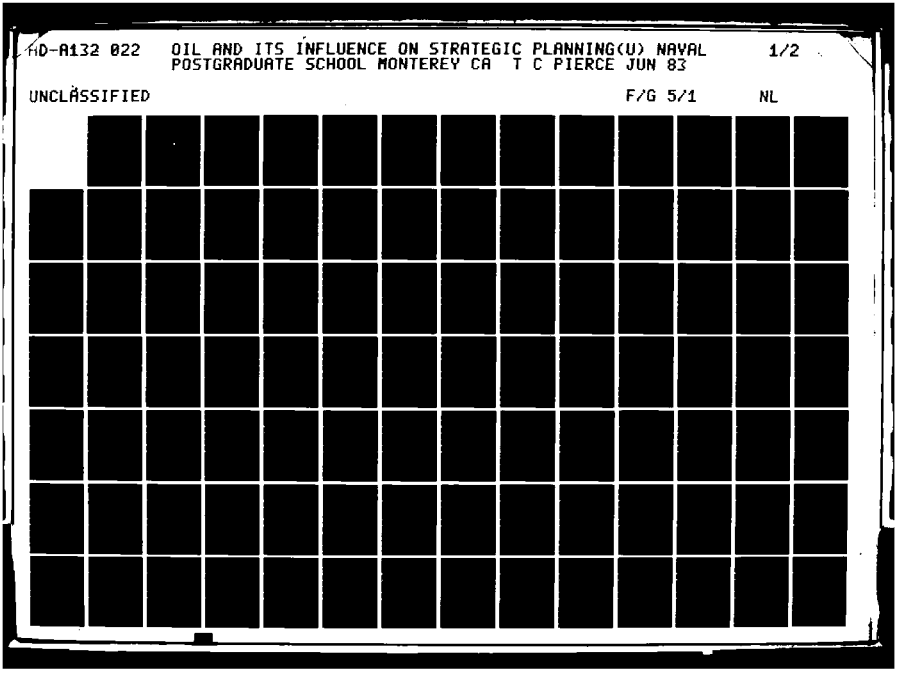
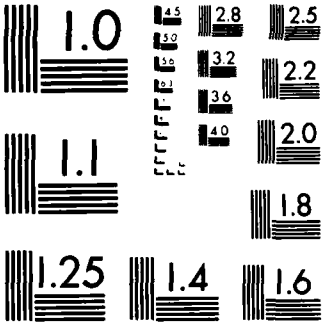
AD-A132 022 OIL AND ITS INFLUENCE ON STRATEGIC PLANNING(U) NAVAL POSTGRADUATE SCHOOL MONTEREY CA T C PIERCE JUN 83 1/2

UNCLASSIFIED F/G 5/1 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

(2)

NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

OIL AND ITS INFLUENCE
ON STRATEGIC PLANNING

by

Terry Cliffton Pierce

June 1983

Thesis Advisor: M. W. Clough

Approved for public release; distribution unlimited.

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A132022	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Oil and Its Influence on Strategic Planning		5. TYPE OF REPORT & PERIOD COVERED Master's Thesis June 1983
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Terry Cliffton Pierce		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Postgraduate School Monterey, California 93940		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Naval Postgraduate School Monterey, California 93940		12. REPORT DATE June 1983
		13. NUMBER OF PAGES 188
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Oil, petroleum, Strategic Planning, shale-oil, Strategic Petroleum Reserve, Naval Petroleum Reserve, OPEC

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This paper analyzes the continuing threat of a serious oil supply disruption and readiness of the U.S. to cope with such a development. Chapter One examines current perceptions of the likelihood of another oil crisis. It argues that these perceptions are critically flawed by an inadequate conceptual understanding of the nature of vulnerability. Chapter Two traces the U.S. response to the 1973-74 and 1978-79 oil crises and surveys the

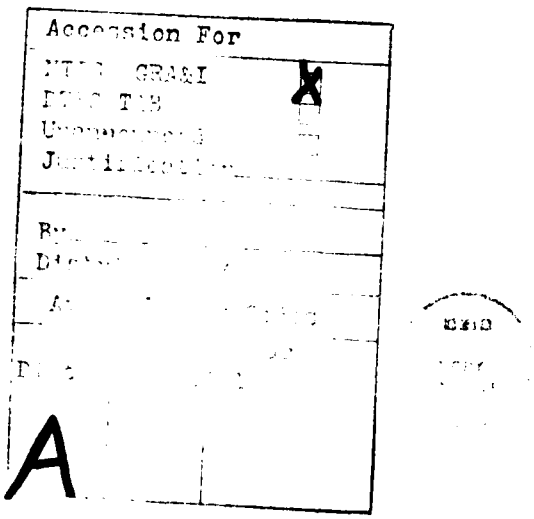
DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

S/N 0102-LF-014-6601

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

20. ABSTRACT Continued

prospects for a future oil crisis. Chapter Three evaluates the present oil glut in relation to the U.S. long-term programs to reduce oil vulnerability. It examines the effect that a new complacent attitude arising from the appearance of surplus may have on efforts to promote policies to avert a future crisis. Chapter Four examines the different contingencies that the U.S. could possibly face as a result of oil dependence. Chapter Five examines U.S. national goals and the linkage between goals and policy. Chapter Six proposes a strategy of attainment to reduce U.S. vulnerability to future oil disruptions. Such a strategy would address both the short and long-term problems that face American strategic planners concerned with the oil issue. Specifically, this strategy of attainment will evaluate the physical and political constraints involved in implementing the plan and will address the free market approach to energy security and the real possibility of exploiting shale oil reserves to meet U.S. national interest. Chapter Seven concludes that the present oil glut is not a long-term phenomenom and immediate implementation of this strategic plan is necessary in order to mitigate the effects of an oil interruption.



Approved for public release; distribution unlimited.

Oil and Its Influence on Strategic Planning

by

Terry C. Pierce
Lieutenant, United States Navy
B.A., Washington State University, 1974

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF ARTS IN NATIONAL SECURITY AFFAIRS

from the

NAVAL POSTGRADUATE SCHOOL
June 1983

Author: Terry C. Pierce

Approved by: Thesis Advisor

Second Reader

Chairman, Department of National Security Affairs

Dean of Information and Policy Sciences

ABSTRACT

This paper analyzes the continuing threat of a serious oil supply disruption and readiness of the U.S. to cope with such a development. Chapter One examines current perceptions of the likelihood of another oil crisis. It argues that these perceptions are critically flawed by an inadequate conceptual understanding of the nature of vulnerability. Chapter Two traces the U.S. response to the 1973-74 and 1978-79 oil crises and surveys the prospects for a future oil crisis. Chapter Three evaluates the present oil glut in relation to the U.S. long-term programs to reduce oil vulnerability. It examines the effect that a new complacent attitude arising from the appearance of surplus may have on efforts to promote policies to avert a future crisis. Chapter Four examines the different contingencies that the U.S. could possibly face as a result of oil dependence. Chapter Five examines U.S. national goals and the linkage between goals and policy. Chapter Six proposes a strategy of attainment to reduce U.S. vulnerability to future oil disruptions. Such a strategy would address both the short and long-term problems that face American strategic planners concerned with the oil issue. Specifically, this strategy of attainment will evaluate the physical and political constraints involved in implementing the plan and will

address the free market approach to energy security and the real possibility of exploiting shale oil reserves to meet U.S. national interest. Chapter Seven concludes that the present oil glut is not a long-term phenomenom and immediate implementation of this strategic plan is necessary in order to mitigate the effects of an oil interruption.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

TABLE OF ABBREVIATIONS

mmb/d	million barrels per day
b/d	barrels per day
SPR	Strategic Petroleum Reserve
DPR	Defense Petroleum Reserve
NPR	Naval Petroleum Reserve
NP&OSR	Naval Petroleum and Oil Shale Reserve
OPEC	Organization of Oil-Exporting Countries

I. CURRENT PERCEPTIONS OF THE LIKELIHOOD OF ANOTHER OIL CRISIS

A. INTRODUCTION

Two times in the 1970's the United States faced a crisis because of developments in the world oil market. In 1973 the Arab oil embargo demonstrated that the U.S. was unprepared for the withdrawal of large sources of oil supply. In 1978 the Iranian crisis demonstrated the situation was even more serious because the U.S. had become more dependent on foreign oil than 1973. One of the main goals of this thesis is to assess the likelihood of another sudden crisis.

The significant threat which could cause another crisis is the withdrawal of a large source of supply at a time when substitution possibilities are very limited. The degree to which this threat is taken seriously is dependent upon the perceived vulnerability associated with foreign oil imports. One of the key issues in assessing the likelihood of another crisis is determining the degree of oil dependence and vulnerability. The apparent lack of a clear understanding of dependence and vulnerability has contributed to false hopes of security and reduced the willingness of American officials to aggressively commit resources to costly strategies designed to increase America's energy self-sufficiency.

To analyze the nature of the threat a clear understanding of what is meant by oil dependence and vulnerability is needed. Such an understanding can help us to evaluate the current belief that the United States has enhanced its ability to cope with a future critical point because the threat has been mitigated as a result of the oil glut reducing dependence and vulnerability.

B. FALSE PERCEPTIONS OF THE OIL THREAT

Editorials, articles in professional journals, and headlines in daily newspapers have recently had a common theme: OPEC is in serious trouble and there appears to be plenty of surplus oil in a situation that is commonly being called an "Oil Glut." This oil glut appears to be signifying a time whereby the United States can relax a little as our vulnerability seems to be reduced. Headlines such as "OPEC Knuckles Under" [Ref. 1]; "The Unrigging of Oil Prices" [Ref. 2]; "OPEC in Disarray: What it Means" [Ref. 3]; are being read by numerous people who are getting the distinct impression that the future of a crisis ridden oil industry seems quite bright.

A typical editorial of this period written by Donald K. White of the San Francisco Chronicle is entitled "The Oil Glut: Getting Even with the Arabs" [Ref. 4]. He writes, "Isn't it great to watch those Arabs as they worry about the drop in crude oil prices? Remember those days in the

mid-70's when we had to line up at gas stations to buy gas at ever increasing prices? Someday, we said, we'll show those Arabs."

William Tucker has written an article entitled "The Energy Crisis is Over!" [Ref. 5] He writes, "Few people seem to realize the OPEC's monopoly of the market lasted only about 3 years...But, as always, the success of a monopoly was also its undoing...We have ended OPEC's dominance of the market within a few short months by swallowing what turned out to be a relatively mild pill and accepting a market price for our own oil."

These quotations illustrate a commonly held belief today that oil and vulnerability dependence has been reduced because of OPEC's troubles and the present oil glut. Unfortunately, this belief arises from the fact that people do not have an understanding of the threat. They feel that the threat is measured in the amount of oil available. If a surplus of oil exists, then the threat of a future oil crisis must be less because plenty of oil is available. As will be demonstrated, this myopic view of the threat clearly shows a lack of understanding of oil dependence and oil vulnerability.

C. NATURE OF OIL DEPENDENCE AND VULNERABILITY

Dependence means a situation in which the United States can be significantly affected by external forces and

interdependence means mutual dependence between the United States and another state or organization, i.e., U.S. and OPEC states.[1] We must be careful not to think of interdependence entirely in terms of situations of evenly balanced mutual dependence. As in the case of OPEC, it is asymmetries in dependence that are most likely to provide sources of influence. In their dealings with the United States less dependent actors like OPEC can often use the interdependent relationship as a source of power in bargaining over an issue and perhaps to affect other issues, i.e., the use of the oil weapon in 1973 against the United States. At the other extreme from pure symmetry is pure dependence; but it too is rare. Most cases lie between these two extremes.

Power can be thought of as the ability of an actor like OPEC to get others to do something they otherwise would not do. To understand the role of power in interdependence, we must distinguish between two dimensions, sensitivity dependence and vulnerability dependence. As will be argued below, it is the failure to understand the distinction between sensitivity dependence and vulnerability dependence that has contributed to the many false assumptions being made about oil security.

---

[1]This section draws heavily on Joseph Nye and Robert Keohane, Power and Interdependence p. 8-19, Little, Brown and Company 1977.

Sensitivity involves degrees of change within a policy framework--how much change in one country is caused by changes in another, and how great are the costly effects? Sensitivity interdependence is created by interactions within a framework of policies. Sensitivity assumes that the framework remains unchanged. An example of sensitivity dependence is the way U.S. was affected by increased oil prices in 1973 and 1978. Sensitivity was a function of the greater cost of foreign oil and the proportion of petroleum the United States imported. Most people were able to recognize that the United States during these two critical points of 1973 and 1978 as sensitive to changes in the supply and price of imported oil. Sensitivity could be easily measured by the increase in inflation and long lines at gasoline stations. This high sensitivity led to the belief that the United States vulnerability was also high.

Vulnerability dependence considers what the situation would be if the framework of policies could be changed. For example, if more alternatives were available, and new and very different policies were possible, what would be the costs of adjusting to the outside change? In petroleum, for instance, what matters is not only the proportion of one's needs that is imported, but the alternatives to imported energy and the cost of pursuing those alternatives. Two countries, each importing 35 percent of their petroleum needs, may seem equally sensitive to price rise; but if one

could shift to domestic sources at moderate cost, and the other had no such alternative, the second state would be more vulnerable than the first. Thus vulnerability dependence would be defined as the difference between the cost of accepting sensitivity and the cost of adopting an alternative energy policy which would reduce sensitivity.

In terms of the costs of dependence, sensitivity means liability to costly effects imposed from outside considering only the effect energy policies are having at that point in time, not what energy policies can possibly accomplish sometime in the future. Vulnerability cost is measured in the willingness in reducing potential sensitivity cost. The time involved in implementing policy changes to reduce vulnerability may be lengthy, therefore one should view vulnerability over a period of time as opposed to sensitivity which is always taken from a point in time.

This very important distinction between sensitivity and vulnerability allows us to measure vulnerability in an indirect way. Measurement of vulnerability dependence may be more difficult because of the time involved in implementing policy changes. Even though corrective policies may have been instituted, each policy will take a different amount of time before it is fully implemented and effective in reducing vulnerability. However, one can attempt to measure it by measuring the sensitivity dependence.

As noted earlier, it is a failure to understand the distinction between sensitivity dependence and vulnerability dependence which has contributed to false hopes regarding America's long run energy security. The problem is that people can recognize sensitivity dependence as being high when outside changes are causing negative changes in the United States, i.e., high unemployment, inflation, etc. However, people do not recognize sensitivity dependence as being high when outside changes are causing positive changes in the United States since people usually assume that vulnerability dependence is high only when a negative sensitivity dependence is high. Unfortunately they do not recognize that a positive sensitivity dependence can mean a high vulnerability dependence.

Today, sensitivity dependence in the U.S. is still very high because as the price of oil dropped and the supply of oil increased positive changes were seen, i.e., reduced inflation in G.N.P. However, this high sensitivity dependence should indicate to people that our vulnerability dependence is also probably high. As seen earlier, by the editorials, people do not seem to perceive that sensitivity dependence is high because it is positive. In order to demonstrate that there is a correlation between a high (positive) sensitivity dependence and high vulnerability dependence it will be necessary to measure vulnerability dependence. The question then becomes, if sensitivity

dependence is high, how high is the degree of vulnerability dependence in the United States? As noted earlier, vulnerability dependence is more difficult to measure and will be dealt with in the remaining sections of this chapter and in chapters Two, Three, and Four.

