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ASSESSING THE APPLICABILITY OF SELECTED FINANCIAL INCENTIVE REGULATION METHODS FOR WATER UTILITY REGULATION

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EXECUTIVE SUMMARY

For the foreseeable future, infrastructure development is going to place great demands on water utility financial resources and managerial skill. Regulatory experience with facilities expansion in the electric and telecommunications utility sectors suggest that rate base/rate-of-return (RBROR) regulation may have perverse economic incentives that will challenge water utility financial and managerial resources.

Successes and failures in the electric, gas, and telecommunications sectors have been linked to imperfections in RBROR regulation. Generally, specific weaknesses identified include the lack of cost control, the weak linkage between monetary reward and cost control, and the lack of explicit and valid ways to measure cost efficiency of utilities. The incentive techniques identified in this report are intended to overcome one or more of these imperfections. Each of the regulatory incentive methods is presented and then examined for its applicability to the investor-owned water utility industry. The incentive mechanisms examined are

- Price regulation
- Incentive rate-of-return
- Cost indexing
- Target construction costs
- Demand management

The report concludes that each incentive mechanism can be applied to regulated investor-owned water utilities. Each mechanism, however, has strengths and weaknesses that may make the incentive mechanism more attractive to regulators in some circumstances and less useful in others. For instance, price cap regulation works

better when there are capacity constraints and competitive markets. On the other hand, the target construction costs mechanism appears to work well when large system expansions are planned, but requires a large amount of effort by a commission in order to ensure that valid construction costs are used.

The report evaluates each incentive mechanism and concludes that the key regulatory question in applying any incentive mechanism is, “What problems are you trying to fix?”

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PREFACE

Important lessons have been learned from the application of various financial incentive mechanisms in other utility sectors that may have applicability to issues facing state commission regulation in the water sector. This report reviews five financial incentive mechanisms at a conceptual level--one step removed from any contentious rate case dispute. This approach allows broad, enduring themes, principles, and characteristics to be extracted. This allows commissioners and senior staff to choose the most appropriate regulatory tool needed in order to achieve state regulatory goals.

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CHAPTER 1

INCENTIVE REGULATION AND WATER UTILITIES

Deficiencies of Traditional Rate Base Regulation

Traditional rate base/rate-of-return (RBROR) regulation has several deficiencies.[1] It can be:

- Costly to administer,
- A barrier to production innovation,
- A barrier to service quality innovation, and
- An impediment to cost efficiency.

The latter deficiency is the focus of this report.

Traditional RBROR regulation provides intrinsic incentives for utilities to have costs in excess of those associated with efficient operations. As a result, strict adherence to a cost-of-service approach in the regulatory process can produce rates that reflect inefficiencies inherent in both the utilities' operations as well as in the cost accounting systems.[2] Lacking the disciplining force of competitive markets, the end result is cost inefficiency. In addition, RBROR regulation can also provide

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[1] James C. Bonbright, Albert L. Danielsen, and David R. Kamerschen, *Principles of Public Utility Rates* (Arlington, Virginia: Public Utilities Reports, 1988), 559-572.

[2] Robert J. Keegan and Paul F. Levy, "Options for Modifying Rate Base Regulation," in *New Regulatory and Management Strategies in a Changing Market Environment*, eds. Harry M. Trebing and Patrick C. Mann (East Lansing, Michigan: Institute of Public Utilities, 1987), 3-21.

disincentives for both conservation and demand management programs.

Traditional RBROR regulation involves establishing revenue requirements for a utility to cover its operating and capital costs for a representative year. In the case of investor-owned utilities, the capital costs are reflected in depreciation and rate of return on rate base. In the case of publicly owned utilities, the capital costs are reflected in debt service costs. Given the cost-recovery nature of the revenue requirement process, there is a cost control problem that results from the disincentive for efficient operations. The lack of an incentive for the utility to decrease its costs of operation means higher prices for the ratepayer. The determination of revenue requirements on a cost-plus basis assures that all utility costs will be recovered. Simultaneously, the potential for cost efficiencies to be retained by the utility is eliminated.[3]

As Pollard indicates, the cost inefficiency can take several forms.[4] One, inputs such as labor and equipment may not be employed in a manner that minimizes unit costs. Two, excess prices may be paid for inputs. Three, organizational changes may not be implemented to achieve lower unit costs of operation.

However, it should be noted that there are defenders of traditional regulation.[5] These defenders argue that the disincentives for cost efficiency are largely academic abstractions which are not quantitatively important. Defenders of traditional regulation also argue that the disincentives can be minimized by intelligent and proactive regulation. In practical terms, they would argue that state commissions have developed regulatory tools--such as quality-of-service standards and audits--to largely

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[3] Harry M. Trebing, "Toward an Incentive System of Regulation," *Public Utilities Fortnightly* 72 (July 18, 1963): 22-37.

[4] William P. Pollard, *Rate Incentive Provisions: A Framework for Analysis and a Survey of Activities* (Columbus, Ohio: The National Regulatory Research Institute, November 1981), 5-10.

[5] Charles F. Stone and John Haring, "The Economics of Price Caps," in *Alternatives to Traditional Regulation: Options for Reform*, eds. Harry M. Trebing and Patrick C. Mann (East Lansing, Michigan: Institute of Public Utilities, 1988). See also Douglas N. Jones, “What’s Right with Utility Regulation,” *Public Utilities Fortnightly* 117 (March 6, 1996): 18-20.

detect and eliminate the incentives to be inefficient.

The Rationale for Incentive Regulation

As indicated over three decades ago by Trebing, the development of incentive mechanisms could substantially alleviate the cost and innovation inefficiencies inherent in traditional RBROR regulation.[6] The beneficiaries of this development of an operable incentive mechanism would be the utility (if it receives higher rates of return and/or better debt service cost coverage), its ratepayers (through lower bills), and the community (from the economic development stimulated by lower utility rates). Two decades later, Seagraves made a similar plea for regulatory experimentation with incentive mechanisms such as flexible prices.[7]

The implementation of incentive mechanisms for the investor-owned water utility sector is particularly appropriate as many water utilities are presently confronted with escalating costs coming from one or more sources.

The implementation of incentive mechanisms for the investor-owned water utility sector is particularly appropriate as many water utilities are presently confronted with escalating costs coming from one or more sources. These sources include compliance with the amended Safe Drinking Water Act, demand growth, and the replacement of aging water supply infrastructure.[8]

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[6] Trebing, "Toward an Incentive System of Regulation," 22-37.

[7] James A. Seagraves, "Regulating Utilities with Efficiency Incentives," *Public Utilities Fortnightly* 113 (January 5, 1984): 18-23.

[8] Janice A. Beecher, Patrick C. Mann, and John D. Stanford, *Meeting Water Utility Revenue Requirements: Financing and Rate Making Alternatives* (Columbus, Ohio: The National Regulatory Research Institute, November 1993), 74-84.

The Definition of Incentive Regulation

Incentive regulation can be defined as a set of innovative regulatory approaches designed to provide utilities with incentives to achieve specified goals, or to meet specified standards or benchmarks, or to operate in a more efficient manner. Most of the newer incentive mechanisms that have been implemented have occurred in the telecommunications, electricity, and natural gas sectors. In some cases, the incentive mechanisms have been implemented in a partially deregulated environment.

One can not overemphasize the link between the structural change in these sectors and the implementation of incentive mechanisms. In some cases, the incentive mechanisms have been a reaction to emerging competitive forces. In other cases, the incentive mechanisms have been implemented as a substitute for market forces.

In general, there exist several categories of modifications, or incentive techniques that can be applied to traditional RBROR regulation.[9] One category includes those techniques that assess the performance of the utility. This category focuses on incentives for cost control. A second category includes those techniques that replace traditional regulation with price regulation. This category focuses on incentives for rate control. Both categories, performance assessment and price restraints replacing rate-of-return restraints, have the primary purpose of promoting cost efficiency.

Within these two general categories, incentive regulation can adopt many forms. However, each form generally involves a mechanism by which utilities are induced to improve operational efficiency by a system of rewards and penalties.[10] One incentive

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[9] Blair P. Kruger, *Report on Alternatives to Rate of Return Regulation* (Tallahassee, Florida: Florida Public Service Commission, September 1988), Chapter 1.

[10] Robert F. Wilson, "The Role of Regulation in Increasing the Productivity of Utilities," in *Proceedings of the Fifth Biennial Regulatory Information Conference -- Volume 2* (Columbus, Ohio: The National Regulatory Research Institute, 1986), 789-829.

mechanism is price caps having the purpose of providing the utility with increased pricing flexibility. Another mechanism involves tying rates of return to cost performance. Other mechanisms include cost-of-service indexing, the development of construction cost benchmarks or targets, and use of incentives for capital investment in demand management and conservation programs.

