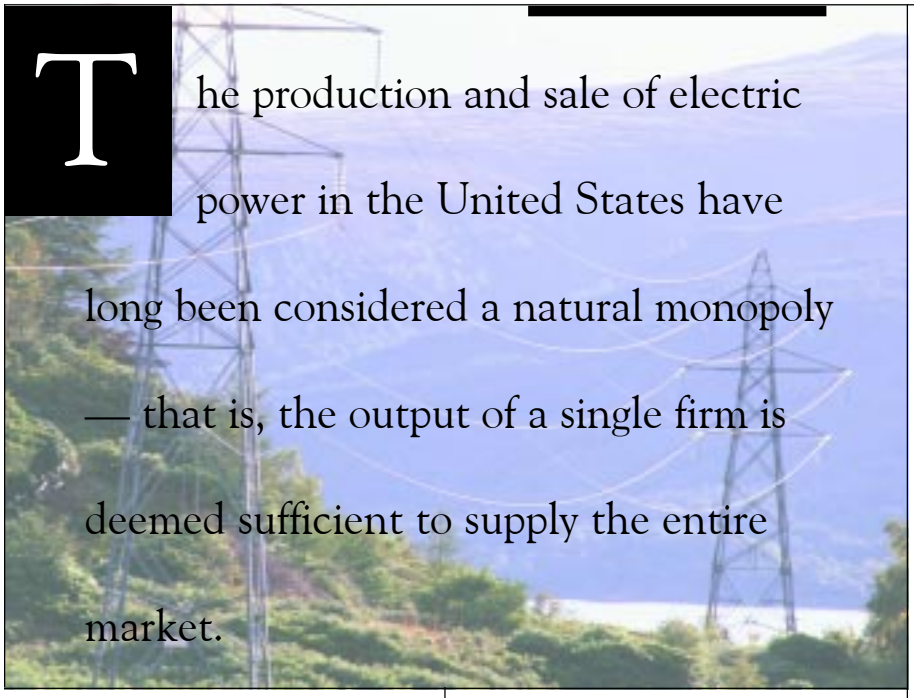
Rewiring the System:

The Changing Structure of the Electric Power Industry

BY TIMOTHY SCHILLER



The production and sale of electric power in the United States have long been considered a natural monopoly — that is, the output of a single firm is deemed sufficient to supply the entire market.

Monopoly electric utilities were permitted in order to achieve economies of scale, but they were subject to government regulation to prevent abuses of monopoly power.
The primary regulators of electric utilities on the consumer side have been the public utility commissions in each state. Wholesale delivery of electric power from one utility to another has been under federal regulation. Now, the structure of the electric utility industry has begun to change in a direction that may ultimately lead to an open market national in scope.

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In the last few years significant changes have been made in federal and state laws that cover the industry. In 1998, Rhode Island and Massachusetts opened up their electric power markets to competition. The three states of the Third Federal Reserve District soon followed suit. Pennsylvania began a phased transition in 1998 that is now complete. In 1999, New Jersey opened its electric power market, and Delaware began to phase in competition among electric power suppliers. Since then, the restructuring of electric power markets has picked up momentum. As of October 2000, 23 states have enacted restructuring legislation. Prior to enactment of the new laws, businesses and households had no choice but to purchase electricity at regulated rates from the state-approved monopoly supplier of electricity. Now, in the restructuring states, purchasers of electric power may choose from among a number of state-approved producers or marketers that compete for customers.

Recent increases in fuel prices and stronger than expected demand for electricity across the country have led to increases in prices for electricity provided by nonregulated suppliers in some states, such as California, where power plant construction by monopoly utilities has lagged electricity demand. According to proponents of the new competitive structure, the current shortfall in supply will be overcome as more generating capacity is built and the electric power industry expands to become a truly national market. In the meantime, higher and more volatile prices are likely until new capacity catches up with demand.

Changes in the electric power industry have not come about overnight. Over the past 30 years, changes in energy markets and power technology and developments in economic theory have converged to produce a rethinking of the nature of electric utilities and a movement to revise the regulations that apply to them. This article reviews developments in public policy and technology that prompted the restructuring of the electric utility industry now under way, describes the new regulatory framework, and looks at what other developments may lie ahead.

