

Economic State of the US Petroleum Industry

Policy Analysis and Strategic
Planning Department

February 26, 1999

Economic State of the US Petroleum Industry

Jody M. Perkins

Policy Analysis and Strategic Planning Department
American Petroleum Institute

February 26, 1999

The contents of this paper are for the purposes of study and discussion of government legislative or regulatory proposals and do not necessarily represent the views of the American Petroleum Institute or any of its members.

Economic State of the US Petroleum Industry

Jody M. Perkins
Policy Analysis and Strategic Planning Department
American Petroleum Institute

February 26, 1999

Introduction and Summary

The US petroleum industry is currently experiencing significant financial difficulties. Many major petroleum companies recently announced plans to restructure and/or cut costs, sometimes by cutting jobs. These companies include Royal Dutch/Shell Group, Texaco Inc., Mobil Corp., Unocal Corp., Atlantic Richfield Co., Occidental Petroleum Corp., Kerr-McGee Corp., Amerada Hess Corp., Chevron, Phillips Petroleum, and Conoco Inc.¹ Smaller companies also are facing financial difficulties.

This paper examines the recent events and longer-term trends behind these economic difficulties. It identifies the following factors:

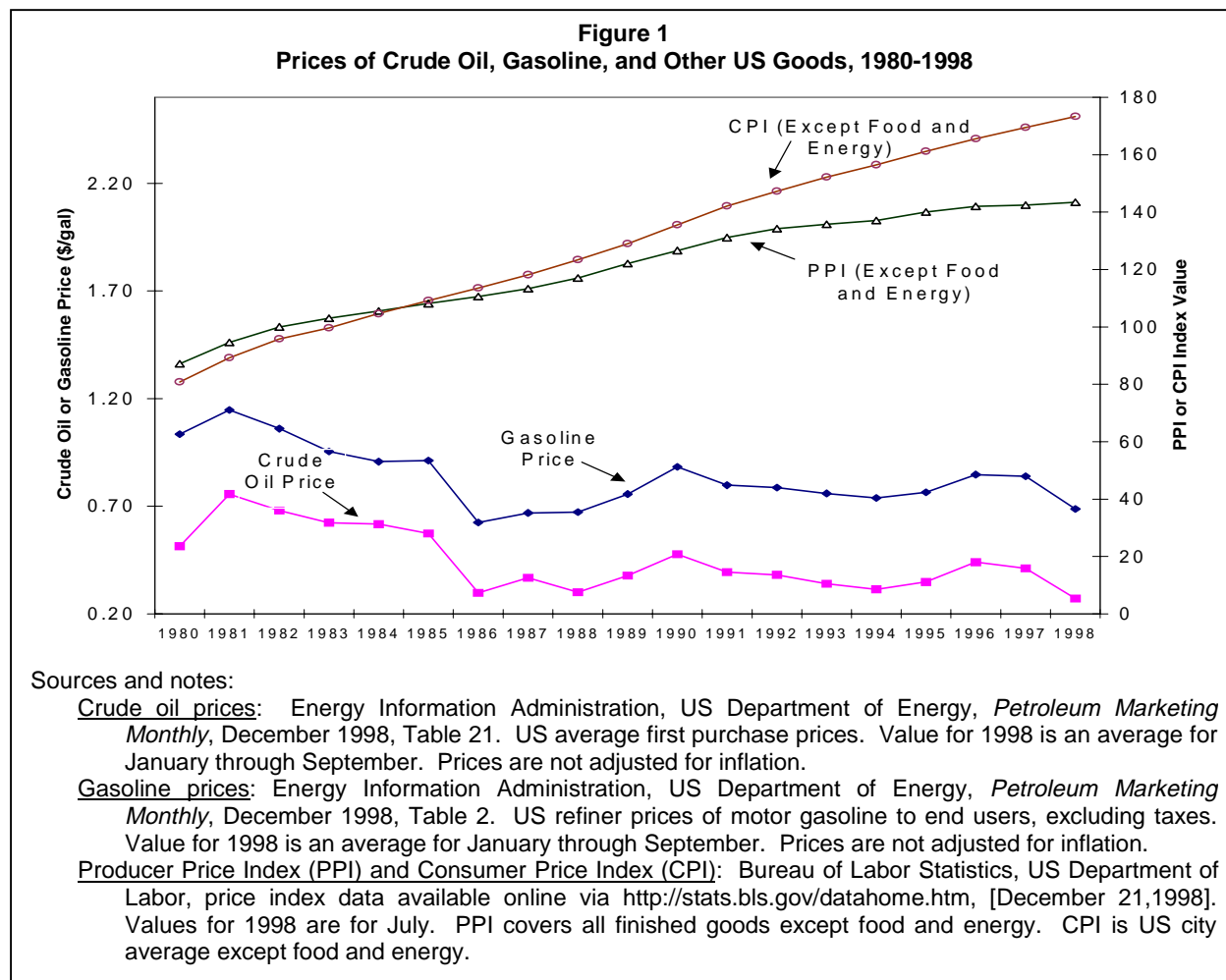
- Declines in crude oil and petroleum product prices since 1981, including dramatic falls in 1998;
- The relationship between inflation-adjusted crude oil prices and the profit rates of oil producers;
- Declines in oil and gas production activity and employment within the US, since the early 1980s;
- Reasons why many small oil and gas producers may be especially vulnerable, financially, during an oil price collapse;
- Closures of many US petroleum refineries since the early 1980s, and the decline in refining employment;
- Refiners' high regulatory compliance costs in the 1990s, primarily to satisfy environmental requirements;
- Reasons why it can be difficult for refiners and marketers to pass along cost increases to consumers;
- Relatively low profit rates for refiners and marketers during the 1990s; and
- Declines in transportation sector employment and profit rates since the early 1980s.

This paper concludes that if crude oil prices remain low and other long-term industry trends continue, reduced employment, profits, and activity levels in the exploration and production sector might well be expected to continue. In addition, employment and/or profitability in the refining, marketing, and distribution sectors could remain low as well.

¹ Paul Merolli, "Oil Majors Set to Produce More Pink Slips," *The Oil Daily*, November 13, 1998; Loren Fox, "Fourth Quarter Was A Bruiser for Oil Companies," *The Wall Street Journal*, January 6, 1999, p. B10C; and Anne Marie Borrego, "Phillips Petroleum To Cut Staff by 8%, Capital Spending," *The Wall Street Journal*, January 7, 1999, p. A4.

An Overview of General Industry Trends Since 1980

Crude oil prices, which are set in international markets, have been on a general decline since 1981 (see Figure 1). Prices fell dramatically in 1986 as the Organization of Petroleum Exporting Countries (OPEC) increased supplies of crude oil. The sharp price decline in 1998 was attributable to plentiful crude oil supplies (partly due to Iraq's increased production) and a reduction in demand from suffering Asian economies.² US demand was low for some products, such as heating oil, because of unseasonably warm weather.³



For companies that produce crude oil, lower prices reduce income. If prices drop far enough, and stay low long enough, companies are induced to curtail some of their exploration and development activities and/or close their higher-cost wells. Hundreds of nonmajor oil and gas producers went out of business after the price collapse in 1986.⁴ Today, some smaller oil producers are cutting salaries and closing wells because their costs exceed the price at which they can sell their crude oil by as much as a

² Bob Williams, "Oil producers face key question: How long will prices stay low?" *Oil & Gas Journal*, vol. 96 no. 52, December 28, 1998, p. 19.