D. STRATEGIC LINK BETWEEN OIL AND U.S. SECURITY

When analyzing the American vulnerability, it is important to establish the link between oil and security. In this respect, the critical question is: what quantities of oil at what cost are considered sufficient? As noted in Table 1, the U.S. derives 50 percent of its energy from oil, the rest comes from natural gas, coal, nuclear power, and hydroelectricity.

TABLE 1

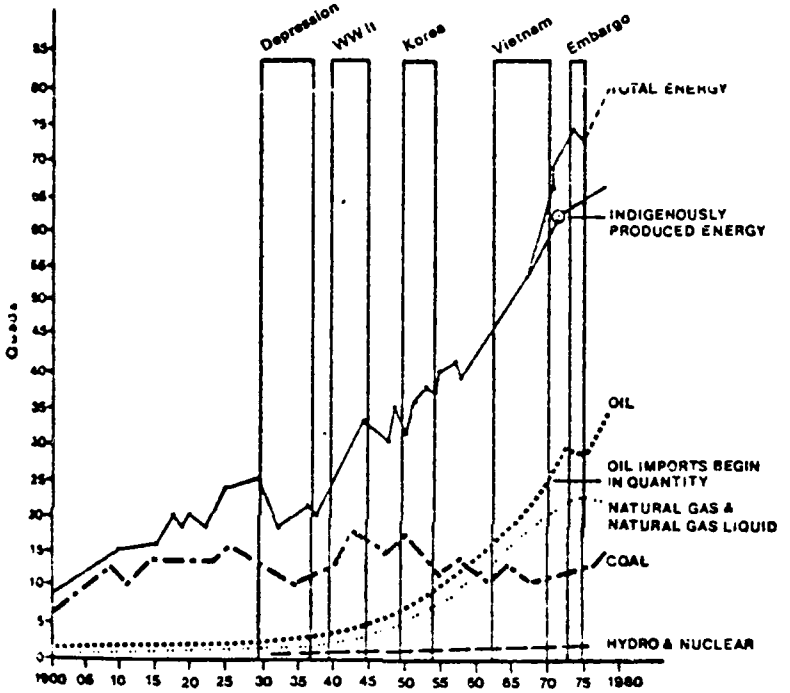
The Importance of Oil as a Source of Energy

1979

	U.S.	West. Europe	Japan
Oil as a percentage of total energy consumed	47	55	73
Percent of oil imported	48	96	100
Percent of oil imported from Persian Gulf	33	61	72
Percent Gulf oil as a percent of total energy consumed	8	32	53

Source: Collins Proceedings p. 80, December 1981

The most important trend in U.S. energy use (See Figure 1) has been the growing importance of petroleum as a major supplier of energy.



Source: Developed from *Mineral Yearbook*, 1955 through 1975, Bureau of Mines, U. S. Department of the Interior (Washington, D.C.: GPO). Adapted from Howard Bucknell, "Energy and National Security: A Status Report," *Energy Communications* 5, no. 4 (1979). By permission of Marcel Dekker, Inc. (1 quad = 0.5 mbpd oil equivalent).

Figure 1 Growth of Energy Demand in the United States

Table 2 shows that petroleum as a percentage of total energy consumption over the last twenty years has been significant. Presently the U.S. is the world's largest importer of oil. In 1982 foreign oil accounted for 33

percent of all the oil Americans used and 28 percent as of mid-1983 [Ref. 6]. Most energy analysts assume that the single most important source of energy for the U.S. over the next decade will continue to be oil [Ref. 7].

TABLE 2

U.S. Energy Consumption: 1960-1981

	Energy Consumption (mbdoe)	Petroleum an % of Total Energy Consumption
1960	20.8	45.2
1965	25.0	43.9
1970	31.5	44.2
1971	32.2	44.7
1972	33.8	46.0
1973	35.1	46.7
1974	34.3	46.0
1975	33.3	46.3
1976	35.1	47.2
1977	36.0	48.6
1978	36.9	48.6
1979	37.2	47.0
1980	36.5	44.9
1981	35.1	43.2

Source: Department of Energy, Energy Information Administration Annual Report to Congress, 1980, Vol. 2 Energy Review, February 1982; U.S. Council of Economic Advisors, Economic Report of the President, 1982

As the demand for oil increased and with cheap foreign oil becoming available, the United States began to rely more and more on imported oil. Table 3 shows the increase in net imports as a percent of consumption. Table 3 also points out the significant fact that when the 1979 oil crisis occurred, the U.S. had become even more dependent upon imported oil since the 1973 oil crisis. Before 1973 net imports were only 28 percent of domestic consumption. By 1977 net imports had risen to about 46 percent of domestic consumption. From the 1973 oil crisis to just before the 1978 oil crisis, the U.S. had increased net imports as a percent of consumption by 18 percent.

Since the 1978 crisis the oil import level has remained relatively high as compared to the pre-1973 levels. In 1982 net imports of oil accounted for 33% of the total oil consumed in the United States. In 1983 net imports dropped slightly to 28% which is equal to the pre-1973 import percentage of 28% [Ref. 8].

As demonstrated, oil has played a significant role in the United States as an important energy source. The question becomes: Will oil continue to play a significant role in the future? The following three tables are presented to give a wide range of oil demand predictions from several credible sources. The purpose of having several predictions is to assess the general trend from the experts. The underlying theme in all the predictions is that oil will continue

TABLE 3

Oil Import Trend: 1960-1977

(Millions of Barrels In One Year)

Year	Consumption	Domestic Production	Imports	Exports	Net Imports* as % of Consumption
1960	3,586	2,916	644	74	16
1961	3,641	2,983	700	64	17
1962	3,796	3,049	760	61	18
1963	3,921	3,154	775	76	18
1964	4,034	3,029	827	74	19
1965	4,202	3,290	901	68	20
1966	4,411	3,496	939	72	20
1967	4,584	3,730	926	112	18
1968	4,902	3,883	1,039	84	19
1969	5,160	3,956	1,155	85	21
1970	5,364	4,129	1,248	94	22
1971	5,553	4,078	1,433	82	24
1972	5,990	4,103	1,735	81	28
1973	6,317	4,006	2,283	84	35
1974	6,078	3,832	2,231	80	35
1975	5,958	3,667	2,210	76	36
1976	6,391	3,577	2,676	82	41
1977	6,712	3,636	3,169	83	46

Source: U.S., Department of Interior, Bureau of Mines, Minerals and Materials, February 1978, p. 19.

to be an important energy source and that oil imports are expected to rise above the pre-1973 oil crisis level.

TABLE 4

1982 U.S. Demand and Consumption

Total Consumption	Imports	Percent
15.3	5.0	33%

TABLE 5

U.S. Oil Outlook for the Future

(Millions of Barrels Per Day)

Year	Domestic Production	Domestic Demand	Implied Imports	Imports as % of Supply
1960	7.9	9.8	1.9	19
1965	8.8	11.4	2.6	23
1970	11.1	14.5	3.4	23
1975	10.0	15.8	5.8	37
1980	10.4	17.0-20.0	7.0-10.0	41-50
1985	10.9	18.0-22.0	7.0-11.0	39-50
1990	11.4	20.0-25.0	9.0-14.0	45-56

Source: Project Interdependence, p. 75, 76, and 181.

TABLE 6

U.S. Oil Outlook for the Future

Millions of Barrels Per Day

	1985	1990
Projected Oil Demand	19.5	19.9
Supply		
Proved Reserves	3.2	1.2
New Discoveries	2.3	3.5
Alaskan North Slope	1.6	1.4
Heavy Oil	.5	.6
Future Tertiary	.4	.7
	8.0	7.4
Minus Projected Supply of Natural Gas Liquids	1.4	1.2
Projected Oil Imports	10.1	11.3

Source: The World Oil Market in the 1980's: Implications for the U.S., Congressional Budget Office, May 1980, p. 9.

TABLE 7

U.S. Oil Outlook for the Future

(Million Barrels Per Day)

	EIA	Shell	PIRF	CBO
1985				
Demand	15.4	17.2	18.3	19.5
Production	9.5	8.6	10.1	9.4
Import Requirement	5.8	8.6	8.2	10.1
1990				
Demand	15.6	17.3	17.8	19.9
Production	10.0	8.9	10.2	8.6
Import Requirement	5.6	8.4	7.6	11.3

Sources:

EIA: U.S. Department of Energy, Energy Information Administration, Annual Report to Congress for 1979, (DOE/EIA-0173-79/3.

Shell Oil Company: The National Energy Outlook 1980-1990, August 1980.

PIRF: Petroleum Industry Research Foundation, Inc., Oil in the U.S., Energy Perspective: A Forecast to 1990, May, 1980.

CBO: Congress of the United States, Congressional Budget Office, The World Oil Market in the 1980's; Implications for the U.S., May 1980.

As Tables 5, 6, and 7, show the projected demand for imported oil through 1990 will be increasing

Oil demand in the U.S. is currently 15.3 mmb/d and has been forecast to remain at least that level with projections stating the level could rise to 19-20 mmb/d by 1990. The U.S. oil import dependence is about 5 mmb/d (33%) and projected to rise to 11-14 mmb/d by 1990 (39%-56%).

In sum, the experts predict that petroleum is a prime source of energy that is expected to increase in importance. What makes petroleum unique is that it cannot be quickly replaced.

E. VULNERABILITY DEPENDENCE: OBJECTIVE ANALYST

Now that it has been established that the United States will continue to depend on oil to meet its future energy needs, it is important to explore the United States energy policies and the overall effect they have had in reducing the potential cost imposed by outside actions, i.e., dependence vulnerability. As noted earlier, dependence vulnerability is defined as the difference between the cost of accepting sensitivity and the cost of adopting an alternative energy policy which would reduce sensitivity.

A reduced vulnerability would be indicated by the ability of the United States to alter its oil dependency situation by changes in oil policies. An unchanged vulnerability would be indicated by the U.S.'s lack of ability to alter its situation through policy changes. This section will not examine each policy change (refer to chapter Two

for a review of policy changes) but only review the results of the policy changes to determine the degree in which they have reduced potential cost imposed by external change.

1. Domestic Petroleum Production

This section will review the results the policy changes have had in increasing U.S. domestic production to reduce the cost imposed by external change. Table 8 compares the projections to total domestic liquids production for 1985 and 1990. (Total domestic liquids production figures in Table 7 include crude oil, enhanced recovery, natural gas liquids, Alaskan production, shale oil, and synthetic liquids). The important point to note in Table 7 is that domestic production is predicted to decline over the next several years.

PE's Best Estimate case is approximately 0.7 mmb/d per day lower in 1985, and 0.8 mmb/d lower in 1990, than similar projections made in February of 1980. Total domestic production is lower in 1985 and 1990 because of a reduction in the assumed conventional lower 48 states resource base.

Figure 2 depicts production, reserve additions, and proven reserves of crude oil from 1950 to 2000. Prior to 1966, the level of proven reserves grew as reserve additions exceeded conventional production. However, growing demand for oil and depletion of the lower-48 resource base combined

TABLE 8

Forecasts of Total Domestic Oil Production

(mmb/d)

		Projected	
	1979	1985	1990
PE Base Forecast	10.2	8.8	8.7
EIA	10.2	9.2	9.6
PFGEP	10.2	9.59.5	
Exxon	10.2	8.1	7.1

Sources:

PE: Reducing U.S. Oil Vulnerability Prepared by Assistant Secretary or Policy and Evaluation, U.S. Department of Energy, November 10, 1980.

EIA: Projections from EIA's Annual Report to Congress, 1978, and Annual Report to Congress, 1979, Chapter 4, Medium Price Case.

PFGEP: Policy and Fiscal Guidance Energy Projections, OAS/PE/DOE, February 1980.

Exxon: Projection from Exxon, Company Energy Outlook 1980-2000, December 1979.

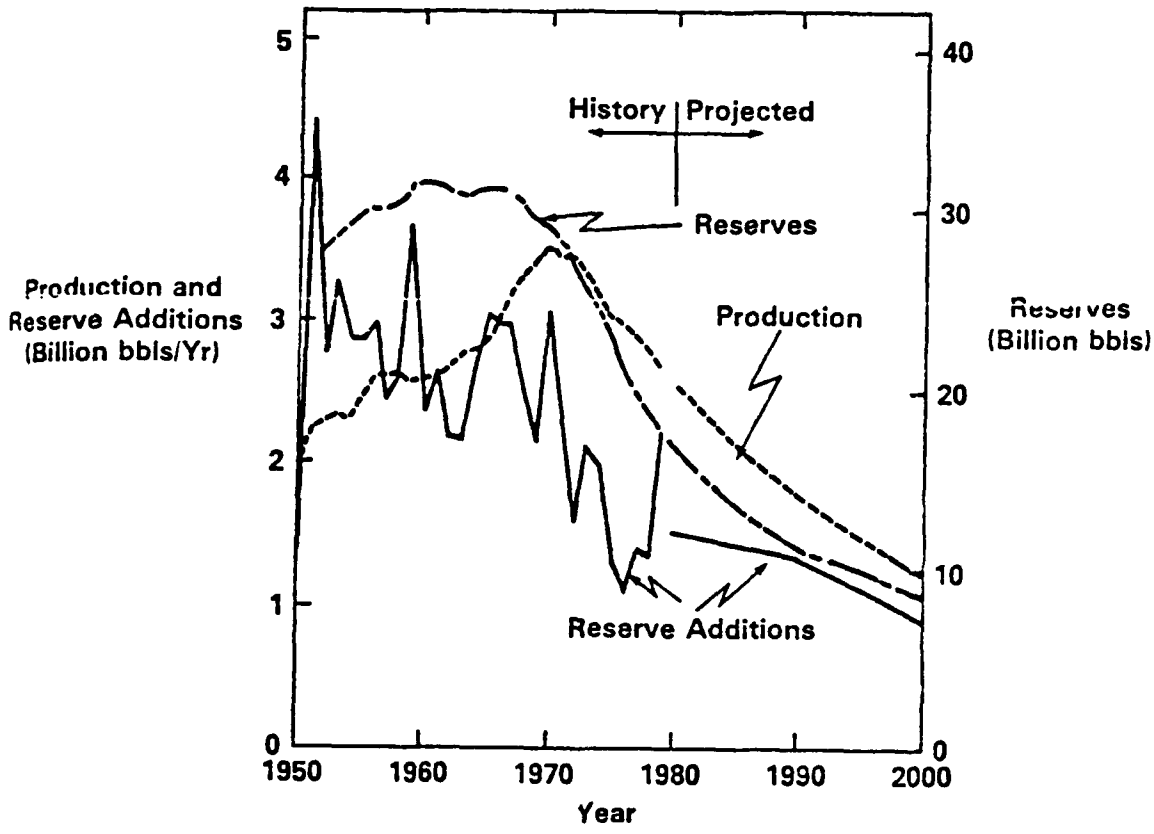


Figure 2 Lower-48 Conventional Oil Production Proven Reserves and Reserve Additions[2]

---

[2]Projection are for the Best Estimate case. World oil prices are assumed to be $34/barrel in 1980, $38/barrel in 1985 and $43/barrel in 1990; and continuation of current energy policies and programs, including oil decontrol and windfall profit tax. Historical values taken from EIA 1979 Annual Report to Congree Vol. II.

to reverse the situation in mid-1960's. During the past 16 years, reserve additions have fallen consistently short of petroleum needs. Consequently, proven reserves have been steadily declining, leading to a fall-off in production [Ref. 9].

It is apparent upon examination of Figure 2 that the root of the U.S. energy proglem lies in the inability of conventional lower-48 states crude oil production to meet the future demand for petroleum products. Unfortunately, production of lower-48 crude has been falling since 1970, and the trend is projected to continue in the future. Decline of lower 48 state production is the reason why the experts in Table 7 have predicted domestic production to decline in 1985 and again in 1990.

