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A REVIEW OF FERC'S TECHNICAL REPORTS ON INCENTIVE REGULATION

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EXECUTIVE SUMMARY

In late 1989 two reports on incentive regulation were prepared by the Federal Energy Regulatory Commission (FERC). Prepared under the auspices of the Office of Economic Policy, one report supports giving natural gas pipelines more flexibility in pricing their services and in levels of profitability, while the other supports the same approach for natural gas pipelines and wholesale electric suppliers. Thus far, FERC has used the reports for discussion purposes only and is not expected to rely on them in the foreseeable future to initiate a notice of proposed rulemaking or in any other formal way.

The significance of the reports lies in their thorough and analytical overview of different incentive systems. Such incentive systems likely will be proposed before state public utility commissions over the next several years. Assessing the merits of different proposals will be a challenge for state commissions. The FERC reports help to crystalize the major issues, thereby facilitating states' efforts to determine the acceptability of proposed incentive systems. Thus, a review of the two FERC reports for state commissions seems warranted.

The incentive systems discussed in the FERC reports are transferable to retail markets falling under the jurisdiction of state commissions, and can be applied at the state level either in part or in whole. In various ways state commissions have undertaken efforts that coincide with those in the FERC reports. Most state commissions already have allowed energy utilities to engage in limited flexible pricing and have taken a more proactive posture in overseeing firms' operational and investment decisions. Although these efforts arguably fall outside the rubric of incentive regulation, they attempt to achieve the same objectives as those promoted in the FERC reports.

The FERC reports can be criticized for misrepresenting traditional rate-of-return regulation. They slight the fact that regulation at both the state and federal level has changed its demeanor during the last several years. These changes call into question the benefits that would be attained from the proposals. Whether states should hasten liberalizing pricing rules and adopting broad-based incentive systems remains an open question. Disagreements over the sizes, and even the sources, of inefficiencies in the electric and natural gas industries complicate what course of action regulators should take.

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FOREWORD

Currently one of the most widely discussed topics in the public utility field is incentive regulation. The idea takes many forms and has a variety of advocates. Among the more recent reports on the subject are two prepared under the auspices of the Office of Economic Policy at the Federal Energy Regulatory Commission. Last year the Board of Directors of NRRI included in our research and assistance agenda the task of technically reviewing those reports. This publication is the result. Fulfilling a major purpose of the Institute, our report is designed to add to the discussion and debate of yet another important regulatory concept.

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CHAPTER 1

INTRODUCTION

Two recent reports prepared for the Federal Energy Regulatory Commission (FERC) fall into the category of reform measures designed to mitigate the alleged major shortcomings of traditional regulation. Specifically, they put forth recommendations called "incentive regulation."[1] Incentive regulation can be defined as a form of regulation that gives firms more incentives than what they have under rate-of-return regulation to make decisions and undertake actions that are consonant with promoting economic efficiency.[2] In recent times, incentive regulation has encompassed efforts on the part of regulators to motivate firms in a way that induces their management to operate systems and plan investments more efficiently, and to price services closer to marginal cost.

Proposals put forth by analysts and others to integrate incentives with regulatory actions have fallen short of achieving optimality. One reason stems from the theoretical problem of designing an incentive system before it is actually used that maximizes economic welfare over a multiperiod horizon.[3] Strategic

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1 Lorenzo Brown, Michael A. Einhorn, and Ingo Vogelsang, *Incentive Regulation: A Research Report*, prepared for the Office of Economic Policy, Federal Energy Regulatory Commission, 89-3 (Washington, D.C.: Federal Energy Regulatory Commission, November 1989); and Federal Energy Regulatory Commission, *Incentive Regulation for Natural Gas Pipelines: A Specific Proposal with Options* (Washington, D.C.: Federal Energy Regulatory Commission, September 1989).

The first study is referred to hereafter as the "Research Report" (149 pages), and the second study as the "Gas Incentives Report" (35 pages). Chapter 2 contains a description of the proposed incentive systems. Thus far, FERC has used the reports for discussion only and is not expected to use them to initiate a notice of proposed rulemaking.

2 Economic efficiency is made up of three components: cost, pricing, and trading. Cost efficiency requires that a firm provide the public with reliable services at the lowest attainable resource cost. Pricing efficiency requires that services are sold to consumers at the firm's marginal cost (assuming no externalities). Trading efficiency occurs whenever a regulated firm imports a service (e.g., economy energy) that costs less to produce than if the firm produced the service itself.

3 Economic welfare refers to the collective economic interests of firms and their customers.

behavior by firms, lack of information by regulators, and changing cost and demand conditions make it difficult for regulators to design an optimal incentive system. Another reason centers around the pressures on regulators to thwart the workings of an incentive system when unexpected or undesirable outcomes transpire (for example, the firm earning "excess" profits or incurring "severe" losses).

Any reform proposal changing the nature and operation of traditional rate-of-return regulation should first identify shortcomings of the status quo. Next, it should exhibit advantages and how, on net, the public interest would benefit. This task is made difficult by uncertainties, especially over how firms would respond to changed incentives. While it is safe to say that the firm will act in its best interest--which means maximizing its profits--it becomes fuzzier to infer the likely economic effect on consumers.[4] In the jargon of economists, incentive systems may not be "incentive compatible" in the sense that what is best for the firm is necessarily best for consumers. In theory, this outcome would most likely occur in competitive or contestable markets.

The big question for state regulators revolves around the implications the proposals have for themselves and their principals, retail customers. Specifically, what are the significant and relevant components of the proposals for state regulation? One part of the answer is related to the effect of the proposals, if they were to be adopted by the FERC, on the economic welfare of retail customers; the other part turns on whether, and to what extent, the proposed incentive system should be integrated by the states into their existing regulatory practices.

The FERC studies in general criticize rate-of-return regulation as a social institution for promoting the public interest.[5] Although the reports are directed at FERC regulations, their proposals to reform regulation reflect a sharp denunciation of traditional state regulation of public utilities. The FERC authors imply that

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4 For example, an inflexible incentive system may increase costs for a firm undergoing changing demand and cost conditions; an incentive system also may induce a firm to take actions (e.g., lowering costs by providing less reliable service) compatible with increasing profits that jeopardize the welfare of its consumers.

5 Similarly, a study by the National Telecommunication and Information Administration in 1986 pointed out that the inefficiencies of rate-of-return regulation for the telecommunications industry may warrant another regulatory mechanism (*Federal Register*, Vol. 51, No. 200 [October 16, 1986], 36839).

traditional regulation represents an anachronism, unable to cope with current conditions in the electric and natural gas industries. These conditions exhibit growing competition and changing market structure within these two industries.[6] The FERC studies might better have included, at least for discussion, deregulation and other proposals for improving efficiency in certain electricity-natural gas markets. They incompletely described the recent actions of state commissions responding to the rapid, and sometimes fundamental, changes taking place in the electric and natural gas industries.[7] Instead, they proposed and examined proposals without considering alternatives with potentially greater promise and they failed to recognize that state commissions have not remained static by continuing with their old ways of regulating. The FERC reports seem to exploit rate-of-return regulation as a "straw man" in part to rationalize their incentives proposals; consequently, the proposals' alleged benefits probably are overstated.

The FERC reports could have reviewed proposals to deregulate specific components of the wholesale markets for electricity and natural gas. One candidate for such treatment is merchant services provided by natural gas pipelines. Some experts believe that most pipelines operate in workably competitive markets where many potential sellers and buyers exist for the merchant services they try to sell.[8] As long as the pipelines provide access to transmission, they must compete with other entities, including producers, marketers, and adjacent pipelines in selling natural gas. Examining the conditions for workable competition, in addition to relaxed or no regulatory intervention, would have contributed to the FERC reports.[9]

If natural gas commodity markets were found workably competitive in the FERC reports, the authors could have concentrated on alternatives for improving

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6 For example, recent technological and economic events favor smaller-scale power plants, which allow electric utilities more flexibility and thereby reduce the risks of unexpected outcomes such as lower-than-expected demand and construction-cost overruns. The trend toward smaller-scale power plants with shorter lead times reflects a rational response to current realities.

7 Some of these actions are discussed in Douglas N. Jones, "What's Right with Utility Regulation," *Public Utilities Fortnightly* (March 6, 1986): 18-20.

8 For example, see Dan Alger and Michael Toman, "Market-Based Regulation of Natural Gas Pipelines," *Journal of Regulatory Economics* 2 (September 1990): 263-80.

9 FERC currently is exploring these issues as well as others in its notice of proposed rulemaking on gas pipeline service obligations and comparability.

efficiencies within the transportation component of pipeline operations. For example, the reports could have examined reselling capacity rights to pipelines and expediting regulatory requirements for new pipelines and pipeline capacity. The FERC reports could have made a more explicit distinction between the merchant and transportation functions of pipelines; the two markets deviate substantially in the degree of competition that now exists and for the foreseeable future.

Deregulating pipelines' merchant services potentially has advantages over the proposals in the FERC reports, assuming of course, that these services are transacted in workably competitive markets: prices would adjust more quickly to changing market conditions, pipelines would have more flexibility to respond to changing market conditions (for example, by offering new and different services without any regulatory interference), and the administrative cost of regulation would fall toward zero.

The proposal in the Research Report to reform regulation of the wholesale electricity market also fails to consider other institutional arrangements for improving efficiency. Certain producers--for example utility unaffiliated independent power producers--may be good candidates for deregulation. Changing property rights for ownership and control of transmission systems has the potential to enhance substantially efficiency in the wholesale electricity market. Although these alternatives, as well as those identified above, may fall outside the rubric of incentive regulation, they cannot be ignored if FERC hopes to assess systematically the function of incentive regulation in an environment where the proper role of regulation can change radically. At best, the incentive programs could act as a transitional regulatory mechanism for industries undergoing fundamental changes toward more competition.

The rationale for incentive regulation is premised on the existence of shortcomings in the current regulatory environment. Identifying sources of the shortcomings and their effects on consumers is briefly discussed in chapter 2. A review of the features of rate-of-return regulation outlines areas where inefficiencies are alleged to arise. The incentive systems proposed in the two FERC studies concentrate on eliminating the major inefficiencies in the electricity and natural gas wholesale markets.

Chapter 3 presents the major components of the incentive system proposed in the FERC reports. Most important, the proposals would give electric utilities and natural gas pipelines more flexibility in pricing individual and overall services, in

the process allowing them to profit more from innovative and cost-efficient actions and to compete more aggressively with other firms. The proposals offer surer benefits for firms than for their customers. The proposals in the FERC reports, as well as many others in recent years (including price caps), more clearly advance the interests of firms and their shareholders than the interests of consumers. By relaxing regulation in the areas proposed in the FERC reports, the firms, rather than their customers, are the likely beneficiaries. Chapter 4 explains why this outcome is plausible.

A wide array of options exists for improving the economic performance of regulated industries. Incentive systems, such as those proposed in the FERC reports, represent only one of several ways to change the inner workings and to attain the goals of regulation. Deregulating pipeline merchant services, opening access to electric transmission lines, and furthering competitive bidding for new electric generating capacity constitute only a few of many institutional arrangements capable of improving economic efficiency. Chapter 5 identifies additional options for improving a firm's performance. The performance of natural gas pipelines, for example, potentially may improve the most by FERC deregulating merchant services and, at the same time, allowing pricing flexibility of transportation services; as another example, open access to electric transmission systems may offer more potential for improving economic performance of the electric industry than any or all of the incentive proposals contained in the FERC reports. By comparing the outcomes of traditional rate-of-return regulation with alternative incentive systems, the FERC reports ignore the potential desirability of other institutional arrangements, and thereby weaken the arguments for their proposals. These arrangements, in some cases, may hold more promise for advancing economic efficiency than any set of regulatory incentive systems.

Chapter 6 assesses the benefits of price caps. Although the FERC studies reject a pure price-cap system, their proposals have similar characteristics. The chapter warns that the widely held perceptions of rate-of-return regulation and price caps may distort differences between the two approaches in terms of their actual effects on economic efficiency.

