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What Can We Learn from the U.S. Experience in Regulating Monopolies?

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Abstract

Production efficiency has taken on more importance, relative to fairness, as a public policy objective. The evolution of U.S. regulatory policy illustrates changing attitudes towards the efficacy of competition in promoting efficiency. Multiple goals still complicate the process, however. For example, universal service and supplier of last resort obligations raise issues in telecommunications. Similarly, state-mandated conservation programs may not be compatible with competition at the electricity generation stage when only the incumbent is vertically integrated. The one certainty is that continued vertical disintegration and partial deregulation are inevitable for the electricity and telecommunications industries. Also, traditional cost of service regulation is rapidly being supplanted by forms of incentive regulation.

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One generation's conventional wisdom becomes another's myth of the past. Interventionist liberal ideology emphasized the fragility and unfairness of markets. Only government regulation could ensure low prices and universal service in capital-intensive infrastructure industries. This view of markets and government is swinging to the other extreme in the USA. New technologies are viewed as eroding incumbent market power everywhere, even protecting small customers from undue price discrimination. Continued government intervention is perceived as protecting inefficient suppliers and providing transfers to politically powerful groups via mandated cross-subsidies. Of course, the truth is somewhere in between these caricatures of markets and governments. The extreme all-or-nothing views of command-and-control regulators and *laissez faire* free marketers are each deficient, although the latter approach identifies important policy lessons regarding incentives and the achievement of innovative efficiency.

1. Factors Affecting the Desirability of Traditional Regulation

This paper provides an overview of regulatory policies toward traditional natural monopoly industries in the U.S. Traditional regulation is only an institutional mechanism for achieving desirable economic (and social) outcomes. We are beginning to see regulators simultaneously relaxing some restrictions while tightening others. Informed policy-makers need to determine whether deregulation or new types of price and entry regulation are the most appropriate responses to technological developments in what have been viewed as natural monopolies.

1.1 Economic Perspectives on Natural Monopoly

Without some form of intervention, industries with significant economies of scale and economies of scope may exhibit undesirable performance. Prices may be *too high* (reflecting monopoly power in some markets). Prices may be *too low* (implying predatory pricing which discourages economic entry in some markets). Prices may be *too high for some but too low for others* (involving subsidies or undue discrimination). Or, prices may be *too unstable* (reflecting destructive competition when capital-intensive facilities are duplicated by entrants). These concerns with the efficiency and fairness of monopoly outcomes are legitimate and stem from analyses of the causes and effects of natural monopoly.

Over two decades ago, Edward Lowry (1973) presented an overview of the "Justification for Regulation: The Case for Natural Monopoly." He noted that efficiency, not scale economies, was the force demanding regulation for a monopolist. His *Fortnightly* article described the historical basis for regulation, and drew upon available economic literature to show that ". . .when one firm can supply the entire market at less cost than can two or more firms. . ." neither entry nor deregulation could be justified. Economies from jointly producing several products complicates the determination of the least-cost provision of traditional utility services. When firms produce several products, identifying scale economies is problematic because total cost depends on the output mix.

Lowry's basic efficiency argument for regulation still holds, although subsequent analyses by Baumol (1977) and others have formalized proper tests for determining whether a multiproduct firm is a natural monopolist for a set of services.

The economic concepts emerging in the early seventies have been made more rigorous by economists, just as technological developments were making it more difficult to determine the least cost supplier for combinations of traditional utility services. Several issues are at the forefront of current policy debates: how to determine which industry structures (and government policies) best promote new services and production processes, how to identify when a natural monopoly situation exists given changing demands and technologies, how to select price configurations that will both recover costs and encourage efficient consumption choices, and how to ensure that those prices are *sustainable* -- that is, not susceptible to the threat of entry or self-production by current customers. In some cases, a natural monopolist's relatively efficient price structure will not be sustainable in the face of entry -- justifying limitations on the provision of utility services by unregulated firms. Alternatively, a non-natural multiproduct monopolist might be protected from socially desirable entry if regulators maintain inappropriate entry restrictions.

Today, many economists view the *contestability* of a market as determining the need for regulation: potential entrants are viewed as disciplining dominant suppliers in many industries subject to traditional regulation. Whether deregulation (and the threat of competitive entry) serves as an adequate substitute for regulation depends on whether there remains adequate pressure for monopoly suppliers to keep prices (and costs) down.

1.2 Basic Economic Conditions and Regulation

It is useful to explore regulated industries in terms of the fundamental economic factors determining industrial organization. These "basic conditions" include production technologies and consumer preference patterns. Factors influencing supply and demand determine the efficient configuration of the industry. These must take into account any external effects and social objectives, such as universal service in telecommunications or environmental impacts of energy use.

The features noted earlier were associated historically with a single supplier as being the least cost arrangement for producing the quantity demanded. Thus, economic (and political) forces lead to government involvement in the past. Because of technological changes, the natural monopoly justification for regulation of these services holds only in segments of these industries today.

Regulation (in the U.S.) and public ownership (elsewhere) have emerged in response to fundamental economic features of industries, so an understanding of these features is essential to understanding the regulatory rules that affect industry structure, corporate conduct, and market performance. Figure 1 outlines the chain of causation, from basic conditions to performance. The key features can be divided into elements associated with either supply or demand. The supply conditions basically relate to underlying production technologies (eg., scale economies) and the availability of inputs. Efficiencies associated with management overseeing several stages of production have often resulted in vertical integration (economies of sequence). Similarly, economies of scope (reflecting multiproduct economies) have existed historically -- as with the joint provision of local and long distance service. On the demand side, the size of the relevant markets

and their rates of growth have a significant impact on the number of firms that can deliver the services in a least cost manner. That is, supply and demand conditions may be such that competition is not efficient or feasible.

In addition to concerns over the exercise of market power, policy-makers have other issues to be addressed. Thus, policy-makers' perceptions regarding market imperfections and market failures lead to intervention. In addition, suppliers often seek protection from potential entrants, and policy-makers utilize cost allocation procedures to create price structures which benefit favored customer classes. Special interest beneficiaries of entry protection, exit prevention (carrier of last resort obligations), and existing price structures are threatened when there are changes in technologies or in public policy priorities.

Thus, basic conditions influence public policy which in turn constrains the evolution of telecommunications markets. If an industry can be described as a natural monopoly, then rate of return regulation is one way to obtain lower prices and reduce excessive profits. However, when changes in production technologies, demand conditions, and other factors occur, we observe changes in regulatory regimes -- as old rules and procedures are recognized as inappropriate for new industry conditions. In addition, even where change has not been profound, an improved understanding of the long term consequences of ignoring key aspects of cost, demand, or traditional rate-of-return incentive structures has led to a re-thinking of regulation.¹

Figure 1 shows how traditional regulation influenced the structure of the telecommunications industry and limited the range of behaviors observed. Regulatory rules defined markets, constrained entry, and facilitated vertical integration by firms. Thus, rate of return on rate (ROR) base regulation was designed to enable the firm to earn a fair return on its investment while protecting customers from monopoly prices. Complex cost allocation procedures resulted in the sharing of capacity costs across customer groups, over markets for different services, and between geographic areas.

Thus, regulation influenced the number of suppliers in various markets and the prices facing customer groups. However, the optimal configuration of firms in an industry depends on the underlying basic conditions -- which change over time. Economies of scale, scope and sequence characterized telecommunications production technologies in the past. Changes in technologies and demand patterns have altered the nature of regulation in the U.S.

¹ In the absence of regulation, basic conditions facing an industry determine the number and size distribution of suppliers which are feasible in an industry. Causation runs from the basic conditions to industry structure (entry conditions, number of firms, degree of vertical integration and product differentiation). Industry structure influences, in turn, the behaviors likely to be observed (prices, promotion, research and development, production process changes and new service introductions). The market outcomes can then be described in terms of performance criteria (profitability, efficiency, innovation and meeting other social objectives). Clearly there are feedbacks in this process—for example, high levels of R&D can lead to innovations which affect the production technologies and entry conditions.

Figure 2 provides a more explicit characterization of causal relationships. Here, feedbacks are recognized. Basic economic conditions (technologies, preference structures, population density, income) determine the structure of the telecommunications industry -- in conjunction with regulations. Four regulatory policies are identified: entry policy, price caps, incentive plans, and sharing rules. These have been adopted in combination and separately in various state jurisdictions. Thus, economists have a natural experiment generating observations on regulatory regimes and (short term) corporate behavior and performance.

Characterizing the regulatory regimes and channels of causation is extremely difficult. For example, entry policies affect industry structure directly, but limits on incumbent price flexibility can encourage entry. Price caps have many components: productivity offsets, bundles of services, inflation adjustments, duration of the plan, quality of service constraints, and procedures (and the timing) for future modifications (Sappington, 1994). Similarly, incentive plans (such as those being implemented in telecommunications) may establish a cap in exchange for network modernization investments. These investments, in turn, affect basic economic conditions and incentives for competitive entry. Sharing rules are other devices which provide more incentives for cost containment and new service introductions than traditional rate of return regulation. Higher earnings provide a flow of funds which can be applied to modernization. Another potential feedback arises from productivity advances which affect political perceptions regarding the industry.

1.3 Rate of Return Regulation²

Traditionally, rate of return (ROR) on rate base regulation has served as the mechanism for constraining profits and reducing prices. In practice, prices often were determined in a stepwise fashion. Under cost pressures, a firm would apply to the appropriate regulatory agency for permission to raise its prices. A hearing would be held at which the commissioner(s) listened to the firm's arguments as to why the increase is necessary. Typically, a test period would be selected, such as the past 12 months, for which the firm gathered data on costs and revenues. Intervenors participated in the hearing, including consumer advocates or environmental groups; they argued, sometimes through outside experts, why prices should not be raised or why capacity expansion should be delayed. The commission also had a staff that studied the arguments and data and made recommendations.