The prediction of falling production of domestic oil made in Figure 2 is directly linked to the projected level of proven oil reserves, which determines the capacity to produce oil in any given year. Due to geological and technical limitations, oil producers cannot exploit more than 10 to 15 percent of existing reserves in a given year. Proven reserves are increased over time by adding each year's new discoveries, and revisions and extensions, and are decreased by the yearly amount of production. Since reserve additions are the key determinant of future conventional production, one has to examine the rate at which they are being found to understand why the domestic

production in lower 48 states is predicted to decline (see Table 8). The best indicator for potential reserve additions would be to look at the trend in drilling activity [Ref. 10].

Figure 3 depicts historical and projected drilling activity and returns-to-drilling for crude oil deposits in the continental United States. Historical drilling activity peaked in 1956 at 200 million feet per year, and then declined until 1973. Since then, total drilling activity for oil has been increasing steadily, largely as a result of higher world oil prices. Concomitant with this increased drilling activity, however, there has been a steep decline in the amount of oil discovered per foot drilled, i.e., returns-to-drilling. Returns-to-drilling have, on the average, been roughly a factor of 1.5-2 smaller in the past 5 years (1974-1979) when compared to the 5 years preceding that (1969-1974). The Department of Energy has recently stated, "that the easy oil has been found so that most deposits discovered in the future will be smaller and at greater depths. These factors (barring some unforeseen technological breakthrough) will cause a decline in drilling productivity through time and an increase in the marginal cost of new discoveries" [Ref. 11].

It was hoped that even though returns to drilling have sharply declined, the vigorous increase in oil drilling would compensate and there would still be steady progress in

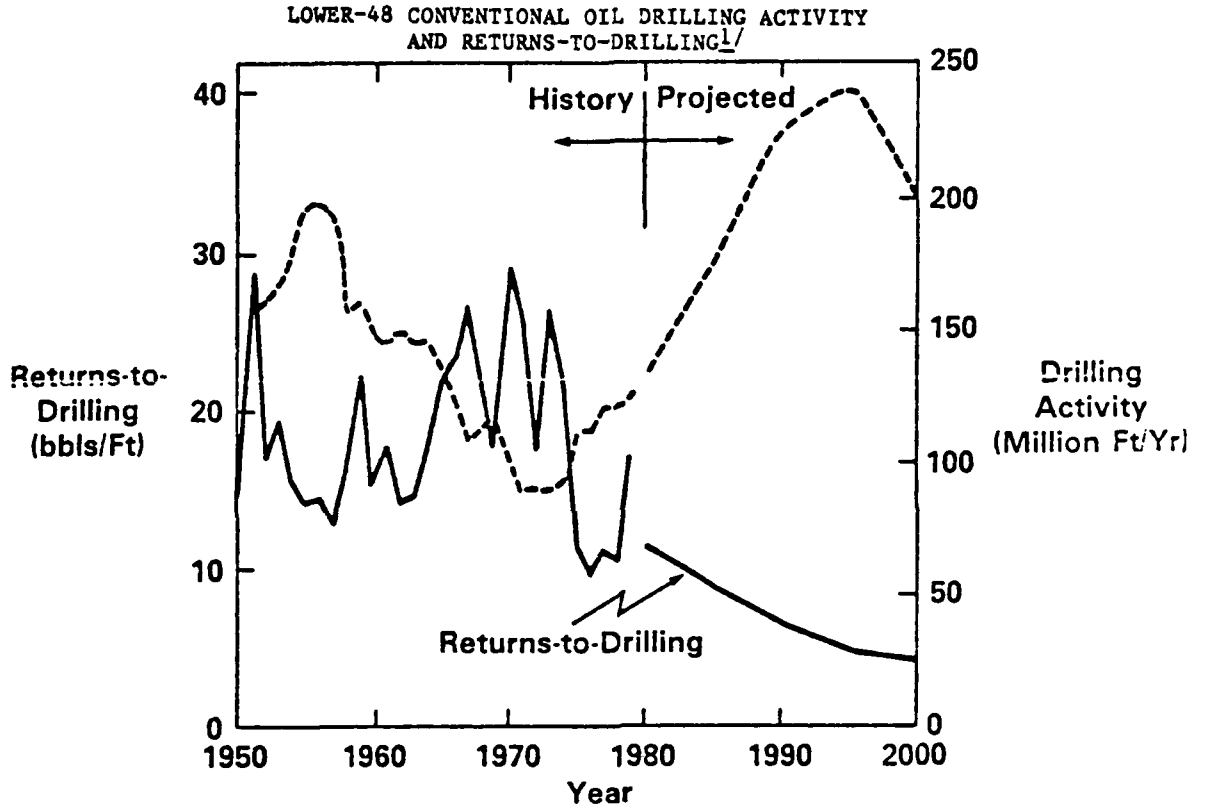


Figure 3 Lower-48 Conventional Oil Drilling Activity and Returns-to-Drilling

new reserve additions. This hope seemed realistic largely as a result of phased federal decontrol of the price of crude oil beginning in April 1979 and of higher OPEC prices that encouraged the oil industry to explore for new sources of oil. At this time both exploratory and developmental drilling increased dramatically for 3 years until 1982 (see Table 9).

TABLE 9

U.S. Drilling Activity

	1979	1980	1981	1982	1983
Average Number of Rigs Operating	2,177	2,909	3,970	4,520	1,882

Source: Petroleum Supply Annual 1981, July 1982 Vol. 1, p. 7 and Time, April 18, 1983, p. 71.

This increase beginning in 1979 halted in annual decline in production in the lower 48 states that average 300 thousand barrels per day through the middle 1970's [Ref. 12].

However, the drilling for new oil sharply declined in 1983. With oil prices sagging, companies have budgeted $35.7 billion for drilling and exploration this year, which is 14 percent less than in 1982 [Ref. 13]. In the field, only 1,882 rigs were drilling in the U.S. in the first week of April 1983 (see Table 9). That count was the lowest in six years and nearly 60 percent below the December 1981 peak of more than 4,500 [Ref. 14].

Reserve additions are expected to decline from 1980 to 1990. This assumption was made expecting that the decline would be slowed by a projected increase of 5.5 to 6 percent in drilling activity that should take place as a result of decontrol and higher world prices. With the present trend of reduced drilling activity, the decline in reserves will be even greater. The Department of Energy believes that the decline in reserve additions from 1990 to 2000 will likely be greater than that in the 1980 to 1990 period as a result of even lower returns-to-drilling and a falloff in drilling activity [Ref. 15]. As a result of the very discouraging trend of decreased well drilling and exploration, Middle East oil will continue to be very important to the U.S.

2. Importance of Middle East Oil

The reason Middle East Oil will remain important to the United States is the fact that the world's reserves are concentrated in a small number of countries in the Gulf region. Presently there is estimated to be 551.6 billion barrels of non-Communist world proved crude oil reserves. The 362 billion barrels of reserves in the Middle East represent over two-thirds of the non-Communist oil reserves.

The importance of proven reserves is that they are major source of oil production in the short term (1 to 7 years). According to the American Petroleum Institute, the definition of proven reserves is: proven reserves are "the

TABLE 10

Regional Distribution of Non-Communist Oil Reserves

Middle East	362	66%
North America	38	7%
United States	26	5%
Africa	57	10%
South America	26	5%
Europe	24	4%
Asia	19	3%

Source: World Petrol ım Availability 1980-2000, October 1980, Office of Technology Assessment: Congress of the United States.

estimated quantities of all liquids statistically defined as crude oil, which geological and engineering data demonstrate with reasonable certainty to be recoverable in future years from known reservoirs under existing economic and operating conditions" [Ref. 16].

With the majority of the non-Communist oil reserves in the Middle East, at least in the short run, that area will remain important. As an indicator of the enormous potential in the Middle East, a Department of Energy study found that the remaining Middle East reserves could be as high as 439 billion barrels and that substantial additional producing capacity could be developed in known deposits in some of the Persian Gulf producing countries [Ref. 17].

OPEC accounts for half the total world production and 60 percent of free world oil production (See Table 11). The United States was an early leader in oil production. Until 1953 it produced more oil than all other countries combined.

Compound annual rates of growth in production reveal many interesting relationships (See Table 12). The growth rate in the U.S. and in OPEC nations was less during the 1950's than it was in the 1960's, because output was restrained during the 1950's by regulation of production imposed by state authorities in the U.S. and by the international majors in the member countries of OPEC. Market demand prorationing was much less effective in restraining

TABLE 11

Average U.S. and OPEC Daily Oil Production: 1860-1980

Year	U.S.	OPEC	Total World
1860	.00	.000	.001
1870	.014	.000	.016
1880	.072	.000	.082
1890	.126	.000	.210
1900	.174	.006	.409
1910	.574	.030	.898
1920	1.214	.084	1.887
1930	2.460	.659	3.868
1940	3.707	1.004	5.890
1950	5.407	3.432	10.419
1960	7.055	8.800	21.026
1970	9.648	23.408	43.210
1980	8.597	26.890	59.455

Source: American Petroleum Institute, Petroleum Facts and Figures, 1971 ed, pp. 548-557, Central Intelligence Agency, Handbook of Economic Statistics, Washington, D.C. 1979, p. 135, U.S. Department of Energy, Monthly Energy Review, 1981, pp. 88-89.

output and maintaining prices during the 1960's. The growth rate declined markedly during the 1970's, as output was once again restrained and demand slackened in response to higher prices [Ref. 18].

TABLE 12

Compound Annual Growth Rates in Oil Production by Region

(In Percent)

Time Period	United States	OPEC	World
1950-1960	2.7	9.4	7.4
1960-1970	3.1	9.8	7.2
1970-1980	-1.2	1.4	3.2
1950-1980	1.5	6.9	5.8

Source: Albert Danielsen, The Evolution of OPEC, p. 17.

Even though the U.S. and OPEC followed each other in the production trends from 1950-1980, the major difference is the production increase of OPEC.

In 1976, the Persian Gulf provided about 21.4 million b/d of oil, representing 47 percent of non-Communist production, or 37% of world production. Average production in the Persian Gulf in 1976 was 7,228 b/d per well as compared to an average of about 16 b/d in the U.S. In 1979 after a serious decline in Iranian production, the Persian Gulf provided 20.6 million b/d of oil, representing about 43 percent of free world production and 33 percent of world production. What makes the Middle East reserves so

appealing to the United States even though the area is so politically unstable is that Persian Gulf production is typified by high productivity, low production costs (10¢ to 25¢ per barrel for exploration and production), huge reserves, and excellent access to marine shipping points [Ref. 19].

The United States and its allies have become heavily dependent on oil produced by OPEC, and particularly on oil produced by the Persian Gulf members of OPEC (See Table 13). U.S. oil imports from all sources increased from about 1.8 million barrels per day, or 18 percent of U.S. oil supply in 1960 to 8.8 mmb/d, or 48 percent of U.S. oil supply in 1977.

TABLE 13

Dependence on Persian Gulf Crude Oil (1979)

(Thousand Barrels Per Day)

Country	Own Production	Imports Persian Gulf	Imports Other	Total Crude	Dependence on Persian Gulf
Japan	10	3,502	1,344	4,856	72.1
Canada	1,480	262	342	1,797	14.6
Germany	95	866	1,281	2,242	38.6
U.S.	10,200	3,100	5,600	18,500	17.0

Source: Quarterly Oil Statistics, Fourth Quarter 1979, OECD.

U.S. dependence on uncertain foreign oil rose rapidly from 3.4 mmb/d in 1970 to 8.5 mmb/d in 1979, or nearly half of U.S. petroleum consumption.[20]

In 1979, the U.S. obtained 3.1 million barrels per day from the Middle East, almost 35 percent of its total oil imports of 8.5 mmb/d. In contrast Europe received 8 mmb/d from the Gulf, against a total import volume of 13 mmb/d. Japan, for all practical purposes, is 100 percent dependent on imports for its daily oil consumption of 5.6 mmb/d, and in that year required 4 mmb/d from the Gulf. In sum, the U.S. obtained 35 percent of its supply from the volatile Gulf region, Europe 62 percent, and Japan 72 percent.[21] By 1980, the U.S. was even more dependent on oil imports from countries in the vulnerable Persian Gulf area than at the time of 1973 embargo (Refer to Figure 4). In depending upon the Middle East, the strategic link is not the physical availability of oil, but the political factors that make the oil accessible.[22] What makes the U.S. so vulnerable is not that oil imports are projected to increase over the next decade, but that a significant amount of suppliers of this oil are from the politically unstable Middle East.

The primary focus of U.S. energy policy development, beginning with Project Independence in 1973 through the passage of the Energy Security Act of 1980, has been to reduce dependence on imports especially from the Middle

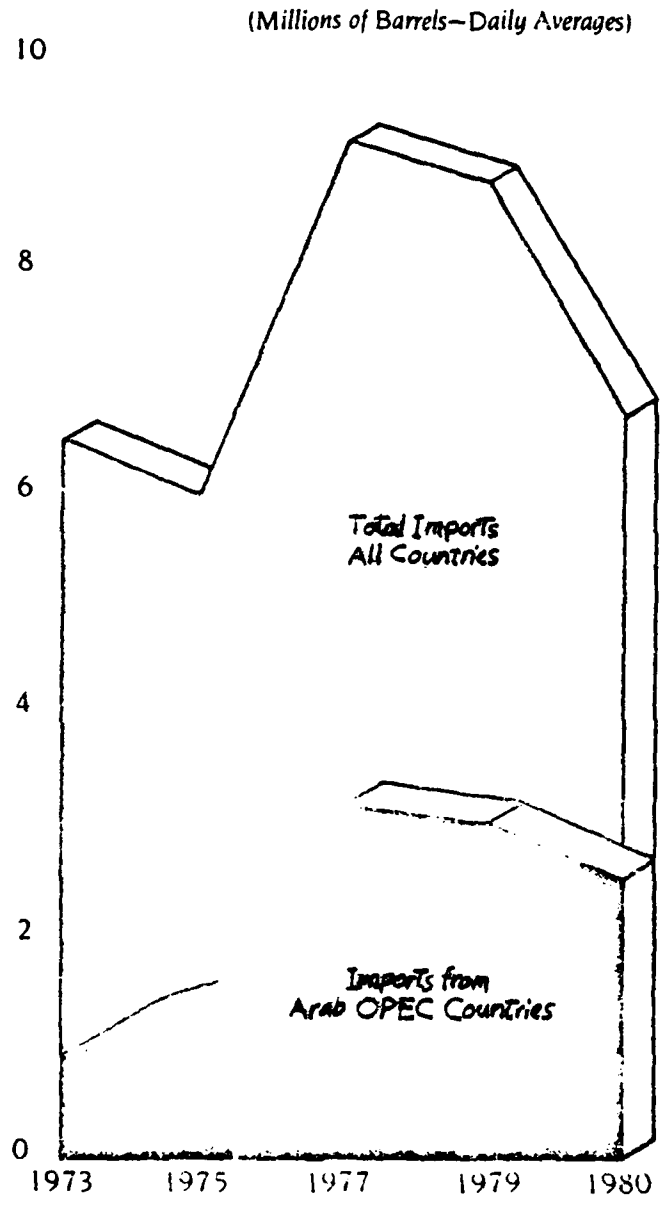


Figure 4 U.S. Dependence on Petroleum Imports

East. Despite these important efforts, energy analysts now generally agree that, due to the lead times involved, the nation will still remain dependent on substantial volumes of oil imports for at least the next decade or two.[23]

TABLE 14

U.S. Crude Oil and Petroleum Products: 1973-1983

	Total	Domestic	Imports	Percent	Arab OPEC (%)
1973	17.3	10.9	6.3	36%	.9 (5%)
1974	16.7	10.5	6.1	37%	.8 (5%)
1975	16.3	10.1	6.1	37%	1.4 (9%)
1976	17.5	9.8	7.3	42%	2.4 (14%)
1977	18.4	9.9	8.8	48%	3.2 (17%)
1978	18.4	10.3	8.4	43%	3.0 (16%)
1979	18.5	10.2	8.5	43%	3.1 (17%)
1980	17.0	10.2	6.9	41%	2.6 (15%)
1981	16.1	10.2	6.0	37%	1.8 (11%)
1982	15.3	10.2	5.0	33%	.8 (5%)
1983 (Jan)	15.3	n/a	4.3	28%	
Average:		10.2			

Source: Monthly Energy Reports March 1983, Department of Energy, pp. 38-39.