CHAPTER 2

CONVENTIONAL CRITICISMS OF CONVENTIONAL RATE-OF-RETURN REGULATION

Critics have lambasted rate-of-return regulation as an anachronism that should be replaced either with deregulation or, at a minimum, relaxed regulation.[1] They advocate changes to the status quo for various reasons, pointing to the inherent inefficiencies of rate-of-return regulation, and the movement toward competition in certain markets where a business-as-usual posture becomes obsolete. The spirit of the FERC reports is that "something is broken"--namely rate-of-return regulation giving firms inadequate flexibility to promote efficient pricing, operation, and planning--but that some form of regulation is still warranted. The reports point to the increased inefficiencies that are likely to occur when rate-of-return regulation coexists with markets where competition is a growing force and natural monopoly conditions are diminishing.

Rate-of-return regulation is said to have several salient properties including prices derived from embedded (historical) costs, a de facto monopoly franchise granted to a local firm, quasi-cost-plus incentives provided to firms, price rigidity, guarantees of a reasonable rate of return on past investments, shifting market and technological risks to consumers, and high administrative and rent-seeking costs especially in times of inflation.[2] The public-interest view of regulation presumes that consumers and other members of society as a whole are better off economically when entry into a firm's markets is restricted and price ceilings are placed where the minimum efficient size of firms precludes competitive conditions.

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1 See, for example, Dan Alger and Michael Toman, "Market-Based Regulation of Natural Gas Pipelines," *Journal of Regulatory Economics* 2 (September 1990): 263-80; Vernon L. Smith, "Currents of Competition in Electricity Markets," *Regulation* 11 No. 2 (1987): 23-29; and Federal Energy Regulatory Commission, "Regulating Independent Power Producers," prepared by the Office of Economic Policy, October 13, 1987.

2 Administrative and rent-seeking costs refer to the costs incurred by the various participants in regulatory proceedings. Most participants attempt to present evidence that supports the interests of their constituents. Their activities are, therefore, aimed at transferring wealth from other members of society to their respective constituents.

According to many economists, rate-of-return regulation breeds different inefficiencies. One source cited is the unwritten social contract between firms and their regulators--often referred to as an implicit contract--whereby in return for the assurance of recovering reasonable and prudent costs, of earning a sufficient rate of return to attract new capital, and of maintaining a de facto exclusive franchise, the firm is obligated to provide highly reliable service at a reasonable price. The possible adverse effects linked to the social contract include: 1) shifting practically all of the risks of market conditions and operating and planning decisions to consumers, 2) blunting incentives for cost control and innovations by firms, and 3) preventing retail customers from buying lower-priced services from nonlocal firms and other suppliers.[3] The social contract has had different interpretations.[4] One that seems the most valid is that the contract is designed to prevent regulated firms from earning high profits when times are good, and from enduring financial distress when times are bad.

Another possible source of inefficiency associated with rate-of-return regulation stems from what is called the Averch-Johnson effect, whereby firms, under certain conditions, acquire excessive capital relative to other inputs used in the production of regulated services.[5] Some analysts contend that since the late 1970s a "reverse" Averch-Johnson effect has befallen the electric industry: firms are investing inadequately in new capital, or in an extreme case, are pursuing a capital-minimization strategy that is economically inefficient.[6]

Some economists point to a number of major deficiencies of rate-of-return regulation:

1) productive inefficiencies (for example, inflated prices for inputs, trading and input distortions),

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3 See Michael W. McConnell, "Public Utilities' Private Rights: Paying for Failed Nuclear Power Projects," *Regulation* 12 No. 2 (1988): 35-43.

4 See Douglas N. Jones, *A Perspective on Social Contract and Telecommunications Regulation* (Columbus, OH: The National Regulatory Research Institute, 1987).

5 It should be acknowledged that not all economists share this view.

6 For example, see Peter Navarro, *The Dimming of America* (Cambridge, MA: Ballinger Publishing Company, 1985). The book represents an attack on the efforts of state regulators in the 1980s to hold down electricity prices. Navarro argues that regulators should have granted electric utilities higher rate increases in the face of inflationary conditions and utilities' building of new, high-cost power plants that earlier received regulatory approval.

2) pricing inefficiencies (for example, pricing insensitive to market and reliability conditions),
3) cross-subsidies and less pronounced forms of price discrimination,
4) nonoptimal industry structure (for example, too many small firms operating within a specified geographical area),
5) distorted risk allocation between firms and their customers, and
6) high administrative and rent-seeking costs.

Whether these costs actually exist and are sizeable enough to validate reform measures, such as incentive systems or a different institutional arrangement, constitutes the fundamental question that the authors of the FERC reports faced. While rate-of-return regulation has its own problems, so do all other proposals for change. As shown later, the proposed incentive systems in the FERC reports are not immune to deficiencies. Deregulation or relaxed regulation also are susceptible to problems. For example, "too little" regulation in certain markets may result in producers with market power charging excessive prices and making exorbitant profits, engaging in cross-subsidies and other forms of socially undesirable price discrimination, and blocking low-cost producers from competing.

Contrary to the beliefs of critics of rate-of-return regulation, regulators are responsive to the effect their actions have on economic inefficiencies. According to the "economic theory of regulation" efficiency losses mean regulators have less of a chance of appeasing different interest groups; that is, inefficiencies reduce the maximum benefits that regulators can bestow on consumer and producers collectively, thereby heightening tension among interest groups.[7] Since 1973, for example, when external shocks afflicted the electric industry, state public utility commissions have applied new tools and procedures to minimize both conflict among different interest groups and political resistance. For example, PUCs

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7 Supporters of the economic theory of regulation contend that regulators place primary importance on distributing wealth among different interest groups, and secondary importance on creating wealth. Yet, creating wealth (i.e., improving economic efficiency) allows regulators to distribute more wealth to interest groups. The economic theory of regulation differs from the public-interest view in that it does not presume that regulators are driven by the desire to maximize the well-being of society. Instead, it presumes that the interests of regulators on occasion may diverge from those of the public. See, for example, Gary S. Becker, "A Theory of Competition Among Pressure Groups for Political Influence," *Quarterly Journal of Economics* 96 (August 1983): 371-400; and Sam Peltzman, "Toward a More General Theory of Regulation," *Journal of Law and Economics* 19 (August 1976): 211-40.

increasingly espoused such practices as fuel adjustment clauses, incentive regulation, the use of a future test year, and phase-ins of new generating facilities in response to inflationary conditions, and, arguably, to minimize efficiency losses.[8] As another example, state PUCs and the FERC both have allowed firms limited pricing flexibility, particularly for services sold in more competitive markets.[9] One reason may stem from inefficiencies of rigid pricing that can increase dramatically when the firm has to compete with others.

In summary, critics of rate-of-return regulation point to its inefficiencies, which are based more on theory than on empirical evidence. In an environment where the status quo expands these inefficiencies, regulators would try to control them, if only because inefficiencies reduce the wealth that they can redistribute to firms and consumers collectively. What this implies is that regulators would employ incentive systems as long as they do not violate "fairness" standards and economic efficiency is likely to improve. FERC and state regulators basically have done this, as will be discussed shortly.[10]

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8 The original article on this description of the regulatory process is Paul L. Joskow, "Inflation and Environmental Concern: Structural Change in the Process of Public Utility Price Regulation," *Journal of Law and Economics* 17 (October 1974): 291-327.

9 For example, FERC now allows in most circumstances coordination services to be priced on the basis of a negotiated agreement between buyer and seller. A common pricing rule for coordination services ("split-the-savings") divides equally the total economic gains from a transaction between buyer and seller.

10 One example is the wide acceptance of incentive rates by state regulators. These rates are designed either to stimulate electricity sales or prevent loss of sales to bypass technologies (e.g., cogeneration). Their appeal stems from their positive benefits to recipient customers, nonrecipient customers, and utility shareholders. (See Kenneth W. Costello, "Incentive Rates or Market Rates: A Rose by Any Other Name?" *Electricity Journal* 2 No. 1 (August/September 1989): 42-51.

CHAPTER 3

PROPOSED INCENTIVE SYSTEM

The two FERC reports include similar proposals for incentive regulation. The report *Incentive Regulation for Natural Gas Pipelines: A Specific Proposal with Options* ("Gas Incentives Report") contains an automatic rate adjustment mechanism along with optional pricing to be applied by natural gas pipelines. The other report, *Incentive Regulation: A Research Report* ("Research Report"), also contains an automatic rate adjustment mechanism (although of somewhat different form) and optional pricing, and in addition includes a mechanism for future rate proceedings that allocates a portion of past profits both to the firm and its customers. (The Gas Incentives Report includes only a brief discussion of how rates should be determined in future rate proceedings.) The Research Report also discusses an incentive system (Reichelstein's incentive mechanism) to determine the amount of actual construction costs that a firm can place in its rate base (see figure 3-1). The incentive system proposed in the Research Report would apply to both the natural gas and electric industries.

Features

Table 3-1 lists the major parts of the incentive system proposed in the two reports. Each includes optional pricing, where a natural gas pipeline or an electricity wholesaler may offer a customer any rate, without FERC approval, as long as the firm also offers the customer a tariff based on traditional costing principles (such as fully distributed costs). According to the authors, option pricing would eliminate uneconomic bypass and drive rates closer to marginal cost in markets where the firm faces competition.[1] Besides being economically efficient,

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1 "Uneconomic bypass" occurs whenever a customer chooses another supplier that has higher costs. When a regulated firm is allowed to price its services as low as marginal costs, uneconomic bypass is unlikely to happen. Regulators, as well as certain consumer groups, generally oppose bypass activity whether it is economic or not. Under rate-of-return regulation, bypass would tend to increase rates for remaining customers. The fact that these customers may be worse off points to an obvious perversity of rate-of-return regulation: the firm is allowed to raise prices

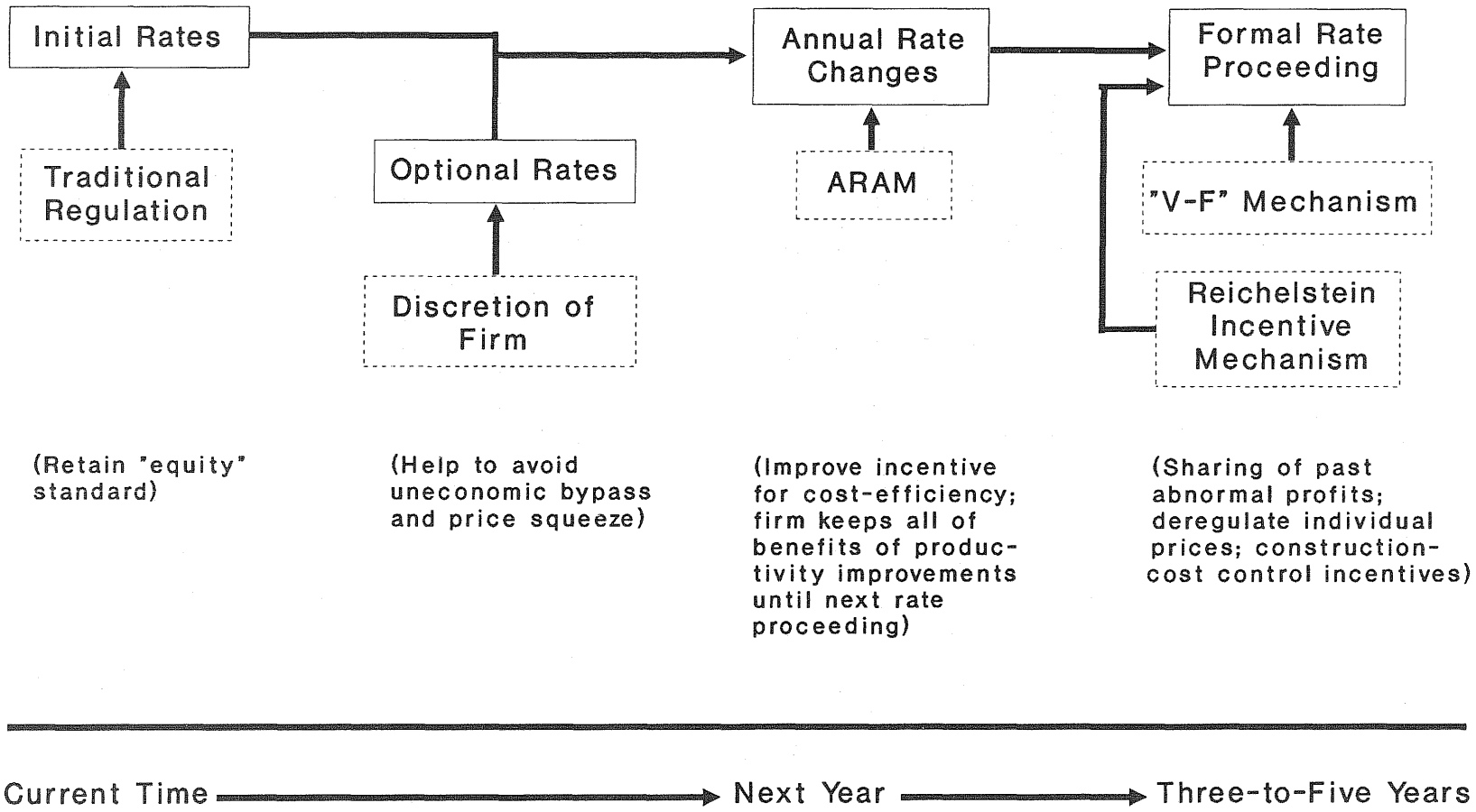

Fig. 3-1. The proposed integrated incentive system (Research Report)

TABLE 3-1

FEATURES OF INCENTIVE-REGULATION PROPOSALS IN FERC REPORTS

Gas Incentives Report*	Research Report**
• Automatic rate adjustment (share of targeted productivity gain kept by firm)	• Automatic rate adjustment (no productivity offset)
• Optional pricing	• Optional pricing
• Rate reviews with sharing of past profits	• Rate review with sharing of past profits
	• Cost-sharing incentive mechanism for large capital investments

* Federal Energy Regulatory Commission, *Incentive Regulation for Natural Gas Pipelines: A Specific Proposal with Options*, 89-1 (Washington, D.C.: Federal Energy Regulatory Commission, September 1989).

