

**TOPIC PAPER #30**

**HISTORICAL PERSPECTIVE  
ON ENERGY CRISES AND  
U.S. POLICY RESPONSES**

This paper consists of Section I excerpted in its entirety from the 1987 NPC Report, *Factors Affecting U.S. Oil & Gas Outlook*

The attached Topic Paper is one of 38 such working document used in the study analyses. Also included is a roster of the Subgroup that developed or submitted this paper. Appendix E of the final NPC report provides a complete list of the 38 Topic Papers and an abstract for each. The printed final report volume contains a CD that includes pdf files of all papers. These papers also can be viewed and downloaded from the report section of the NPC website ([www.npc.org](http://www.npc.org)).

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# Factors Affecting U.S. Oil & Gas Outlook

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A Report of the  
National Petroleum Council

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February 1987

James L. Ketelsen, Chairman  
Committee on U.S. Oil & Gas Outlook

# Section I

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## Historical Perspective on Energy Crises and U.S. Policy Responses

# CHAPTER ONE

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## INTRODUCTION

In the 1970s, the world experienced two energy crises due to the 1973 Arab oil embargo and the 1979 Iranian revolution. However, since 1950, several other potential crisis situations occurred that did not lead to dramatic price increases similar to those of the 1970s and early 1980s. These included the Iranian nationalization of the early 1950s, the Suez Canal closure in 1956, and the 1967 Arab/Israeli war. The primary reason why these situations did not result in major price increases was that, prior to 1970, significant excess oil productive capacity existed outside of OPEC, especially in the United States. The downturn in U.S. production after 1970, coupled with rising non-communist world oil demand, significantly increased the dependence of the non-communist world—especially the United States—on imports from Middle East OPEC (see Figure 17). This increased the vulnerability of the non-communist world to oil supply disruptions and/or rapid oil price increases.

In addition, during the 1960s and early 1970s, OPEC was developing as a force that could exploit its position to either raise oil prices, as in the 1973 crisis, to support higher price levels, such as post-1973, and to sustain the spot oil price increases, such as those induced by the Iranian crisis. However, in the early 1980s, excess productive capacity challenged OPEC's resolve to maintain prices at 1981 levels.

Since 1981, oil prices have declined, with a collapse occurring in early 1986. The U.S. refiner acquisition cost of crude oil declined from a peak of over \$37 per barrel in March 1981, to about \$27 per barrel in December 1985, and to \$12 per barrel in mid-1986. The price of

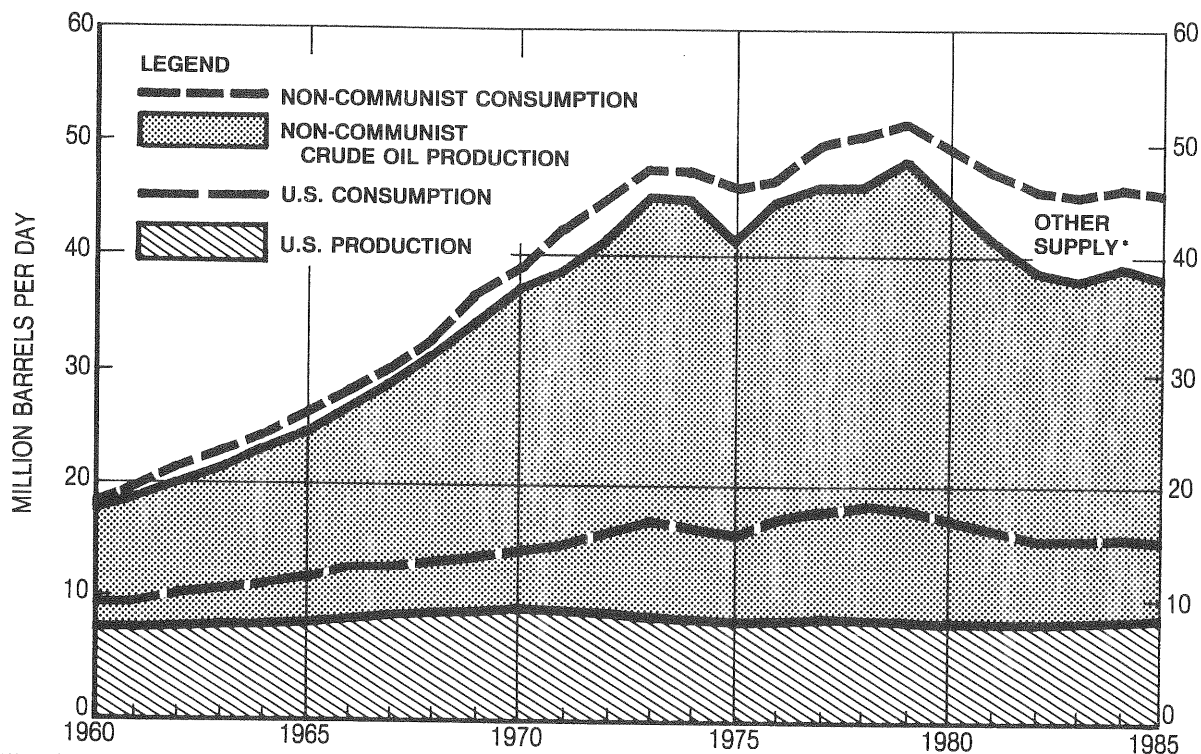
West Texas Intermediate crude oil declined from \$32 per barrel in November 1985 to as low as \$10 per barrel in 1986. These price declines occurred because oil demand fell and non-OPEC supplies grew—both of these actions in response to higher prices—increasing the excess productive capacity of OPEC members.

When OPEC's production has been over 80 percent of its available capacity, as in 1973 and the late 1970s, OPEC has been able to push prices upward or maintain them at high levels. In the 1980s, OPEC's capacity utilization rate fell below 60 percent, and OPEC failed to maintain prices. In late 1985 and early 1986, certain of OPEC's members decided to regain market share, causing the price of oil to collapse.

The sharp price decrease of early 1986 has caused the oil industry to drastically reduce its exploration and development expenditures; production has declined; the work force has been cut substantially; and the industry is restructuring. The exploration and production support and service industry has been especially hard hit. Given the size of the petroleum industry in the overall U.S. economy, the reductions in the oil industry are having negative effects on the economy that initially offset the positive effects of the lower prices. The energy crises of the 1970s and the latest price decrease are making long-term energy planning difficult for producers, consumers, and governments.

Oil prices have been more volatile since 1973 than in the three previous decades. But, as shown in Figure 18, the recent yearly percentage changes in wellhead oil prices are rivaled by those that occurred in the 1900 to early 1930s





\*Natural gas liquids, net imports from communist countries, refinery gain, inventory change, tar sands, shale, and synthetic fuels.

Figure 17. U.S. and Non-Communist World Oil Consumption vs. Production.

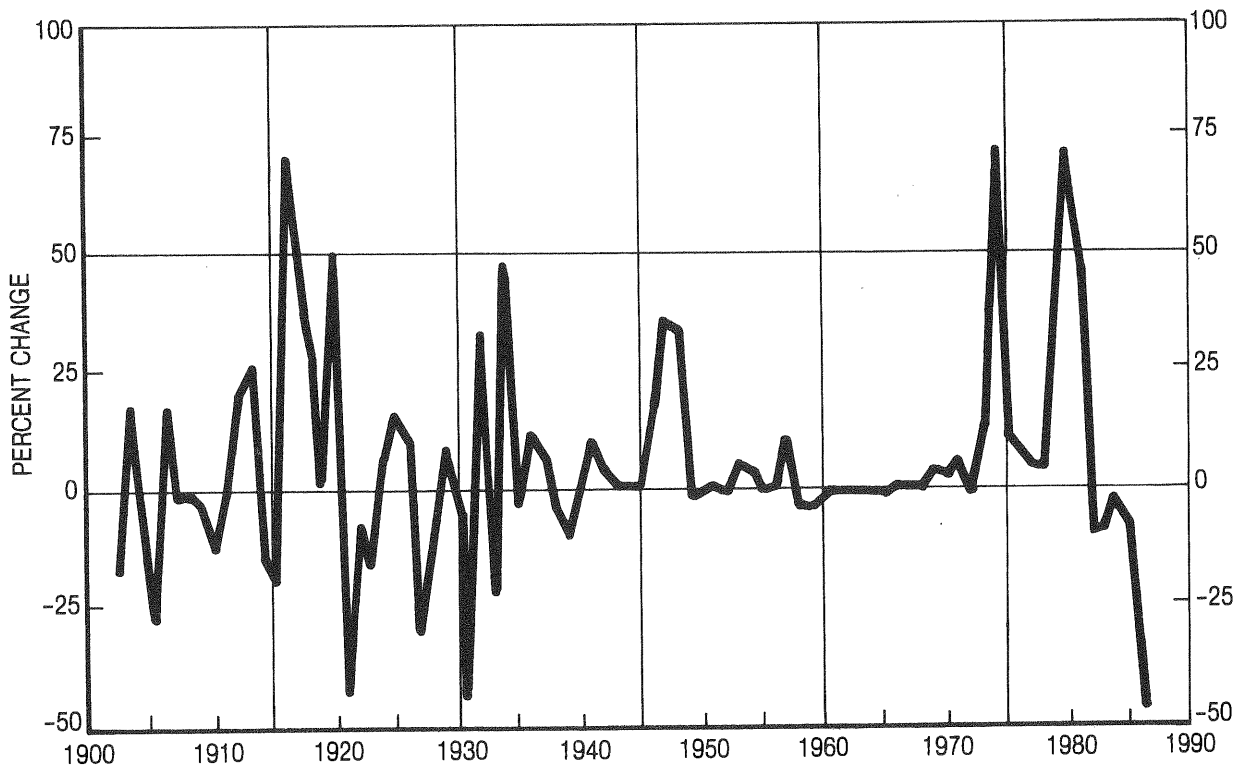
period. (Figure 31 in Chapter Five contains the actual wellhead oil price levels.) Furthermore, as shown in Figure 19, although gas prices were more stable than oil prices from 1930 to 1970, they too have displayed increased instability since 1970. Interstate wellhead gas prices were controlled by federal regulators, and price increases from 1970 to the early 1980s were allowed in order to increase gas supplies. Since then, gas prices have decreased in response to the excess gas deliverability that has developed.

Energy crises are not just restricted to oil. Supply curtailments and dislocations were already commonplace in the natural gas market when the 1973 oil embargo started. Because federal and state regulations held down the price of natural gas, demand grew rapidly from the 1940s through the early 1970s. However, interstate supply stagnated since reserve additions were often dedicated to the intrastate market due to higher unregulated prices, especially in the 1960s and the 1970s. Interstate gas supply shortages were developing by the late 1960s. In response to the shortages, the regulators did allow interstate gas prices to rise but not to the levels corresponding to the oil price increases after 1973. This maintained and increased the potential demand for gas and induced fuel switching from oil where possible, but offered little incentive to bring forth additional supply, exacerbating the gas supply shortage.

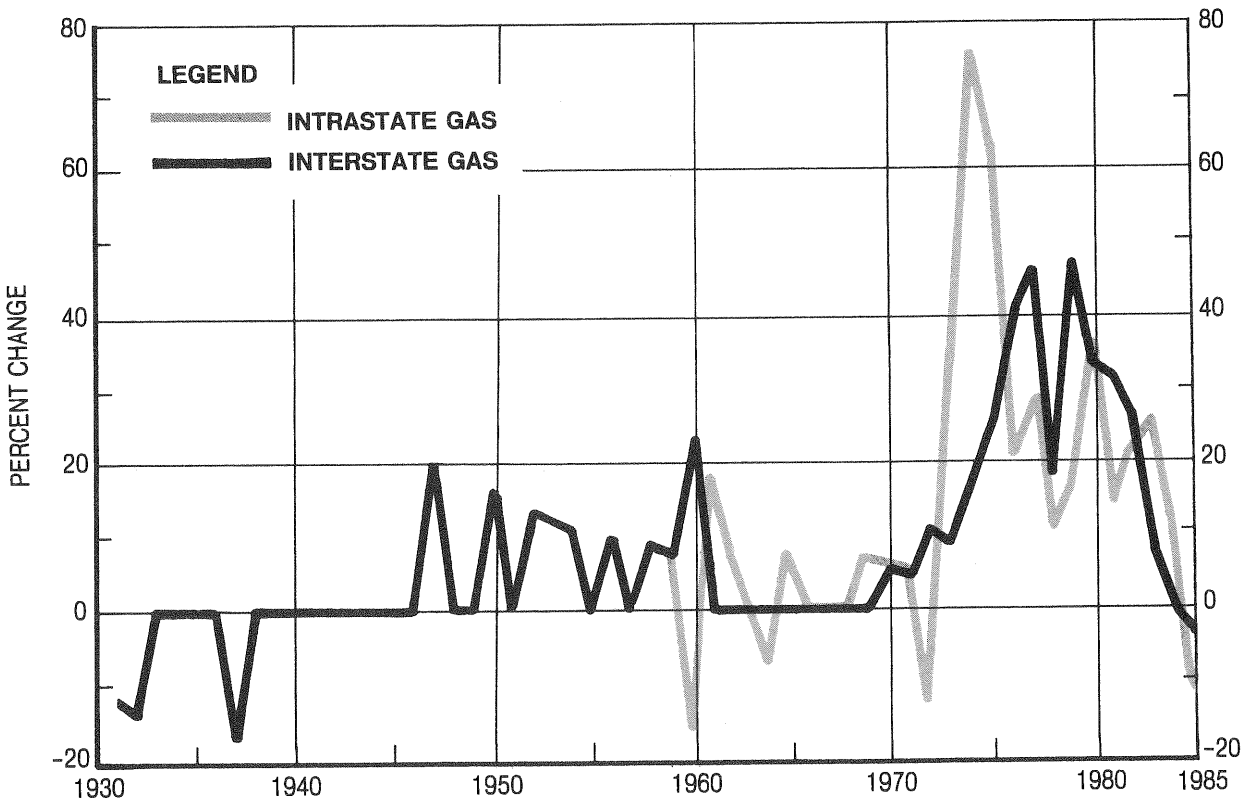
One means to offset an oil supply shortage and/or lessen the impact of higher oil prices would have been the flexibility to switch from oil to an alternative fuel, such as gas. Since inadequate gas supply existed in the United States in the 1970s, many companies were forced to maintain or install the capability to also burn oil. This aggravated the effect of the oil price shock on the U.S. economy and increased U.S. oil import dependence.

The increasing dependence of the United States on imports in the 1970s, especially from Middle East OPEC producers, seriously increased its vulnerability to oil price shocks. In addition, since the world oil market was highly integrated, the United States could not have isolated itself from an oil price shock even if it had not been dependent on Middle East sources. That is, other areas, especially Western Europe and Japan, would have then been even more dependent on the Middle East OPEC producers for their imports. A price shock originating from a cutback in Middle East supplies would have affected the United States as it rippled through to non-Middle East suppliers.

The United States should have paid attention to the warning signals that indicated a growing U.S. and world vulnerability to events in the oil market. Figures 20 through 24 summarize a set of warning signals for the United



SOURCE: *Salomon Brothers* Figure 18. Percent Change in Annual Average Crude Oil Wellhead Prices (Nominal Dollars per Barrel).



SOURCE: Prices are taken directly from or calculated from data in the *Natural Gas Monthly* published by the Energy Information Administration of the Department of Energy.

Figure 19. Percent Change in Annual Average Natural Gas Wellhead Prices (Nominal Dollars per Thousand Cubic Feet).

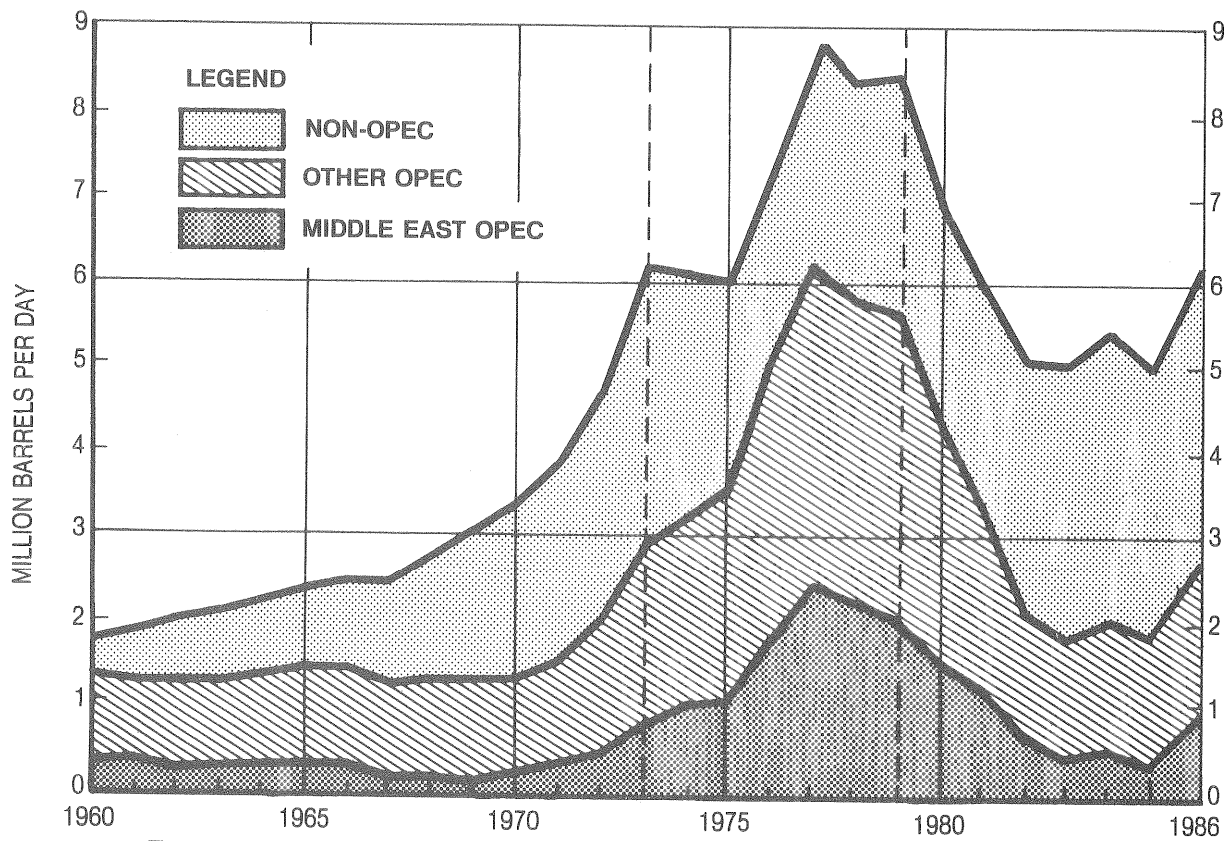


Figure 20. Gross U.S. Imports of Crude Oil and Refined Products by Source.

