ELECTRIC POWER DEREGULATION: BACKGROUND AND PROSPECTS

VERNON L. SMITH*

The incentive failures of rate-of-return regulation are well known and thus raise the question of whether to deregulate electric power. The development of long-distance transmission and of alternative power sources in networks has spawned several institutions that would or could allow markets to substitute for such regulation. These include long-term contract sales, spot power exchange, contract power pooling, shared facility ownership, and economic dispatch. Because of the current surplus of power, the existence of such institutions has caused increasing competition in the electric power market and has catalyzed the movement to deregulate generators from state authority and to restructure utility assets. By encouraging this movement, regulators can further the discipline that markets already exert on prices and costs. By making counterproposals to the utilities, regulators can influence asset restructuring so that some of the capital gains inherent in such restructuring can be shared with consumers in the form of rate relief. Finally, for the future, the cotenancy agreement—which is antitrust supervised and competitively ruled—has promising possibilities for deregulating transmission and distribution.

I. INTRODUCTION

The United States is in the midst of a deregulation revolution. The trend toward substituting competition for regulation so as to discipline prices and costs already has struck the transportation and communications industries. According to Bailey (1986, p. 1211), the impetus for this trend came from the fact that "over time, it become increasingly evident that regulated companies lacked incentives to keep cost under control and to be responsive to consumer demands." Particularly in the airline and trucking industries, consumer groups no longer were willing to foot the bill for regulation. They formed a new political coalition so as to overcome these industries' strong resistance to losing the economic shelter of competition-limiting regulations.

*Professor and Research Director, Economic Science Laboratory, Department of Economics, University of Arizona, Tucson. This paper is based on the author's keynote address at Least Cost Energy Planning in the Midwest: A Symposium, Palmer House, Chicago, Feb. 10, 1987. An earlier version of this paper was presented at the 62nd Annual Western Economic Association International Conference, Vancouver, B.C., July 1987, in a session organized by Robert J. Michaels, California State University, Fullerton.

The disincentives of rate-of-return regulation (RORR) have failed to discipline costs in the electric power industry, but the future may look brighter due to growing competition in the sale of electric power. The future may look brighter still if the deregulation resistance from those who regulate the industry, and from those in the industry being regulated, can be broken. (For a parallel discussion of some of these issues, see Smith, 1986.)

II. BACKGROUND

The electric utility industry began in the same way as did other successful new-product industries such as the automobile, private plane, ball-point pen, hand-held calculator, and microchip businesses. The recurrent history in such new industries is that a rush of entry is followed by declining costs and prices, leading to a shakeout, mergers, bankruptcies, and consolidations with stockholders' bearing the attendant risks. This process often creates political pressures to cartelize the industry so as to protect it from competition. In the political environment of the utility industry at the turn of the century, cartelization took the form of state-franchised local monopolies. Later, in the airline industry, cartelization took the form of federal regulation under the Civil Aeronautics Board (CAB). A study of this period (Jarrell, 1978) shows that the first states to adopt regulation were those in which electric rates and profits were lower and output was higher than in states adopting regulation later. Furthermore, the effect of regulation was to increase prices and profits and to reduce output during the pre-1920s period. Already, regulation apparently had a perverse effect on consumers. It should be noted that Samuel Insull, then president of the National Electric Light Association, was a persistent speaker and lobbyist for electric power regulation as early as 1898. He repeatedly called for exclusive licensing of utilities and for fair profit pricing.

Beginning during the 1920s and ending about 1970, a general downward trend in inflation-adjusted power rates occurred. (An exception occurred during the deflationary period 1930–1933.) This was due primarily to the declining real price of petroleum and to technological improvements that increased thermal efficiencies in generation and increased scale economies in generation and transmission. Demand growth made introducing these new technologies painless. But these external developments masked the internal incentive problems of cost-plus pricing under RORR since such prices are backward looking and are based on historical accounting cost—not opportunity cost. Thus, in unregulated industries subject to rapid technological advance, competition forces obsolescence of facilities before they are fully depreciated. Efficiency requires that such facilities be written off and abandoned earlier in accordance with their shortened economic lives. Under regulation, such assets tend to be protected by embedding their historical

cost in the rate structure. The price inflexibilities characterizing RORR are particularly evident during 1930–1933, when electric utility rates failed to keep pace with the economy's rapid general deflation rate. But so long as an overall decline in real electric rates continued, no political motivation existed to question the efficiency of the regulatory apparatus. In the adversary process of regulation, no one represents opportunity cost. Therefore, this most important ingredient of competition fails to discipline prices.

