn affects the design of the water system. A planning framework allows the consideration of nontraditional approaches, not only marginal cost analysis but rate structures (such as seasonal rates and even increasing block rates) that can be used to implement it. Planning may force the more thorough and honest evaluation of incremental costs associated with adding capacity.

Efficiency is an untapped resource in the water sector partly because of distorted prices. Water resource economists have long attributed many of the distributional issues in water to the lack of cost-based price signals. Yet price alone is not a panacea for our water sector problems. An integrated approach combines pricing with public education and other strategies to manage demand more effectively. Pricing also can be used to achieve multiple policy goals (discussed further below). A striking example is how a good conservation rate can resemble a lifeline rate because both help make a basic amount of water available at a more affordable price.

3. Externalities Assessment. While most analysts would recognize that the social costs of utility services exceed those actually accounted for by utilities and borne by ratepayers, they disagree over what to do about it. Thus there exists no consensus on the issue of incorporating externalities either in cost allocation and rate design or in planning. Some analysts have argued that for least-cost planning to be effective, a narrow definition of cost should be employed. They contend that cost definitions should not be broadened to incorporate more ambiguous factors such as economic development, costs incurred by ratepayer participation, and social costs. More integrated frameworks are more likely to consider externalities.

Undoubtedly, a narrow definition may make least-cost planning easier to implement and evaluate because of greater ease in quantification. However, it also may preclude consideration of qualitative issues as well as externalities. In the case of water supply, substantial health, environmental, and natural resource considerations exist. In an integrated planning framework, social costs and benefits and other externalities can be explicitly addressed, if not quantified. The inability to quantify certain outcomes should not preclude their inclusion in a comprehensive analysis. The planning sciences have long considered "intangibles" in the planning process. Regulators, too, consider externalities, either explicitly or implicitly, when determining which courses of action are "in the public interest."

Many states have begun to take environmental and other externalities into account in utility planning processes. New methodologies and decision guidelines are under development for this purpose. The debate over incorporating externalities in planning decisions is far from over in the electricity sector and has hardly begun in the water sector. As water is a natural resource, however, it will be virtually impossible to ignore the environmental consequences of future water resource planning decisions at all levels, including planning by water utilities and the agencies that regulate them. Indeed, it is arguable that the purpose of integrated resource planning in the first place is to provide a forum for considering these very issues. SDWA costs, in effect, are someone else's externalities come home to roost. Had we protected our water supplies from many forms of contamination in the first place, we would not be paying the price of clean up today. In the long term, an integrated approach could be used to assess the degree to which implementation of the Clean Water Act and other forms of environmental protection can offset the need for stringent regulations of certain contaminants under the SDWA.

4. Small System Viability. Water utility regulation, by both public utility commissions and drinking water administrators, share an interest in the small system viability issue. This issue has two distinct dimensions. First is the need to control the emergence of new systems and second is the need to deal with existing systems whose viability is at best precarious.

Integrated or comprehensive policies toward emerging water systems emphasize better coordination among regulatory agencies and long-term structural solutions (especially consolidation). In this case, integrated planning is generally not of the least-cost variety that can be conducted by larger public utilities, but of the type that must be initiated by the governmental agencies and designed to encompass the small water systems under their jurisdiction or by large water systems taking into account the interests of small systems in nearby territories. However, research in this area also has emphasized that one test of viability is the capacity of even the smallest systems to prepare a basic business plan.

Integrated resource planning can help alleviate the proliferation of nonviable small water systems by shifting the emphasis of utility planning and making it more comprehensive in scope. For planning to help resolve the small systems problem, several institutional mechanisms may be required. Planning of this nature may require new legislative authorities as well as a redefinition of state and local agency roles and responsibilities. As certifiers of new investor-owned (and other) water utilities, the state drinking water administrators and the state public utility commissions (when they have this authority) can provide critical checkpoints to assure that new systems will not emerge if doing so is not in the public interest. To make this determination, however, these agencies need to coordinate their efforts as well as be aware of state water-resource, land-use, and other planning mandates governed by other agencies. Local governments, too, must help assure that the establishment of new water systems comports with planned development and land use. Further, it is not unreasonable to hold local governments responsible for providing water service should new systems that local officials help initiate become nonviable. Agencies with certification authority may need to find ways of integrating their planning considerations into various regulatory proceedings (that is, making them part of the evidentiary records on which decisions are made).