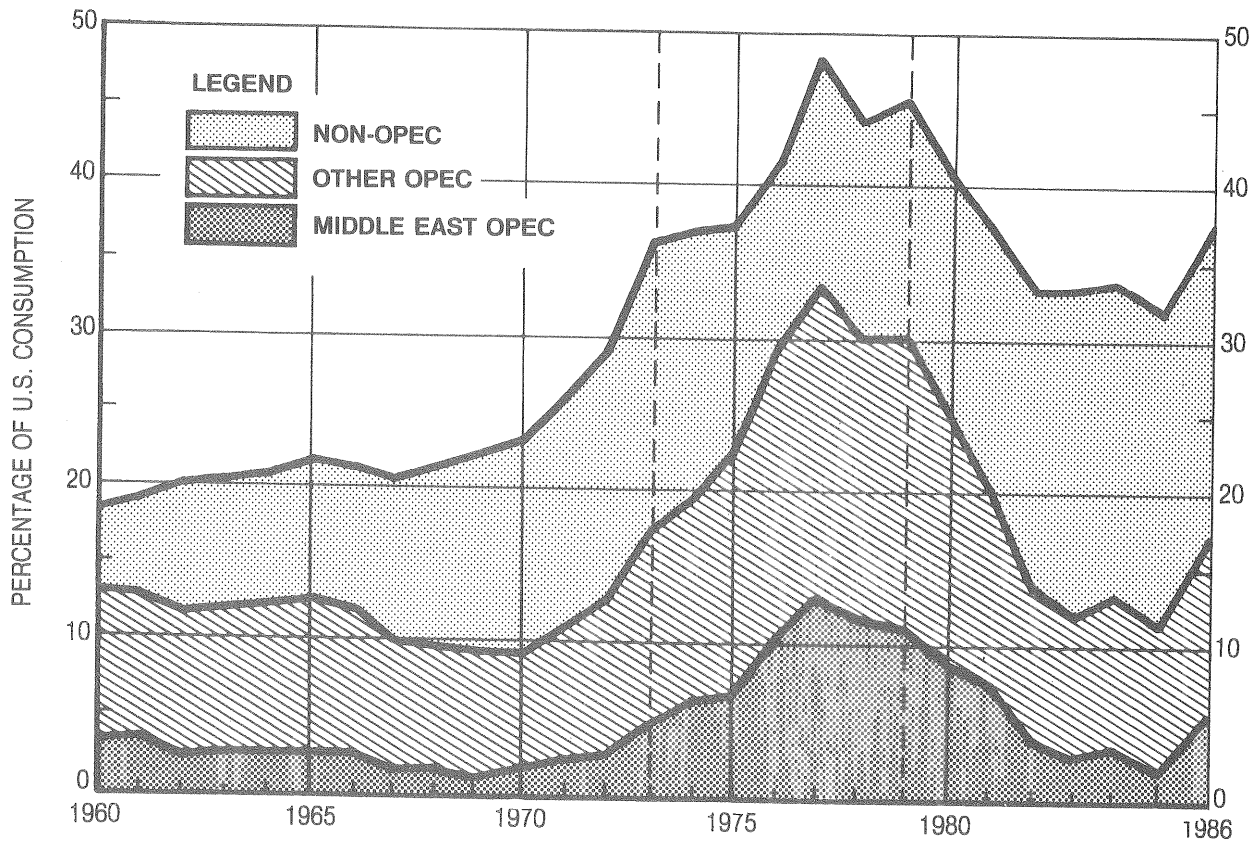


Figure 21. Gross U.S. Imports of Crude Oil and Refined Products by Source as a Percentage of Consumption.

States. Comparable charts could also be developed for other non-communist countries either individually or in total. The trends on these figures prior to the 1973 and 1979 energy crises represent the basic warning signals. These signals include:

- Low or declining levels of excess oil production capacity in the Middle East OPEC and other OPEC countries
- Increasing imports of crude oil and refined products, both in absolute terms (Figure 20) and as a percentage of total U.S. consumption (Figure 21), both in total and from insecure sources such as the Middle East OPEC and other OPEC countries
- Trends towards lower reserve-to-production ratios for crude oil and natural gas (Figure 22)
- Inability to replace domestic petroleum production with domestic petroleum reserve additions (Figure 23 for crude oil and Figure 24 for natural gas)
- Governmental policies that simultaneously encourage consumption and discourage domestic production (such as

low regulated interstate wellhead gas prices or price controls on oil).

As outlined throughout this report, the recent decline in oil and gas prices will increase the vulnerability of the United States and the non-communist world to future energy price shocks. In order to determine if another crisis may be building, these signals of past vulnerability will need to be monitored closely in the future.

The remaining chapters in Section I discuss many of these historical issues in more detail.

Chapter Two reviews the historical actions and events in the oil and gas industry that led to the energy crises. This chapter describes the factors that increased U.S. vulnerability to the 1970s oil supply disruptions, along with the U.S. governmental policy responses to the crises. Since the U.S. natural gas crisis of the 1970s contributed to the severity of the oil crises, this chapter also reviews the factors and the governmental policies affecting natural gas. Finally, the government's energy policy responses to the crises are evaluated with regard to their effects on the crises.

Chapter Three discusses the effects of the energy crises on the U.S. economy, and analyzes the effect of the recent oil price decline on the economy.

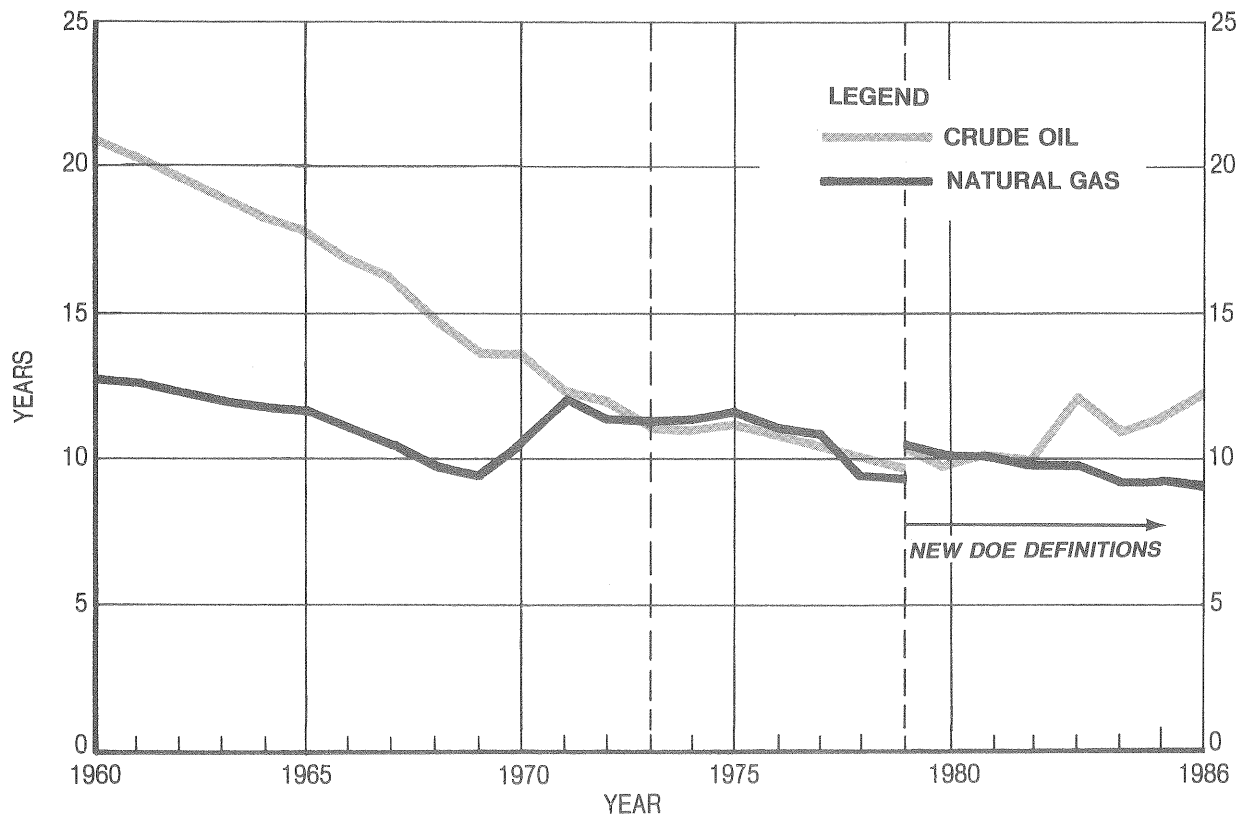


Figure 22. U.S. Reserves to Production Ratios of Oil and Natural Gas.

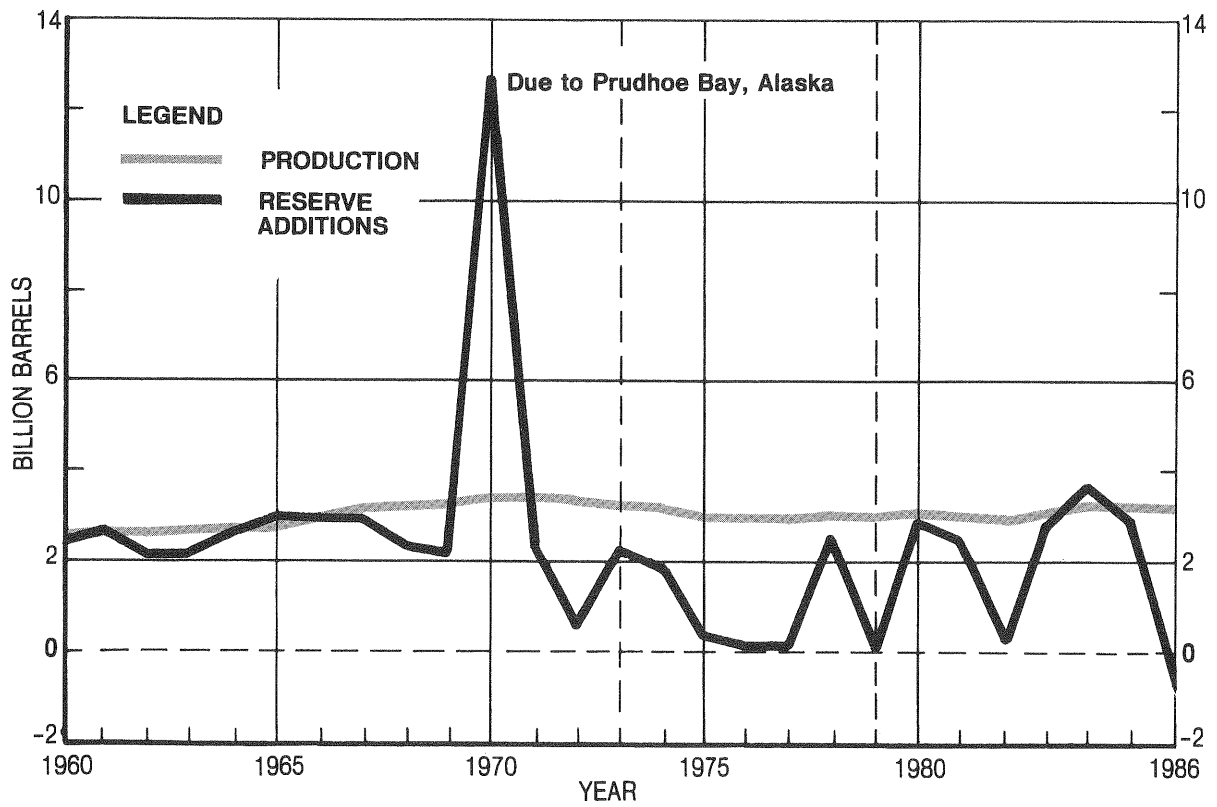


Figure 23. U.S. Crude Oil Production vs. Reserve Additions.

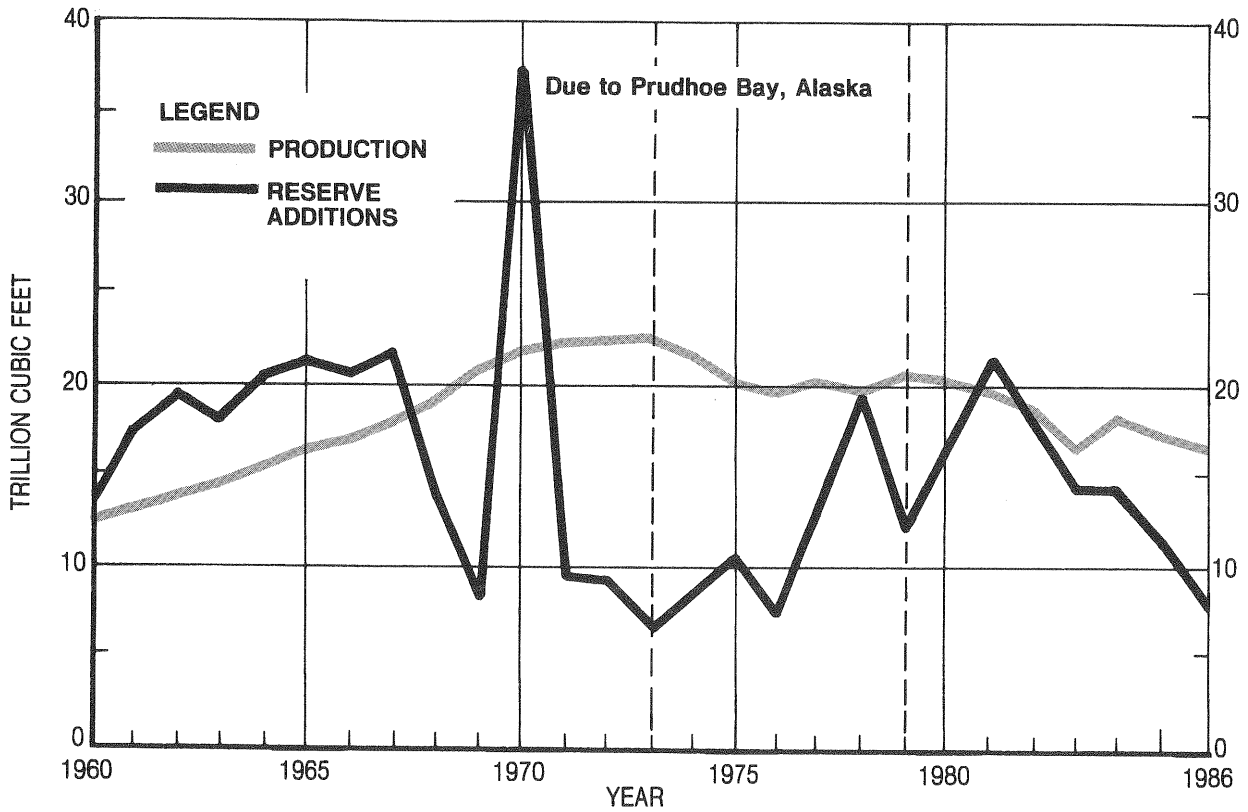


Figure 24. U.S. Natural Gas Production vs. Reserve Additions.

## CHAPTER TWO

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### HISTORICAL ACTIONS AND EVENTS ASSOCIATED WITH THE ENERGY CRISES OF THE 1970s

#### INTRODUCTION

The purpose of this chapter is to identify those actions and events that contributed to the energy crises experienced by the United States during the decade of the 1970s. Three separate energy crisis periods have been analyzed: the Arab oil embargo of 1973–74; the natural gas curtailments of the mid-1970s; and the Iranian oil crisis of 1978–79. In each case, attempts will be made to identify and discuss the factors that precipitated or otherwise contributed to the development of the crisis, as well as the reactions of government, industry, and consumers to the crisis situation. It is hoped that by reviewing the events and decisions of the past, government and industry alike will be better prepared to avoid or mitigate the vulnerability to future supply disruptions.

#### SUMMARY AND OVERVIEW OF PRE-EMBARGO HISTORY (Up to 1973)

##### Pre-War Energy Policies

Prior to World War II, the federal government's role in energy was primarily directed at control of the public domain (pursuant to provisions of the Mineral Leasing Act of 1920), taxation, and the regulation of interstate commerce. However, there were other instances of government involvement—for example, the adoption in 1932 of a 21¢ per barrel tariff on imported crude oil and the passage of the Connally Hot Oil Act. The tariff was imposed at the request of the domestic industry in an effort to combat the combined effects of low demand

brought about by the Depression and production from the new prolific East Texas discoveries. The tariff achieved the desired results, reducing imports almost immediately. The Texas Railroad Commission began effective implementation of prorationing in 1933, protected by a Presidential Executive Order under the National Industrial Recovery Act, which prohibited the shipment, interstate or abroad, of oil produced contrary to state laws. After the National Industrial Recovery Act was ruled unconstitutional in 1935, the Connally Act was passed, extending federal enforcement of state proration laws.

##### The Wartime Effort

In May of 1941, President Franklin Roosevelt created the Office of the Petroleum Coordinator of the National Defense. The war period was characterized by cooperation between government and business leaders.

The government's coordinator role was formalized in the Petroleum Administration for War. The industry's advisory function was provided by the Petroleum Industry War Council, which was composed of 66 oil industry executives selected by the coordinator. The recommendation of the council, in light of exceptional domestic fuel demands, was that the U.S. companies embark on an effort to secure access to the world's oil supplies.

In 1945, concerned over the need to maintain domestic productive capabilities, the War Council adopted the "Petroleum Policy for the United States," which remained the industry's official public policy on the import question for

however, due to the presence of spare productive capacity in the United States and the member countries' reliance on the oil companies' expertise to produce their oil.

By the end of the decade, the combination of the growing demand for world oil and the resource potential of the Middle East shifted the market advantage to the OPEC producers. By 1970, the United States had become a major importer of both crude oil and refined petroleum products. The loss of domestic "surge" capacity and the growing inability of the United States to supply its allies in the event of a more localized disruption further shifted the advantage to the Middle East producers.

U.S. crude oil production peaked in 1970 at 9.6 MMB/D and began to decline, falling to 8.8 MMB/D in 1974. Net import reliance continued to grow, almost doubling from 3.2 MMB/D in 1970 to over 6 MMB/D in 1973, or 35 percent of total consumption. In particular, dependence on Middle East OPEC oil increased from less than 200 MB/D in 1970 to over 800 MB/D in 1973 (see Figures 26 and 27).

During the 1960s and early 1970s, increased demand for oil, beyond the capability of incremental new domestic supplies, was the result of a combination of factors. These factors included:

- Increased economic growth worldwide. In the late 1960s and early 1970s, economic "boom" conditions occurred simultaneously in the United States, Europe, and Japan. Growth rates in real GNP were at peak levels for the two years immediately preceding the embargo. Oil's share of worldwide energy consumption increased from 35 percent in 1960 to 46 percent in 1972.
- Reduced contribution of other fuels. Coal consumption, as a percentage of total energy use, declined; natural gas production, after initially growing, leveled off, at least in part due to price controls and uncertainty resulting from regulations and court challenges.
- The delay in the development and delivery of new oil supplies from the Outer Continental Shelf and Alaska, due to environmental and regulatory constraints.
- Increased gasoline demand stimulated by the expansion of the interstate highway system and more driving. Gasoline demand rose by 2.1 percent per year between 1960 and 1965; that growth rate more than doubled between 1965 and 1970.

