

# Employment trends in energy extraction

*In the wake of the 1973–74 oil embargo, higher prices for foreign and domestic fuels stimulated rapid expansion of U.S. extraction industries, and encouraged development of previously unprofitable energy sources*

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Since the 1973–74 Arab oil embargo, rising energy prices have encouraged domestic suppliers to develop additional sources of energy. For example, in the first 6 months of 1980, domestic oil producers drilled 19 percent more wells in the United States than they did during the comparable period in 1979 and opened 15 percent more oil and gas wells than they did during all of 1973.<sup>1</sup> This increase in exploration and development activity has in turn resulted in significant employment growth in the oil and natural gas extraction industries.

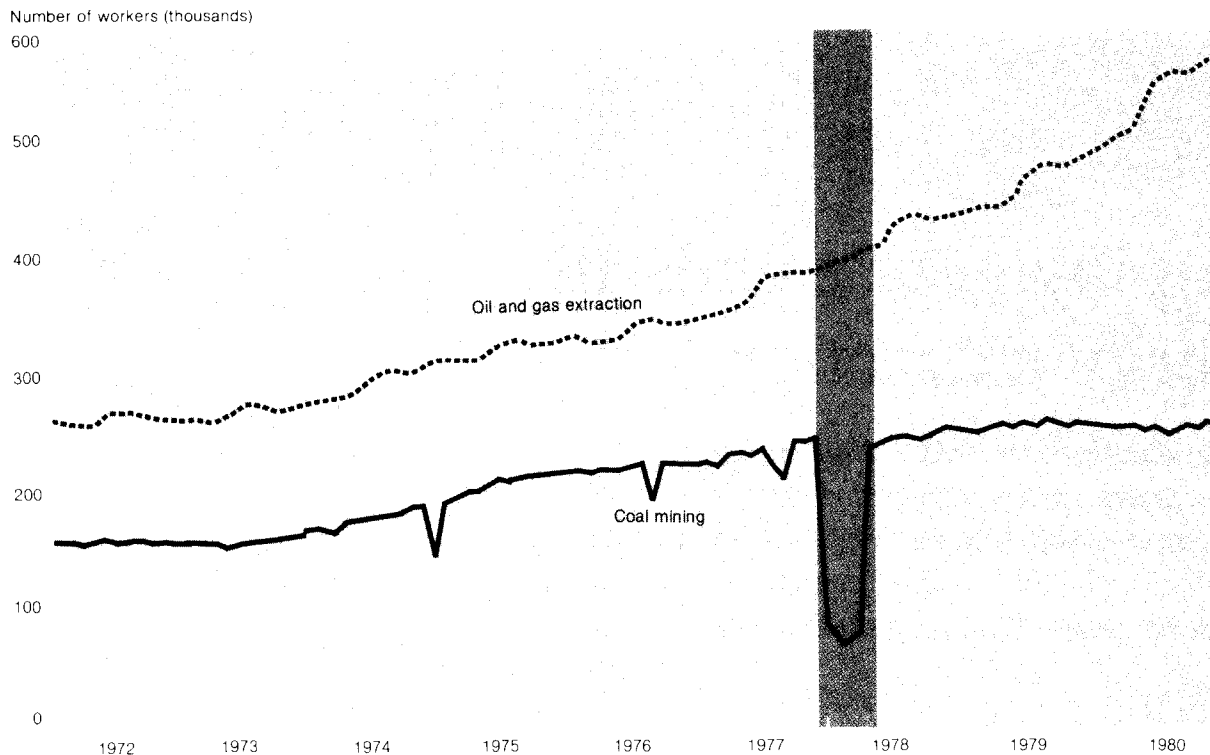
In fact, by the end of 1980, employment in the basic energy extraction industries—coal, oil, and natural gas—had risen by more than 400,000, or 91 percent, since the embargo. (See chart 1.) This growth was almost six times the rate of increase in the total nonagricultural sector of the economy. During 1973–80, employment in the goods-producing sector would have fallen by almost 80,000, or 0.3 percent, without the tremendous growth in the energy extraction industries. These industries, which represent a little more than 3 percent of the total employment in the goods-producing sector, posted a rate of growth which was 123.8 percent of that recorded for the sector as a whole. Other important employ-

ment trends in the energy extraction industries since the embargo:

- The employment growth rate has been accelerating recently, particularly in the oil and natural gas industries, with almost 37 percent of the total increase since the embargo taking place in the last 2 years. Employment in oil and gas field services (primarily contract drilling and maintenance) has almost doubled in the last 4 years.
- During 1973–78, employment in the coal mining and oil and natural gas extraction industries grew at approximately the same rate. Subsequently, however, the oil and natural gas industries have accounted for more than 75 percent of the growth in energy extraction employment and have expanded at almost double the rate of the coal mining industry.
- As would be expected, employment in oil field and mining equipment manufacturing industries has also risen sharply, by 62,300, or 85.3 percent, over the 1973–80 period. This contrasts markedly with the very flat employment growth trend for the total manufacturing sector. The production of oil and gas equipment accounted for 86.2 percent of the increased activity in the energy extraction equipment manufacturing industry. Employment in other indus-

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**Chart 1. Monthly employment levels in the coal mining and oil and natural gas extraction industries, 1972-80**

NOTE: Shaded area indicates strike in the coal mining industry.

tries manufacturing energy extraction-related equipment, such as offshore drilling platforms and oil and natural gas pipelines, has also significantly increased. However, an accurate estimate of the employment growth in these industries could not be obtained from the data sources used for this study.

This article details national and State employment trends in the energy extraction industries since the 1973-74 oil embargo. Employment data are from two Bureau of Labor Statistics payroll employment programs.<sup>2</sup> The post-oil embargo period is the focal point for this study because of the profound impact of that event on the subsequent development of both government and private industry energy plans.

Throughout the article, oil and natural gas extraction is defined to include such activities as exploration; drilling; building, completing, and equipping wells; and operation of the wells. The oil and gas field services industry, which is a subgroup of the extraction industry, primarily involves contract drilling and other specific contract field operation activities including building well foundations and chemically treating and clearing

walls. Separate employment data for the oil and natural gas industries are not available under the 1972 Standard Industrial Classification (SIC) coding system. Mining also includes activities such as dredging and mine preparation plants.

The oil field machinery and equipment industry includes establishments primarily engaged in the manufacturing of oil and gas field derricks, drilling tools, and drilling rigs and other machinery used to operate oil and gas fields. The mining machinery and equipment industry includes the manufacturing of coal breakers, mine cars, rock crushing and mineral cleaning machinery.

### Background

U.S. dependence on oil imports and vulnerability to interruptions of foreign oil supplies were visibly demonstrated during the 1973-74 Arab oil embargo. Subsequently, the Iranian revolution and oil cutoff, the invasion of Afghanistan by the Soviet Union, and the Iran-Iraq war have only increased the risk of reliance on oil imported from the Middle East. In 1960, imports accounted for only about 20 percent of U.S. oil con-

sumption. However, as oil consumption in the United States began to outpace new domestic discoveries and import quotas were removed (May 1, 1973), this dependence rose to more than 37 percent in 1974 and to 51 percent in early 1977, before dropping back below 37 percent by the end of 1980.<sup>3</sup>

Despite the recent decline in U.S. oil imports, the economy at the beginning of 1981 remained heavily dependent on imported oil. And, the price of this oil has soared. Since just before the embargo, the price of a barrel of Saudi Arabian benchmark crude oil has risen from \$5.18 to \$32.<sup>4</sup> The effect of these enormous changes in the availability and price of imported oil have affected every sector of our economy.

In the United States, a major result of the changes in the price and availability of imported oil has been the development and implementation of government policies designed to facilitate the discovery, production, and use of domestic sources of energy—primarily oil, coal, and natural gas.<sup>5</sup> Examples of these policies include:

<i>Law</i>	<i>Major purpose</i>
Natural Gas Policy Act of 1978	Extension of Federal regulatory control to all natural gas production, and the gradual decontrol of all natural gas prices <sup>6</sup>
Energy Policy and Conservation Act of 1979	Provide authority for the phased decontrol of domestic crude oil <sup>7</sup>
Power Plant and Industrial Fuel Use Act of 1978	Encourage the use of coal by major utilities and industrial consumers

Other measures promoting the development of domestic energy sources provide for increased access to Federally owned lands for oil and gas exploration and the resumption of the Federal coal leasing program in 1979.