** Lorenzo Brown, Michael A. Einhorn, and Ingo Vogelsang, *Incentive Regulation: A Research Report*, 89-3 (Washington, D.C.: Federal Energy Regulatory Commission, November 1989).

the authors argue that optional pricing would maintain the equity standards that FERC has long adhered to, since all customers would have the choice either of a rate founded on traditional "equity" standards or a lower rate offered by a natural gas pipeline or electricity wholesaler.

The two reports propose different automatic rate adjustment mechanisms (ARAM) to adjust rates between rate cases. Generically, an ARAM lets a firm adjust its rates periodically--usually yearly--without a formal regulatory proceeding

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(Footnote continued from p.11)

when sales decline or when it unsuccessfully competes in the market place. These outcomes are contrary to what would be expected in a smoothly functioning unregulated market.

on the basis of prespecified indices. Possible indices include those that reflect the actual total cost of a firm, the cost of an industry group, and the expected productivity of a group of firms within the same industry. The applicable cost may be the firm's total costs or the costs for a particular component of the firm (for example, fuel costs). Fuel adjustment clauses, for example, represent a type of ARAM where an electric utility passes through actual increases in fuel costs to its customers.

The ARAMs proposed in the two FERC reports cover a firm's total costs, with the exception of major new capital adjustments (which the firm would recover in a formal rate proceeding), and use a comprehensive adjustment index for a firm's actual costs. In the Gas Incentives Report a natural gas pipeline would be allowed to change automatically its rates by the difference between an inflation index (for example, Consumer Price Index, Producer Price Index) minus a FERC-specified share of the targeted productivity adjustment. As an illustration, assume that the Producer Price Index increased by 5 percent between 1991 and 1992, the targeted productivity index by 3 percent, with FERC determining that 50 percent of the benefits from productivity growth are shared, at the time of the annual adjustment, between the pipeline and its customers. In this example, the pipeline between 1991 and 1992 would be able to increase its rates on average by 3.5 percent [5 - (.5)3] without a formal rate request.

The Research Report includes no productivity offset in its prepared ARAM, so the benefits from productivity gains in the example, which lowered the firm's average cost by 3 percent, would go entirely to the firm, at least until the next rate proceeding.[2] The authors of the Research Report assert that attempting to set an appropriate productivity target would be plagued with difficulties. For example, should the target be based on a firm's past productivity gains, the industry's past productivity gains, or productivity gains for the economy as a whole? In addition, calculating a productivity index would raise arguments over what data should be used, what economic model is most correct in measuring

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2 This is in contrast to price caps adopted for the telecommunications industry at both the state and federal levels, where a productivity target is specified in determining allowable price changes.

productivity, and other issues.[3] Deleting the productivity component in adjusting rates would, therefore, reduce the administrative costs of regulation.[4]

The Research Report contains a more detailed discussion on how rates should be adjusted during a future regulatory review. Specifically, it recommends a mechanism that distributes a specified proportion of profits in excess of normal levels earned by a firm for a prior period(s) to ratepayers in the next period.[5] The mechanism is labelled by economists the "Vogelsang and Finsinger" system, or, more simply, the V-F system. The mechanism in its pure form imposes no limits on individual prices; rather it constrains the total revenues that a firm can earn to a previous period's total costs (that is, historical costs). In other words, the firm's aggregate price reflects its average cost in the previous period.

Under a pure V-F system, above-normal profits earned in a prior period are distributed to ratepayers in the next period (unlike the mechanism in the Research Report where a FERC-determined portion would be retained by the firm);[6] prices are supposed to converge ultimately to economically efficient levels--namely, Ramsey prices. As discussed later, a V-F system reflects a special case of a sliding-scale incentive plan where consumers receive all the benefits and bear all the risks from outcomes unexpected at the time of rate adjustment.

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3 For a summary of the difficulties of using total factor productivity to determine rates, see Paul L. Joskow and Richard Schmalensee, "Incentive Regulation for Electric Utilities," *Yale Journal on Regulation* 4 No. 1 (Fall 1986): 31-32.

4 Deletion also can be more justifiable if the industry is undergoing minimal productivity growth and if there exists a special reason to maximize a firm's incentive during the initial years of ARAM. As a tradeoff, the actual (ex post) gains from productivity improvements can be distributed sooner to consumers by way of a formal rate review.

5 "Normal profits" can be defined as profits needed by a firm to attract new financial capital; normal profits correspond to a firm earning a rate of return on investments equal to its cost of capital.

6 To put it differently, the V-F system sets rates for a current period on the basis of the firm's average cost for a prior period. As an illustration, assume that in 1990 a firm's revenues were $100 million, the quantity of electricity sold was 1 billion kilowatt hours (kWhs), and revenue requirements were $90 million. Under the V-F system the price this period would be set at 9 cents per kWh ($90 million/1 billion kWhs), which is the firm's average cost in the prior period. Assuming a stationary world with no change in demand or costs, the firm would be expected to earn only its revenue requirements this period ($90 million). In effect, the $10 million ($100 million - $90 million) of above-normal profits earned last period are shifted to ratepayers this period in the form of lower prices.

The V-F system has been criticized for providing firms with an incentive to engage in strategic behavior, resulting in waste in the form of avoidable costs and a delay in the convergence of individual prices to economically efficient levels.[7] Also, as discussed later, core customers, with little or no alternatives to switch to other suppliers, would suffer higher prices under a pure V-F system.[8]

Finally, the Research Report includes an incentive component to minimize costs for large new capital projects. As pointed out by the authors, capital projects pose four major problems for regulators from the planning to the rate-treatment stages. First, the firm may have an incentive to file with regulators a biased estimate of the actual cost for a proposed capital project. For example, the firm may prefer building a certain type of power plant, which it can only justify to its state commission if cost estimates lie below the "best guess" level. Second, the firm has more and better information than the regulator on whether it has made a reasonable effort to minimize its construction costs, as well as to select the most cost-efficient facility at the planning stage. Third, the firm itself may have highly unreliable information on the final construction cost of the facility; thus, even when the firm provides regulators with an honest assessment of costs it may be "waving at the wind" given the technological complexities of large-scale capital projects and uncertainties over future inflationary and financial market conditions. So at the planning stage both the regulator and the firm may have little confidence that the chosen project will turn out to be the best. Finally, the firm may lack the incentive to minimize the cost of building a new facility, as well as selecting (*ex ante*) the least-cost one. Regulation, at least until recently, as a general rule allowed firms to burden ratepayers with the risks associated with bad planning and

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7 "Waste" means that the firm could deliver the same amount and quality of service at less cost than actually incurred. The "waste" effect of the V-F system was recognized first by David Sappington, "Strategic Behavior Under a Dynamic Regulatory Adjustment Process," *Bell Journal of Economics* 11 No. 1 (Spring 1980): 360-72.

8 This outcome is similar to that under Ramsey pricing, where the firm would earn higher profit margins on serving so-called core customers, while responding more aggressively to competition in other markets. It should be noted that core customers likely will decline over time as more customers have opportunities to purchase utility-type services from other suppliers. For example, small commercial customers increasingly have purchased natural gas from brokers and independent marketers.

construction oversight; it is not surprising then why regulated firms frequently experience large cost overruns for new capital projects.

Suggested Benefits and Comments

The proposed incentive systems aim to improve the economic performance of natural gas pipelines and electric utilities (see table 3-2). The reports contain much discussion on the importance of retaining the equity standards that regulators currently apply.[9] Further, they discuss in detail why the proposed incentive system (with the exception of incentives for large capital projects) would impose minimal informational requirements on regulators.[10]

The reports, perhaps more successfully than anything else, show how incentive systems developed and rationalized in the economic literature can be applied to the "real world." The authors attempt to integrate the new wave of literature on incentive regulation with industries undergoing fundamental changes. The Research Report in particular differs from many earlier approaches to apply incentive regulation at both the state and federal level, which relied less on formal theory and more on practicality and ad hoc judgment.[11] Unlike pricing rules such as Ramsey pricing, rules for optimal incentive systems apparently are either nonexistent, or at best, less precise. At best, the theoretical literature can compare one type of incentive system with others under different market and technological

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9 Especially from the perspective of state regulators, the equity factor recognizes that so long as no group, class of customer, or the firm is worse off political opposition would vanish, or at least subside.

10 The incentive proposal for capital projects (the Reichelstein system) requires regulators to estimate the effect of random events on actual construction costs. Imprecise estimates would result in an incentive system that may depart from optimality. Since each project is unique, estimation would not improve over time. The prospects for precise estimates thus are dim, especially for projects where actual costs are driven by events beyond the firm's control. In addition, the incentive system requires information that the firm can bias when presenting to the regulator.

11 See, for example, Leland L. Johnson, *Incentives to Improve Electric Utility Performance: Opportunities and Problems*, Rand Report R-3245-RC (Santa Monica, CA: The Rand Corporation, March 1985); and Resource Consulting Group, *Incentive Regulation in the Electric Utility Industry*, prepared for the Federal Energy Regulatory Commission (Washington, D.C.: Federal Energy Regulatory Commission, September 1983).

TABLE 3-2

SUGGESTED BENEFITS OF
INCENTIVE-REGULATION PROPOSALS

Type of Benefit	Source
· Eliminate or reduce uneconomic bypass and price squeeze	· Prices closer to marginal costs, especially to price-sensitive customers (optional pricing)
· Increase incentive to control operating costs	· Price changes not linked to cost changes for individual firms; firm keeps permanent share of past cost savings (ARAM, modified V-F mechanism)
· Recognize fairness concerns	· Customers have choice of selecting initial rate based on fully distributed cost or "discount" rate (optional pricing)
· Lower administrative costs	· Less formal rate proceedings (ARAM)
· Improve pricing efficiency	· Firm has discretion to deviate from embedded-cost pricing and incentive toward efficient pricing (optional pricing)
· Reduce construction costs for large new investments	· Risk-sharing of cost overruns (Reichelstein mechanism)

conditions. For example, with high degrees of demand and technological uncertainties, a cost-plus incentive system would tend to be more optimal.[12]

The proposals, unlike other incentive systems considered in earlier years or adopted by regulators, stress both pricing and cost efficiencies. Applied incentive regulation in the electric industry, at the state level, has focused on motivating utility management to lower operating costs for a particular component of an electric power system. For example, incentive systems for improving power plant performance currently are operating in several states.[13] Their goal is to reduce fuel costs, especially for a utility with base-load generating facilities that operate at low cost. Most state incentive systems, in fact, use either plant capacity factor, plant availability, heat rate, or fuel costs as the performance indicator.