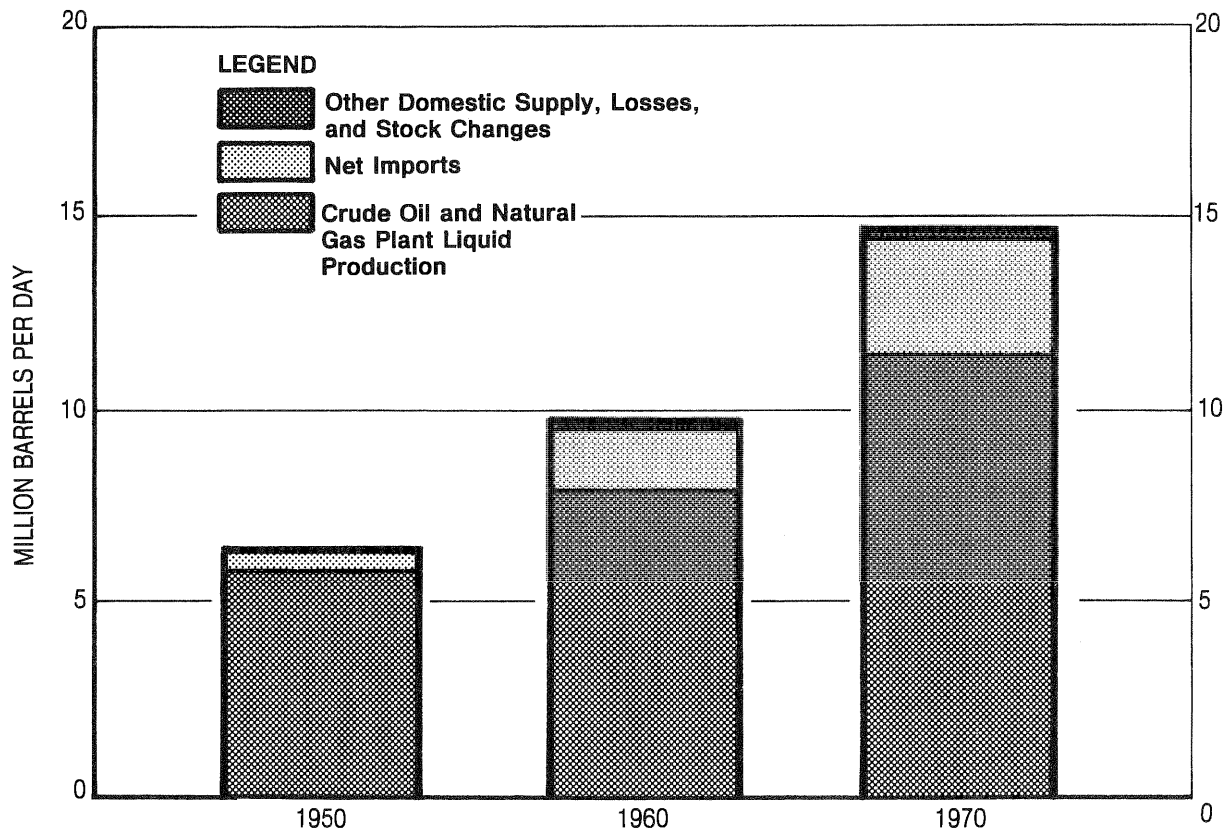
- The adoption of price controls on domestic oil as part of the Nixon administration's attempts to control inflation. Price controls had the dual effect of limiting exploration activity as well as encouraging increased consumption (because of lower prices). The combination of increased demand for petroleum coupled with reduced output resulted in greater reliance on oil imports. As the exceptions to the Mandatory Oil Import Program were increased, the program became meaningless; it was formally abandoned in April 1973 and replaced with a system of license fees.

Now faced with rising oil import dependence, the United States was also constrained in locating secure sources of foreign oil supplies. In 1969, Nigeria was in the midst of a civil war; Algeria had nationalized its country's petroleum operations; a revolution in Libya had replaced a previously pro-Western government with Col. Qaddafi; the Trans-Arabian pipeline in Syria was damaged; and Canadian oil policy shifted towards restricting exports to the United States to only those volumes "surplus" to domestic needs. As a result, U.S. reliance on OPEC oil increased from 1.3 MMB/D in 1970 to just under 3 MMB/D by 1973, with about a third of that volume coming from the Middle East.

At about the same time, after negotiation of the Tehran and Tripoli agreements of 1971, OPEC prices were increased and concessions to the multinationals were eliminated. The British had withdrawn as a military presence in the Persian Gulf. The price of Saudi Arabian light crude oil increased from \$1.80 per barrel in 1970 to \$2.48 per barrel by 1972.

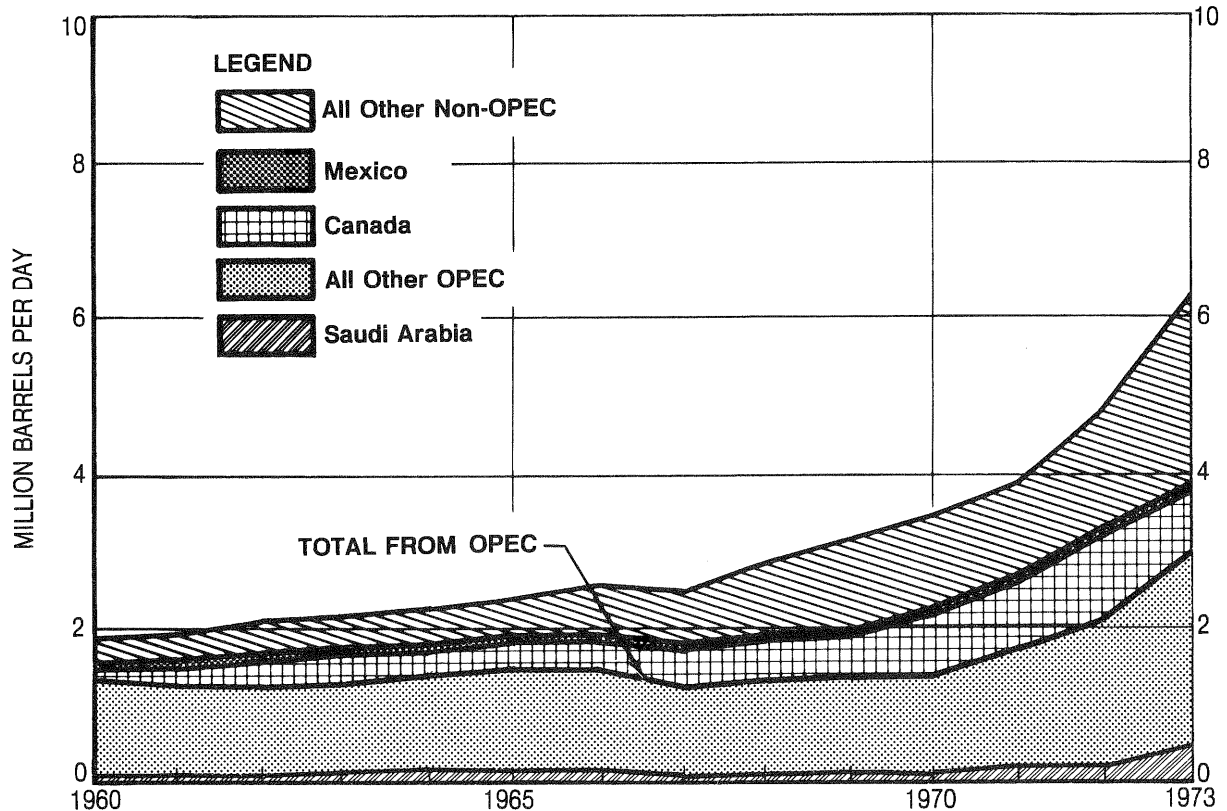
### **The Adoption of Oil Price Regulations Under the Economic Stabilization Act**

In an attempt to curb the inflationary problems of 1970-71, the Nixon administration on August 15, 1971, imposed a wage and price freeze program that affected the entire nation. Phase I of the price control program was intended to remain in effect for only 90 days, until November 13, 1971. Phase I affected all companies, with prices frozen at August 1971 levels. The Cost of Living Council was given broad powers to administer the freeze program. Under the program, however, increased costs for imported products could, at least partially, be passed along to consumers. Consequently, under the program, domestic refiners were disadvantaged relative to their foreign competitors.



SOURCE: Annual Energy Review 1985, Energy Information Administration.

Figure 26. Petroleum Supply and Disposition, 1950, 1960, 1970.



SOURCE: Annual Energy Review 1985, Energy Information Administration.

Figure 27. U.S. Imports of Crude Oil and Petroleum Products by Country of Origin, 1960-1973.



The August freeze date imposed by Phase I controls caused particular price and supply problems for No. 2 fuel oil. Summer inventory fill discounts and high stocks depressed an already low seasonal heating oil price. The drawdown of high distillate stocks helped to avert shortages during the winter of 1971, but low prices gave no incentive to increase No. 2 fuel oil production or replenish inventories. The cold, wet fall of 1972, along with low prices, triggered increased demand for No. 2 oil and propane for heating and crop drying. Spot shortages appeared in the fall and winter of 1972-73.

Phase II of the price control program was implemented on November 15, 1971, and lasted until January 10, 1973. Under Phase II, prices were allowed to increase to cover "permissible" cost increases, but profit margins were strictly controlled.

Large firms, however, were guided by Term Limit Pricing arrangements, which allowed prices on specific products to increase so long as the weighted average increase of their total product slate did not exceed historical profit margin levels. Oil companies were not allowed to include gasoline, No. 2 oil, or residual fuel oil in Term Limit Pricing arrangements—yet collectively, these products accounted for over 70 percent of refinery yields.<sup>2</sup>

As a consequence of rising demand and price controls on domestic oil, import dependence continued to grow, as far as the Mandatory Oil Import Program would allow, and spot shortages of products began to develop.

On September 18, 1972, by presidential proclamation, additional imports were allowed into the East Coast as an advance to 1973 allocations. On January 17, 1973, import quotas for the East Coast were increased further. Quotas for the rest of the country were also increased.

On April 18, 1973, President Nixon issued a proclamation that suspended tariffs and quotas on imports of crude oil and refined products and shifted to a system of import license fees. On May 1, 1973, all volumetric controls on imports of oil were removed.

Phase III of the price control program began on January 11, 1973, and continued until June of that year. The goal of Phase III controls was to reduce the 1973 inflation rate to 2.5 percent by year end. The program was largely ad-

ministered by the companies, and within a few months prices began to rise sharply. Congressional hearings were conducted early that spring to examine the reasons for the oil price increases. The results of the inquiry demonstrated that the price increases were largely cost justified. As indicated earlier, OPEC oil prices were on the rise during this period.

Notwithstanding the evidence justifying the rise in oil prices, congressional pressure to control inflation and restrain heating oil prices, in particular, resulted in the Cost of Living Council's issuance, on March 6, 1973, of Special Rule No. 1.

Special Rule No. 1 placed mandatory price controls on the sale of crude oil and refined products by firms with annual sales greater than \$250 million—the 24 largest oil companies. The rationale was that by limiting the price increases of the larger companies, price fluctuations could be controlled on an industry-wide basis. This was not the case.

In fact, the regulations acted to disadvantage those larger, controlled companies, restricting their ability to compete for crude supplies on the world market and subsequently their ability to supply many smaller refiners and purchasers. As a consequence, historical supply patterns were disrupted, and shortages ensued. Faced with rising import prices and the loss of historical suppliers, these refiners and purchasers began to demand allocation relief.

At the same time, shortages of natural gas created increased demand for propane. Firms not regulated under Special Rule No. 1 bid up the price for propane, and some rural customers who were deprived of their historical sources were now forced to pay higher prices to secure supplies.

By May of 1973, it was apparent that relaxation of the import restrictions alone would not correct the growing supply problems, which were spreading and now threatened gasoline availability as the driving season approached. Congressional hearings were held in May of 1973 with witnesses calling for allocation relief. On May 17, Sen. Henry Jackson introduced the Emergency Fuels and Energy Allocation Act of 1973.

The legislation called for establishment of a mandatory oil allocation program. The administration resisted calls for this type of federal intervention, but recognized that the problem was growing. An amendment to the Economic Stabilization Act of 1970, giving the President discretionary authority to allocate oil supplies to meet essential needs, was offered by Sen. Thomas Eagleton and passed by Congress that spring.

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<sup>2</sup>It should be noted that No. 2 oil and gasoline prices had been included in calculating the Consumer Price Index. Consequently, by excluding these products from price adjustments, the Consumer Price Index was artificially lowered.

In testimony before the Senate Banking Committee on May 10, the administration, in an attempt to diffuse congressional action for a mandatory allocation scheme, unveiled its proposal for the Voluntary Petroleum Allocation Program.

The voluntary program soon ran into trouble. The Ohio Turnpike Commission, for example, sued a major oil company for breach of contract relating to supply commitments for gasoline arrangements to service stations along the turnpike. An Ohio state court ruled in the commission's favor, noting that the company's participation in the voluntary program did not supersede prior contractual agreements.<sup>3</sup> Further, since the program was "voluntary," not all companies elected to participate. Shortages continued to develop and constituents continued to pressure Congress for mandatory allocation relief.

On June 13, 1973, Special Rule No. 1 was amended (Phase III 1/2), effectively freezing prices for all oil, imported and domestic alike. During the June 13–August 12 period, not even the increased cost of imports could be passed through. Import levels fell slightly. The reduction may have contributed to the product shortages experienced during the late summer and fall of 1973.

Phase IV of the price regulations took effect in September of 1973 and covered all segments of the industry. It established a May 15, 1973, base date for crude oil and product prices. Subsequent increases in price had to be "cost-based." Phase IV also established a two-tier price mechanism for crude oil with three categories of domestic oil—old, new, and released.<sup>4</sup>

Refiner product margins were also frozen at the May 15, 1973, levels under the Phase IV pro-

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<sup>3</sup>Ohio Turnpike Commission vs. Texaco, 1 En. Mgmt. Rep. (CCH) Para. 9701 (Court of Common Pleas of Ohio, Cuyahoga County, June 13, 1973). Texaco had restricted the gasoline available to its company-operated stations on the Ohio Turnpike, and instituted a limit on the sale of gasoline to 10 gallons per automobile. These stations were operated under a contract with the Ohio Turnpike Commission that required Texaco to service the needs of all customers on the turnpike.

<sup>4</sup>Old oil was that produced from a property in production in 1972; new oil was from properties developed after 1972 or production that exceeded 1972 base levels. Prices for old oil were set at May 15, 1973, levels plus 35 cents (i.e., approximately \$4.25 per barrel). New oil was allowed to be sold at \$5.12 per barrel, the prevailing market price. The category of "released oil" was intended to provide incentives for incremental production as producers were allowed to release one barrel of old oil from price controls for every incremental new barrel produced from an old oil property (above 1972 base level output).

gram, with further price increases pegged to "identifiable" cost increases.

## **GOVERNMENT RESPONSES TO THE OIL EMBARGO AND SHORTAGES (1973–75)**

On October 6, 1973, the Arab/Israeli conflict resumed, with Egypt and Syria at war with Israel. On October 7, 11 Arab nations announced their intention to cut exports to any country that aided Israel. On October 10, the United States began to resupply Israel with weapons and spare parts; one week later, the Arab producers announced retaliation.

By the time the embargo became effective, President Nixon and most senior policy officials in the White House were already preoccupied with the Watergate affair. Consequently, many of the initiatives developed to deal with the embargo and its aftermath were mandated by the Congress in response to constituent pressure. In the spring of 1973, the administration had unsuccessfully attempted to diffuse congressional action on an allocation measure. The Voluntary Petroleum Allocation Program was specifically created to address the spot shortages problem without the need for a massive congressionally mandated allocation effort. On October 2, the administration announced the establishment of a mandatory allocation program for propane. A similar program was announced for heating oil two weeks later. Ironically, the allocation regulations were perceived by the government as a means to solve some of the problems created by price controls.

The Emergency Petroleum Allocation Act was already winding its way through Congress before the embargo decision was made. The House passed, by a vote of 337 to 72, its version of the legislation on October 17, the same day the embargo was announced. The resulting price and allocation regulations would continue, under the guise of consumer protection, to deter domestic exploration and production activity, increase demand and subsequent import reliance, and cause shortages and distortions in the marketplace that were disproportionate to the actual cutoff of Arab oil.

The production curtailments resulting from the embargo reduced Arab oil supplies worldwide by approximately 5 MMB/D (from 20.8 MMB/D to 15.7 MMB/D) between mid-October and the end of the year. These reductions were partially offset by increased output from other producers, including Indonesia, Canada, Venezuela, Nigeria, and Iran. The resulting net non-communist world oil shortfall

was consequently about 4 MMB/D, or 7 percent of pre-embargo consumption.

Following the onset of the embargo and the enactment of mandatory allocation legislation, the principal objectives of both the Congress and the government were to "equitably" distribute available supplies to consumers and to constrain price increases.

On October 16, the day before the embargo was announced, the Arab OPEC members increased their crude oil price from \$3.01 per barrel to \$5.12 per barrel. By the end of the year, the price had quadrupled to almost \$12 per barrel.

The principal means selected by the administration to constrain oil price increases were the Phase IV price controls. A final two-week price freeze was imposed between October 15 and 31, 1973. However, just as the period was coming to an end, gasoline shortages began to appear. The shortages only served to underscore the perceived political need for allocation regulations, and, in retrospect, also contributed to the decision incorporated in the Emergency Petroleum Allocation Act to extend price controls for the oil industry long after the freeze was lifted for all other sectors of the economy.

Exclusive of price and allocation controls, the government had few alternatives to cope with the ensuing shortages. A number of demand restraint measures, both voluntary and mandatory, were imposed between November 1973 and January 1974 in an effort to induce conservation. These initiatives included lower thermostat settings, fuel switching (from oil to coal, where possible), reduced highway speed limits, odd/even days and minimum-fill gasoline purchase restrictions, and the voluntary ban on Sunday gasoline sales.

Despite these efforts, however, total petroleum product demand during the fourth quarter of 1973 was higher than that of 1972; gasoline demand for the quarter averaged almost 3 percent higher than the comparable 1972 period. Gasoline sales did not decline until shortages and long lines became evident early in 1974.

On December 4, 1973, the Federal Energy Office (FEO) was established by executive order. A successor agency, the Federal Energy Administration (FEA) was created by legislation in May 1974 with the mandate to develop national energy policy objectives and "promote stability in energy prices to consumers."<sup>5</sup> Both FEO

and FEA were given responsibility for implementing the price and allocation regulations.

On January 15, 1974, the initial set of crude oil regulations was published in the Federal Register. Over the course of the next several years, the regulations would be amended and expanded several hundred times through a combination of legislative amendments, regulatory proceedings, and/or the issuance of "interpretive" guidelines.

A selected number of the major regulatory programs established over the next seven years are briefly outlined below. The impacts that these programs had on U.S. import dependence and vulnerability to the Iranian disruption experienced five years after the embargo are outlined later in this chapter.

### **Crude Oil Allocation: The Buy-Sell Program**

In the interest of "sharing" available crude oil supplies to more evenly distribute the effects of the embargo shortfall, the government established a buy-sell allocation program for crude oil. Under the program, refiners with excess supplies were required to sell oil to refiners who needed additional supplies.