### National trends

*Oil and natural gas.* Employment in the oil and natural gas extraction industries rose from 278,000, just before the 1973–74 embargo, to 595,000 by the end of 1980. (See chart 1.) More than 43 percent of this increase occurred after the April 4, 1979, announcement of the phased price decontrol of newly discovered domestic crude oil. The average monthly employment increase in these industries has been approximately 6,600 since the phased price decontrol was announced. This increase is more than double the rate of the period between the beginning of the embargo and the announcement of the phased price decontrols. The post-embargo oil and natural gas employment trend contrasts sharply with that observed over the 10-year period prior to the embargo, during which employment in these industries had actually declined by about 10,000.

Clearly, a major reason underlying the recent surge in oil and natural gas exploration and extraction employ-

ment is the increased price firms in these industries are receiving for their products. Higher product prices have not only encouraged the search for new sources of oil and natural gas, but have made the use of enhanced oil recovery techniques and the development of fields previously categorized as sub-marginal more attractive. Other factors affecting recent employment trends are the increased participation of Canadian firms in the discovery and development of U.S. oil and gas fields;<sup>8</sup> improved search techniques, which decrease the risks associated with exploration activities; and unsettled political conditions in the Middle East which highlighted the vulnerability of the United States to the disruption of imported oil supplies.

A notable component of industry growth has been the increase in drilling activity, which is now at its highest level in more than 20 years.<sup>9</sup> Employment in the oil and gas field services industry—basically well drilling, building, and maintenance on a contract basis—has grown by almost 100,000 in the last 2 years alone. The following tabulation shows the level and proportion of the employment in the oil and natural gas extraction industries involved in field services over the 1972–80 period:

<i>Year</i>	<i>Total field services employment (in thousands)</i>	<i>Percentage of employment in field services</i>
1972 . . . .	124.5	46.5
1973 . . . .	134.6	49.1
1974 . . . .	155.6	51.8
1975 . . . .	173.6	52.8
1976 . . . .	184.3	53.3
1977 . . . .	211.4	55.4
1978 . . . .	246.7	57.5
1979 . . . .	276.2	58.4
1980 . . . .	329.1	60.1

*Coal.* Coal mining employment increased by almost 60 percent, from 167,000 in November 1973 to 266,100 in December 1980. (See chart 1.) During the 10 years prior to the embargo, coal mining employment had only increased by 16 percent. It should be noted that the coal mining employment data shown in chart 1 were strongly affected by labor disputes in December 1974 and December 1977–March 1978. In contrast to trends exhibited in the oil and natural gas industries, coal mining employment growth has been modest over the last 2 years, increasing by only 3 percent. It is significant that since the Natural Gas Policy Act was passed in November 1978, total coal mining employment has increased by only about 5,000 workers. In fact, almost 56 percent of the post-embargo coal mining employment growth occurred within 2 years of the beginning of the embargo.

Nevertheless, during this period coal mining employment growth, while not as spectacular as the expansion in its companion oil and natural gas extraction industries, has still been more pronounced than the increase

in almost every other goods-producing industry. The major reason for this growth is that the tremendous increases in imported oil and natural gas prices have caused some industrial users to switch to coal.

Employment growth in the coal mining industry has been moderate compared with that in oil and natural gas extraction in part because of the expanded use of less labor-dependent surface mining techniques. Coal mining productivity is approximately three times greater in surface mines than in underground mines. Surface mining techniques now account for over 60 percent of total production and 33 percent of total employment in the industry.<sup>10</sup> It is also probable that the recent relatively large price increases for oil and natural gas had a correspondingly favorable effect on employment in oil and natural gas fields, while lower growth in coal mining reflects more moderate price increases for industry output. The Bureau of Labor Statistics Producer Price Index, based on the prices received by producers of commodities, provides a measure of relative price changes between various commodities. The following tabulation compares changes in the Producer Price Index for the major domestic energy sources since the beginning of the oil embargo:

Product	Index		Percent increase
	December 1973	December 1980	
Coal . . . . .	218.1	475.7	118.1
Natural gas . . . . .	141.4	954.3	574.9
Domestic crude oil . . .	146.2	596.0	307.7
Total finished goods . .	127.9	244.7	91.3