Various forms of cost inefficiency can be addressed by the aforementioned incentive mechanisms. However, other forms of inefficiency are not directly amenable to the various cited incentive mechanisms. For example, allocative efficiency caused by poorly designed rates and regulatory inefficiency caused by the failure of agencies to weigh the costs versus the benefits in allocating regulatory resources essentially remain outside the scope of the incentive mechanisms.

Summary

Incentive regulation is aimed at addressing the problem of the weak cost control incentives in traditional rate base/rate-of-return regulation.

Incentive regulation is aimed at addressing the problem of the weak cost control incentives in traditional RBROR regulation. Efforts to modify traditional regulation can be viewed as changing the form of regulatory control. The incentive mechanisms obviously can impact on rates, cost of service, operational efficiency, and quality of service. Each incentive mechanism has some potential for decreasing the resources required for RBROR regulation. However, the implementation and administration of each incentive mechanism does require some level of regulatory resources.

Incentive programs can be integrated with management audits.[11] For example, management audits can be the vehicle for recommending and implementing a specific incentive plan. Management audits can be employed to monitor the operation of an incentive program. In addition, management audits can be the mechanism for evaluating the effectiveness of an incentive plan and for deciding questions of continuance, modification, and termination. In brief, management audits are a device by which regulators can form a partnership with utility management.[12] In this partnership, the management audit can move beyond the traditional operating and financial parameters of the utility; that is, the management audit can assess trends in unit costs, trends in productivity, and the potential for cost savings (including regulatory savings) from improved operational efficiency.

Incentive programs can be integrated with management audits.

One issue involving incentive regulation and water utilities is paramount. Since water utilities are not confronted with the same competitive pressures that affect the telecommunications and energy sectors, an important issue is whether the incentive mechanisms implemented in these two sectors are transferable to the water utility sector. The answer is, “partly.”

The wide array of incentive mechanisms that are available and their applicability to the water utility sector are discussed in the chapters that follow. Chapter 2 identifies the incentive mechanisms that have potential applicability to water utilities. Chapter 3 assesses the applicability of each incentive mechanism to water utilities.

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[11] Ibid.

[12] Robert T. Glenn, "Improving Utility Regulation: A New Role for Management Audits," *Public Utilities Fortnightly* 115 (February 7, 1985): 34-36.

CHAPTER 2

TECHNIQUES FOR INCENTIVE REGULATION

Incentives in Traditional Rate Base Regulation

Traditional RBROR regulation is intended to recover prudently incurred costs and does contain some cost minimization incentives. However, these cost efficiency incentives can be flawed or ineffective in several ways.[1]

- Under regulation, the regulatory process forces the utility to submit rate filings that do not visibly contain inflated costs. The end result is a rate application that has the appearance of being reasonably cost efficient. Absent an audit or investigation, however, a commission can not tell if the submitted costs have been incurred in a cost-efficient manner.

- The time, or lag, between rate cases means that the utility can enhance its financial position and increase its rate of return by keeping operating costs as low as possible. The regulatory lag incentive can be weakened by automatic cost adjustment mechanisms.

- Allowing rate adjustments only when rates of return fall outside a zone of "reasonableness," means that the cost-efficient utility can be rewarded and that the inefficient utility can be penalized.

- Cost efficiency incentives under regulation will be less than the efficiency incentives possible in competitive markets.[2]

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[1] Mohammad Harunuzzaman, Kenneth W. Costello, Daniel J. Duann, and Sung-Bong Cho, *Incentive Regulation for Local Gas Distribution Companies under Changing Industry Structure* (Columbus, Ohio: The National Regulatory Research Institute, December 1991), 45-83.

[2] Alfred E. Kahn, *The Economics of Regulation: Principles and Institutions -- Volume 2* (Cambridge, Massachusetts: MIT Press, 1988), 47-94.

Financial Incentive Mechanisms

Most of the incentive mechanisms that have been implemented in other public utility sectors involve financial incentives. These techniques can be implemented independently or can be combined in various ways.[3] For example, price regulation can incorporate both price ceilings and profit sharing. Price caps could also incorporate cost indexing linked with productivity offset adjustments.

Most of the incentive mechanisms that have been implemented in other public utility sectors involve financial incentives.

Financial incentive techniques are all aimed at getting the utility to reduce costs. However, it is acknowledged that the incentive to reduce costs can produce the undesirable byproduct of a reduction in service quality.[4]

Some of the incentive mechanisms involve a form of performance assessment that incorporates penalties and rewards. Performance assessments generally measure utility performance in areas such as unit costs and productivity. A common assessment technique is the use of a control or index group of firms with similar operating characteristics. The use of an index group to assess utility performance is sometimes referred to as benchmarking or benchmark regulation.

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[3] Lorenzo Brown, Michael A. Einhorn, and Ingo Vogelsang, *Incentive Regulation: A Research Report* (Washington, D.C.: The Federal Energy Regulatory Commission, November 1989), 31-48.

[4] Raj Addepalli, "Service Quality Incentives for Electric Utilities in New York," in *Proceedings of the Ninth NARUC Biennial Regulatory Information Conference -- Volume 2* (Columbus, Ohio: The National Regulatory Research Institute, September 1994), 473-492.

Price Regulation

Incentive techniques can involve a social contract.[5] Social contracts between the utility and the regulatory agency have generally incorporated agreements to provide basic or core services (for example, residential service) at specified rates for a designated time period, in exchange for eliminating rate-of-return controls.[6] The primary intent of a social contract is to provide an incentive for the utility to decrease costs and improve operational efficiency.

The social contract, which has been applied in the telecommunications sector, has generally involved the substitution of price regulation for RBROR regulation. In many cases, the price regulation has incorporated rate indexing coupled with price ceilings or caps. For example, a utility may agree to limit rate hikes for a specified period to increases in a predetermined cost index. Thus, upper limits are placed on residential rates with the price caps being adjusted periodically upward for inflation. The result is the modification of traditional regulation. However, the utility is subject to regulatory monitoring during the contract period.

In addition to establishing price caps and allowing pricing flexibility, price regulation can take other forms.[7] One alternative is to establish a rate-of-return constraint while allowing the utility pricing flexibility in nonresidential markets. Another alternative is to establish a price band incorporating both price minimums and price maximums, and allowing pricing flexibility within that range. Price regulation via price caps is similar to price regulation via price bands.

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[5] Douglas N. Jones, *A Perspective on Social Contract and Telecommunications Regulation* (Columbus, Ohio: The National Regulatory Research Institute, June 1987).

[6] Kruger, *Report on Alternatives to Rate of Return Regulation*, Chapters 2 and 3.

[7] Bonbright, Danielsen, and Kamerschen, *Principles of Public Utility Rates*, 572-578.

The substitution of price regulation for RBROR regulation has several advantages.[8] First, there is the introduction of an incentive for cost efficiency. Price regulation, by severing the link between rate of return and cost of service, provides an incentive for the utility to reduce costs. For example, the utility can increase its rate of return by reducing its cost of operation.[9] Price regulation provides protection for captive consumers in exchange for allowing the utility pricing and rate-of-return flexibility. Some of the cost savings achieved under price regulation can be passed on to consumers in subsequent rate cases, and some can be retained by the utility.

Under price regulation, utilities may be more willing to modernize plant and provide new services since revenues are not restricted.

Second, price regulation is easier to administer than RBROR regulation. Its administrative simplicity provides a powerful advantage for price regulation. Third, under price regulation, utilities may be more willing to modernize plant and provide new services since revenues are not restricted. Finally, price regulation can reduce the cost of regulation by decreasing the administrative and compliance costs of regulation. For example, a system of price caps can reduce regulation costs by eliminating the need for cost-of-service and rate-of-return analyses.

According to Bonbright, Danielsen, and Kamerschen, price regulation (sometimes labeled price cap regulation) not only provides an incentive for cost efficiency but it also enhances capital attraction for the utility and is simpler for

[8] Burl W. Haar and Benjamin Omorgobe, "An Analysis of Regulatory Alternatives for the Telephone Industry, "in *Proceedings of the Sixth NARUC Biennial Regulatory Information Conference -- Volume 3* (Columbus, Ohio: The National Regulatory Research Institute, September 1988), 43-62.