Initially, the program was set up to ensure that all refineries would be able to operate at some national average percentage of total capacity. The unreliability of capacity data eventually led regulators to use historical base period data on actual crude oil runs as a means for determining allocations. Under both schemes, however, since sales of additional barrels were transacted at mandated "average prices," sellers were unable to recoup the full cost of the last barrel that they previously had acquired. Consequently, refiners and importers that were successful in securing additional oil on the world market were now likely to have that oil allocated away, possibly at prices below what they paid to secure it. Conversely, refiners that had elected not to contract for long-term crude oil supplies and who were either unwilling or unable to locate needed feedstocks were now "awarded" allotments through the allocation system.

To the extent that crude oil transfer sales went from larger, more efficient refiners to smaller, less efficient processing plants, fewer refined products were ultimately made available to consumers. Thus, by discouraging additional imports and allocating the remaining scarce supplies to less efficient refiners, the regulations worked to aggravate rather than mitigate the effects of the embargo shortfall.

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<sup>5</sup>Federal Energy Administration Act of 1974, P.L. 93-275, May 1974.

## **The Entitlements Program**

As indicated earlier, federal price controls on domestic crude oil were first imposed in 1971. In August 1973, the Cost of Living Council promulgated Phase IV price regulations establishing a tiered price system for domestic production: "old" oil was price controlled and "new" oil was free of price controls. (Later, new oil was once again placed under price controls.) This two-tiered pricing system was designed to provide adequate price incentives to stimulate new crude oil exploration and production while concurrently holding average domestic crude oil prices below world levels in order to insulate consumers from the effects of higher prices.

By the end of the 1973-74 embargo, the combination of domestic price controls and the fourfold increase in world oil prices had created a significant disparity between the price of domestic "old" oil and imported crude oil in the United States. This differential in crude oil costs accordingly resulted in a wide range of prices paid by consumers for refined petroleum products.

Once the government had decided to address the embargo shortfall through the use of price and allocation controls, rather than by reliance on the marketplace, a means for "equalizing" the multi-tiered crude oil costs of refiners had to be developed for both equity and political reasons. The mechanism selected was the Old Oil Allocation or Entitlements Program. The purpose of the entitlements program was to equalize U.S. refiners' crude oil acquisition costs, by distributing the benefits of access to lower priced domestic crude oil proportionately to all domestic refiners, through a system of monetary rather than physical transfers.

As a procedural matter, the FEA calculated and published, on a monthly basis, a national average ratio of old oil supplies to total crude oil runs. Refiners were then issued entitlements equal to the product of this ratio and their adjusted crude oil receipts. Each entitlement gave a refiner the right to receive into inventory and refine one barrel of domestic old oil. Cost equalization was achieved by requiring various refiners to purchase or sell entitlements, based on whether their access to controlled domestic oil supplies was higher or lower than the national average.

Refiners with greater than average access to price controlled domestic oil were required to purchase entitlements. Refiners who used a disproportionate amount of foreign or uncontrolled domestic crude oil were required to sell entitlements. The FEA initially set the value of an entitlement as the difference between the

average cost of imported oil and the average cost of price controlled domestic oil, minus 21 cents. The 21 cents, equal to the fee imposed on imported crude oil, represented an incentive to encourage the refining of domestic oil and to discourage the importation of higher priced foreign oil.

Because the entitlements program was "funded" through intra-industry transfers, rather than by government appropriations, the scope of the program was often readily expanded to address a variety of new problems. For example, because the entitlements program subsidized crude oil imports but not product imports, Caribbean refiners who supplied the U.S. East Coast with residual fuel oil produced from uncontrolled foreign crude oil were unable to compete with domestic refiners. Consumers on the U.S. East Coast were, therefore, adversely affected. As a result, the entitlements regulations were modified to correct this problem. Later in the program, entitlements awards or exceptions were made to encourage the production of heavy California crude and tertiary oil production. The program was also used to subsidize selected synthetic fuel projects.

## **The Small-Refiner Bias**

The entitlements program also included a provision known as the "small-refiner bias." The small-refiner bias was, in theory, compensation awarded to small refiners to offset their lack of economies of scale and relatively higher operating and capital costs. Modeled after the sliding scale that had been incorporated in the Mandatory Oil Import Program (1959-73), this portion of the entitlements program partially exempted small refiners (those with 175 MB/D capacity or less) from entitlements purchase requirements or awarded them additional entitlements to sell. The amount of additional entitlements was scaled in an inverse relation to refinery runs so that the greatest benefits were derived by refiners running 10 MB/D or less.

In the first two years after the small-refiner bias program was implemented, 24 new refineries of less than 30 MB/D capacity were built or reopened in the United States. During the seven years of U.S. price and allocation controls, more than 60 refineries of less than 30 MB/D capacity were built, over two-thirds of which were under 10 MB/D. The bulk of these refineries were built only to take advantage of the subsidies available to the operator rather than to contribute to supplies of refined product.

The small-refiner bias was not the only regulatory program to produce unintended

results. As a number of the selected programs evolved over time and in the context of changing supply conditions, new initiatives were added in response to special interests or to achieve other specific, short-term objectives, many of which were beyond the scope of the original program intent. The tertiary incentive program, the distillate and resid entitlements programs, and the California heavy oil program, all of which were perceived to have had positive effects on either crude oil or heating oil supplies, are examples of this evolution.

### **Summary of Government Responses**

Because of the degree of detail associated with many of the regulatory programs and the level of intrusion and interference that they created in the marketplace, modifications and expansions of the various regulations often resulted in new sets of winners and losers.

Despite the intent of protecting consumers and equitably distributing scarce supplies, the price and allocation controls discouraged needed investment in exploration, production, and refining ventures; encouraged rather than discouraged demand, by artificially restraining prices; subsidized the importation of and increased reliance on foreign oil; and encouraged imprudent and inefficient distribution and market behavior. The average price of old oil in 1974, before royalties and state taxes, was \$6.87 per barrel, while imported oil averaged \$12 per barrel.

Additionally, the suspicion and alienation shared in turn by both government and industry officials undermined the effective partnership approach to addressing supply and distribution problems that had proved to be so effective during the World War II and Korean War efforts. At its height, this political "conflict of interests" concern precluded the government's hiring of employees with any recent prior oil industry experience or affiliation.

A number of the Arab OPEC members lifted the embargo against the United States in March 1974, but Libya, Syria, and Iraq continued their curtailment policies until summer. However, the widespread belief that the U.S. oil industry had caused or at least contributed to the crisis prompted the Congress to extend both the price and allocation controls well beyond the "crisis period."

### **CONTINUED U.S. OIL IMPORT DEPENDENCE PRIOR TO THE IRANIAN CRISIS (1975-78)**

Because of the lag time in developing and implementing regulations and programs to ad-

dress the embargo crisis, the bureaucracy at both the federal and state levels was expanding just as supplies were coming back into balance. By the fall of 1974, FEA had been authorized to administer both the allocation and price regulations formerly administered by the Cost of Living Council. The industrialized nations of the world had formed a pact for sharing information and supplies through the International Energy Agency (IEA). The entitlements program was established to address the equity issues resulting from the disparity between uncontrolled world oil prices and those capped under domestic price controls. By now, the Cost of Living Council's wage and price controls had expired, except for those imposed on the oil industry.

The disruption caused by the embargo had ended and the administration favored the termination of the troublesome controls. In his January 1975 State of the Union Address, President Gerald Ford called for more favorable changes to the tax code for oil and gas producers and the elimination of controls in order to make the nation "invulnerable to future cutoffs of foreign oil. . . ."<sup>6</sup>

The Congress, however, bolstered by public opinion polls showing a general distrust of the oil industry, instead proposed and adopted several punitive pieces of legislation. The depletion allowance was eliminated for major oil companies and a number of divestiture bills were introduced in both houses of Congress.

The Emergency Petroleum Allocation Act, which was scheduled to expire on February 28, 1975, was extended through August. In July, President Ford unveiled a plan to phase out controls on oil over a 30-month period. He also proposed the adoption of a "windfall profits" tax to ensure that domestic producers would not derive the full benefits of higher prices that resulted from the embargo conditions and subsequent price adjustments by the OPEC members.

However, by year end, the passage of the Energy Policy and Conservation Act (EPCA) eliminated any chances for rapid decontrol. The legislation granted the President standby authority to impose rationing, to reduce demand through conservation initiatives (including the establishment of auto fuel efficiency standards), and to fulfill U.S. obligations under the IEA agreement. The measure also established the creation of the Strategic Petroleum Reserve

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<sup>6</sup>"Address before a Joint Session of Congress Reporting on the State of the Union, January 15, 1975." Public Papers of the Presidents: Gerald Ford, 1975. Washington, DC: GPO, 1977, p. 42.

(SPR). The bill's oil pricing provisions re-established price controls on new, released, and stripper well oil, categorized as "upper tier" oil, rolled back the price for domestic old "lower tier" oil, and extended the controls for another 40 months.

The statutory extension of price and allocation controls beyond the actual crisis period perpetuated existing supply and distribution problems. Further, by keeping prices artificially low, domestic exploration and production activity was impeded while consumption was encouraged.

At the same time, environmental regulations, such as the Mine Safety and Clean Air programs, skewed boiler demand to low sulfur residual fuel oil imports and natural gas rather than coal. Lower controlled gasoline prices prompted a resurgence of consumer demand for bigger cars. Environmental restrictions, offshoots of the 1969 Santa Barbara spill, resulted in delays in offshore exploration and production.

Between 1973 and 1977, domestic crude oil production declined from 9.2 MMB/D to 8.2 MMB/D (see Figure 28). Domestic gas production also declined by 12 percent. However, following the 1973-75 recession, consumption continued to grow and imports increasingly filled the gap. Between the time of the oil embargo and the election of President Carter, U.S. dependence on foreign oil had grown from 35 percent to 46 percent of consumption.

While campaigning for the presidency, Jimmy Carter had promised natural gas decontrol and replacement cost pricing for oil.

However, following the natural gas curtailments of the winter of 1976-77, upon assuming the presidency in January 1977 he was confronted with the political reality that neither goal would be immediately achievable (see section entitled "Significant Factors Affecting the Development and Use of Natural Gas").

On April 20, 1977, in a nationally televised address before the House and Senate, President Carter unveiled the National Energy Plan. The goals of the plan were to reduce the annual growth rate in energy demand to below 2 percent and to cut oil imports to below 6 MMB/D. The objectives were to be met through a series of initiatives that included conservation, fuel switching, synfuels development, a new natural gas pricing regime, and the adoption of the Crude Oil Equalization Tax. Under the proposal, new oil would gradually rise to market levels and production from enhanced oil recovery (EOR) projects and stripper wells would be free of controls. Old oil would remain under price controls with increases pegged to inflation adjustments.

The House of Representatives, with the aid of some extraordinary procedural maneuvers that substantially altered traditional committee jurisdiction, passed the National Energy Act intact in less than six months. In the Senate, the plan stalled due to opposition over the Crude Oil Equalization Tax, the centerpiece of the oil price plan.

In October of 1977, a new cabinet level agency, the Department of Energy, was created and James Schlesinger was confirmed as the first Secretary of Energy.

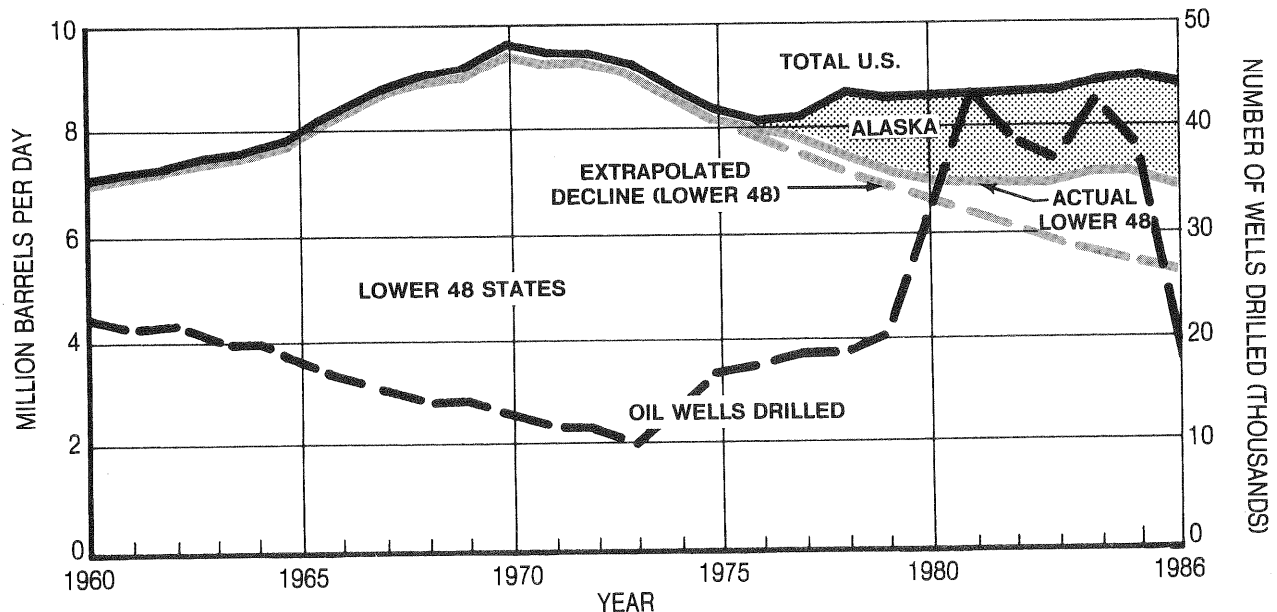


Figure 28. U.S. Crude Oil Production, Actual and Normal Decline, and Oil Wells Drilled.

In July 1978, while attending the Bonn Economic Summit, President Carter pledged that by the end of 1980, U.S. oil prices would be at world market levels. Later that summer, the administration began developing plans to de-control domestic crude oil prices. The extension of price controls under EPCA was scheduled to expire the following June.

At the end of October 1978, Congress passed its "revised version" of the National Energy Plan, including as separate pieces of legislation the Natural Gas Policy Act and the Powerplant and Industrial Fuel Use Act. The Crude Oil Equalization Tax provisions were stripped from the package as were those provisions deregulating oil prices.

Within two weeks of the passage of the National Energy Act, the Iranian revolution and the mass exodus of that country's oil field operators resulted in a precipitous decline in Iran's oil output and exports. Between September 1978 and January 1979, Iranian production dropped from 5.6 MMB/D to almost nothing.

## **GOVERNMENT RESPONSES TO THE IRANIAN SHORTFALL**

Prior to the curtailment of Iran's oil production, world oil prices had remained stable since the 1973-74 embargo. Between 1974 and September 1978, crude oil prices had risen less than the average rate of inflation in the industrialized countries. In September 1978, the price for Saudi light was \$12.70 per barrel (U.S. landed cost of \$14.03 per barrel), only about a dollar above OPEC's posted price in January 1974. Composite U.S. oil prices in the fall of 1978 were \$4 per barrel below the Saudi price due to controls; U.S. stripper oil, now free of domestic price controls, was sold for \$14.03 per barrel. Old oil averaged only \$9 per barrel in 1978. U.S. import dependence in the fall of 1978, prior to the Iranian revolution, was about 8.5 MMB/D, or 45 percent of consumption.

Disruptions in the flow of Iranian oil began with strikes in the Abadan refinery and neighboring oil fields on October 20, 1978. As the strikes became more widespread, production continued to decline until December 26, 1978, when all oil exports were terminated. Oil production during January and February 1979 was not even sufficient to meet Iran's internal needs.

Prior to the cutbacks, the United States was the second largest importer (after Japan) of Iranian oil. For the first nine months of 1978, import levels approximated 750 MB/D, representing about 9 percent of total oil imports and

4 percent of total U.S. petroleum demand. At the time of the disruption, Iran was the world's fourth largest oil producer and the second largest exporter of crude oil.

Iran resumed exports of crude oil at about 2 MMB/D in March of 1979. By June, Iran's oil output was back to 75-80 percent of the pre-disruption levels and exports approached 3.5 MMB/D.

As indicated earlier, the loss of Iranian oil during the November 1978-June 1979 period was partially offset by increased production elsewhere in the world. Although the resulting loss of world oil supplies during the revolution was between 2 and 2.5 MMB/D, the U.S. share of the total supply shortfall approximated 200 to 400 MB/D at any given time.<sup>7</sup>

Ordinarily, a shortfall of this magnitude should have produced only minor disruptive effects, and certainly not a tripling of oil prices. In retrospect, however, the convergence of a variety of factors, including price and allocation controls, low pre-crisis inventory levels worldwide, the prevailing uncertainty regarding the duration and magnitude of the crisis, the curtailment of third party sales, and consumer behavior and panic buying (evidenced by tank topping, supply hoarding, and bidding up prices for spot cargos of oil), produced an array of consequences totally out of line with the size of the disruption.

Panic buying was not limited to U.S. consumers. In short order, major industrialized nations (e.g., Japan) that had been particularly dependent on Iranian oil supplies became active in the spot market, bidding up prices for crude oil and product cargos.

In December 1978, OPEC announced an official price increase of 60 cents per barrel. However, between October and the end of the year, Rotterdam spot market prices had already doubled from \$10.50 per barrel to almost \$22.50 per barrel.

In the United States, petroleum consumption was peaking at 18.9 MMB/D, yet total primary stocks of crude oil and refined products were 7 percent below 1977 levels. Crude oil inventories were less than 310 million barrels, close to the projected minimum operating level for primary stocks. Gasoline consumption for the year was at a record pace and, by the end of the summer driving season, motor gasoline stocks had been depleted to their lowest levels since the embargo.

<sup>7</sup>U.S. General Accounting Office, *Report to the Congress by the U.S. Comptroller General on the Iranian Oil Cutoff*. Doc. #EMD 79-97, GAO, September 13, 1979.

As refineries pressed to maintain higher gasoline output levels as late as December, distillate stocks were necessarily drawn down to keep up with the seasonal incremental demand for home heating oil.

At the outset of the crisis, the Carter administration attempted to minimize the shortfall by encouraging a variety of conservation measures. The Department of Energy estimated that the combination of compliance with the 55 mile per hour speed limit, reduced discretionary driving, and lower thermostat settings could save up to 500 or 600 MB/D, thus making the shortage manageable. Fuel switching from oil to gas and electric power wheeling initiatives were recommended as means to save additional fuel, theoretically more than offsetting the loss of Iranian supplies.

Additionally, the administration proposed the adoption of several mandatory conservation measures, including a plan for reduced heating in commercial buildings and a ban on unnecessary outdoor lighting, including Christmas lights. A standby gasoline rationing program was also proposed. Of these measures, only the mandatory commercial thermostat setting proposal was adopted by Congress, as part of the Emergency Energy Conservation Act of 1979. Conservation programs were also developed by various state and local jurisdictions.

Finally, as required by EPCA and in response to prevailing congressional concerns relative to the inflationary effects of subsequent oil price increases, controls on crude oil and gasoline remained in place for the duration of the crisis. Earlier attempts at decontrolling motor gasoline had been rejected by Congress. Continued controls severely limited the government's ability to address the supply imbalances by using measures directed predominantly at the demand side of the equation.

In an abbreviated effort to restrain runaway world oil prices, the government also urged domestic refiners and importers not to bid up the prices for spot cargoes of crude oil. The rationale for this action was twofold—to alleviate some price pressure on spot market sales by removing potential bidders from the process, and to allow other consuming nations the short-term benefits of the availability of incremental supplies in order to get their internal supply/demand balances somewhat under control.