³ "California Oil Drillers Staring at Extinction?" *The Sacramento Bee*, December 9, 1998, available online via <http://cnfn.news-real.com/>, [December 9, 1998].

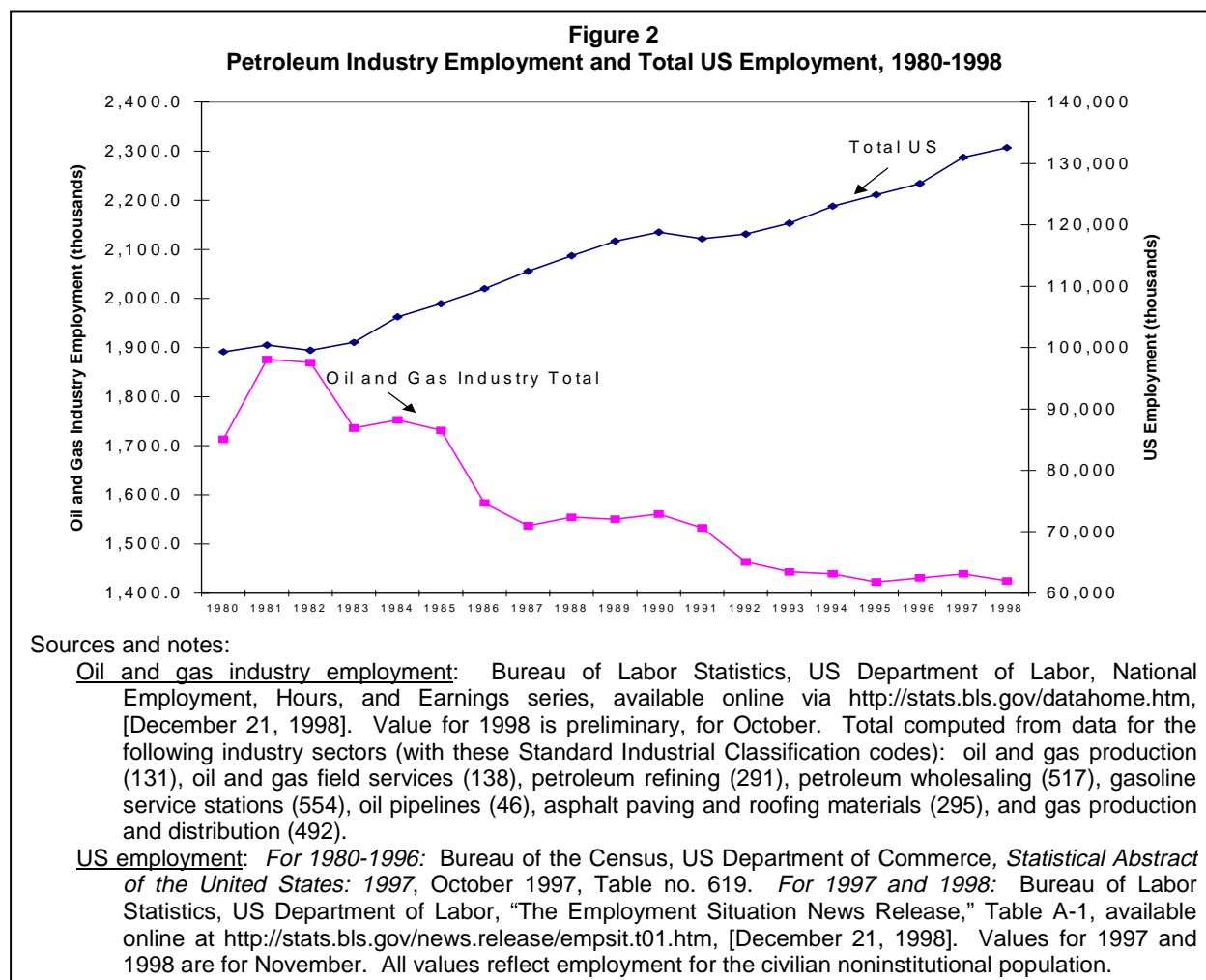
⁴ Energy Information Administration, US Department of Energy, "Oil and Gas Development in the US in the Early 1990s: An Expanded Role for Independent Producers," October 1995, p. v.

dollar per barrel.⁵ Major oil companies are cutting their exploration and production capital budgets, and layoffs at these companies are tending to fall more heavily on exploration and production operations.⁶

For petroleum refiners, reduced crude oil prices lower input costs. However, lower crude oil prices generally have not yielded higher refinery profit rates. As shown in Figure 1, prices of final petroleum products (e.g., gasoline) tend to track crude oil price changes, falling as crude oil prices decline. One reason for this close association between prices is competition, particularly with finished petroleum products that are imported and that may not reflect every kind of cost incurred in the US. In addition, consumers of petroleum products can be sensitive to price changes.⁷ (The competitive nature of final product pricing can affect petroleum marketers and transporters as well as refiners.)

The price declines in crude oil and gasoline stand in marked contrast to the general price trends for other US goods and services. As Figure 1 shows, both the Producer Price Index and the Consumer Price Index for goods other than food and energy have grown dramatically since the early 1980s.