THE IMPETUS FOR CHANGE

Why is the electric power industry being restructured now, after nearly a century of regulation as a natural monopoly? (See *Traditional Regulation of Electric Utilities* for a summary of the regulatory structure under which electric utilities operated until new laws were enacted.) To understand these developments, we must look at changes that have occurred in energy technology and markets during the past several decades as well as the evolution of

Traditional Regulation of Electric Utilities

The first electric utilities in the United States began operation in the 1880s as small generators and suppliers of electricity to city neighborhoods. Municipalities around the nation regulated entry into the industry through franchises. These franchises gave utilities the right, often for a specified number of years, to supply electricity within defined areas. In general, these rights were not exclusive. Thus, competing utilities would often serve identical or overlapping areas. As the technology of electric power generation and transmission developed, utilities began to serve larger areas, including entire cities. Concentration increased as utilities merged in some markets and as one or a few dominant utilities gained market share. By the first decade of the 20th century, increasing concentration prompted a movement toward state and federal regulation.

The first states to undertake regulation of electric utilities were New York and Wisconsin in 1907. State regulation had replaced municipal regulation in most states by 1914. Laws establishing state regulation were broadly based on the Wisconsin law, which established an independent state commission to regulate utilities. The commission controlled entry into the electric utility industry by requiring that new utilities obtain a certificate of convenience and necessity. In other words, the commission decided when and where new utilities could be established. The commission set service standards and rates, and it had authority over utilities' corporate structure and financial arrangements. The commissions reviewed utilities' operations and finances, inspected utilities' operations, and responded to complaints about service or safety from consumers. Either in response to utilities' requests, or on its own, the commission reviewed and proposed changes in electric rates.

Consolidation among utilities continued in the 1920s and 1930s, and corporations were formed that controlled utilities in several states. These corporations came under federal regulation with the passage of the Public Utility Holding Company Act (1935). This law gave the Securities and Exchange Commission detailed control over utilities' corporate structure. The commission has approval authority over holding companies' issuance of securities, ownership of assets, and dealings among subsidiaries. The law prohibited utilities from engaging in businesses not related to the production or transmission of electric power. The law also established the Federal Power Commission (renamed the Federal Energy Regulatory Commission in 1977) to regulate utilities involved in interstate wholesale marketing or transmission of electric power (the sale or delivery of electric power from one utility to another). Another federal regulator of electric utilities is the Nuclear Regulatory Commission. Although primarily concerned with regulating the construction and operation of nuclear reactors, the commission also applies antitrust law when it considers a utility's application for a license for a nuclear reactor. *

The state and federal regulatory structure established in the early 20th century remained largely unchanged until the century was nearly over. Public policy, under both state and federal governments, was based on the theory of natural monopoly: electric power was most cheaply provided by a single supplier at all levels of production and distribution because of large fixed costs (capital investment in generation, transmission, and distribution facilities) and economies of scale. Public acceptance of this market outcome in order to achieve lower costs was accompanied by regulation intended to protect consumers from monopoly abuses in pricing.

Rather than simply dictate prices for electricity, state commissions tried to establish the requisite size of the sole supplier of electricity for the franchise areas (in terms of capital investment), then set rates to ensure the utility earned a market rate of return on its capital investment. However, over time, rates came to be set at various levels for various classes of users. State commissions defined types of users — such as residential, industrial (typically large manufacturing plants), and commercial (such as stores and office buildings) — and size classes and set rates at different levels for them, often favoring large users.

For most of their history, utilities remained vertically integrated, franchised, and regulated monopolies. There were occasional calls to reform the industry's structure, and some modifications were made to electric power pricing schemes, notably the introduction of peak-period prices in the late 1970s. Nevertheless, the federal and state regulatory structures put into place nearly a century ago prevailed until the pro-competition changes described in this article were put into effect.

* A brief summary of the state and federal regulatory structure may be found in Claire Holton Hammond, "An Overview of Electric Utility Regulation," in *Electric Power: Deregulation and the Public Interest,* John C. Moorhouse, editor, San Francisco: Pacific Research Institute for Public Policy, 1986, pp. 31-61.

economic thinking about industrial organization. An especially important development was the formation of regional transmission grids that reduced the need for every electric utility to have enough capacity to supply all the power needed in its service area at times of exceptionally high usage. New technologies and stricter environmental regulation also tended to reduce the cost advantages of large fossil-fuel steam-power plants.