The process can be divided into three basic steps: (1) The firm's costs are reviewed, and costs deemed to be unnecessary are eliminated. (2) A rate of return judged to be fair for the firm is specified. (3) Prices and their structure are set to generate enough revenue to cover costs and provide a fair rate of return. This process is referred to as rate of return regulation, and it is widely used by state and federal regulatory commissions. Rate of return regulation probably has been studied more than any other form of regulation. A general description of the rate of return process and problems inherent in that process follows.³

² This section is drawn from Berg-Tschirhart (1988), pp. 298-299.

³ The presentation here should be viewed as a description of what regulators who impose a rate of return constraint must consider, rather than as a description of the regulatory process. Joskow

Consider a regulated firm that uses two inputs to produce a single output. Profit for the firm is

$$\pi = R - wL - rK - d - T$$

where L is a variable input such as labor or fuel (for a power company), and K is the capital stock. The prices of L and K are w and r , respectively, and the firm takes these prices as given. R is revenue, which is price times quantity. Depreciation of the capital stock is d , and T is the firm's tax bill. Assuming profit-maximizing behavior, the firm's objective is to maximize. However, regulation imposes a constraint on the firm's behavior, requiring the firm's rate of return to be no greater than a specified allowed rate of return. The rate of return constraint takes the form

$$\frac{R - wL - d - T}{K - D} \leq s$$

where the left-hand side is the rate of return, and where s is the allowed rate of return specified by the regulator. The numerator is the net operating income, and the denominator is the firm's rate base.

Note that the rate base is the capital stock less cumulative depreciation, where D is the sum of all past periods' depreciations (i.e., the sum of past d 's). A more detailed description would specify time periods and would subscript the d 's, but for now, the formulation is sufficient to capture the important elements. To impose this constraint, regulators require a uniform system of accounting for public utilities. This framework is important in order to maintain consistency across firms in categorizing operating expenses, capital outlays, depreciation, and taxes. Without a uniform system, the regulator would be faced with the time-consuming task of interpreting accounting procedures that vary from firm to firm. This formulation takes the price of physical capital as one dollar per unit; so the rate base, $K - D$, is measured in dollars, and r is a percentage -- reflecting the cost of financial capital, which is then used for the acquisition of physical capital.

There are inherent problems with imposing the rate of return constraint on a firm's behavior. These can be divided into four classes: (1) allowable costs; (2) depreciation expense; (3) incentives; and (4) the rate base and allowed return.⁴ Each of these raise significant issues:

- (1) Are advertising outlays legitimate expenses?
- (2) How should research and development be treated (expensed or capitalized)?

(1974) criticizes what he believes is an over-emphasis on models with a rate of return constraint.

⁴ For more detail on these problems, see Kahn (1971) or Phillips (1984).

- (3) Should the rate base be valued at original cost or replacement cost?
- (4) What is the appropriate cost of capital (i.e., how risky is the industry)?
- (5) What mix of debt and equity is appropriate?
- (6) How should construction work in progress be treated?
- (7) Should changes in tax and depreciation policies be "normalized" or flowed through to customers?
- (8) How are "excessive" returns to be recycled to customers?

The issues have been addressed in the context of specific cases, and state regulatory commissions have reached a variety of conclusions regarding these issues. Note that traditional regulation has a number of institutional features which discourage inefficient behavior (Doug Jones, 1992, p. 127):

- (1) "disallowance of imprudently incurred expenses,
- (2) prudence reviews and application of the used-and-useful test,
- (3) yardstick performance comparisons, not only with public power but among similarly situated investor-owned utilities,
- (4) commission-ordered management audits of both the reconnaissance and focused type,
- (5) judicious employment of regulatory lag,
- (6) altering the allowed rate of return to induce appropriate utility behavior, [and]
- (7) occasional and selective jawboning by regulators."

The seven features suggest that cost of service incentive (COSI) regulation is not a "cost-plus" approach; instead, it could be described as a system of command and control. Although the seven features of this system raise a number of incentive issues, they are utilized in most state jurisdictions.

One does not have to look far to observe technological and organizational changes that have induced changes in regulatory policies towards industries. Firms have responded by adopting new price structures, entering new (but unrelated) markets, and diversifying into unregulated industries. Given the large number of issues facing regulators and managers in the capital-intensive energy and telecommunications industries, it is useful to survey how economists now approach the cases for and against regulation. Politicians and academic economists sometimes find themselves on different sides of the policy fence. This review can partly explain how two observers with different

backgrounds (and perspectives) can view the same situation so differently -- one with alarm and the other with hope.

1.4 Technological Change and Industry Restructure

The driving forces behind deregulation efforts are diverse: a renewed emphasis on perceived indirect costs of ROR regulation, observed technological changes in energy and telecommunications that alter optimal industry structures, and concern that the substitution of administrative processes for competitive pressures is an inadequate stimulus to innovation. Each of these points is debatable, but they certainly set the stage for current discussions.

Consider the first point: regulation reduces incentives for efficient production -- both in terms of input use and the composition of output. The evidence on this matter is mixed. Statistical researchers have not definitively established the existence of an Averch-Johnson effect: overcapitalization when the allowed rate of return is greater than the cost of capital (Boyes, 1976 and Zimmer, 1978). Furthermore, from the standpoint of theory, uncertainty (in terms of demands, input prices, and allowed returns) can induce undercapitalization. Regulatory lag also mitigates against input-mix inefficiencies. Thus, alleged inefficiencies related to the so-called "cost-plus" nature of regulation are supported by neither theory nor empirical observation.

The other two concerns may be harder to definitely support, but the potential costs to ignoring them can be significant. Innovations have dramatically affected technological opportunities in telecommunications, and market growth has persuaded policy-makers that long-distance can support a number of competitors. Perhaps more important, but more difficult to document, is the link between competitive pressures and innovation. Utilities that are insulated from competitive pressures may be outperformed by other firms who ultimately capture segments of what had been regarded as monopoly markets.

The long-run threat to the viability of the regulated firm may not induce appropriate public and private responses because of regulatory inertia or inadequate cash flows for making necessary investments. In addition, regulatory lags in an inflationary environment or the absence of penalty (reward) systems for poor (strong) performance ultimately hurt consumers. For example, Bower (1987) argued the asymmetric regulatory treatment of investments in excess plant will ultimately force deregulation of the generation phase of the electric utility industry. His predictions are coming true in the new world of independent power producers.

1.5 Consequences of Deregulation

Applying the concepts of least-cost suppliers, contestability, and sustainability to formulate public policy is problematic, since they represent idealized cases, involve difficult empirical examinations of industry cost and demand functions, and can require projections of technological developments. Nevertheless, the ultimate goal of economists working in this arena is to translate these conditions into recommendations concerning which industries should be regulated, and which industries should be deregulated (when contestable markets and sustainability ensure relative efficient outcomes).

Decision-makers cannot wait for full information and complete certainty regarding impacts on all affected parties. From the late 1970's to the present, policy-makers have made many changes in the extent of regulators' domains, without waiting for unanimity among economists (admittedly an elusive goal) as to the efficacy of such policies. On the one hand are the trucking and airline industries which have been substantially deregulated. Here, there probably is widespread agreement among economists that this policy was proper, since firms in these industries are either not natural monopolies, or the markets are contestable. In fact, deregulation of the airlines is probably one of the crowning achievements of regulatory economic analysis, particularly since it was orchestrated by CAB Commissioner Alfred Kahn under the constant scrutiny of the public (McCraw, 1984).

On the other hand are the telecommunications, railroad and natural gas industries which have been partially deregulated. The need for deregulation, or at least particular mixes of deregulation activity, was less clear. For instance, deregulation of telecommunications by permitting entry may prove to be wise if technological advances are spurred as a result. But if entry is only due to bad regulatory policies to begin with, viz., regulated prices that involve cross subsidies, then deregulation of entry without allowing for price flexibility by the dominant firm may prove costly. We must continue to improve our methods for determining where regulation is justified and where deregulation can yield efficiency gains. These determinations will seldom be obvious or go unchallenged, and where deregulation is implemented it must be assessed for its success or failure.

Although this survey mainly describes recent developments in telecommunications and electricity, regulators face challenges in other industries as well. The natural gas, rail, and water industries are undergoing transformation to different degrees. In late 1985, the Federal Energy Regulatory Commission's Order 636 restructured the first industry as it instituted an open-access natural gas transportation program. Unbundling transportation has introduced new risks and opportunities for local gas distribution companies. State commissions are now addressing retail competition at the local level. In the second industry, railways have been permitted greater pricing flexibility since the Staggers Rail Act of 1980. The Interstate Commerce Commission monitors the financial condition of railroads, consolidations, abandonments, and other activities, but it does not impose rate of return regulation on private railways. Trucking has been substantially deregulated. Water utilities represent the most fragmented and pluralistic industry, with thousands of private and municipal suppliers. Water quality standards related to pollution and wastewater are established under the U.S. Environmental Protection Agency. In addition, one state agency might regulate environmental impacts while another issues permits regarding withdrawals from groundwater. The state public utility commission regulates rate of return and prices of investor-owned utilities -- only a portion of the total. The fragmented regulatory authority limits opportunities for integrated resource planning. There is evidence that real water prices are rising more rapidly than income (Rubin, 1994, p. 79). Clearly, these three industries present policy-makers with a wide range of issues.

The fundamental issue facing policy-makers in telecommunications and electricity involves ensuring that the benefits of competition flow to those who successfully commercialize new services and introduce new production processes and to consumers who desire those services. Addressing residual market power in these two industries remains a key problem. Examples are presented

below to illustrate regulatory trends in the USA. The irony is that the transition to greater competition involves new types of regulation rather than less regulation.