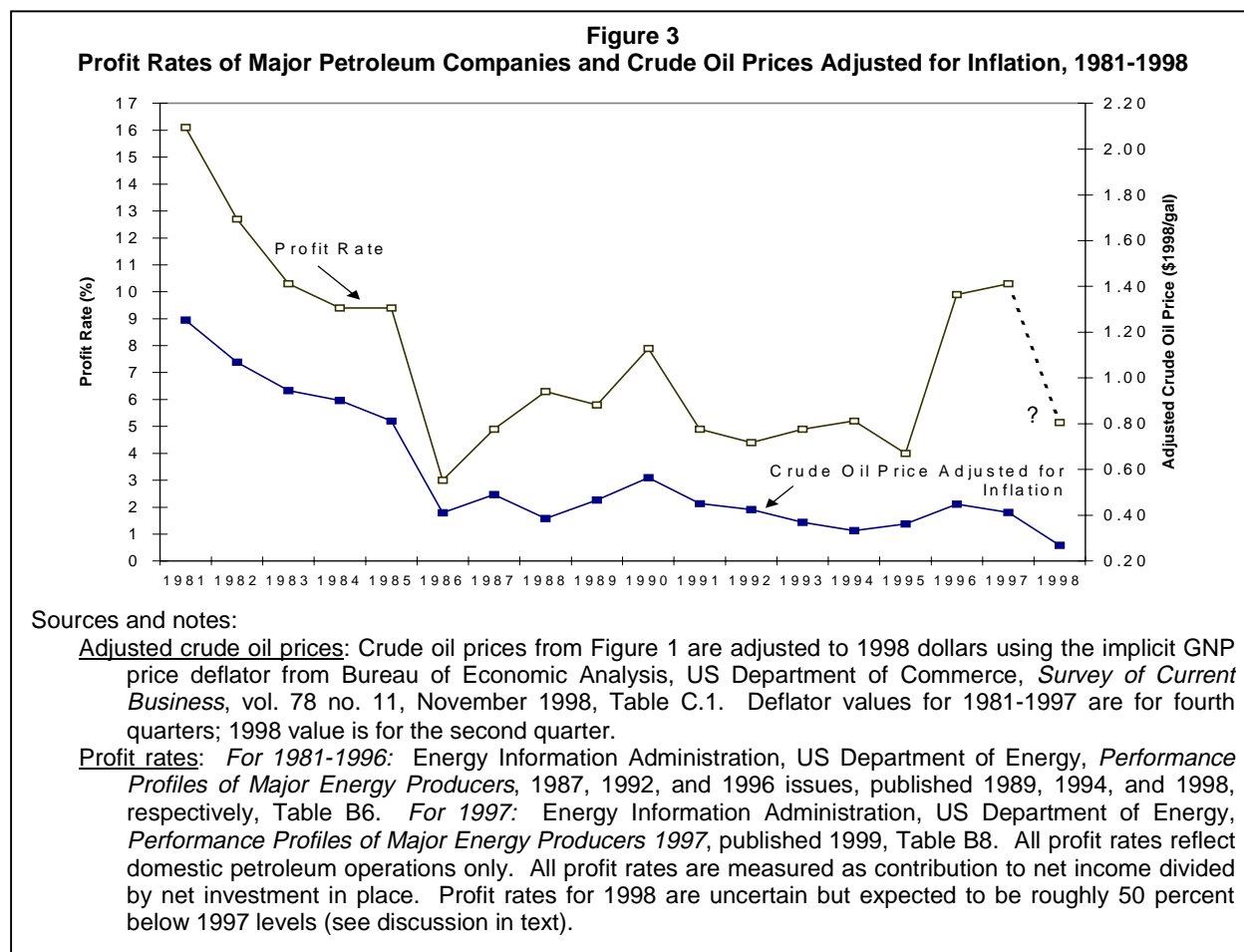
Figure 2 shows the decline in the petroleum industry's employment, since 1980, relative to other types of US businesses. Petroleum industry employment declined in the exploration and production sector, the refining/marketing sector (except at gasoline service stations), and in the transportation/distribution sector.



⁵ "California Oil Drillers Staring at Extinction?"

⁶ Merolli, "Oil Majors Set to Produce More Pink Slips"; and Borrego, "Phillips Petroleum To Cut Staff by 8%, Capital Spending."

Figure 3 shows profit trends, and crude oil prices adjusted for inflation, since 1981. The profit rates in Figure 3 are for major oil companies' domestic petroleum operations. Average profit rates in a given year for smaller companies, such as independent refiners and independent producers, can differ from the average rate for the majors.⁸ Figure 3 shows profit rates for the majors since 1980 and inflation-adjusted crude oil prices. During 1996 and 1997 profitability was higher than might be expected, considering the level of crude oil prices. Reasons for this included a dramatic increase in natural gas prices (they rose 45 percent in 1996 and rose further in 1997) and relatively strong profits in the refining/marketing sector.⁹



Profit rates for 1998 are not yet available for the data series depicted in Figure 3. However, greatly reduced profits are likely, for three reasons. First, as Figure 3 shows, inflation-adjusted crude oil prices fell dramatically in 1998. Second, natural gas prices also fell.¹⁰ And third, refinery profitability

⁷ Energy Information Administration, US Department of Energy, *Petroleum 1996: Issues and Trends*, September 1997, p. 70; and American Petroleum Institute, "Cumulative Impact of Environmental Regulations on the US Petroleum Refining, Transportation and Marketing Industries," October 1997, pp. 3-4.

⁸ See Energy Information Administration, *Petroleum 1996: Issues and Trends*, p. 142, Figure 102.

⁹ Energy Information Administration, US Department of Energy, *Performance Profiles of Major Energy Producers*, 1996 issue (p. 6) and 1997 issue (pp. 7-8), published 1998 and 1999, respectively.

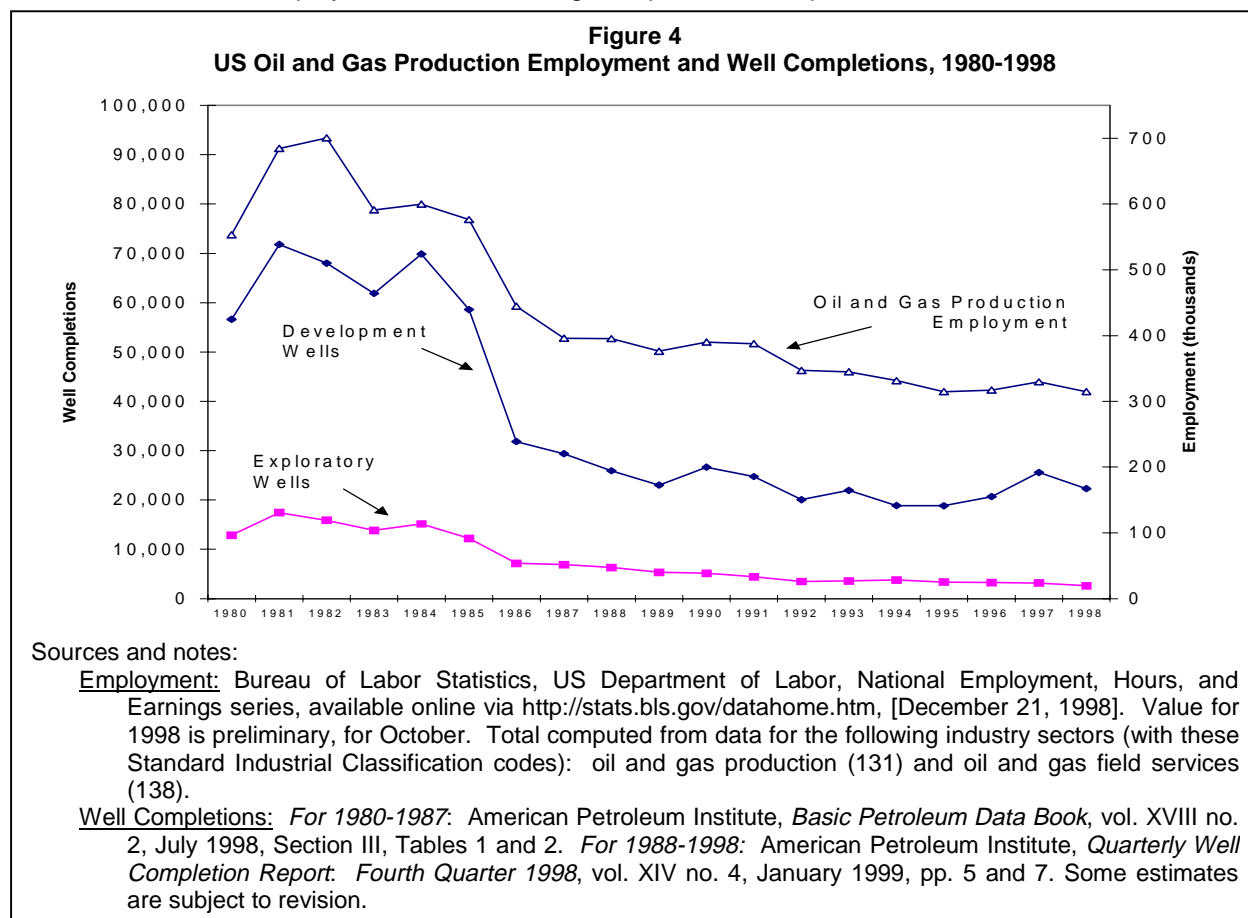
¹⁰ Natural gas wellhead prices averaged \$1.68 per thousand cubic feet in August 1998; average prices were \$2.32 and \$2.17 in 1997 and 1996, respectively. (The price for August 1998 is preliminary.) Energy Information Administration, US Department of Energy, *Natural Gas Monthly*, December 1998, Table 4, available online via <http://www.eia.doe.gov/>, [January 12, 1999]. Reasons for the low gas prices include a slackening Western Hemisphere demand caused by mild weather. Cliff Edwards, "Energy Prices Collapse Anew," Associated Press, December 8, 1998.