[9] Richard Stannard and Eric A. Leighton, "A Social Compromise with Limits," *Public Utilities Fortnightly* 121 (May 12, 1988): 16-23.

consumers to understand than RBROR regulation.[10] Price regulation can be designed to facilitate innovative rate design with optional tariff schedules. Price regulation can be the vehicle by which a utility having excess capacity can competitively price its output from this capacity and market the surplus output in competitive wholesale markets. Price regulation can provide incentives for introducing new technology and new services. However, Bonbright, Danielsen, and Kamerschen view as highly debatable the notion that price regulation automatically results in lower regulatory costs.[11] Price regulation still requires some determination of revenue requirements, demand analyses, and regulatory monitoring. The substantial monitoring costs and the comprehensive analyses necessary to establish the initial price caps (and subsequently change the caps) may result in regulatory costs no less than that of RBROR regulation.

It is highly debatable that price regulation automatically results in lower regulatory costs.

There are several implementation problems associated with price regulation. The implementation problems are similar for both the case of rate caps and the case of price bands, in which rates have both lower and upper limits.[12] First, there is the problem of selecting the appropriate cost or price index. A choice must be made between, for example, either the Consumer Price Index (CPI), the Producer Price Index (PPI), or a specially constructed index of utility costs. The CPI is sensitive to many costs that are largely unrelated to utility services, such as medical costs; the PPI is less

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[10] Bonbright, Danielsen, and Kamerschen, *Principles of Public Utility Rates*, 572-578.

[11] Ibid.

[12] Charles S. Parsley, "Alternatives to Rate of Return Regulation of Local Exchange Carriers," *Proceedings of the Sixth NARUC Biennial Regulatory Information Conference -- Volume 3* (Columbus, Ohio: The National Regulatory Research Institute, September 1988), 99-139.

affected by consumer costs and has the advantage of permitting slower rate increases than will the CPI.[13]

The conceptual basis for rate indexing may also permit an increase in the price cap in response to changes in exogenous factors; that is, factors beyond the control of utility management. These exogenous factors include inflation, taxes, and environmental regulation. Obviously, a pure price index may not capture these types of external costs.[14] As a result, some indexing mechanisms may permit rate adjustments for factors not captured by a general price index.

The second implementation problem centers around the need for the initial rate base (either the cap or the band) to be cost-based. If the initial rate or price is too high, or too low, the price cap process will lock in this price as a "given." During the duration of a price cap plan--generally three to five years--the base price is not reexamined, so any economic distortions become magnified when the base price is multiplied by the index. Any indexing mechanism can "lock in" an inefficient and/or inequitable rate level and structure. In brief, price regulation may not be conducive to efficiency if the existing rate structure is inefficient.[15] Thus, prior to indexing, regulators and the utility must agree as to what constitutes a reasonable base rate level and base rate structure.

Any indexing mechanism can "lock in" an inefficient and/or inequitable rate level and structure.

A third implementation problem occurs when selecting the time period over which the agreement or contract is to be effective. To capture any benefits of price regulation, the contract period should probably be at least two years. The

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[13] Jones, *A Perspective on Social Contract and Telecommunications Regulation.*

[14] Stannard and Leighton, "A Social Compromise with Limits," 16-23.

[15] Harry M. Trebing, "Telecommunications Regulation: The Continuing Dilemma," *Public Utility Regulation*, eds. Kenneth Nowotny, David B. Smith, and Harry M. Trebing (Boston, Massachusetts: Kluwer Academic Publishers, 1989), 93-130.

determination of the contract period is critical since it may be necessary to terminate the agreement if the anticipated benefits are not realized. One option is to have a review (reopener) clause effective within a year of contract implementation. Jones argues that a reregulation clause should be incorporated in any contract arrangement.[16] A related issue is whether the regulatory commission should monitor rate of return during the contract period.

The fourth implementation problem is the concern that price regulation can provide an implicit incentive for the utility to reduce the quality of service provided to its customers. Because the main way a utility can prosper under price caps is to reduce its costs, the easiest way to do this is to reduce utility operating or capital expenditures. Price cap incentives, however, are intended to have the utility make efficiency-increasing investments which then allow it to have lower costs, not simply to lower costs by neglecting service responsibilities. The potential for this particular byproduct of price regulation necessitates regulatory monitoring of the rate arrangement.

Some price regulation plans include a component to reflect the productivity gains historically experienced by the utility sector.[17] The productivity offset has ranged from 2 to 7 percent and exerts a downward pressure on rates so to ensure that the ceiling price possible for ratepayers is less than purely inflation-determined price. A price cap mechanism may also include a consumer productivity factor (for example, 0.5 percent) to further ensure that ratepayers receive a guaranteed share of the cost savings anticipated from the implementation of price regulation. The issue here is whether the productivity offset is a sufficient economic stimulus to encourage a utility to make efficiency increasing investments and other cost lowering innovations.

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[16] Jones, *A Perspective on Social Contract and Telecommunications Regulation.*

[17] James E. Norris, "Price Caps: An Alternative Regulatory Framework for Telecommunications Carriers," *Public Utilities Fortnightly* 124 (January 8, 1990): 44-46.

A variation of price regulation involves the use of price bands. Under this mechanism, the utility has rate discretion within a specified range, without regulatory approval.[18] The upper price boundary, as with price caps, is generally perceived as necessary for protecting consumers from monopolistic pricing. The lower price limit is perceived as necessary for protecting competitive providers of the utility service. In essence, price bands provide rate flexibility in accordance with changing market conditions. One important issue is the appropriate width of the band; should, for example, price boundaries diverge 10 or 20 percent from existing rates? Another important issue is the development of criteria for adjusting the price bands in subsequent time periods.[19]

There are several other regulatory issues associated with price regulation. For example, if the utility has substantial excess capacity, the utility may view rate indexing more favorably than if the utility is operating at full capacity. Another issue is the development of a mechanism that assures that cost savings are at least partially passed onto consumers. The absence of an explicit mechanism can result in ratepayers not sharing in the cost savings. Unless a utility is faced with actual competition or believes that lower prices will stimulate demand, it is economically irrational to pass on cost savings absent a regulatory-enforced sharing mechanism. Another issue is the extent to which regulatory commissions should monitor operating costs and the extent to which commissions should apply prudency tests to capital investment. This information may not be needed during the duration of the price cap plan, but would be needed to adjust the base price in subsequent time periods.

It is uncertain how service quality and continuation of basic service can be assured in the context of price regulation. The quest for increasing economic efficiency

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[18] Tara Kalagher, "Alternatives to Rate of Return Regulation in Telecommunications," *Proceedings of the Sixth NARUC Biennial Regulatory Information Conference -- Volume 3* (Columbus, Ohio: The National Regulatory Research Institute, September 1988), 233-253.

[19] Parsley, "Alternatives to Rate of Return Regulation of Local Exchange Carriers," 99-139.

runs counter to the rate averaging notion that has historically supported universal service.[20] The potential for service quality reductions and a redefinition of service obligations clearly indicate that regulatory monitoring is an essential component of any price regulation plan.

The effectiveness of price regulation may hinge on the degree of potential competition that exists

In the final analysis, the effectiveness of price regulation, relative to traditional RBROR regulation, may hinge on the degree of potential competition that exists in the market for the specific utility service. Price regulation can provide some of the benefits of competition with some protection for consumers against the abuse of market power. That is, in the context of the disincentives for efficiency inherent in traditional regulation and the implementation problems associated with price regulation, the choice between traditional rate-setting and price regulation is a choice among imperfect alternatives.

Price regulation involves either price caps or price bands, generally indexed by a cost index and adjusted for productivity gains. The conceptual purpose of price regulation is to provide cost minimization incentives for utilities, with a possible savings in regulatory costs. The price caps or price bands provide an efficiency incentive as the utility retains a portion of the profits from lower costs, since its cap or band is based on an index not influenced by the costs of the utility.

Incentive Rates of Return

Under the incentive rate-of-return technique, the utility is permitted to earn a premium rate of return if the utility is found to be operationally efficient by a set of predetermined standards. Conversely, an inefficient utility is penalized by only being

[20] Haar and Omorgobe, "An Analysis of Regulatory Alternatives for the Telephone Industry," 43-62.

allowed a lower rate of return. For example, if unit costs are below some predefined standard, the permitted rate of return is set above the normal rate of return; if unit costs exceed the standard, the permitted rate of return is set below the normal rate of return. Thus, increased rates of return are used to reward the utility for being efficient while decreased rates of return are used to induce the utility to improve its efficiency.

In some rate-of-return incentive plans, a unit cost index is used as the basic standard of utility performance. This unit cost index may be based on the cost performance of a control group of similar utilities.[21] This is preferable to using the utility's own costs as the standard.