The recent interest in embodying pricing efficiency into incentive regulation (referred to here as the "present-day incentive regulation") arises from increased competition in utility services. The inefficiencies from faulty pricing are potentially much greater when bypass and other symptoms of competitive markets are present. Absent competition, inefficient prices resulting in services to be produced by higher-cost suppliers are nonexistent. Although traditional embedded-cost pricing in monopoly markets produces some inefficiencies, the size of these inefficiencies could be substantially less than if the services of the regulated entity were sold in competitive or quasicompetitive markets.[14]

The Research Report's proposal allowing a firm wide latitude to set individual prices is designed to produce pricing efficiency without requiring regulators to acquire hard to obtain information or specify precisely their goals. Ramsey pricing, for example, requires measuring price elasticities of demand and marginal costs by class of customer or service. Inefficient pricing results from poor information available to both regulators and firms on the correct level of prices, from a primary

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12 The literature supports the general rule that optimal incentive systems, under most circumstances, would involve risk sharing between a firm's shareholders and consumers (for example, see Jean-Jacques Laffont and Jean Tirole, "Using Cost Observations to Regulate Firms," *Journal of Political Economy* 94 No. 1 (1986): 614-41).

13 See Joskow and Schmalensee, "Incentive Regulation for Electric Utilities," 1-49.

14 See Kenneth W. Costello and Ross C. Hemphill, "Competitive Pricing in the Electric Industry," *Resources and Energy* 12 (April 1990): 54-55.

objective of regulation to set rates compatible with unannounced "equity" standards, or from using other criteria that relegates economic efficiency to a secondary importance. Consequently, efforts by regulators to determine efficient prices either would be unattainable, because of informational problems, or lacking in commitment, because of other regulatory goals. An alternative approach, supported in the FERC reports, is to provide a firm with incentives so that their efforts to price efficiently are compatible with their pursuit of making profits.

The proposal for optional pricing would allow firms to deviate from embedded cost pricing. Especially in an environment where firms face competition, the flexibility of varying prices on the basis of market conditions has the potential to produce large efficiency gains. As discussed in the reports, optional pricing can mitigate the condition where consumers purchase their utility energy services from suppliers with higher costs. For a firm threatened with bypass by large industrial or wholesale requirements customers, pricing flexibility becomes crucial for deterring customers from turning to higher-cost suppliers or technologies; society benefits and the regulated firm recovers more of its fixed costs than under embedded-cost pricing.

The authors of the Research Report view optional pricing as preferable to Ramsey pricing, or one of its variants, in maintaining sustainability in a competitive environment. Otherwise, applying a strict pricing rule based on consumers' varying price elasticities of demand can result in a firm losing customers to suppliers with higher costs--that is, the prices of the firm are unsustainable.[15] To put it differently, a firm may apply Ramsey pricing and experience uneconomic bypass. This is because the pricing rule as originally developed assumes monopoly markets and, therefore, does not account for the possibility of uneconomic bypass. Optional pricing on the other hand, permits the regulated firm to offer prices as low as marginal costs to individual customers when required by market conditions. For example, firms would be allowed to negotiate contracts tailored to the individual needs of customers.

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15 This applies even to a firm possessing the necessary characteristics for a natural monopoly. The implication is that competitive entry may prevent society from receiving the benefits of a natural monopoly. Optimal regulatory policy may, therefore, call for blocking entrants from competing with the incumbent utility. Such a policy sustains the status quo, as well as the firm's prices.

The Research Report proposes a ratemaking mechanism that deregulates prices for individual services after the next rate review, subject to an aggregate revenue constraint determined by the Vogelsang-Finsinger mechanism. The proposed mechanism is similar to price-cap regulation where all services are placed in one basket. Pricing efficiency is achieved by a convergence to Ramsey pricing over a multiperiod time horizon.[16] To repeat, the environment where some services operate in competitive, or quasicompetitive markets, pricing flexibility would prevent unsustainable prices. As another benefit espoused by the authors, the V-F mechanism would not require regulators to allocate costs to individual services or classes of customers, or to measure marginal cost and the price elasticity of demand (which Ramsey pricing would require), since firms would lack the "right" incentives that would exist under the V-F system.

The authors of the Research Report argue that their proposal would strengthen incentives to minimize the cost of service over a multiperiod time horizon. Specifically, allowing a firm to retain permanently a portion of the excess profits earned in past periods gives the firm a greater incentive to control its costs when compared with rate-of-return regulation.

The authors proposed a modified V-F mechanism in which the last period's excess profit--actual profits minus normal profits--are shared between shareholders and consumers. (Under a strict V-F mechanism all of the excess profit would go to consumers.)[17]

The modified V-F mechanism, similar to a sliding-scale plan or a partial cost adjustment mechanism, allows the firm to retain permanently a share of the profits

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16 See Ingo Vogelsang, *Price Cap Regulation of Telecommunications Services: A Long-Run Approach*, Rand Note N-2704-MF (Santa Monica, CA: The Rand Corporation, February 1988). Specifically, a firm trying to maximize profits would set individual prices within the overall price-cap constraint such that over time consumer's surplus would converge to a maximum level with the firm earning normal profits; economists call such prices "Ramsey prices."

17 Ingo Vogelsang and Jorg Finsinger, "A Regulatory Adjustment Process for Optimal Pricing by Multiproduct Monopoly Firms," *Bell Journal of Economics* 10 No. 1 (Spring 1979): 157-71.

beyond some prespecified level.[18] Under the modified V-F mechanism, if a firm realizes average cost below that for a previous period, it retains a share of the difference as permanent profits.[19] A firm would have an incentive to control its costs or increase sales, assuming that the percentage change in total costs from making additional sales is less than percentage change in additional sales. The firm, in effect, faces an average-cost target (the average cost in the previous period) from which efforts to "beat" the target would yield permanent profits. These profits, unlike those obtained by a firm under traditional regulation, would be shared between customers and shareholders after the next rate review.[20]

The partial cost-adjustment mechanism represents an example of a (ex post) sharing model. To illustrate, let us specify the mechanism as

$$P_t = AC_t^e + g(AC_t - AC_t^e),$$

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18 A sliding-scale plan, for example, allows the firm to keep a prespecified share of the difference between the earned rate of return and the targeted level. As an illustration, assume that a regulator specifies that 80 percent of the difference benefits consumers and that the earned rate of return equals 12 percent and the targeted level equals 9 percent. Under traditional regulation the firm would keep the "excess" return until the next rate case, when the regulator may adjust downward the firm's rates so that it would be expected to earn only 9 percent during the next period. Under a sliding-scale plan, the firm also would keep the "excess" return until the rate-adjustment period when the rates are adjusted downward so that the firm can earn 9.6 percent (12%-.8[12%-9%]) during the next period. The firm effectively retains the "excess" 0.6 percentage points beyond the next rate case.

19 To see this, let $P_{T+1} = AC_T + k(P_T - AC_T)$, where the price in period T+1 (P_{T+1}) equals the average cost in period T (AC_T) plus some specified share (k) of the difference between price (P_T) and average cost in period T. Under a strict V-F system, P_{T+1} would equal AC_T; above-normal profits earned in period T are transferred to customers (i.e., the value of k equals zero). A modified V-F system would set the value of k at greater than zero; as k increases more of the profits are retained permanently by the firm. For example, in the extreme case where k equals one, the firm keeps permanently, all of the profits (i.e., $P_{T+1} = P_T$), therefore, the level of above-normal profits earned in period T would not affect the price in period T+1. Using the illustration in fn. 5, the price in period T+1 would continue to be 10 cents per kWh.

20 Returning to the equation $P_{T+1} = AC_T + k(P_T - AC_T)$ (see fn. 18), under traditional regulation the firm would retain none of the profits earned during period T; its price would equal average cost in the previous period.

where the price charged in period t, P_t, is a function of the expected (target) average cost for period t, AC_t^e, determined previously, and the difference between actual average cost, AC_t, and expected average cost for period t; "g" is the sharing parameter measuring the fraction of difference between actual and expected average cost incorporated into price.[21] A price-cap mechanism is a special case where "g" takes on a value of zero (that is, $P_t = AC_t^e$): price is based solely on expected average cost (which may not necessarily reflect the "best guess" forecast for an individual firm) with a zero weight assigned to actual cost; the firm bears all the risks of disappointing outcomes, as well as reaping all the benefits of favorable outcomes. At the other extreme, a cost-plus mechanism would be in place when "g" equals one (that is, $P_t = AC_t$). Legislative statutes may limit the authority of regulators to subscribe to any one particular mechanism.

Under a typical sharing arrangement, "g" would have a value between zero and one. For example, a value of .8 for "g" means that price will be determined 80 percent by actual cost and 20 percent by expected cost. (To see this, rearrange the above equation to $P_t = AC_t^e(1-g) + AC_t\, g$.) As an illustration, assume that the expected average cost was 10 cents a kilowatt hour and the actual average cost was 8 cents a kilowatt hour. Applying a "g" value of .8, the new price would be 8.4 cents a kilowatt hour [(10 cents) .2 + (8 cents) .8]. A high value for "g," such as .8, imposes most of the risks of bad outcomes on consumers as well as distributes most of the benefits to consumers.

A high value for "g" also weakens the firm's incentive to control its costs, since actual cost determines largely the price that the firm is able to charge.[22] Although no simple rule can be applied to determine the optimal value, the value that maximizes economic welfare, for "g," economic theory shows that "g" should be larger as economic and technological uncertainty increases.[23] Equity and other

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21 The model also may include a component that links the price to the expected average cost submitted by the firm. For example, the firm may be allowed to earn additional revenues when its expected cost lies below the regulator's expectations.

22 For example, most state fuel adjustment clauses and purchased gas clauses reflect automatic adjustment mechanisms where the value of "g" would be one.

23 See, for example, Jean-Jacques Laffont and Jean Tirole, "Using Cost Observations to Regulate Firms," *Journal of Political Economy* 94 No. 1 (1986): 614-64); and Richard Schmalensee, "Good Regulatory Regimes," *Rand Journal of Economics* 20 (Autumn 1989): 417-36.

regulatory goals constrained by legislative statutes and judicial interpretations of those statutes also would influence the value of "g." Implicit in rate-of-return regulation is regulators' preference for a high value of "g;" that is, regulators generally are inclined toward passing risks and gains from exceptionally good outcomes to consumers.[24] While this aspect of the so-called regulatory contract may have some harmful effects (for example, a firm is given weak incentives to operate efficiently) it has some benefits that are apparent to regulators. These benefits include precluding a firm from "getting rich" when circumstances are favorable or "going broke" when they are unfavorable. The social costs for avoiding these conditions is a loss of economic efficiency; but to say that society is worse off requires more information than what can be acquired from economic principles. One conceivably large cost of the regulatory contract is illustrated by the large cost overrun among recently constructed nuclear power plants. At the time they were prepared, most utilities probably expected consumers to absorb the higher construction costs. Consequently, they were inclined to make decisions that were not reflective of maximum efforts to control costs.

As discussed earlier, the V-F mechanism is criticized for creating an environment in which the firm may have an incentive to inflate its costs during some periods. A firm, for example, may attempt to fool its regulators by intentionally raising costs just prior to a rate review, and thereby foregoing current profits for the benefits of increasing profits over future periods. For example, by increasing its costs this period, the firm would be allowed to increase its prices during the rate review, assuming it occurs in the next period, over what they would otherwise be. The reason is that future prices are based on average cost for

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24 Until recently, as some regulated markets for energy services became competitive and regulators instituted prudence and used and useful tests, consumers bore almost all of the risks associated with bad outcomes and even bad management. But, it remains true that consumers more than utility shareholders enjoy the fruits of new technologies and improved productivity gains by a regulated firm.

previous periods. (It is assumed here that the firm's waste can be avoided in later periods.[25])

A firm may engage in this strategic behavior for two reasons. First, regulators may lack the information to detect waste when it actually occurs. Regulators may have little or no knowledge of a firm's technology to discern whether the firm is behaving efficiently or otherwise over different periods. Second, a firm may have a low discount rate to justify ceding some profits today for higher profits in the future; assuming that the firm is not myopic, it would attempt to maximize profits over some multiperiod time frame. The firm therefore may have an incentive to reduce profits today by engaging in waste if it means increasing profits in present value terms over some specified period. The modified V-F mechanism proposed in the Research Report, however, would lessen the likelihood of strategic behavior. Compared to the strict form, the firm would incur a larger loss from current waste, since it would forgo receiving permanently a portion of the higher profits that would otherwise be earned in the absence of waste.