In the second half of the 20th century, the nation's electric industry began to feel the strains of growing demand and rising costs. In 1965, New York City suffered a blackout when the utility supplying the city experienced problems at a generating plant and could not obtain power from nearby utilities. To prevent future

blackouts, the nation's utilities formed interconnections to provide back-up sources of power and an organization (the North American Electric Reliability Council) to oversee their coordination. The ability of one utility to tap others through grids (networks of interconnected power plants) and pooling arrangements (joint operating management of multiple independent utility companies) meant that each individual utility no longer needed as large a capacity as it had previously.

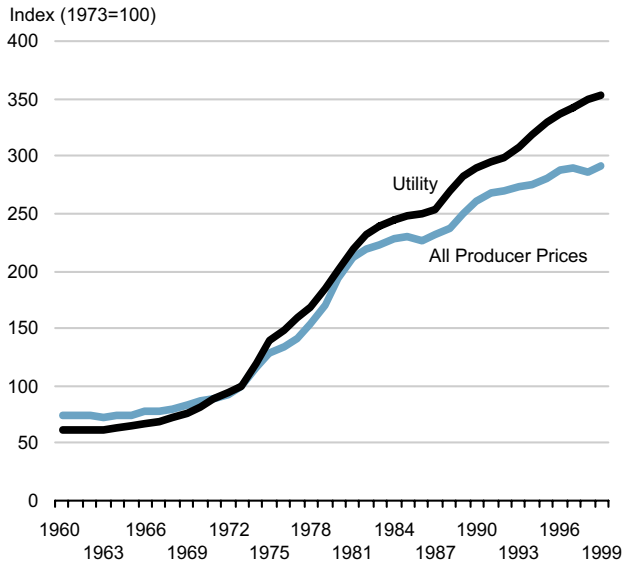
Beginning in the late 1960s, advances in operating efficiency that had been achieved almost regularly with the introduction of new large-capacity steam-power plants began to fade. New large fossil-fuel steam-power plants failed to achieve the efficiency in converting heat to electric power that had been expected of them, and the reliability of these large plants, as well as the reliability of large nuclear steam-power plants, proved to be less than that of small plants. Downtime for maintenance increased for large plants, both fossil-fuel and nuclear, making it difficult for large plants to attain the scale efficiencies they had been expected to achieve through high output rates. Furthermore, some utilities shifted to lower operating rates, running their generators at less than full capacity, to improve reliability and reduce maintenance needs, further undermining efficiency.

In the 1970s, utilities' costs increased rapidly. Costs of fossil fuels began to rise. Also during this period, construction costs for electric utilities began to rise, and they rose faster than overall producer prices (Figure 1). Besides actual costs for construction, financing costs rose as construction periods lengthened as a result of the growing complexity of large power plants and longer regulatory reviews during construction. Rising costs led utilities to postpone or cancel plans to build more plants. After the accident at the Three Mile Island nuclear generating plant in March 1979, opposition to nuclear power plants increased and safety regulation expanded, resulting in a drop in nuclear plant construction.

As construction and fuel costs rose in the 1970s, the cost of electricity began to rise sharply after falling during the previous decade (Figure 2). At the same time, growth

FIGURE 1

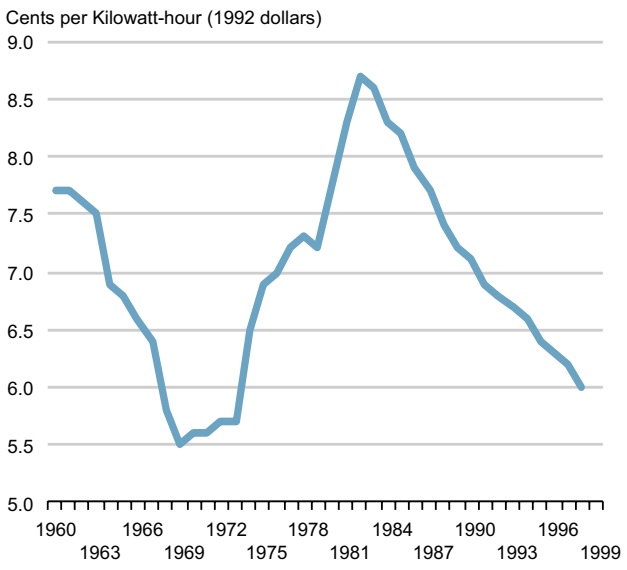
Electric Utility Construction Costs Compared with All Producer Prices*