One variation of incentive rates of return incorporates lagged price adjustments. For example, if due to unit cost decreases, the rate of return exceeds a target rate of return, then prices are eventually decreased. Conversely, if due to unit cost increases, the rate of return falls below the target rate of return, until prices are eventually increased. The critical aspect of this variation is that price changes will be less than the unit cost changes, thus providing the utility with an implicit incentive for cost efficiency. In this variation, the utility and its ratepayers always share in the benefits of increased efficiency, and in bearing the costs of inefficiency.

Another incentive rate-of-return mechanism can involve the setting of a rate-of-return band.[22] In some cases, regulators set an upper return limit (for example, 14 percent) and a lower return limit (for example, 12 percent). The lower boundary is used in the determination of revenue requirements and thus establishes the permitted rate of return. The upper boundary establishes the maximum permitted rate of return; that is; the utility must refund earnings in excess of the upper limit. The utility can be mandated to decrease its rates so as to decrease its rate of return; conversely, the

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[21] Enver Masud, "Incentives for Efficiency through Regulation," *Public Utilities Fortnightly* 112 (October 13, 1983): 13-18.

[22] Parsley, "Alternatives to Rate of Return Regulation of Local Exchange Carriers," 99-139.

utility may be permitted to increase rates so as to increase its rate of return. Rates of return within the band are presumed to result from efficiency and are shared by both the utility and its ratepayers. Obviously, the critical determination of the sharing fraction will determine the magnitude of the efficiency incentives facing the utility.

A variation of the band approach that is more conducive to efficiency is to have the utility retain all profits for a performance within the rate-of-return band. This variation would involve a sharing arrangement for both rates of return exceeding the upper limit and rates of return less than the lower limit, for example, 80/20 percent.[23]

The profit sharing inherent in this incentive rate-of-return technique is a form of performance assessment. If the actual rate of return exceeds the target rate of return (or target band), the utility is allowed to retain some of that profit. Conversely, if the actual rate of return is less than the target rate of return (or target band), the utility is permitted to raise rates to recover some portion of the rate-of-return deficiency. A problem with profit sharing is that stockholders, and not management, receive the performance rewards (and bear the penalties). Thus, the linkage between rewards, penalties, and management performance can be relatively weak.[24] Some commissions have implemented rate-of-return reductions to encourage management to improve cost performance as well as to ensure service quality.[25]

If the actual rate of return exceeds the target rate of return, the utility is allowed to retain some of that profit.

Profit-sharing mechanisms involve price adjustments based on the difference between the achieved and allowed rate of return. The primary purpose of sharing

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[23] Harunuzzaman, et al., *Incentive Regulation for Local Gas Distribution Companies under Changing Industry Structure*, 45-83.

[24] Kruger, *Report on Alternatives to Rate of Return Regulation*, Chapters 2 and 3.

[25] Paul V. Nolan, "Incentive Rates of Return," *Public Utilities Fortnightly* 108 (July 30, 1981): 50-53.

plans is to have the utility and its ratepayers share both the rewards and the penalties from cost changes. The crucial selection of the sharing fraction should be guided by the capability of the utility to bear risk, the ability of the utility to forecast future supply and demand conditions, and the relationship between cost performance and managerial effort.

An alternative rate-of-return incentive technique focuses on consumer bills.[26] If bills decrease due to operational efficiency, the utility is rewarded with an increased rate of return. If bills change due to economic or weather conditions, the utility is neither rewarded nor penalized. This type of incentive return can employ average bills for a control group of utilities. The average bill of the target utility is then compared to the average bill for the benchmark group. A variation of this approach focuses on average price rather than average bills. The use of average residential bills may be more appropriate than the use of bills for other customer classes. For example, average bills for commercial and industrial users may have to be modified in recognition of the diversity of customers in these user classes.[27]

The merits of incentive rate-of-return plans are several.[28] The plans are relatively simple, the plans are compatible with traditional RBROR regulation, and the plans provide explicit cost efficiency incentives.

Implementation problems include establishing reasonable performance standards and the magnitude of rate-of-return rewards and penalties.

As noted above, however, there are some implementation problems. These include the problem of establishing reasonable performance

[26] David Moskovitz and Richard B. Parker, "How to Change Regulation to Reconcile the Private Interest with the Public Goals of Least-Cost Electric Planning," *Proceedings of the Sixth NARUC Biennial Regulatory Information Conference -- Volume 1*, (Columbus, Ohio: The National Regulatory Research Institute, September 1988), 37-51.

[27] Kruger, *Report on Alternatives to Rate of Return Regulation*, Chapters 2 and 3.

[28] Paul R. Joskow and Richard Schmalensee, "Incentive Regulation for Electric Utilities," *Yale Journal on Regulation* 4 (Fall 1986): 1-49.

standards and establishing the magnitude of rate-of-return rewards and penalties for deviations from these performance standards. For example, the target rate of return or the target return band must be determined. Second, there is the problem of the recognition of the cost influences that are beyond the control of utility management. Again, the utility should be rewarded and penalized only for cost outcomes within its control. The cost influences outside its control include changes in supply prices, changes in the regulatory environment, changes in inflation rates, and changes in local economic conditions. For example, in the incentive return technique that focuses on average bills, the appropriate average bill must be ascertained and it must be determined which elements of the average bill are within and which elements are beyond management control. If a control group of utilities is used as a benchmark, a key issue is the degree to which the control group is representative of the conditions faced by the utility.

Cost Indexing

An incentive technique that can be incorporated into both price regulation and incentive rates-of-return mechanisms is cost-of-service indexing. This incentive mechanism generally involves an indexing of rates in which base rates are increased automatically on the basis of a specific cost index, which may be based on a control group of similar utilities. In brief, the costs recovered in the rates charged to consumers are linked to changes in an external cost index.

This incentive technique is sometimes referred to as an automatic rate adjustment mechanism or ARAM.[29] When the cost index is based on a control group, cost indexing is a form of benchmark regulation; that is, an incentive technique in which

[29] Wilson, "The Role of Regulation in Increasing the Productivity of Utilities," 789-829.

the rewards and penalties are a function of the cost performance of the utility relative to that of a control group of similar utilities.

Cost indexing provides an efficiency incentive in the context of utility management attempting to have actual unit costs increase less than indexed costs. If the unit costs of the utility increase less than the indexed costs, the utility retains the cost savings. Conversely, if the unit costs of the utility increase more than the indexed costs, the utility absorbs the excess costs without cost recovery.

Cost indexing does involve some implementation problems. For example, the appropriate base rates must be determined. Similarly, the appropriate base costs (the target costs to be indexed) must be determined. Conceptually, the base costs should be only those costs within the control of management. Any cost indexing plan must distinguish between those cost changes that are within management control and those costs that are beyond management control. The former should be part of the indexed cost base; the latter should be separated out for eventual RBROR regulation adjustment. The specific interval of adjustment must be specified, such as three months, six months, one year, etc. If there is a sharing mechanism incorporated in the cost indexing approach, the sharing fraction must be ascertained as well as the time period over which the mechanism is to be operative.[30]

The cost index should have a statistically verifiable relationship to historical changes in long-term unit costs.

Most importantly, the appropriate index, by which to adjust the base rates, must be selected. Conceptually, the cost index should have a statistically verifiable relationship to historical changes in long-term unit costs for the utility service. As indicated above, one

[30] Harunuzzaman, et al., *Incentive Regulation for Local Gas Distribution Companies under Changing Industry Structure*, 45-83.

approach is to construct a cost index for comparable utilities within the region.[31] There are some difficulties associated with the control group approach. For example, the operational constraints on the index utilities may be substantially different from those constraints on the target utility. It simply may be difficult to identify many similar utilities for inclusion in the index group.

Finally, while cost indexing can provide a powerful incentive for efficient utility operation (similar to other incentive techniques), cost indexing can not ensure that the utility will operate efficiently. Utility management must be capable and willing to respond to the particular incentives.

An incentive technique which is compatible with cost indexing is the use of productivity measurements to induce cost efficiency.[32] The productivity mechanism can incorporate a pricing formula which allows the utility and its ratepayers to share in the efficiency benefits. Under the pricing formula, cost increases due to inflation and other factors beyond management control are passed automatically onto ratepayers.

Forecasted increases in productivity and forecasted increases in input prices are incorporated in the pricing formula since these targets are beyond the control of the utility. In contrast, actual input price increases and actual productivity increases can be influenced by the utility.