The effort was short-lived, however. The spot market continued to be active, with Japanese and European traders continuing to bid up the price for oil. Some U.S. companies that felt obliged to secure foreign supplies to meet their customer demands also continued to be active in spot purchases. By May 1979, in

the face of looming product shortages, the administration reversed its earlier policy decision and encouraged U.S. refiners to re-enter the spot market.

During the spring of 1979, the administration, in anticipation of the possibility of a protracted shortage, also urged refiners to use their inventories sparingly and to rebuild stocks whenever possible. The cumulative effects of these decisions and the various "quirks" of the allocation regulations were predominantly responsible for the gasoline shortages that developed over the next four months.

Data published by government sources after the Iranian crisis ended indicated that total oil supplies available through the first seven months of 1979 averaged only about 1 percent less than the volume of total products supplied during the same period of the previous year. However, as a consequence of the low pre-crisis stock levels and the consequent efforts of refiners and other consumers to rebuild oil inventories throughout the crisis period, supplies available to consumers were noticeably reduced. Ironically, the most obvious manifestations of the Iranian shortfall in the United States, i.e., gasoline shortages and oil price increases, occurred after the actual supply shortfall had ended.

Gasoline lines first appeared in California in May of 1979. For the next three months, the phenomenon was repeatedly observed in various locations throughout the nation, primarily in metropolitan areas. Surpluses continued to exist in rural, resort, and farm areas. The hidden culprits behind the gas lines, at least in part, were the allocation regulations—the use of outdated historical base periods as a means for distributing supplies, the identification and expansion of priority users, state set-aside programs—and "tank topping" by panicked consumers.

### **How Selected Allocation Regulations Contributed to Shortages and Gas Lines**

It should be noted at the outset that the only major product shortages evidenced by the Iranian cutoff involved supplies of motor gasoline. Products that were uncontrolled were generally in adequate supply throughout the crisis period.

#### **Crude Oil Allocation: The Buy-Sell Program**

The allocation of crude oil among refiners contributed to the gasoline shortages in two



principal ways. First, to the extent that oil was transferred from larger refiners with high gasoline productive capacity to smaller refiners with little gasoline-making capability, the result of the transfer was a net loss in terms of gasoline supplies. Further, the removal of incremental barrels from the distribution system of major gasoline refiners and marketers put additional pressure on the ability of the system to service regions in short supply.

### The Use of Historical Base Periods

The adoption of an allocation mechanism to equitably distribute scarce supplies necessarily requires the use of some base period for computing allocation fractions for future months. The more current the base period, the more likely that it will reflect, on a pro-rata basis, recent changes in consumption patterns. However, recognizing that crisis consumption patterns will, by definition, not coincide with "normal" base period data, the formulation of allocation fractions will necessarily be inexact.

As in 1974, the government's program for allocating scarce supplies of motor gasoline in response to the Iranian shortfall centered around the use of a historical base period. Consequently, when gasoline supplies became tight during the early spring of 1979, the initial allocation volumes used were based on the volumes of gasoline purchased during the corresponding months of 1972, with some limited adjustments.

The use of this "outdated" base period caused predictable results. In some cases, suppliers were assigned to customers that they had not served since 1972. Further, the sales volume data often failed to reflect the growth adjustments that particular regions, states, and metropolitan areas had experienced since the embargo.

To redress this oversight, the Department of Energy updated the gasoline allocation base period from calendar year 1972 to a more current, pre-Iranian revolution base and added special provisions to allow for "unusual growth." Despite these attempts at updating, however, the program was never able to adjust to the problem of rapidly changing markets and consumption patterns.

Because of consumer fears of being unable to buy gasoline on any given day at any given location, many motorists altered summer vacation plans or remained at home. As a consequence, remote resort and low growth areas were often awash with gasoline while residential and high growth areas were faced with shortages.

### State Set-Aside Allotments

In response to the Iranian shortfall, state governments, concerned with their ability to ensure that state police, hospitals, fire departments, and municipal, county, and state officials had enough fuel supplies, lobbied for and received special state set-aside volumes. Under the set-aside program, suppliers were required to withhold between 3 and 5 percent of their total supplies from their normal distribution channels in order to make those volumes available to "special need" consumers identified by the state.

The withholding served to further reduce the amount of available, allocatable supplies that otherwise could have been used to mitigate the effects of the shortfall on the general public. Further, to the extent that the set-aside volumes were not used by the state during any particular month, the supplies were then to be hurriedly redistributed into normal channels.

### The Identification of Priority Users

In addition to the base period allocations and state set-aside requirements, suppliers were also required, in special cases, to supply selected "priority users" (e.g., farmers, hospitals, police, and fire fighters) with 100 percent of current needs.

As expected, the priority user classification became a favorite target for abuse. For example, Special Rule No. 9 allowed farmers to receive all the diesel fuel they needed in order to complete their spring planting. In response to this "preferential" treatment, the truckers went on strike, refusing to carry farm goods to market and closing down major portions of the interstate highway system to highlight their predicament. Shortly thereafter, Special Rule No. 9 was amended to include truckers among the class of priority users entitled to 100 percent of their diesel fuel needs.

The combination of special exemptions and the set-aside programs reduced the level of available allocation volumes to the general public, exaggerating the general shortage situation and fueling the tank-topping response of the average consumer.

### The Impact of Tank-Topping

Prior to the advent of consumer panic, the average U.S. motorist drove with his gas tank between one-third and one-half full. With the coming of long lines and odd/even day rationing, consumption patterns began to be drastically altered so that "tank-topping" became the rule rather than the exception.

In 1978, there were some 150 million motor vehicles registered in the United States. If only half of the owners of those cars and trucks adopted the tank-topping practice, assuming a 14 gallon tank capacity, there would have been an additional 13 to 18 million barrels of fuel sitting in storage in personal vehicles at any given time and consequently unavailable for more general distribution.

## Crude Oil Decontrol

Under provisions of EPCA, the non-discretionary authority for continuing price controls on domestic oil was scheduled to expire in May of 1979. Prior to that time the administration had to choose whether to extend controls for an additional 30 months or seek deregulation on either an immediate or a more gradual phase-out basis.

Early on, in response to the shortfall, Secretary of Energy Schlesinger and some members of the Carter administration recognized that price and allocation controls were not only ineffective in correcting the Iranian supply problem but, in fact, were worsening the crisis. They believed that the time had come for U.S. consumers to recognize the true costs of energy. Attempts at convincing the public and the Congress that this was the case, however, caused substantial political damage.

During the previous summer, before the Iranian revolution took place, the Department of Energy was developing options for a phased deregulation plan. With the advent of the Iranian crisis, however, prospects for decontrol were not favorable.

On April 5, 1979, President Carter announced his program of phased decontrol and the creation of an Energy Trust Fund. Under the deregulation plan, beginning on June 1, controls would gradually be lifted over a 30-month period. The phased deregulation schedule was selected in the interests of minimizing the cost to consumers and the inflationary effects of immediate decontrol.

To prevent domestic oil companies from reaping "excessive, windfall profits" as a result of price deregulation, a special tax was proposed to capture 50 to 70 percent of the expected increase in revenues. The tax would then be used to subsidize the development of alternative energy sources, mass transit projects, and low income energy assistance credits.

The decontrol formula itself was relatively simple. As an incentive to encourage new exploration and production activity, newly discovered oil was to be decontrolled on June 1.

Lower tier or old oil would be released to upper tier levels at the rate of 1.5 percent per month. Upper tier oil would be allowed to gradually rise to world price levels, also in monthly increments. To stimulate investments in EOR projects, the proposal allowed producers to release certain lower tier oil to help pay for the EOR effort. All controls were to be eliminated on October 1, 1981.

Between 1979 and 1985, the combination of higher oil prices and the targeted investments in new drilling and EOR projects resulted in record level rotary drilling rig activity (1981) and an increase in total domestic crude oil production from 8.6 MMB/D to 9.0 MMB/D. During the period, incremental production in the lower 48 states was more than sufficient to offset the historical decline normally associated with reservoir depletion and, in fact, may have contributed as much as an additional 1.5 to 2.0 MMB/D of daily U.S. oil production (see Figure 28).

In the spring of 1980, Congress enacted the Windfall Profit Tax, a measure that both congressional and industry officials privately conceded as the political "quid pro quo" for having achieved decontrol.<sup>8</sup> The tax effectively capped producer returns on investment, but more importantly set a precedent for Congress to tax revenues rather than income.

The Congress also adopted, as part of a more delayed energy response plan, the Energy Security Act, which established a fast track, government-sponsored synfuels development effort.

Later that year (1980), the Department of Energy released a response plan for reducing U.S. vulnerability to supply cutoffs in the future.<sup>9</sup> The report called for the adoption of a variety of supply and conservation initiatives, including: the return to a system of free-market pricing for both oil and gas, the expansion of purchases for the SPR, government assistance in developing alternative fuels, a revamping of the leasing system to allow better access to resources located on federal lands, improved energy-efficiency programs, and the diversification of oil import sources. It is significant to note that even in the face of the potentially volatile supply situation associated with the Iran/Iraq conflict, the administration refused to backtrack on its commitment to decontrol.

<sup>8</sup>U.S. Congress, *Conference Report: Crude Oil Windfall Profits Tax Act of 1980*. House Report 96-817 (96th Cong., 2nd Sess.), March 7, 1980, pp. 92-115.

<sup>9</sup>U.S. Department of Energy, Office of Policy and Evaluation, *Reducing U.S. Oil Vulnerability, Energy Policy for the 1980s*. An analytical report to the Secretary of Energy, November 10, 1980.

On January 28, 1981, a newly inaugurated President Ronald Reagan, fulfilling a campaign pledge, by executive order terminated the remaining controls on domestic oil, accelerating the phased decontrol schedule established by President Carter almost two years earlier.

### **The Post-Decontrol Environment (1981-85)**

In direct response to the substantial increases in world oil prices following the Iranian crisis and the elimination of domestic oil price controls, U.S. drilling activity reached record levels in 1981. As a function of this increased activity, domestic crude oil production rose by 400 MB/D between 1979 and 1985, from 8.6 MMB/D to 9.0 MMB/D. The majority of this net increase resulted from the combination of increased production in Alaska; the maintenance of production in the lower 48 states over and above the normal reservoir decline rates; and incremental new supplies from enhanced recovery and new production efforts.

Domestic consumption of oil and gas—similarly responding to price changes, increased efficiency, and conservation—declined over the same period by 15 percent. Net oil imports declined over the same period from 8.0 MMB/D to 4.2 MMB/D, a decrease of over 47 percent from 1979 levels.

Consistent with the reduced demand for oil products, increased competition, and the loss of special programs such as the small-refiner bias, the post-decontrol environment produced a substantial shutdown of domestic refining (distillation) capacity. Between January 1, 1981, and January 1, 1986, the U.S. refining industry experienced a net loss of 3.2 MMB/D of operating and distribution capacity, including the shutdown of 120 refineries.

In an apparent attempt to reduce U.S. vulnerability to another protracted oil supply disruption, domestic refiners and importers dramatically shifted their import sources. At the same time, the SPR was being more than quadrupled in size, from 91 million barrels in 1979 to 493 million barrels at the end of 1985.

In 1979, total crude oil and product imports from OPEC nations accounted for some 5.6 MMB/D, about 70 percent of total import volumes. Imports from Middle East OPEC represented 2.1 MMB/D of that total. By way of contrast, imports from Western Hemisphere nations (Mexico, Canada, and OPEC member Venezuela) accounted for 1.7 MMB/D, or less than 20 percent of the total.

By year-end 1985, imports from the Western sources made up some 44 percent (2.2 MMB/D) of U.S. oil imports. Imports from Saudi Arabia had declined by over 1 MMB/D during this period, and imports of total OPEC and Middle East OPEC oil registered only 1.8 MMB/D and 300 MB/D, respectively.

### **SIGNIFICANT FACTORS AFFECTING THE DEVELOPMENT AND USE OF NATURAL GAS**

#### **Growth of Natural Gas as an Energy Source**

A brief background of the development of natural gas as a major source of energy in the United States is helpful to understand government actions that have occurred since the 1940s. Until the late 1940s, gas found in combination with oil reserves was often either flared or burned on site to generate energy to support oil production.

Prior to the 1930s, commercial development of gas usage was limited by the proximity of the user to the production site. Regional, small diameter pipelines often connected the early gas finds to municipal utilities in nearby towns. As the technology for piping gas long distance improved, these delivery systems were expanded as gas proved to be clean, safe, and inexpensive.

During World War II, demand for natural gas increased, as did the transmission systems necessary to deliver the fuel to market. By 1945, the total domestic gas pipeline system—including gathering, transmission, and local distribution lines—reached over 200,000 miles in length. Because of various regulatory restrictions and the fundamental differences between the businesses of producing and transporting gas for sale, integration became the exception rather than the rule in the gas industry, and three distinct segments evolved—gas production, transmission, and distribution.

In 1940, total gas consumption was 3 trillion cubic feet (TCF), representing 10 percent of all energy consumed. By 1950, gas consumption had doubled—to 6 TCF—and represented 18 percent of U.S. energy consumption. By 1960, gas consumption had more than doubled again—to 12 TCF—and gas had captured 28 percent of the energy market. In 1972, coincident with tight supplies of fuel oil and propane, gas use peaked at 22 TCF, which amounted to 32 percent of domestic energy consumption.

## Early Regulation of Gas Transportation, Sales, and Wellhead Prices

### The Natural Gas Act of 1938

In 1934 and 1935, a 96-volume report was released by the Federal Trade Commission contending that a small number of companies dominated the transportation of natural gas. As a result of this report and other perceived natural gas problems, Congress adopted the Natural Gas Act (NGA) of 1938.

The NGA gave the Federal Power Commission (FPC), now the Federal Energy Regulatory Commission (FERC), the authority to regulate the interstate transportation and sales for resale of natural gas. The Act specifically excluded from the FPC's jurisdiction "the production or gathering of natural gas" and its "local distribution." Accordingly, the Act was initially interpreted by the FPC and the courts as precluding FPC jurisdiction over wellhead prices.

### The Phillips Decision

In a test of the question of jurisdiction over producers, the FPC ruled in 1951 that Phillips Petroleum, a natural gas producer not involved in the interstate transportation of gas, was not a natural gas company as defined by the NGA. Therefore, the FPC ruled that it had no jurisdiction over Phillips or any other independent producer or gathering company.<sup>10</sup>

The FPC's decision in the *Phillips* case was appealed to the Supreme Court in the case of *Phillips Petroleum Company vs. Wisconsin*. The court held that the NGA required regulation of the price of natural gas at the wellhead, but did not provide the FPC any guidance as to how it should regulate wellhead prices pursuant to the NGA.

The Supreme Court found that the exemption in the NGA for those engaged in "production or gathering of natural gas" did not apply to Phillips, since the interstate sales in question took place after the gathering and/or production functions and constituted a "sale for resale" within the meaning of the NGA. The Supreme Court applied the production and gathering exemption only to the "physical process" of producing and gathering gas, and not the "sale for resale." In addition to forcing the FPC to begin

a long series of decisions setting prices for interstate sales of gas at the wellhead, the decision for the first time created a "dual market" for natural gas—with price controlled gas flowing in interstate commerce, and market priced gas sold within producing states (the intrastate market).

In the *Panhandle Eastern Pipeline* case in 1954, the commission approved Panhandle's request to allow commodity (market based) prices for the gas that it produced. The commission pointed out the short-term irrationality of multiple prices for gas coming from different wells but going to the same consumers. From a long-term perspective, the commission concluded that an arbitrary, depressed price based on short-run cost would tend to accelerate consumption and fail to encourage future exploration. However, an appellate court overruled the FPC (the Supreme Court declined to review the case) and held that costs must remain the "point of departure" for federal rate regulation of pipelines (*City of Detroit vs. FPC*, 1955).

### Early FPC Wellhead Pricing Decisions

Forced by the *Phillips* decision and constrained by the *City of Detroit* ruling, the FPC undertook the task of setting ceiling prices for natural gas at the wellhead. Until approximately 1960, the FPC itself did little to implement the regulation of independent producers, in the belief that Congress would override the *Phillips* decision. Efforts were made to modify the court's decisions through legislation in every session of Congress from 1954 through the mid-1970s. No legislative attempt was successful until the enactment of the Natural Gas Policy Act of 1978.

### Company-by-Company Regulation

Initially, the FPC attempted to regulate the wellhead price of gas on an individual producer "cost-of-service" basis. Based on this standard, the FPC employed the cost-of-service methodology, traditionally used in utility rate regulation, for its wellhead price regulation. In general, the cost-of-service pricing methodology provides a rate of return based on net investment plus depreciation allowance and production costs, rather than the market value of the commodity or its replacement cost.

The sheer magnitude of this company-specific approach was both administratively unmanageable and impractical. By 1960, the

<sup>10</sup>Federal Power Commission, "In the Matter of Phillips Petroleum Co." Opinion 217, 10 FPC 246 (1951).

FPC case backlog approximated 3,000 cases.<sup>11</sup> Until the *CATCO*<sup>12</sup> decision by the Supreme Court in 1959, the FPC made no attempt to regulate the price of newly sold gas. After that decision, the FPC imposed price restrictions on the sale of new gas to “hold the line” on prices until geographical area ceiling rates could be established.

## Area Regulation

Consequently, in 1960, the FPC discarded company-by-company regulation, and in its place began to regulate producers by determining “just and reasonable” rates on an area basis. Under the area-rate system, uniform wellhead price ceilings were set for all gas produced within a specific geographical producing area. Ceilings were based on average production costs and investment expenditures made by producers in that area.

The FPC chose the Permian Basin, located in portions of Texas and New Mexico, for its first area-rate proceeding. Proceedings in the *Permian* case lasted five years, and the commission’s 1965 decision was not confirmed by the Supreme Court until 1968. Other area-rate proceedings took much longer. For example, the *Southern Louisiana* case began in 1961 and was not finally decided by the Supreme Court until 1974.

A distinguishing feature of the commission’s *Permian Basin* order was the use of “vintaging,” a two-tier pricing system for “old” and “new” gas. The commission believed that allowing higher incentive prices for new gas would encourage producers to engage in further exploration, while concurrently preventing windfall profits from the sale of old gas. While both ceiling prices were cost-based, “old” and “new” gas were priced substantially below the market value of the gas to the consumer, and market demand expanded rapidly. Interstate pipeline systems, aided by a guaranteed rate of return, were built and expanded to meet the demand, and consumption grew rapidly.

## Natural Gas Shortages

Under the effects of FPC regulation, it took just 20 years of low prices and rapid demand growth to transform natural gas from an almost valueless by-product to a scarce commodity. Because of the relatively low price of natural gas,

consumption grew almost fourfold between 1950 and 1970. But the same low prices failed to elicit sufficient exploration drilling, and the nation found itself moving quickly toward a shortage situation. During the 1960s, prices remained relatively flat, while the costs of new exploration and production rose. The watershed year was 1968—the first year when production exceeded reserve additions. Shortly thereafter, the warning signs began to emerge. A moratorium was placed on new gas hookups, and limited interruptions in service began to appear. In late 1973, domestic natural gas production began to decline. By 1974, service curtailments for industrial customers in interstate gas markets were widespread. Curtailment, measured in terms of contracted supply obligations that went unfulfilled, reached 16 percent nationally and was measurably higher in particular areas. By 1976, production had declined by 12 percent from its 1973 peak. Figure 29 compares natural gas production and reserve additions in the 1960–86 period.