* Handy-Whitman Index of Public Utility Construction Costs: Total Plant-All Steam Generation (Source: Whitman, Requardt and Associates, LLP)
Producer Price Index-Finished Goods (Source: Bureau of Labor Statistics)

FIGURE 2

Real Retail Price of Electricity*



* Deflated by the chained gross domestic product price deflator.
Source: Energy Information Administration

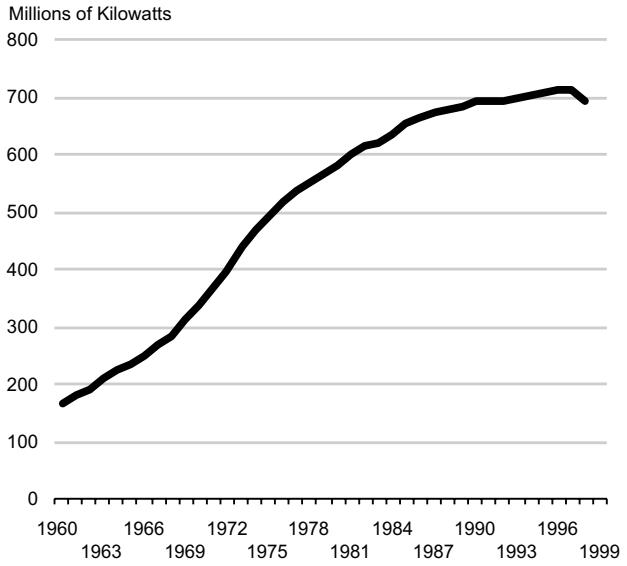
in the output capacity of the nation's electric power generators (called capability) began to slow (Figure 3). But electricity usage continued to increase despite some dips associated with economic slowdowns (Figure 4). The rising costs of electricity and the concern that generating capacity would not increase in line with growing demand for electric power prompted a search for new ways to meet the nation's electricity needs.

In the 1970s, the design of new generating systems focused on reducing fuel costs, but the new systems also demonstrated that electricity could be produced efficiently on a scale much smaller than that of a typical large steam plant used by electric utilities. In addition to their more economical use of fuel, the new smaller generators generally produced less pollution and could be built and put into operation more quickly than was possible with the older technology. Two main approaches were implemented. One was more efficient cogeneration technology. In cogeneration systems, heat is produced for an industrial process, and any excess heat is used to drive a turbine to produce electric power, or steam is used to drive an electric generator, and the waste heat from the generator is used in an industrial process. Cogeneration systems are used mainly by large manufacturing firms. The other technological innovation was combined-cycle generating systems, which use waste heat from gas turbines (driving electric generators) to produce steam for steam turbines (also driving electric generators), thus getting additional electric power from the same amount of fuel. These technological innovations bolstered arguments against the economies of scale model that had motivated the development of large utility firms and their regulation. They also made it possible for large commercial users of electricity to produce their own power or to use the option of producing their own power as a bargaining strategy to obtain electricity at negotiated prices lower than those on existing rate schedules.

As part of the federal response to rising energy costs and slowing expansion of electric capacity, the Public Utility Regulatory Policies Act (PURPA) was enacted in 1978. This law allowed the formation of

FIGURE 3

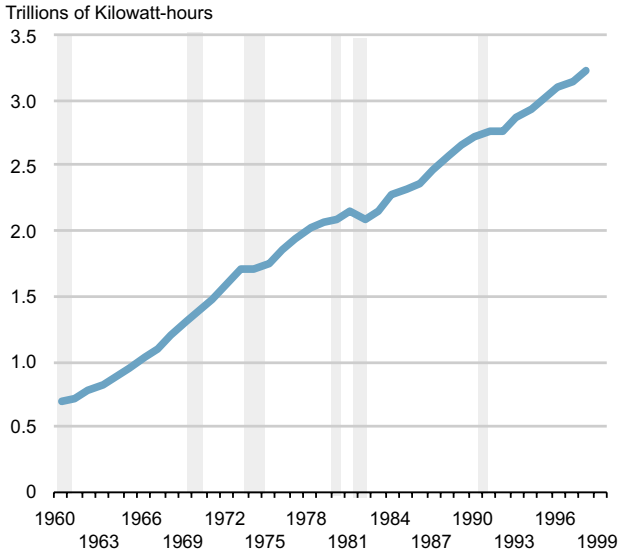
Electricity Utility Capability*



* Maximum continuous output of all generating plants in the U.S.
Source: Energy Information Administration