If the actual productivity performance of the utility exceeds the targeted rate, the utility experiences an increased rate of return. If the actual productivity performance of the utility is less than the targeted rate, the utility experiences a decreased rate of return. There is an explicit incentive for efficiency. The targeted productivity mechanism provides a reward for good performance and a penalty for bad performance. The target productivity technique is another form of benchmark incentive

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[31] Kruger, *Report on Alternatives to Rate of Return Regulation*, Chapters 2 and 3.

[32] William J. Baumol, "Productivity Incentive Clauses and Rate Adjustments for Inflation," *Public Utilities Fortnightly* 110 (July 22, 1982): 11-18.

regulation, particularly if the target productivity is based on the average productivity of a target or control group of similar utilities.

The targeted productivity technique does not automatically permit rate increases that fully recover increased costs, as cost adjustment clauses do. Instead, the mechanism provides the utility an opportunity to earn an adequate rate of return if its productivity increases at a reasonable rate and to earn a premium rate of return if its productivity increases at a rate in excess of the targeted rate. Conversely, the mechanism penalizes the utility if its productivity increases at a rate less than the targeted productivity rate.

There are several implementation problems associated with the targeted productivity technique. The most important problem concerns the validity of the mandated statistical measurement of utility productivity; namely, are the measures really comparable? Second, there is the critical determination of the targeted rate of productivity increase and the targeted rate of input price increase. As these are clearly judgement calls, there is room for error. Third, there is the problem of maintaining a specified level of service quality, particularly in the context of the incentive to increase productivity and reduce costs.

Under the Baumol plan, the sharing of productivity benefits is a result of forecasted input prices and productivity growth. For example, lower expected increases in input prices and higher expected productivity rates increase the share of benefits flowing to ratepayers. Conversely, higher expected increases in input prices and lower expected productivity rates increase the share of benefits flowing to the utility. Thus, it is obvious that the input price estimates and the productivity estimates must be carefully developed.[33]

Cost indexing permits the utility to pass on cost increases to ratepayers. Cost indexing can involve the costs of the utility or the costs of a control group. Cost

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[33] Kruger, *Report on Alternatives to Rate of Return Regulation*, Chapters 2 and 3.

indexing can allow either partial or full-price adjustment as a result of the identified cost changes. Cost indexing that relates to a control group of utilities provides more incentives than indexing related to utility own-costs. Most cost indexing plans allow for partial rather than full-cost adjustments and employ a sharing mechanism in which cost savings and cost overruns are shared by both the utility and its ratepayers.

Target Construction Costs

In the target construction cost technique, regulatory commissions establish a new capacity target cost that the utility is permitted to recover. Under this incentive mechanism, the utility is provided an incentive to consider alternative sources of supply, including both new facilities that they own as well as external facilities that they do not own. This incentive approach is sometimes referred to as a construction cost control incentive program or CCIP.[34]

If the utility is capable of developing a new supply source that is less costly than the target cost, then the utility is permitted to retain all or some portion of the cost savings, that is, the cost saving being the difference between the actual construction cost and the target construction cost. In this case, the incentive mechanism permits a rate increase in excess of the actual construction cost. Conversely, if the actual cost of the new capacity exceeds the target construction cost, the utility is forced to absorb all or a portion of the cost overrun. In this case, the incentive mechanism permits a rate increase that is less than the actual construction cost.

The approach encourages the utility to examine the capacity options of both owned and unowned facilities.

The merits and demerits of the target construction cost technique are similar to those of the incentive rate-of-

[34] Wilson, "The Role of Regulation in Increasing the Productivity of Utilities," 789-829.

return technique.[35] In fact, some target construction cost programs link rate of return on equity to the construction cost performance of the utility.[36] The construction cost incentive mechanism is relatively simple and provides an unambigious efficiency incentive. In addition, the approach encourages the utility to examine the capacity options of both owned and unowned facilities. For example, if a reasonable markup is permitted on wholesale purchases of the utility service, this incentive mechanism tends to eliminate the disincentive of a decreased rate base that is associated with reliance on external capacity.

The construction cost approach does have, similar to other incentive mechanisms, the problem of external cost influences, that is, those factors affecting construction costs that are beyond the control of utility management. For example, there are several sources of construction cost overruns.[37] Some factors such as project management are within management control. Other factors such as unanticipated rates of inflation are beyond management control. In addition, the technique focuses only on supply-side efficiency and does not recognize that demand-side management can be the least-cost method of meeting demand. Finally, regulatory monitoring is required to preclude management from inflating initial construction cost estimates. That is, the utility must be required to submit realistic construction cost estimates.

The target construction cost approach may incorporate a target cost range or "dead band." For example, if actual construction costs exceed the upper target cost limit, this results in a partial (for example, 50 percent) recovery of the costs exceeding the upper limit. Conversely, if actual construction costs are less than the lower target cost limit, this results in a partial (for example, 50 percent) savings to the utility, in that

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[35] Joskow and Schmalensee, "Incentive Regulation for Electric Utilities," 1-49.

[36] Wilson, "The Role of Regulation in Increasing the Productivity of Utilities," 789-829.

[37] Pollard, *Rate Incentive Provisions: A Framework for Analysis and a Survey of Activities*, 5-10. See also Henry T. Canaday, *Construction Cost Overruns in Electric Utilities: Some Trends and Implications* (Columbus, Ohio: The National Regulatory Research Institute, 1980).

rates will recover more than actual costs incurred. If the actual costs of construction are within the target cost range, the utility receives neither a reward nor bears a penalty.

The commission must determine the appropriate target cost range, in which there are no rewards or penalties.

In implementing the target construction cost approach, the regulatory commission must determine the appropriate target cost range, in which there are no rewards or penalties. That is, the commission must determine the cost variation above and below the target cost that constitutes a reasonable "band."

A related issue is the determination of the penalty/reward sharing fraction. For example, if actual construction costs exceed the upper cost boundary, it must be determined whether the utility recovers 50, 70, or 90 percent of the cost overrun. Conversely, if actual construction costs are less than the lower cost boundary, it must be determined whether the utility retains 50, 30, or 10 percent of the cost savings. The determination of the sharing fraction should be based on factors such as the extent to which specific cost variances are either within or beyond management control, the penalties and rewards needed to motivate efficiency, and the impact of non-cost recovery (as well as more than full-cost recovery) on utility earnings.

Demand Management Incentives

Incentive mechanisms can be employed to induce utilities to consider and possibly adopt demand-side solutions to capacity shortages. Regulatory agencies can ensure that the utility earn a rate of return on demand-side investment equal to that earned on supply-side investment. In addition, the regulatory agency can ensure that the utility and its ratepayers share in the savings from demand-side investment.

Historically, RBROR regulation has tended to provide an incentive for the utility to avoid demand-side and conservation investment. For example, capital investment in supply-side facilities has been generally easier to recover than capital investment in conservation programs. Even when demand-side investment has been more efficient than either producing or purchasing the incremental supplies, cost recovery has generally been easier for the supply-side investment.

The disadvantage of demand-side investment, in the context of traditional regulation, is relatively simple. The utility receives revenues for the delivery of services. An increasing amount of services delivered means increasing revenues. If consumers conserve, this translates into decreasing revenues. Therefore, under traditional RBROR regulation, there is a bias toward increased utility sales. Thus, the

utility does not have an incentive to incur conservation investment. Under this approach, if the utility installs conservation equipment on the premises of the ratepayer, it may be permitted to recover its capital investment and possibly may be permitted to earn a return on its investment. However, the real savings, the value of the usage conserved from the demand-side investment, accrues to ratepayers.[38] Although the utility, in certain cases, may be indifferent to supply-side versus demand-side investment, in reality, the utility will have a bias toward meeting expanding demand by increased delivery of services.

In brief, there exist disincentives for demand-side investment.[39] As indicated by Beecher, Mann, Hegazy, and Stanford, demand-side options can increase risks for the utility and threaten its profitability.[40] For example, demand management may decrease utility load factors and thus precipitate rate increases. Regulators may conclude that the demand-side investment was not prudently implemented, or is not "used and useful," and therefore is not accorded full-cost recovery.

Demand-side options can increase risks for the utility and threaten its profitability.

To offset the bias toward supply-side investment, several incentive techniques can be implemented to induce the utility to make demand-side investment.[41] One technique is the previously discussed ARAM. The ARAM, by ensuring that unexpected changes in sales volume do not affect utility earnings, would eliminate the disincentive

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

[39] Eric Hirst, "Regulatory Disincentives and DSM," *Public Utilities Fortnightly* 132 (July 1, 1994): 43-48.

