

4. Feature Article: How Changing Energy Markets Affect Manufacturing

Introduction

The market for natural gas has been changing for quite some time. As part of natural gas restructuring, gas pipelines were opened to multiple users. Manufacturers or their representatives could go directly to the wellhead to purchase their natural gas, arrange the transportation, and have the natural gas delivered either by the local distribution company or directly through a connecting pipeline.

More recently, the electricity markets have been undergoing change. When Congress passed the Energy Policy Act of 1992, requirements were included not only to open access to the ownership of electricity generation, but also to open access to the transmission lines so that wholesale trade in electricity would be possible. Now several States, including California and Pennsylvania, have passed laws opening electricity markets to retail competition. Other States are considering similar laws while the U.S. Congress debates proposed Federal legislation.

Manufacturers spend a lot of their dollars on energy--approximately \$69.2 billion in 1994. Most of their energy expenditures were used to purchase electricity and natural gas (77 percent). What happens in those two energy markets affects the manufacturing sector. In turn, the manufacturing sector's high market share for both energy sources affects the natural gas and electricity markets.

This chapter takes a brief look at the natural gas and electricity markets. It is organized into three sections with a view to answering the following questions.



Natural Gas Market. Why did the natural gas market undergo restructuring? How did the market change? Did natural gas restructuring affect the way manufacturers obtain their natural gas, the amount they purchase, or the prices they pay for their natural gas?



Electricity Market. Why is the electricity market changing? How is it changing? How did manufacturers obtain their electricity in 1994? How much did they pay for electricity and how much did they use? What did they use the electricity for? What changes might take place in the manufacturing sector in response to the present restructuring of the electricity market?



Lessons From Natural Gas Restructuring. Will manufacturers be able to look at how natural gas restructuring has affected them and whether they can expect similar results in a restructured electricity market? What are the implications of the restructured energy markets for Energy Information Administration (EIA) data collections from manufacturing establishments?



Natural Gas Market

Impetus for Change in the Natural Gas Market

The natural gas market faced by manufacturers today is significantly different from that of 20 years ago. At that time, rising natural gas prices and difficulty in obtaining supplies gave the impression that natural gas had become a scarce resource. Early Federal action to deal with those problems resulted in legislation in the late 1970's. The legislation discouraged the use of natural gas (and petroleum products) in large industrial boilers⁵ and established pricing categories for wellhead gas production⁶ that did not allow the sending of competitive price signals in the marketplace.

In the past, manufacturers had one source of natural gas supply, the gas utility (local distribution company). Because gas distribution was such an expensive effort, distribution companies were regulated monopolies with exclusive rights to provide gas service in their franchise areas. Thus, there were few opportunities for manufacturers to save on their gas bills by seeking out different sources of natural gas supply.

Change in the Natural Gas Market

Market forces and a new regulatory initiative brought about significant changes in the options manufacturers had for getting natural gas. In 1985, the Federal Energy Regulatory Commission (FERC) issued Order 436, which allowed interstate pipeline companies to become "open-access" transporters. A "spot" market in natural gas also developed as producers made gas that was not already dedicated to the pipeline companies available for purchase by any buyer.⁷

Prior to becoming open-access transporters, interstate pipeline companies generally purchased natural gas from producers, transported it, and sold it to local distribution companies (LDCs), who then sold and transported the gas to manufacturers. An LDC's bill for a gas sale includes the cost of the natural gas itself and the cost of transporting it to the manufacturer. The cost of the gas is the weighted average cost of gas purchased by the LDC from all sources. This same average cost is passed on to all of the LDC's sales customers—manufacturers, commercial establishments, residential users, and others.

When interstate pipeline companies became transporters, manufacturers then had the option, with regulatory approval, of bypassing their gas utilities through a direct connection with the pipeline company. Manufacturers could purchase natural gas at the wellhead and become shippers on an interstate pipeline, paying to have the gas they purchased transported on the pipeline and delivered to their site. Manufacturers must compare the cost of constructing the pipeline connection and paying separately for transportation on the pipeline with the savings they can achieve by purchasing gas at the wellhead at a lower price than the weighted average price their LDCs would charge them.

Such arrangements are usually economical only for large-volume gas users. However, even smaller manufacturers, or those at great distances from interstate pipeline systems, generally benefit from this changed role of the pipeline companies. Gas utilities themselves were able to contract independently for natural gas supplies and use the pipeline company only for transportation. As a result, many LDCs were able to reduce their weighted average cost of purchasing natural gas, benefiting all classes of LDC customers.⁸

⁵Powerplant and Industrial Fuel Use Act of 1978 (PIFUA).

⁶Natural Gas Policy Act of 1978 (NGPA).

⁷See the Glossary for definitions of open-access transportation service and spot market.

⁸Energy Information Administration (EIA), *Natural Gas 1992: Issues and Trends*, DOE/EIA-0560(92) (Washington, DC, March 1993), Chapter 5, "Trends in End-Use Prices."

Many manufacturers have been able to use the threat of bypassing their local distribution company to negotiate more favorable terms with the LDC. Some LDCs offer large gas customers the option of purchasing only transportation service from the LDC. This enables the manufacturer to make its own purchases of natural gas and have the gas transported through the existing distribution network, rather than investing in a direct connection with the interstate pipeline. The LDC benefits by maintaining the transportation volume on its system and earning revenues from this service. This method of obtaining natural gas has been used by an increasing number of manufacturers since the late 1980's.

Most major interstate pipeline companies had become open-access transporters by the late 1980's; FERC's Order 636, which became effective on November 1, 1993, made it mandatory for all of them.

Along with greater options for manufacturers in obtaining natural gas came greater responsibilities related to transportation. When pipeline companies owned the gas moving through their systems, they were able to use the gas as needed for operating the pipeline system and to divert gas or make exchanges with other pipeline companies in order to respond quickly to changing customer demand. Now, the transportation contracts that manufacturers have with pipeline companies spell out the responsibilities the manufacturer has as a shipper on the pipeline. Some examples of those responsibilities are scheduling the amount of pipeline capacity required, balancing the flow of gas into and out of the pipeline, and arranging for the use of storage. All of these details must be agreed upon mutually between the manufacturer and the pipeline company so that the pipeline system remains operationally sound.

These complicating factors, along with the effort needed to find and negotiate for lower-cost supplies from producers, mean that it is usually only LDCs or companies like the larger manufacturers that are able to complete all their own arrangements to acquire natural gas today. These changes in the industry were one of the moving forces behind the appearance of a new player in the mid-1980's, the natural gas marketer.