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25 See David Sappington, "Strategic Firm Behavior Under a Dynamic Regulatory Adjustment Process," *Bell Journal of Economics* 1 No. 1 (Spring 1980): 360-72. Sappington concludes that:

> It has been demonstrated that the most attractive feature of the V-F regulatory mechanism may, in fact, prove to be its tragic flaw. Although the mechanism is ideal in the sense that it does not require the regulator to possess detailed information regarding the demand and cost parameters in the industry, it is flawed because it cannot prevent the regulated firm from exploiting the regulator's ignorance to its own advantage (p. 369).

CHAPTER 4

LIKELY OUTCOMES OF PROPOSALS

One way to view the incentive proposals in the FERC reports includes asking what effect they would have on the economic performance of the natural gas and electric industries if adopted either by FERC or state PUCs, or if adopted by both FERC and state regulators. One outcome, probably more transparent than any other, is that regulated firms would be given more discretion in their pricing. Specifically, they would have more freedom to offer lower rates to customers with high price elasticities of demand (that is, to noncore customers) and higher rates to core customers. In an ad hoc way, this is happening now at both the state and federal levels. For example, most states allow utilities to offer discount rates to attract new customers, induce greater energy usage by existing customers, or prevent loss of sales to existing customers.[1] Frequently the discounting is achieved by lowering the demand charge of a multipart tariff.

If applied at the state level, the proposals in the FERC reports would go further in giving utilities pricing discretion. Under optional pricing any customer would have the choice between an embedded-cost rate or a special (discount) rate offered by the utility in response to a customer's demand situation. The appeal of optional pricing is that a consumer has a choice between a rate that is regarded as "fair" by traditional regulatory practices and a rate that, if accepted, would make the consumer better off. Most special rates offered by electric utilities and local gas distributors apply only to industrial customers. Optional pricing would allow a utility to offer discounts to any customer at any time. Since discounts probably would go only to noncore customers, and since those customers now are often given discounts, optional pricing may achieve little additional efficiency gains.[2]

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1 Discount rates offered by electric utilities have evolved from where they applied only to new demand to where they now sometimes apply to all existing demand of a customer. The change stems from growing competition in the electric industry in which utilities increasingly are vulnerable to "bypass" suppliers and technologies.

2 "Noncore customers" refer to those customers who can, with minimal cost, switch from buying the services of the regulated firm to buying those of other suppliers. These suppliers can be in the same industry or another where services are close substitutes to those of the regulated firm.

Deregulating individual prices under the Vogelsang-Finsinger mechanism, if applied at the state level, could alter drastically the rates of electric utilities and local distributing companies (LDCs).[3] (The average rate should, however, be comparable to that under rate-of-return regulation in the long run. The firm's total revenue would continue to be limited by its revenue requirements.) Specifically, utilities would earn higher margins on serving core customers, while responding more aggressively to competition in noncore markets. Residential and other customers who are less responsive to utility prices would face higher rates, and other customers would face lower rates. Although efficiency in the form of aggregate economic welfare would likely improve, the distributional effects probably would be unacceptable to state regulators. Ramsey pricing, for example, virtually has been nonexistent in the regulated energy industries partially because of resistance by regulators and other parties in the political arena to the perceived distributional effect. There is little reason to believe that the Vogelsang-Finsinger mechanism, in its pure form, would gain acceptance from state regulators.

One proposal that may receive better reception from regulators, and at the same time enhance pricing efficiency, involves deregulating prices in markets considered to be workably competitive and to maintain traditional pricing in the remaining markets.[4] In contrast to the Vogelsang-Finsinger approach, deregulating prices in nonmonopoly markets would protect core customers by breaking the linkage between the prices they pay and the prices received from other customers, given a revenue constraint over all services. With workably competitive markets subject to rate-of-return regulation, the firm may be earning small profit margins in those markets. Under the Vogelsang-Finsinger mechanism the firm would be able to compensate for small margins by charging higher rates to core customers. With

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3 The authors of the Research Report offer as an option a hybrid of the V-F mechanism, where optional pricing would see the firm setting a ceiling price equal to embedded cost. This option would disrupt the convergence of prices to Ramsey levels and thereby erase the major benefit of the V-F mechanism. For example, if a residential customer or some other core customer has a choice between an embedded-cost price or a price based on Ramsey principles, he or she would almost always opt for the first price than one that explicitly discriminates against core customers.

4 Deregulation implies that the costs of certain services would be excluded from the firm's revenue requirements, which are used to determine prices in regulated markets.

partial deregulation the firm would not have this opportunity, since the revenues it could recover from core customers do not hinge on the revenue recovered from others.[5]

The proposal to charge interim (between-rate-case) rates on the basis of a comprehensive automatic rate adjustment mechanism (ARAM) represents a fundamental departure from rate-of-return regulation. Most important, the revenues that the firm can collect are not determined by the firm's actual or forecasted revenue requirements. Under the proposed ARAM, the firm is allowed periodically to change its overall rates by up to the same percentage as some specified price index. The allowed price changes would deviate from a firm's actual or forecasted cost changes for two reasons. First, movement in the price index does not reflect cost changes to an individual firm. Depending on what index is chosen, it may instead reflect cost changes for an industry, retail market, or wholesale market for all commodities produced in the United States.

Second, the proposed ARAM in the Research Report includes no productivity offset. Consequently, even if the price index reflects accurately the effect of inflation on a firm, the actual change in average cost for the firm would be less than the allowed change in price (assuming positive productivity gains). For example, assume that the inflation rate for the country is 5 percent, that it represents the average cost increase of inputs for a firm, and the firm's total factor productivity (TFP) grows by 3 percent. Using the proposed ARAM formula, the firm would be able to increase its overall price by 5 percent. The firm's average cost, however, would increase by only 2 percent (that is, 5 percent minus 3 percent).[6] If the firm is permitted to increase its price to the level of new average cost, the increase would be 2 percent. In other words, the firm would need only a 2 percent increase in price to cover its higher costs and earn a normal rate

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5 Under deregulation the firm's revenue requirements would exclude the costs required to serve nonmonopoly customers.

6 To see this, average cost equals total cost divided by the output level; total cost, in turn, equals the sum of the product of input prices and input levels. Reaveraging terms average cost (AC) comes to the following:

$$AC = \frac{\text{price of inputs}}{\text{total factor productivity}},$$

thus, $\%\Delta AC = \%\Delta$ price of inputs $- \%\Delta$ total factor productivity.

of return. The proposed ARAM, in the example, would call instead for a price increase of 5 percent; the firm would earn additional profits and the productivity improvement would go entirely to shareholders, at least until the next rate case when a specified proportion of above-normal profits earned in previous period was distributed to customers.

ARAM provides a firm with explicit incentives to control costs, either by holding down the price of inputs or advancing productivity improvements. Each activity allows the firm to retain the entire gains until the rate review, and a share of the gains permanently under the proposed V-F mechanism. As another feature, ARAM may reduce the rent-seeking and other regulatory costs associated with protracted rate reviews. Assuming that the periodic rate adjustments do not produce exorbitant profits or financial distress, the firm would need to file a rate increase (or a regulator request a rate decrease) less frequently. With the slowdown of inflation relative to the 1970s and early 1980s when ARAMs in some quarters were being proposed, electric and natural gas utilities are filing fewer rate increases[7] and regulatory lag has subsided greatly as a problem for utilities. This implies that ARAMs may have less justification as a regulatory tool today than in recent periods.

The proposed ARAM in the Research Report has one serious defect: customers do not share at all in the gains from productivity improvements until after the next rate case. As long as the firm files no rate change, it retains the productivity gains. Under rate-of-return regulation, productivity improvements typically are built into current rates. For example, new rates reflect a "best-guess" forecast of a firm's total costs during a specified test year. New rates, either explicitly or implicitly, account for estimated test-year input prices, sales, mix of inputs, and consequently, total factor productivity (output per unit of input). Setting a zero

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7 Supporters of ARAM argue that it would eliminate some of the major problems associated with rate-of-return regulation; they include the lack of explicit incentives for promoting utility productivity gains, the inability of firms to earn a "fair" rate of return under inflationary conditions, and the recurrence of rate cases because of regulatory lag. For example, see William J. Baumol, "Productivity Incentive Clauses and Rate Adjustments for Inflation," *Public Utilities Fortnightly* (July 22, 1982): 11-18; and Resource Consulting Group, *Incentive Regulation in the Electric Utility Industry*, prepared for the Federal Energy Regulatory Commission (Washington, D.C.: Federal Energy Regulatory Commission, September 1983). In the second study the authors proposed an ARAM mechanism as an alternative incentive system that could be used by FERC. The mechanism, similar to the one proposed in the Research Report, excludes a productivity offset.

growth rate for total factor productivity, assuming other things remain constant, would favor a firm's shareholders, at least until the next rate case. Whether consumers would benefit relative to rate-of-return regulation is highly uncertain. Consumers would likely pay higher rates under the ARAM proposal at least until the next rate review; afterwards consumers may pay lower rates if ARAM induces cost-efficiency gains for the firm, with a portion of the gains passed through to consumers in the form of lower rates after the next rate review.

Proponents of ARAMs would argue that consumers benefit in the long run: the firm would have greater incentive to control costs and its cost of capital would fall with the mitigation of regulatory lag. Whether these benefits would accrue to consumers is uncertain. Linking a lower cost of capital to the presence of ARAM is not obvious. Technically, the question centers on whether ARAM reduces a firm's systematic risk. Believing that ARAM would improve incentives for cost control also may be overstated. As discussed above, rate-of-return regulation gives firms incentives to control their costs. For example, whether using an historical or future test year, a utility retains (at least until the next rate case) every dollar that is saved: by lowering its input prices or improving its overall productivity, a utility actually would earn a higher rate of return until it was "taken away" by the regulator. The regulator may do this by setting a higher productivity target in the next rate case to account for improved productivity growth in the preceding periods. This so-called ratchet effect--namely lower costs today translate into lower rates in the future--dilutes a firm's incentive to improve its productivity especially when large investments are required, since the firm would receive no benefits beyond the next rate case when past improvements are fully reflected in future rates. Knowing that this possibility exists, firms subject to either rate-of-return regulation or to an ARAM may have an incentive to inflate their costs shortly before the next rate case.

A major rationale for incentive regulation, in fact, revolves around the presence of a ratchet effect, a feature of rate-of-return regulation. No serious observer would argue that regulated firms lack incentives to control costs in view of regulatory lag and recent applications of other regulatory mechanisms such as

prudence, used and useful tests, and least-cost utility planning.[8] The policy question should focus on the strength of incentives faced by regulated firms under rate-of-return regulation to operate and plan efficiently and adopt new, economical technologies.

The Research Report features an after-the-fact sharing of profits above a specified level between shareholders and consumers. Specifically, a specified proportion of above-normal profits, defined as profits in excess of those needed to attract new capital, earned during the period(s) prior to a rate review would be dispersed to consumers. Leaving the firm with no permanent gain from above-normal profits characterizes a pure ratchet effect, which to some analysts constitutes a major deficiency of rate-of-return regulation.

How the benefits of cost savings are shared between consumers and shareholders (the value set for "g") has both efficiency and equity implications. Rate-of-return regulation, as a general rule, distributes cost savings to consumers in the form of lower prices, starting after the next rate case. Exceptions exist, however, when the firm has better information than the regulator. For example, a firm would have an incentive to overstate its costs for a test year (future or historical) as well as to understate its sales. To the extent that it can misreport its expectation of the true cost and sales, the firm can earn, without taking any incremental actions, above-normal profits without the regulator realizing it. This outcome is especially true when rapid technological changes occur and information available to regulators is delayed. The regulator at some point likely would apprehend this strategic behavior and transfer excess profits to consumers. Using a simple equation to illustrate this point, the net gain to a firm from misreporting estimated costs can be expressed as,

$$G_f = (c^r - c^e) - b(c^r - c^e)$$

$$= (c^r - c^e)(1 - b),$$

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8 "Used-and-useful" tests, for example, allocate the cost of a new power plant to utility shareholders for any reason that makes the plant uneconomical or unneeded--e.g., inflation, governmental regulations, inaccurate forecasting, changing market conditions for electricity, bad luck. Prudence tests, in contrast, typically scrutinize a firm's decisions at the time they were made; that is, "bad" decisions not "bad" outcomes form the basis for penalty.

where the net gain to the firm, G_f, equals the difference between reported costs (c^r) to the regulator and expected costs (c^e) by the firm, minus the proportion (b) of the misreporting level ($c^r - c^e$) that the regulator deducts from cost estimates presented by the firm in future test years.[9]

As the value of "b" approaches one, the ratchet effect become more powerful: the firm suffers from misreporting in previous periods by being granted lower prices in the future. In the extreme case where "b" equals one, a firm's overreporting of cost in one period (thereby increasing its prices) is fully offset by lower prices in later periods. (The firm, of course, benefits marginally since its discount rate is greater than zero. Thus regulatory lag provides the firm with some incentive to control costs.) The presumption here is that the regulator would look at a firm's cost figures and deduct from them the amount that the utility overforecasted in a prior period. The regulator, however, may be legally constrained from taking such an action.