Beginning around 1970, the industry's tranquil half-century of hidden problems ended abruptly. Previously rapid improvements in fossil fuel technology slowed considerably. The political environment demanded more severe pollution emission standards. Petroleum prices began their unprecedented increase: $3 (per barrel) petroleum became $12 and ultimately $30 petroleum. Finally, the economy's accelerating inflation also severely impacted non-energy input prices and construction costs. Whereas earlier regulatory lag had benefitted profits, it now squeezed profits severely.

In this environment, and expecting that demand growth would continue unabated, much of the industry turned to nuclear construction—although the availability of low sulphur coal continued to attract new plant investment in the Southwest. Nuclear power promised a new source of scale economies and much lower fuel cost. At the time, this new technology seemed the answer to the industry's wrenching problems. One should also bear in mind that the regulatory environment had long promised rates that would yield the revenues required to cover costs plus a reasonable profit. This was *not* an environment that would condition managers to be wary of investing in risky untried technologies or of possible cost overruns. At the time, it was reasonable for management to expect that construction costs would be embedded in new higher rates if such were required.

The widespread fear that the energy crunch was here to stay, and that potential power shortages existed, seemingly required new political initiatives. One response was the Public Utility Regulatory Policies Act (PURPA) adopted in 1978. This legislation provided tax benefits for hot-housing tiny "mom and pop" hydroelectric, windmill, solar, or woodchip-burning power sources. The PURPA also required utilities to purchase both this power and power from industrial cogeneration units at rates as high as avoidable cost—the most expensive internal source of marginal power available. The positive side of this legislation is that it helped utilities to overcome their reluctance to deal with alternative energy power sources. Many cogeneration projects are cost effective at today's power rates even without special inducement legislation. By encouraging new sources of power, this legislation also demonstrated that power generation can be decentralized yet compatible with long-distance transmission. On the negative side, some states applied the avoided cost concept so as to encourage an oversupply of uneconomic energy sources.

The 1970s decisions to pursue the new and relatively untested nuclear technologies in an inflationary economy led to the 1980s cost overruns. Many of these overruns were more than the political environment could absorb. Although rates generally were increased—at times substantially—the commissions have balked at fulfilling management expectations that new rates would cover these costly ventures' full revenue requirements. That some utilities and some states relied on alternatives to the nuclear construction route exacerbated the problem. In the Southwest, some utilities expanded with new and more traditional coal-fired technologies. Wisconsin used load-shifting programs and time-of-use rates so as to encourage conservation as a substitute for expanding capacity. Consequently, with 20–20 hindsight, some managers and commissions in some circumstances clearly had controlled costs. Politically, this increased the difficulty of rewarding the costly nukes with cost-plus rate schedules.

But far more important than any of these events has been the steadily increasing interconnection of local utilities and the concomitant growth in development of remote power sources over the past 50 years. These changes have made possible several market institutions, some of which are foreign to or directly contradict the concept of regulated monopoly. These institutions already have laid the foundations for deregulating generation. They already have brought competition on the fringes and have planted the seeds for deregulating transmission and perhaps even distribution.

A. *Long-term Contracting*

Under long-term contracting agreements, power is transferred from generator owners to distributors over transmission lines. (The rights to such lines are granted by one of the parties and/or a third party.) The buyer is either exclusively a distribution utility or a utility whose generator capacity is insufficient to meet customer demand. In either case, the buyer company seeks to acquire energy through contract purchases instead of through ownership. The seller most likely is an integrated utility with access to coal or other energy sources, and with power-generating potential exceeding such utility's native load requirements. But to the extent that alternative sources of power are available to the buyer and alternative buyers are available to the seller, a competitive discipline is introduced when these contracts are initiated. Many such contracts, written at high prices during the energy crunch, have been renegotiated downward in response to market forces.