Marketers may be independent or, as is increasingly the case, may be affiliated with a traditional natural gas company, such as a producer or a pipeline company. Marketers generally operate on low profit margins per unit of gas sold but make money by aggregating the needs of many customers and moving large amounts of natural gas. They enable smaller manufacturers (and even smaller LDCs, such as municipally owned utilities) to benefit from restructuring in the natural gas industry.

Today, a manufacturer has several options for obtaining natural gas. With a direct connection to a major pipeline, it may seek out the best purchase and transportation arrangements from the production area to its delivery point on the pipeline. It may continue to rely only on the LDC, but the LDC may, in turn, make all its own arrangements or may rely on a marketer to do so. Also, a manufacturer may directly contract with a marketer to make all arrangements from gas purchase to final delivery. The manufacturer's decision depends on its experience in the new natural gas market and the price and quality of service it can expect to receive from the many entities offering to provide it with natural gas.

Natural Gas Usage in the Manufacturing Sector

How Much Natural Gas Did Manufacturers Use? Manufacturers consumed 6.6 trillion cubic feet of natural gas in 1994, providing 32 percent of manufacturers' total first use of energy. Natural gas use by manufacturers increased an average 3.9 percent per year from the 5.9 trillion cubic feet consumed in 1991.

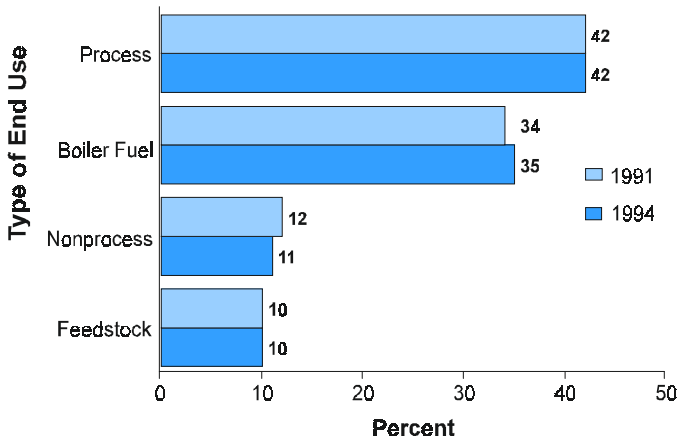
How Did Manufacturers Use Natural Gas? Manufacturers used natural gas in processes, in boilers, for nonprocess uses, and as feedstock. In 1991 and 1994, the proportions of total gas used in each area were almost identical (Figure 4.1).⁹

⁹For natural gas, the total quantity shown in Table A1, Total First Use of Energy for All Purposes, is equal to the sum of natural gas in Table A3, Total First Use of Combustible Energy for Nonfuel Purposes (i.e., feedstocks), and in Table A10 (A39 in 1991), Selected Combustible Inputs of Energy for Heat, Power, and Electricity Generation and Net Demand for Electricity. The percentage for each type of natural gas use is the result of dividing the quantity for the type of use by total natural gas used, from Table A1.

Process use, most of it in the form of process heating, accounted for more manufacturing consumption of natural gas than any other application. In 1994, process use accounted for 42 percent of natural gas consumption. The second largest use was boiler fuel, which accounted for 35 percent of natural gas consumption in 1994. The use of natural gas for boiler fuel increased 4.5 percent annually between 1991 and 1994, reaching 2.3 trillion cubic feet.

Nonprocess uses of natural gas, which are split almost evenly between facility space heating and conventional electricity generation, increased only slightly between 1991 and 1994, resulting in a smaller share of total manufacturing consumption of gas in 1994, 11 percent. The use of natural gas as a feedstock showed stronger growth, increasing 5.5 percent annually between 1991 and 1994, and accounted for 10 percent of total consumption in both years.

Figure 4.1 Percent of Total Natural Gas Consumption by Type of End Use, 1991 and 1994

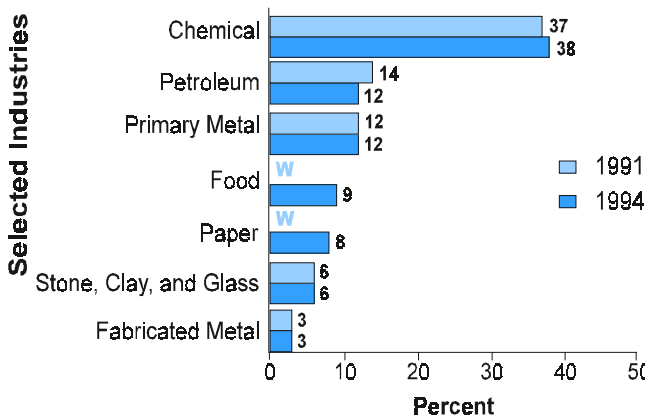


Notes: Percentages were calculated using natural gas data in Table A1. That total is equal to the totals in Table A3 and Table A39 in 1991 MECS and Table A3 and Table A12 in 1994 MECS. In both 1991 and 1994, the type of end use was not reported for 2 percent of first-use quantities.

Sources: Energy Information Administration, 1991 and 1994 Manufacturing Energy Consumption Surveys.

Among the different types of manufacturers, the chemical industry consumed more than triple the amount of natural gas used by any other industry in 1994. The 2.5 trillion cubic feet of gas used by chemical establishments accounted for 38 percent of 1994 consumption (Figure 4.2). The petroleum and primary metal industries tied for second in 1994, each consuming 0.8 trillion cubic feet of gas and accounting for 12 percent of manufacturing consumption. The same three industries were the top consumers in 1991, when the shares of total consumption were 37 percent for the chemical industry, 14 percent for petroleum, and 12 percent for primary metal.

Figure 4.2. Percent of Total Natural Gas Consumption for Selected Industries, 1991 and 1994



W = 1991 data were withheld.

Note: Industries shown are the seven industries that consumed the most natural gas in 1994.

Sources: Energy Information Administration, 1991 and 1994 Manufacturing Energy Consumption Surveys.

The increase in natural gas consumption by the chemical industry between 1991 and 1994 drove the increase in consumption by manufacturers as a whole. The chemical industry consumed 333 billion cubic feet more natural gas in 1994 than in 1991, accounting for 46 percent of the increase by all manufacturing.

The second largest contributor was the primary metal industry, which consumed 99 billion cubic feet more in 1994 than in 1991, or 14 percent of the total manufacturing increase. These changes correspond to 4.9 percent and 4.6 percent annual growth for these industries, respectively.