[40] Janice A. Beecher, Patrick C. Mann, Youseff Hegazy, and John D. Stanford, *Revenue Effects of Water Conservation and Conservation Pricing: Issues and Practices* (Columbus, Ohio: The National Regulatory Research Institute, September 1994), 103-137.

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

of decreased earnings that is associated with lost sales from conservation and other demand management programs.

The ARAM approach, sometimes termed the “lost-base” revenue approach, is relatively straightforward. Lost revenue from demand management programs are recovered via a lost revenue adjustment.[42] An alternative, the decoupling approach, is somewhat different. The decoupling approach involves adjusting rates via periodic surcharges and rebates, on the basis of sales fluctuations from expected levels. The lost revenue approach is limited to the anticipated result of specific demand management programs. The decoupling approach generally applies to all changes in utility sales; that is, there is a decoupling of revenues and profits from its sales levels. Both approaches address the existing disincentives to demand management programs. However, decoupling eliminates the incentive for the utility to increase sales; the lost revenue adjustment does not.[43]

Another incentive mechanism is the regulatory allowance of both recovery of demand-side capital investment and a return on the invested capital. Many commissions permit the recovery of demand-side investment only as an operation expense.[44] Allowing a return on demand-side investment would provide equal treatment for demand-side and supply-side investment programs. Thus, the utility should be indifferent as to either type of investment.

Allowance of both recovery of demand-side capital investment and a return on the invested capital.

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[42] David Moskovitz, Cheryl Harrington, and Tom Austin, "Decoupling Versus Lost Revenues: Regulatory Considerations," *Proceedings of the Eighth NARUC Biennial Regulatory Information Conference -- Volume 1* (Columbus, Ohio: The National Regulatory Research Institute, September 1992), 245-254.

[43] Ibid.

[44] Wiel, "Making Electric Efficiency Profitable," 9-16.

Another mechanism for inducing demand-side investment is shared savings.[45] This mechanism allocates predefined portions of the savings in overall system costs from demand-side activities to both ratepayers and shareholders. To implement the shared savings approach, information on the avoided costs from conservation programs is needed. The merits of the shared savings approach are that it is performance-based (the technique rewards utility performance in accomplishing demand-side objectives), and it appears to be accepted by both ratepayers and utility managements. Its limitations include that it can be difficult to administer due to the complex calculation of avoided costs and the crucial determination of the sharing allocation.

A related incentive technique is unit bonuses.[46] With this technique, the utility receives a payment for each unit (for example, cubic foot of water) of verified conservation achieved; this payment takes the form of a specified increase in allowed revenues for demand management programs. The payment would include program cost recovery. This incentive mechanism is clearly performance-based and is linked to the magnitude of demand-side savings. Its advantages are that it is relatively easy to implement and monitor, as well as relatively easy for the ratepayer to understand. A limitation is that it may induce utilities to implement measures that yield short-term savings (thus creating short-term bonuses) rather than engage in long-term demand-side management programs.

Other incentive mechanisms for demand-side investment include premium rates of return on demand-side investment and utility rewards (for example, rate-of-return adjustments) for controlling utility bills via demand management.

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[45] Beecher, Mann, Hegazy, and Stanford, *Revenue Effects of Water Conservation and Conservation Pricing: Issues and Practices*, 103-137.

[46] Ibid.

The implementation of demand management and conservation incentives can serve as an alternative to the construction of new capacity.

The implementation of demand management and conservation incentives can serve as an alternative to the construction of new capacity increments, or at a minimum, delay the construction of the capacity increments. These techniques could also be used to induce water utilities to develop new services--such as automatic meter reading capability and maintenance of fire protection systems--that could be marketed to other utilities or firms.

Administrative Incentive Mechanisms

The incentive mechanisms that can be labeled as managerial or administrative are relatively few in number. One managerial technique is direct management rewards.[47] This modification of unit bonuses provides a reward to utility management rather than to shareholders. An underlying premise of this incentive technique is that utility management has an important role in least-cost planning. Management bonuses could be an effective method of encouraging management to implement demand-side programs at a cost consistent with least-cost planning.

Bonuses paid for achieving specified demand management goals would be included in the revenue requirements of the utility.

The philosophy underlying bonuses is that shareholders are not the direct cause of the efficiency (or inefficiency), rather it is management that is responsible for operational efficiency and least-cost planning. A merit of this approach is that rewarding managers for assisting in the achievement of specified conservation goals may be less expensive

[47] Ibid.

than rewarding all shareholders via other mechanisms (for example, premium rates of return) that affect overall utility profitability. The bonuses paid for achieving specified demand management goals would be included in the revenue requirements of the utility.

A variation of the bonus approach is sometimes labeled as rate control incentive programs, or RCIP. The RCIP can involve reward payments to key utility managers.[48] Managers receive a bonus payment if the cost performance of the utility is better than the cost performance of a control group of similar utilities. Again, in all of the incentive mechanisms involving managerial rewards (or penalties), the key element is to ensure that the efficiency (or inefficiency) is due to managerial performance and not due to exogenous factors beyond the control of management.

Another administrative incentive technique is the safe-harbor approach to utility regulation.[49] With this approach, if rates and other operating variables stay within certain parameters, the utility is permitted to operate independent of direct commission regulation. There is an incentive for the utility to keep costs and rates from exceeding the defined upper boundaries for these parameters. The safe-harbor approach uses triggering mechanisms by which certain regulatory processes are either terminated or implemented. For example, regulation can be triggered if rates, rates of return, and customer complaints exceed specified limits.

The difference between the price regulation and the safe-harbor approach is that with the latter, the price bands apply to all customers, rather than only to residential customers. A problem with the safe-harbor approach is when regulation is reimplemented, some utility problems may be more difficult to resolve. The safe-harbor approach can be employed in conjunction with cost indexing. For example, the rate

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[48] Wilson, "The Role of Regulation in Increasing the Productivity of Utilities," 789-829.

[49] Janice A. Beecher and Patrick C. Mann, *Deregulation and Regulatory Alternatives for Water Utilities* (Columbus, Ohio: The National Regulatory Research Institute, February 1990), 91-92.

parameters can be tied to a particular cost index; the rate-of-return parameters can be tied to a interest rate on a particular U.S. Treasury security.

Summary

In the above discussion of incentive techniques, several common themes emerge regarding the alternative mechanisms. The first is that the performance measure should be sufficiently comprehensive so that the utility has minimal potential for influencing the performance measure. Second, the incentive mechanism should focus on the aspects of utility operation in which management can exercise influence and minimize the impact of external factors that affect utility performance. Third, the performance measure should be implemented over a sufficiently long time period so to ensure that tradeoffs do not affect short-term cost efficiency, long-term quality of service, and cost performance.

Fourth, the incentive mechanism should be symmetric; that is, rewards for superior performance should be approximately equal to penalties for poor performance.

Finally, the incentive mechanism should be result oriented and should be continuously monitored, evaluated, and modified to allow for changing utility behavior and changing economic conditions.

Go to Chapter 2

CHAPTER 3

TRANSFERABILITY OF INCENTIVE MECHANISMS TO THE WATER SECTOR

The financial pressures on water utilities have increased over the past decade. This increase in financial constraints is due to a combination of the capital intensive nature of the public water sector and the factors of compliance with the amended Safe Drinking Water Act, the need to replace aging distribution system infrastructure, and the need to meet growing customer demands. The increasing financial pressures mandate regulatory change. One form of regulatory change is incentive regulation.

Given the prior discussion of the incentive techniques that have either been proposed and/or implemented in the energy and telecommunications sectors, a key issue is the transferability of these incentive techniques to the public water sector.

There are several issues that are germane to incentive regulation and its applicability to the water industry. Investor-owned water utilities are not generally confronted with the same competitive pressures that characterize the telecommunications and energy sectors. Competitive pressures facing water utilities are in some cases limited to the threat of self-supply by large industrial users. However, some water utilities are involved in competition for customers in new service areas. This rather limited competition raises the legitimate issue of whether the incentive programs in the more competitive utility sectors are appropriate for the water sector.

Competitive pressures facing water utilities are in some cases limited to the threat of self-supply by large industrial users.

One can offer several arguments as to why these established incentive techniques are indeed appropriate for water utilities. First, there are some parallels in operating conditions between the water sector and other utility sectors. Second, many incentive regulation techniques are aimed at eliminating the disincentives of RBROR regulation and are not necessarily aimed at assisting the utility in surviving in competitive markets. For example, price cap regulation, which has evolved most extensively in telecommunications, has a primary emphasis on efficiency incentives and only a secondary emphasis on assisting the telecommunications firms in providing a service mix under varying degrees of competition.