A very important trend (See Table 14) is to notice the level of domestic production has averaged about 10.2

mmb/d from 1973 to 1983. When domestic demand goes up, the import level goes up; consequently, when the demand falls, the import level falls. For example, in 1981 the U.S. significantly reduced its dependence on petroleum imports by reducing domestic consumption of petroleum. This decline in domestic consumption occurred principally as a result of lower economic activity in 1981 and the ongoing effects of repeated sharp increases in petroleum product prices since 1973.[24] (See Table 15) Since domestic production was stable during 1981, the .9 million barrels per day drop in domestic consumption resulted in a .9 million barrels per day drop decrease in imports.

TABLE 15

Direct Relationship Between Imports and Demand

	1980	1981	Change
Total Products Supplied	17.0	16.1	.9
Total Petroleum Production	10.2	10.2	0
Petroleum Imports	6.9	6.0	.9

Source: Monthly Energy Reports March 1983.

An important assumption based upon the trends of Exhibit 1 is that one can expect that as the economic recovery progresses more oil will be demanded. As domestic production has leveled off at 10.2 mmb/d, this increased demand can only be met through higher imports. With the Middle East oil having the largest non-communist reserves

available, one can only expect that the Gulf states will help met U.S. import demands.

OPEC producers saw demand for their product fall by 40 percent from 31 mmb/d in 1979 to less than 18 mmb/d in early 1982.[25] However, even with the last two years or so, new supplies on energy will be required to satisfy the nations future energy needs. Recent projections still indicate that the U.S. will need from 13 to 21 percent more energy in 1990 than it is using today.[26] If present trends continue, this increase in energy demand equates to the U.S. being a steady consumer of Middle East oil for quite some time. Despite reports of a glut of oil in the international petroleum market, the margin between an adequate and inadequate supply is so thin that a crisis in any of the major oil exporting nations could produce a serious threat to global economic and political security.

Presently the surplus margin production now exceeds 2,000,000 b/d. The potential for a similar incident to the Iranian/Iraqi conflict is an example of a Middle East crisis which could eliminate this 2,000,000 b/d surplus. The Iranian/Iraqi conflict has already interrupted exports by those two countries, as follows:

TABLE 16

Decrease in World Oil Supply as a Result of Iran/Iraqi War

Iran	500,000 b/d
Iraq	3,000,000 b/d
Total	3,500,000 b/d

A crisis like this could end the surplus oil very quickly. Nearly one-third of the world's total supply of oil moves through the Strait of Hormus at the mouth of the Persian Gulf. Iran recently threatened it would mine the Strait, and if such an operation were undertaken successfully, it would constitute a major blow to Western economies.[27]

The availability and the price of energy in the U.S. respond primarily to the supply and price of oil. Currently there are no domestic energy plans that will alleviate our need to import oil from the Middle East. The best recent estimates of qualified oil analysts are that demand for OPEC oil in 1985 will be between 32.8 mmb/d and 48.7 mmb/d.[28] The U.S. requirements for Middle East oil will persist. The possibilities of substituting other OPEC or non OPEC oil for Middle East sources are limited.

To escape dependence on the Middle East, the U.S. would need to find substitute sources for the 46 percent of its projected import requirements, or around four mmb/d.

3. Military Vulnerability

The U.S. military is very vulnerable to oil disruptions. The Department of Defense is the largest single user of our nation's energy. The DOD accounts for approximately 1.7 percent of the total national consumption. During wartime conditions, the DOD petroleum requirement is expected to increase by a factor of three or more. However, during

peacetime with normal requirements, the DOD experienced difficulty procuring sufficient fuel for peacetime operations during both the 1973-74 Arab oil embargo and the 1979-1980 Iranian oil crisis.[29]

Although the strategic components of naval fleets (aircraft carriers, missile submarines) are being converted to nuclear power, much of the rest of the strategic military forces of the U.S. and its allies and all their tactical forces are fueled by oil. By 1977, George Marienthal, Deputy Assistant Secretary of Defense stated that there was a strong consensus among the Joint Chiefs of Staff and the Military Departments that recent petroleum levels of the operating forces have been at least marginally adequate to maintain force readiness.[30]

In February 1978 Secretary of Defense Harold Brown stated: "I cannot report that our forces are as ready as I would like them to be...our necessary efforts to conserve fuel have meant reductions in ground combat training exercises, Navy steaming hours, and flying hours for all services."[31]

U.S. Department of Defense fuel cost will run some 7 billion dollars in 1980, double what they were a year previously. This constitutes a tangible and visible drain on the resources available for our military security. In 1980 alone, fuel cost increases consumed enough capital to build another aircraft carrier.[32] DOD analyst recently

computed that each one cent per gallon rise in cost of fuel adds $80 million daily to DOD's operating cost.[33]

Aside from operating cost, the U.S. military is also directly linked to oil vulnerability but from a slightly different angle. During the 1973-74 embargo, NATO members except Portugal and briefly Germany, refused the U.S. the use of their territories to resupply Israel out of fear of retaliatory cutoffs of oil supplies. A reliable supply of oil is considered essential to the effectiveness of NATO because the European members of NATO obtain most of their oil from the Middle East.

Strategic stockpiling of oil was designed to diminish U.S. vulnerability to the effects of an oil supply disruption. However, there is serious doubt that the SPR could maintain the viability of the national economy in the absence of critical oil imports and simultaneously support the needs of the DOD. The Strategic Petroleum Reserve is not designed to meet military needs effectively. (A detailed discussion of the DOD and the Strategic Petroleum Reserve can be found in Chapter 6 Section 6.)

F. VULNERABILITY DEPENDENCE: SUBJECTIVE ANALYST

The previous section analyzed the objective vulnerability dependence as a result of the policy changes that have been implemented. This section will analyze the degree to which various groups recognize the index of vulnerability noted in the previous section.

1. Energy Experts and Analyst

G. Henry M. Schuler, director of energy programs at the Georgetown University Center of Strategic and International Studies, believes that even though oil consumption was down in 1982, there is little solace to be found in oil figures showing that the United States imported 30 percent of its oil requirements in 1982. Schuler states, "If our reliance upon oil imports--albeit a marginally reduced reliance--still poses a threat to our national security, we must develop a strategic response to that threat."[34]

Ragaei El Mallakh, director of the University of Colorado's International Research Center for Energy and Economic Development warns that, "a third oil shock could happen much sooner than most people expect."[35] Charles Ebinger, associate director of energy programs at the Center for Strategic and International Studies believes that with global reserve/production ratios continuing to decline at a rate of 3 to 3.5 billion barrels per year and exploration and development deferred because of lower oil prices, "there is an acute danger that 10 years from now, we could experience serious petroleum shortfalls."[36]

Oil experts believe that present policies have not altered the situation enough to reduce economic vulnerability to oil disruptions. The loss of a few million barrels per day could raise the oil price by 10 dollars per barrel; the

loss of the whole Persian Gulf could push the price of oil over $100 per barrel.[37]

In 1979 the U.S. spent $57.8 billion on oil imports. In 1980, Americans reduced their oil consumption yet paid more--almost $80 billion--for less foreign oil.[38]

The U.S. and its allies are suffering the consequences of a 1000 percent increase in oil prices during the 1970's created by our excessive dependence on an OPEC controller world oil market. The Department of Energy estimates that the U.S. GNP loss from an interruption in Persian Gulf oil supply would be a 75 percent reduction for 6 months and a 50 percent reduction for another 6 months would reduce the GNP by about 940 billion dollars.[39] The Congressional Budget Office estimates that the loss of Saudi oil for a year in 1984 would cost the U.S. 272 billion dollars.[40]

Even though the U.S. belongs to the IEA which would share their supplies, the U.S. would still be left with a shortfall of 3.5 mmb/d, the unemployment rate increased by 2.1 percentage points, and the inflation rate increased by 20 percentage points.[41]

There is good reason to think that the vulnerability of economies to future shocks has actually increased. The share of GNP in Western economies devoted to energy expenditures has tripled, from about 3 percent to 8 to 10 percent. Thus, an oil price rise of any given magnitude

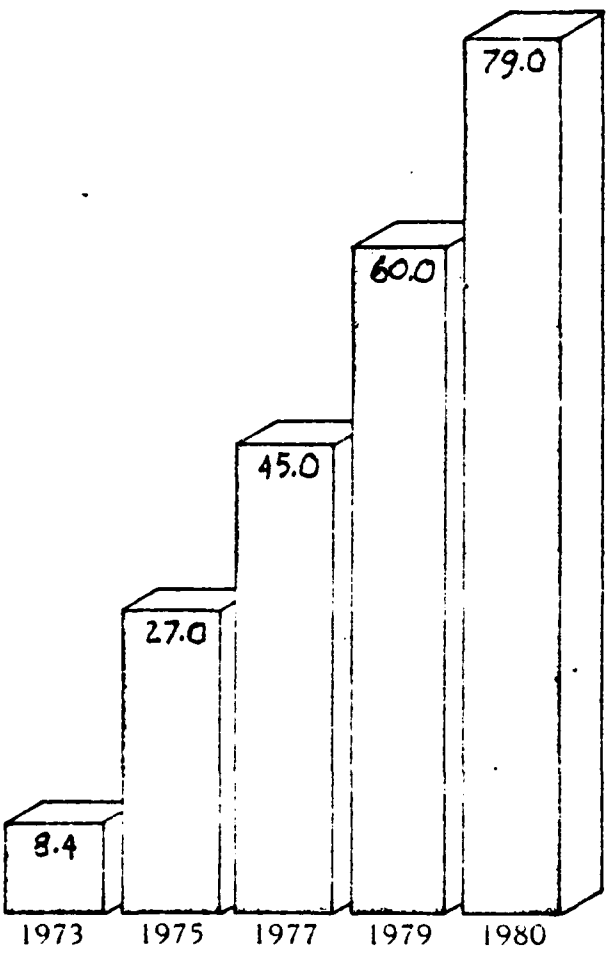


Figure 5 Total Cost of U.S. Oil Imports

TABLE 17

Impact of a Year Long Oil Supply Interruption

(Amounting to 3.5 Million Barrels Per Day)

	1984	1987
Change in Real GNP (in billions of 1984 dollars)	-272	-100
Change in Real GNP (percent)	-6.6	-2.2
Change in Unemployment Rate (percentage points)	2.1	1.2
Change in Inflation Rate (percentage points)	20.0	2.5

Source: The World Oil Market in the 1980's: Implications for the U.S., p. 60.

will now have a greater effect on the consuming nations than the first or second shock did, i.e., sensitivity has increased.[42]

The problem is that many people do not recognize or ignore that sensitivity has increased which is an indicator that vulnerability has increased. During a surplus condition (oil glut) it is a recurring temptation for the United States to regard the oil acquisition process as being met through reliable, secure, bountiful resources. As noted previously in the Iranian/Iraqi example, Americans still tend to ignore the point that these principal exporters are as capable of creating a condition of surplus as they are of precipitating a shortage. Yet when a surplus appears, it is an American predilection to assume that sensitivity has decreased so they can relax.[43]

There is little doubt about the physical adequacy of reserves for the next decade, at least. As has been demonstrated, the energy experts and analyst assume that rather than the physical availability of oil, it is the political factor that that is the key question. This assumption assumes that the Middle East oil sources will remain the key suppliers of the international oil barrel.[44] As noted in the next section, Government agencies generally agree with the energy experts.

2. Government

The Department of Energy believes that by 1990, the best case projection is for dependence to decline to just above 15 percent--still enough to be a major factor. Additionally, the policies and programs that are in place now or are being established under existing statutes are not likely to free the U.S. from dependence on imported oil until sometime in the 1990's at the earliest. The Department of Energy recommends that other measures and policies should be adopted to lessen the vulnerability the U.S. now faces. The DOE concludes its warning with this statement, "the wisest policy course would seem to be to assume that--unless added initiatives are undertaken--the United States will continue to import oil at close to today's level for the next 5 years, and that our situation will improve only modestly by 1990."[45]

3. Congress

The Senate Committee of Energy and Natural Resources recently completed a study on the geopolitics of oil. In its assessment of U.S. dependence on Persian Gulf oil, the study states, "The United States and our allies are likely to experience at least two more decades of vulnerability to supply disruptions, political manipulation of oil supplies, and periods of panic buying on the spot market."[46]

Senator James McClure, Chairman of the committee on Energy and Natural Resources, recently stated, "We are all

too quick to forget how potentially unstable world petroleum supplies are and how quickly consumers react when even threatened with a shortage."[47] This chapter has demonstrated that the reason many people fail to recognize the degree of vulnerability is that they fail to understand or ignore the difference between sensitivity and vulnerability. The problem occurs during a surplus condition when people fail to recognize that the U.S. has a high sensitivity to oil disruptions. Sensitivity is a measure of vulnerability and when sensitivity is high, there is a good possibility that vulnerability is high. In sum, despite report of a glut of oil in the international petroleum market, the margin between adequate and inadequate supply is so thin that a crisis in any one of the major oil exporting nations could produce a serious threat to global economic and political security.

II. U.S. RESPONSE TO 1973-74 AND 1978-79 OIL CRISES

A. INTRODUCTION

This chapter will first review the changes in U.S. oil dependence from 1947-1973; 1973-1979; 1979-1983. This section will be primarily historical, presenting the changes in U.S. dependence and explaining the causes. The second part of the chapter will review U.S. reactions and policies, i.e., the pre-embargo period; Nixon response to 1973; post embargo Ford and Carter policies; Carter and Reagan reactions to 79 crisis.

B. OVERVIEW OF U.S. OIL USE, PRODUCTION AND POLICY ISSUES

Before the war, and up to 1945, the United States was the leading exporter of petroleum products to Europe and to other parts of the world, but it soon lost that position as its relatively slowly growing oil production was required at home to sustain the country's rapid economic development. Its oil industry became a separate entity with such differences in price levels and in organization from the rest of the world as to necessitate an increasingly autarkic policy on the part of the United States, whose oil industry would have greatly diminished in size if it had been subjected to competition from outside in the 1950's and the 1960's. This situation has changed since 1973 because of

major increases in the price of international oil and because of the inability of the United States oil industry to produce enough oil to meet the country's growing demand [Ref. 48].

Before the 1930's holders of mineral rights were permitted to take as much oil as they could be drilling on their property, whether or not they drew oil from under other properties. This led to competitive drilling, with each party attempting to extract as much of the common oil pool as possible irregardless if the oil pool extended beyond the property boundaries. Not surprisingly, the result was extremely rapid exploitation of oil fields.