Does the EIA Manufacturing Energy Consumption Survey (MECS) Show Changes in Manufacturers' Sources of Natural Gas? By the early 1990's, manufacturers had many more ways of obtaining natural gas than they had even a decade earlier. In an attempt to capture these changes, the MECS, in both 1991 and 1994, asked manufacturers to identify the source of their natural gas. In 1991, the options were the utility, transmission pipelines, or other. In 1994, the options were the utility or a nonutility (for example, a pipeline company or a marketer).

In 1991, manufacturers reported that they purchased 37 percent of their natural gas from utilities. In the 1994 MECS, this share increased. The increase was unexpected, given the variety of options that manufacturers now have for obtaining natural gas. Marketers and other nonutility providers have been successful in luring customers away from the natural gas utilities because, as traditional utility contracts expire, they have been able to offer natural gas services at competitive prices. Large manufacturers in particular have the resources to seek out the best deals for natural gas from among their local distribution company and other natural gas providers.

After a preliminary investigation by EIA, there is evidence that a misclassification might have taken place in the 1994 MECS. Natural gas that was purchased from a source other than the LDC may have been classified as utility natural gas. Under these circumstances, EIA has decided to withhold all data that show a differentiation between utility and nonutility sources of gas, including quantities, expenditures, and average prices. Because of the restructuring of the natural gas market, the MECS is potentially the only source for nonutility expenditures and average prices. The value of such data is recognized and EIA plans to study why the potential misclassification may have taken place and what can be done to correct the situation before the 1998 MECS is fielded.

Does the EIA Supplier Survey Show Changes in Manufacturers' Sources of Natural Gas? EIA conducts a separate, annual survey of natural gas suppliers¹⁰ that indirectly provides some insight into the natural gas purchasing patterns of manufacturers. In the supplier survey, the respondents are companies that physically deliver natural gas to the end user and are composed largely of local distribution companies and natural gas pipeline companies. These companies report the amount of gas they deliver by end-use sector: residential, commercial, industrial, and electric utility. It is the industrial sector that is relevant here because manufacturers are a subset of this sector and consume most of the natural gas that is delivered to the sector. In both 1991 and 1994, natural gas purchases reported in the MECS were 79 percent of the industrial deliveries reported in the supplier survey.

The MECS and the supplier survey differ in several important ways (Table 4.1), one being how they reflect changes in natural gas purchasing patterns.¹¹ The MECS attempted to have manufacturers identify the source of their natural gas (utility or nonutility). In the supplier survey, suppliers separate total natural gas deliveries into the amount they sold to the end user (onsystem gas) and the amount they simply transported for the end user (offsystem gas). The latter case occurs when a manufacturer purchases gas from a source other than the delivering company, for example, from a producer or a marketer.

The definition of utility and nonutility gas purchases in the MECS is different from that of onsystem and offsystem gas deliveries in the industrial sector,¹² yet the purchasing and delivery *trends* shown in the two surveys are expected to be similar. The same market forces that drive manufacturers away from utility purchases are the ones that drive them and other industrial consumers to offsystem suppliers, such as marketers. While the MECS results show an increase in the proportion of natural gas purchased from utilities, the supplier survey shows that the onsystem proportion of natural gas deliveries in the industrial sector has declined, from 33 percent in 1991 to 26 percent in 1994 (Figure 4.3). In fact, the

Table 4.1. Comparing EIA's Surveys of Manufacturing Energy Consumption and Natural Gas Suppliers

¹⁰Energy Information Administration (EIA), Form EIA-176, "Annual Report of Natural and Supplemental Gas Supply and Disposition." Data appear in EIA's *Natural Gas Annual*, DOE/EIA-0131.

¹¹Further details can be found in EIA, *Manufacturing Consumption of Energy 1991*, DOE/EIA-0512(91) (Washington, DC, December 1994), Appendix D and EIA, *Natural Gas Monthly*, DOE/EIA 0130(94/11) (Washington, DC, November 1994), "Highlights: Comparability of Supply- and Consumption-Derived Estimates of Manufacturing Consumption of Natural Gas," pp. vii-ix.

¹²Consider the case of a pipeline company selling natural gas to a manufacturer. The pipeline company would report the sale as an onsystem delivery in the supplier survey, but that manufacturer would report its purchase as coming from a nonutility source in the MECS because the pipeline company is not the local gas utility.

Item	Manufacturing Survey	Supplier Survey
Respondents	Manufacturing establishments	Companies that make final delivery of natural gas (LDCs and pipelines)
End-User Classification	Manufacturers by SIC code	End-use sector: residential, commercial, industrial, and electric utility
Differences in Manufacturing and Industrial Coverage	Manufacturing <ul style="list-style-type: none"> • only nonutility generators of electricity at the manufacturing site 	Industrial Sector <ul style="list-style-type: none"> • manufacturing • mining • construction • all nonutility generators of electricity
Sources of Natural Gas	Utility/LDC Nonutility/NonLDC	Onsystem (respondent owned and sold the gas to the end user) Offsystem (respondent only transported the gas for the end user; did not own or sell the gas)

SIC = Standard Industrial Classification.

LDC = Local Distribution Company.

Source: Energy Information Administration, Office of Energy Markets and End Use.

supplier survey shows a continuous decline in the onsystem proportion of industrial deliveries, from 85 percent in 1982 (the first year such data were available) to only 19 percent in 1996.¹³

How Much Did Manufacturers Pay for Natural Gas? The average price of natural gas paid by manufacturers was \$2.65 per thousand cubic feet in 1994, a 1.1-percent real annual average increase from the 1991 level. During the same period, the national average wellhead price for natural gas showed 1.5 percent real annual growth, reaching \$1.85 per thousand cubic feet in 1994.¹⁴ The total growth in wellhead prices during the 1991 to 1994 period would have been stronger had the price not fallen by \$0.24 per thousand cubic feet from 1993 to 1994. This drop at the end of the period probably helped to moderate the price of natural gas to manufacturers in 1994.

Regionally, average natural gas prices paid by manufacturers in 1994 were \$2.40 per thousand cubic feet in the South, \$2.64 in the West, \$2.91 in the Midwest, and \$3.64 in the Northeast. It is not surprising that the South had the lowest average price and the Northeast had the highest. Manufacturers in the South are much closer to the major gas-producing areas of the United States, while the Northeast is not only far from these areas, but also far from Canadian supplies, which are located mainly in the province of Alberta. The regional price spread in 1994 is somewhat more narrow than the one seen in 1991 when the prices per thousand cubic feet, in 1994 dollars, ranged from \$2.20 in the South to \$3.76 in the Northeast.