weakened.¹¹ Analysts have estimated that oil companies' earnings in 1998 could average 50 percent lower than 1997 levels. Several petroleum companies posted losses for the fourth quarter of 1998.¹²

Trends in the Oil and Gas Exploration and Production Sector

The US oil and gas exploration and production sector changed greatly after oil prices fell in 1986.

The sector's activity decline is illustrated in Figure 4 with annual numbers of US well completions. Oil and gas production activity declined dramatically during and following 1986 as many high-cost wells became unprofitable and were shut down.¹³ Activity also declined significantly in 1998; the number of operating drilling rigs declined during 1998 to less than half its level at the end of 1997.¹⁴ Figure 4 also shows the decline in employment in the oil and gas exploration and production sector since 1982.



¹¹ Refining/marketing earnings or profits may have fallen by 25 percent, when compared with 1997 levels. See David Chance, "Big oil companies brace for brutal earnings season," Reuters Limited, January 12, 1999, available online via <http://biz.yahoo.com/>, [January 13, 1999]; Fox, "Fourth Quarter Was a Bruiser for Oil Companies"; and Paul Merolli, "Convergence of Negative Factors Combines To Pummel Earnings for Major Oil Companies," *The Oil Daily*, November 23, 1998.

¹² Chance, "Big oil companies brace for brutal earnings season"; and "Fourth-Quarter 1998 Profits for 658 Companies," *The Wall Street Journal*, February 16, 1999, p. C15.

¹³ Energetics Incorporated, "Petroleum: Industry of the Future -- Energy and Environmental Profile of the US Petroleum Refining Industry," for Office of Industrial Technologies, US Department of Energy, December 1998, p. 2.

¹⁴ The number of US rotary oil rigs declined from 361 in December 1997 to 152 in December 1998. "Baker Hughes Rig Count," *Oil and Gas Journal*, vol. 96 no. 52, December 28, 1998, p. 92.

From the mid-1980s to the mid-1990s, major US oil companies shifted more of their petroleum exploration and development activities to locations outside the US. In 1985, the majors' development expenditures totaled roughly \$20 billion domestically and \$7 billion overseas. By the 1991 to 1995 period, the majors' domestic and foreign expenditures were more or less equal, in the \$8 billion to \$9 billion range.¹⁵

The reasons for this shift are both political and economic. As oil prices declined, many foreign countries became more hospitable to US production activities. For US majors, the profitability of oil and gas production has generally been higher in foreign locations than domestically, since at least as early as 1977.¹⁶ Oil and gas fields overseas are typically larger than those in the US, and overseas production usually yields higher production per well. Within the US, the federal government restricts petroleum exploration and production in some of the most promising areas (e.g., Alaska and the Outer Continental Shelf). In addition, US environmental regulations increase producers' operating costs.¹⁷ For many years the costs associated with new US fields were higher than the worldwide average. (It should be noted that the shift overseas has not been made by the majors exclusively. Many smaller oil and gas producers have initiated overseas operations as well.)¹⁸

In the late 1990s, new technologies and favorable economics allowed US majors to greatly increase their domestic exploration and production activities in the Gulf of Mexico, particularly in deepwater areas.¹⁹ However, with 1998's decline in crude oil prices, offshore projects are becoming uneconomic.²⁰

Figure 5 shows how the majors' profit rates for US oil and gas production have tended to fluctuate with inflation-adjusted crude oil prices. The relatively high profit rates in 1996 and 1997 are at least partially attributable to the high natural gas prices mentioned earlier. It is likely that 1998's average profit rate declined dramatically from the 1997 level as inflation-adjusted crude oil prices fell below 1986 prices.

Profit rates are one indicator of past financial performance. Reserve values are one indication of future financial viability. The latter measure looks especially bleak for oil producers, because their reserves must be valued with year-end crude oil prices.²¹

Another important trend in the oil and gas production sector has been the increased role (onshore) assumed by US nonmajor oil and gas producers. Some majors sold production facilities to nonmajors with lower overhead costs. The share of exploration and development investments made by nonmajors rose from roughly 33 percent of the US total in 1988-90 to almost 50 percent by the mid-1990s. In fact, most oil and gas producers are small and privately-owned; these types of operations accounted for roughly 7,400 of the nearly 8,000 oil and gas producers operating in the US in 1992.²²

¹⁵ Energy Information Administration, *Petroleum 1996: Issues and Trends*, p. 54, Figure 41.

¹⁶ This trend, however, did not hold true in 1996 or 1997. See Energy Information Administration, *Performance Profiles 1991*, p. 19, Figure 10; *Performance Profiles 1996*, Table B6; and *Performance Profiles 1997*, Table B8.

¹⁷ Energy Information Administration, US Department of Energy, *Performance Profiles of Major Energy Producers 1991, 1992*, pp. 23-25.