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9 It is assumed here that the firm does not misreport its sales and that its internal forecasts are correct.

CHAPTER 5

COMPARISON WITH OTHER INCENTIVE SYSTEMS

The incentive system proposed in the FERC reports appears at first sight to represent a comprehensive and radical change in how regulation currently is conducted. Certain aspects of the proposal would accelerate the evolution of state and federal regulation that has occurred over the last several years in response to changes in the electric and natural gas industries. For example, regulation in recent years has become noticeably more flexible in setting individual rates and deviating from the cost-plus nature of regulation. Electric or natural gas utilities in virtually all states are offering industrial customers special rates in response to changed economic and market conditions. State regulators, in addition, have intensified their scrutiny of new power plants built by electric utilities by more frequently applying prudence and used-and-useful tests.[1] Management audits have become a common tool of state regulators to help determine the prudence of past costs, in addition to recommending more effective management practices in the future. Least-cost energy planning and competitive bidding for new generating capacity are spreading rapidly at the state level to hold down the costs of new supplies needed to accommodate growing demands. Increasingly, states have relied on partial incentive systems to improve power plant productivity or reduce fuel costs of electric utilities.[2]

In summary, states have deviated (utility advocates would say violated) recently from the regulatory contract by moving farther away from the strict tenets of cost-plus and inflexible regulation. Utilities have been forced to bear additional risks, an expected and desirable result of a competitive environment. Utility shareholders probably on average are less risk-averse than consumers; and besides, by bearing more risks utility management would give more concern to cost overruns

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1 See Paul L. Joskow, "Regulatory Failure, Regulatory Reform, and Structural Change in the Electrical Power Industry," Martin Neil Baily and Clifford Winston, eds., *Brookings Papers on Economic Activity: Microeconomics 1989* (Washington, D.C.: The Brookings Institution, 1989), 125-208.

2 See, for example, Leland L. Johnson, *Incentives to Improve Electric Utility Performance: Opportunities and Problems*, Rand Report R-3245-RC (Santa Monica, CA: The Rand Corporation, March 1985).

and other symptoms of questionable management practices. Whether utilities are being compensated for higher risks is uncertain. Some argue that regulators have not compensated them adequately in view of the apparent one-sided, asymmetric nature of prudence and use-and-useful tests that in recent years have become common regulatory mechanisms. On the other hand, utilities may be receiving more revenues to offset their increased cost of capital associated with higher risks. It should be noted, however, that the financial conditions of the electric industry as a whole have improved substantially since the early 1980s.[3]

Current state incentive systems have not yielded the highest possible benefits to consumers. One reason is that they lack one or more principles that should be adhered to when applying incentive systems (see table 5-1). Scant evidence exists to measure whether state incentive systems have benefitted consumers. Almost all systems are targeted at one operating component of a utility. For example, on the electric side, incentives to improve power plant productivity are most popular. Their attractiveness can be attributed to sizable potential benefits, which especially applies to base-load power plants with low operating costs. Most current incentive systems for electric utilities have the objective of reducing fuel costs. They measure performance as either capacity factor, power plant availability, heat rate, or fuel costs. In some cases historical statistics for a specific plant establish the baseline target.[4]

The problem of measuring effects on consumers stems from the difficulties of predicting a utility's costs in the absence of an incentive system. Prediction requires a counterfactual exercise in which the analyst needs to ask how utility

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3 For example, Salomon Brothers calculated that as of early 1987 the average market-to-book ratio for the common stock of a group of 100 electric utilities exceeded 1.4 (see Salomon Brothers, Inc., *Electricity Utility Monthly*, March 2, 1987, 34). Other financial indicators support the position that electric utilities (with the exception of utilities constructing nuclear power plants) have improved financially since the early 1980s (see Merrill Lynch, *Utility Industry: A Statistical Review*, May 1988). A 1988 NARUC study found that electric utility investors earned higher rates of return (150 basis points) than investors of other U.S. industries during the period 1972-1987 (see "NARUC Study: Utility Shareholders Fared Better Than Others 1972-1987," *Electric Utility Week*, May 30, 1988, 12-13).

4 See, for example, Johnson, *Incentives to Improve Electric Utility Performance: Opportunities and Problems*.

TABLE 5-1

SOME PRINCIPLES FOR APPLYING INCENTIVE SYSTEMS

1. Partial incentive systems should account for possible distortions that may give firm incentive not to minimize its total cost of service.
2. Incentive systems should be properly structured otherwise they may yield minimal or negative benefits to consumers.
3. Incentives should provide for both rewards and penalties.
4. Optimal incentives should lie between cost-plus and price-cap mechanisms (i.e., involves cost sharing).
5. Incentives should be directed at improving efficiency of decisions by management.
6. Incentive rules should not change at the whim of regulators.
7. Incentives should consider both productive and pricing efficiencies (which can be conflicting).

Source: Authors' construct.

management would have acted without the new incentives. One study concludes that:

> The goal of specific target incentive payment regulations [e.g., power plant productivity incentives] in electric production during 1968-1987 appears to be the reduction of managerial [inefficiencies]. However, we did not find that the [inefficiencies were] significantly reduced by narrow incentive regulations (p. 9.).[5]

Most state incentive systems apply a partial measure of utility performance, and they are designed to reduce costs over a short period. Because of these two

5 Sanford Berg and Jinook Jeong, "An Evaluation of Incentive Regulation for Electric Utilities," *Journal of Regulatory Economics*, forthcoming 1991.

features, incentive systems can create distorted incentives, or encourage strategic behavior by utilities; one possible outcome involves utilities spending money to control costs in a way that maximizes their rewards (or minimizes penalties), rather than minimize their cost of service for a multiperiod time frame. For example, specifying fuel costs as a performance target may induce utility management to substitute capital and other inputs for fuel, even when revenue requirements in present value terms would be increased. As another example, power plant productivity incentives at the state level generally apply only to a subset of generating facilities (for example, base-load facilities), and therefore discourage efficient substitution among facilities. Such incentives may have led to excessive spending by the firm on operation and maintenance, as long as the costs were passed through to consumers on a cost-plus basis. Thus, applying fuel costs or other narrowly based measures in an incentive system may be counterproductive--consumers may end up paying higher prices.[6]

The incentive systems proposed in the FERC reports differ from most of those currently in place at the state level. First, state incentive systems do not attempt to improve pricing efficiency. Instead, most state systems aim to reduce a utility's cost of producing electricity by decoupling the link between costs and revenues that holds more strictly under rate-of-return regulation. Joskow's model of regulatory prices predicted that state regulators (after external shocks afflicted the electric industry in the 1970s) would test new tools and procedures to minimize both conflict among different interest groups and political resistance.[7] Incentive systems are one way for regulators to cope with inflationary conditions. By passing more of the risks from bad outcomes to utilities, consumers are better protected from inflationary costs.

Second, the proposals in the FERC reports would widen the base of regulatory incentives in relation to state incentive systems. The proposals would sweep aside

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6 Other reasons exist for why state incentive systems may not benefit consumers or benefit them marginally such as: rewards may be given to a utility for outcomes that would have otherwise occurred, earnings volatility may increase a utility's cost of capital, inflexible systems may increase a utility's cost of capital as technological and market conditions change, and explicit incentives may have little effect on utility management in conducting their operations more efficiently.

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

all of the alleged inefficiencies associated with rate-of-return regulation--namely, pricing inefficiencies, cost inefficiencies, and high administrative costs of regulation. Consequently, unlike state incentive systems that are more modest in their goals, the proposed incentive system in the FERC reports is designed to "wipe out" all the alleged deficiencies of rate-of-return regulation at one time; a most ambitious goal to say the least.

CHAPTER 6

A NOTE ON PRICE CAPS

Although the two FERC reports proposed incentive systems that differ from pure price-cap regulation, the systems contain attributes and produce outcomes that are similar. For example, the proposed ARAM would adjust rates on the basis of price indices external to a regulated firm. The authors of the Research Report refer to their proposed incentive system as a "modified price cap plan." This section cautions regulators against replacing rate-of-return regulation with price-cap regulation. The alleged benefits of price caps may be more theoretical than real.

Some analysts believe that rapidly changing technological and market conditions demand an alternative to rate-of-return (ROR) regulation. They propose price caps (that is, price regulation) to replace ROR regulation, which they characterize as unresponsive to the changing environment and to the need to advance economic efficiency (pricing plus productive efficiencies).[1] These analysts believe that price caps do not represent a "zero-sum" game in which one group's gain is another group's loss. According to proponents, price caps will improve the economic well-being of both consumers and the firm.

Price-cap regulation, in its basic form, specifies the maximum price that a firm can charge for a specified basket of services. The maximum price is derived from an indexing mechanism that remains unchanged for a given period. Maximum prices typically would change in accordance with a formula (or rule) which subtracts productivity gains from a chosen price index.

The typical price-cap formula contains a specified price index from which a productivity measure is subtracted, and can be expressed as:

$$\dot{P} = \dot{PI} - \dot{X},$$

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1 In the privatization of monopolies in the United Kingdom the government chose price-cap regulation over rate-of-return regulation. The major reasons include the perception that price caps provide firms with a greater incentive to control costs and price more efficiently, and reduce the administrative costs of regulation (see M. E. Beesley and S. C. Littlechild, "The Regulation of Privatized Monopolies in the United Kingdom," *Rand Journal of Economics* 20 (Autumn 1989): 454-72).

where the allowed percentage increase in price, $\dot{P}$, equals the percentage increase in some specified price index ($\dot{PI}$) minus the percentage increase in productivity, ($\dot{X}$).[2] Productivity gains, for example, could reflect historical gains for the industry within which the firm is operating.[3] The price index could encompass a broad range of commodities and be either regional or national in scope. One possible choice is the Consumer Price Index (CPI), which, according to the authors of the Research Report, is attractive because it is easy to apply, well understood by the general public, and tends to minimize real price changes.[4]

Are the Benefits Real?

Table 6-1 shows widely held perceptions of traditional, rate-of-return and price caps. The perceptions in important ways convey a distortion by overstating the defects of ROR regulation in relation to price-cap regulation.

Price caps stripped of their guise are special cases of the sliding-scale/partial-cost-adjustment family of models.[5] That is, price adjustments depend on the difference between the actual rate of return and some prespecified target level; or, to say it differently, on the difference between actual average cost and the target

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2 For example, in the United Kingdom "PI" is measured as the Retail Price Index and "X" is supposed to measure a firm's gains in total factor productivity. The initial level of "X" is set by the government as one component of a package of parameters affecting the costs, revenues, and risks of the newly formed privatized firm.

3 Historical performance of a firm arguably may not constitute an exogenous standard. To set a standard including other firms in the industry, however, may not be appropriate as well since it would not reflect the unique situation of a regulated firm. One way to avoid this problem would be to set a performance standard based upon the increase in a firm's efficiency relative to those in a selected comparison group. If it is, say, 20 percent, then it can be said that one out of five firms in the group is more efficient than the firm under review. The target then can be set, for example, as 10 percent for the next three years to enhance its relative efficiency.

4 It should be noted, however, that the CPI heavily weights food and other household commodities that are not pertinent to a firm's production technology. Some analysts feel that the Producer Price Index may be more germane.

5 For a history of sliding-scale plans, see Harry M. Trebing, "Towards an Incentive System of Regulation," *Public Utilities Fortnightly* (July 18, 1963): 22-27.