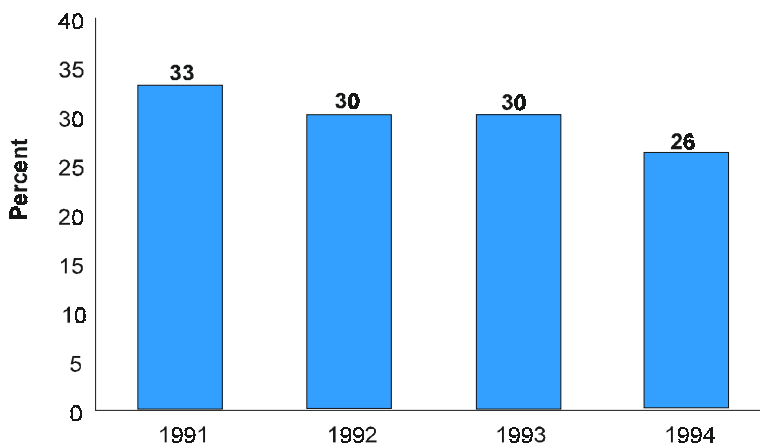
¹³Energy Information Administration (EIA), *Natural Gas Annual*, 1982-1996, DOE/EIA-0131 (Washington, DC).

¹⁴Natural gas wellhead price data are found in EIA, *Natural Gas Annual 1995*, DOE/EIA-0131(95) (Washington, DC, November 1996), Table 1. Data from the same source show that onsystem industrial prices also increased in real terms between 1991 and 1994, by 1.7 percent annually.

When considering regional natural gas prices across the different types of manufacturers, the range of prices is remarkably similar in 1991 and 1994, even after adjusting for inflation (Figure 4.4). In all but one case, either the chemical industry or the petroleum refining industry has the lowest price in the range, while the highest prices are accounted for by the furniture, rubber, leather, and miscellaneous industries.

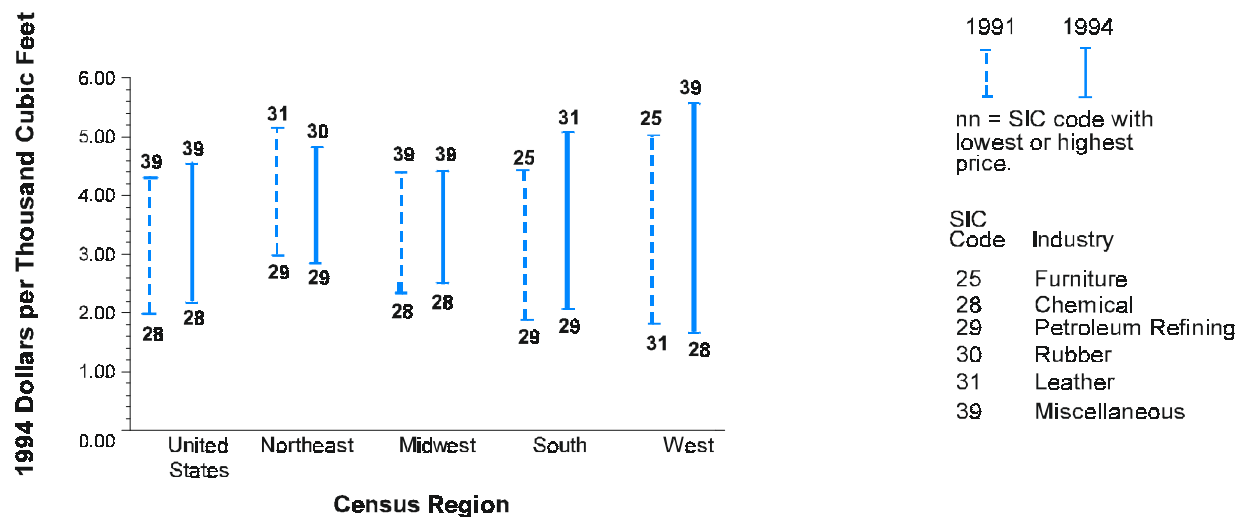
When only the top three gas-consuming industries are considered (chemical, petroleum refining, and primary metal industries in Figure 4.5), the range of prices seen in both 1991 and 1994 is much smaller than the range across all industries (compare Figures 4.5 and 4.4). The highest prices in the range for the top three industries are much lower than those for all industries, reflecting the ability of the major consuming industries to make the best arrangements for obtaining natural gas. It remains difficult, however, to discern any overall pattern in the price ranges between 1991 and 1994.

Figure 4.3. Onsystem Percent of Industrial Deliveries of Natural Gas, 1991-1994



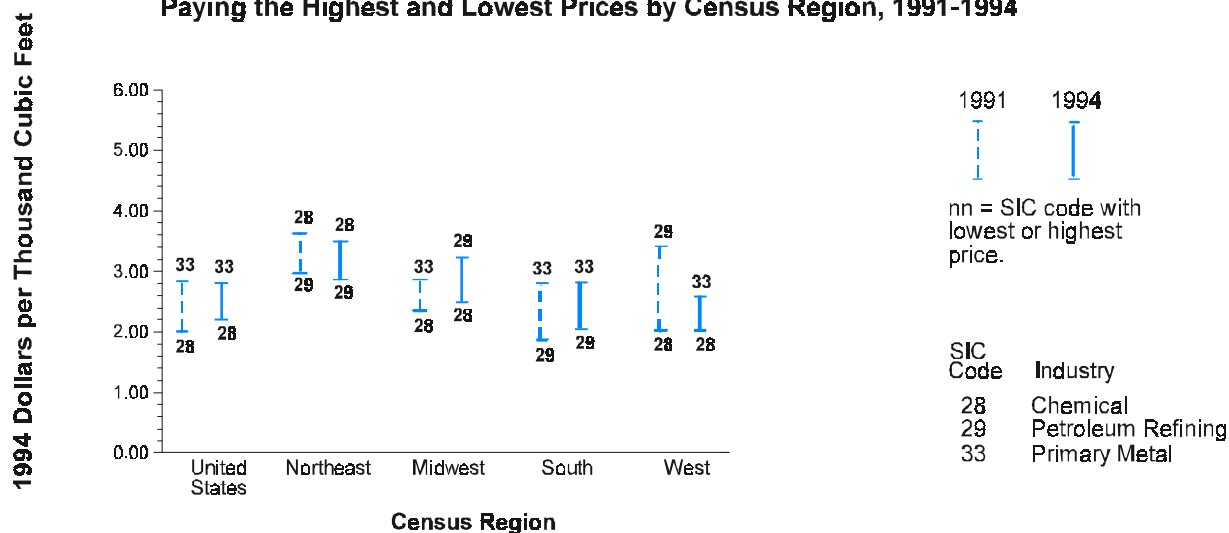
Source: Energy Information Administration, *Natural Gas Monthly*, DOE/EIA-0130(97/07) (Washington, DC, July 1997), Table 4.