B. *Economy Energy Exchange*

The exchange of economy energy has established an hourly spot market for bulk wholesale power. This market is the short-term counterpart of the contracting market discussed above. Once locally regulated utilities were interconnected, the diversity of these separate companies' circumstances in-

evitably would create a basis for trading electric power in the short term. Because seasonal and daily demand peaks occur at different times for different distributors in the network, hourly spot transfers of power are needed for production to be smoothed in the system at minimum cost. This institution arose in response to market forces' crossing the traditional local monopoly boundaries that state authority creates. It was not the product of regulation.

C. *Power Pooling*

Electric utilities, like the rental services of motels and airline seats, invest in a product that cannot be stored. Surges in demand, and replacement power for unscheduled outages, can be satisfied only from reserves. This is a source of technological interdependence among separate utilities in the network. Some view this interdependence as contrary to the requirements of a decentralized market. Such a view, however, neglects or downplays the significance of the numerous power pools that provide multilateral contractual approaches to the problem of providing on-line spinning reserve and back-up ready and replacement reserves that make blackouts rare—and of short duration when they do occur. These power pools are supplemented with bilateral contracts for emergency assistance. Several utilities that are pure or nearly pure distributors (e.g., Mesa Electric) use contracts to solve the problem of obtaining reliable external power sources. The market responded to the private value of power pooling by inventing the appropriate contracting instruments. These arrangements also help control or provide compensation for the effects of inadvertent power flows in the system.

D. *Cotenancy Capacity Rights to Large-scale Facilities*

In the electric utility industry, a common contracting institution is for several utilities to jointly finance the construction cost of large-capacity generating units and/or transmission lines. This device spreads the risk of new technologies and spreads the impact of placing the unit in each utility's rate base. Typically, the sharing companies receive capacity rights in proportion to their respective contributions to the unit's annualized construction and output-insensitive operating costs. In the case of generators, each participant pays a "demand charge" for these capacity costs—whether or not the capacity is used—and an "energy charge" for fuel to the extent that the rights are exercised by drawing power. In Arizona, some generators have as many as six co-owners with capacity shares as small as 7 percent, and transmission lines often have two, three, or even four owners of a fraction of the line's transfer capacity. The cotenancy contract surely was not invented for the purpose of enhancing competition in the electric utility industry. Yet it is a socially ingenious device for providing competition in the presence of scale economies. If a company owns 7.5 percent of the capacity of a 750-megawatt unit at the Navajo plant, then it has the rights to draw up to 56 megawatts

of power to be either consumed by its customers, sold under long-term contract to California, or sold spot to a Utah utility. In effect, such a company has drawing rights to a small package of power at the unit construction cost of a facility 13 times larger! Similarly, if the company shares the capacity of a transmission line, then it can either use it, sublet it, or sell it. If just one line with excess capacity exists, then a potential user has two or more owners with whom he or she can bargain. Consequently, competition in a market for rights can exist even where only one physical producing unit exists. Scale economies in production need not have anything to do with monopoly in ownership and control. This institution is particularly important in understanding future possibilities for deregulating transmission and distribution.

E. *Economic Dispatch*

Ever since the marginal cost load balancing rule was discovered by engineers during the 1920s and was extended so as to include transmission line losses in networks, the technology of "economic dispatch" or optimal network loading has become increasingly sophisticated. Today, the integrated electric utility's system lambda is based on the computerized loading of its dispersed generating units. This institution can provide the basis for an economic dispatch center or regional energy exchange bearing the same relationship to the utility industry that the New York Stock Exchange bears to the securities industry.