FIGURE 4

Electricity Usage*



* Total annual usage of electricity in the U.S.
Source: Energy Information Administration
Shaded areas indicate recession years.

companies that could generate electric power without being subject to federal and state regulation as utilities. The law also required utilities to purchase the output of these new suppliers at a price equivalent to the cost the utility would incur if it were to build a new generating plant itself (called avoided cost). Besides the technological factors that influenced the new view of electric markets as legislated in PURPA, new thinking about the presumed efficiency of natural monopolies began to suggest even further steps in opening electric power markets to competitive suppliers.

REFINING MONOPOLY THEORY

Around the same time that questions about the need for and efficiency of large generating plants were being raised, economists began to question the validity of the argument that the existence of natural monopolies inevitably leads to the combination of higher prices and lower output that regulation was intended to overcome. Consequently, economists began to offer explanations of how industries that might be natural monopolies could, in fact, behave competitively.

The main theory of how industries with high fixed costs and economies of scale could be competitive was based on the insight that firms in such industries could compete to be the single supplier of an entire market. Such competition could result in prices and quantities supplied in that market at the same levels as would occur if several firms were competing within that market.[1] Elaboration of this theory posited that even if only one firm established itself as the supplier for the whole market, it could not raise prices to monopoly levels if there remained a threat that a new firm might enter the market. Markets open to entry and exit by potential competitors are said to be "contestable."[2] An important element of contestable markets is that competitors' sunk costs are low even if fixed costs are high. Construction of a large plant is a fixed cost—one that has to be incurred in order for the firm to operate but that does not vary with the scale of production. This fixed cost becomes a sunk cost if it cannot be recovered by the firm, say, by selling the plant to another firm or by switching it to other uses.

Suppose a firm cannot recoup the cost of a plant. Then in determining how much to produce and how much to charge for its product, the firm should ignore these sunk costs. But a firm that is deciding whether to enter the industry must take into account whether it pays to incur the sunk costs of entry. The existing firm that ignores sunk costs can price its product below that of the potential entrant that cannot ignore sunk costs. Under these circumstances, potential new competitors would be reluctant to enter the market. To be contestable, markets must allow firms to enter without incurring large sunk costs in order to begin operations, and they must not allow firms already in the market to have exclusive use of already existing sunk-cost facilities.

The development of contestable markets theory began to influence public policy with respect to regulation in a variety of industries previously considered natural monopolies, notably, air transportation, trucking, and telecommunications.[3] Such industries were considered natural monopolies largely because of their high fixed costs. Elements of contestable markets theory, especially the significance of keeping sunk costs low, provided a rationale for reevaluating the regulation of utilities. For example, the separation of generating facilities from other segments of a utility's operations, especially transmission facilities, as promoted by the Federal Energy Regulatory Commission's (FERC) orders and state restructuring laws, is one way of reducing utilities' sunk costs and making markets more contestable. Prior to these changes in regulations, existing generating facilities were sunk-cost facilities because they could not easily be sold separately (to recover their cost of construction) by the utilities that owned them. With restructuring, generating facilities became more salable, and several utilities have, in fact, divested their generating facilities. Likewise, federal and state mandates on "wheeling" allow competing power suppliers to use the same transmission facilities, which are sunk costs, instead of giving exclusive use of them to a single utility.[4] Wheeling expands the options available to an electricity distributor: the distributor can obtain electricity from less expensive suppliers to which its own transmission lines are not directly connected.

NEW FEDERAL REGULATORY STRUCTURE

Previously viewed as monolithic natural monopolies, electric utilities have come to be considered integrated firms, combining three stages of the electric power supply system: generation (producing electricity at generating plants), transmission (moving electricity over high-voltage lines from generating plants to distribution nodes), and distribution (moving electricity over low-voltage lines for delivery to the final user). Recent federal regulations have had a major impact on the first

[1] An early statement of this theory was by Harold Demsetz, "Why Regulate Utilities?" *Journal of Law and Economics*, 11, April 1968, pp. 55-65.