There is the issue of whether the incentive regulation techniques will actually decrease the cost of regulation. For example, Bhattacharya and Laughhunn conclude that the substitution of price regulation for traditional regulation only changes the nature of regulatory focus and may not decrease the cost of regulatory monitoring.[1] For example, with the substitution of price regulation for RBROR regulation, there will be decreased resources devoted to the determination of rate of return, the valuation of rate base, and the inclusion/exclusion of specific operating costs from revenue requirements. At the same time, there will be increased resources devoted to selecting the appropriate cost index, the appropriate productivity increase offset, determining the applicability of price caps to the various services, and determining the composition of the index group of utilities.

Price regulation may not decrease the cost of regulatory monitoring.

[1] Sushil K. Bhattacharya and Dan L. Laughhunn, "Price Cap Regulation: Can We Learn from the British Experience?" *Public Utilities Fortnightly* 120 (October 15, 1987): 22-29.

Implementation Issues

As indicated by Smith and Dickter, the implementation of incentive regulation requires the resolution of several problems.[2] One is the construction of quantitative standards of performance. The design of performance standards can be complex and may require extensive engineering analyses. In brief, efficient incentive regulation requires the establishment of performance targets. The emphasis should be on what utility performance is desirable and not on historical utility performance. The dimension of utility operations requiring examination must be determined; for example, unit costs for a specific function, unit costs for a special service, total operating costs, etc. The selected performance dimension must then be measured. Finally, the performance must be evaluated, either relative to some absolute standard or relative to the performance of a control group.

The design of incentives should be an area in which regulators and utilities engage in cooperative behavior.

Another problem area is the construction of the incentives to induce the utility to attain the performance targets. That is, a system of rewards and penalties must be established. The design of efficient and equitable incentives (and disincentives) should be an area in which regulators and utilities engage in cooperative behavior, such behavior incorporating both judgment and flexibility. This problem area involves the issue of whether a system of rewards (without penalties) or a system of penalties (without rewards) can be effective in inducing efficiency and improved management performance. For example, some commissions have adopted the approach of levying penalties to eliminate inefficient utility operation, such as

[2] Morton J. Smith and William Dickter, "Living with Standards of Performance Programs," *Public Utilities Fortnightly* 114 (August 16, 1984): 26-30.

reduction in rate of return, denial of recovery of prudently incurred costs, denial of rate increases, and the assessment of revenue penalties.[3]

A third problem area is the development of a flexible implementation process for the incentive mechanism. The utility must be allowed flexibility in making adjustments to affect long-term performance without being penalized for short-term performance. The need for flexibility can require the setting of bands (performance ranges in which there is neither a penalty nor a reward) around each performance target.

Criteria for Effective Incentive Regulation

Each incentive technique should be examined in the context of standard regulatory practice and conventional utility operating procedure. A key issue is whether the incentive technique can improve the cost performance of the utility, or more specifically, the issue is whether the incentive technique can improve the cost efficiency of water utilities under commission jurisdiction. As Goins indicated, the answer to this question is related to the answers to a set of questions:

1. Toward which dimension of water utility operations should the incentive technique be oriented?

2. How should the performance of the selected operational dimension be measured?

3. Should the performance of the water utility be evaluated against a control group of utilities?

4. In what form should the water utility receive the rewards and penalties associated with its performance?

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[3] Inez M. Massella, "Penalizing Utility Management," *Public Utilities Fortnightly* 111 (February 17, 1983): 65-68.

5. What is the magnitude of rewards and penalties required to induce improved performance?[4]

Obviously, these questions do not represent a complete set of relevant questions, however, the questions do provide a starting point in the process of constructing and implementing an incentive technique appropriate for regulated water utilities.

In the selection process, several criteria can be offered for selecting among alternative incentive mechanisms.[5] These selection criteria include:

1. The magnitude of potential efficiency gains: the incentive technique should eliminate the disincentives that presently exist in utility rate regulation.

2. The administrative costs of implementation: the benefits of the technique should exceed the costs of implementation.

3. The potential for inducing decreases in service quality: the technique should have minimal potential for undesirable consequences.

4. The acceptability by the utility, ratepayers and regulators: the utility and its ratepayers should be given clear signals as to how utility performance will be evaluated and how rewards/penalties will be distributed.

The incentive technique should provide clear signals to utility managers to improve operating efficiency, avoid penalizing and rewarding for performance outcomes beyond the control of utility management, and have an equitable distribution of the benefits and costs from utility performance changes. In more pragmatic terms, the incentive technique should motivate the utility to conduct activities which are in its best interest

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[4] Dennis Goins, "Can Incentive Regulation Improve Utility Performance?," *Public Utilities Fortnightly* 115 (January 10, 1985): 20-23.

[5] Pollard, *Rate Incentive Provisions: A Framework for Analysis and a Survey of Activities*, 55-66; and Anand Desai and Min-Bong You, "Incentive Regulation and Measurement of Performance," *Proceedings of the Sixth NARUC Biennial Regulatory Information Conference -- Volume 3* (Columbus, Ohio: The National Regulatory Research Institute, September 1988), 155-181.

(but which are difficult to facilitate), and assist regulators in achieving regulatory objectives. The incentive technique should be relatively easy to understand, should not incorporate complex adjustment formulae, and should be reliable in achieving cost efficiency.

An effective incentive plan should provide a framework that promotes efficiency via the decisions of utility management. That is, utility management must have clear and direct financial incentives to improve performance. The incentive plan should generate signals to management to operate efficiently in both the short term and the long term, but should not emphasize short-term results at the sacrifice of long-term results. The data required to evaluate utility performance should be relatively free from manipulation, and the performance targets, rewards, and penalties should be clearly specified. Finally, as Pollard asserts, the incentive program should be oriented toward results, for example, the application of the incentive technique should produce cost savings such that future rate hikes under the incentive plan are less than what would have been required under regulation.[6]

An effective incentive plan should provide a framework that promotes efficiency via the decisions of utility management.

In the context of the acceptability criteria, it is instructive to examine why some incentive plans have been abandoned.[7] Factors causing the termination of incentive plans include (1) public opposition to rewarding utilities for performance they should have achieved absent a reward, and (2) adverse reaction by ratepayers and regulators to utility earnings in excess of that traditionally allowed under RBROR regulation.

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[6] Pollard, *Rate Incentive Provisions: A Framework for Analysis and a Survey of Activities*, 55-66.

[7] David E.M. Sappington and Dennis L. Weismann, "Designing Superior Incentive Regulation," *Public Utilities Fortnightly* 132 (February 15, 1994: 12-15 and March 1, 1994): 27-32.

Applicability of Incentive Techniques to Water Utilities

The critical issue is whether incentive regulation can improve the operating efficiency of water utilities by eliminating the disincentives inherent in traditional regulation. The singular issue is whether the incentive techniques implemented in other utility sectors can improve the operating performance of water utilities under commission jurisdiction.

The five incentive techniques discussed in Chapter 3 are evaluated. Each of these techniques (price regulation, incentive rates of return, cost indexing, construction cost targets, and demand management incentives) are here evaluated by a set of five criteria, largely adopted from Pollard.[8] Each of the five techniques has its strengths and limitations in achieving regulatory goals. Thus, each technique can possibly be viewed as one component in an overall incentive regulation plan.[9]

Four of the evaluation criteria reflect necessary but not sufficient conditions for acceptability. In applying Criterion One, the incentive approach should be assessed according to the criteria of potential efficiency gains. This criterion involves reliability in achieving cost efficiency as well as avoidance of rewards and penalties for performance results beyond the control of management. Criterion Two says that the incentive technique should also be evaluated by the criteria of administrative costs. This criterion involves avoidance of complex formulae as well as providing clear signals to utility management to operate efficiently in both the short term and the long term.

The incentive approach should be assessed according to the criteria of potential efficiency gains.

[8] Pollard, *Rate Incentive Provisions: A Framework for Analysis and a Survey of Activities*, 55-66.

[9] Harunuzzaman, et al., *Incentive Regulation for Local Gas Distribution Companies under Changing Industry Structure*, 83-92.

Criterion Three states that the incentive technique should be assessed as to minimizing the potential for declines in quality of service. This criterion involves regulatory safeguards required to ensure the maintenance of service quality.

Fourth, the incentive technique should be evaluated by the criteria of ratepayer, utility, and commission acceptance. This involves ease of understanding, clearly defined performance targets, and the anticipated result of rate increases less than what would occur under traditional RBROR regulation.