5. SDWA Compliance. Compliance with the SDWA for the industry as a whole can benefit in the long term through integrated planning. As has been noted, least-cost compliance solutions are unlikely to emerge with the industry structured as it is today. As they face SDWA costs (and other costs), water utilities should seek out all possible means of economizing. This runs the gamut of least-cost financing, to shared facilities, to satellite management, to full-blown restructuring.

The prudence of investments related to the SDWA, the appropriateness of financial arrangements associated with them, and the anticipated effects of SDWA compliance costs on ratepayers (perhaps especially low-income ratepayers) should be evaluated in an integrated framework. This means coordinating regulatory efforts among state regulatory agencies. The state public utility commissions should be able to easily incorporate compliance information from state drinking water administrators into proceedings for commission regulated utilities, especially in cases where the prudence of SDWA related investments or expenses are involved. Likewise, drinking water administrators should hear from the commissions about the economic implications of drinking water regulations. All state agencies affected by the SDWA should work together to formulate compliance strategies as well as become involved in federal SDWA activity, including future administrative rules and statutory amendments.

Ideally, integrated planning also means coordinating SDWA compliance strategies among water utilities themselves. Large water utilities may have a role to play in furthering compliance by small community and noncommunity systems. Larger systems could provide management or operational services at a fee that would cover their costs while being less than what small systems would have to pay on their own. The very largest systems, with the best economies as well as technical expertise, are in an excellent position to provide constructive solutions to SDWA compliance for the water industry as a whole.

6. Performance Evaluation. Integrated water resource planning provides an important means of assessing water utility performance. Planning instruments provide utilities and their regulators a tool for evaluating performance. Utilities can use plans to monitor their own progress and make necessary adjustments in their supply and demand management programs and other areas of utility operations. Regulators can use them to assess viability, management prudence, and other jurisdictional issues. Regulators also can help assure that planning by jurisdictional water systems comports with the provisions of all applicable planning processes in addition to least-cost and other utility planning principles. Finally, regulators also might consider providing performance incentives and designing evaluation criteria consistent with long-term integrated planning goals. Performance incentives could recognize not only utility planning efforts but efforts in such areas as SDWA compliance, customer service, and conservation.

Integrated planning is not a substitute for traditional regulatory evaluations (for example, used and useful test) but a complement to them. A current debate in the electricity sector is whether commissions should provide **preapproval** of investments associated with Clean Air Act provisions. SDWA compliance costs raise the potential need for preapproval because water utilities have such limited access to capital. Advance regulatory approval could help some small utilities secure loans by assuring bankers that debt costs will be recovered through rates. For many middle-sized or larger water utilities, integrated planning is a superior alternative to preapproval. Capital construction programs consistent with approved planning instruments should be viewed favorably by the investment community. Unlike preapproval, however, integrated planning provides for a continued sharing of risks and rewards by investors and ratepayers and does not unrealistically try to tie the hands of future regulatory agencies.

7. Industry Restructuring. Integrated planning can be used to assess alternative structural arrangements in the water sector. Specifically, proposals to consolidate systems should be subjected to least-cost, no-losers, and viability tests. Not every merger or acquisition can pass all three tests, but regulators must be aware of the tradeoffs being proposed (for example, higher costs and rates for long-term viability). Statewide and even regional or river-basin based planning might provide some important inputs for restructuring decisions.

Long-term consolidation of the water supply industry may require some rather invasive government policies, such as the creation of more effective barriers to market entry (that is, certification of new systems) and the mandatory takeover of water systems by public agencies. However, this is not to say that major industry restructuring cannot be accomplished in the long term through private sector initiatives, as through voluntary mergers and acquisitions. Larger water systems can further consolidation goals by actively seeking to extend service to areas served by small community and noncommunity providers.

