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Evolution of U.S. Electricity Regulation

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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, state-mandated conservation programs may not be compatible with competition at the generation stage. The one certainty is that as in telecommunications, continued vertical disintegration and partial deregulation are inevitable for the electric utility industry. Also, traditional cost of service regulation is likely to be supplanted by forms of incentive regulation.

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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 1992 Energy Act's emphasis on deregulation and increased competition in the electricity sector.

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 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.

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
Markets	Vertical Integration

TRADITIONAL BEHAVIOR

Cost-of-Service Regulation	Price-Regulated
	Production Process

TRADITIONAL PERFORMANCE

	Technological Advances
Rate of Return on Rate Base	Fair Return on Investment
Cost Allocation Manuals	Prices Based on Cost Allocations

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 tend 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 2. 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 2 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

Figure 2
Regulatory Policy Development:
Multiple Targets and Instruments

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

administrative process. The objectives listed for 1907-1949 (Figure 2) 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 due to excess capacity in the market).[1] 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).

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[1]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!

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.[2]

Figure 2 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, that asymmetric treatment 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.

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

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).[3]

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

[3]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.

of the century. From 1900-1960, the real price per KWH nearly halved every twenty years (Hirsh, 1989, p. 9).[4]

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 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. 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

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[4]Hyman (1993) provides another historical overview of the evolution of the industry.

prices. In addition, nuclear cost overruns (stemming from a combination of unanticipated inflation 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 prudency 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 DeBondt (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.

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). Price signals were given greater prominence, although regulators tended 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 are offered 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. Only a few states have moved in this direction. 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. They were determined from the bottom up--with minimal attention to incremental cost causation. Today, prices and investments are constrained by competitive alternatives--induced by regulatory promotion of cogeneration and independent power

producers. 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 they have become more problematic in a world where traditional entry restrictions are being set aside.

5. Emerging Issues in the '90s

Energy raises new issues in the 1990s. Production efficiency has taken on more importance, relative to fairness, as a public policy objective. The evolution of U.S. energy regulatory policy illustrates changing attitudes toward the efficacy of competition in promoting efficiency. Multiple goals still complicate the process, however. For example, state-mandated conservation programs may not be compatible with competition at the electricity generation stage. The one certainty is that as in telecommunications, continued vertical disintegration and partial deregulation are inevitable.

Figure 3 depicts the new features of energy industries -- showing how regulatory policies have changed from traditional rate of return on rate base (COSI) regulation. The figure outlines changes in regulatory policies in response to changes in technologies, institutions, and demand. Vertical disintegration is encouraged by public policy, such as the Federal Energy Act of 1992. Still unresolved are issues of transmission access and pricing, bidding procedures, siting regulations, and alternative regulatory constraints.

Looking ahead, we can already see the outlines of changes that are altering the regulatory landscape. Some believe that competition has become an objective--rather than

Figure 3
New Features of Energy Industries

REGULATORY POLICIES	STRUCTURE
Substitutes Promoted	Multiple suppliers
Entry Encouraged--IPP	Entry Barriers Reduced
Transmission Access	Vertical Disintegration
	BEHAVIOR
Flexibility Introduced	Rate Design
Unbundling Required	Product Mix
Standards Promulgated	Quality
Fuel Use Mandates	Production Process
Structural Safeguards	Capacity Bids
Service Restrictions	No Incumbent Entry
Load Mgt. Incentives	Conservation
Supplier of Last Resort	Exit Limited
	PERFORMANCE
Incentive Regulation	Shared Earnings and Banded Returns
Wholesale Price	Price Reflects Market Realities
Residual Regulation (Imputation)	Regulated/Unregulated Services
Siting and Integrated Resource Planning	Environmental Impacts

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 demand side programs which partly obviate the need for new capacity--whatever the ownership.

Nonutilities supply almost ten percent of all electric power in the U.S., and between 1991 and 1994, they will build 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 being brought forward in generic workshops 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 and of independent power producers, 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) as another vehicle for introducing new players into the game. Access to transmission can be mandated by FERC. Ultimately, large buyers may gain access to alternative suppliers via the transmission network: retail markets change. The problems for network

coordination, construction, reliability, and pricing are substantial (Joskow, 1991). Terms and conditions of transmission access will become a significant regulatory issue.

In addition, 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 specific generating capacity option and when choosing between new capacity and DSM programs. Environmental concerns will continue to raise issues. New mechanisms for addressing them are likely to emerge in the coming decade. With competition continuing to put traditional utilities under severe pressures, regulation as usual is brought into question.

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 yardstick regulation or price caps. If regulators move away from command and control micromanagement, more comprehensive incentive regulation is likely to emerge in the various jurisdictions.

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