2. Telecommunications in Transition

The U.S. Federal Communications Commission is the independent regulatory agency responsible for regulating all interstate and foreign communication by means of radio, television, wire, cable, or satellite. The FCC requires common carriers to furnish service upon request and at reasonable rates. Common carriers must file tariff schedules (lists describing services and charges) for review and regulation by the commission. The carriers must show that all charges, practices, classifications, and regulations are just and reasonable. If the commission concludes that the rates are too high or provide an excessive rate of return, it may suspend the terms of the filing. Among other responsibilities, the FCC regulates with price-caps AT&T and the portions of local exchange companies (LECs) affecting interexchange competition, monitors the reallocation of costs of telephone service between local and long-distance customers, ensures equal access to the long-distance network, monitors the degree of competition among cable operators, and (currently) oversees their rates.⁵

The irony is that the transition to greater competition involves new types of regulation rather than less regulation during the evolution to new industry structures. Numerous contentious issues remain: funding universal service, maintaining network interoperability, ensuring service quality, developing number portability, continuing supplier of last resort obligations, determining the appropriate extent of unbundling, and designing efficient prices for network components. The politics of regulation are such that regulators dare not withdraw from the field before they are confident that politically powerful consumer groups are, indeed, protected from the exercise of residual market power. Similarly, to the extent that policy-makers can operate as honest brokers in the development of complex contracts in vertical markets, they may be able to make the transition to competitive markets less disruptive. However, involvement in these negotiations (or dictating new supply arrangements) requires different types of regulation than in the past. To some extent, hearing rooms will continue to serve as the arbiters of outcomes -- limiting the role of the marketplace in rewarding good performance.

As telecommunications markets become effectively competitive, incentive regulation (in the form of price caps or profit sharing rules) will be unnecessary for consumer protection. Antitrust policies will replace regulation as the main constraint on firms. Of course, if social objectives such as universal service are not met via competition, other funding mechanisms will be needed. Aside from this caveat, competition displaces regulation as a vehicle for achieving economic objectives -- although the terms and conditions of access to network components will keep regulators occupied for the foreseeable future!

The most important issue facing policy-makers is the *process* whereby competition is introduced into telecommunications markets. We know that local telephony, long distance,

⁵ Note that LEC regulation involves the sharing of profits, while the AT&T price caps do not.

information services, television, and mobile services will be organized very differently in the future due to technological innovations and changes in public policy. The precise steps whereby incumbent firms in one industry become entrants into another will be determined by laws proposed and passed by Congress and state legislatures, and by rules established by the FCC and state commissions. The rules will depend on the priorities established in law. Incentive regulation in markets with residual market power represents one approach to constraining firms. New features of the telecommunications industries are listed in Figure 3.

2.1 Post-Divestiture Developments

With AT&T divestiture, Local Access and Transport Areas (LATAs) were created to delimit the geographic areas; the LECs could transport telephone calls within broadly matched standard metropolitan statistical areas (SMSAs) and adjacent rural regions. Interexchange companies (IXCs) such as ATT, MCI, and Sprint interconnect with LECs to provide long distance (interLATA) service. Today LATAs do not necessarily mesh with cellular or PCS territories or cable TV franchises, yet firms using these technologies are likely entrants into telephony service. Furthermore, extended area service (EAS) is expanding the size of "local" calling areas, as communities with substantial economic and social ties are brought into the same local calling territory. Such bundling could also be viewed as enabling LECs to expand their markets under existing regulatory arrangements.

The markets for intraLATA and local communications are primarily state regulated, with Federal regulators retaining authority over parts of the local carriers that influence interexchange competition, such as access, interconnection, transport, and switching. Every state has some agency responsible for telecommunications regulation of LECs. Public service commission (PSC) authority, resources, and regulatory policies vary widely by state. The 1993 U.S. local communications market was \$97.7 billion in revenues. Local Exchange Carriers (LECs) account for approximately \$91 billion (93.2%), Competitive Access Providers (CAPs) \$0.2 billion (0.2%), and Cellular \$6.5 billion (6.7%).⁶ In the intraLATA toll market, state regulators may allow resale and/or facilities-based competition for intraLATA toll services. Some states prohibit intraLATA competition, which may hold down local rates since this policy reduces the likelihood of revenue-erosion induced by competition. In states where competition is not prohibited, state regulatory policies still affect the degree of competition, e.g., type and quality of transmission, switching, and access available to competitors.

In the market for local communications, states are clearly adapting to technological and economic changes, dropping rate of return (ROR) regulation and permitting entry against the incumbent LEC. According to a recent study by Davis, Zearfoss, and Reed (1995), thirty-five states have alternatives to traditional ROR regulation. For example, 11 states have implemented price caps and another ten have them under formal consideration. Others have revenue sharing (Idaho and Oregon) and profit sharing (Florida and Nevada) mechanisms or make distinctions between basic and competitive services. Sharing mechanisms often result in revenues being retained by the

⁶ Jamison (1993).

supplier. Sometimes revenues are allocated to network investment or directly to consumers via rebates. Competition in switched local service has been allowed in 13 states, with 16 more formally considering full local competition. Of course, the terms and conditions of interconnection access will ultimately determine the rate of entry, but the trend is clear. In addition to state regulation, municipalities may levy franchise fees and right-of-way charges that affect entry and competition. A regulatory concern is that these fees may be discriminatory.

A fundamental goal of the FCC has been to encourage universal telephone service (UTS). The carrier common line charges and residual interconnection charges paid to LECs by IXC's per minute of access provide about \$10 billion per year towards keeping local service prices low.⁷ To the extent that these per minute charges exceed incremental costs, uneconomic bypass is encouraged. These cross-subsidies are at the heart of current regulatory concerns for competition in local exchange and the potential re-entry of the regional Bell operating companies (RBOCs) into interexchange markets. Since divestiture, the regional holding companies have faced line-of-business restrictions that prohibit them from offering interLATA services. Several proposals currently before the U.S. Congress may drastically alter the present market structure by reducing the line-of-business restrictions on the RBOCs and setting new rules for interconnection and unbundling of the network. These proposals may pave the way for direct competition among LECs, cable carriers and IXC's. With these proposals and continued adoption of new technologies, the LATA definitions that currently partition the local and long-distance markets will become obsolete. State and Federal regulatory authorities will overlap to a greater extent. Many states have assumed a reactive stance, waiting for the outcome of Federal regulatory change. Some states, such as New York and California have taken a more proactive approach, testing the competitive waters. Paramount among Federal regulatory concerns is the need for an equitable, consistent, unified policy that fosters competition and innovation, and results in compatible technologies with minimal inefficient duplication of facilities. Translating these concerns into a coherent and consistent policy has not come easily.

2.2 State and Federal Initiatives

Jurisdictional issues arise to complicate policy-making. For example, New York, California and other states have filed appeals on the October 18, 1994 Ninth Circuit Court decision upholding the FCC's preemption of state rules regarding customer proprietary information and structural separations rules for BOC provision of "jurisdictionally mixed" enhanced services. At the national level, state regulators are very concerned that federal telecommunications legislation will shift oversight to the FCC of carrier of last resort obligations, intrastate regulations for unbundling, competitive entry into rural areas, and some local rate adjustments.

A series of New York Public Service Commission (NYPSC) decisions has created what may be the first competitive market in local service. The Rochester Telephone Corporation (RTC) restructured itself into a basic network services company and a competitive company, Frontier

⁷ The estimates are from Jamison (1994). The effectiveness of such transfers in promoting universal service is questioned by many. See Kaserman, Mayo, and Flynn (1990).

Communications -- regulated as a nondominant carrier by the NYPSC. Rochester provides unbundled services (loop, switching, and transport functions) as well as interstate access. The FCC approved waivers of the Part 69 Rule to enable Rochester to recover access charges in a manner appropriate in a competitive marketplace involving resellers. Some potential entrants, including AT&T, question whether those rates facilitate entry. The Rochester Plan provides one model for introducing competition into the local loop.

In May 1994, Maryland became the second state to open the local market. Metropolitan Fiber Systems (MFS) was allowed interconnection to compete for business and government customers. Thus, MFS moves from being a competitive access provider to a full service supplier, including long distance, local, and other services. Within days, a local cable company owned by Southwestern Bell Corp. filed with the state PSC to provide telephony service to residents.

To illustrate how other state PSCs are beginning to promote competition, we note that 6 commissions have implemented intraLATA toll presubscription, 7 have required network unbundling, and 15 have established collocation standards. Each of these points raises important issues. The first addresses how intraLATA service providers are selected when competition is initiated. Network unbundling determines the network services and functions available to entrants. Collocation involves competitors' ability to physically locate switching and other equipment inside or near LEC facilities. Formal consideration of these three issues is occurring in over one-quarter of the states. For example, after the FCC's 1993 order allowing competitors to interconnect with LEC networks for interstate switched access services, a major competitive access provider (MFS) received co-carrier status in New York, Illinois, Maryland, Washington and Massachusetts. It had applied in 8 others by mid 1995. Similarly, panels and task forces are studying distance learning, telemedicine, and other aspects of advanced telecommunications infrastructure in almost every state. For example, in September 1994, Texas PUC proposed that health facilities experimenting with telemedicine receive a 25% discount on ISDN services.

Public policy continues to evolve in response to innovations and commercial opportunities. The trend has been towards deregulation and flexible pricing for competitive services. As noted earlier, if a firm or market is deregulated, it is not necessarily unregulated. States (and cities) often extract commitments for specific types of network modernization. Thus, entry conditions differ widely across states and even within state regulatory jurisdictions. Dyslexic fans of acronyms observe that state PSCs (Public Service Commissions) may be reconstituted into CSPs (Competitive Service Police)!

State commissions also tend to have fairly broad responsibility for ensuring that service quality standards are met. For example, the Idaho Commission ruled (December 1994) that 25% of US West's regulated revenue would be placed at risk until service quality decline was reversed. Similarly The Colorado PUC reached an agreement with US West to provide \$4 million for public service projects as "reparations" for service quality violations occurring in 1993 and 1994. Monitoring and encouraging quality becomes especially important under price cap regimes (Berg and Lynch, 1992).