In an integrated framework it probably is best to keep an open mind about institutional alternatives, including alternative ownership arrangements (that is, public v. private and all options in between). In fact, institutional diversity is probably desirable because it allows for experimentation, comparison, and competition among specific options, all of which should enhance viability in the long term.

8. Multisector Approaches. Integrated resource planning in the water sector has implications for integrated planning in other sectors as well. Examples of integrated resource planning with respect to water utilities include the combined consideration of utility planning with water-resource planning, land-use planning, wastewater-service planning, energy-resource planning, and emergency-response planning.

Historically, the interrelationships between water and land-use planning have been inadequately addressed, in large part due to organizational conflicts between federal water resource development and management on the one hand and local land-use planning on the other. Unfortunately, water supply adequacy has not always been recognized as a critical land-use planning factor. Particularly in arid climates, better planning can promote ways to limit future water needs through such measures as reduced lot sizes, water-efficient plumbing codes, and water-efficient landscaping (xeriscape) practices. In addition to supply adequacy and the need for efficiency, flooding, urban runoff, and wastewater needs are among the many areas that could be addressed through integrated water and land-use planning for water systems.

Small system viability can and should be addressed through multisector approaches. The emergence of small water systems in the first place frequently is associated with unrestrained real-estate development. Integrated planning can help make long-term viability a higher priority for water systems. One innovative multisector approach to small systems is to explore the potential for nonwater utilities (such as electric utilities) to play an ownership, managerial, or operational role in the water sector. Customer service and regulatory relations are among the many areas of expertise where larger utilities of any variety have an advantage. Still another connection between energy and water utilities is in conservation savings related to hot water use. In an integrated framework, creative multisector solutions can be encouraged in these and other areas.

9. Multiobjective Policymaking. Increasingly, the regulatory community recognizes competing policy goals. Whether approving certificates of convenience and necessity or reviewing rates or hearing customer complaints, tradeoffs among equity, efficiency, affordability, and so on are more obvious than ever. As the price of water rises, the difficulty of trading off competing goals intensifies.

Integrated planning may provide some means of meeting sometimes competing or segregated goals. There are connections to be made between conservation and affordability, between acquisitions and long-term viability, between rate shock and restructuring, and of course between supply management and demand management. No single planning solution will resolve all of these issues at once, but in a world of scare resources addressing multiple goals simultaneously seems to make far better sense than the disjointed processes that traditional schemes sometimes foster.

10. Institutional Coordination. Our water resources are governed by a highly fragmented and pluralistic system of policymaking institutions. In most states, different agencies regulate different aspects of the water sector (for example, permitting, rates, and water quality). Most state governments are so far away from "one stop shopping", whereby water utilities could get all necessary regulatory approvals from a single agency, that the room for improvement is obvious. Decisions by some agencies may severely constrain a utility's planning options. Integrated planning may help shed light on sometimes competing state policies goals (such as economic development and conservation).

States with more comprehensive planning processes emphasize interagency coordination. The growing interest in integrated planning is demonstrated by statutory authorities as well as the development of memoranda of understanding among various governmental agencies involved in water system regulation. These agreements serve to coordinate not the only certification of new systems but ongoing regulation of existing systems. The regulatory burden on water systems is reaching new heights, especially when the monitoring and compliance demands of the SDWA are combined with the reporting and ratemaking demands of economic regulation. The states may want to incorporate regulatory alternatives, including alternative dispute resolution, under a more integrated approach.

Without better coordination among our water resource governing institutions, the cost of regulation itself could far outweigh its benefits. If the goals of SDWA compliance, restructuring, and so on are not achieved, we will have only ourselves and our regulatory institutions to blame.

CONCLUSION

The collection of water papers presented at this conference reflects wide ranging interests: the politics of the regulatory process, small system viability, alternative ratemaking techniques, financial assessment methods, the effect of rising costs on low-income consumers, the importance of examining rate structures with care, conservation rates and surcharges, alternative management arrangements for distressed systems, and the institutional settings in which this all takes place. Many questions have been raised. Under the umbrella of integrated water resource planning, perhaps some solutions within specific regulatory decisionmaking areas will begin to emerge.