[2] A detailed explanation of contestable markets is given in William J. Baumol, John C. Panzer, and Robert D. Willig, *Contestable Markets and the Theory of Industry Structure*, New York: Harcourt Brace Jovanovich, 1982.

[3] See, for example, Elizabeth E. Bailey, "Contestability and the Design of Regulatory and Antitrust Policy," *American Economic Review,* 71, May 1981, pp. 178-83. Besides discussing entry conditions, this article also discusses the need to handle sunk-cost problems by encouraging access to or transfer of sunk-cost facilities.

[4] Wheeling is the transmission of electricity from a first-party producer over the transmission lines of a second-party utility to a third-party utility for final distribution to the consumer.

two stages of the electric power supply system: generation and transmission; the third stage, distribution, has been largely unaffected.

The National Energy Policy Act of 1992 (NEPA) set the stage for major changes in electric utility regulation. NEPA expanded the class of independent firms and subsidiaries of utilities that could be formed to generate electricity without being subject to federal utility regulation. These so-called exempt wholesale generators had first been legalized by the Public Utilities Regulatory Policy Act of 1978, as part of the national government's response to high energy prices in the 1970s. NEPA also directed FERC to require wholesale wheeling. To implement this mandate, FERC issued two regulatory orders in 1996 that brought sweeping changes to the industry.

The first, Order 888, requires owners of all interstate transmission lines to make them available to all power generators under equal terms for wholesale transmission (wheeling). Prior to issuing the order, FERC and the Nuclear Regulatory Commission ordered wheeling arrangements for individual utilities on a case-by-case basis. Most transmission lines are currently owned by utilities, but Order 888 also established standards under which transmission systems may be operated as free-standing entities. Thus, the order laid out a regulatory framework under which the production and transmission of electricity could be conducted by different companies instead of being combined in a single firm, as under the previous structure of regulated monopoly utilities.

The second regulatory order, Order 889, requires every electric utility to provide all other utilities and power providers with online, real-time information about its available transmission capacity. This information provides the basis for spot markets in transmission capacity, making wheeling more flexible in responding to changing needs for electric power in different areas. Order 889 also requires that utilities establish separate administration and accounting for their transmission and power-generation activities. This provision of Order 889, along with the provisions of Order 888 that set standards for free-standing transmission companies, promotes arm's-length dealings between owners of transmission systems and power providers. By fostering equal access to transmission, these orders reduce the possibility that owners of transmission systems that also own generation facilities will discriminate against other power providers. For example, in the absence of a rule such as Order 889, a firm owning both generation and transmission facilities could shift some of its generation costs to its transmission operation, thereby lowering its generation price and raising the price it charges other power suppliers for transmission. Since the states began deregulation, FERC has been studying further changes in regulation to increase competition in the industry.[5]

The new state laws separate the generation stage from the transmission and distribution stages and allow businesses and households to select their own supplier.

NEW STATE REGULATIONS

By opening up power production to competition and enforcing open, nondiscriminatory transmission, federal policy established market features that enabled states to open the retail market to competition for selling electric power to consumers. Traditional regulation of electric utilities was based on the notion that the three stages of electric supply—generation, transmission, and distribution—were technically inseparable or that their combination into a single enterprise was the most cost-effective way to provide electricity. The new state laws separate the generation stage from the transmission and distribution stages and allow businesses and households to select their own supplier.[6] At this time, transmission and distribution remain regulated monopolies. Transmission and distribution systems are operated mostly by the former monopoly utilities, although changes are taking place in these sectors as well. (These changes are discussed in the section on the future of the industry.)

The new structure of intrastate electric markets is broadly similar among the states that have instituted competitive electric markets. Firms that meet certain requirements for operating standards to ensure reliability of supply are allowed to offer electricity at unregulated prices. Former monopoly utilities are also allowed to offer unregulated prices for electric power. However, because these former monopolies created systems designed to supply the whole market, they have higher total costs than new entrants. Referred to as "stranded costs," these expenses result largely from the utilities' reliance on large plants or long-term contracts for energy negotiated in the 1970s, when energy prices were higher than they are today. Most state restructuring laws allow former monopoly utilities to recoup these expenses through a charge on all consumers' electric bills, regardless of whether they switch to a new supplier. At the same time, most states require the former utilities to

[5] Recently, FERC issued Order 2000, calling for further separation of transmission and generation.