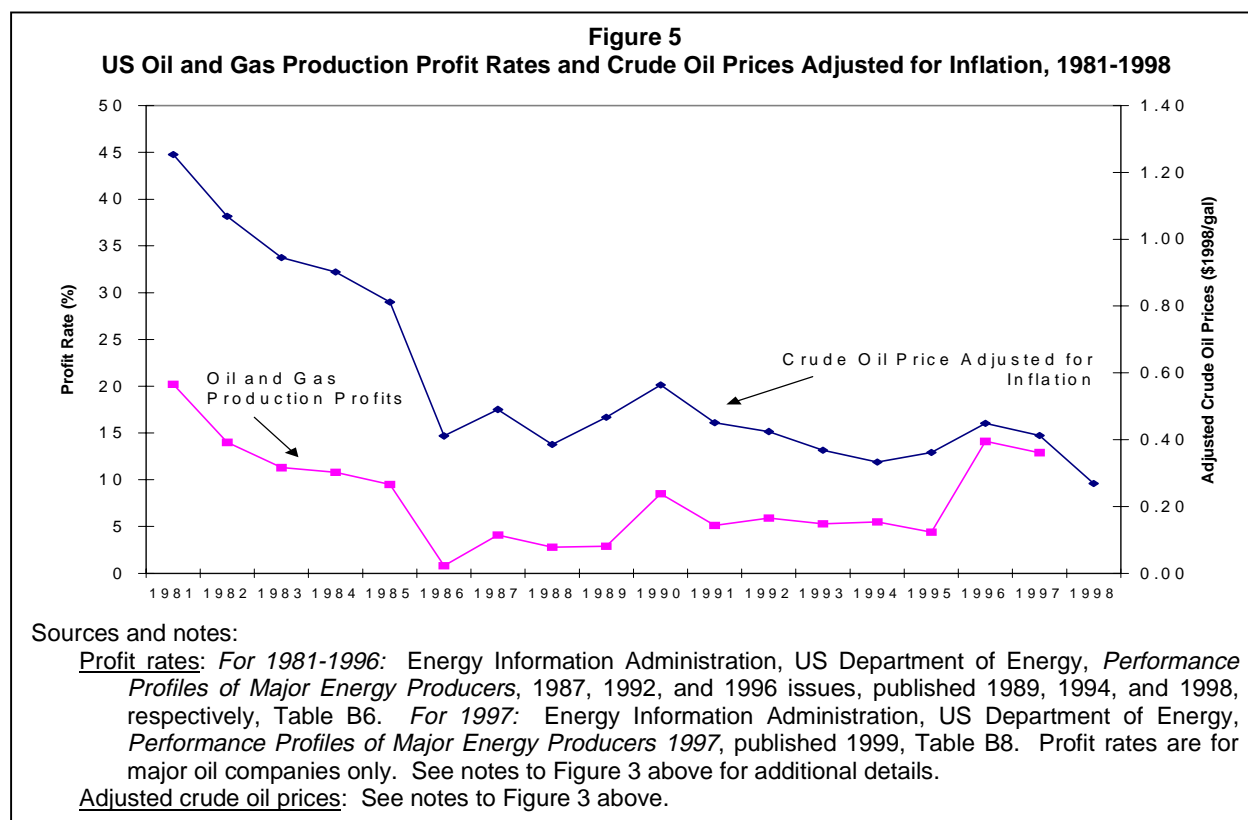
¹⁸ Energy Information Administration, *Petroleum 1996: Issues and Trends*, pp. 49 and 52.

¹⁹ Minerals Management Service, US Department of the Interior, "Deepwater in the Gulf of Mexico: An Update on America's New Frontier," January 1998, p. 1.

²⁰ The number of oil and gas rotary rigs offshore Texas and Louisiana declined from 127 in December 1997 to 91 in December 1998. "Baker Hughes Rig Count."

²¹ Publicly-owned companies report such valuations annually to the US Securities and Exchange Commission. See Arthur Andersen & Co., "Oil & Gas Reserve Disclosures," (Chicago), July 1994, pp. i, 23, and 74.

²² Energy Information Administration, *Petroleum 1996: Issues and Trends*, p. 54; and Energy Information Administration, "Oil and Gas Development in the US in the Early 1990s," pp. v, 11, 49, and 52.



Nonmajor oil and gas producers can be especially vulnerable, financially, during an oil price collapse, for several reasons. First, nonmajor oil and gas producers tend to finance their operations more heavily with debt than the majors do. In the event of an oil price decline, producers with more debt may have more difficulty making their payments.²³ Second, for those oil and gas producers that specialize in this line of business, poor profit rates cannot be offset by stronger returns in other business activities.²⁴ Third, very low volume producers may have special difficulties covering their production costs. (Today the nation's 436,000 "stripper" oil wells produce on average only 2.2 barrels of crude oil each day.)²⁵

Trends in the Refining and Marketing Sectors

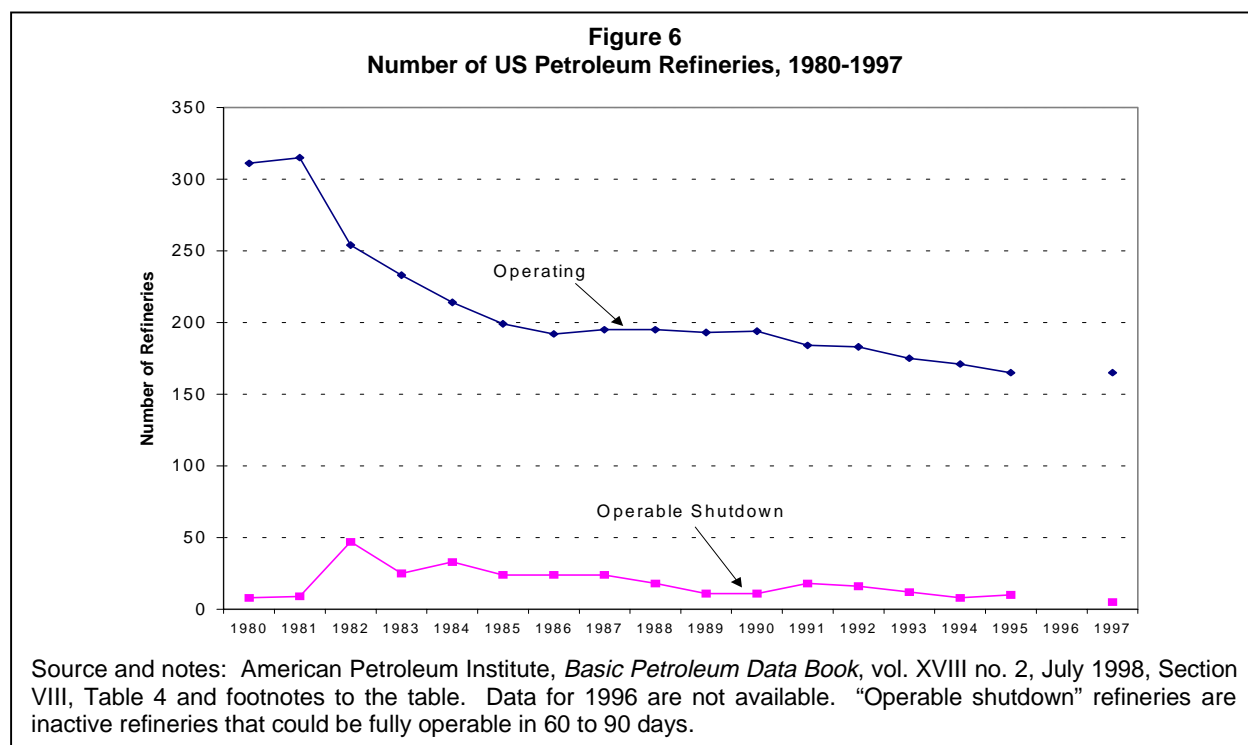
One of the most dramatic trends in the petroleum refining sector has been the closure of almost half of US refineries since 1980. This is illustrated in Figure 6.