In October 1994, the FCC passed an order on Video dialtone (VDT) to facilitate increased LEC involvement in the videoservices market. However, it retained the common carrier aspects of

the platform, so other programming suppliers have access to VDT. It renounced its prior assertion of exclusive jurisdiction -- recognizing a role for states. The statement also reiterated a desire to avoid cross-subsidization from telephone ratepayers and prevent predation against cable systems.

Telecommunications markets are in transition. Policy-makers recognize that they can limit excessive profits by depending on competitive pressures or on regulations. There is widespread agreement that traditional return on rate base regulation (and associated cost allocation procedures) diminish incentives for efficiency. However, price caps are no panacea. Periodic reviews of price-cap plans tend to result in tighter regulation in response to revealed firm profitability (i.e., a "ratchet effect"). When this happens, incentives to reduce costs and price efficiently are diminished. The composition of baskets, the baseline prices, the productivity X-adjustment, adjustments for exogenous developments, and plan duration represent other points for debate.

Long distance contributions to covering costs of the local loop (via access charges) comprise over half the "cost" of interstate calls and encourage bypass -- through alternative access providers. The price caps applied to LEC access charges have been under review by the FCC. In May 1995, the FCC issued a Report and Order with an "interim" plan allowing LEC's to choose one of three productivity ("X") factors: 4.0, 4.7, or 5.3 percent. The low performance targets are linked to lower rewards, with the 5.3 factor involving no sharing or rate of return caps. Additional downward pricing flexibility was facilitated. Furthermore, a decrease in base rates of up to 2.8 % was ordered, applied to the index, rather than rates -- since actual prices are less than the index in some jurisdictions. The reinitialization of access prices looks like a "ratchet" effect -- tightening regulation when profit (or productivity) performance turns out to be higher than had been previously expected.

There is much concern over creating a "level playing field" during this transitional phase. For example, the FCC has rules that limit BOCs use of Customer Propriety Network Information (CPNI) in marketing services to customers. Customers can request that information regarding calling patterns be denied to marketing personnel. Potential demands for enhanced services and telephony appliances (customer premises equipment -- CPE) can be gauged using these data bases. Balancing customer privacy with efficiency and competitive fairness has raised this concern within state and national jurisdictions. Currently, third parties must obtain permission from customers to obtain billing or other information from LECs. Given the strategic alliances developing between LECs and other suppliers, the FCC is continuing to examine alternatives to current rules. As Figure 4 indicates, the multiple goals pursued by policy-makers greatly complicate the regulatory process. Regulators seldom prioritize their objectives!

2.3 Transitional Regulation

The common thread through Congressional hearings and proposed legislation, National Telephone and Information Administration (NTIA) recommendations state initiatives, and FCC opinions and policies is the need for a modern national telecommunications infrastructure. In the debates over transitional regulation, six issues warrant particular attention:

- 1) In the transition to competitive markets, are price caps or sharing rules superior for encouraging cost reductions and the introduction of new services? Does frequent price cap review equate with ROR?
- 2) Are there "essential facilities" in telecommunications; and what are the economies and problems associated with vertical integration? What concentration ratios and entry conditions are likely to characterize deregulated telecommunications markets?
- 3) Should the goal of universal basic (dial-tone) service be replaced by a goal of universal broadband service?⁸ Is the issue one of timing or actual access to two-way video communication? How will lives be affected by the presence (or absence) of particular enhanced telecommunications services?
- 4) What are the levels of subsidies currently in place? Are there more efficient ways of obtaining revenues to promote universal service? Should one carrier be required to provide ubiquitous service, serving as a supplier of last resort?
- 5) What kinds of market structures are most likely to promote innovation? Who should bear the risks associated with the massive infrastructure investments expected over the next two decades?
- 6) Do we really need a "national" infrastructure policy at all? Given the uncertainties about the optimal configuration of suppliers, would it be better to allow different approaches to emerge, so that the diffusion of the best ideas arises via the competitive marketplace instead of through bureaucratic processes?

The regulatory issues are complex; consider those related to legal/regulatory, environment, technical issues, and universal service. The first set includes current barriers to competition, appropriate roles for regulators during transitional regulation, and interconnection. All three topics are contentious. For example, regulators can use entry policy as a regulatory instrument which influences incumbent firms: letting telcos into new markets (interLATA or video) would provide new net revenue streams which makes a lower price cap feasible for basic service. Similarly, excluding potential entrants from local telephony enables a continuation of geographic rate averaging. In addition, the appropriate level of unbundling and the pricing of network elements will affect the revenues of incumbents and costs of entrants. Too high a price will unduly dampen competition, too low a price will confer unjustified savings onto entrants in the local exchange market. Establishing prices which are efficient, fair, and nondiscriminatory will be a challenge. Compensation for access to networks also raises important issues regarding value-based versus cost-based pricing.

⁸ Broadband technology supports data rates in excess of 45 Mbps (Megabits per second): "...an integrated, all-fiber, all-digital, two-way, high-speed network." (Egan, 1991, p. 4)

The technical issues are probably less important politically, but their resolution will not be simple. Included in this set are telecommunications infrastructure development, open network architecture policies for resellers, and mechanisms for sharing capacity (and technologies). In addition, reliability, network interoperability and number portability raise regulatory issues.

The third area to be addressed by regulatory initiatives relates to the potential impacts on universal service of competitive entry in the local exchange. Linked to this issue is the appropriate definition of basic service, the current level of subsidies (or contributions) from other services, possible future mechanisms for keeping local calling rates low, and costs (or benefits) of carrier of last resort obligations. Policy-makers are trying to ensure that the benefits of competition are partly captured by consumers.

Another issue is number portability. In January 1995, the FCC identified key principles for the administration of the North American Numbering Plan and applied them to an area code proposal by Ameritech for dealing with scarce numbers for the Chicago area. The proposal would have required that cellular and paging carriers to surrender the 708 code currently assigned (and created a new "overlay" area code). The FCC saw this "take-back" as unjust and unreasonable. Such discrimination among technologies or carriers raises concerns regarding open entry and access. The declaratory ruling illustrates the fundamental importance of interconnection issues.

Similarly, taxes and other jurisdictional issues arise with entry that erases traditional geographic boundaries. Property taxes will be paid by all firms. Also, sales taxes are often levied on CATV and other services. There is a concern that the information superhighway could be adversely affected by local authorities. Are requirements that a PCS tower on a public building involve exceedingly high payments to the city a legitimate use of local power? Are requirements to improve a city park a reasonable quid pro quo? The information superhighway issue has been labeled one of Highway Beautification vs. Highway Robbery. A similar problem surrounds payments for pole attachments -- whether owned by a municipal utility, an investor owned electric utility, or a LEC. The FCC has oversight for pole attachments, but the issue of PCS stations is quite similar.

The movement towards competitive markets is both inevitable and disruptive. However, the extent of the savings to customers will be determined by the particular path of deregulation selected by legislators and mediated by regulators. Forms of incentive regulation are often introduced in conjunction with pro-competitive policies.

The listing of topics demonstrates how related issues complicate the development of public policy in the area of telecommunications. Repeating the words "competition and incentives" three times (or even enshrining the word in law) does not resolve these important issues. Policy-makers must structure the transitional regulations so that competition is introduced in such a way that benefits flow to efficient suppliers and to the purchasers of telecommunications services. According to the economic theory of regulation, (Stigler, 1971 and Peltzman, 1976) some of the savings made possible by new technologies may be diverted to other groups to meet other objectives (for example, to low income groups to meet the universal service objective).

Political pressures influence public policy. Congress recently re-regulated cable TV in response to extensive consumer complaints about poor service and exorbitant rates. Some view the FCC's ultimate goal as fostering competition by allowing telephone companies to enter cable television. However, the FCC seems willing to defer to the courts on this issue. A clear directive from Congress could alter the situation. Several Congressional proposals may drastically alter the present market structure in telecommunications and cable. The proposals involve

- i) lowering the line-of-business restrictions on the regional Bell operating companies (RBOCs),
- ii) establishing a test for appropriate RBOC entry into new lines of business, and
- iii) setting procedures for establishing rules for interconnection and unbundling of the network.

In addition, electric utilities are urging Congress to pass legislation that allows them to compete in telecommunications using their fiberoptic networks.

2.4 Emerging Technological Developments

Even without new national legislation, regulatory agencies change and evolve. Reflecting the auctioning of the Personal Communications Systems (PCS) licenses, in December 1994, the FCC Wireless Telecommunications Task Force officially became a "Bureau", overseeing policy and the administration of resource-spectrum auctions, cellular, paging, PCS, and other services. The \$7 billion raised from the auction should serve as a catalyst for additional auctions in the future. As entry into the local exchange market occurs via this technology, deregulation of telephony will have an even more significant impact on prices and new services. There will likely be multiple lanes (technological platforms) on the information superhighway -- but establishing different rules for each lane is likely to highly inefficient. In another development, in September 1994, the FCC granted ATT's request to transfer control of McCaw's more than 400 radio licenses (including 30% of the nation's top 200 urban areas). FCC approval of the merger was justified in terms of increasing consumer choice (via the promotion of competition) and enhancing the nation's capabilities for operating in the global marketplace.

Emerging technological developments will continue to condition regulatory and corporate activities. The dramatic success of Internet and its progeny illustrates the ability of innovative applications to elude regulatory constraints. Voice e-mail substitutes for local and long distance calls. Mosaic has integrated a range of Internet Services, including the World Wide Web -- defined by the National Institute of Standards and Technology (Framework, 1994, p. 6-13) as "a collection of interconnected information hypertext servers and repositories". Portions of the information superhighway are actively utilized by scientists, high-tech researchers, and large businesses.

Recent partnerships and strategic alliances are transforming the industry. They tend to link transport and content providers, often using a variety of technologies:

MCI announced in May 1995 that it can invest up to \$2 billion for 13.5% of Rupert Murdoch's News Corp (which owns Delphi Internet Services, Fox television network, and Sky and Star satellite services, to list a few).