At first, price differences between gas sold in the interstate and intrastate markets were minimal. Because the FPC would not allow more flexible contract terms, and because it insisted that wells once used to produce gas for interstate sale be perpetually dedicated to the interstate market, producers opted to sell new gas to the intrastate market. Once shortages began to occur, intrastate prices rose in an attempt to bring supply and demand back into balance. However, rigid, cost-based pricing by the FPC prevented this market mechanism from working in the interstate system, and shortages spread throughout most of the nation.

At the same time, environmental regulations and the relatively low price of gas stimulated increased demand for gas by residential and industrial customers in the interstate markets, further exacerbating the shortages.

## Gas Curtailments

In 1968, although the average price of natural gas sold in the intrastate market was below that of comparable gas sold in the interstate system, the prices for newly contracted intrastate gas were 18 percent higher than newly contracted interstate gas. This differential widened in the early 1970s and peaked in 1975 when the price of new contracts for unregulated intrastate gas was nearly two-and-one-half times the price of gas sold in the interstate market.<sup>13</sup>

<sup>11</sup>U.S. Congress, *Natural Gas Policy Act Amendments of 1983*. Senate Report 98-205 (98th Cong., 1st Sess.), July 29, 1983, p. 5.

<sup>12</sup>A partnership of Cities Service, Atlantic, Tidewater, and Continental.

<sup>13</sup>U.S. Congress, *Natural Gas Policy Act Amendments of 1983*. Senate Report 98-205 (98th Cong., 1st Sess.), July 29, 1983, p. 6.

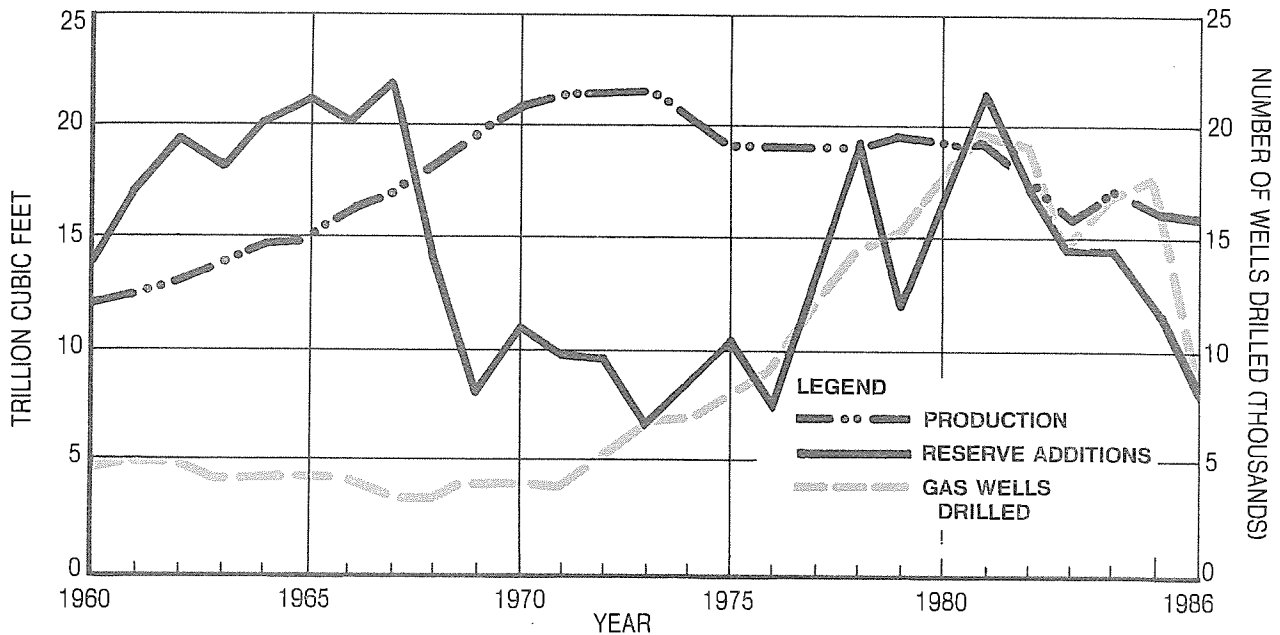


Figure 29. U.S. Natural Gas Production vs. Reserve Additions and Gas Wells Drilled (Lower 48 States).

When prices are not allowed to balance supply and demand, some other mechanism must be used to allocate the over-demanded commodity. With rigid FPC prices and limited supply, the pipelines began to curtail industrial customers in 1970. Although small at first, these curtailments grew rapidly, reaching 3.7 TCF by 1977. Curtailments meant higher fuel costs, plant closings, layoffs of workers, and eventual disruption of public services in the areas most affected. Sharp regional disparities developed as different pipeline systems had differing supply situations (such as access to offshore reserves, which were, by definition, dedicated to the interstate market).<sup>14</sup> During the unusually severe winter of 1976-77, interstate curtailments resulted in factory and school closings in several Midwestern, Northeastern, and Mid-Atlantic states.

The initial round of curtailments fell almost exclusively on "interruptible" customers, those industrial users whose contracts specified that their service could be temporarily interrupted during periods of peak demand. These customers were often electric utilities or large industrial users that maintained dual-fuel-burning capability in order to benefit from the "bargain rates" for interruptible service. This arrangement of interruptible service also benefited the pipeline companies by allowing them

flexibility in managing seasonal load variations. However, in the face of more gas shortages, where expansive curtailments were no longer either temporary or limited to interruptible customers, the FPC was forced to intervene to devise some criteria for rationing the available supplies.

After initially approaching the problem on a case-by-case basis, the FPC in 1973 issued Order 643, an eight-step curtailment plan that gave residential and small commercial customers the highest priority classifications for receiving uninterrupted supplies. The pipelines tried to blunt the impact of the FPC order on their large industrial customers by contending that the commission had no authority to regulate direct industrial sales, which were not "sales for resale," and, therefore, not under the NGA pricing regulation. The pipelines' position was upheld in circuit court. However, the case was reversed by the Supreme Court in *FPC vs. Louisiana Power & Light Company* (1974), when it ruled that the FPC's curtailment jurisdiction was based on the transportation, rather than the pricing, provisions of the NGA. Had the circuit court's decision not been overturned, the large industrial users would not have been subject to the curtailments that occurred.

Congressional response to the gas shortages in the interstate market led to the enactment in January 1977 of the Emergency Natural Gas Act and the subsequent enactment in November 1978 of the Natural Gas Policy Act.

<sup>14</sup>Vietor, R. H. K., *Energy Policy in America Since 1945*. Cambridge University Press, 1984, p. 275.

## Market and Outside Forces

The warning signs for the shortages became evident in 1968, when for the first time consumption in the interstate market exceeded new reserve additions and dedications. The oil embargo and subsequent OPEC price increase of 1973-74 increased the relative price differential between imported oil and natural gas. Demand for gas rapidly increased at the same time that easily producible and low cost domestic supplies were diminishing. In the absence of rapid price responses, the supply and demand of interstate natural gas was thrown completely out of balance. Because of cumbersome regulatory procedures, the FPC was unable to respond quickly enough to these changes. Moreover, the commission had to deal with vocal members of Congress who contended that the gas shortage was fictional rather than real, created artificially by producers to force the removal of price controls.

## GOVERNMENT RESPONSES TO THE NATURAL GAS SHORTAGES AND CURTAILMENTS OF THE 1970s

During the 1970s, the FPC tried several methods to increase the flow of gas in the interstate market. In response to industry cash flow concerns and their impact on exploration and production expenditures, in 1970 the commission issued Order 410, which enabled producers to receive advance payments from interstate pipeline systems for committing gas supplies. These cash advances were included in the pipeline's rate base. The FPC also attempted to exempt small producers from federal regulation, but this action was overturned by the Supreme Court in 1974.

In spite of the substantial regulatory lag in the area-rate cases, no serious supply problems occurred during the 1960s, basically for two reasons. First, adequate gas supply existed to meet still developing demand. Until 1968, annual reserve additions exceeded production, and although the finding rate and reserve-to-production ratio were declining, interstate proved reserves and deliverability were still high because of the net additions to reserves made over the previous 20 to 30 years. Second, producer revenues, though declining, were still sufficient to finance continued exploration and production activity, but the activity was declining.

In 1974, the FPC altered its rate setting methodology by employing a single national ceiling price for the first time. This change was

undertaken by the commission in explicit recognition of the fact that the wellhead price regulations were holding the price of interstate gas artificially low, thereby adversely affecting supply and creating availability problems in the interstate market.

In June 1974, the FPC issued Opinion 699, establishing a uniform price of 42 cents per thousand cubic feet (MCF) for new natural gas. This price applied to all gas in the lower 48 states, both onshore and offshore, from wells newly begun or reserves newly committed to the interstate market after December 31, 1972. Upon rehearing, almost two years later, the commission revised the price to 53 cents and extended its application to flowing gas upon expiration of existing contracts. The commission found perpetual vintage pricing an "anachronism" and decided to abolish it on a gradual basis as contracts expired. Opinion 699 also provided for biennial review to "determine if the rate was sufficient to bring forth the supply of gas." New gas would henceforth be priced at the new rates established by each review, so as not to create multiple vintages. Gas from wells drilled prior to 1973 continued to be regulated based on the historical cost of service.

On July 27, 1976, the FPC further addressed national rates in the first "biennial review," by issuing Opinion 770. In deriving the rates under Opinion 770, the FPC: (1) modified the cost-based rate method to include a component for federal income taxes (previously employed methodologies assumed that producers incurred no tax liability); (2) established a three-tier price system with the highest rate at \$1.42 per MCF, escalating at 4 cents per year, for gas produced from wells commenced on or after January 1, 1975; (3) vintaged the gas from wells dedicated to interstate commerce during the 1973-74 biennium (reversing the position previously put forward some two years earlier in Opinion 699); and (4) relied on non-cost criteria to determine whether market factors (intrastate rates, alternative fuels, inflation, etc.) supported the cost-based rates.

While the new gas price in Opinion 770 was substantially above the previous rates set by the commission, the commission's reaction appeared to be too little too late. By early 1977, the newly elected administration became openly critical of the prevailing regulatory system. The Carter administration's proposed National Energy Plan stated that "producer claims that historic cost-based regulation is no longer appropriate for a premium fuel in short supply are fundamentally correct."

## Supplemental Sources

When demand for new gas began to outpace additions to domestic reserves, pipelines and suppliers looked to supplemental sources of gas to fill the demand gap. These included foreign sources, such as gas from Canada and Mexico, as well as liquefied natural gas (LNG) from North Africa, Indonesia, South America, Russia, Australia, Trinidad, and the Persian Gulf; and longer-term synthetic gas and coal gasification efforts.

Pipelines were able to absorb the high cost of supplemental sources by "rolling in" those costs with less expensive domestic gas. In general, LNG projects did not meet with much success because of both price and supply reliability problems. The original Border Gas Project from Mexico was scuttled because the price was too high relative to Canadian gas and other fuel costs, and the Alaskan Natural Gas Transportation System has not been built due to its huge capital requirement. Canadian gas remained a significant contributor, but the frequent export price adjustments caused serious consumer and policy concerns.

Of the synthetic gas projects, only the federally supported Great Plains Gasification Plant was constructed and commenced operation. When projected gas price increases envisioned at the time construction was initiated failed to materialize and the requested price guarantees and debt restructuring were denied, the operators terminated their participation in the project. The plant is currently owned and operated by the government.

### **The Political Debate— Competing Interests and Requisite Compromise**

The political debate over the degree and form of federal intervention in natural gas markets evolved in three stages. From 1969 to 1973, Congress considered partial deregulation and structural reform of FPC procedures. From 1974 to 1977, momentum developed toward complete deregulation, but never fully took hold. Proposals were made for full deregulation as early as 1949; a deregulation bill passed Congress in 1956, but was vetoed by President Eisenhower. Finally, as part of the Carter energy plan, a compromise program emerged for commodity price regulation accompanied by gradual decontrol of new gas. Throughout the debate, the same issues predominated: distributive equity between producers and consumers, economic regionalism, the competitive versus monopolistic nature of energy markets,

and the tensions between cost-based and commodity-based rate regulation.

Beginning in 1973, the energy crisis seemed to polarize the gas question between two fundamental alternatives: Congress could either deregulate the wellhead price of gas (or at least new gas) in the interstate market or else extend regulation to the intrastate markets, where market-based (commodity) pricing already prevailed. The growing gas demand and resulting depletion of interstate reserves militated for one or the other. The gas question also involved a basic disagreement between those who supported market-based prices, and those who contended that alleged monopolistic conditions required prices to be controlled by the government. Proponents of expanded regulations alleged that producers were "withholding" gas from the market to force removal of price controls. Investigations by the FPC, the Federal Trade Commission, and the Congress proved this theory to be factually unsupported, but it continued to be put forward by advocates of price controls. As a result, most bills introduced between 1974 and 1977 were either deregulation measures or counter-proposals for expanding the FPC's jurisdiction.

Throughout the area- and national-rate proceedings in the 1960s and 1970s, the commission relied on estimates of historical average costs, on either an historical (for "old" gas) or "current" basis (for "new" gas) to determine ceiling prices. The use of historical average cost estimates necessarily put the ceiling prices out of synch with actual costs. Because of the length of time required to develop a record, first through the hearing process and later through rulemaking procedures, the cost data were often out of date before the ceiling prices were ever decided upon. The averages were further distorted by the failure to include small producer data because of the administrative burden involved in collecting such data. The result of this approach was to render uneconomic the exploration and development of new gas supplies that cost more than the calculated "average." In addition, contracts with prices that were below the ceiling were enforced, while contracts with prices that were above the ceiling were reduced to the ceiling price level. Thus, while interstate ceiling prices increased substantially in the 1970s from the levels of the 1960s, they remained considerably below prices in the intrastate system, which were established and continually adjusted by market forces.

### **The Natural Gas Policy Act**

After 18 months of deliberation and a contentious conference, Congress passed the



Natural Gas Policy Act in 1978 as part of the National Energy Plan. Under the Act, wellhead prices for certain categories of gas were to be decontrolled permanently in 1985 and in 1987, but other categories were to remain price controlled in perpetuity until produced and depleted. As a result, 40 to 50 percent of domestic gas remained under controls beyond the January 1, 1985, date and approximately 15 to 30 percent, absent further deregulation, will still remain under controls in 1990. In addition, in an attempt to resolve the disparity between the interstate and intrastate markets, the NGPA brought intrastate gas under federal regulation for the first time. The legislation also limited the FERC's authority to determine ceiling prices, except for certain powers to increase, but not decrease, the ceiling prices on pre-NGPA gas.

The NGPA's partial decontrol, phased over time, reflects judgments made in 1978 about U.S. energy, macroeconomic, and social policy. The Act was based on the premise that a soundly crafted price structure would concurrently stimulate domestic gas production and yet avoid unwanted consumer and macroeconomic impacts associated with generally higher prices.<sup>15</sup> However, the projected price structure chosen was based on then-current forecasts through 1985, which proved to be inaccurate. The NGPA did not provide a mechanism to permit the FERC to modify the ceiling prices when actual oil prices did not match the forecasted level.

The NGPA provided for:

- *Price Ceilings.* The NGPA set a series of maximum lawful prices for various categories of natural gas, including gas sold in both the interstate and intrastate markets. This eliminated the regulatory distinction that had previously existed between the two markets, with interstate rates set on the federal level and intrastate rates largely unregulated.
- *Deregulation of New Gas.* Price controls on new gas and certain intrastate gas were lifted as of January 1, 1985. Certain high cost gas was deregulated approximately one year after the NGPA's enactment. Gas from certain new onshore wells will be deregulated in July 1987. Old gas and some new gas from old leases will remain under price controls indefinitely.
- *Incremental Pricing.* The purpose of this provision was to protect residential con-

sumers by first passing through some portion of increased gas prices to industrial users. It also was intended to discipline pipelines bidding for new gas. The concept never worked as planned and instead resulted in tying certain industrial gas prices to oil prices.

Despite unsuccessful attempts in Congress to modify the NGPA deregulation schedule, partial decontrol of natural gas was in fact accomplished on January 1, 1985, as scheduled. As a result, approximately half of the nation's gas supplies are free of controls today.

## The Fuel Use Act

The Powerplant and Industrial Fuel Use Act was also enacted in 1978 as part of the National Energy Plan. It is important to remember that the Act was devised in reaction to the shortages and curtailments of the mid-1970s and predicated on the belief that the United States was running out of gas.

The Powerplant and Industrial Fuel Use Act prohibits the use of oil and gas as a primary fuel in any newly constructed utility power generation facility or in new industrial boilers with a fuel heat input rate of over 100 million British thermal units (BTU) per hour (unless exemptions are granted by the Department of Energy). The Act also limits the use of natural gas in existing powerplants to the proportion of total fuel used during 1974-76, and prohibits fuel switching from oil to gas.

## The Post-NGPA Environment and Formation of the Gas Bubble

In reaction to higher oil prices and in anticipation of the removal of price controls, domestic oil and gas producers responded with record drilling in 1980 and 1981. For the first time in over a decade, reserve additions in 1981 exceeded annual consumption. Management of curtailments gave way to management of a surplus of deliverability. Market demand for natural gas fell as higher priced new gas supplies found their way into pipelines, and as fuel efficiency and conservation took hold on a national basis in reaction to the price increases arising from Opinion 770 and the NGPA. After 1981, this excess supply was compounded by decreases in the price of oil. As a consequence, reserve additions again began to fall as the "incentive" prices authorized by the NGPA became uncollectible in the marketplace, and revenues realized by producers declined.

It is interesting to note that in terms of its impact on increasing domestic supplies of

<sup>15</sup>U.S. Congress, *Natural Gas Policy Act Amendments of 1983*. Senate Report 98-205 (98th Cong., 1st Sess.), July 29, 1983, p. 10.

natural gas, the NGPA—like Opinions 770 and 770A—had precisely the desired effect. Through the use of incentive and market pricing and accompanied by rising oil prices, it stimulated new drilling activity and resulted in new gas production, which was previously thought to be limited. Two principal shortcomings were its lack of foresight with respect to demand elasticities for oil and gas and the pegging of gas prices to a fixed projection of rising oil prices.

### **Special Marketing Programs**

In an attempt to address the problems associated with the gas bubble and maintain existing sales, the FERC authorized the use of special marketing programs (SMPs) in 1983. They were the first of a series of gas transportation programs that allowed lower priced spot market gas to be sold directly to distributors and industrial end-users rather than the traditional scheme in which the pipelines first bought and then resold the gas. SMPs were designed to regain lost direct and indirect customers of pipelines that were threatening to switch to an alternative fuel. Since most of the customers who can switch fuels are industrial users, SMPs were aimed primarily at them. On May 10, 1985, the District of Columbia court of appeals decided *Maryland People's Counsel vs. FERC* and found SMPs and certain other transportation programs flawed because they discriminated against local distribution companies and captive customers.