[6] A supplier may be a utility generator, a non-utility generator, or a marketing company that sells power supplied by a generator.

cap or reduce their combined charges for electric generation, transmission, and distribution. Costs for transmission and distribution remain regulated, but they must be separately enumerated on consumers' bills.

DEREGULATION IN THIRD DISTRICT STATES

Changes in federal laws and regulations paved the way for restructuring, but state action is necessary to actually bring about changes in the regulations that govern the electric power industry. As noted earlier, 23 states have passed legislation that now permits or will soon permit retail consumers to choose electric suppliers. All three states in the Third District are among those 23.

Pennsylvania. Pennsylvania was not the first state to implement changes, and it is not the largest state electricity market. But it has become the focus of national attention for its restructuring experience because a greater percentage of consumers there have switched to new electric suppliers than in any other state. Consumer choice was phased in during 1998, and all state residents gained the right to choose their electric supplier in January 1999. The state law authorized the Public Utility Commission to cap each former monopoly utility's total combined charges for generation, transmission, and distribution for four-and-a-half years. (Charges for generation are deregulated, but transmission and distribution charges remain under state regulation.) The seven former monopoly utilities that served the state now compete with 23 electric power suppliers for residential customers and 45 suppliers for commercial and industrial customers.

As of mid-year 2000, the percentage of customers that have switched suppliers from the former monopoly utilities ranged from just under 1 percent for the utility that lost the least customers to 30 percent for the utility that lost the most customers for residential service. For commercial customers (such as stores and offices) that switched, the percentages ranged from 1 percent to 30 percent, and for industrial customers (such as manufacturers), the percentages ranged from none to 44 percent.

A reason often cited for Pennsylvania's greater participation in choice of electricity suppliers is the state's treatment of stranded costs. When it determined the new pricing structure for generation versus transmission and distribution charges, Pennsylvania's Public Utility Commission set the stranded cost charge that would appear on all consumers' bills at a relatively low amount. This left the former monopoly utilities with the need to recover these costs through the unregulated prices they would charge for generation. Consequently, new suppliers that were allowed to supply electric power in the state have been able to charge less for generation than the former monopoly utilities. With greater savings possible from switching electricity suppliers, Pennsylvania residents have switched in greater numbers, proportionately, than residents of other states that have enacted consumer-choice legislation.

> If the current restructuring trend continues, electric power generation and transmission will probably evolve into two distinct industries.

Another factor that possibly accounts for the extent to which customers have chosen new suppliers in Pennsylvania is the emergence of buyers' consortia. Envisioned by some consumer-advocacy groups as a means for individual customers to combine their buying power, consortia are groups of customers who bargain jointly with suppliers. In Pennsylvania, buyers' consortia do not face the regulatory restrictions that they do in many other states, and Pennsylvania has a well-established tradition of buyers' consortia. In fact, some existing consortia simply added electric power to the list of products they buy for their members. Consortia simplify the switching process, speed it up, and increase the number of customers who switch. In Pennsylvania, businesses, school districts, municipal governments, and even state government agencies have combined to negotiate contracts with sole suppliers. According to the Pennsylvania Public Utility Commission, consortia members have obtained savings greater than the average available to individual customers under the new law allowing choice of supplier.

A third factor boosting changes to new suppliers in Pennsylvania is the state's extensive consumer-education program. The Public Utility Commission and community organizations have been very active in providing information on consumer choice and instruction in comparison shopping and selecting electric power providers.

Initial price reductions in Pennsylvania ranged from 2 percent to 10 percent, depending on the type of user and the specific provisions of the service arrangements, such as interruptibility. In Pennsylvania, as well as in other restructuring states, the extent of price reductions in the longer term will depend on the balance between the demand for electric power and the number of new suppliers that establish themselves in the market.

New Jersey. New Jersey enacted consumer choice for electric (and gas) suppliers in February 1999, and the program went into effect in November of that year. The law mandated an immediate 5 percent reduction in total charges for generation, transmission, and distribution from former monopoly electric utilities and provided for further reductions up to a total of 15 percent, to be maintained for at least four years. The New Jersey Board of Public Utilities will determine former monopoly utilities' stranded costs and allow their recovery over an eight-year period. As of March 2000, 32 companies had been licensed as energy suppliers in New Jersey, in addition to the four former monopoly utilities operating in the

state. By the middle of 2000, approximately 2 percent of the state's residential electric consumers had switched from their former regulated utility to a competitive supplier and 6 percent of nonresidential consumers had switched.