III. CURRENT DEVELOPMENTS AND PROSPECTS

This brings us to the present situation in the U.S.: an economy with the lowest inflation rate in a quarter-century; a political environment that has spawned a deregulation revolution in transportation and communication; a power industry with substantial excess capacity since demand has not kept abreast of the expansion decisions of the past; an industry whose development of long-distance transmission, and a number of correlative market institutions, has set the stage for competition and undermined the traditional justification for regulation (i.e., local natural monopoly); an increasingly competitive bulk power market; and an industry reluctant to undertake new generator investment and with many utilities moving to restructure their generator assets.

Because surplus power is available, industrial and other bulk power consumers want more freedom to bypass the embedded cost rates of their local distributors and to contract directly with cheaper power sources. Industrial customers who have the option of cogenerating power and getting cheaper electricity under the PURPA provisions are either exercising that option or threatening to do so if they cannot get rate concessions. Hence, the effect of the PURPA has been to increase competition in power generation. The distribution companies who contract for their power needs want both the freedom

to shop and the "wheeling" (i.e., transmission) rights enabling them to implement this desire to buy cheaper power. The success of Geneva, Ill., in bypassing its traditional supplier, Commonwealth Edison, and contracting to wheel its power from Wisconsin has been a widely publicized example. These competitive forces already are causing the regulatory apparatus to come apart at the edges, and other developments are threatening to pull it apart at the seams. I refer to the trend toward converting existing or partially completed generator units into "entrepreneurial" generators. At some point in time, these generators become free to market their power subject to Federal Energy Regulatory Commission (FERC), but not state, regulations.

To understand this trend and the financial forces breaking across the utility industry, we must develop some background. Many utilities' balance sheets have been ravaged by costly nukes. One should bear constantly in mind, however, that such balance sheets carry assets at historical cost less accounting depreciation, which can diverge sharply from market value. This is especially true in the regulated industries, where risks traditionally are borne by customers instead of stockholders. Consequently, these companies are less prone to periodic capital loss write-downs and capital gain write-ups that bring accounting values in line with market realities. But this situation is changing. In today's environment, one cannot expect the commissions to blank-check any new generation capacity. This means that stockholders—not consumers—will bear more investment risk. This new market-like environment, in which "you lose some and you win some," is pressuring management to examine closely discrepancies between individual asset market value and book cost. At the same time, competition in the bulk power market is pressuring management to revest assets in more flexible financial units.

Utilities with no nuclear participation have the most generator assets whose market value exceeds book cost. Because management is obligated to serve its stockholders, it is under pressure to marketize those values and carry the capital gains to its stockholders. The pioneering example was the Alamito Company spinoff from Tucson Electric Power (TEP) to its stockholders in 1985 as an independent wholesale power producer. At the time, Alamito assets consisted of one nearly completed coal-generating unit, a one-half interest in an older unit, and the coal supply and wheeling rights required to support these units. The power from these units was committed under contract to TEP and to San Diego Gas and Electric. The excess of market value over book value for cost-efficient coal-fired units—even under the current conditions of excess capacity—is well illustrated by Alamito. Alamito's spinoff shares initially traded at about $70, but $1\frac{1}{2}$ years later the company was bought out for $165 per share after a four-way bidding war. The winning bidder, Catalyst Corporation, recently has been subjected to a tender offer.

In the case of utilities with investment in nuclear units, pressures are rising to revest these assets so that they can become entrepreneurial generators. But in the case of nukes, either write-offs or rate increases, or both, are necessary to bring market value in line with accounting cost. The first such proposal was the case of Eastern Utility Associates (EUA). In a 1985 FERC settlement, EUA was allowed to buy the beleaguered and incompleted Seabrook nuclear project for just under 25 cents on the dollar of sunk construction costs. EUA was permitted to charge qualified market-based rates, and was allowed up to a 25 percent return on equity for the first 12 years. In this example, the opportunity cost response of the market is to salvage an investment gone sour so that it can make a productive contribution even if insufficient to cover historical sunk cost.

Another example was Commonwealth Edison's proposal to revest three nuclear units in a subsidiary regulated under the FERC. According to news reports, Edison would have written off some of its investment and received a 9 percent rate increase this year, but would have to refrain from seeking new rate increases for five years. The subsidiary would sell power back to Edison under a take-or-pay contract in which the buyer pays a fixed annual fee for drawing rights and pays all the variable costs of power actually taken. After five years, the unit would be free to sell power in the open market. Had this proposal been approved, these assets would have been positioned for a spinoff.