British Telecom paid \$4.3 billion for 20% of MCI, gaining access to the US market and adding to its global capabilities.

Sprint established a joint venture with three major CATV systems (TCI, Cox and Comcast) to provide wireless PCS. It is also forming a global alliance with France Telecom and Deutsche Telekom.

US West purchased a 25% share in Time Warner's entertainment unit -- providing content for US West and local telephony capabilities for Time Warner's cable systems.

Tele-TV Venture was formed by Bell Atlantic, NYNEX and Pacific Telesis for the development and acquisition of programming.

Ameritech, Bell South, and SBC established a programming project with Disney.

Bell Atlantic and NYNex merged their cellular operations and joined with USWest and AirTouch Communications to offer PCS.

AT&T paid \$11.5 billion for McCaw Cellular Communications.

IBM and GTE have teamed up to provide IBM data services via GTE cellular remote laptops.

The pace and pattern of new services will be influenced by national and state regulatory constraints, but fundamental economic forces will ultimately reconfigure the industry in ways that are consistent with the emerging technologies and commercial opportunities.

3. Evolution of U.S. Electricity Regulation

The electric energy industry lags behind telecommunications in terms of competitive pressures, but regulatory roadblocks to competition at various stages of production are beginning to fall. Traditionally, most regulatory authority has been vested in the states, so the system is conducive to regulatory innovation. However, for the past two decades, national legislation has been a major factor shaping entry conditions. The process of evolution within the American regulatory environment is driven by wider adoption of approaches that have been successfully implemented in a few states. This heterogeneity also results in confusing and sometimes contradictory state regulatory regimes. ROR on rate base regulation has characterized the industry, with customer-class cost allocation rules, fuel adjustment clauses, and management audits further constraining prices and revenue requirements.

The evolution of US regulatory policy illustrates changing attitudes towards the efficacy of competition in promoting efficiency. At the same time, concern over environmental impacts has

placed new objectives onto the regulatory agenda; the new instruments for achieving new objectives raise complex issues. For example, state-mandated (utility-funded) conservation programs may be inconsistent with competition at the generation stage, especially if retail wheeling is widely adopted. As price is driven towards incremental cost, funds for programs dry up. Nevertheless, most industry observers expect vertical disintegration and partial deregulation to continue.

Regulatory constraints often create incentives for the regulated firm to change behavior. Current interest in "incentive" regulation suggests a desire to avoid negative performance outcomes associated with cost of service incentive (COSI) regulation. Generally characterized by command and control, COSI establishes accounting rules, allowed rates of return, and cost allocation procedures to assure procedural fairness, limit excess profits, and establish prices across a wide range of customer groups. Regulations emerged over time to address these issues. As problems arose (or new social objectives were identified), new regulatory instruments were proposed to address the concern. The adoption rates of the new instruments across states, while of substantial interest, is not examined here. Rather, the focus is on how new command and control regulatory procedures have tended to be overlaid upon one another. The negative impacts of mutually inconsistent constraints partially explain the 1992 Energy Act's emphasis on deregulation and increased competition in the electricity sector.

3.1 Fairness: The Traditional Regulation of Profitability

The justification for regulation goes beyond the traditional natural monopoly conditions yielding single suppliers in a service territory. However, the features of natural monopolies characterized the electric utility industry for half a century. The underlying basic conditions (shown earlier in Figure 1) included economies of scale, scope, and sequence. Low costs were obtained when firms were larger, multiproduct (peak and off-peak electricity at a variety of voltage levels), and vertically integrated (generation, transmission, and distribution). Given the pattern of demand, least cost production required a single supplier. Thus, the industry structure was a function of basic industry conditions. In the absence of regulation, the resulting corporate behavior raised public policy issues. Without intervention, industry performance was perceived as being inadequate: social and economic goals were viewed as unachievable without regulation.

Historically, instruments and goals have tended to be added over time, not replaced or eliminated. This process of accretion can cause inefficiencies since some regulatory instruments make it more difficult to achieve particular regulatory objectives. In other cases, the instruments reinforce one another. Some analysts label the accretion of rules as a "tar baby effect" with regulators introducing more and more constraints over time in response to evolving utility strategies. Note that the complex links between instruments and objectives are often not discovered until after the fact. Furthermore, regulators operated on a case-by-case basis; they tended to prefer having flexibility rather than having to adhere to a clear set of priorities. Thus, a consistent set of trade-offs is not achieved over time.

The growing complexity of the regulatory landscape is depicted in Figure 5. The historical evolution of state and national regulation is far more complex than can be captured in a listing, but

this impressionistic characterization sheds light on changing objectives. The time period breakdown focuses on regulatory developments in the last three decades to illustrate recent developments. Figure 5 shows how policy development can be described in terms of two factors: (1) economic (and social) objectives, and (2) instruments adopted to achieve the regulatory goals.

Greer (1993) argues that the answer to the question of why we have regulation revolves around justice (or fairness). He identifies five categories of fairness: to buyers generally, to sellers generally, among different buyers, among different sellers, and as an administrative process. The objectives listed for 1907-1949 (Figure 5) generally fall into the fairness category. For example, setting a maximum price level limits a natural monopolist's ability to obtain excess profits which protects ratepayers in general from high prices. Similarly, the geographic entry restrictions established by state regulatory commissions attempted to limit the likelihood that duopolists would engage in destructive price wars (and ultimately, consolidation when there was excess capacity in the market).⁹ Incumbent firms were protected from entry so prices did not reflect incremental costs, leading to a wider range of sustainable price structures.

Achieving fairness among customer classes involves sharing the benefits from production economies among customer classes, while allowing investors a fair return on investment. This policy could be labelled the prevention of "undue" price discrimination. Complicated cost allocation procedures have been developed to distribute costs over residential, commercial, and industrial customers. In addition, within each customer class, cost of service might differ due to location and density of the service area. Averaging across areas leads to different mark-ups of price above marginal cost, but that is accepted in the name of fairness -- as when the same price is charged despite rural vs. urban cost of service differentials. The economic theory of regulation explains such disparities in terms of the concentration of beneficiaries and the many losers (of relatively small amounts). Posner (1971) labelled "taxation by regulation" as the result of a coalition between suppliers and particular customer groups (at the expense of unorganized customers).

Administrative law attempts to address the last aspect of fairness. Standards for regulatory hearings (presentation of testimony and opportunities for cross-examination) and procedures for processing customer complaints both represent attempts to promote procedural fairness. Specification of test years and adherence to accounting rules are additional ways the process can be made open and predictable. Another element of fairness relates to demographic and income distributional concerns. Geographic averaging might promote this objective, as access to electricity has become a national goal. Regulated utilities have an "obligation to serve" at "fair and reasonable prices"; exit restrictions are the quid pro quo for protection from entry.¹⁰

⁹ Using data on prices and profits in states where regulation came early (rather than late), Jarrell (1978) argues that early intervention benefitted electricity suppliers. Municipalities had been using franchise competition to keep prices down, so early state regulation could be viewed as pro-producer in impact. While fairness may not be achieved by regulation, it is generally used to justify government constraints!

¹⁰ Owen and Braeutigam (1978) emphasize the role of regulation in protecting the status quo. This equity-stability explanation maintains that regulatory delays and the role of precedent are

Figure 5 presents a highly stylized characterization of regulatory instruments and objectives, as they emerged over time. However, to some degree, these objectives remain with us today. This paper does not attempt to examine each instrument, but often the link between the concern and the instrument is tenuous. For example, the inclusion of the "used and useful" test for allowing generating or other capacity in the rate base is listed as an instrument which promotes cost minimization. However, asymmetric treatment with respect to investments can lead to non-cost minimizing behavior. For example, Kolbe and Tye (1991) argue that firms will avoid risky cost-minimizing investments if good decisions are unrewarded by regulators, while bad decisions are penalized.

3.2 Instruments for the Promotion of Production Efficiency

The post-war development of regulatory policy continued the fairness objectives adopted earlier, and gave some additional emphasis to production efficiency. Regulatory lag and specific cost disallowances were seen as providing incentives for the prudent acquisition and use of resources. The Public Utilities Holding Company Act (1935) represented an earlier attempt at preventing abuses stemming from intra-company transactions. The same concerns for cost minimization continued to be addressed in the 1950s and 1960s. For example, concern with over-capitalization due to rate-of-return (ROR) regulation led to the formalization of the classic ROR constraint model (Averch and Johnson, 1962).¹¹

It is interesting to consider the extent to which ROR on rate base regulation actually constrained electric utilities through the 1950s. With technological change resulting in greater scale economies, with the increasing availability of electric appliances, and with real income growth, the industry faced dramatic growth and substantial profit potential. Financial indicators can give us an idea of how investors view profit potential. Increases in expected dividends plus stock price appreciation lead to higher stock market prices. The market to book ratios of electric utilities were often greater than two -- suggesting that investors were faring well under this scenario (Brigham and Tapley, 1986). Furthermore, regulators could take credit for real price reductions that occurred throughout the first half of the century. From 1900-1960, the real price per KWH nearly halved every twenty years (Hirsh, 1989, p. 9).¹²

Another regulatory concern surfaced with the New York/New England blackout in 1965. Reliability -- one component of service quality -- became the focus of intense interest at the state and

designed to prevent the sudden capital losses that arise in a competitive market.

¹¹ Subsequent analyses of ROR regulation under demand uncertainty and follow-up empirical tests brought the simple A-J model into question. Nevertheless, there was a heightened awareness of how specific constraints led to adjustments that could run counter to other regulatory objectives.