The final criterion expresses a necessary and sufficient condition for acceptability. The incentive technique must be ultimately evaluated by the criterion of transferability to the regulation of water utilities. This criterion involves the question of whether there are any operating, financial, or institutional characteristics of water utilities that would preclude the incentive technique from being effective in the water sector.

In the context of these five evaluation criteria, price regulation has the greatest potential for reducing regulatory costs but may suffer from acceptability problems both in terms of the absence of competitive markets in the water sector and the regulatory monitoring required to prevent declines in quality of service. Incentive rates of return, cost indexing, and target construction costs do not necessarily reduce regulatory costs. They require regulatory surveillance to insure satisfactory service quality, but do not have major obstacles to their acceptability. These four techniques are comparable given the criteria of potential cost efficiency benefits. Demand management incentives have the greatest potential for cost efficiency benefits, but may meet regulatory resistance. Overall, there appear to be no operating and financial characteristics of water utilities that would preclude the application of any of the five incentive techniques to the regulation of water utilities.

Price Regulation

There are several implementation problems associated with price regulation. These include the selection of an appropriate adjustment index, the determination of either the base rates or the base rate band, and the potential for a decline in quality of service. Another obstacle is the perception of some (including regulators) that competitive markets are a necessary prerequisite to price regulation. In the mixed market context, price caps are applied to captive markets (for example, residential and small business services) while the utility is provided pricing discretion in actual or potentially competitive markets or in deregulated markets. However, there seems to be no obvious reason why the efficiency incentives inherent in price regulation would not be operable if price caps (or price bands) were applied to all services except large user and wholesale transactions.

In sum, price regulation provides the potential for improved cost efficiency and does not involve overly burdensome implementation costs. Regulatory monitoring is required for maintaining quality of service.

Price regulation provides the potential for improved cost efficiency and does not involve overly burdensome implementation costs.

Incentive Rates of Return

Incentive rates of return do have some implementation problems. These include the determination of the target rate of return (or target band); the determination of the sharing fraction (that is, the formula for sharing the benefits of efficiency and the costs of inefficiency); the selection of either unit costs, average consumer bills, or average price as the performance standard; the selection of a control group of utilities; and the

determination of the magnitude of the rate-of-return rewards and penalties necessary for inducing efficiency.

Incentive rates of return can provide the potential for an improvement in cost efficiency. However, the technique may not produce lower regulatory costs. Similar to price regulation, regulatory monitoring is necessary for ensuring the maintenance of a satisfactory level of service quality. In general, incentive rates of return do not appear to have the acceptability problems associated with price regulation.

Cost Indexing

Cost indexing does have some implementation problems. These include the determination of the base level (or base rate band) of rates, the determination of base costs, the separation of costs into those within and those beyond management control, and the selection of the appropriate cost index. The latter may mandate the development of a control group of utilities.

Cost indexing provides the potential for cost efficiency improvements.

Cost indexing provides the potential for cost efficiency improvements. Similar to other incentive techniques, regulatory monitoring is necessary to insure the continuance of satisfactory service quality. Cost indexing does not appear to have substantial acceptability problems, particularly if the indexing is based on a control group of utilities.

Target Construction Costs

The problems associated with the implementation of the target construction technique are several. These include the determination of the target cost (or target cost band), the identification of the costs linked to capacity construction efficiency and

within management control, the determination of the savings retention fraction when actual costs are below target costs (and the cost recovery fraction when actual costs exceed target costs), the choice of whether construction cost performance should be linked to rate of return or to rates, and the specification of the options to be considered by management (for example, wholesale purchases, leasing of capacity).

The target construction approach appears to have few acceptability problems.

Similar to other incentive techniques, the target construction cost technique does provide incentives for cost efficiency and also requires regulatory monitoring. The target construction approach appears to have few acceptability problems except with reliance on unowned capacity to provide service.

Demand Management Incentives

The technical problems associated with the implementation of demand management incentives include the selection of the reward mechanism (that is, increased rate of return on equity versus management bonuses) and the specification of the sharing fraction regarding the savings from demand-side programs. The biggest obstacle in the past to the adoption of demand-side incentives has been regulatory inertia in providing equal treatment for demand-side and supply-side investment. At a minimum, both cost recovery of and return on conservation investment are needed.

The demand management incentive technique provides the potential for cost efficiency, but unlike other incentive techniques, it does not require extensive additional regulatory monitoring to insure an acceptable level of service quality. As noted above, the technique does have an acceptability problem in the context that, historically, regulators have been reluctant to provide equal treatment for demand-side and supply-side investment.

Demand management incentives may provide the greatest benefit relative to cost of any of the incentive techniques.

Given the increasing emphasis on water conservation in various parts of the United States, demand management incentives may provide the greatest benefit relative to cost of any of the incentive techniques reviewed here. The incentive mechanism can incorporate a lost revenue adjustment (for example, revenue stabilization accounts), the decoupling of revenues from sales volume, shared-saving programs, a premium rate of return on conservation investment, cost performance incentives, and cost recovery either via rate base inclusion or as an operating expense.[10]

Summary

It may be instructive to revisit the advantages, the disadvantages, and some special considerations in the application of incentive techniques to water utilities.[11] Incentive techniques can be used for a wide range of purposes including cost control and demand-side management. Water utilities can be rewarded for efficiency and innovation in operations and penalized for inefficiency. Incentive techniques allow water utilities to respond to market forces while shifting some risks to utility managers and stockholders. Finally, in some cases there is the potential for a reduction in regulatory costs.

Incentive techniques do have some limitations. Incentive techniques require regulators to give up some regulatory oversight. Substantial uncertainty can be introduced for both the water utility and its customers. The implementation of incentive

[10] Amy Vickers and Edward J. Markus, "Creating Economic Incentives for Conservation," *Journal American Water Works Association* 84 (October 1992): 42-45.

[11] Beecher, Mann, and Stanford, *Meeting Water Utility Revenue Requirements: Financing and Rate Making Alternatives*, 142-146.

techniques can be complex and thus may increase regulatory costs. Finally, utilities can earn excessive profits and thus customers may perceive that the water utility is not being regulated.

Incentive regulation may be inappropriate for small water systems due to their financial viability problems.

Some special considerations regarding the application of incentive techniques to water utilities need to be examined. Incentive regulation may be inappropriate for small water systems due to their financial viability problems and the corresponding need for continuous regulatory oversight. Experience with incentive techniques in other utility sectors is not totally transferable due to differences across the utility sectors such as differences in competitive opportunities. Regulators need to educate themselves as to the performance incentives that have the greatest potential for being effective in the water sector.

There are several factors that can ensure the successful transfer of the various incentive techniques to the water utility sector.[12] One is where ratepayer education is mandated to promote both ratepayer understanding and ratepayer support for the regulatory implementation of the incentive techniques. A second is where ratepayers have a substantial and clear stake in the superior cost performance of the water utility. The third factor occurs when ratepayers support the incentive plan because of its perceived fairness. The perception of unfairness can be mitigated by devices such as symmetrical sharing fractions and the use of control groups as performance benchmarks. Finally, the incentive plan should be as comprehensive as possible, so that there is minimal latitude for conflicting interpretations as to the operation of the incentive plan.

[12] Sappington and Weismann, "Designing Superior Incentive Regulation," 27-32.

The challenge for regulators is to identify the incentive techniques that are both appropriate and that will be effective in promoting efficiency in water utility operations. Determining the causality between water utility performance and incentives is difficult.[13] Even if causality is clearly established, there remains the issue of the appropriate levels of rewards and penalties. Under-rewarding and under-penalizing can undermine regulatory efficiency objectives. Over-rewarding and over-penalizing can translate into both excessive and deficient profits. Poorly designed incentives can produce undesirable effects such as the deterioration in quality of service. Poorly designed incentives also can conflict with the used-and-useful standard as well as the prudent investment standard. Finally, some incentive techniques may simply reward the water utility for what the firm should be doing without any incentives, that is, operating in the public interest.

Determining the causality between water utility performance and incentives is difficult.

As eloquently stated by Joskow and Schmalensee, incentive regulation will not dramatically improve the cost performance of utilities, however the careful design and well-planned application of incentive techniques to water utilities can generate some noticeable improvement in operating efficiency.[14]

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[13] Beecher, Mann, Hegazy, and Stanford, *Revenue Effects of Water Conservation and Conservation Pricing: Issues and Practices*, 103-142.

[14] Joskow and Schmalensee, "Incentive Regulation for Electric Utilities," 1-49.

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