Figure 4.4. Range of Average Natural Gas Prices and Industries Paying the Highest and Lowest Prices by Census Region, 1991 and 1994



SIC = Standard Industrial Classification.
Sources: Energy Information Administration, 1991 and 1994 Manufacturing Energy Consumption Surveys.

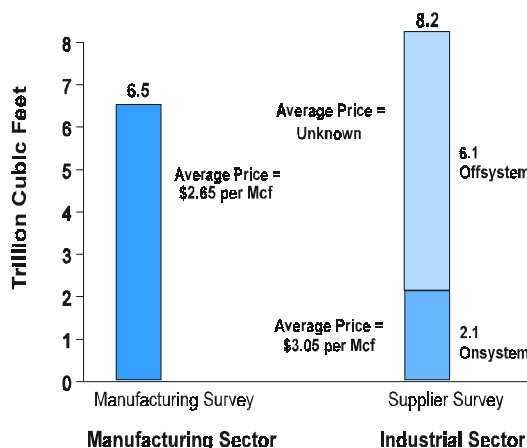
Figure 4.5. Range of Average Natural Gas Prices for the Top Three Consumers and Industries Paying the Highest and Lowest Prices by Census Region, 1991-1994



SIC = Standard Industrial Classification.
 Sources: Energy Information Administration, 1991 and 1994 Manufacturing Energy Consumption Surveys.

What Have Been the Effects of Restructuring on Information on the Price of Natural Gas? Data on the price of natural gas from utilities and nonutilities turned out to be difficult to obtain in the 1994 MECS. However, the overall average price paid by manufacturers is still of value, considering that EIA's supplier survey also lacks data on prices. As mentioned earlier, natural gas suppliers may either sell or merely transport the gas that they deliver to industrial customers. Suppliers have pricing information only for the onsystem portion of their deliveries, that is, the gas that they actually sell to the end user. The average onsystem industrial price for natural gas in 1994 was \$3.05 per thousand cubic feet, yet this price applies to only 26 percent of all the natural gas delivered to industrial customers, leaving the average price of the other 74 percent unknown (Figure 4.6). EIA analysts think that because lower prices are often the motivating factor for an industrial customer to go offsystem, the average price for all industrial natural gas is likely to be lower than the onsystem price. The overall manufacturing price of natural gas in 1994 is lower, at \$2.65 per thousand cubic feet. It is the average price for 6.5 trillion cubic feet of natural gas purchased by manufacturers, which is equivalent to 79 percent of industrial consumption.

Figure 4.6. Manufacturing Purchases and Industrial Deliveries of Natural Gas and Average Natural Gas Prices, 1994



Mcf = Thousand cubic feet.
 Notes: The industrial sector includes consumers of natural gas that are not included among manufacturers. Onsystem industrial deliveries are those for which the natural gas supplier has price information because the supplier sold the gas to the consumer. Otherwise, the delivery was only transported by the supplier and is referred to as offsystem.
 Sources: Energy Information Administration (EIA), **Manufacturing Sector:** 1994 Manufacturing Energy Consumption Survey. **Industrial Sector:** EIA *Natural Gas Monthly*, DOE/EIA-0130(97/07) (Washington, DC, July 1997), Tables 3 and 4.

Data collection and interpretation problems with respect to natural gas in the 1994 MECS all revolve around the attempt to quantify activities in the natural gas market place that have arisen as

a result of restructuring. The natural gas industry is more than a decade into this process, and with retail activities being the next restructuring target, manufacturers can expect to have even more options, and therefore more decision making, related to their natural gas purchases.

Electricity generation and transmission are entering a new phase of federally mandated restructuring. This report provides the most detailed information available from EIA on how manufacturers used electricity before implementation of the new structure. The next section reviews the highlights of these data.



Electricity Market

Impetus for Change in the Electricity Market

The electricity market has been commonly referred to as a “natural” monopoly. Industries that are natural monopolies have historically been those where they are only economically profitable if production is on a large scale. Therefore, it is only “natural” that the industry would have only a few establishments. Historically, those types of industries have been regulated. The natural monopolies of industries, such as the airline, telecommunication, and natural gas markets, have been challenged mostly because of changes in technology and competitive forces in the market place. Regulators have responded by deregulating or restructuring those industries. Now, the electricity market is undergoing restructuring. There are three main reasons for the restructuring: technology improvements, price disparity, and changes in the belief that the industry can be restructured to allow competitive forces to work towards lowering prices.¹⁵

Technology Improvements. Today, there is less of a need to build large, expensive power stations when extra capacity is needed. Smaller, inexpensive units can be built that can provide electricity at low cost.

Price Disparity. Customers, and especially manufacturers, who use large amounts of electricity, have been pressuring their legislative bodies and utilities to address the disparity in the prices of electricity. Manufacturers in different parts of the country face varying prices. In 1994, manufacturers in the New England Census Division paid on average almost 8 cents per kilowatt-hour, whereas those in the East South Central Census Division paid on average 3.5 cents per kilowatt-hour (Figure 4.7). Within a region, prices can differ between industries. For example, in 1994 manufacturers in the paper industry paid on average 2.9 cents per kilowatt-hour in the Mountain Census Division, whereas those in the chemical industry in the same region paid 4 cents per kilowatt-hour.

Changes in Regulation. In general, manufacturers in the Northeast face higher prices. That area seems to be moving faster towards electricity restructuring than are other areas where the prices are lower. Some of the States in the Northeast, such as Pennsylvania and Rhode Island, have actually passed legislation. Another example of a State where electricity restructuring is on a fast track is California. That State has passed restructuring legislation to begin retail competition in 1998. That legislation includes a 10-percent rate reduction for residential and small commercial customers and authorizes retail competition for some customers, including manufacturers, by January 1, 1998, and retail competition for all customers by 2002.¹⁶

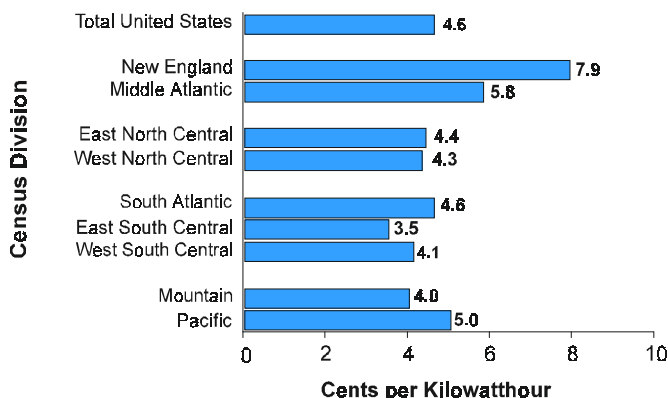
¹⁵For an in-depth discussion of electricity restructuring, refer to Energy Information Administration, *The Changing Structure of the Electric Power Industry: An Update*, DOE/EIA-0562(6) (Washington, DC, December 1996).