Many other examples of generator asset restructuring exist. These include the sale lease-back of generator units, usually for contract terms longer than five years.

I believe that in the interests of consumers, the regulatory commissions should avoid giving a flat "no" to these proposals. Instead, they should negotiate. These proposals allow state commissions to use the regulatory apparatus so as to make reasonable counterproposals and thus enhance the ability of competition to discipline prices and costs. The counterproposals could seek a shortening of contracts—say, to five years—calling for longer lease-back terms so as to speed up the creation of entrepreneurial generators. In the short run, the commissions could seek lower contract power rates for the parent companies so that some implicit capital gains of stockholders are shared with residential ratepayers. This is straightforward in the case of cost-efficient coal units with market value exceeding book value. In the case of the costly nukes, which otherwise would require a rate increase so as to make the assets attractive to a potential buyer or attractive as a spinoff candidate, the appropriate counterproposal would be to offset all or part of the rate increase by sweetening the package with other assets whose market value exceeds book cost. The goal is to offset the implicit capital losses of the nuclear investments with the implicit capital gains of non-nuclear assets. Even utilities with a large nuclear exposure are solvent. They have other marketable assets with low book cost such as fossil fuel plants, transmission

lines, and real estate holdings representing the former sites of abandoned plants, and have undeveloped properties adjacent to office buildings, substations, power plants, and transmission rights of way. If the nukes are combined with assets whose market values have appreciated above book cost, such a restructuring should provide some capital gains for shareholders and some immediate rate reductions for residential consumers. Through this mechanism, commissions may use rate reductions for commercial and industrial customers to meet competition from cogeneration so as to offset compensating rate increases to "captive" residential customers. Whether rate reductions are due to competition from cogeneration or to asset restructuring, they are financed from reduced capital gains.

Utility managers, in the interests of their shareholders, are entitled to be aggressive in seeking permission to restructure assets when their objective is to maximize asset market value. If management does not do this, then corporate raiders will. I think, however, that the regulatory commissions should be just as aggressive in seeking ways to share some of these immediate gains with the ratepayers.

IV. FUTURE PROSPECTS

A growing number of people now view deregulating generation as feasible both technically and politically. They understand that a local electric power distribution monopoly needn't own generators, coal deposits, or coal-hauling rail facilities any more than it need manufacture trucks if it employs a fleet of trucks. The existence of distribution utilities that satisfy all or most of their power needs by contract purchase shows clearly that nothing about a monopoly permit to serve a particular geographical area requires a utility to be vertically integrated. Deregulating generation merely limits the definition of the regulated utility to transmitting and distributing power. Because generation accounts for at least half of power costs, consumers' benefits from deregulating generation can be substantial. If, as I expect, the U.S. moves toward deregulating generation, power will be priced just like any other basic commodity is priced. This likely will bring new types of contracts. Futures markets in power may replace or supplement forward contracting. Option markets, as well as power pooling and emergency assistance contracts, may become instrumental in maintaining reliability.

But can we possibly go further? Can we think the unthinkable? Does the future hold the possibility of deregulating transmission or even distribution? I think that it does. The industry already uses extensively an institution which, if modified strategically, could be used to replace RORR. The institution of shared capacity rights or cotenancy contracts, discussed earlier, may become the vehicle through which competition replaces regulation by converting it into a competitively ruled cotenancy contract. The U.S. Department of Justice already has used such joint ventures as an al-

ternative to mergers in settlement decrees (*United States v. Alcan Aluminum Ltd. et al.*, 1985).