¹² Hyman (1993) provides another historical overview of the evolution of the industry.

national level. One result was the establishment of regional reliability councils and regulatory standards related to outages. In addition, allowed ROR could be lowered if this objective were not reached. Power pools and inter-ties were encouraged both to obtain reliability and reduce operating costs. The stability and growth that characterized the industry made it relatively easy for decision-makers to be successful. Customers tended not to complain when real prices kept falling and growth quickly erased costs associated with excess capacity. Thanks to perfect hindsight, we can now identify important developments that were to change the nature of regulation. Few realized it at the time, but the electric utility industry was on the threshold of a new era.

3.3 New Challenges: Inflation and the Environment

Joskow's 1974 analysis of structural change in the electric utility industry identified inflation and environmental concerns as inducing regulatory innovations: fuel adjustment clauses and acceptance of environmental outlays as a cost of service. The latter expenditures were capitalized or expensed, depending on the type of outlay and on regulatory treatment. However, since these outlays raised costs, the industry began to feel pressure from consumer groups. Not unrelated to this was the fact that the thermal efficiency of generating units leveled off after decades of cumulative improvements (Hirsh, 1989, p. 4). Operating cost pressures were compounded by the impact of OPEC on fuel prices. In addition, nuclear cost overruns (stemming from a combination of unanticipated inflation, inept management, and additional mandated safety requirements) combined with slower demand growth to create substantial consumer pressure for disallowances.

The expanded use of fuel adjustment clauses allowed the automatic pass-through of fossil fuel price increases. The financial viability of electric utilities was threatened without responsive regulation. Most jurisdictions still required prudence reviews, but lengthy (and costly) hearings could be avoided by expanded use of automatic price adjustment. Utilities could avoid the risk of a fixed price regime for electricity. These instruments had originated in World War I, when rapidly rising fuel prices prompted their adoption (Kendrick, 1975). Their use expanded in the 1970s.

Theory suggests that input use distortions could result when cost components are treated differently in the regulatory process. For example, Baron and DeBont (1979) found that utilities would tend to overutilize fuel. With automatic adjustment clauses, firms may not expend reasonable search and bargaining efforts to obtain least-cost fuel supplies. In addition, they may have less incentive to switch their production processes to use lower cost fuels. Empirical studies support this hypothesis (Kaserman and Tepel, 1982). Thus, this particular instrument affects the utility's incentives to operate efficiently.

A number of states adopted targeted incentives to address continued concerns over whether utility managers were operating generating units efficiently. However, by rewarding utilities for meeting the narrow performance objectives (associated with heat rates and/or generating plant availability) regulators were not necessarily improving cost performance (Berg and Jeong, 1991). Cost component regulation can improve engineering efficiency, but may induce utilities to devote excessive resources to ensuring that a narrow goal is reached.

3.4 Allocative Efficiency in the '80s: Price Signals and Conservation

Pressure for cost containment and for moderating price increases lead state regulators and national policy-makers to identify rate design as an area in need of attention. The National Association of Regulatory Utility Commissioners (NARUC) joined with the Electric Power Research Institute (EPRI) in sponsoring a major study of costing and pricing. Time-of-use rates found their way into use in a number of states. Spurring this process was the Public Utilities Regulatory Policy Act of 1978 which required state commissions to consider the cost effectiveness of eleven rate-making standards (Joskow, 1979; Acton, 1982).

3.5 Issues in the 1990s

Production efficiency has taken on more importance as a policy objective, compared with fairness. Price signals are being given greater prominence, although regulators tend to avoid dramatic changes in rate design for fear of political repercussions. Running counter to the role of prices as signals is another regulatory innovation: Electric Rate Adjustment Mechanisms (ERAMs). One such ERAM is the revenue decoupling mechanism (RDM) which attempts to sever the link between incremental utility sales and incremental utility profits. Thus, RDMs have been adopted in several states as a way to neutralize the disincentive for utilities to offer conservation programs when price is greater than incremental cost. Suffice it to note that authorized (rather than realized) revenues drive profitability -- leading to a potential for corporate gaming and inefficiencies. Most states continue to use the more traditional price calculation mechanisms, while designing specific policies to encourage conservation.

Historically, prices for different customer groups were set using cost allocation procedures. Revenue "requirements" were determined from top down -- with minimal attention to incremental cost causation. Today, prices and incumbent investments in generating capacity are constrained by competitive alternatives -- induced by regulatory promotion of cogeneration and independent power producers (IPPs). Thus, in non-core (industrial) markets, customers have alternatives in the form of self-generation or geographic re-location. When revenues from some customer groups fall short of "allocated" costs, utilities experience financial pressures. Core (residential) customers can flex their political muscle to avoid rate increases, resulting in realized returns becoming a residual. Rates of return were never "guaranteed"; rather, they were "allowed". However, they have become more problematic in a world where traditional entry restrictions are being set aside.

Shifts among fuels and between electricity and fuels characterize the energy sector at all times. Relative prices change, and technologies (including appliances) for using alternative forms of energy also change. Deregulation will tend to promote least cost supply (which may involve seasonal fuel-switching). The bottom line will be determined by whether gas contracts, coal supplies, or renewable resources offer advantages for real savings.

Nonutilities supply almost ten percent of all electric power in the U.S., and between 1991 and 1994, they built over half of all new capacity. Barriers to effective competition were dramatically lowered by the Energy Act of 1992. The courts and regulatory agencies will mediate its impact, but the trends are clear. As layers of regulations have accrued, and some deregulation has

occurred, the overall incentive impacts are difficult to untangle. Both increased and decreased flexibility occur for managers, depending on the particular decision variable. For example, rate design (including decoupling) and environmental issues are investigated in generic workshops (often collaborative processes) and utility-specific hearings.

National regulatory policy has leaned in the direction of pro-competitive market structures at the generation level. Since PURPA's promotion of cogeneration via qualifying facilities (QFs) and of IPPs, national policy has continued to view wholesale competition as stimulating real savings for final demanders. Vertically integrated firms under ROR regulation will be greatly affected by new options available to them (and their customers). The Energy Act of 1992 created Exempt Wholesale Generators (EWGs) owned by holding companies with regulated subsidiaries. This serves as another vehicle for introducing new players into new geographic areas. Access to transmission can be mandated by FERC. Terms and conditions of transmission access has become a significant regulatory issue. When large buyers gain access to alternative suppliers via the transmission network, retail markets change dramatically. The potential problems for network coordination, construction, reliability, and pricing are substantial. Figure 6 depicts these new features of energy industries.

The interests of various constituencies are tough to reconcile. Independent power producers (IPPs) are highly leveraged; there is concern that financial and operating risks will be shifted to consumers who have few alternatives. The National Association of Regulatory Utility Commissioners (NARUC) wants to preserve the flexibility of states so that state PSCs can craft policies which fit their unique circumstances. Groups benefiting from current state regulations also want to retain "local" control -- preserving their relative benefits.

The American Public Power Association (APPA) supports the agenda of municipally-owned utilities. The National Rural Electric Cooperative Association (NRECA) seeks retention of rules that assist rural electric utilities. At the national level, FERC oversees wholesale and transmission issues, while state PSC regulate facility additions and retail rates. The conflicting pressures and overlapping jurisdictions make coherent policy development very difficult. For a description of New York's policies and burdens borne by incumbent utilities, see Okure (1995).

In 1994, both California and Michigan established programs designed to promote retail wheeling. The regulatory problems are substantial. Larger customers who have the ability to shop will tend to pay market-based (incremental cost) prices, leaving core (residential) customers at risk for covering the costs associated with higher cost capacity. The fear of so-called "stranded investment" blunts efforts to open up local markets. The short run impacts of competition differ from the long run impacts. In the short run, the efficiency gains may not be substantial, given the demand elasticities. However, the monetary transfers could be significant. Over the long run, the movement away from cost-based regulation is likely to further stimulate cost-containment and improved price signals.

PURPA-induced competition in the wholesale market for electricity has increased the importance of transmission access as utilities try to find the lowest cost suppliers whose generating facilities may be located far from the utilities' retail markets. The use of one utility's transmission

network to facilitate a trade between two other utilities is called "wheeling." The provision of EPAct (1992) requiring utilities to offer wheeling to third parties for a fee is possibly the biggest change in the industry in more than fifty years.

In April 1994, the California Public Utilities Commission's (CPUC) proposed to allow big and medium sized electricity buyers to buy power from any source while requiring utilities to transmit that power. By 2002 even homeowners could be permitted to choose their power company. The CPUC proposal also included plans to supplant the current investment and cost based ratemaking regime with one designed to reward utilities for operational, managerial, and investment efficiency judged against a series of benchmarks.

After a hearing process of over a year, the California PUC announced what some have termed as an "interim" electricity plan. Commissioners rejected a plan which would have required vertical disintegration of the investor-owned firms, separating transmission and distribution companies from generation companies. Under this "free market reform" scenario, even household customers would have had choice of supplier by 1997. The "moderate restructuring" alternative which was adopted in May 1995 allows continuation of vertical integration, with IPPs, EWGs, and utilities providing power to a pool. The plan includes provisions for addressing stranded capacity (generating capacity whose book value exceeds its true economic value in a competitive setting). On the same day, the PUC approved a plan by PG&E (the nation's largest electric utility) which will reduce prices for power produced at its Diablo Canyon nuclear plant. The compromise plan reduces PG&E revenues by \$2.1 billion relative to that obtained under a 1988 agreement. Stranded capacity gets addressed (with investors taking a hit)!

In the current California Pool Plan, generators and buyers would generally sell and purchase electricity at single rates, with transmission and distribution costs included in the final retail price. Long term supply contracts would be available to some large power users ("virtual direct access" -- similar to retail wheeling). However, the state legislature has held related hearings and threatens to be the final arbiter of industry restructuring. Implementation issues are still under review and continue to breed controversy.