¹⁶See “What is it and Will it Affect Me?” for a complete description of California’s restructuring Plans on the Internet at http://energy.ca.gov/energy/restructuring/restructure_FAQ.html.

Change in the Electricity Market

In 1978, the Public Utility Regulations Policy Act of 1978 (PURPA), a Federal law, was passed. One section of PURPA required utilities to buy electricity from independent power suppliers who generated electricity using renewable energy or cogenerated the electricity. These new suppliers had to meet certain qualifying criteria set by the Federal Energy Regulatory Commission (FERC). PURPA and other legislation and regulatory policies started affecting the market structure earlier on. The Energy Policy Act of 1992 (EPACT) changed the market structure. No longer would the electricity market be looked upon as a natural monopoly. The Federal legislation promoted the competitive wholesale market for electricity and granted open access to the transmission lines similarly to what had earlier taken place in the natural gas and telecommunications markets. In Order 888, issued in April 1996, FERC carried out EPACT requirements by presenting the guidelines for access to transmission lines to promote competition in the wholesale market for electricity.

Figure 4.7. Average Price of Electricity by Census Division, 1994



Source: Energy Information Administration, 1994 Manufacturing Energy Consumption Survey.

In 1994, less than 3 percent of the purchased electricity used in the manufacturing sector came from a source other than the local utility. Now, retail competition is coming to the electricity market. Manufacturers and other customers will be able to choose their supplier of electricity.

As of July 7, 1997, Tennessee was the only State that had no activity on the path to electricity restructuring.¹⁷ Restructuring bills have been passed in seven States (California, Maine, Montana, New Hampshire, Pennsylvania, Rhode Island, and Oklahoma). In 11 States, restructuring bills have been vetoed or have failed in State legislatures. Thirty-eight States have held public forums on the topic--most States have undertaken legislative study. Restructuring bills are still pending in the following States: Alabama, Arkansas, Delaware, Georgia, Hawaii, Indiana, Kansas, Kentucky, Louisiana, Massachusetts, Mississippi, New Mexico, New York, North Dakota, Ohio, Oregon, South Carolina, Utah, Vermont, and Virginia.

Electricity Usage in the Manufacturing Sector

How Much Electricity Did Manufacturers Use and Where Did They Get It? In 1994, manufacturers purchased 788 billion kilowatt-hours of electricity, either from their local utility (97 percent) or from a nonutility (i.e., independent power producer, small producer, or a cogenerator not at the establishment). Another 143 billion kilowatt-hours (90 percent of which was cogenerated) were generated on site. Only 2 percent of the generation was through the use of renewables. The transfer of electricity from central company offices to establishments added another 16 billion kilowatt-hours.

Manufacturers generated or purchased more electricity than they could use, so they sold or transferred offsite 28 million kilowatt-hours. In sum, 918 billion kilowatt-hours of electricity was actually used in the manufacturing sector in 1994, almost the same amount used by all U.S. households in 1993.¹⁸

¹⁷National Regulatory Research Institute. Online (<http://www.nrri.ohio-state.edu/restruct/summary.txt>) (July 7, 1997).

¹⁸Energy Information Administration, *Household Energy Consumption and Expenditures 1993*, DOE/EIA-0321(93) (Washington, DC, October 1995), Tables 5.2 and 5.4.

Another source of manufacturers' additional electricity is what is commonly called "negawatts"--kilowatthours saved through the use of energy management programs. In 1994, almost 45 thousand establishments participated in at least one energy management program.

How Much Did Electricity Cost?¹⁹ Electricity expenditures, as other energy expenditures for the most part, are a small amount of the cost of producing a product. Energy costs, though, are very important to manufacturers. Although a company may incur only a small percentage of its total cost of production as costs of electricity, a particular establishment in that company may have electricity and other energy costs that are substantial, and the amount of expenditures may determine whether or not the establishment makes a profit.²⁰

Therefore, manufacturers do indeed pay attention to the price of electricity. In 1994, manufacturers spent a total of \$36 billion on electricity at an average price of 4.6 cents per kilowatthours. Unlike an individual household, a manufacturer may be the largest buyer of electricity from a local utility and may even be able to generate its own electricity. This position is one factor leading to lower electricity prices in the manufacturing sector than in the residential sector. In 1993, if all U.S. households had been able to purchase electricity at 1994 manufacturing prices, they would have paid \$44.3 billion, instead of the \$81.1 billion they actually paid.²¹

How Did Manufacturers Use Electricity? Most of the electricity used in the manufacturing sector is used in the process of manufacturing a product. Very little is used for heating the buildings, air conditioning, office equipment, or other nonprocess end uses. In fact, in 1994, 80 percent of all the electricity used in the sector--including onsite generation--was used in the process itself. Of all of the electricity used, 54 percent was used solely for machine drives (motors).

Similar statistics pertain to two of the three largest users of electricity--the paper and chemical industries. In 1994, the paper industry used 85 percent of its electricity in the manufacturing process (80 percent for motors). The percentage was even higher for the chemical industry. That industry used 90 percent of its electricity for process usage, but only 62 percent for motors. Some of the electricity is used for process heating and the electrochemical process. Although the third largest user of electricity, the primary metal industries, also used most of its electricity directly for the process (91 percent in 1994), only 29 percent of that amount was for motors. That industry also used 24 percent for process heating and 36 percent for the electrochemical process (Figure 4.8).

How Electricity Restructuring Might Affect Manufacturing

In summary, most electricity used by manufactures is purchased. The two exceptions are the paper and chemical industries, which produce a large portion of their electricity onsite. Additionally, most of the electricity is used directly for the manufacturing process, and mostly for motors. These characteristics need to be considered in any discussion of potential effects that electricity restructuring may have on the manufacturing sector. A few of the major areas that might be affected are: future prices, participation in energy management programs, and onsite generation.