During the 1930's the solution in a number of oil producing states was for the state governments to allocate a share of the production to each of the landowners. The rate of extraction was called the "maximum efficient rate of production" or MER. Along with this, a statewide restriction on production was often imposed. These two measures were implemented in a number of states, including major oil producers such as Texas, Oklahoma, and Louisiana, and together they came to be called "market-demand prorationing" [Ref. 49].

The Texas Railroad Commission, a state institution that enforced market demand prorationing was very effective in instituting very rigid production controls and preventing wasteful uncontrolled pumping of oil. These controlling

agencies were also able to raise prices of crude oil under state direction. The domestic cartel price was substantially above the price that would have existed in a competitive market with unitized fields [Ref. 50].

In the 1950's as demand for oil increased, United States oil companies sought both oil and markets abroad to obtain lower cost crude oil supplies than they had available from their fields in the United States as a result of the prorationing. Their intention was to ship their cheap foreign oil back to the United States so as to increase the profitability of their domestic refining and marketing operations by selling the imported oil for a higher price.

By 1955 overseas imports had increased four times, and domestic producers were concerned that their domestic production would have to be cut back to make room for the indefinite expansion of overseas imports [Ref. 51].

For United States producers there was no remedy for the situation in the private sector. The only recourse was political in attempting to have the Federal Government solve the situation. As the phenomenon of an increasing dependence on oil imports coincided with the political difficulties of the Cold War and a feeling in the United States that much of the world was hostile to its power and influence, politicians quickly backed up the security-of-supply argument in their pleading for restrictions in imports of oil [Ref. 52].

In 1954 and again in 1958 the Federal Government called for voluntary restraint on the part of importing companies. These were ineffective and in 1959 President Eisenhower introduced mandatory quotas on both crude oil and oil products and effectively close the United States market to the unlimited entry of oil from the rest of the world except Canada and Mexico. (Canada and Mexico were excluded from the restrictions on the grounds that imports from these countries were not at risk as they did not depend on ocean transportation.) [Ref. 53]

The economic effects of this decision by the United States government gave a high degree of protection to domestic oil interest, whose output was maintained at a level far higher than it would have been with continued unrestricted foreign competition. The controls also produced a situation in which United States oil and coal reserves ran down faster than would have been the case if unlimited foreign oil had been allowed into the country, i.e., the U.S. managed to reduce sensitivity in the short run but at a cost of greater vulnerability in the long run as demonstrated by having a greater dependence on Middle East oil when the 1978 crisis occurred [Ref. 54].

The oil that became available on the world market as a result of import quotas in the United States dropped in price. As prices in the market fell, OPEC in 1960 was

organized to try to ensure that producing countries did not lose further revenues.

With the 1973 oil crisis, foreign oil prices rose to the point that the price of delivered foreign oil was comparable to domestic crude. In these circumstances the quotas served no function except to allocate the foreign crude among importers. The quotas were not keeping oil out, nor were they keeping domestic prices up. In April 1973, the President announced the end of import quotas and substituted a system of license fees to encourage domestic production and refining [Ref. 55].

With the 1973 oil crises and the resulting oil price hikes, U.S. consumers still wanted cheap energy. The Emergency Petroleum Act of 1973 was the beginning of a combination of measures that effectively kept the price of oil to U.S. consumers below the world level.

These energy measures have had the effect of taxing domestic oil production in order to subsidize oil imports [Ref. 56]. Under this policy the Federal Energy Administration set an average price that domestic producers would receive $7.66 for a barrel of oil in 1976. In order to refine this crude oil, the producer had to purchase a ticket called an "entitlement" at a cost of approximately $2 a barrel. This constituted a tax on domestic production. Imports were subsidized by granting refiners who imported oil at the (then) world price of about $12.5 a barrel an

entitlement worth $3 a barrel. Whatever the source of the imported oil the cost to refiners was the same $9.50 a barrel, and the price of oil was substantially below the world market price. Either way, the effective cost of oil to refiners was about the same $9.50 a barrel (See Table 18).

TABLE 18

Post-1973 Subsidizing of Oil Imports

Price Domestic Crude	$7.66	$12.50	World Price of Crude
Tax to Refine U.S. Crude	+2.00	- 3.00	Federal Subsidy
Total Cost to Refiners	$9.66	$ 9.50	Total Cost to Refiners

Source: Webb, Michael G., and Ricketts, Martin J., The Economics of Energy, p. 267, the Macmillan Press LTD, 1980.

As price controls on U.S. produced oil continued, the lower prices resulted in the U.S. increasing the quantity of its oil imports [Ref. 57]. With low prices shielding U.S. consumers somewhat from the rise in international prices, demand for oil continued to rise as there was little incentive for conservation. With U.S. oil production peaking in 1970, and oil producers not receiving higher prices to justify expanded production, the effects of these measures were that imports of crude oil rose from 4.7 mbd in 1972 to 8.6 mbd in 1977, the latter figure representing over 40 percent of consumption.

The 1978 oil crises were followed by a doubling of oil prices. Following the 1978 crises, oil prices were decontrolled and U.S. prices were allowed to rise to the world oil price. The following section assesses the dependence changes in oil imports.

C. REVIEW OF CHANGES IN U.S. DEPENDENCE

1. Introduction

This section will review that the United States became a net importer of petroleum (crude and products) in 1947. Thereafter, total consumption in the United States rose from approximately 6 million barrels per day in 1948 to over 17.3 million just before the embargo in 1973. Production of domestic crude oil and liquids rose from 5.9 million barrels per day in 1948 to 10.8 million in 1973, but it had peaked in 1970 at 11.2 million. Imports represented over 36 percent of consumption by 1973; midway in that year, direct imports of Arab oil were running one million barrels per day (or 5 percent of the total oil consumed), up from less than half that amount a year and a half earlier [Ref. 58].

2. Review of Changes in U.S. Dependence: 1947-1973

Between 1850 and 1973, energy consumption increased some thirty-five times over. Petroleum has not always played a significant role in the U.S. energy picture. In 1850, wood was the major source of energy in the U.S. supplying 91

percent of the total consumed. This trend continued as late as 1870 when America obtained three quarters of its energy from wood. Coal by 1910 had replaced wood by contributing 77 percent to the total energy.

The modern oil industry was born in the United States in 1859. From the beginning, the United States supplied not only its own needs but, as the leading exporter, those of much of the rest of the world as well. As late as 1929, a third of the total demand for oil outside the United States was met by U.S. exports. Out of seven million barrels of oil used by the Allies in World War II, six were provided by the United States [Ref. 59]. In 1949, the National Petroleum Council remarked that oil was a prime weapon of victory in two world wars and it was the bulwork of our national security [Ref. 60]. By 1950 petroleum had passed coal as the main contributor of energy and by 1976 supplied 47.3 percent of the total (See Table 19) [Ref. 61].

Total energy consumption more than doubled (see Table 19) between 1950 and 1973. The shift away from coal was substantial--from a third to a sixth of total energy consumption. During this time, American society was conditioned to the easy availability of energy, especially oil. Between 1950 and 1973, the price of domestically produced crude oil declined in real terms by 21 percent. The composite price of all domestically produced fossil fuels fell by 19 percent [Ref. 62].

TABLE 19

U.S. Energy Consumption: 1950-1973

	1950		1973		
	mbdoe*	% of total	mbdoe	% of total	Absolute Growth
Domestic Oil	5.7	36	10.4	29	82%
Imported Oil	.6	4	6.1	17	917%
Coal	6.1	38	6.3	18	3%
Natural Gas	2.8	18	10.7	30	282%
Hydro	.7	4	1.4	4	100%
Other**			.4	1	
Total	15.9	100	35.3	100	122%

*mbdoe = millions of barrels daily of oil equivalent

** includes nuclear

Source: Energy Information Agency, Report to Congress, 1979, Vol. II, pp. 7, 13.

The reasons oil was being substituted for coal was twofold: First, the easy availability of oil especially cheap foreign oil; and second, influential environmental organizations whose increased concern for the environment caused legislation requiring the use of oil as a preferred fuel over coal in many industries [Ref. 63]. Concern about the environmental impact of burning coal led to fuel switching to oil. This change led to a dramatic increase in oil consumption by oil companies. For example, between 1968 and 1973, oil consumption by electric utilities more than tripled, much of this being low sulfur imported oil [Ref. 64].

The reason for the rapid growth in the demand for oil in the United States through the nineteen-sixties were many, but the most important was probably the fall in domestic real prices for oil combined with a high rate of growth in the economy. In January, 1969, the price of oil, when compared with the price of other products at wholesale, was 10 percent lower than it had been eleven years earlier. Energy was becoming cheaper relative to almost everything else, and demand both in the United States and in the world reacted accordingly.

In the United States consumption of oil and its products grew at an annual rate of over 4 percent during the nineteen-sixties, rising to a 5.4 percent annual growth rate during the period 1967-72. The supply from domestic

TABLE 20

U.S. Crude Oil Consumption and Imports: 1960-1973

Millions of Barrels Per Day

	Consumption	Imports	Percent of Imports
1960	9.8	1.8	18%
1961	9.8	1.9	19.3%
1962	10.4	2.1	20%
1963	10.7	2.1	19.6%
1964	11.1	2.2	19.8%
1965	11.5	2.5	21.7%
1966	12.1	2.6	21.4%
1967	12.6	2.5	19.8%
1968	13.4	2.8	20.8%
1969	14.1	3.2	22.6%
1970	14.7	3.4	23%
1971	15.2	3.9	26%
1972	16.4	4.8	29%
1973	17.3	6.3	36%

Source: U.S. Department of the Interior, Bureau of Mines, Minerals and Materials, February 1978, p. 19.

sources failed to keep pace. One factor depressing the long-run development of domestic crude-oil reserves was the severe restriction on output that state prorationing controls imposed during the fifties and early sixties. In 1963, for example, the large, efficient, low-cost fields in Texas were cut back to under 30 percent of maximum efficient rate, while the high-cost stripper wells were allowed to produce without restriction. The result was a dampening of profit incentives for further exploration and development [Ref. 65].

When demand presses upon capacity, as it did upon domestic capacity after 1970, the price will rise and the market will go in search of cheaper alternatives. As matters worked out in the early nineteen-seventies, the cheapest alternative was imported oil. Until 1973, quantitative restrictions on imports prevented the wholesale substitution of foreign for domestic production, but when increasing demand for lagging domestic supply began to push prices up, the import restrictions gave way. Meanwhile, the alternative domestic energy sources, instead of absorbing part of the incremental demand as oil prices rose, actually contributed elements of their own to the growing energy shortage [Ref. 66].

The turning point came in 1970, when U.S. oil production reached its peak and then began to decline. By 1972 spare production capacity was exhausted. Consequently,

the U.S. would have to seek foreign oil to meet any additional oil requirements as well as enough to make up for falling domestic production.

In 1970, the year of greatest domestic petroleum production, when 4.12 billion barrels were supplied by producers in the U.S., only 1.16 billion barrels, or 22 percent of the total consumed, came from foreign sources. By 1974 domestic production was down to only 3.85 billion barrels, and imports were 2.19 billion barrels, or 36 percent of total consumption [Ref. 67].

Consumption rose in 1971-73 at 4 percent per year and nobody noticed that domestic oil was harder to find. In order to make up for this growing gap between supply and demand, we turned to importing more oil [Ref. 68]. U.S. imports of crude oil rose by 145 percent from 1970 to 1973 and 46 percent between 1972 and 1973 [Ref. 69]. During this same time period, 1971 to 1973, net oil imports into OECD countries rose by 22 percent, straining world oil production capacity [Ref. 70].

Beginning in 1970 world demand for oil was rising at an astronomic rate and the U.S. was one of the biggest demanders. The U.S. oil companies were unable to discover new reserves fast enough to keep pace with the demands.

3. 1973 Embargo: Changes in U.S. Dependence

When the 1973 Arab oil embargo struck, the U.S. was caught in an energy crisis for which it had no plan.

TABLE 21

U.S. Domestic Oil Production Trend

1960	7.9 mmb/d	1969	10.8 mmb/d
1961	8.2	1970	11.3
1962	8.4	1971	11.2
1963	8.6	1972	11.2
1964	8.8	1973	10.9
1965	9.0	1974	10.5
1966	9.6	1975	10.4
1967	10.2	1976	9.8
1968	10.6	1977	9.7

Source: U.S. Department of the Interior Bureau of Mines, Minerals and Materials, February 1978, p. 19.

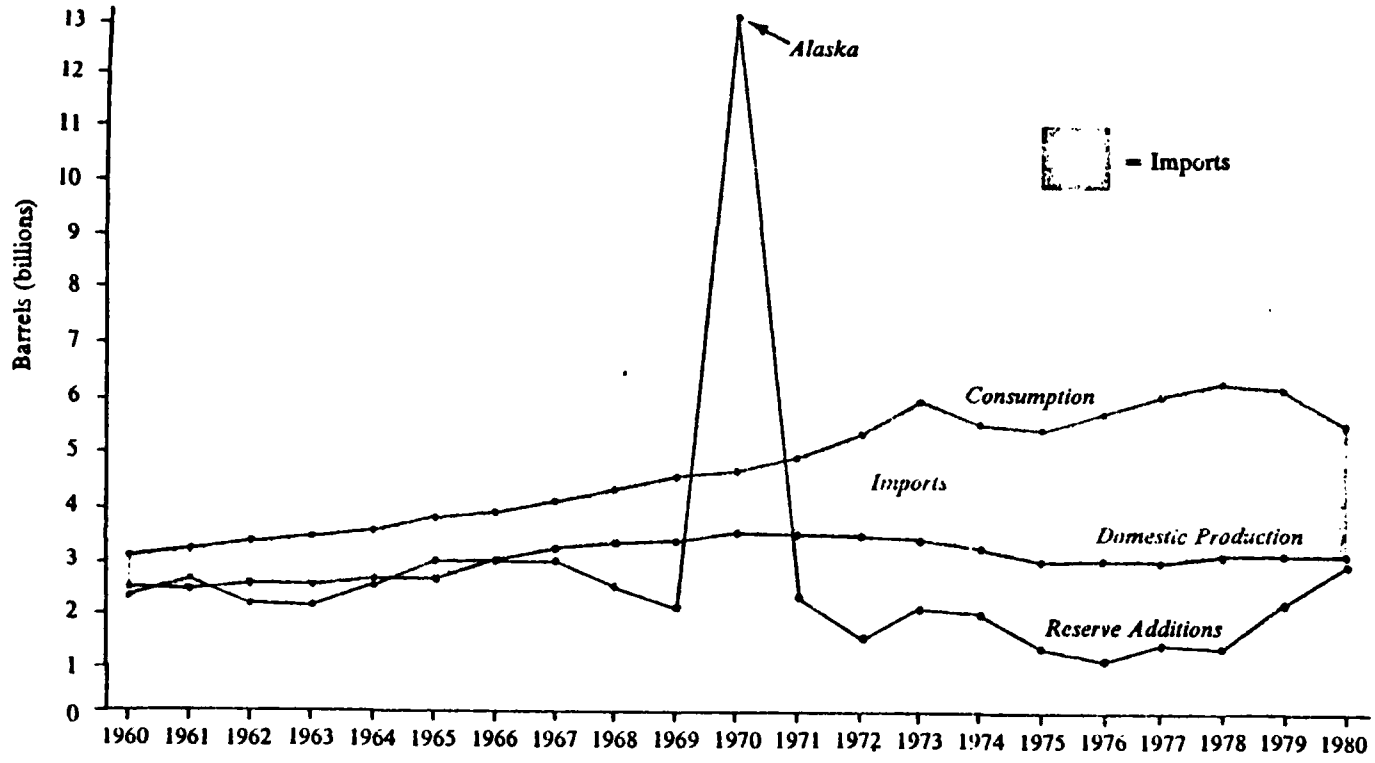


Figure 6 U.S. Oil: The Passing of Self-Sufficiency

Source: Yergin and Hillenbrand, p. 103.