In the early 1980s, the US government discontinued a number of regulatory and control programs established in the 1970s that had favored small refiners. In addition, demand for petroleum products declined as conservation measures were undertaken. Many small or inefficient refineries shut down.

²³ For example, in the 1991-1993 period, publicly-traded independents financed 49 percent of their operations with long-term debt, while over the same period the majors financed 27 percent of their operations with long-term debt. Energy Information Administration, "Oil and Gas Development in the US in the Early 1990s," pp. 19-20.

²⁴ *Ibid.*, p. 21.

²⁵ In total, however, stripper wells provide a significant share of US crude oil production -- roughly 25 percent, excluding Alaska and federal off-shore. Interstate Oil and Gas Compact Commission, "A Battle for Survival? The Real Story Behind Low Oil Prices," report for annual meeting, December 1998, p. 1.



As crude oil and product prices declined after 1986, petroleum users relaxed their conservation measures and increased demand. Many refineries successfully responded to the increased demand while at the same time meeting regulatory and other challenges (discussed below) by improving efficiency, becoming more flexible, adopting new technologies, and upgrading processing units. Regulatory compliance costs, however, forced some refineries to close in the 1990s.²⁶

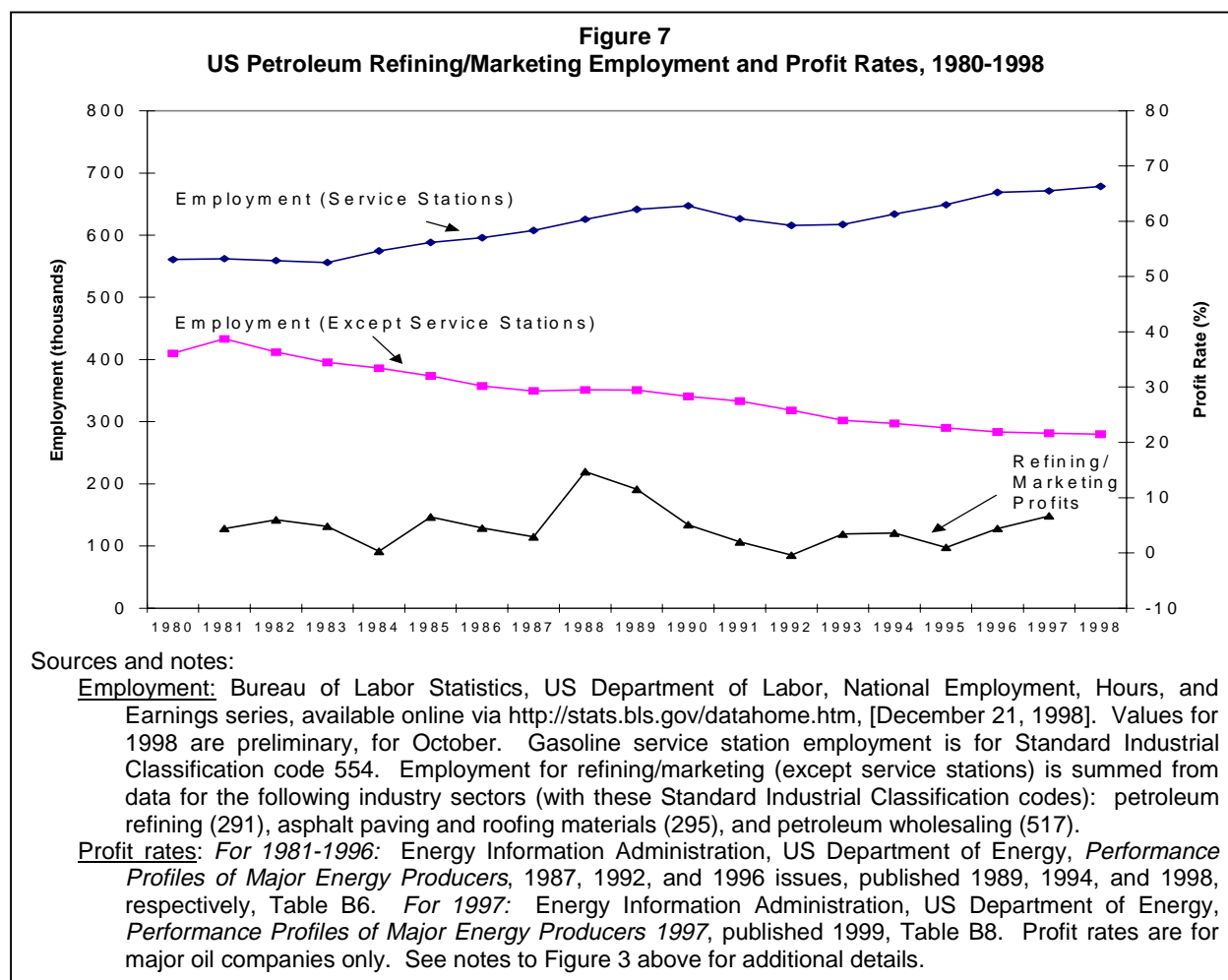
Figure 7 shows how refining/marketing employment declined since 1981. Figure 7 also shows that refining/marketing profit rates peaked in 1988 and then sank in the early 1990s, to near zero in 1992. In the 1990s, refiners' cash operating margins have been low, as have returns on equity.²⁷ Even when profitability rose in 1996 and 1997,²⁸ it still remained well below 1989's profit level. As mentioned earlier, refining/marketing profitability weakened in 1998.

What are the causes of refiners' low profit levels? Various operating cost increases have been one factor. First, refineries have had to comply with numerous government regulations, especially regulations aimed at environmental improvement. Regulatory compliance cost refineries roughly \$30 billion in the 1990s. Refineries' capital costs for environmental compliance almost quadrupled between 1988 and 1992. The Clean Air Act Amendments of 1990 required that refineries produce oxygenated gasolines, lower sulfur diesel fuels, and reformulated gasoline (RFG). Some of the markets for these fuels are extensive; for example, 31 percent of gasoline sales in 1996 were RFG. In addition, some states also established new environmental requirements, such as California's standards for gasoline and diesel. To produce the cleaner fuels, refineries have had to modify their existing processes. Refineries also incur

²⁶ Energetics Incorporated, "Petroleum: Industry of the Future," pp. 2-3; and Energy Information Administration, *Petroleum 1996: Issues and Trends*, pp. 3 and 8.