¹⁹In August 1997, the Energy Information Administration published the report *Electricity Prices in a Competitive Environment*, DOE/EIA-0614 (Washington, DC, August 1997). The report "... provides price projections as 'illustrations' of the potential effects of changes in certain parameters on the price of electricity that may emerge under competition," p. iii.

²⁰Based on the author's conversations with various manufacturers and various manufacturing seminar discussions.

²¹Energy Information Administration, *Household Energy Consumption and Expenditures 1993*, DOE/EIA-0321(93) (Washington, DC, October 1995), Tables 5.2 and 5.4.

What Might Happen to Prices? At the present time, as discussed earlier, manufacturers face variable pricing depending on a number of factors such as location, amount, use, and even the manufacturing process itself. Most studies show that electricity restructuring should bring about more uniform pricing because manufacturers will be able to purchase electricity from many different sellers of electricity. In 1994, manufacturers purchased less than 3 percent of their electricity from a supplier other than a utility.

Whether the manufacturers will face lower prices will be limited by a number of factors. One of these factors may be flexibility--do they need a constant supply during peak times? Presently, the more flexible a manufacturer is in terms of time and ability to switch to another energy source, the better the prices they face in the electricity market.

Also, if a manufacturer is one of a utility's largest customers, this manufacturer is in a good position to demand lower electricity prices. This might not be the case under restructuring. The manufacturer's market power might not be as strong. The local utility will have the option to sell its electricity to whomever it wishes.

Will Energy Management Programs Be Important? Many large establishments use energy managers to monitor their energy usage. Some even have the technology to control loads, use electricity during off-peak times of day, and improve the technologies used in their processes, motors, lighting, etc. Many perform their own energy audits.

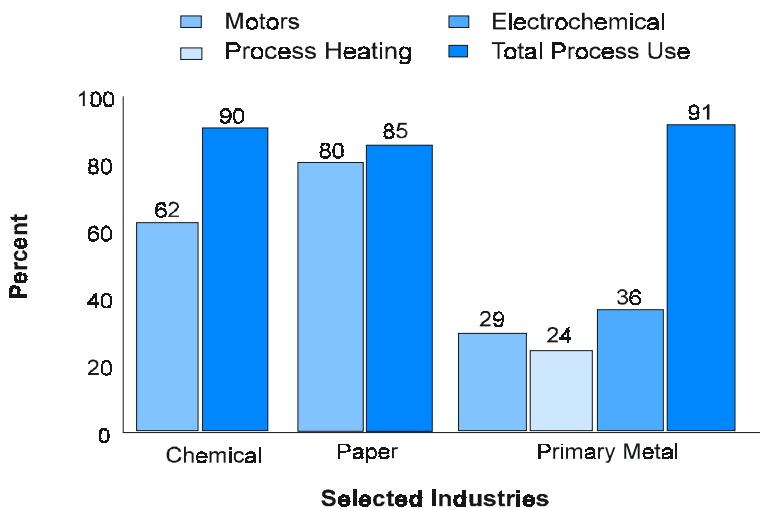
In 1994, 54 percent of the electricity used by manufacturing establishments was used to run motors. Fifteen percent of the establishments evaluated all expected costs, including electricity, over the lifetime of the system before deciding on new motor purchases or modifications to existing motors. The percentages climb to 27 percent, 27 percent, and 28 percent for the largest users of electricity, the paper, chemical, and primary metal industries, respectively.

Under electricity industry restructuring, manufacturing energy management programs might diminish or might even grow. In industries such as the chemical industry that have cogeneration technologies similar to those used by independent power producers, the market may be such that electricity savings may be important--excess electricity could be sold in the market.

Electric utilities work with both large and small establishments by offering such programs as audits, equipment rebates, assistance with special rate schedules, and load controls. In 1994, over 29 thousand establishments participated in at least one electric utility energy management program. Under restructuring, this will change--energy management may become, in a competitive market, a commodity. Programs may be sold by the utilities as they are today by the energy service companies or they may become a product of good will to maintain customer relationships.

What Will Happen to Onsite Electricity Generation? In 1994, manufacturers generated on site 142.5 billion kilowatt-hours of electricity, 90 percent of which was cogenerated. Cogeneration was found mainly in those industries that have large steam requirements for process heating. It is economically more efficient to use the energy twice, mainly as a

Figure 4.8. Electricity Demand for Three Industries by Each Industry's Major End Uses, 1994



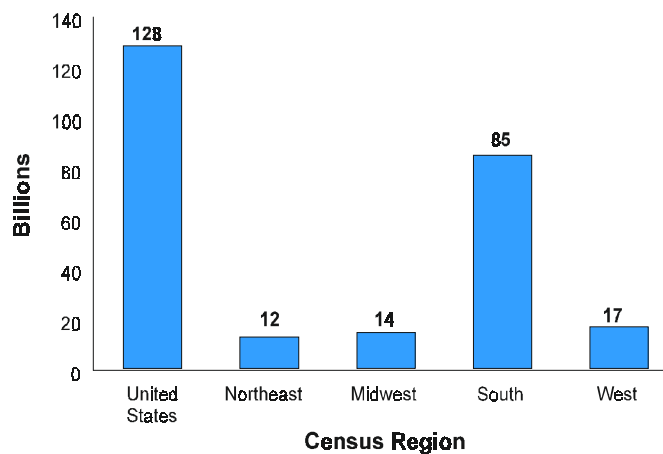
Note: Percents are based on total electricity demand for the selected industries.

Source: Energy Information Administration, 1994 Manufacturing Energy Consumption Survey.

source of both thermal heat and electricity. Additionally, many of the establishments that use cogeneration technologies have a large supply of byproducts such as bark, wood chips, black liquor, or different forms of gas. Those establishments usually use the most common technology, boiler/steam turbines, because multiple kinds of energy inputs can be used with that technology. Most cogeneration takes place in establishments located in the South Census Region (Figure 4.9).

In 1994, as in other years, the paper industry had large amounts of usable byproducts, such as wood chips and black liquor. Approximately 40 percent of all cogenerated electricity took place in the paper industry, where 61 percent of the electricity was cogenerated using boiler/steam turbines. In 1994, most of the paper industry's cogeneration took place in the South (62 percent).

Figure 4.9. Cogeneration of Electricity by Census Region, 1994
(billion kilowatthours)



Source: Energy Information Administration, 1994 Manufacturing Energy Consumption Survey.