How would the competitively ruled cotenancy contract apply to the classical natural monopoly problem? To clarify the principles involved, consider the simple example in which a single capital facility or channel, such as a transmission line or a pipeline, serves a city. Instead of granting an exclusive monopoly permit to one company and subjecting that company to continuing regulation, the government offers a set of rules under which the facility is operated under a cotenancy agreement:

(1) Each of several co-owners acquires capacity rights to the facility in proportion to his contribution to fixed costs;

(2) These rights are freely transferable—i.e., they can be sold, leased, or rented spot to any outsider or to any co-owner subject only to antitrust limitations on concentration of ownership;

(3) Each co-owner pays his agreed share of any variable costs up to his percentage of ownership whenever he exercises his rights;

(4) The facility is managed as a cost center by a separate operating company;

(5) Any co-owner or any outsider can increase his share of capacity utilization rights by expanding capacity unilaterally.

These rules are designed to create price competition and discipline costs among the joint owners of a single physical facility, and to provide an incentive for capacity expansions as signaled by the market. This institution clearly applies if one or two radial lines from remote generating plants serve several consumption centers. By making the lines a joint venture of the plants, the government increases the number of competing suppliers of delivered energy to the alternative consumption centers.

The cotenancy contract also may apply to interdependent regional networks treated as a single, multinode, power transfer facility. I believe it is inevitable that regional dispatch centers will be in the power delivery system of the future. Therefore, each such dispatch center might be organized under a cotenancy agreement among the deregulated generator owners using the regional network.

A distribution system could be organized as a competitive cotenancy venture by transferring the distribution network and its operating and maintenance facilities to a separate management company. The latter would be owned jointly by several independent retailers that solicit and service residential power accounts. Each retailer would acquire rights to some number of customer hook-up facilities, initially by spinoff assignment and thereafter by purchases from other retailers or by new construction. But inactive customer rights could be exercised anywhere in the city so that no single power retailer would have an uncontested local monopoly. Customers would choose freely among these competing power retailers and no longer be captives of the legal monopolies that state regulation had created. Furthermore,

the alleged inefficiency of duplicate distribution lines would not exist. Retailers would be free to compete for customers not only on the basis of price but also on the basis of pricing structure. Some might offer annual or seasonal flat-rate pricing and thus attract customers preferring simple pricing structures. Some might specialize in time-of-use pricing and thus attract customers willing to invest in the load management systems that provide economic adjustments to these time-variable prices. Still others might offer interruptible power contracts to be implemented at peak levels of demand.

If any such possible future scenario should result, it will be either because the process is forced onto the system by external events or because both the regulators and the regulated have the foresight and flexibility to abandon ancient, outmoded, and inappropriate ways of thinking. The latter route is preferred.

V. SUMMARY

The recurrent incentive failures of rate-of-return regulation suggest strongly that achieving a least-cost discipline by regulatory planning is not an attainable goal. The technological development of long-distance transmission and of alternative power sources in networks has spawned several market institutions outside the state regulatory apparatus: long-term contract sales, spot power exchange, contract power pooling, shared facility ownership in generation and transmission, and economic dispatch. These institutions' prior existence combined with the current power surplus has increased competition in the electric power market. This has brought market forces to bear on electric power rates. It also has catalyzed the movements to deregulate generators from state authority and to restructure utility assets. By encouraging this movement, the regulatory commissions can further the discipline that markets exert on prices and thus on costs. By activist counterproposals to the utilities, the commissions can influence this restructuring of assets so that some capital gains inherent in such restructuring are shared with consumers in the form of either rate reductions or offsets to rate increases. Finally, for the more distant future, the cotenancy contracts that are antitrust supervised and competitively ruled have promising possibilities for deregulating transmission and perhaps even distribution.

REFERENCES

Bailey, E. E., "Deregulation: Causes and Consequences," *Science*, December 1986, 1211–1216.

Insull, S., *Central Station Electric Service: Its commercial development and economic significance as set forth in the public addresses (1897–1914) of Samuel Insull*, privately published, Chicago, 1915.

Jarrell, G. A., "The Demand for State Regulation of the Electric Utility Industry," *Journal of Law and Economics*, October 1978, 269–295.

Smith, V. L. "Currents of Competition in Electricity Markets," *Regulation*, September/October 1987, 23–29.

Legislation

U.S. v. Alcan Aluminum Ltd. et al., final judgment entered, January 1985, U.S. District Court, Western District of Kentucky.