²⁷ Returns on equity have averaged roughly 5 percent. Energetics Incorporated, "Petroleum: Industry of the Future," pp. 2-3.

²⁸ The relatively strong profits in the refining/marketing sector were partly attributable to strong demand for heating oil and gasoline in 1996 and cost-cutting and decreases in costs of raw materials (e.g., crude oil, electricity) in 1997. Energy Information Administration, *Performance Profiles 1996*, p. 6 and *Performance Profiles 1997*, pp. 8 and 42.



costs as they comply with regulations designed to reduce their own (direct) emissions to the environment.²⁹

Second, refiners have incurred expenses upgrading processing units in order to handle deteriorating qualities of crude oils. Crude oils processed by US refineries have become heavier and more contaminated with materials such as sulfur.³⁰

Third, refineries have had to upgrade their operations to adapt to changes in demand for their products. Demand increased for lighter products such as gasoline and diesel fuel and lessened for heavier products. For example, over the period 1980 to 1995, volumes of heavy residual fuel decreased from 11.7 percent of final petroleum products to 5.4 percent.³¹

As these three trends have raised refiners' costs, competitive pressures (e.g., competition with imported finished products, discussed above) have helped keep refiners' product prices low. This combination has depressed refiners' profits.

²⁹ Energy Information Administration, *Performance Profiles 1996*, pp. 16-17; Energetics Incorporated, "Industry of the Future," p. 3; Energy Information Administration, *Petroleum 1996: Issues and Trends*, p. 21; and American Petroleum Institute, "Cumulative Impact," pp. iii, 3, and 6.

³⁰ Energetics Incorporated, "Petroleum: Industry of the Future," p. 4; American Petroleum Institute, "Cumulative Impact," p. 3; and Energy Information Administration, *Petroleum 1996: Issues and Trends*, p. 15.

³¹ American Petroleum Institute, "Cumulative Impact," p. 3; and Energy Information Administration, *Petroleum 1996: Issues and Trends*, p. 15.

Once refined, petroleum products enter distribution and marketing networks. Like refiners, in the 1990s marketers had to modify their operations in order to comply with RFG requirements (as discussed further below). Many retail outlets also incurred expenses upgrading underground storage tanks to meet environmental requirements promulgated in 1988.³²

As is true for refiners, market pressures can limit how much marketers' cost increases can be passed on to consumers. Marketing operations generally have low profit rates (or margins).³³

Trends in the Transportation/Distribution Sector

The transportation/distribution sector of the petroleum industry encompasses many different facilities and activities. Among them are pipelines and bulk storage terminals that transport and store crude oils and finished products.

These facilities have been subject to some of the same factors as those that caused reduced profit rates in the petroleum refining sector, such as environmental requirements. The distribution and marketing network for finished petroleum products was developed to be flexible, allowing products to be "batched" and then combined when desired. RFG complicated this network, requiring the separation of many batches of gasoline that would otherwise be combined. Because of RFG, terminal operators sometimes have to drain and clean tanks between product shipments. In addition, terminals and pipelines have recently had to comply with new environmental requirements designed to reduce air emissions from gasoline and/or other petroleum products.³⁴

These facilities can operate on thin margins. (Figure 8 shows employment and profit declines for pipelines.) The price sensitivity of consumers can limit the extent to which distributors can increase their prices to cover any cost increases.³⁵

Concluding Remarks

If crude oil prices remain low, all oil producers will be affected. The majors are more diversified than smaller companies, but the majors' profits from other business activities might not be strong enough to compensate in the event of low returns from oil production. Natural gas prices currently are low. Marketing and distribution operations tend to operate on slim margins. Refining operations will soon incur new expenses to meet more stringent environmental requirements, such as new standards for reformulated fuel that will take effect in the year 2000.³⁶ In addition, reduced Asian demand for petrochemicals is hurting profits of refiners manufacturing petrochemicals such as ethylene.³⁷

Many nonmajor oil producers are suffering now. In the third quarter of 1998, a sample group of independents had, overall, negative earnings.³⁸ If oil prices remain depressed, nonmajor oil producers may struggle financially due to the reasons discussed above: low production volumes, reliance on long-

³² American Petroleum Institute, "Cumulative Impact," pp. 4 and 27.

³³ *Ibid.*, p. 4.

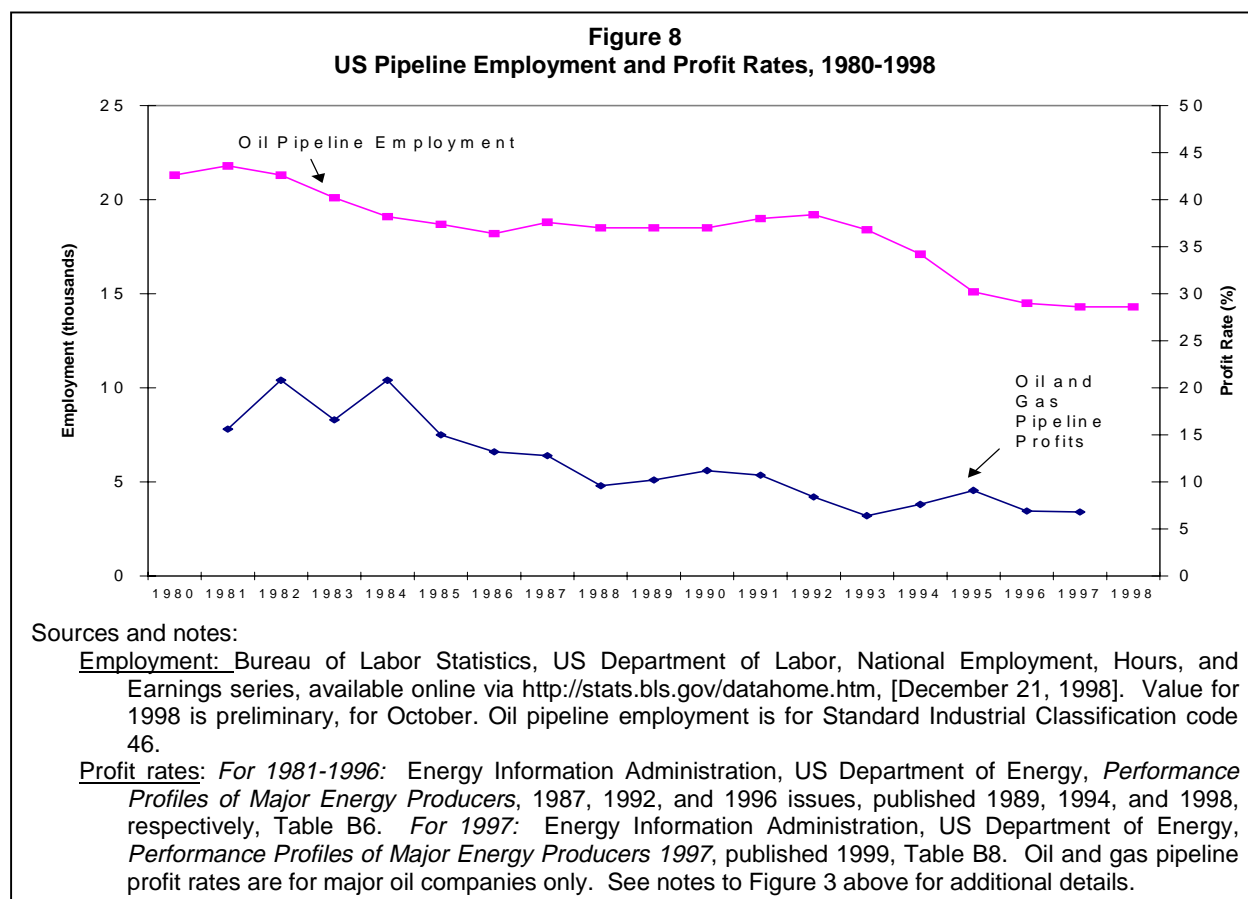
³⁴ *Ibid.*, pp. 4 and 27.