### **FERC Order 380**

As a means of giving interstate pipeline customers greater flexibility in choosing between competing suppliers, the FERC implemented Order 380 in August 1984. The order removed gas costs from pipeline minimum bills. The effect was to greatly reduce the minimum costs of not purchasing gas from a pipeline supplier. For example, in 1984 this amounted to relieving customers of \$2.75 per MCF of their \$3 per MCF purchase obligation, leaving just a 25¢ per MCF obligation. No concomitant relief was given to pipelines on their contractual take-or-pay obligations to producers. The FERC argued lack of jurisdiction to modify gas purchase contracts, as contrasted to pipeline sales contracts.

### **FERC Order 436**

In October 1985, the FERC issued Order 436 in an attempt to revamp the regulation of gas pipeline operations. The transportation program outlined in the order requires nondiscriminatory access to a pipeline's carriage service, and volumetric, downwardly flexible cost-of-service rates for firm-service and interruptible-service transportation.

Although the FERC had previously adopted programs aimed at allowing pipelines to transport gas for others (so-called "contract carriage") under certain circumstances, Order 436 was designed to allow broad, simplified, self-implementation of such programs. The FERC action followed inconclusive congressional consideration of mandatory contract carriage legislation. It also resulted from a belief by the commission that, in times of surplus, end-users and local distributors should be able to receive the benefits of low cost supplies. The commission also believed that, in the interest of competition, producers similarly should be able to sell surplus low cost gas supplies to customers other than their traditional pipeline purchasers.

### **FERC Order 451**

Shortly after issuing Order 436, the FERC began consideration of a rule proposed by DOE to fundamentally restructure the "old" gas pricing system. The DOE proposal would have eliminated vintage pricing and replaced the various ceiling prices with a single ceiling price—the ceiling price for old gas brought into production after 1974.

In May 1986, the FERC issued Order 451, modifying the DOE proposal. This rulemaking would eliminate the large number of vintages of old gas by establishing a single ceiling price for gas dedicated to interstate commerce prior to enactment of the NGPA and still-regulated categories of gas sold under rollover contracts. The rule also establishes procedures for renegotiations of contracts and allows pipelines with multi-vintage contracts to nominate high cost gas for renegotiation when a producer nominates lower cost old gas under the same or other existing supply contracts between the parties.

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## CHAPTER THREE

### IMPACT OF HISTORICAL PRICE SHOCKS

#### INTRODUCTION

The year 1973 was a major watershed for the U.S. economy, dividing the high growth period of the 1960s from the stagflation of the 1970s and early 1980s. Table 8 provides a few

highlights. For example, more than twice as many people were out of work, on average, after 1973 as before. The sharp drop in real GNP growth per employee highlights the sharp productivity decline after 1973. Without the sharp rise in female labor force participation in the 1970s and the entry of baby boomers into the labor force, the decline in real GNP growth would have been even more severe than it was. Moreover, the fact that real consumption growth was one-third lower after 1973 than before takes on much greater significance considering that the post-war baby boomers were coming of age in the 1970s. Consumption growth should have increased, not decreased. Similarly, despite the demographics, car sales and housing starts did not grow sharply between the two periods.

The year 1973 represented the same watershed for the rest of the industrialized world as well. Real GNP growth in the countries of the Organization for Economic Cooperation and Development (OECD), excluding the United States, averaged 5.6 percent per year from 1960 to 1973. From 1973 to 1985, the average was only 2.4 percent per year. Data for selected major industrial countries are shown in Table 9.

The slowdown in real GNP or GDP (gross domestic product) growth after 1973 was less pronounced in the United States than in other major industrial countries. However, as noted above, the slowing of growth in the United States was limited by the great expansion of the labor force.

What happened in 1973? Many things happened: Vietnam war spending was winding down; wage and price controls had been in effect since mid-1971; capacity was being strained in

**TABLE 8**  
**U.S. ECONOMY**  
**BEFORE AND AFTER 1973**

Indicator	Average Annual Growth Rates (%)	
	1960-1973	1973-1985
Real GNP	3.9	2.3
Real Consumption	4.1	2.7
Real Investment	5.5	1.8
Industrial Production	5.2	2.3
Consumer Price Index	2.3	7.6
Employment	2.0	1.9
GNP per Employee	1.9	0.3

Indicator	Annual Averages	
	1960-1973	1974-1985
Treasury Bill Rate (%)	4.4	8.6
AAA Corporate Rate (%)	5.8	10.7
Unemployment Rate (%)	4.9	7.5
Unemployed Workers (millions)	3.8	7.8
Trade Balance (billion dollars)	3.3	-39.4
Federal Deficit (billion dollars)	5.5	86.8

**TABLE 9**  
**WORLD ECONOMY**  
**BEFORE AND AFTER 1973**

Country and Indicator	Average Annual Growth Rates (%)	
	1960-1973	1973-1985
Canada		
Real GNP	5.6	2.6
Real GNP per Capita	3.9	1.4
France		
Real GDP	5.6	2.1
Real GDP per Capita	4.9	1.2
Germany		
Real GNP	4.4	1.9
Real GNP per Capita	3.5	2.0
Italy		
Real GDP	4.7	2.8
Real GDP per Capita	4.0	2.4
Japan		
Real GNP	10.4	4.0
Real GNP per Capita	9.7	3.1
United Kingdom		
Real GDP	3.2	1.3
Real GDP per Capita	2.7	1.2
United States		
Real GNP	3.9	2.3
GNP per Capita	2.7	1.2

many industries; monetary policy turned to fighting inflation; and the Nixon administration was preoccupied with Watergate.

The most important event, however, was the Arab oil embargo announced in October 1973. This event was both dramatic and unprecedented. The newspapers of the day expressed early incredulity, which rapidly turned to great uncertainty as to the implications for the U.S. economy. The effect of the embargo and accompanying production cutbacks on oil prices was dramatic. From the third quarter of 1973 to the third quarter of 1975, average OPEC oil prices rose by over 300 percent, from about \$2.60 per barrel to about \$10.50 per barrel.

Before the impacts of the Arab oil embargo and the associated oil price shock were fully understood or even fully felt, world oil markets were subjected to a second major shock, again the result of political developments in the Middle East. Work stoppages in the oil fields of Iran, part of the revolution that ultimately drove the

Shah from Iran in January 1979, caused a cessation of oil exports from Iran in December 1978. The disruption of Iranian oil production and exports and the reaction in world oil markets triggered another sharp rise in oil prices.

From the first quarter of 1979 to the first quarter of 1980, average OPEC oil prices increased by 153 percent, from about \$14 per barrel to over \$35 per barrel. While the percentage change had been greater in the previous price shock, the absolute change was far greater during the 1979-80 period, both in current and constant (inflation-adjusted) dollars.

### **IMPACTS OF 1973 AND 1979 OIL SHOCKS**

The fourth quarter of 1973 and the first quarter of 1979 represented somewhat similar economic environments in the United States: business cycles were peaking in both cases; the economy was operating near full employment; inflation was accelerating; and interest rates were at high levels. In both periods, most economic forecasts for the next year projected a mild recession.

In neither case did these forecasts recognize political developments in the Middle East, the dramatic impact of these events on oil prices, or the serious implications for the U.S. economy. As it happened, the U.S. economy suffered its two worst post-war recessions following the oil price shocks.

Beyond these similarities, the oil price shocks of 1973 and 1979 affected the U.S. economy to different degrees and with substantially different timing. Without trying to assign quantitative economic impacts to the oil price shocks themselves, a chronology of economic events is as follows.

The fourth quarter of 1973 coincided with a business cycle peak. By the trough of the recession in the first quarter of 1975, real GNP had declined by 4.3 percent. The unemployment rate rose from 4.8 percent to 8.9 percent by the second quarter of 1975, representing 3.9 million additional persons out of work. Industrial production had fallen 13.4 percent by the second quarter of 1975.

In 1979, on the other hand, real GNP continued to grow—by 1.6 percent—in the year following the oil price shock. There was a brief recession during 1980, due to credit controls and monetary tightening, but the full-blown recession did not start until the third quarter of 1981. This recession, the worst since the Great Depression, was more directly attributable to

monetary policy than to the oil price shock. However, the tightening of monetary policy was in part a response to the inflationary impact of the price shock.

To suggest the magnitude of the impact on the U.S. economy of the oil shocks of the 1970s, it is useful to compare what actually occurred with typical forecasts made in late 1973 and early 1979. One major forecasting firm,<sup>1</sup> for example, expected real GNP to grow by 2.1 percent from the end of 1973 to the end of 1974 and by 15.3 percent through the end of 1976. The actual results were -2.4 percent and +3.4 percent, respectively. The level of consumer prices, at the same time, was expected to rise by 3.1 percent over the next year and by 12.0 percent over the next three years. The actual results were 12.1 percent and 29.3 percent, respectively.

Forecasts of a mild recession were common in early 1979. As of the first quarter of 1979, the same forecasting firm predicted that real GNP would grow by 0.4 percent over the next year and by 12.7 percent over three years. The actual results were 1.6 percent and -0.4 percent, respectively; the recession was delayed. The level of consumer prices was expected to rise by 6.8 percent over one year and by 19.5 percent over three years; the actual results were 14.3 percent and 36.8 percent, respectively. The point of these numbers is not to blame one particular firm for poor forecasting, but to show the macroeconomic consequences of the 1970s oil shocks.

## Modeling and Analytical Approaches

Contemporaneous analysis of the economic implications of the oil embargo of 1973 and subsequent quadrupling of imported oil prices left much to be desired. The severity of the impact was generally underestimated. By September 27, 1974, the date of President Ford's conference on inflation, it was increasingly apparent that the economy was in a recession, and that the peak of the business cycle had occurred in the fourth quarter of 1973.

To be fair, there was no comparable period in the previous two decades of U.S. economic history from which to infer the impacts of the embargo and subsequent price increase. Some analytical approaches that were used for these inferences are discussed in Appendix C.

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<sup>1</sup>The forecasts cited were from Chase Econometric Associates, Inc. However, the forecasts of the other major econometrics firms at that time—Data Resources, Inc., and Wharton Econometric Forecasting Associates, Inc.—were similar.

## Results of Econometric Studies of the 1970s

Many econometric studies have been made of the first (1973) oil shock;<sup>2</sup> fewer have been made of the second shock. These studies, however, were based in 1972 dollars rather than the current yardstick, 1982 dollars.<sup>3</sup> For this study, the current version of Wharton Econometric Forecasting Associates' Quarterly Model, which is based on 1982 dollars, was used to estimate the impact of both oil price shocks.<sup>4</sup> The results are summarized in Tables 10 and 11 and presented in more detail in Appendix C, Tables C-2 and C-3.

The results indicate that the cumulative real effects grow strongly for about two years and level out after about three years. While the impact on economic growth rates fades, the level of economic activity remains permanently below the level that would have occurred had there been no shock. Similarly, the impact on the inflation rate fades over time, while the increase in the price level is permanent.

In summary, the cost of the 1973 oil shock appears to have been about 2.7 percent of real GNP by 1976, 1.4 million jobs, and an increase in the inflation rate of about 3 percentage points for one year and an average of about 1 percentage point for two additional years.

The simulated impact of the 1979 oil price shock is substantially greater than the 1973 shock. The 3.6 percent reduction in real GNP attributable to the oil price shock (through the fourth quarter of 1981) compares with actual growth of 1.2 percent over the same period. In other words, robust growth of 4.8 percent could have been expected had there been no shock.

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<sup>2</sup>The results of one such study are presented in Appendix C, Table C-1.

<sup>3</sup>The National Income and Product Accounts are now reported in 1982 dollars instead of 1972 dollars. Because of the large growth of the oil industry between those dates, the domestic energy industries have a bigger weight in real GNP as currently reported than previously. Since the impact of higher oil prices in the 1970s was favorable to the domestic energy-producing industries, one would expect the effect of rebasing the National Income and Product Accounts to be to lower the real cost to the economy and (for similar weighting reasons) to raise the inflation impact. These expectations appear to be borne out in the Wharton simulations.

<sup>4</sup>The model was used to simulate the U.S. economy in the absence of the price shocks. Differences between the hypothetical no-shock case and what actually happened measure the impact of the price changes. The simulations were conducted without changing economic policies (except when endogenous to the model), exchange rates, or other exogenous variables. Holding economic policies constant is discussed in Appendix C.

**TABLE 10**  
**ECONOMIC IMPACT OF 1973 OIL PRICE SHOCK**  
**ACTUAL VERSUS HYPOTHETICAL NO-SHOCK CASE**  
**(Wharton Model Results)**

	<u>Third Quarter 1974</u>	<u>Third Quarter 1975</u>	<u>Third Quarter 1976</u>
Real GNP (Billion 1982 Dollars)	-11.1	-58.9	-79.7
Percentage Change	-0.4	-2.1	-2.7
Inflation* (Percentage Points)	2.6	0.8	0.8
Unemployment Rate (Percentage)	0.2	1.0	1.4
Nonresidential Fixed Investment (Billion 1982 Dollars)	0.6	-10.0	-19.4
Percentage Change	0.2	-3.4	-6.1
Industrial Production (Percentage Change)	0.4	-3.5	-3.3
Trade Balance (Billion Dollars)	-8.9	-7.8	-8.7

\*Percentage change in Consumer Price Index from one year earlier.

**TABLE 11**  
**ECONOMIC IMPACT OF 1979 OIL PRICE SHOCK**  
**ACTUAL VERSUS HYPOTHETICAL NO-SHOCK CASE**  
**(Wharton Model Results)**

	<u>Fourth Quarter 1979</u>	<u>Fourth Quarter 1980</u>	<u>Fourth Quarter 1981</u>
Real GNP (Billion 1982 Dollars)	-27.4	-93.3	118.2
Percentage Change	-0.9	-2.8	-3.6
Inflation* (Percentage Points)	2.5	2.6	1.8
Unemployment Rate (Percentage)	0.3	1.3	1.9
Nonresidential Fixed Investment (Billion 1982 Dollars)	-2.9	-16.7	-27.7
Percentage Change	-0.7	-4.3	-6.6
Industrial Production (Percentage Change)	0.9	-3.8	-5.3
Trade Balance (Billion Dollars)	-10.6	-6.5	-1.3

\*Percentage change in Consumer Price Index from one year earlier.

About 2 million jobs were lost, and the inflation rate was increased by nearly 3 percent for two years.

At least two factors contributed to greater severity of the 1979 shock compared with 1973: the relative sizes of the price increase and the share of energy imports in GNP. As noted above, the post-1979 price increases were greater in absolute magnitude than the post-1973 price increases, albeit lower in percentage terms. In 1973, before the Arab oil embargo, imports of petroleum and products amounted to roughly one-half of one percent of nominal GNP; by the time of the Iranian revolution, this ratio had quadrupled. Thus, one might have expected the 1979 event to have mattered more than the earlier one.

Moreover, domestic oil was subject to strict price controls throughout the first shock, lowering the average impact on individual and industrial users, while price controls were lifted completely during the first quarter of 1981. Thus, not only was the ratio of energy imports to GNP higher in 1979 than in 1973, but the effective price increase was much greater as well.

The relative impacts of the two price shocks of the 1970s are reflected in the shares of consumer budgets (disposable income) spent on motor fuels, home heat, electricity, and natural gas. The share rose from under 6 percent prior to the Arab oil embargo to nearly 7 percent later in the 1970s and nearly 8.5 percent after the second price shock. Recent declines in energy prices have lowered the share to the 6 to 7 percent range.

## **Sectoral and Regional Impacts**

Some academic work has been done on the sectoral impacts of oil price shocks. The effect on energy-intensive industries is obviously adverse. However, the effect on virtually all sectors of manufacturing is unfavorable to some extent.

Most studies do not provide detailed impact estimates by industry. It is often difficult to separate oil price impacts from underlying long-term trends. Nonetheless, comparing what happened in different industries after the oil price shocks is informative. Not only are the results not necessarily what might have been expected, but they differ between the post-1973 and post-1979 periods. Tables 12 and 13 illustrate these points.

First, the downturn in industrial production appears to have been much faster and more severe after the 1973 price shock than after the 1979 shock. This result is partly due to the fact

that November 1973 represented a business cycle peak, while the major downturn after the second shock did not start until July 1981. In any event, the peak-to-trough decline in the industrial production index was 14.8 percent in the 1973-75 recession and 11.4 percent in the 1981-82 case.

Second, overall domestic oil and gas exploration and production activity did not respond quickly to the rapid rise in world oil prices after the 1973 OPEC embargo. After 1979, on the other hand, domestic exploration and production grew sharply, notwithstanding the recession. More detailed industrial production indexes for the oil and gas extraction industries are in Appendix C, Table C-4. Part of the lack of rapid response in the earlier period was, no doubt, due to the long-term real price decline that had pervaded the petroleum industry in the 1950s and 1960s. This long-term decline contributed to expectations that the price increase was only temporary, and to a lack of capability by the oil industry to respond quickly. Part of the delayed response after 1973 was also due to price controls, which kept the price of most domestically produced oil and gas below world-market levels and thereby muted price signals to producers.

Third, the industries with the greatest output declines after the oil price increases were not the chemical and petroleum refining industries, which are directly downstream from petroleum production. Rather, production of transportation equipment, especially automobiles, declined sharply following both price shocks, as did construction-related activity. The declines in transportation equipment production reflected the increased cost of driving, the unavailability of fuel-efficient domestic cars, and the existence of temporary petroleum product shortages, as well as the effects of two recessions. Increasing competition from imported cars, particularly for small, fuel-efficient vehicles, was also an important part of the explanation.

The decline in construction-related activity (nonmetallic mineral mining; stone, clay, and glass; lumber and wood products) may be a result of the oil price jumps on inflation and, thus, on interest rates. High interest rates tend to reduce the demand for housing and nonresidential structures.

The last point is consistent with the behavior of the fabricated metals industry, which was adversely impacted by the oil price shocks of the 1970s. Many of the items produced by this industry are investment goods, and investment in general is hurt by rising



TABLE 12

**POST-1973 INDUSTRIAL PRODUCTION INDEXES, SELECTED INDUSTRIES**  
(Percentage Changes from November 1973)

<u>Industry</u>	<u>After One Year</u>	<u>After Two Years</u>	<u>After Three Years</u>
All Industries	-5.5	-8.8	-0.8
Crude Oil and Natural Gas Extraction	-2.8	-4.5	-4.4
Nonmetallic Minerals Mining	-5.5	-13.1	-5.5
Textiles	-19.2	0.2	-7.7
Lumber and Wood Products	-21.2	-10.7	0.0
Paper	-9.4	-7.8	-4.2
Chemicals	-1.3	-3.2	6.5
Petroleum Refining	-3.1	-4.9	4.5
Stone, Clay, and Glass	-6.8	-11.3	-0.9
Primary Metals	-9.7	-25.4	-19.7
Fabricated Metal Products	-6.9	-16.3	-5.6
Transportation Equipment	-11.0	-14.4	-5.9

TABLE 13

**POST-1979 INDUSTRIAL PRODUCTION INDEXES, SELECTED INDUSTRIES**  
(Percentage Changes from February 1979)

<u>Industry</u>	<u>After One Year</u>	<u>After Two Years</u>	<u>After Three Years</u>
All Industries	0.5	0.3	-3.5
Crude Oil and Natural Gas Extraction	7.2	10.1	16.1
Nonmetallic Minerals Mining	0.9	9.5	-4.8
Textiles	5.9	-0.2	-9.6
Lumber and Wood Products	-1.5	-7.1	-21.6
Paper	3.5	4.7	3.6
Chemicals	-1.3	1.3	-5.2
Petroleum Refining	0.9	-7.9	-19.7
Stone, Clay, and Glass	-0.5	-7.5	-15.5
Primary Metals	-9.5	-9.7	-31.5
Fabricated Metal Products	-3.8	-9.0	-16.2
Transportation Equipment	-8.7	-15.7	-23.8

interest rates. Also, machine tools—an important item in automobile manufacturing—are produced by this industry. The sharp declines in primary metals production are also related to these factors.