Delaware. Delaware's electric restructuring law was signed by the governor on March 31, 1999, and will take effect in two stages: large customers could choose suppliers as of October 1, 1999, and all customers can choose starting April 1, 2001. Rates will be reduced 7.5 percent and frozen until September 30, 2002. The new law provides for recovery of stranded costs for the state's sole investor-owned electric utility through a charge applied to large commercial and industrial electricity users; it does not apply to small businesses or residential customers. As of March 2000, the Public Service Commission had certified 16 companies as electricity suppliers, in addition to the former utility.

MORE CHANGES AHEAD?

So far, the restructuring of the electric power industry has been influenced by developments in economic theory, electric power technology, and market structure. Some of these developments have advanced further than others. For example, the recent price spikes in California, a restructuring state, have been attributed in part to the absence of a market in the state that would permit more efficient transactions between power generators and power distributors. Another difficulty facing California, and states in some other regions of the country, is the lack of sufficient capacity in the power grid for wholesale transmission of power into the region at times of peak demand. As the California experience indicates, merely eliminating monopoly among utilities is not likely to provide the hoped-for benefits of a more complete restructuring of the electric power industry.

Despite the elimination of electric power monopolies in many states, the generation sector of the industry is not yet fully open. State restructuring laws have deregulated only investor-owned utilities and cooperatives. These two classes of utilities together supplied 81 percent of the nation's electric power in 1998. The rest of the national supply comes from federally owned utilities or those owned by state and local governments. Although these two classes together supplied just 19 percent of electric power in 1998, in some regions of the country they are dominant. So far, these classes of suppliers have not been included in state restructuring moves. FERC has recommended that government electric utilities open their transmission systems and be fully integrated into the emerging national market, and several bills to this effect have been introduced in Congress.

The restructuring laws passed by states to date envision the continued operation of transmission and distribution systems as regulated monopolies. However, policymakers have already begun to formulate a structure that at least partially opens up the transmission sector of the electric power industry. FERC Order 888 established standards under which transmission systems may be organized as free-standing entities, referred to as independent system operators (ISOs), clearing the regulatory way for such development. Several ISOs are already in operation.[7] ISOs are expected to eliminate discriminatory practices by separating management of transmission facilities from their generator-owners and to set prices that avoid an undersupply of power or congestion of the grid.

More recently, FERC has required all utilities that own, operate, or control interstate transmission facilities to file proposals to create or participate in a regional transmission organization (RTO) that will provide nondiscriminatory access to transmission grids. The RTOs are similar to ISOs, but FERC has set standards for RTOs' independence from power suppliers, as well as for geographic scope, system reliability, and operational authority and responsibility. If the current restructuring trend continues, electric power generation and transmission will probably evolve into two distinct industries.[8] Many details of grid operation need to be worked out to ensure reliable service and equitable treatment of power suppliers. Transmission organizations, power suppliers, and FERC are giving their attention to these details.

While electricity producers and consumers are adjusting to the recent changes in the electric power industry, a potentially more significant development is looming. Small generators that will be located at the site of use are becoming available for both industrial and residential users. Referred to as distributed power, these small units are dedicated to their owner's or primary user's needs; nevertheless, they can be connected to the electric distribution system. At times when their owner (or primary user) does not require their full output, they can provide power through the distribution system to other users. In this way, the system that used to deliver electricity in only one direction, from the utility to its customers, could become a two-way system.

The past few years have brought great changes in the structure of the nation's electricity system, but the system is still evolving.

[7] California utility regulators were the first to approve an ISO, which began operation in March 1998. An ISO covering most of Pennsylvania as well as all of New Jersey and Delaware was started in April 1998. The ISOs that have been established to date are not identical; they differ considerably in organization and operation.

[8] This structure would be similar to the court-ordered separation of telephone service into distinct local and long-distance markets. See Paul L. Joskow and Roger G. Noll, "The Bell Doctrine: Applications in Telecommunications, Electricity, and Other Network Industries," *Stanford Law Review,* 51, May 1999, pp. 1249-1315.