TABLE 6-1

PERCEPTIONS OF TRADITIONAL AND PRICE REGULATION

Traditional Regulation (ROR)	Price-Cap Regulation
· Pricing rigidity	· Pricing flexibility for individual services
· Zero *ex ante* profits	· Strong incentives for cost efficiency
· Cost-plus contract	· Simple to administer
· Ratchet effect (cost savings passed to consumers over time)	· Most beneficial when technological conditions change rapidly and entry is liberalized
· Most beneficial when technological conditions move slowly and entry is limited	· Protects captive customers
· Firm profits from cost savings only until next rate case and when unanticipated	· Rate review activated by prescribed regulatory rule
· Conducive to cross-subsidization	· Allows firm to compete aggressively in price-sensitive markets
· Rate review generally activated by firm or intervenors	· Risks internalized to firm
· Pricing driven by fairness-political criteria	· Profits generally unregulated
· High regulatory costs	· Quality of service may decline
· Stimulates excessive reliability of service	
· Socialization of risk	

Source: Authors' construct.

level. Price-cap regulation adjusts prices when market conditions change, not when the actual conditions for an individual firm change. ROR regulation, by comparison, determines new prices for a firm on the basis of that firm's cost, demand, and technological conditions. Price caps usually apply some specified market indicators of inflation and productivity growth. Productivity growth, for example, may reflect technological improvements for an industry or for the economy as a whole.

Table 6-2 lists eight fundamental issues associated with price-cap regulation. The complexity of different parties reaching agreement on these issues weakens the argument that price-cap regulation would reduce rent-seeking costs occasioned by formal rate cases. While the number of rate cases would decline, parties to them likely would allocate more resources to each case. For example, debate over which inflation index and productivity measure to use, how much a firm should be allowed to earn, how often and under what conditions a firm should be called in for readjustment of the price-cap formula, and so forth would be time-consuming and expensive for the different parties. The fact that price-cap regulation could avoid adjudication of some issues now inherent in traditional rate proceedings (for example, cost-of-service studies) belies the reality of parties "fighting hard" to advance their positions; parties would be expected to expend about the same resources that they now expend under ROR regulation, since the dollars at stake remain unchanged.

A second observation is that the differences between ROR regulation and price caps in affecting pricing efficiency may not be as great as what is generally acknowledged. Specifically, the benefits of price caps relative to ROR regulation may be insignificant. Price caps may not necessarily reduce pricing inefficiencies--that is, prices deviating from marginal costs--if both core and noncore services are placed in the same basket. An aggregative basket creates the possibility for the firm to charge below-cost prices to noncore customers and fund the temporary losses by raising prices to core customers, assuming prices for core services are below the profit-maximizing level. The firm could accomplish this as long as it stays within the bound of an aggregate price cap.

Even if price caps are expected to improve pricing efficiency, political fallout may inhibit their use by state regulation. Price caps would tend to change the current pricing structures toward Ramsey prices. For example, a firm would have an incentive to select individual prices within a capped basket such that consumers'

TABLE 6-2

STRUCTURING PRICE CAPS

1. Basis for price change (e.g., Consumer Price Index minus growth in total factor productivity)
2. Base price (e.g., embedded cost, stand-alone cost)
3. Cost components covered by price cap (e.g., nonfuel O&M expenses, controllable costs)
4. Services covered by price cap (e.g., all, captive)
5. Separate services or combination of services
6. Rules for profit review (e.g., 5-year interval)
7. Price floor (e.g., incremental cost)
8. Price-cap adjustment over time (e.g., industry inflation rate, economy-wide inflation rate)

Source: Authors' construct.

benefits from purchasing the firm's services will increase over time. The prices would converge at a level where consumer surplus is maximized and the firm is earning normal profits; hence, Ramsey prices.[6] Ramsey prices, as discussed elsewhere in this report, would most surely worsen the economic well-being of core customers; consequently, this outcome would meet with strong opposition from state regulators and legislatures. For political reasons, price caps perhaps should be

6 See Ingo Vogelsang, *Price Cap Regulation of Telecommunications Services: A Long-Run Approach*, Rand Note N-2704-MF (Santa Monica, CA: The Rand Corporation, February 1988).

limited to core services.[7] Firms then would have to compete with others in noncore markets without the luxury of cross-subsidization funded by core consumers. Further, including noncore services in the same basket as core services improves the chances that with more competition noncore consumers would be paying less, and core consumers more, than they are currently.

The argument that price caps strengthen a firm's incentive to control costs needs qualification. Price caps, compared to ROR regulation, promote cost efficiency when price adjustments do not reflect changes in a firm's cost, and rate reviews take place at predetermined multiyear intervals prescribed by regulators. Price caps should, therefore, provide firms with stronger incentives when prices are linked to cost factors outside the control of an individual firm, and regulators do not readjust the price-cap formula any time a firm is earning above- (or below-) normal profits or for some arbitrary reason. Otherwise, the firm discounts the ability to retain permanently higher profits created by improved cost efficiencies. Capricious "taking" of a firm's excess profits is far from remote, since current regulators are unlikely to bind future regulators to stay with today's ground rules if they choose not to. It is sensible to believe that any price-cap mechanism inevitably would require some "trueing-up" process. Political pressures induced by "high" (or "low") profits may force regulators to change the rules for "trueing up" profits that depart from anticipated levels. For example, regulators may switch to a different price index or adjust the productivity offset at a higher level to compensate for "high" profits earned in earlier periods. Consequently, the firm's incentive to control costs would diminish, perhaps approaching a point where the ratchet effect under price-cap regulation is as strong as that under rate-of-return regulation.[8] Management, for example, may pad expenses for its own benefit.

One way to mitigate the ratchet effect is for regulators to prespecify how actual "excess" profits would be shared between the firm and customers. The V-F

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7 For example, a state regulator may want to apply price caps for residential customers so that they are protected from the competition occurring in markets serving other customers. Under rate-of-return regulation, in contrast, lower revenues earned by a regulated firm in competitive markets translate into higher prices for services to residential customers.

8 As a general rule, the ratchet effect would come into play under price-cap regulation any time a firm expects current benefits of increased efficiency to be "taken away" by future lower prices. If so, price-cap regulation would provide firms with an incentive to control costs comparable to rate-of-return regulation.

mechanism, discussed earlier, illustrates a rule for distributing past profits as well as for limiting total revenues.

Another incentive mechanism for disposing of "excess" profits involves the regulator specifying a sharing arrangement for actual rates of return on equity that fall outside some specified "dead band" range. For example, a firm may be allowed to keep all profits when the actual rate of return on equity falls between 12 and 14 percent. Rates of return above 14 percent would be shared between ratepayers and shareholders; those below 12 percent would also be shared by allowing the firm to charge a higher price in the following period.

Contrary to common view, ROR regulation does not represent a cost-plus contract. Firms have an incentive to control their costs because of regulatory lag and prudence tests. Once a price is fixed, a firm earns a higher profit anytime it reduces its costs, at least until the rate review. At that time, the firm may lose any future benefits from previous cost savings to the extent they are built into future rates. (This was referred to earlier as the ratchet effect.) The time between when cost savings are made and the next anticipated rate review, in addition to the firm's discount rate, all influence the firm's incentive to reduce its costs. For example, electric utilities, which in the early 1980s did not anticipate initiating a rate filing for several years, had a strong incentive to curb their costs. They were able to retain the cost-savings long enough to, perhaps, justify making large productivity-innovation investments.

Advocates of price caps argue that ROR regulation only allows a firm to make above-normal profits whenever it exceeds the targets embedded in the test-year revenue and revenue requirements dollars. For example, anticipated benefits from cost-savings flow to consumers, assuming that cost-savings are reflected in new rates. Cost savings beyond the projected level benefit the firm's shareholders, at least until the next rate case.

As applied, ROR regulation probably deviates from the view that rates set by regulators would, on the average, allow a firm to earn normal profits. The fact that firms have better information than regulators on costs and demand conditions raises the question of whether this perception is valid. The firm, as stated elsewhere, would have an incentive to overstate costs and understate sales, each having the effect of justifying higher rates. Regulators know this incentive exists, but are constrained by insufficient information on the probabilities of the firm achieving test-year cost and sales commensurate with above-normal profits, given

the information available to the firm at the time. Consequently, the rates established by a regulator in a rate proceeding may, in fact, give a firm a reasonable opportunity to earn above-normal profits. Regulation, on occasion, may overcompensate by approving a new rate for which a firm expects to earn below-normal profits; but probably more times than not the firm would be expected to earn above-normal profits.[9] The firm would attempt to capitalize on having better access to information by misreporting expected revenues under existing rates and expected costs. For example, assume that the firm presents projected costs to the regulator consistent with productivity gains that lie below what the firm's management expects.[10] The regulator, however, is not unlikely to catch on over time by adjusting for the firm's biases. If, for example, a firm has been earning above-normal profits for several past periods, the regulator may become suspicious of the firm's projections in the next rate case. The regulator may adjust the firm's cost or sales projections, or both, as a way to compensate consumers for being "overcharged" in past periods.

A major issue revolving around price caps is how core customers can be protected from revenue losses incurred by the firm because of competition. One obvious proposal is to apply price caps only to those services deemed not currently operating in workably competitive markets. Whether all services should be combined under one basket or placed in separate baskets depends on the regulators' other objectives. If the primary objective is to protect core customers, then separate baskets of services should be established. If instead, the objective is to allow maximum pricing flexibility, then one basket of services could be established with

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9 The same results also may arise when the firm applies an adaptive learning model to forecast sales over a test period; the firm would therefore update its forecasts each period using new information. Assuming adjustments of current forecasts to new information on a lagged basis (partly because of the uncertainty over the accuracy of new information) the firm may consistently generate biased forecasts. When sales exhibit an upward trend, for example, the forecasts of growth rates for the next period may be biased downward. Consequently, the firm would tend to request at its next rate filing new rates that would give it a reasonable opportunity to earn above-normal profits. In this example, the outcome is attributed to the firm's faulty forecasting procedure, rather than intentional misreporting.

10 Average cost can be expressed as the price of inputs divided by total factor productivity. Underreporting productivity gains, for example, would cause the regulator to approve new rates that would produce expected revenues greater than expected revenue requirements.

the firm allowed to engage in cross-subsidization and other anticompetitive activities.[11]

The costs covered by a price cap should include those controllable by a firm's management and for which current controlling incentives are weak. For example, nonfuel costs for natural gas pipelines may be a good candidate for price capping.[12] The ability of a firm's management to cut its costs, of course, depends on the degree it controls prices of inputs and can substitute among inputs. In some facets of a firm's operations, service obligations and markets may dictate the level of costs.

Candidates for the starting price include prevailing, embedded-cost prices and stand-alone prices. The FERC reports choose current prices as the starting point for their ARAM. As argued, these prices have been found to be equitable and, additionally, provide a firm with a rate of return previously approved.[13] An alternative to current prices is stand-alone prices. These rates may correspond to the lowest-priced alternative source of supply available to a customer under competitive conditions. For example, the stand-alone price for industrial electricity customers may be defined as the cheapest cogenerated power available, taking into account the hypothetical condition that the local utility would transmit

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11 The resulting prices would converge toward Ramsey pricing. One may ask, why not deregulate noncore services? Core customers would be protected against cost shifting by the firm and a firm could set any price it wants in noncore markets. It is difficult to argue against deregulation of prices for noncore services, especially if they are being sold in markets where buyers have opportunities to purchase from several suppliers or to substitute a comparable service. If the firm has inherent cost advantages in providing noncore services, it may earn above-normal profits. The policy question then becomes whether the firm should retain these profits for its shareholders or distribute them to core customers. Splitting the profits between the shareholders and core customers represents one way to dispose of the gains from noncore transactions.

12 With open access to pipelines' transmission systems, pipelines would have strong incentives to minimize their gas commodity costs. Pipelines would face stiff competition from other entities (e.g., competing pipelines, marketers, producers, local gas distribution companies) in gas commodity markets; consequently, they would be motivated to control their costs to the lowest attainable levels for services sold in these markets. See Lorenzo Brown, Michael A. Einhorn, and Ingo Vogelsang, *Incentive Regulation: A Research Report* prepared for the Office of Economic Policy, Federal Energy Regulatory Commission, 89-3 (Washington, D.C.: Federal Energy Regulatory Commission, November 1989), 124.

13 See also Vogelsang, *Price Cap Regulation of Telecommunications Services: A Long-Run Approach*.

cogenerated power if produced in another service area.[14] The rationale for this definition is that stand-alone price simulates competitive conditions, even when the firm in reality may not be operating in a competitive fashion. According to the theory of contestable markets, maximizing pricing efficiency would require stand-alone prices.[15] Stand-alone prices, however, are difficult to measure and would be subject to dispute at rate proceedings. More importantly, they would raise the fundamental question of why prices are based on hypothetical situations rather than on a firm's actual costs.