Cities such as Houston, Tulsa, and Denver grew rapidly with the growth of the oil industry, presumably at the expense of the rest of the country. Among the losing regions, the hardest hit were New England and the Middle Atlantic states. These areas have relatively cold climates and rely heavily on oil heat, which in 1980 was much more expensive than natural gas. In decreasing order of impact, other losing regions included western New York and the upper Midwest, with severe winters and heavy reliance on natural gas; Florida and nearby areas, with high electricity prices and usage; the lower Midwest, with its milder climate but heavy reliance on natural gas; and the upper Northwest, with its mild climate and cheap electricity.<sup>5</sup> One study, however, found that most economic activities were not sensitive on a regional basis to changing energy prices.<sup>6</sup>

The extent of differential regional responses to the oil price shocks can be seen in terms of the behavior of payroll employment in the United States—in the leading oil and gas importing states and in the leading oil and gas exporting states. As shown in Table 14, the latter states have performed better than the former since 1960, and the relative performance improved after 1973. Note that Alaska and California are shown separately as special cases: Alaska as a recent major oil producing state and California as both a major producing and importing state.

### Macroeconomic Impact of Government Policy Responses

Few understood the macroeconomic consequences of the first oil shock. The Federal Reserve Board tightened monetary policy sharply in the spring and summer of 1974, which contributed to the timing and perhaps the severity of the 1973–75 recession.

<sup>5</sup>See Proctor, Mary, "The Impact of Regional Political Issues on Energy Price Increases." In Landsberg, H. H., ed., *High Energy Costs: Assessing the Burden*. Washington, DC: Resources for the Future, 1982, p. 332.

<sup>6</sup>Miernyk, William, "The Differential Effects of Rising Energy Prices on Regional Income and Employment." In Landsberg, H. H., ed., *High Energy Costs: Assessing the Burden*. Washington, DC: Resources for the Future, 1982.

The contemporary policy dilemma was well summarized by a quotation from the December 12, 1973, *Wall Street Journal*:

Policymakers are puzzled because the Arab oil boycott threatens to produce an entirely new kind of business slump. "We've never had a shortage-induced recession before," says a White House official. "How do you handle it? If you just pump money into the economy, all you do is push up prices, because the goods aren't out there to buy. It's a dilemma we really haven't thought through."

In 1979, monetary policy was more accommodative, thereby delaying the recession. The degree of accommodation in 1979 may well have been greater than intended. There were credit controls in early 1980 that contributed to the brief recession of that year, but the Federal Reserve Board did not pursue a period of sustained tight monetary policy until late 1980. The sharp tightening of monetary policy, a response to the double-digit inflation caused by the oil shock and previous excessive monetary growth, triggered the worst U.S. recession of the post-war era.

TABLE 14  
REGIONAL NONFARM PAYROLL EMPLOYMENT

	Percentage Growth in Nonfarm Payroll Employment	
	1960-1973	1973-1984
<b>Oil and Gas Importers</b>		
New York	15.4	6.0
Illinois	26.4	3.7
Pennsylvania	21.3	3.1
Ohio	30.7	3.3
Florida	110.4	51.5
New Jersey	36.8	21.0
Average	29.3	11.2
<b>Oil and Gas Exporters</b>		
Texas	75.5	55.4
Louisiana	50.2	35.8
Oklahoma	47.6	39.1
Kansas	36.3	25.8
New Mexico	46.4	45.4
Wyoming	30.7	57.7
Average	60.5	46.9
Alaska	96.5	102.7
California	55.7	38.5
United States	41.7	23.0

## IMPACT OF RECENT PRICE DECLINES

### Symmetry of Response

It is tempting to argue that, however costly the jumps in oil prices were in the 1970s, an equal benefit will occur in the 1980s from the collapse of oil prices. Econometric model simulations implicitly assume (and show) such symmetry.

"Symmetry" in this sense implies an equal and opposite reaction to oil price changes of equal and opposite magnitude. In historical context, moreover, symmetry has to do with reversibility: if the oil price shocks of the 1970s knocked the U.S. economy off a high growth path, can the reversal of the price shocks in the mid-1980s restore that higher path?

It seems more reasonable, however, to argue against full symmetry and to treat the model results as suggesting upper bounds for favorable impacts. Certainly some factors such as investments in energy conservation (e.g., additional home insulation, more efficient automobiles and gas furnaces, and fuller industrial use of waste materials for process heat) are largely irreversible. Other factors, such as perceptions of energy cheapness versus scarcity, may eventually be reversed, but the adjustment lags may be longer now than during the 1970s.

The principal argument for asymmetry in response to changing oil prices is that adjustment to changing economic conditions is never costless. Regardless of whether prices jump or collapse, time and effort are needed to recognize and adapt to the changing environment. Thus, even if the response of a frictionless economy were symmetric with respect to oil price changes, the existence of adjustment costs represents an effective lowering of output in both responses.

One source of irreversibility has to do with capital obsolescence. Plant and equipment that became uneconomic to operate following the two oil price shocks of the 1970s are not, in general, available for reuse in a world of lower oil prices. However, further new equipment spending for energy conservation (e.g., advanced jet aircraft) is being deferred.

The petroleum sector is far larger now than it was during the oil shocks of the 1970s. If one views the overall impact of oil price changes as being composed of "winning" and "losing" sectors, the "winners" were relatively small in the 1970s but the "losers" are more important in the 1980s. Thus, the growth of the petroleum

sector, itself a result of the price shocks of the 1970s, creates an asymmetry in response.

A similar point concerns the growth of the service sector relative to manufacturing. Since services are typically less energy-intensive than manufacturing, the energy-to-GNP ratio has fallen.

The debt situation, domestic as well as international, is another source of asymmetry. High and rising oil prices do not lead to default on loans made for petroleum development; lower prices do, as has been seen in the southwestern United States.

The great international lending boom of the late 1970s and early 1980s was financed by the recycling of OPEC receipts. Countries such as Brazil absorbed large quantities of these funds, in particular to meet their high and rising bills for imported oil. The financial community was thus able to accommodate the vast inflow of deposits. What would happen in the event of equally massive withdrawals of OPEC funds? These financial asymmetries have become widely apparent in the wake of the general commodity price collapse of the early 1980s.

Another source of asymmetry has to do with consumer behavior. In 1973, and again in 1979, there were physical shortages of gasoline in certain key markets, as well as sharp price increases. There is no symmetry to the fear of continued shortage in a world of declining oil prices and ample fuel supplies. One might expect, then, that consumers would have cut back more sharply on purchases of cars (in particular) in the 1970s, for fear of not being able to drive, than they would increase such purchases in the 1980s.

Policy actions create additional asymmetries. Motor fuel taxes were not cut in the 1970s to compensate buyers for higher material prices. However, many states, and the federal government, have raised these taxes since 1982. Thus, consumers do not see symmetry in relationship between crude oil prices and retail product prices. Quantitative energy policies work in a somewhat similar way: the existence of Corporate Average Fuel Economy (CAFE) standards for automobile fuel efficiency means that, even if lower oil prices were to induce consumers to buy "gas guzzlers," the production of such cars would be severely limited.

A final source of asymmetry concerns the timing of responses. In the 1970s, consumption and investment spending were cut relatively quickly, while the increase in petroleum industry activity took more time to accomplish, particularly following 1973. Since the beginning of 1986, exploration and production investment

has been cut more sharply than consumer spending has been increased. In essence, the downside effects of oil price changes are felt first regardless of whether prices rise or fall, while the upside effects are delayed.

An implication of the above points is that economic adjustment reflects both long- and short-term factors. Short-term factors are nearly all costly, while the longer-term ones are mixed. Thus, one might expect to see short-term negative impacts from oil price declines with more positive later results.

## Macroeconomic Impacts

In general, a decline in oil prices directly benefits consumers and energy-intensive industries. By paying less for energy, real disposable income increases, with positive resultant effects on other broad-based macroeconomic variables, particularly consumption. As shown in Table 15, growth in personal consumption expenditures has accelerated significantly since the decline in oil prices.

	Fourth Quarter 1984	Fourth Quarter 1985	Fourth Quarter 1986
Personal Consumption Expenditures	2,271.7	2,351.7	2,450.4
Durable Goods	326.8	347.0	381.3
Nondurable Goods	830.5	847.2	876.2
Services	1,114.4	1,157.5	1,187.6

Lower oil prices also reduce the oil import bill, improving the current account balance, reducing the transfer of wealth from the United States to oil exporting countries, and leaving more income to be spent on goods and services other than oil. The U.S. net oil import bill fell from \$45 billion in 1985 to about \$34 billion in 1986, despite a large increase in oil import volumes. If oil import volumes had remained constant, the oil import bill would have fallen to about \$22 billion.

The economic benefits from lower oil prices take time to permeate the economy. Such benefits are initially overshadowed by the deep decline in the energy sector. While a rapid fall in oil prices has an immediate impact on the income of energy-producing, energy-service, and energy-related financial sectors, the positive effects of lower energy prices are more diffuse and slower to impact overall economic activity.

As discussed in the previous section, such positive economic effects are generally the reverse of those precipitated by the oil price shocks in the 1970s. However, the benefits are neither proportional nor symmetric to the earlier detriments—due to evolving political and structural changes in the economy.

Both the magnitude and the duration of the positive economic effects are dependent on the shape of the downward-price trajectory. It is uncertain whether oil prices will remain highly volatile, fluctuate within a narrow range, or remain relatively constant. The lower the oil price and the longer the duration of a low price, the greater the presumed macroeconomic benefits. Of course, fear of a rapid return to higher prices might limit these benefits. Consumers and producers of goods and services are not likely to change spending habits or make substantial investments if the price collapse is perceived to be short-lived. Eventually, however, a sustained period of lower oil prices can be expected to result in an increase in the overall level of economic activity.

## Regional and Sectoral Effects

Lower oil prices have immediate negative regional and sectoral impacts. The depressive impact of the price collapse appears to have rapidly permeated oil-dependent regions and oil-related businesses. With the major oil producing states of Texas, Louisiana, Alaska, and Oklahoma accounting for roughly 10 percent of U.S. employment and retail sales, the deep and rapid oil industry decline significantly diminishes the positive macroeconomic benefits.

- Total investment in nonresidential structures (oil wells are treated as structures in the National Income and Product Accounts) fell at a 30 percent annual rate during the second quarter of 1986.
- Employment in the petroleum and petroleum-service sector has declined. These employment cuts create unemployment in area retail, wholesale, and other services dependent upon consumer spending.

- Reduced state and local revenues in oil-producing regions are leading to state and local government spending cuts and employee layoffs.
- Exports of oil industry equipment have fallen off, negatively impacting a portion of the U.S. trade balance.
- Regional financial institutions with large petroleum-investment portfolios and those with substantial exposure to oil-exporting-country loans are putting liquidity pressure on the U.S. financial system.

Several energy-related industries have directly benefited by the oil price collapse. Petrochemical producers, refineries, and metals, paper, transportation, and other petroleum-using industries are experiencing significantly lower factor costs.

- Higher profits are the immediate (if not long-term) result of lower raw material and lower "heating" costs. Initial gains in profitability have been secured as petroleum-related input costs have fallen faster than product prices.
- If expectations of lower energy prices are longer-term, many of these industries are likely to expand or to delay plant closings.
- New capital investment would likely (1) enhance the competitiveness of these industries, (2) increase industry productivity, and (3) raise their energy consumption.
- State and local governments in oil consuming regions will benefit from increased tax revenues as well as reduced spending for transfer payments.

The initial impact on the total U.S. economy has balanced out as shown in the selected data on industrial impacts that are presented in Table 16.

### **Selected Studies of Impact of Lower Prices**

Most studies of the macroeconomic impact of lower oil prices are based on simulations of existing econometric models. These models were estimated with data from a decade of rising oil prices, hence the simulations represent nonhistorical experience. In general, the model results are symmetric with the price increase results, although, for reasons discussed earlier, symmetry is not likely to occur in the real world.

A Stanford Energy Modeling Forum study (EMF7) looked at the impact of a 20 percent

decrease in oil prices on the U.S. economy from 1982 levels.<sup>7</sup> Fourteen models were simulated, and the results were surprisingly similar across models. Virtually all adjustment occurred within two years, with the economy basically resuming its prior growth trends thereafter.

Real GNP, in the median case, was 1.2 percent higher in the second year, abating to 1.0 percent higher after four years. The price level was 0.9 percent lower in the third and fourth years. The unemployment rate was 0.5 percentage points lower in the second year (more than a half-million workers) and 0.4 percentage points lower in the fourth year. As discussed in the section on symmetry of response, however, these results should be interpreted as upper bounds for what one might expect.

The EMF7 results were based on 1972 dollars. As argued above, however, the shift to 1982 dollars is theoretically important, and one might expect more of a price response and less of a real output and employment response. Accordingly, several simulations were run with current versions of macroeconomic models.

### **Macroeconomic Performance Under NPC Price Trends**

The two price cases used in the NPC survey (explained in Chapter Five) were run through the Data Resources, Inc. (DRI) model to evaluate impacts through the year 2000. Shorter-term impacts were investigated with the Wharton PC Mark 8 model and Washington University Macro Model. The results are summarized in Tables 17 and 18. More complete results are presented in Appendix C, Tables C-5, C-6, and C-7.

The Wharton model was simulated for the first quarter of 1986 through the first quarter of 1989; the Washington University model from the second quarter of 1986 through the fourth quarter of 1988. The 4 percent and 5 percent real appreciation of the two price scenarios was implemented only approximately for these model simulations, using whatever the underlying inflation rate was in the starting simulation. The minor variation from the strict NPC scenario definition results from the feedback of oil prices on the GNP deflator.

There is a relatively wide range of results. The DRI model, for example, shows the three-year real GNP differential impact reaching just under 1 percent; in the Wharton model, the

<sup>7</sup>Hickman, Bert G., and Huntington, H. G., "Macroeconomic Impacts of Energy Shocks: An Overview." Working Paper EMF 7.2, Energy Modeling Forum, Stanford University, Palo Alto, CA, 1984, pp. 41 ff.

TABLE 16

## RECENT ECONOMIC INDICATORS

<u>Unemployment (%) *</u>	<u>November 1985</u>	<u>November 1986</u>
United States	6.7	6.6
Alaska	9.5	11.0
Louisiana	11.3	13.4
Oklahoma	7.1	7.6
Texas	6.5	8.8
New Jersey	5.6	4.1
New York	6.1	5.3
Ohio	9.0	7.3
Pennsylvania	7.6	6.0

\*Not seasonally adjusted.

Source: U.S. Department of Labor, Bureau of Labor Statistics.

## PERCENTAGE CHANGES FROM PREVIOUS YEAR

<u>Industrial Production</u>	<u>December 1985</u>	<u>December 1986</u>
Total	2.4	0.8
Oil and Gas Extraction	-4.7	-15.0
Petroleum Refining	5.1	2.7

Source: Board of Governors, Federal Reserve System.

<u>Inflation (Consumer Prices)</u>	<u>December 1985</u>	<u>December 1986</u>
All Items, All Urban Consumers	3.7	1.1
Household Fuels	0.7	-9.4
Fuel Oil	5.5	-33.4
Utility (Piped) Gas	-4.6	-5.8
Gasoline	3.0	-30.6

Source: U.S. Department of Labor, Bureau of Labor Statistics.

<u>New Plant and Equipment Spending</u>	<u>Actual 1985</u>	<u>Planned 1986</u>
All Industries	9.2	-1.7
Mining	-5.9	-29.2
Petroleum (Manufacturing)	4.6	-30.1

Source: U.S. Department of Commerce, Bureau of Economic Analysis.

**TABLE 17**  
**U.S. ECONOMY**  
**UNDER LOWER AND UPPER**  
**PRICE TRENDS**

	<u>DRI</u> <u>Lower</u>	<u>DRI</u> <u>Upper</u>
<b>Average Annual Growth Rates, 1985-2000 (Percent)</b>		
Real GNP	2.6	2.5
Consumer Price Index	4.5	5.0
Real Fixed Nonresidential Investment	3.4	3.3
Industrial Production	2.8	2.5
<b>Average, 1986-2000</b>		
Unemployment Rate (Percent)	6.7	6.7
Net Exports of Goods and Services (Billion Dollars)	-15.4	-42.5
Federal Budget Deficit (Billion Dollars)	120.1	140.5
Automobile Sales (Million Units)	11.7	11.7
Housing Starts (Million Units)	1.7	1.7

maximum difference of 1.5 percent is reached in six quarters before settling at 1 percent, while the Washington University model shows continued widening through the end of 1988, albeit only to the 1 percent range. As argued above, these results should be interpreted as representing upper bounds for the favorable impacts of lower oil prices on real output, particularly in the short run.

Because the DRI model generates business cycles and because changes in oil prices affect the timing of these cycles, it is misleading to compare specific years under the two simulated scenarios. Doing so could result in comparing a business cycle peak to a business cycle trough. It is best to infer from the DRI model results, detailed in Appendix C, Tables C-6 and C-7, that the long-run real GNP difference between the two price scenarios is approximately one-half of one percent.

The unemployment rate results mirror the real GNP impacts. The DRI model shows a maximum difference of about 0.3 percentage points (slightly more than 300,000 jobs), while the Wharton model shows twice the effect and the Washington University model shows a maximum of 0.5 percentage points (slightly more than 500,000 jobs) in the fourth quarter of 1988.

The inflation impacts are quite similar in the models. There is initially a significant differential in the inflation rates between the two price trends. Later, the difference settles into the 0.2 percentage point range. This persistent difference reflects the feedback from oil price paths to overall inflation.

The econometric model simulations suggest that differences in long-run economic growth rates under the two NPC price trends would be relatively small. This is consistent with the oil-price-to-GNP relationships in the responses to the NPC Oil & Gas Outlook Survey. The economic impacts of higher oil prices are more severe in the case of a sudden price shock than in the case of a higher, but gradually rising, long-term price trend.

**TABLE 18**  
**U.S. ECONOMY**  
**UNDER LOWER AND UPPER PRICE TRENDS**

	<u>Wharton</u>		<u>Washington</u> <u>University</u>	
	<u>Lower</u>	<u>Upper</u>	<u>Lower</u>	<u>Upper</u>
<b>Average Annual Growth Rates, 1985: 4 Qtr. to 1988: 4 Qtr. (Percent)</b>				
Real GNP	3.4	3.1	3.0	2.7
Consumer Price Index	2.8	3.6	2.4	2.8
<b>Average, 1986-1988</b>				
Unemployment Rate (Percent)	6.3	6.8	6.9	7.1
Automobile Sales (Million Units)	10.4	10.4	7.5*	7.3*

\* Domestic only.

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