TABLE 22

U.S. Oil Imports: 1970-73

Million of Barrels Per Day

	1971	1972	1973	Rise: 1973 over 1968 (percent)
United States	3,930	4,740	6,205	17.2%

Source: B.P. Statistical Review of the World Oil Industry, 1973.

By 1973 we were importing close to 39 percent of our oil (around 6.8 mmb/d with consumption about 17.3 mmb/d). Of the 39 percent imported oil, OPEC oil was accounting for 44 percent (3.0 mmb/d). The remaining 3.3 mmb/d or 56 percent was non OPEC.

On October 16, 1973, a world that was consuming oil with abandon got a sudden shock. OPEC announced that it was doubling the price. The jump in price was unexpected. Arab governments reduced oil production by 10 percent near the end of October 1973 and embargoed the shipment of their oil to the U.S. Resentful of U.S. resupply of Israel during the October 1973 Arab-Israeli war, Arab producers cut production 25 percent. The OPEC embargo directly jeopardized 28 percent of U.S. imports of crude oil [Ref. 71].

During the embargo of 1973-74, consumers paid on the open market as much as 17-18 dollars per barrel compared with 3 dollars a barrel before the embargo. The embargo was undoubtedly effective in keeping both crude oil of Arab origin and the bulk of petroleum products refined from Arab crude in Europe or the West Indies from reaching the U.S. market during the embargo period.

The 1973 embargo caused U.S. oil imports to fall only from 6.8 million barrels per day in November 1973 to 5.3 million in January 1974. Thereafter, imports continued to climb with 6.1 mmb/d average for 1974.

TABLE 23

Monthly U.S. Oil Imports

During the Arab Embargo, 1973-74

	1973			1974		
	Oct	Nov	Dec	Jan	Feb	Mar
Arab Countries						
Algeria	147	62	1	---	3	8
Bahrein	19	18	3	---	---	---
Egypt	25	---	---	---	---	---
Iraq	12	---	---	---	---	---
Kuwait	56	63	---	---	---	---
Libya	203	138	24	1	17	5
Oman	1	---	---	---	1	2
Oatar	18	9	2	---	---	---
Saudi Arabia	788	635	196	21	39	86
United Arab Emirates	62	107	---	10	---	---
Total, Arab Countries	1336	1035	228	32	59	103
Total, Non-Arab Countries	5189	5826	5718	5323	5162	5112
Total, All Countries	6525	6864	5945	5335	5221	5215

Source: U.S. Bureau of Mines, pp. 33-95.

Since the 1973 oil embargo, the U.S. has dramatically increased its oil imports. Net refined and crude imports rose from about 6.3 mmb/d in 1973--representing 36 percent of U.S. oil consumption--to about 8.5 mmb/d in 1979--approximately 43 percent of U.S. oil consumption [Ref. 72]. The countries responsible for the 1973 oil supply interruption now provided a much larger share of U.S. petroleum imports. In 1973 AOPEC provided 5 percent of U.S. domestic demand (.9 mmb/d). By 1979 AOPEC provided 17 percent or 3.1 mmb/d of U.S. import needs.

After the initial shock of the 1973-74 embargo wore off, concern shifted to the other component of energy security: affordability. Noting the prices that people were prepared to pay to get oil, the Shah of Iran convinced most of the OPEC nations that it would be safe to double the price again; they did so on 1 January 1974 [Ref. 73].

This led to panic buying mainly by the U.S. that followed the Arab boycott led to further doubling of the price. The era of cheap oil was over, and as from January 1, 1974, oil was costing its consumers four times more than it had in the previous September. By 1978 its share had risen to 39 percent, or 17 percent of U.S. domestic demand.

By 1979 the U.S. was importing over 40 percent of its petroleum. The proportion of oil imports climbed as high as 48 percent in 1977. Since then Alaskan oil, high prices,

conservation and foreign revolutions have reduced the proportion to 43 percent.

TABLE 24

U.S. Imports from 1973 to 1979

	Total	Imports	Percent
1973	17.3 mmb/d	6.4 mmb/d	36%
1974	16.7	6.1	37%
1975	16.3	6.0	37%
1976	17.5	7.3	42%
1977	18.4	8.8	48%
1978	18.8	8.1	43%
1979	19.0	8.1	43%

Source: Monthly Energy Review, Department of Energy, 1979.

In 1979 the U.S. sustained the high import rate because importing was the most economical way to fill the gap between domestic production and demand [Ref. 74]. Before the events in Iran, the U.S. was the second largest market, behind Japan, for Iranian oil. In 1978, U.S. imports of Iranian crude oil accounted for 9 percent of U.S. oil consumption [Ref. 75].

Through 1978, Iran accounted for approximately 10 percent of the world's oil production, with output of 5 million to 6 million barrels per day. The overthrow of the Shah in early 1979 led to a 10 week period in which Iran produced almost no oil. With the fall of the Shah in Iran,

oil prices increased two and one half times its former level. The Iranian crisis led to world oil prices being raised a staggering 120 percent in 1979, from an average of 13 dollars per barrel at the beginning of January to 28 dollars by the end of December [Ref. 76].

Still, in 1981 foreign oil accounted for 36 percent of all the oil Americans used and 31.6% as of mid-1982. And despite the decreased volume of imports, the 1981 oil import bill was $76.7 billion--only a little less than 1980's $80 billion [Ref. 77].

Petroleum was the principle U.S. energy import in 1982. During 1982, petroleum (crude oil and refined petroleum products) accounted for 88.7 percent of total energy imports. In 1982, the United States imported more crude oil but less refined petroleum than in 1973. Imports of crude oil grew 6.7 percent while imports of refined petroleum fell 50.3 percent over the 9-year period [Ref. 78].

The large drop in net imports of energy into the United States in 1982 was the fifth consecutive annual decrease. The peak year for net imports of energy was 1977. The 1982 net imports level is only 41 percent of the 1977 record level and just 58 percent of the 1973 net imports total. Net imports of energy into the U.S. accounted for 10.4 percent of the Nation's total energy consumption in 1982, down from the 1981 net imports contribution of 13.0

TABLE 25

U.S. Crude Oil and Petroleum Products: 1973-1983

	Total	Imports	Percent	OPEC (%)	OPEC (%)
1973	17.3	6.3	36%	3.0 (17%)	.9 (5%)
1974	16.7	6.1	37%	3.3 (19%)	.8 (5%)
1975	16.3	6.1	37%	3.6 (22%)	1.4 (9%)
1976	17.5	7.3	42%	5.1 (29%)	2.4 (14%)
1977	18.4	8.8	48%	6.2 (33%)	3.2 (17%)
1978	18.4	8.4	43%	5.8 (32%)	3.0 (16%)
1979	18.5	8.5	43%	5.6 (30%)	3.1 (17%)
1980	17.0	6.9	41%	4.3 (25%)	2.6 (15%)
1981	16.1	6.0	37%	3.3 (20%)	1.8 (11%)
1982	15.3	5.0	33%	2.1 (14%)	.8 (5%)
1983 (Jan)	15.3	4.3	28%		

Source: Monthly Energy Reports, March 1983, Department of Energy.

percent, and significantly lower than the 1977 net imports portion of 23.6 percent [Ref. 79].

In sum, the U.S. increased its oil imports considerably after the 1973 oil crisis. After the 1978 oil crisis, oil imports have begun to decline to the point where Arab OPEC levels are the same now as they were in 1973 (see Table 25). The important point is that the U.S. is just as dependent on oil imports from countries in the vulnerable Persian Gulf area as it was during the time of the 1973 embargo [Ref. 80].

D. U.S. REACTIONS AND POLICIES

The 1973 Arab oil embargo and the 1978 Iranian crisis caught the United States by surprise. In both cases, the United States was ill-prepared to cope with the sudden decrease of available foreign oil and the ensuing rise in crude oil price.

The most salient reason that the 1973 oil embargo caught the U.S. by surprise was that no one fully anticipated the emerging dependence and vulnerability associated with the Middle East. Consequently, there were no policies to cope with an interruption of a significant amount of imports of crude oil and products into the United States. Although the possibility of a disruption of Arab oil supplies had been aired for some time in public and intergovernmental discussions, neither government nor industry took steps to

provide for increased imports from alternative sources in such an emergency [Ref. 81].

The focus of our leaders in the 1960's and early 1970's was primarily on the Soviet threat, Vietnam, civil rights, Watergate, and space exploration. No one thought an oil cartel composed of unstable Gulf States could cooperate on anything especially manipulating oil exports.

1. Pre-1973 Embargo Responses

A brief description of the U.S. response to the energy situation before the 1973 oil embargo is necessary in order to adequately understand the entire scope of U.S. dependence on oil. In less than 50 years the U.S. had gone from energy self-sufficiency to a significant dependency on imported energy. In March 1959 the federal government instituted the mandatory oil import program, imposing a quota based upon a percentage of domestic production which lasted until 1970. The oil import program of the U.S. limited petroleum imports (with the exception of imports of residual fuel oil) to 12 percent of domestic production. Thus the U.S. drew on world markets for only a fraction of its additional oil demand [Ref. 82]. The effect of the quota was to promote the development of domestic production capacity and to maintain domestic crude prices about 60 percent higher than foreign prices. One result of the quota was that U.S. dependence on foreign imports stayed at less than 25 percent of domestic oil consumption [Ref. 83].

However, the oil import quota created a recurring windfall gain for U.S. refiners by giving them the rights to the restricted (but cheaper) oil imports in proportion to their shares of domestic refinery "throughput." The quota had a number of unintended and apparently ill side effects, i.e., a shortage of domestic refining capacity in the early 1970's (because of uncertainty about access to crude oil within the U.S.), and a sharp increase in oil imports just before the Arab embargo of 1973 (through the rapid relaxation of the quota in an attempt to stem crude oil price increases) [Ref. 84].

After 1970 the government relaxed oil import quotas in the U.S. to meet the projected gap between domestic demand and domestic production at prevailing energy prices. As a result of the more liberal quota policy and domestic price controls which tended to discourage domestic production, net petroleum imports in the U.S. increased from 21 percent of total consumption in 1969 to 28 percent in 1972. In April 1973 President Nixon removed the mandatory quotas entirely and replaced them with a less restrictive system of license fees or tariffs which further encouraged oil imports [Ref. 85]. By 1973, the year of the oil embargo, the oil import figure had risen to 36 percent [Ref. 86].

Oil was the only commodity in the entire economy that was never freed from President Nixon's temporary wage and price controls imposed in 1971. This created an inevitable

gap between supply and demand for domestically produced oil. We bridged it by importing more oil, leaving us vulnerable [Ref. 87].

Nixon was concerned with becoming too dependent on foreign sources of oil. However, in 1971 Nixon imposed an across the board temporary wage and price freeze. These controls did not allow oil prices to rise. Production from oil wells was leveling off and the development of new sources was proving expensive. The artificially low price of domestic oil discouraged new expensive exploration. But it also allowed consumers to go on guzzling oil as if nothing had happened.

2. Responses to 1973 Embargo

U.S. foreign policy during the embargo was directed toward persuading the Arabs that their boycott of the U.S. was unwarranted [Ref. 88]. Three weeks after the 1973 embargo Nixon announced the goal of energy independence by 1980: "Let us set as our national goal, in the spirit of Apollo, with the determination of the Manhattan project, that by the end of this decade we will have developed the potential to meet our own energy needs without dependence on any foreign energy sources" [Ref. 89]. Unfortunately for Nixon and Congress, the oil dependence and vulnerability problem was considerably more serious and complicated than anyone realized.

The U.S. government was not aware of its degree of dependency on imported oil. Congress declared, "Only since November 1973 has the nation discovered the full dimensions of U.S. increasing dependence on oil from the Arab states. Thought to be five to six percent dependent on Arab oil, it was determined the U.S. was 14 to 18 percent dependent [Ref. 90]. After 1973 the easy assumptions about limitless cheap energy to fuel economic growth were suddenly dispelled. According to the U.S. Congress in December 1973, "The burgeoning U.S. energy crisis has dealt our nation the most serious threat to its national security since World War II" [Ref. 91].

The U.S. was ill-prepared for the 1973 Arab oil embargo. When it came, the U.S. encouraged oil companies to spread the burden equally among all consuming countries [Ref. 92]. In response to the Arab oil embargo, the U.S. proposed an International Energy Program (IEP) to coordinate the energy policies of the industrial oil importing states. The U.S. argued that the IEP establish a 7 dollar floor price so that cheaper oil would not destroy incentives for investing in long term energy alternatives.

The U.S. strategy following the Arab oil embargo of October 1973 was to maintain control on the wellhead price of domestic oil and prohibit exports of Alaskan oil. It is very important to note that the price controls on domestic crude oil implemented as part of the general price controls

of 1971-1974 took on a life of their own. The purpose of tying the controlled price of oil to 1972 production levels reflected the motive of preventing U.S. crude oil producers from reaping windfall profits on the sharp increase in world oil prices in 1973-74. The government was very concerned that U.S. oil producers would try to take advantage of the sudden fourfold increase in crude oil prices and thus try to increase domestic production. An important side effect of the controls, which restricted domestic U.S. crude oil production, was to increase the demand for crude oil imports [Ref. 93].

The general consensus in Congress during the embargo was that the inflated oil prices would drop considerably once events that had precipitated the embargo had been normalized. Many believed the inflated prices would create a glut in the market and dissolve OPEC. However, the full impact of the embargo was not to be realized until a much later date. This lack of foresight was the reason Congress did not use the Naval Petroleum Reserves to ease the decreased oil imports during the embargo. The following sections will assess each administration's response to the 1973 and/or 1978 oil crisis.

a. Nixon Response

Responding to the oil embargo, President Nixon stated in an address to the American people on November 7, 1973, that the national goal by the end of the decade should

be to meet U.S. energy needs without any dependency on foreign oil [Ref. 94]. Nixon stated, "Let us set as our national goal, in the spirit of Apollo, with the determination of the Manhattan Project, that by the end of this decade we will have developed the potential to meet our own energy needs without dependence on any foreign energy sources." But Watergate, not energy, was on the mind of the President so the desire and ability to do much about energy were sharply limited [Ref. 95].

President Nixon had recently imposed price and wage controls on the economy in an effort to slow the inflation. When the 1973 embargo occurred, the oil-producing countries in a span of six months raised the price for imported crude oil by over 300 percent. The increased import prices created problems in the United States significantly different from those of its trading partners in Europe and Japan. First, the U.S. still produced over half the petroleum it consumed. It was considered unfair that these American producers should benefit by receiving the artificially high prices charged by the OPEC countries. Second, although the United States' domestic oil market had (and still has) a multitude of competing firms--major oil companies, independent oil companies, and small oil companies--the major oil companies had the main access to the cheap foreign oil; giving them, it was thought, an

undeserved competitive advantage. Third, consumers had come to treat inexpensive energy as a necessity [Ref. 96].

The U.S. government reacted by controlling oil prices, as embodied in the Emergency Petroleum Allocation Act (EPAA) of 1973. As price controls on U.S. produced oil continued, the lower prices brought the logical result: the U.S. increased the quantity of its oil imports. The low prices shielded consumers somewhat from the rise in international prices, and thus did little to encourage conservation; they did even less to encourage domestic production. Legislation was passed that attempted to increase conventional domestic oil production by offering incentives such as higher prices for certain categories of oil with, presumably, higher potential production. For example, new oil discovered after 1973 was priced higher than old oil discovered before 1973 [Ref. 97].