In comparison with Ramsey pricing, price caps have three major advantages. First, core customers are better protected when competitive or quasicompetitive services, (that is, noncore services) are excluded from the basket for core services. As an illustration, if prices are allowed to increase by 3 percent a year for core consumers under a price-cap regime, the firm would be unable to compensate for revenue losses in noncore markets by raising prices in core markets. Under Ramsey pricing and rate-of-return regulation, the prices charged to core consumers are inversely linked to the prices the firm is able to charge noncore consumers.[16] When noncore services are especially competitive, core consumers would be asked to pay higher prices so that the firm could receive enough revenues to satisfy its revenue requirement, a condition of both rate-of-return regulation and Ramsey pricing.

Second, Ramsey pricing does not provide firms with a greater incentive to control their costs. Instead, it gives the firm the ability to price different services in a discriminatory fashion so that it can meet its revenue requirements. Ramsey pricing, compared to cost-of-service pricing, results in the firm recovering more revenues from core services and less from noncore services. The firm, in fact, may have less incentive to control costs under Ramsey pricing since the harm from

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14 See Kenneth W. Costello and Ross C. Hemphill, "Competitive Pricing in the Electric Industry," *Resources and Energy* 12 (April 1990): 49-63.

15 For an exposition of contestable markets see William J. Baumol, John C. Panzar, and Robert D. Willig, *Contestable Markets and the Theory of Industry Structure* (New York, NY: Harcourt, Brace, Jovanovich, 1982).

16 The reason, of course, is that more (less) revenues the firm can collect from noncore customers, the less (more) it needs to collect from other customers in order to achieve a previously rate-case determined level of profits.

higher costs on profits can be mitigated through discriminatory practices that shift the burden of management inefficiencies onto core services.

Third, Ramsey pricing requires firms to measure price elasticities of demand and marginal costs for individual services. The firm has an advantage over regulators in knowing the true values of these things. Even the firm has imperfect information, however, so the actual efficiency gains from Ramsey pricing are likely to fall short of their theoretical expectations. Further, disputes between parties over the "correct" values of price elasticities of demand and marginal costs add another complexity to rate proceedings driving up costs to participating parties.

Evidence and Additional Theoretical Issues

Empirical evidence on the effects of price-cap regulation is scant, but what is available paints a favorable picture. One empirical study on price caps indicated that direct-dial, long-distance rates for daytime, evening, nighttime, and weekend services in 1987 were significantly lower in those states with price-cap regulation.[17] The study also showed that during the 1983-1987 period, prices rose more in rate-of-return states for four of the five long-distance groups. Another study showed that customers of Michigan Bell, particularly business customers, preferred to have rates that were more predictable and held below the general rate of inflation;[18] these outcomes were realized when Michigan Bell came under price-cap regulation during 1980-1983. The researcher also found that price caps reduced the administrative costs of regulation. As expected, he found profits more volatile under price-cap regulation, which one can interpret as a desirable outcome, reflecting the performance of competitive and contestable firms.

Statistics for British Telecom show that during the initial years of price-cap regulation (1984-1988), the rates for local calls rose rather steadily while rates for

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17 Alan D. Mathios and Robert P. Rodgers, "The Impact of Alternative Forms of State Regulation of AT&T on Direct-Dial, Long-Distance Rates," *Rand Journal of Economics* 20 (Autumn 1989): 437-53. The study controlled for factors affecting rates and differing across states. It is worthwhile to note that in half of the states with price-cap regulation the prices being offered were below the price caps.

18 Howard K. Face, "The First Case Study in Telecommunications Social Contracts," *Public Utilities Fortnightly* (April 28, 1988): 27-31.

long-distance calls dropped sharply during the same period.[19] Possible reasons for this include badly inefficient prices for British Telecom when it was a nationalized entity, and the competition for long-distance services that sprung after privatization of the British telephone industry.

The social desirability of price-cap regulation depends on the degree of uncertainty over future costs, demands, and asymmetric information. The literature shows that cost-plus regulation performs better in maximizing economic welfare when there exists great uncertainty over the future costs of a regulated firm and the firm possesses more accurate information than the regulator.[20] Conversely, price-cap regulation is more defensible when cost uncertainty is low. One researcher, for example, argues based on an application of numerical methods and applying different regulatory objectives that:

> Price caps provide superior incentives for cost reduction, but the more uncertain the environment, the higher the cap must be set in order to keep the regulated firm profitable, and the greater the average ex post price-cost cap. Cost-plus regulation is then preferred, at high levels of uncertainty (p. 418). . .[T]his study suggests that price caps have been oversold relative to simple alternatives, particularly if regulators are (or should be) more concerned with consumers' surplus than with the profits of regulated firms (p. 434).[21]

Given this logic the question becomes, what industries exhibit low enough cost uncertainties and asymmetric information to justify price-cap-type regulation? It seems ironic that those industries currently under, or considered good candidates for price-cap regulation represent better models for cost-plus regulation, applying Schmalensee's logic and empirical results.

Theoretical structures and numerical evidence suggest that price caps would tend to be more optimal as an incentive system when uncertainties over costs and

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19 See Leland L. Johnson, *Price Caps in Telecommunications Regulatory Reform*, Rand Note N-2894-MF/RC (Santa Monica, CA: The Rand Corporation, 1989).

20 See, for example, Jean-Jacques Laffont and Jean Tirole, "Using Cost Observations to Regulate Firms," *Journal of Political Economy* 94 No. 1 (February 1986): 614-41; and Richard Schmalensee, "Good Regulatory Regimes," *Rand Journal of Economics* 20 (Autumn 1989): 417-36.

21 Ibid.

demand are low and information symmetric; that is, information is equally available to firms and regulators. Currently, price caps (at least politically) have more appeal for industries experiencing rapid technological change and movement toward competition. When these conditions exist, however, regulators would fall farther behind firms in acquiring relevant information about costs and demand. Further uncertainties over future costs and demand would increase for both firms and regulators, thereby giving support to a more cost-plus regulatory regime.

A counterargument says that the benefits of price-cap regulation are potentially larger for industries where technological conditions are rapidly changing and competitive conditions are penetrating.[22] The reason is that price caps would give firms more incentive to innovate and adopt new technologies, and enhanced opportunities to compete with more flexible pricing. The electric industry has more potential for technological improvements on the supply side than the natural gas industry.[23] On the other hand, the natural gas industry currently is more competitive. No conclusion therefore can be made at this point using the previous arguments on whether price caps are more justifiable for one industry over the other.

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22 See Beesley and Littlechild, "The Regulation of Privatized Monopolies in the United Kingdom," 454-72.

23 This view stems from the widely-held perception that natural gas pipeline and distribution technologies are mature, with little foreseeable prospects for new, major technologies permeating the industry.

CHAPTER 7

CONCLUSION

Rate-of-return regulation has undergone severe attack in recent years. Critics point to its inadequacies in an environment where technological changes are rapidly occurring and competition is growing. They criticize rate-of-return regulation for its rigidity in allowing regulated firms to compete in markets and to reap the rewards of innovative cost-saving activities.

"Flexibility" has become the new battle cry among advocates of change. These proponents of change punctuate the need for less rigid regulation on how firms can price their services and what profits they can earn. Their support for "flexibility" is discriminating, however. They oppose "flexibility" when it means accommodating public demand by deviating from traditional interpretations of prudence tests and regulatory oversight of planning and other management activities.

Two reports on incentive regulation, prepared recently for the Federal Energy Regulatory Commission (FERC), would give regulated firms more flexibility. A clear feature of the proposals is that they would allow regulated firms to exploit further their market power and inherent informational advantages over regulators. Any regulatory proposal that promotes price discrimination and earning high profits, of course, looks good to the firm. Does it look just as good to consumers? The answer is less certain since consumers benefit only to the extent that they share in any productivity gain that accompanies the proposals. The proposals do not assure lower prices to consumers. The Research Report, for example, proposes adjusting yearly rates so that all the gains from productivity improvements are enjoyed by the firm until the next rate review. The authors implicitly argue that although productivity improvements made between rate reviews would benefit only the firm, the proposal would stimulate regulated firms to strive for higher productivity gains. Part of the higher gains, it is assumed, would benefit consumers. Consumers ultimately may profit from the proposals, but it is safe to say that such benefits would be more speculative and less direct than those to the firm.

Both reports apply recent theoretical developments in incentive regulation to the "real world" of energy regulation. These developments include a broadening of incentives to encompass pricing practices, and a realization that incentives need to

be constructed in such a way that what is best for the firm is best for consumers (that is, incentive compatibility). In other words, the new wave of incentive regulation attempts to simulate competitive conditions where the outcomes of firms' rational behavior to maximize profits are in harmony with promoting societal interests.

The FERC reports attempt to accomplish this feat by combining market-based pricing (optional pricing) with explicit incentives designed to activate innovations and other cost-saving actions by regulated firms. The incentive proposals would allow regulated firms to compete on an equal footing with other suppliers in certain markets, and to retain permanently profits earned from cost-saving activities. Under the proposals, for example, regulated firms would keep a share of above-normal profits earned in prior periods rather than distribute these profits to consumers in the form of lower rates.

The incentive proposals reflect the workings of price-cap regulation. First, prices between formal rate reviews would be adjusted on the basis of price indices and productivity gains (Gas Incentives Report) outside the control of a firm. Second, individual prices could be adjusted downward from embedded-cost levels. As discussed in this review, the case for price-cap regulation may have been oversold by advocates. Distinctions between rate-of-return regulation and price-cap regulation may be narrower than what is widely perceived.

The authors of the two FERC reports seem to have overstated the certainty of benefits stemming from their incentive proposals, especially to consumers. First, as stated earlier, the gains to regulated firms and their shareholders are more certain and direct than the gains to consumers. Some consumers undoubtedly would benefit as recipients of favorable price treatment, but others (especially core customers) would not. The proposals leave in doubt how much consumers would benefit from productivity gains by firms. For example, in the Research Report firms would retain all the benefits of productivity gains for a number of years before distributing a FERC-specified portion to consumers.

Second, the incentive proposals are premised on the continued practice of traditional, rate-of-return regulation by both FERC and the state public utility commissions. To the contrary, both FERC and the states in recent years have adapted to changing conditions in the marketplace. Economic theory predicts that they would, in view of the costs of staying with the status quo. Consequently, the

FERC reports unfairly exploit rate-of-return regulation in its pure form as a "straw man" partially to rationalize the selected proposals.

Third, the FERC reports fail to account for the full set of institutional arrangements for improving economic performance. In the electric industry, competitive bidding for new capacity, liberalized access to transmission systems, and deregulation of utility-unaffiliated generation would be good candidates for regulatory reform.[1] It is unclear how the proposed incentive systems would integrate with these reforms. Although these alternatives may fall outside the rubric of incentive regulation, they cannot be ignored if FERC hopes to assess systematically the function of incentive systems in a world where the proper role of regulation can change radically. At best, the incentive proposals act as a transitional regulatory mechanism for industries undergoing fundamental changes toward more competition.

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[1] Joint ownership represents one institutional arrangement for liberalizing access to regional transmission systems. Joint ownership would avoid the social costs of monopoly power by single-owner transmission facilities, transfer ownership-control rights between entities on the basis of economic value (e.g., access availability to those willing to pay the highest prices), minimize transaction costs (e.g., joint ownership would avoid contracting costs associated with the possibility of opportunistic behavior by owners of the transmission grid), and eliminate the need for complex bureaucratic access and pricing rules and the incurrence of rent-seeking costs by various groups. See Kenneth W. Costello, "The Struggle Over Electricity Transmission Access," *CATO Journal* 8 No. 1 (Spring/Summer 1988): 107-24; and Vernon L. Smith, "Currents of Competition in Electricity Markets," *Regulation* 11 No. 2 (1987): 23-29.

Joint ownership of natural gas pipelines also has been proposed to encourage competition. See Dan Alger and Michael Toman, "Market-Based Regulation of Natural Gas Pipelines," *Journal of Regulatory Economics* 2 (September 1990): 263-80. Joint ownership, according to the authors, would allow pipelines to "reap scale economies, by competitive offering of transportation services by multiple shareholders to limit the exercise of market power (p. 276)."

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