It is important to note that until the end of 1978, employment grew at about the same rate in the coal mining industry as in the oil and natural gas industries. But, as previously mentioned, strong price incentives were provided to the oil and natural gas extraction industries during 1979. Other factors contributing to the more sluggish coal mining employment growth include the costs associated with compliance to health and safety rules in the mines; environmental regulations associated with the mining of coal; increased transportation costs; and the large capital outlays required to convert an industrial plant from natural gas or oil to coal.<sup>11</sup>

Coal mining employment did, however, increase sharply during the last quarter of 1980 primarily because of the huge increase in foreign demand for coal. This demand reflected the increased substitution of coal for Middle East oil by foreign industry, as well as prolonged strikes by coal miners in Poland and Australia.

*Equipment manufacturing.* Employment in the oil and natural gas field equipment manufacturing industry rose from 47,100 in November of 1973 to just over 100,000 by December 1980. (See chart 2.) In the decade preceding the embargo, employment in the industry increased

by about 45 percent. The 114-percent increase roughly parallels the relative magnitude and timing of the employment increases in the oil and natural gas extraction industry. Employment in coal mining machinery equipment manufacturing rose by a third, from 25,900 to 34,500 over the same period, approximately the same rate of growth observed during the 10 years preceding the embargo. Employment in this industry increased at only about one-half the annual rate of that in its companion coal mining industry, and almost all of its post embargo growth occurred within 18 months of the end of the embargo.

**State trends**

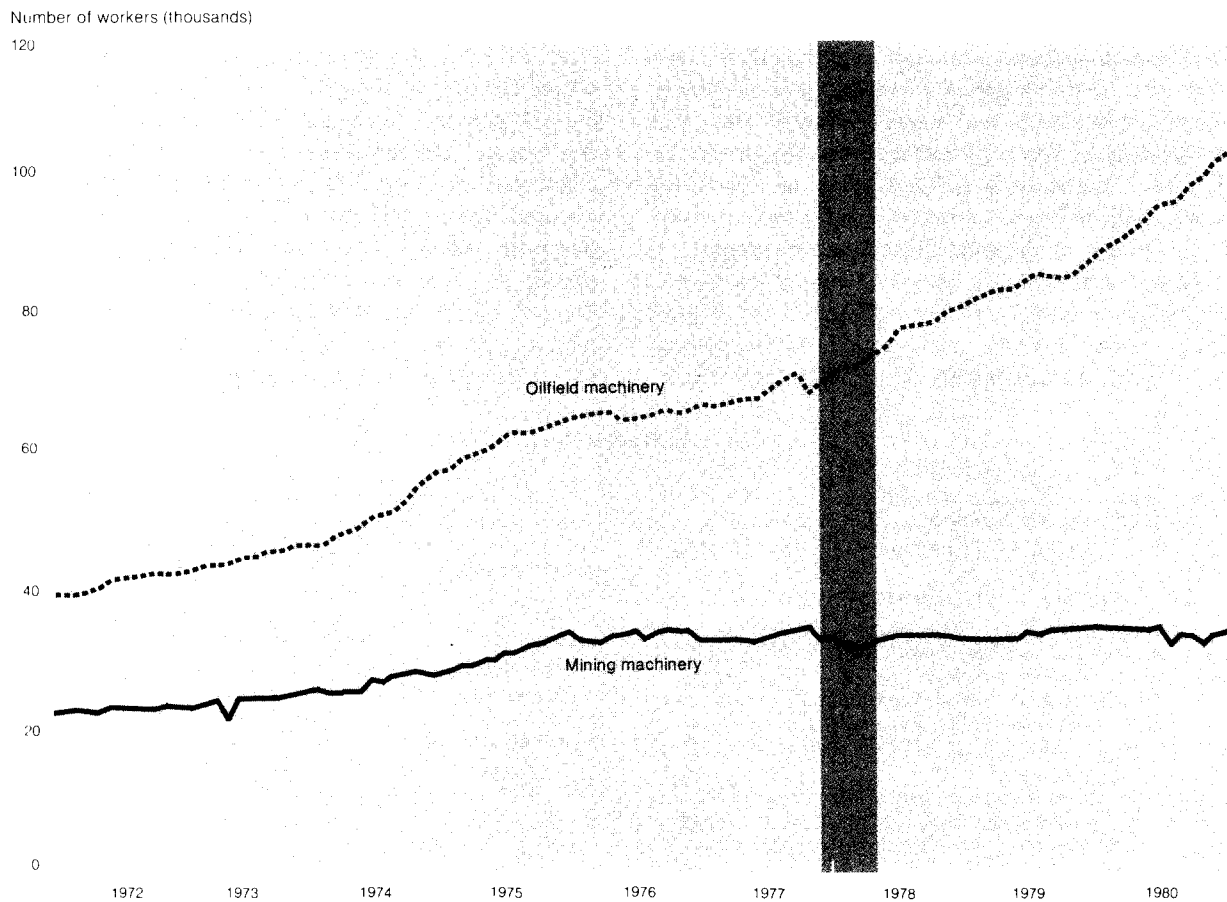
*Oil and natural gas.* Almost two-thirds of the total employment in the oil and natural gas extraction industries is located in three southwestern States—Texas, Louisiana, and Oklahoma. Texas alone accounts for almost 40 percent of the Nation's employment in these rapidly expanding industries. The following tabulation shows the employment trends for the 10 States with the largest oil and natural gas extraction employment between the beginning of the embargo and June 1980:

State	Oil and natural gas employment (in thousands)		Percent change
	November 1973	June 1980	
Texas . . . . .	105.5	213.3	102.2
Louisiana . . . . .	48.4	78.0	61.2
Oklahoma . . . . .	35.4	65.5	85.0
California . . . . .	20.4	32.9	61.3
Wyoming . . . . .	7.5	18.3	144.0
Colorado . . . . .	7.8	16.4	110.3
Kansas . . . . .	7.6	12.8	68.4
New Mexico . . . . .	7.6	12.8	68.4
Ohio . . . . .	5.4	9.8	81.5
Mississippi . . . . .	4.2	8.8	109.5

As might be expected, the three largest oil and gas extraction States also accounted for a majority—more than 60 percent—of the post-embargo employment growth. However, the States experiencing the largest relative employment increases following the embargo were North Dakota, Wyoming, Utah, Montana, Colorado, and Alaska. Most of these States have areas located in the Western "Overthrust" Belt<sup>12</sup> and Willeston Basin sections of the Rocky Mountains. These areas are potentially rich in petroleum and natural gas, but extraction is difficult and costly. Thus, the development of these areas did not become economically feasible until the recent oil and natural gas price increases.<sup>13</sup>

*Coal.* The coal mining industry also has the bulk of its employment concentrated in three States—West Virginia, Kentucky, and Pennsylvania. These States account for almost 55 percent of total industry employment.

**Chart 2. Monthly employment levels in oilfield machinery and mining machinery manufacturing, 1972-80**



NOTE: Shaded area indicates strike in the coal mining industry.

The following tabulation shows the employment trends for the leading coal mining States between the beginning of the 1973-74 embargo and June 1980:

State	Coal mining employment (in thousands)		Percent change
	November 1973	June 1980	
West Virginia . . . . .	48.5	55.1	13.6
Kentucky . . . . .	27.9	47.2	69.2
Pennsylvania . . . . .	31.1	39.4	26.7
Virginia . . . . .	13.4	20.8	55.2
Illinois . . . . .	12.0	16.4	36.7
Ohio . . . . .	11.3	16.4	45.1
Alabama . . . . .	6.0	13.0	116.7
Indiana . . . . .	3.0	6.1	103.3
Wyoming . . . . .	.8	6.0	650.0
Colorado . . . . .	1.6	5.5	244.0

In terms of relative employment increases, the leading States have been Wyoming, Montana, and Colorado. As in the case of the oil and gas extraction industries, this growth reflects recent increased interest in developing the Western "Overthrust" Belt and Willeston Basin regions. It is also noteworthy that, as a result of the expected increased activity in this industry, the Power Plant and Industrial Fuel Use Act of 1978 provides financial assistance to areas impacted by coal or uranium development activities.<sup>14</sup>

During the last 5 years, employment growth has been much sharper in the States where there is a greater reliance on surface mining techniques. Surface mining now produces about 60 percent of the Nation's coal while employing only one-third of the coal mining work force. In 1973, surface mining accounted for about half of the Nation's coal production, and one-quarter of total coal mining employment.<sup>15</sup>

*Machinery manufacturing.* Not surprisingly, most employment in the energy extraction machinery equipment manufacturing industries is located near areas where the actual mining and extraction activities occur. Most of the machinery is large, highly specialized, and cumbersome, and is consequently expensive to transport over long distances.