Ironically, an administration strongly committed to the free market ended up regulating and rigidifying the petroleum market with price controls, with an allocation system that encourage oil imports and inefficient refiners [Ref. 98].

b. Ford's Response

The Ford Administration was devoted to trying unravel the controls and regulations that had been imposed by the Nixon administration [Ref. 99]. But in response to Watergate, voters had sent a heavily Democratic Congress

back to Washington in the 1974 elections. Some of the new members, highly critical of "big oil," wanted to roll back oil prices. With inflation still a primary concern, price decontrol was not exactly a popular issue [Ref. 100].

By the time President Ford released the Project Independence report in November 1974, U.S. energy policy-makers were aware that under no political circumstances could the United States become totally self-sufficient in energy at reasonable economic costs. President Ford's motto, "reasonable self-sufficiency," was heard more and more. Although the Project Independence report reflected this new mood in concluding that it would be difficult for the U.S. to reduce its dependence on imported petroleum substantially before 1980, the report's energy supply projections were wildly optimistic [Ref. 101].

President Ford advocated bold initiatives, designed for the most part to encourage development of domestic energy supplies: creation of a 300 million barrel strategic petroleum reserve (SPR), a tariff on imported crude oil, attempts to decontrol domestic oil and natural gas prices, the authority to order major power plants to convert from oil and gas to coal [Ref. 102]. Additionally, Congress approved the Alaskan pipeline. This made possible the single most important contribution to American energy supply in the 1970's. The Alaskan pipeline project when completed would contribute 1.5 million barrels a day [Ref. 103].

In 1975, Congress set fuel efficiency standards for the automobile industry. By 1985, averages would have to double to 27.5 miles per gallon. Since one out of every nine barrels of oil used in the world every day was burned as gasoline on American highways, such a change would have a major impact not only on America's oil balance [Ref. 104].

President Ford proclaimed the Project Independence theme with what might be called a "high production" strategy. In January 1975, he called for a ten year program to build 200 nuclear power plants, 250 major coal mines, 150 major coal-fire power plants, 30 major oil refineries, and 20 major synthetic fuel plants [Ref. 105].

This strategy proved unrealistic for a variety of reasons. One of the most important was that the environmental movement had been gaining momentum since the late 1960's. The strongest impact had initially been on the strip mining and burning of coal, but in the mid-1970's it was even more so on nuclear power. By 1974, a national movement opposing atomic energy had taken clear shape. Environmentalism was not by any means solely responsible for the difficulties encountered by nuclear power; rather, it interacted with the economics--continually rising costs, inflation, and, later high interest rates--to place major roadblocks in the way of nuclear's further development [Ref. 106].

c. Carter's Response

The main objective of the Carter National Energy Plan was to reduce imports of crude oil and oil products and to limit the effect of interruptions to supply. In April 1977 Carter introduced his plan which placed greater emphasis on coal use (to be doubled by 1985) and on conservation. Carter said, "our goal is to reduce our growing dependence on foreign supplies of oil" [Ref. 107]. The first step Carter took was the creation of a single U.S. Department of Energy. This was followed by the first National Energy Plan with the goal of reducing reliance on oil imports from projected levels of 16 mmb/d in 1985 to 6 mmb/d. In addition, the Strategic Petroleum Reserve was to be expanded to 1 billion barrels [Ref. 108].

The president postulated ten fundamental principles as the underlying rationale for the plan and the framework within which present future policies should be formulated. In summary, the ten principles are: 1. The energy problem can be effectively addressed only by a government that accepts responsibility for dealing with it comprehensively and by a public that understands its seriousness and is ready to make necessary sacrifices. 2. Healthy economic growth must continue. 3. National policies for the protection of the environment must be maintained. 4. The U.S. must reduce its vulnerability to potentially devastating supply interruptions. 5. The program must be

fair. The United States must solve its energy problems in a manner that is equitable to all regions, sectors, and income groups. 6. The growth of energy demand must be restrained through conservation and improved energy efficiency. 7. Energy prices should generally reflect the true replacement cost of energy. 8. Both energy producers and energy consumers are entitled to reasonable certainty about government policy. 9. Resources in plentiful supply must be used more widely and the nation must begin the process of moderating its use of those in short supply. 10. The use of nonconventional sources of energy--such as solar, wind, biomass, geothermal--must be vigorously expanded [Ref. 109].

The *U.S. Congress*, which feared incurring the wrath of its constituents if it supported higher energy prices, did not share the president's sense of urgency about the energy crisis. Most members of Congress, like most citizens, believed either that the energy crisis would pass with time or that the crisis had been manufactured by the energy industry to bolster its prices and profits. While Congress, the administration, the media, and the energy industry traded charges and countercharges about who was to blame for the energy crisis, little progress was made formulating a national energy program [Ref. 110].

The first Carter program was thoroughly worked over by Congress. The problem that President Carter's

National Energy Plan encountered in Congress was, that although legislators agreed that higher domestic oil and natural gas prices were needed to encourage conservation, they could not agree on how high oil prices should get or who should benefit from the increases [Ref. 111].

The Energy Bill, which was approved by the 95th Congress in early October 1978, differed substantially from Carter's first energy plan. Although Congress largely agreed with the objectives of the Energy Plan, it refused to endorse many of President Carter's proposed measures to achieve them. A notable omission from the approved bill was the proposed tax on crude oil. Even though the energy plan's proposals would not have resulted in the domestic price of crude oil being equal to the price of imports, the gap between these two prices would have been substantially reduced [Ref. 112].

The December 1978 passage of the National Energy Act was heralded as a major step toward reducing U.S. dependence on imported oil. In reality most of the provisions had only a marginal impact on the way Americans produced and consumed energy, while others, particularly the Powerplant and Industrial Fuel Use Act (PIFU), actually served to increase oil imports by limiting the use of natural gas by electric utilities [Ref. 113].

Although oil imports fell from 8.8 mmb/d in 1977 to 8.2 mmb/d in 1978, the U.S. energy situation had

improved very little since 1973. Much of the decline had occurred because of rising domestic Alaskan oil production, a drawdown in oil stocks that had been built up to historically high levels in the fourth quarter of 1977 when a national coal strike had been feared, enhanced conservation in response both to rising OPEC prices, and fear that the 1976-1977 gas shortage would be repeated. By the time of the Iranian crisis of 1978, the U.S. oil import bill hovered around $3 billion per month [Ref. 114].

d. Iranian Crisis: The Domestic Policy Response

Gas lines from April through June 1979 created national hysteria. President Carter admonished the nation in April 1979 that the nation's energy problem was serious and getting worse. "Our national strength is dangerously dependent on a thin line of oil tankers stretching halfway around the earth to the Persian Gulf," warned Carter. "We must produce more. We must conserve more."

In July 1979, the President offered a second energy program, built around an $88 billion synthetic fuels effort--primarily liquids from shale and liquids and gas from coal. Unfortunately Carter's effort to reduce U.S. vulnerability from another oil disruption was ineffectual as demonstrated by the 1978 oil crises. Once again, the U.S. was unprepared for a sudden decrease in foreign oil. The continued regulation of oil prices was one of the

major reasons why the U.S. found itself to be even more dependent on foreign oil in 1978 than in 1973.

The U.S. response to the 1978 oil disruption was typical of the lack of preparedness and action demonstrated in the 1973 oil crisis. The U.S. dispatched several high level emissaries to Saudi Arabia to encourage them to raise production. However, Saudi officials continued to state that only the enactment of a comprehensive U.S. energy policy designed to limit oil-import dependence could fundamentally alter the pressures on world oil supply and demand [Ref. 115].

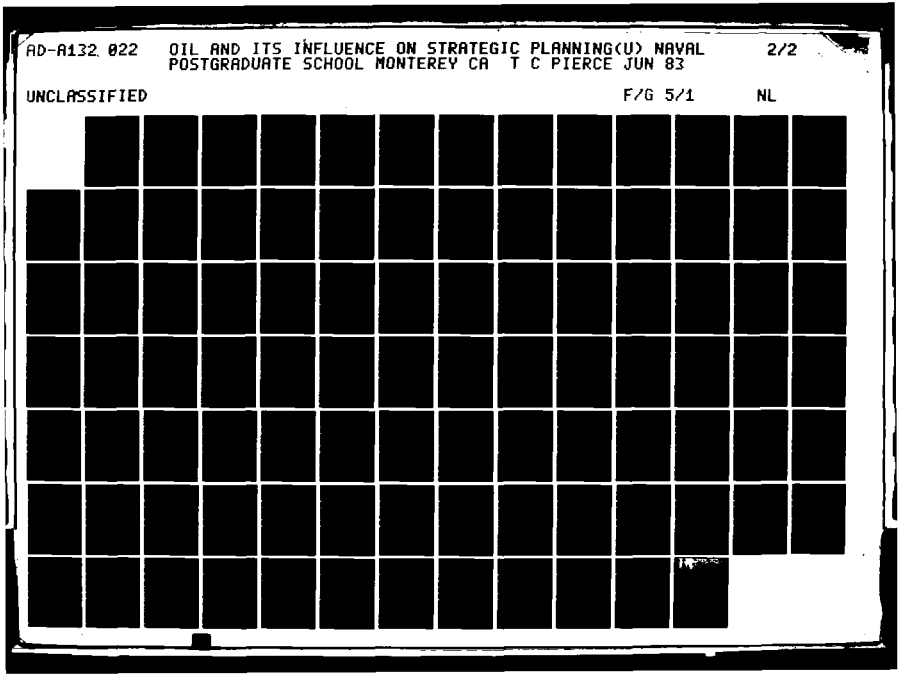
In April 1979 the U.S. began the gradual decontrol of domestic oil prices that will end the subsidization of imports. At this time, the Department of Energy issued a response describing the steps being taken to mitigate the oil shortages: 1. Increased production at Elk Hills Naval Petroleum Reserve 2. Reduction in the federal use of oil 3. Gradual decontrol of domestic crude oil prices 4. A second energy program built around 88 billion dollar synthetic fuels effort.

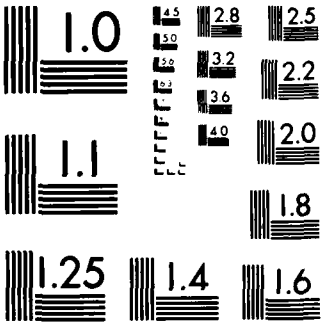
e. Reagan's Response

The Reagan administration has responded to the oil problems of the 70's by relying on free market forces to solve the energy problems. The election of Ronald Reagan clearly indicated that there was not yet a consensus on the energy problem in the United States. As to the role of the

government, the Reagan administration set its agenda in conscious opposition to that of the Carter administration. For the Reagan administration, the government was seen as the real source of the energy problem. In 1978, at the time of congressional action on Carter's First National Energy Plan, Michael Halbouty, subsequently head of the Reagan administration's energy task force in 1980, declared, "There is no question that the public is confused about the energy situation. I would like to clarify a flagrant misconception by making it perfectly clear that there is no energy crisis in the United States. This country has a tremendous amount of energy potential. But there is a very very serious energy problem--in fact, the problem is a crisis--namely, Washington has politically manipulated, interfered, and imposed dictatorial controls and regulations which severely stymied discretionary productive efforts by the energy industries" [Ref. 116].

In place of a policy concentrating on reducing demand by a vast program of energy conservation measures and the implementation of alternative energy strategies, the present policy is based on complete confidence in the market. "if we had applied a free market policy on energy questions from the beginning," according to one of the new men on the Reagan White House Staff, "I think we would not have an energy problem today" [Ref. 117].


AD-A132 022 OIL AND ITS INFLUENCE ON STRATEGIC PLANNING(U) NAVAL POSTGRADUATE SCHOOL MONTEREY CA T C PIERCE JUN 83
2/2
UNCLASSIFIED
F/G 5/1
NL



f. A Free Market Policy

The free market approach consists of encouraging private sector preparation for the possibility of disruptions by establishing a policy of not interfering in the free market pricing and allocation of oil in the event of a disruption. The risk of temporarily higher oil prices sometime in the future would induce oil consumers to hedge by stockpiling oil, signing long-term purchase agreements with domestic suppliers, and undertaking oil conservation measures [Ref. 118].

The emphasis on the free market approach has led the Reagan administration to request the dismantling of the regulatory system that has held up the development of domestic production and also the Department of Energy created by President Carter in 1976. The basic objective is to stimulate domestic energy production under the effect of the rise in world prices. The only major exceptions to this rule are the Strategic Petroleum Reserve, which is regarded in a national security perspective as a defense against oil import interruptions [Ref. 119].

The Reagan administration, confident in its new free market philosophy appears to be bringing a clear separation between energy policy and security matters. Energy questions, which were a central concern of the Carter administration, have seemingly been reduced to their purely economic and national dimension, and left to private

industry [Ref. 120]. Consequently the administration has virtually eliminated conservation and solar budgets, and greatly reduced support for synthetic fuels development. Reagan laid aside the post 1985 fuel efficiency standards for the auto industry. Contingency planning for energy emergencies has been downgraded.

One of the most controversial issues of domestic energy policy is whether the decontrol of oil will raise production enough to offset the declining reserve base of oil. The United States is unlikely to produce more oil in 1985 or 1990 than it does today given the fact that consumption continues to outpace production [Ref. 121].

E. CRITICAL LESSONS LEARNED FROM 1973 and 1978

The 1973 oil crisis demonstrated that the U.S. was vulnerable to oil supply disruptions from the Middle East in which it was strongly dependent upon. The U.S. did not learn its lesson from this experience because by the time of the second oil crisis in 1978 it was even more dependent on Middle East oil. Also, the U.S. was more vulnerable in the 1978 crisis because it had failed to institute policies to find viable substitutes to oil or increase domestic production which had peaked in 1970. During this period, the government kept oil prices artificially low to world oil prices which caused consumers to take their cheap oil for granted.

The American people assumed that the federal government would evolve a policy to protect Americans from future supply disruptions. However as noted, the government's response to the 1973 oil crisis was very similar to the people's. The government instead of planning for a future oil interruption was more concerned with the windfall profits of oil companies. As a result, the Strategic Petroleum Reserve just before the Iranian revolution contained only 92 million barrels--about 12 days of imports [Ref. 122].

The 1973 Arab oil embargo seemed to have taught the U.S. nothing when the Iranian revolution curtailed production in 1979. The filling of the Strategic Reserve that was to alleviate oil shortages during a future oil crisis was delayed and domestic price controls continued to encourage oil imports to rise to a peak of 47 percent of oil consumption by 1977. Yergin argues that the second oil shock in absolute terms was more significant [Ref. 123].

Decontrolling in itself will not decrease our vulnerability. The U.S. presently imports over 30 percent of our oil which is close to 1973 oil dependence. However, the less dependence trend has created a false optimism that our problems are solved as can be exemplified in William Turcker's The Energy Crisis is Over. "On January 28, 1981, after less than a week in office, President Reagan announced that he was bringing an immediate end to the price controls

that had governed American oil for almost ten years. With that simple act, the energy crisis of the 1970's ended" [Ref. 124].

However, even with decontrol, oil industry officials project declines in domestic oil production levels during the 1980's, and the U.S. will be hard pressed to meet its goal of halving imports by 1990 [Ref. 125].