The chemical industry was the next largest cogenerator (35 percent). That industry also is located primarily in the South, where, in 1994, 90 percent of the industry's cogeneration took place. The MECS data show that the industry used at least two different cogeneration technologies.²² Because the chemical industry is the largest user of natural gas as feedstock and for process heating, it would be reasonable to assume that some of the 1994 cogenerated electricity came from the use of combined-cycle turbine systems, which can burn both natural gas and byproduct gases. Additionally, in 1994, the chemical industry was the second largest seller of electricity (7.7 billion kilowatthours). It may be reasonable to assume that some of the electricity was cogenerated using the conventional combustion turbine that also burns natural gas. The conventional combustion system is the one used more frequently when there is excess capacity and electricity is sold.

How cogenerating industries will change under electricity restructuring is unknown at this time. Some industries might face lower market prices for electricity, which would dampen the incentives for cogeneration. Other industries, especially smaller establishments lacking large electricity loads and facing relatively high prices, might have increased incentives to cogenerate. There are some industries that need a reliable supply of electricity. Risk aversion might cause those industries to use the best technology and to generate their own electricity, possibly through cogeneration. Industries such as the chemical industry have the technology, and thus the ability, to cogenerate excess electricity to sell if the price is right.

²²This paragraph includes cogeneration technology information from the Gas Research Institute, *Current Status and Projected Trends in Industrial Cogeneration* (GRI-93/0467) (Washington, DC, December 1993), pp. 2.1 - 2.12. The cogeneration technology data used are from Table A13 in this report.



Lessons From Natural Gas Restructuring

Historically, the natural gas and electricity markets have been regulated by some of the same entities.²³ At the Federal level, that entity has been FERC. At the State level, the regulatory body has usually been the public utility commission for each State. As mentioned in the beginning of this chapter, the economic theory of “natural monopoly” was the justification for the regulation. Developments such as new emphasis on the economic benefits of competition, price differentials, emergence of new technologies, and the experiences obtained from the deregulation of other industries, such as the telecommunication industry, has changed how regulators, Congress, and customers look at energy markets.

How Long Will Electricity Restructuring Take? The restructuring of the natural gas market has been going on for approximately 20 years and it is still undergoing changes. Although manufacturers have long been able to benefit directly from restructuring, only recently have other market segments, such as residential customers, been able to participate--on a limited basis and, for the most part, as participants in pilot projects. There is no reason to believe that the restructuring of the electricity market will be any faster. However, lessons that have been learned from the restructuring of the natural gas market may assist in having a faster transition to a competitive environment and a smoother one. As in the natural gas market, the first participants to benefit from restructuring most likely will be manufacturing establishments. As was noted earlier, manufacturers who use large amounts of electricity already can and do receive rate concessions from their local utility. Reasons include the potential competition of onsite-generated electricity and other factors such as desirable load characteristics not present in other sectors.

Will the Structure of Electricity Markets Remain the Same? Historically, the natural gas market had a structure where gas owners, transporters, and distributors (the local utility) were different entities. Local utilities purchased the gas at the city gate and then distributed the gas to their customers. Under restructuring, however, gas utilities, manufacturers, and others may purchase the gas at the wellhead.

In contrast, electric utilities had, for the most part, generated their own electricity, transported it, and distributed it to customers, including manufacturing establishments. The utility or its affiliate owned all three stages--electricity production, transportation, and delivery to the ultimate customer.²⁴ Under restructuring, each of the three stages is accomplished by independently owned units. Unlike natural gas, for which production points are geologically fixed, electricity can be generated wherever facilities are put in place. Thus, in the emerging competitive market, manufacturing establishments--especially chemical or paper establishments, as noted earlier--could become generators of electricity for the sole purpose of sales, including sales to customers other than electric utilities.

Will the Electricity Market Have New Entrants--Brokers and Marketers? Manufacturing establishments may now go to the wellhead to buy gas or hire gas brokers to buy it for them. Many of the gas marketers or brokers are entering the electricity market. New entities are being created specifically to market electricity. The new entities can also arrange for the purchase and delivery of large quantities of gas for sale to each of the many small establishments located in the same region. This strategy of combining small establishments to create market power could take place for electricity as well. This strategy can, and likely will, be used in market segments other than manufacturing.

²³For a discussion of the similarities of and differences between the natural gas and electricity markets, see Energy Information Administration, *Natural Gas Monthly*, “Restructuring Energy Markets: Lessons from Natural Gas,” DOE/EIA-013(97/05) (Washington, DC, May 1997).

²⁴There are some exceptions, most notably are cooperatives or municipal utilities that purchase most, some, or all of the electricity they sell. Also, some utilities purchase electricity from entities such as independent power producers.

Are There Energy-Plus Companies on the Horizon? In the past, manufacturers in many of the regions of the country have been able to purchase both gas and electricity from the same utility. In the future, manufacturers may be buying their natural gas, electricity, energy-management, cable, internet, and telecommunications services from the same company.²⁵

How Will Restructuring Affect Data Collections? In many States such as California, utilities have been required to collect data that different States' public utility commissions used to support some of their regulatory decisions. In a more competitive environment, these types of data might not be readily available. Additionally, survey respondents may find it difficult to report information on the supplies and prices for natural gas and electricity. The arrangements have become very complex and the individuals responding to the surveys may not have been involved in the actual purchases.

The misclassification of utility and nonutility natural gas quantities and the consequent effect on the natural gas prices in the 1994 MECS may be just the beginning in the difficulties data collectors such as EIA will face because of restructured energy markets. As noted in this chapter, respondents to EIA's supplier survey are able to report quantities but have not been able to report prices for offsystem gas. This difficulty will only be compounded when consumer choice for electricity becomes more than a pilot test. It is very important that EIA thoroughly examine the results of the 1994 MECS before the 1998 MECS is fielded, at which time some manufacturers may be purchasing electricity from several electricity providers.

Electric power analysts and data collectors at EIA have been engaging in extensive redesign efforts for many of the electric power data collections. Changing roles of electric utilities, direct consumer purchases from nonutility generators, uncertainty in transmission maintenance and responsibility, and greater uncertainty in electricity prices affect data collection. Some institutions will no longer exist, while new ones will arise. Data traditionally found at electric utilities might be dispersed to many different types of entities. Data once thought to be discloseable due to the regulated nature of electric utilities might now be thought of as proprietary by the data providers. EIA has been in contact with industry representatives, consumer groups, media, government officials, and other potential EIA data customers to better understand the implications that the restructuring of energy markets may have on data collections.

²⁵Electricity and natural gas markets are merging their resources with nontraditional entities. UtiliCorp United Inc. and Peco Energy Company recently formed a partnership with AT&T and ADT Security Services. The Oil Daily Company, *Natural Gas Week*, July 14, 1997, p. 1.