3.6 "Stranded" Investment and Environmental Concerns

As in telecommunications, the courts, regulators, and legislators represent points at which major changes can be blocked by powerful economic constituencies. Environmental groups, industrial demanders, small customers, and the utilities themselves all vie for advantage in the transition to more competitive markets. Resolution of the issues such as funds for conservation, rate restructuring, and stranded capacity are seldom "resolved" -- they just get passed on to the next set of decision-makers. Of course, this leaves lobbyists with plenty to do under whatever scenario is "temporarily" adopted. Thus, while various groups may propose comprehensive plans, the most likely changes are incremental in nature.

Continued regulatory and legislative debate can be expected on transmission access and pricing, bidding procedures, and alternative regulatory constraints. We can already see the outlines of changes that are altering the regulatory landscape. Some believe that competition has become an objective -- rather than a mechanism for achieving economic objectives. Certainly, national

legislation and FERC have promoted entry into generation markets as a way to keep energy costs down. With this thrust has come pressure for transmission access at a fair price. In addition, we continue to have pressure to expand conservation side programs which partly obviate the need for new capacity -- whatever the ownership.

Environmental concerns have been addressed by trying to curtail the growth in the demand for electricity on the one hand and by limiting emissions on the other. Most state agencies take environmental externalities into account while making their decisions. The Clean Air Act Amendments (1990) limited sulphur dioxide emissions, leading to a system of tradeable emission allowances. However, to date only about a quarter of the state PSCs have established policies for accounting treatment of emission allowances for rate-making purposes. The issue remains fraught with uncertainty regarding regulatory treatment (Rose, 1995). This use of market processes rather than mandates means that emissions will be reduced at far less cost than would have been the case. The Energy Policy Act (EPAct) of 1992 provides tax incentives to generators that use wind and closed-loop biomass systems. It also allows tax-exempt bonds to be issued to finance mitigation of environmental damage from government owned and operated hydro-electric facilities.

Because of environmental concerns, several state jurisdictions have implemented environmental adders when comparing supply options with demand side management (DSM) options. That is, a specific number for external costs is used when selecting a generating capacity option and when choosing between new capacity and DSM programs. Environmental concerns will continue to raise issues, including the appropriate calculations for incremental environmental damages. New mechanisms for addressing the benefits and costs of conservation need to be developed. With competition continuing to put traditional utilities under severe pressures, regulation as usual is brought into question.

PURPA and failed investments in nuclear energy have played significant roles in the once staid electric industry's dramatic and sometimes painful transition since the early seventies. Nuclear plants were plagued with safety problems and cost-overruns that the regulators were unwilling to pass on to the consumers. PURPA, on the other hand, has shown that there are viable economical alternatives to utility owned generating capacity. Recently, a number of states have moved to replace the avoided costs method by competitive bidding for supply contracts.

Reduced demand growth, nuclear plant cost overruns, environmental costs, and continued low natural gas prices have led to excess and high cost capacity whose economic value is lower than book value. The resolution of the stranded investment problem has been linked by some to the terms and conditions of transmission access. There had been a "regulatory compact" under which firms built capacity and recovered costs over time: some argue that changing the rules of the game is unfair. As Costello, Burns, and Hegazy (1994) note, vertically-integrated utilities, conservationists, and environmentalists tend to oppose retail wheeling. For the former, monopoly franchises are lost as competitors threaten to take away customers. The two latter groups fear reductions in (or elimination of) utility-funded Demand-Side Management (DSM) programs. Also, competition threatens the forms of Integrated Resource Planning (IRP) which emphasize environmental costs above and beyond those addressed in national laws. Those supporting retail wheeling argue that sunk costs ought to be ignored for policy purposes -- leaving investors holding the bag. Large

industrial and commercial customers do not want to bear transition costs. Certainly, when competitive pressures are allowed to emerge, regulators are affecting both efficiency and fairness.

The future will continue to yield regulatory experiments in different states and regions of the country. Cullen et. al. (1994) have outlined the policy options facing states -- focusing on Wisconsin. They conclude that different degrees of competition can be fostered under three alternative scenarios: the flexible-regulation model, the incremental-change model, and the commercial (or marketplace) model. Unless states are pre-empted by federal initiatives, we can expect to see a wide range of policies emerging in various states.

Over time, the identification of additional regulatory objectives has led to the introduction of additional instruments (or rules) to enable those issues to be addressed. Some of the new policies reduced the likelihood that "old" objectives could be met. Because of this, more attention is being given to avoiding potentially incompatible goals. In some states, for example, the requirement that incumbents buy IPP output at relatively high prices promoted the entry of new suppliers -- but conflicted with other objectives. Commissions are beginning to recognize problems with such mandates.

The regulatory community today is the scene of a lively discussion on the possible ways of making the system more efficient without harming core customers who face few alternatives. Rapid changes in technology as well as in the structure of the electric industry may well cause substantial changes in the not too distant future. In the short term, the industry is likely to move towards increased competition wherever possible. The recent California proposal for phasing in retail wheeling illustrates this trend.

4. Concluding Observations

We summarize regulatory lessons from the U.S. below:

1. Both Economics and Politics have affected the pattern of regulation and deregulation in the United States.

The historical phases of regulation point towards continued change in the energy and telecommunications industries in the coming decade.

2. Economic concerns over natural monopoly in electricity have shifted to environmental and other concerns, as generation scale economies seem to have bottomed out.

While distribution to core customers will remain immune from entry for the time being, changes in transmission access regulations mean that competition will expand at the generation level.

3. Social concerns over universal service in telecommunications remain, but technological developments in fiber optics, data compression, computers, and spectrum utilization open up the industry to a wide range of potential entrants.

The emerging strategic alliances are altering the configuration of information/entertainment producers, transport firms, and local (often mobile) delivery entities. Regulatory policy-makers are seeking to protect consumers without alternative sources of supply while ensuring that the benefits of competition flow to those who successfully commercialize new services and to consumers who desire those services.

4. Traditional infrastructure industries are much more at the mercy of external forces than in the past.

The socio-economic conditions affecting business processes reflect underlying production technologies and input markets (financial capital, people, plant/equipment, and raw materials) and demand conditions (customers).

5. In particular, the political environment greatly affects the nature of regulation.

Federal, state, and local regulations constrain electricity suppliers and telecommunications providers in different ways than in the past. The media, environmental advocates, civic groups, and attitudes of the general public influence the political process to shape policy.

6. Traditional regulation was a highly choreographed process, wherein various rate-making objectives were sought after through a process involving formal hearings and a variety of regulatory procedures.

The traditional objectives focused on revenue sufficiency and fairness, with cost containment encouraged by disallowances, reviews, and adjustments to the allowed rate of return.

7. Rate of return on rate base regulation involved adding up cost components to achieve overall revenue requirements.

Prices for different customer groups were set using cost allocation procedures. Prices were determined from the bottom up.

8. Today, prices and investments are constrained by competition -- induced both by regulatory promotion of alternative suppliers and by changes in fundamental economic conditions.

Price is determined exogenously in non-core markets -- so revenues from some customer groups will fall short of "allocated" costs. Core customers can flex their political muscle to avoid rate increases. Realized returns become a residual.

9. Industry structure and strategy depend on basic economic conditions and the political environment.

The political process and industry fundamentals determine regulatory policies. These policies can alter industry structure and corporate behavior.

10. In the past, demand growth and technological innovations resulted in a "public utility" where there was no fear of outside entry, the service was undifferentiated, and firms were vertically integrated.

Regulation defined markets, cost of service regulation determined price, and production processes were determined by utility planners.

11. Holding companies have responded to competitive pressures by adopting comprehensive cost-containment programs; regulators are moving to greater use of incentive regulation.

In electricity, slow growth and the exhaustion of scale economies affected capacity additions; but regulatory rules tend to promote competition through capacity bidding procedures, access to transmission, and the emergence of cogeneration and independent power producers. In numerous jurisdictions, conservation is being mandated through aggressive demand-side management. Environmental considerations are affecting the generation mix and site selection.

In telecommunications, down-sizing has been dramatic, as incumbents seek to prepare for competition. Innovations have led to corporate diversification across technologies and services. At the state and national level, deregulation is promoting multiple centers of initiative through the unbundling of services, although terms and conditions of access to local exchange services remain a highly contentious issue.

There is no simple and comprehensive roadmap for policymakers in this decade of dramatic change. Rough maps of relatively unexplored territory are bound to contain errors and omissions. Mistakes will be made--some turns to the left or right will lead to dead-ends. Then politicians will have to retrace their steps or strike out over uncharted territory. The regulatory lessons from the U.S. suggest that the politics and economics of infrastructure industries are complex. The best decisions are those which are based on reality. That which seems familiar is not necessarily appropriate in new territory.

The central message of this overview has been the need to design institutions which promote efficiency. The U.S. is slowly abandoning rate of return on rate base regulation, though it sometimes seems like two steps forward and one step back. The competitive forces unleashed by new technologies, court rulings, and new legislation can be channeled but not totally diverted. Entrants become stakeholders, and while they too attempt to manipulate the political system to their advantage, incumbent suppliers will not depart the field of battle without a fight. If the incentives are such that least cost suppliers win markets and those who introduce valued new services obtain profits, then the economy as a whole is the winner.

We have learned some principles that can be useful in new situations. However, in some instances, the art of policy development requires compromise. Pricing of access to essential facilities is probably the toughest issue confronting regulators in the U.S. and elsewhere. Arrangements have emerged in some state jurisdictions, based on a blend of economic principles or political compromise. Other principles have been enunciated for the regulatory transition in energy

and telecommunications. In his survey of incentive regulation, Sappington (1994) identified ten guidelines for designing incentive regulation plans:

1. Use incentive regulation to better employ the firm's superior information.
2. Prioritize regulatory goals and design incentive regulation to achieve stated goals.
3. Link the firm's compensation to sensitive measures of its unobserved activities.
4. Avoid basing the firm's compensation on performance measures with excessive variability.
5. Limit the firm's financial responsibility for factors beyond its control.
6. Adopt broad-based performance measures where possible, unless their variability is excessive.
7. Choose exogenous performance benchmarks.
8. Allow the firm to choose among regulatory options, while recognizing the interdependencies among the regulatory options that are offered to the firm.
9. Promise only what can be delivered, and deliver whatever is promised.
10. Plan for the rare, unforeseen event, but minimize after-the-fact adjustments to the announced regulatory policy.