³⁵ *Ibid.*, pp. iii, 1, and 4.

³⁶ American Petroleum Institute, "Cumulative Impact," p. iii; and Energetics Incorporated, "Petroleum: Industry of the Future," pp. 22 -23.

³⁷ Merolli, "Convergence of Negative Factors"; and Fox, "Fourth Quarter Was a Bruiser for Oil Companies."

³⁸ Energy Information Administration, US Department of Energy, "Financial News for Independent Energy Companies," December 15, 1998, available online via <http://www.eia.gov/>, [February 11, 1999].



term debt, and a lack of diversification. Even for the many who produce natural gas in addition to crude oil,³⁹ the current situation is difficult, due to the recent decline in natural gas prices.

Nonmajor petroleum distributors and marketers have already had low profit rates for some time. Environmental requirements are in fact forcing some small, independent gasoline stations to close. (These types of businesses have had a much more difficult time than the majors complying with standards for underground storage tanks, which took full effect in December 1998).⁴⁰

In sum, if crude oil prices remain low, then reduced employment, profits, and activity levels in the exploration and production sector might continue. Small oil producers are especially vulnerable, financially, during an oil price collapse. Also, established trends in other petroleum sectors – e.g., competitive pressures and new environmental requirements – continue to threaten the refining, marketing, and distribution sectors as well.

³⁹ A 1996 survey by the Independent Petroleum Association of America found that the typical independent responding to the survey produced both crude oil and natural gas. Independent Petroleum Association of America, "Profile of Independent Producers," available online via <http://www.ipaa.org/>, [January 8, 1999].

⁴⁰ Josh White and Maria Glod, "Cost of Replacing Underground Tanks Sinks Some Gas Stations," *The Washington Post*, January 4, 1999, p. B1.

References

- American Petroleum Institute, "Cumulative Impact of Environmental Regulations on the US Petroleum Refining, Transportation and Marketing Industries," October 1997.
- _____, *Basic Petroleum Data Book*, vol. XVIII no. 2, July 1998.
- _____, *Quarterly Well Completion Report: Fourth Quarter 1998*, vol. XIV no. 4, January 1999.
- Arthur Andersen & Co., "Oil & Gas Reserve Disclosures," (Chicago), July 1994.
- "Baker Hughes Rig Count," *Oil and Gas Journal*, vol. 96 no. 52, December 28, 1998, p. 92.
- Borrego, Anne Marie, "Phillips Petroleum To Cut Staff by 8%, Capital Spending," *The Wall Street Journal*, January 7, 1999, p. A4.
- Bureau of Economic Analysis, US Department of Commerce, *Survey of Current Business*, vol. 78 no. 11, November 1998.
- Bureau of Labor Statistics, US Department of Labor, price index data available online via <http://stats.bls.gov/datahome.htm>, [December 21, 1998].
- _____, _____, National Employment, Hours, and Earnings series, available online via <http://stats.bls.gov/datahome.htm>, [December 21, 1998].
- _____, _____, "The Employment Situation News Release," Table A-1, available online at <http://stats.bls.gov/news.release/empsit.t01.htm>, [December 21, 1998].
- Bureau of the Census, US Department of Commerce, *Statistical Abstract of the United States: 1997*, October 1997.
- "California Oil Drillers Staring at Extinction?," *The Sacramento Bee*, December 9, 1998, available online via <http://cnnfn.news-real.com/>, [December 9, 1998].
- Chance, David, "Big oil companies brace for brutal earnings season," Reuters Limited, January 12, 1999, available online via <http://biz.yahoo.com/>, [January 13, 1999].
- Edwards, Cliff, "Energy Prices Collapse Anew," Associated Press, December 8, 1998.
- Energetics Incorporated, "Petroleum: Industry of the Future -- Energy and Environmental Profile of the U.S. Petroleum Refining Industry," for Office of Industrial Technologies, US Department of Energy, December 1998.
- Energy Information Administration, US Department of Energy, *Performance Profiles of Major Energy Producers*, 1987, 1991, 1992, 1996, and 1997 issues, published 1989, 1992, 1994, 1998, and 1999, respectively.
- _____, _____, "Oil and Gas Development in the US in the Early 1990s: An Expanded Role for Independent Producers," October 1995.
- _____, _____, *Petroleum 1996: Issues and Trends*, September 1997.
- _____, _____, *Petroleum Marketing Monthly*, December 1998.
- _____, _____, *Natural Gas Monthly*, December 1998, available online via <http://www.eia.doe.gov/>, [January 12, 1999].
- _____, _____, "Financial News for Independent Energy Companies," December 15, 1998, available online via <http://www.eia.doe.gov/>, [February 11, 1999].
- "Fourth-Quarter 1998 Profits for 658 Companies," *The Wall Street Journal*, February 16, 1999, p. C15.
- Fox, Loren, "Fourth Quarter Was a Bruiser for Oil Companies," *The Wall Street Journal*, January 6, 1999, p. B10C.

Independent Petroleum Association of America, "Profile of Independent Producers," available online via <http://www.ipaa.org/>, [January 8, 1999].

Interstate Oil and Gas Compact Commission, "A Battle for Survival? The Real Story Behind Low Oil Prices," report for annual meeting, December 1998.

Merolli, Paul, "Oil Majors Set to Produce More Pink Slips," *The Oil Daily*, November 13, 1998.

_____, "Convergence of Negative Factors Combines To Pummel Earnings for Major Oil Companies," *The Oil Daily*, November 23, 1998.

Minerals Management Service, US Department of the Interior, "Deepwater in the Gulf of Mexico: An Update on America's New Frontier," January 1998.

White, Josh and Maria Glod, "Cost of Replacing Underground Tanks Sinks Some Gas Stations," *The Washington Post*, January 4, 1999, p. B1.

Williams, Bob, "Oil producers face key question: How long will prices stay low?" *Oil & Gas Journal*, December 28, 1998, vol. 96 no. 52, pp. 18-23.