Texas establishments employ approximately two-thirds of the Nation's oil and natural gas equipment manufacturing workers and have accounted for more than two-thirds of the post-embargo growth in this industry. Other relatively large equipment manufacturing States are California and Oklahoma, each with approximately 11 percent of the total industry employment.

The largest employers in the coal mining equipment manufacturing industry are Pennsylvania, with almost 19 percent of the Nation's total, and West Virginia and Wisconsin, with approximately 17 percent each. Indus-

try employment in West Virginia and Wisconsin has more than doubled since 1975. The largest mining equipment manufacturing State in the West is Colorado, with about 6 percent of the industry's total employment.

THE 1973-74 ARAB oil embargo and the subsequent 6-fold increase in the price of imported oil have sharply curbed demand for imported crude oil. Coupled with the phased decontrol of domestic energy prices, the change in the price and availability of imported oil has resulted in unprecedented employment increases in the domestic energy extraction industries. Employment growth in these industries, aided in part by changes in Federal energy regulation policies, is an integral component of the Nation's effort to expand the development and use of domestic sources of energy. □

—FOOTNOTES—

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<sup>1</sup> *Economic Report of the President*, January 1981, p. 91.

<sup>2</sup> Employment estimates for the Nation and the larger States were compiled from the BLS Current Employment Statistics program. These data are produced from employer payroll records reported to the Bureau of Labor Statistics and its cooperating State agencies by more than 160,000 establishments on a voluntary basis each month. Self-employed persons and others not on a regular civilian payroll are outside the scope of this survey.

State employment data were also compiled from the ES-202 program, which collects information on the employment and wages of workers covered by unemployment insurance (UI) programs. Each calendar quarter, all UI-covered employers submit mandatory reports of employment and wages to the appropriate State Employment Security Agency. These reports are edited and summarized by county, State, and detailed industry, and forwarded to BLS. Self-employed persons are also not covered in this statistical program.

<sup>3</sup> *Monthly Energy Review* (U.S. Department of Energy, Energy Information Agency), February 1981, pp. 30, 32, and 92.

<sup>4</sup> *Weekly Petroleum Status Report* (U.S. Department of Energy, Energy Information Agency), Mar. 20, 1981, p. 21.

<sup>5</sup> *Special Analyses—Budget of the United States Government, Fiscal Year 1981* (U.S. Office of Management and Budget), 1981, p. 383.

<sup>6</sup> The natural gas decontrol schedule allows the price of "new" natural gas to gradually rise to the equivalent of \$15 for a barrel of oil (in 1978 dollars) by 1985, a level thought at that time to permit a smooth transition to uncontrolled prices. Thus, by 1985, when oil prices will probably be more than double the anticipated level, there will still be a large gap between decontrolled gas and "new" gas. See *Economic Report of the President*, January 1981, p. 101.

<sup>7</sup> The statute also provided for the termination of domestic crude oil price controls by October 1981 and gave the President discretion on price control levels from June 1979 forward. In January 1981, President Reagan ended all crude oil price controls.

<sup>8</sup> "Canada's oil policy is starting to hurt," *Business Week*, Dec. 8, 1980, p. 24.

<sup>9</sup> *Voice* (Federal Reserve Bank of Dallas), December 1980, p. 8.

<sup>10</sup> *Weekly Coal Report* (U.S. Department of Energy, Energy Information Agency), Mar. 6, 1981, p. 5.

<sup>11</sup> *Energy Economics*, August 1979, p. 1.

<sup>12</sup> The U.S. Overthrust Belt is an approximately 60-mile wide strip running from Alaska to Mexico.

<sup>13</sup> Frank Niering, "Drilling Boom Gathers Pace," *The Petroleum Economist*, July 1980, pp. 289-90.

<sup>14</sup> *Federal Register*, Mar. 8, 1979, pp. 12936-37.

<sup>15</sup> *Weekly Coal Report* (U.S. Department of Energy, Energy Information Agency), Mar. 6, 1981, p. 5.