As Sappington points out, ". . . the design of sound, effective regulation in particular settings will require careful attention to the idiosyncratic features of the environment. The best incentive regulation plan in any given setting will vary according to regulatory goals, institutional and technological factors, the nature of the information asymmetry between regulatory and firm, and the commitment abilities of the regulator." (p. 269)

Performance-based incentive mechanisms are emerging in state regulatory jurisdictions; these new initiatives include price caps, revenue caps, yardstick regulation, and profit sharing. Some of these alternative rate plans have emerged as a result of a collaborative process involving the participation of major stakeholders. The design issues (such as those noted earlier in conjunction with price caps) require the resolution of a set of interrelated problems. Attention to fundamental economic principles has strengthened new regulatory initiatives.

Some read the history of regulation, and conclude that new initiatives are *not* called for. Shepherd (1992) states, "The 1980s search for a mechanical, automatic method of 'incentive regulation' was largely illusory. In complex situations, there is no easy substitute for sophisticated, effective regulation." (p. 71) In contrast to Shepherd, Strasser and Kohler (1989) describe the overlapping command and control mechanisms comprising cost of service regulation as tools which are ". . . at best blunt and crude, preventing the worst abuses, but not sharp enough to encourage

anything better. An incentive approach promises more." (p. 137) Later they state, "Controls can keep managers from doing specific things, but they cannot command managers to use management processes energetically and creatively to tackle the problem of more efficient operation, although improved processes are essential to improved performance." (p. 169) Movements away from cost-of-service regulation are illustrated by profit sharing via banded returns and various forms of incentive regulation. Generalized incentive regulation could be characterized as decoupling prices from costs via new regimes, such as yardstick regulation or price caps. As regulators move away from command and control micromanagement, they are lowering entry barriers (especially in telecommunications) and utilizing incentive regulation in those markets with residual market power.

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FIGURES

Figure 1
Traditional Features of
Regulated Industries

BASIC CONDITIONS

Economies of	Demand Patterns
Scale	Price
Scope	Income
Sequence	Demographics

TRADITIONAL STRUCTURE

Regulatory	No Entry
Defined	Public Utility
	Vertical Integration
Markets	Homogeneous Output

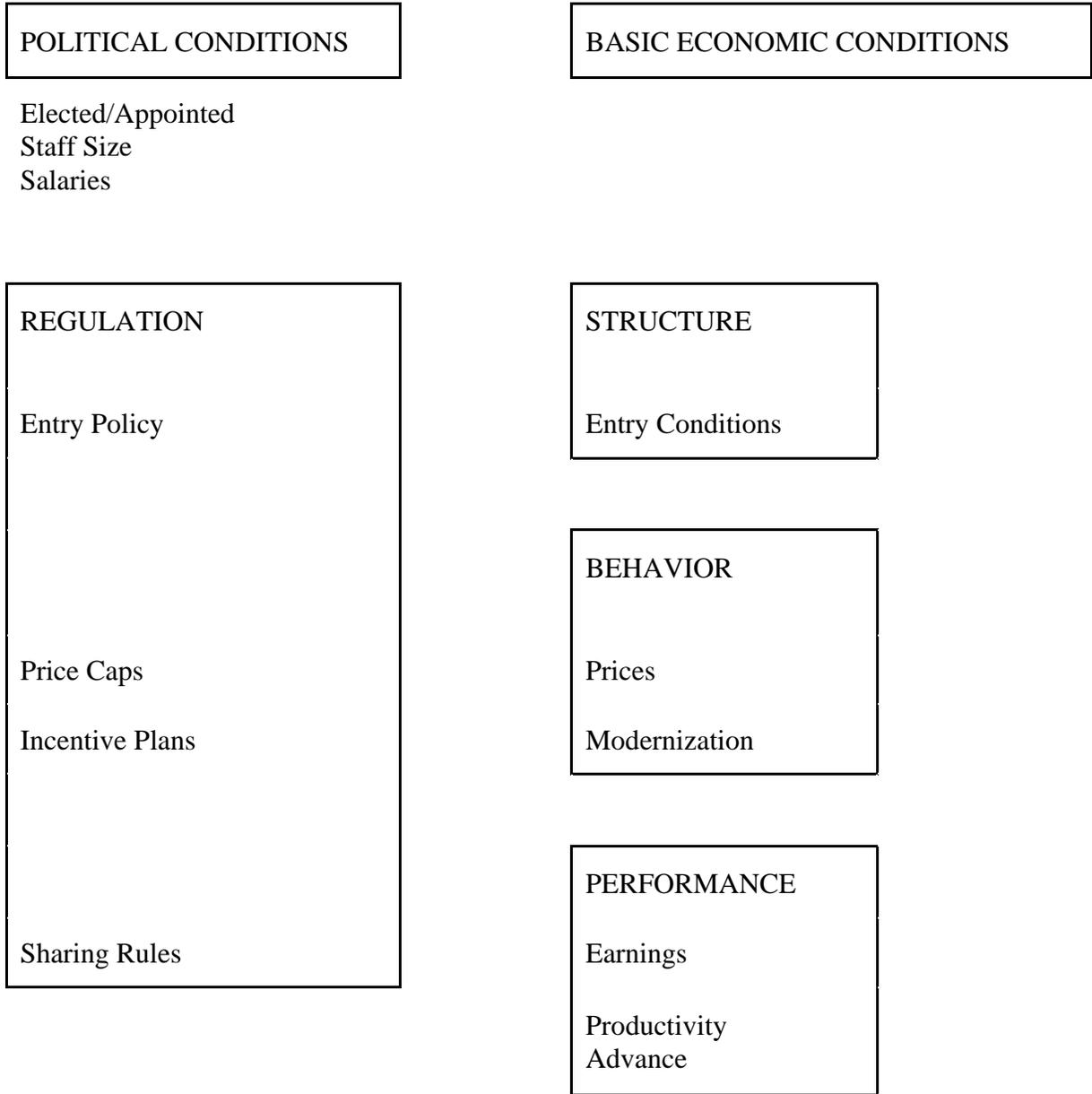
TRADITIONAL BEHAVIOR

Cost-of-Service Regulation	Price-Regulated
	Production Process R&D

TRADITIONAL PERFORMANCE

	Technological Advances
Rate of Return on Rate Base	Fair Return on Investment
Cost Allocation Manuals	Prices Based on Cost Allocations
Geographical Averaging	Universal Service

Figure 2
Chains of Causation:
Regulation, Behavior, and Performance



(1) Performance = f (Regulation, Economic Conditions, Structure, Behavior)

(2) Behavior = g (Regulation, Economic Conditions, Structure)

(3) Regulation = h (Performance, Economic Conditions, Political Conditions)

Figure 3
New Features of
Telecommunications Industries

REGULATORY POLICIES

Substitutes Promoted
Entry Encouraged
Divestiture

Flexibility Introduced
Unbundling Required
Standards Promulgated
Modernization
Structural Safeguards
Service Prohibitions
Behavior Mandates
Supplier of Last Resort

Incentive Regulation
Price Caps
Residual Regulation
Externalities

STRUCTURE

Multiple Suppliers
Entry Barriers Reduced
Vertical Disintegration

BEHAVIOR

Price Structure
Product Mix
Quality
Production Process
Diversification
No Incumbent Entry
Compatibility -- ONA
Exit Limited

PERFORMANCE

Shared Earnings and Banded Returns
Price Reflects Market Realities
Regulated/Unregulated Services
Universal Service

Figure 4
Telecommunications Industry:
Dimensions of Performance

Production Efficiency
Allocative Efficiency
Price-Cost Margins
Profitability Commensurate with Risks
Productivity Advance
New Service Introductions
Universal Service
Income Distributional Concerns
Network Reliability
Job Security
International Balance

Figure 5
Regulatory Policy Development:
Multiple Targets and Instruments

Period	Objective	Instrument
1907-1919	Reduce prices and limit excess profits Avoid destructive competition	Rate of return regulation Entry restrictions
1920-1949	Fairness among customer classes Fairness within customer classes Procedural fairness Universal access Cost minimization	Cost allocation procedures Geographical averaging Open hearings/test years Exit restrictions (obligation to serve) Used and useful test
1950-1969	Cost minimization Cost minimization Reliability	Regulatory lag Disallowances Alter allowed return
1970's	Limit impact of input price instability Environmental improvements Environmental improvements Innovation Conservation Safety Cost minimization	Fuel adjustment clause Expense/capitalize outlays Siting constraints Expense/capitalize outlays Promotional advertising disallowances Mandates (eg., nuclear) Targeted incentives (heat rates)
1980's	Allocative efficiency Cost minimization Cost minimization Cost minimization Conservation Conservation Social cost minimization Environmental improvements	Rate design mandates Banded returns: Profit sharing Unbundling: Cogeneration Vertical disintegration: Bidding for capacity Demand side management Revenue decoupling mechanism Integrated resource planning Environmental adders for supply options
1990's	Competition/Cost minimization Competition/Cost minimization Cost minimization	Exempt wholesale generators Mandate transmission access Cost decoupling via yardstick regulation

Figure 6
New Features of
Energy Industries

REGULATORY POLICIES

Substitutes Promoted
Entry Encouraged--IPP
Transmission Access

Flexibility Introduced
Unbundling Required
Standards Promulgated
Fuel Use Mandates
Structural Safeguards
Service Restrictions
Load Mgt. Incentives
Supplier of Last Resort

Incentive Regulation

Wholesale Price

Residual Regulation
(Imputation)
Siting and Integrated
Resource Planning

STRUCTURE

Multiple suppliers
Entry Barriers Reduced
Vertical Disintegration

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Services
Environmental Impacts