The U.S. never learns from its previous mistakes when a surplus appears. Americans assume that it is a permanent condition and they tend to relax and not worry about the future. Even following the 1978-79 crises, there is an unwillingness of American citizens to believe that an energy crisis does exist.

President elect Reagan in 1980 is quoted as predicting that with decontrol, we could be producing enough oil to be self-sufficient in five years [Ref. 126]. It is quite apparent that President Reagan believes that the U.S. has an abundance of domestic oil reserves. Presently, the U.S. lacks an effective energy contingency planning for a major national emergency. Just as the 1973-74 oil embargo and 1978-79 oil crisis were unexpected, any significant future world oil supply interruption is apt to have aspects that have not been anticipated.

At the beginning of the century, a system of four naval petroleum reserves was established. The largest known reserve is Elk Hills in California. During the Arab oil

embargo, Congress debated but was unable to authorize a single barrel of oil production from Elk Hills to alleviate the harsh economic effects of the embargo. However, at a later date, Congress authorized and appropriated funds for full development of the Naval Petroleum Reserves. By 1976, these reserves were placed on full production, with the petroleum being sold to offset development cost.

The attitude that seemed to prevail following the 1973 oil crisis was that it was a phony oil crisis. As a result the U.S. pressed Saudi Arabia to moderate prices by holding auctions and increasing its productive capacity toward 20 million barrels per day, even though this would make us more dependent on the Persian Gulf [Ref. 127]. In addition to the phony oil crisis attitude, a false optimism developed because energy consumption was growing at a much slower pace than a few years ago; new sources of crude oil in the North Sea, Alaska, and Mexico, had temporarily eased the pressure of the world's reliance on OPEC oil. People believed this trend to mean that energy conservation was working. This false hope perceived a new energy crisis occurring in the next decade as declining.

The U.S. expected the enormous post embargo price increases to stimulate exploration for new energy supplies, restrain demand, and eventually reduce the real price of imports. The problem was the reserve base for oil could not sustain the kind of growth that it had in the past. From

February 1976, our imports climbed from 33 percent to almost 50 percent by mid 1979.

III. OIL GLUT AND U.S. VULNERABILITY

A. INTRODUCTION

The present drop in total oil demand and a much greater reduction in demand for OPEC oil has resulted in a situation which is being called the oil glut. This chapter will focus on the oil glut and how it has affected U.S. sensitivity and vulnerability dependence.

B. PRESENT SITUATION

After three straight years of declining free-world demand for oil and with a fourth decline possible in 1983, the 13 member Organization of Petroleum Exporting Countries (OPEC) is splintered by dissension. The present situation is one of oil surplus and is commonly known as an oil glut.

The characteristics of the world energy scene have changed radically in a very short period of time. In 1979/80 the major features of the oil situation were a concern about security of supplies and a rapid escalation of petroleum prices. However, quite different features dominate today's situation. First, there is a marked decline in world oil demand and a much greater reduction in demand for OPEC oil. Secondly, the concern about prices no longer relates to their high level or to prospects of future rises, but to distortions in the price structure continually

aggravated by competitive undercutting by some producing countries [Ref. 128]. Unless economic recovery brings a surge of new demand later this year, some analysts predict, oil prices could plunge by as much as 10 dollars a barrel to 24 dollars in the face of a market glut. Prices already have fallen an average $3.47 a barrel during 1982 because of the sluggish economy, expanded conversation measures, the use of alternative fuels and sharper competition among the oil producers. Price cutting is spreading both inside and outside OPEC. Before the OPEC unilateral price reduction from $34 to $29 a barrel in March of 1983, Iran was believed to be selling oil for 26 dollars a barrel to raise money to pay for its war with Iraq. Mexico was reported to be selling oil to the U.S. Strategic Petroleum Reserve for 24 dollars and Egypt was expected to be selling its top-quality crude for 31 dollars. Britain was also selling North Sea oil below OPEC's bench-mark price of 34 dollars a barrel [Ref. 129]. The combined effects of conservation and world-wide recession have left oil prices skidding, creating a global supply glut where once there was scarcity. The free-world demand for OPEC oil has dropped from a high of 31 m.b.d. in 1979, to about 19 million. Oil demand in the noncommunist world declined 12 percent over a three-year period (1980-82), from 52 m.b.d. to 46 million barrels a day [Ref. 130].

Adding to OPEC's dilemma is the fact that countries outside the cartel are pumping more oil than ever before,

with Mexico and Britain's fields in the North Sea leading the way. China's output almost certainly will grow and a vast new field just discovered off the coast eventually may add substantially to U.S. production [Ref. 131].

Within OPEC, three of its members, Iran, Libya, and Venezuela openly flout OPEC decrees by boosting their production well above quotas assigned to them by cartel decision March 1982.

The oil glut resulting in lower oil prices would benefit the world economy. Billions of dollars that might have gone to OPEC producers remain in oil consuming countries if the price continues to drop. In fact a steep decline in the cost of oil would give the sluggish American economy a welcome shot in the arm. Data Resources, Inc., an economic consulting firm, estimates that a 10 dollar drop in oil prices would translate into a 2 percent increase in U.S. industrial production and a 4 percent hike in pre-tax company profits while boosting the gross national product by about 1.5 percentage points [Ref. 132]. For consumers every 1 dollar drop in the price of a barrel saves them about 2 billion dollars a year, according to Commerce Department estimates, or about 9 dollars for each citizen [Ref. 133]. Additionally, a 10 dollar cut in crude-oil rates would mean that gasoline prices, after falling 10 cents a gallon in 1982, could decline 20 cents more--a drop that would more

than offset the impact of the new 5 cent a gallon gas hike [Ref. 134].

George James, Senior Vice President of the Air Transport Association of America, estimates that a 6 cent decline in jet-fuel prices in 1982 already has saved the airline industry 600 million dollars. In addition, says Wharton analyst Mark French, a 5 dollar drop in oil prices would create roughly 400,000 new jobs in the U.S. by the end of 1983 [Ref. 135].

The so called "glut" in supply or in high levels of inventories in 1981 is not to be judged a signal of a permanent reverse in the market. It can be ascribed to the recession (in part brought on by energy price increases), efforts at conservation, commercial and strategic stock-piling, and the willingness of primarily Saudi Arabia to increase exports, thus helping to make up for supply losses caused by the Iraqi-Iranian war, and to persuade other producers to agree to the Saudis' pricing formula for internationally traded oil. Virtually all forecasts for the 1980's still warn of a general condition of tight supply [Ref. 136].

C. ORIGIN OF THE OIL GLUT

The salient factors that have contributed significantly to the glut are: 1. Economic elasticity of market system; 2. Sharply increased oil production from non-OPEC sources;

3. Decontrol of crude oil; 4. Recession; 5. Drawdown of inventories; 6. Ineffectiveness of OPEC in agreeing to a price scale.

The world's appetite for oil has abated more than anyone dreamed it could a decade ago when it was believed that the normal laws of supply and demand did not apply, i.e., oil was thought to be inelastic. However, contrary to many oil experts predictions, when the price of oil was finally high enough the laws of supply and demand prevailed. A major reason for the fall off in oil consumption can be attributed to the direct effect of higher energy prices as a result of the marked increases in prices in 1979 and 1980. Rapid increases in price, coupled with the expectation of higher prices in the future, induced a massive shift in the market, i.e., small cars; a reduction in the amount of travel by automobile; and a proliferation of efficiency improvements in homes such as shifts away from oil to other fuels [Ref. 137].

We have had two major price increases. The first one was in 1973-1974, and the second was more recently, 1979-1980. In 1973-1974, prices doubled and we paid them. The prices were paid because they were still low enough that patterns of oil consumption did not have to be adjusted. This was reassured by price controls that effectively kept U.S. oil prices artificially lower than world prices. The story in 1979-1980 was very different. When prices doubled again, it

did effect U.S. consumption patterns. When gasoline reached 1 dollar a gallon, and it took 20 dollars to fill a tank, consumers began to change their behavior. People began to demand smaller cars, consumption began to decline, and prices began to soften. This is the classical kind of economic behavior (elastic) one would expect in that situation.

The coming to power of the Khomeini regime in Iran removed about 4 percent of the noncommunist world's oil supply in 1979; the outbreak of the Iran-Iraq war in September 1980 took away another 6 percent. With Iraq's denunciation, on September 17, 1980, of the Algiers agreement signed in June 1975 between the Shah of Iran and Saddam Hessein, 3.8 mmb/d suddenly vanished from the oil market. Immediately, moderate Gulf states led by Saudi Arabia increased production to help those consumer countries most affected by the interruption of Iranian and Iraqi exports. Although these loses were partly offset by increases in output in Saudi Arabia and other oil exporting countries, the net effect was a loss of 4 mmb/d in oil availability between late 1978 and early 1981. As a result, long-term contract prices for market crude increased from $14 to $35 per barrel--about a doubling in price dollars. As a result, economic growth in 1979 and 1980 slowed due to the higher oil prices. During May 1981, market trends constantly favored the consumers with demand ranging from 1

to 2 mmb/d below oil companies estimates. This lack of demand combined with the partial resumption of Iranian and Iraqi production contributed to a glut of 2 to 3 mmb/d [Ref. 138].

A second major reason for the present oil glut is increased production by non-OPEC producers such as Mexico and Britain's North Sea production area. With the doubling of oil prices in 1979-1980, it became economically feasible to increase oil production and take advantage of the extremely high oil prices.

TABLE 26

North Sea Production (U.K. and Norway)

mmb/d

1979	1980	1981	1982
2.1	2.2	2.4	2.7

Source: Merrill Lynch, Pierce, Fenner and Smith: January 26, 1983.

A third major reason is the decontrol of oil prices in the U.S. The rapid decline in oil demand since the near doubling of prices in 1979-1980 has had a dramatic impact on the oil market. While substantial in and of itself, the impact of that increase has been intensified in the U.S. as a result of crude price decontrol. The U.S. market is very big and because of decontrol has become very responsive to world market forces. U.S. suppliers and consumers are no

longer shielded from price movements in the international oil market. As a result, the U.S. is now allowed to face market reactions as they occur. When decontrol went into effect, oil production in the United States increased because of the oil companies wanting to take advantage of the high oil prices. Expensive secondary and tertiary methods of acquiring more oil now became more attractive as the international oil price more than compensated for the high cost of pumping. Additionally, decontrol coupled with high oil prices encouraged U.S. oil companies to drill and explore for more oil. Decontrol allowed the U.S. to compete in the international market and as a result more oil was introduced adding to the glut.

A fourth major reason for the present oil is the world wide economic recession. Sluggish economic growth is a very important element contributing to the fall of oil prices. Some of the reduction in petroleum consumption was due to the recession, while estimates vary, according to an American Petroleum Institute study, about 25 percent of the decrease could be attributed to the recession [Ref. 139]. Because the U.S. imports more oil than any other country, the reduction in this country's demand because of the recession had a significant impact on the world oil market. U.S. reduced consumption made more oil available for the other oil-importing countries. That in turn, meant that oil exporting countries including OPEC had to cut their prices

to compete with each other for sales to oil-importing countries [Ref. 140]. It is not clear how long it is going to last, but one thing is certain, when the recession is over, there will be renewed upward pressure on demand.

Inventories are a significant factor in the oil glut. Non-Communist world petroleum production in 1981 was 3.6 million barrels per day below 1980 levels due to a drawdown of world inventories (down 0.6 million barrels per day in 1981 compared to an increase of 0.8 million barrels per day in 1980) and decrease in consumption of 2.2 mmb/d. The drawdown in non-Communist world primary stocks (including both commercial and strategic inventories) is estimated to be over 200 mmb/d during 1981 [Ref. 141]. The issue is inventory drawndown or buildup by the oil companies must be viewed mainly in an economic sense not in a national security sense. The incentives to stockpile oil are: 1. To ensure the supply of oil to affiliates and to honor contractual obligations. 2. Expectations of supply interruption. 3. Expections of price increases, which will lead to inventory profits. Thus stockpiling beyond a certain strategic level is affected by the perceptions of availability and price of oil. If the oil market is tight and prices are rising (and/or are expected to continue to rise) inventory buildup is a rational economic/strategic move for the private oil companies. The buildup, itself, brings further pressure on the market and leads to higher

prices. This is what happened in 1979. Conversely, if supplies are abundant and prices are expected to be stable or declining, there is no incentive to maintain costly stockpiles and it is rational to draw down stocks--further weakening the market. Indeed, this is what happened in 1981 and 1982 [Ref. 142]. While prices were rising rapidly in 1979 and 1980, inventories were being built up by at least 2 million barrels a day. Consumption was going down in that 18 month period, so in many respects it was this large inventory buildup that put the pressure on the market and led to the doubling in the world oil price [Ref. 143]. Presently the converse to this situation is happening with oil companies depleting their oil reserves which adds to the oil glut.

The sixth reason is the decreased effectiveness of OPEC. Significantly, OPEC kingpin Saudi Arabia, which in the past could effectively bring the other OPEC members into line through overproduction and underpricing policies of its own has apparently lost its club. The chief reasons for Saudi Arabia's decrease control are rising non-OPEC production and the decision of money-short debt ridden members to use over-production and underpricing policies of their own. (Saudi Arabia and OPEC discussed in more detail in chapter IV.)

In sum, the most salient factor contributing to the oil glut has been the sharp rise in oil prices. As a result, elastic market forces have prevailed in which demand is

lower with abundant supply. Higher prices have also contributed to an economic recession which has resulted in a fall in demand.

D. IS THE GLUT LONG TERM?

With the world in an economic recession, the demand for oil among the industrial and third world countries has declined significantly. When the recession bottoms out, the demand for oil will increase again. At this time the demand for oil from the industrial countries will receive the greatest amount of attention as oil experts try to analyze and predict.

The major points to be considered when analyzing the long term prospects for a continuation of the current glut are: 1. Length of recession. 2. Discretionary production of OPEC. 3. Degree of stock draw downs.

A rapid end to the current worldwide recession would help end the oil glut. However, the recovery will probably be a slow but steady process in which the glut will disappear slowly as economic activity begins to increase. However, OPEC could help end the glut if it can cooperate on discretionary production.

Discretionary production of OPEC nations could help cause the glut to end. The key to discretionary production is the amount of cooperation that OPEC can maintain. Saudi Arabia has designated itself as the swing producer and is

willing to make the largest sacrifice for OPEC's latest plan to work. Therefore the key question becomes if the Saudis can survive a major cutback in production. A Saudi production cut from 10 million to 5 million barrels a day would cut Saudi revenues in half--from the current $120 billion a year to around $60 billion a year [Ref. 144]. A detailed analysis of this question is found in Chapter IV which indicates that the Saudis will be able to make the sacrifice. However, how long before it has an impact on the oil glut is difficult to predict.

One of the major contributors to the continuing oil glut is the drawdown of present inventory stocks. Flooding the market with inventory stocks means that oil companies are depleting their strategic reserve which is supposed to be used in time of a critical shortage. The lowered inventory levels may cause concern whether end-of-year 1982 stocks are adequate for anticipated requirements. The estimated 2-year inventory drawdown is expected to lower primary stocks (both commercial and strategic) from 5.4 billion barrels at the end of 1980 to 4.5 billion barrels at the end of 1982 [Ref. 145]. As demand for oil increases and prices stabilize and eventually begin to rise again, oil companies will once again begin to stockpile oil. This practice will contribute to a greater demand for oil on the world market.

As demonstrated, the economic recession will end which will result in a higher demand for oil. This demand for oil

can be increased even earlier if OPEC can eliminate the surplus of oil supply through discretionary production. As the demand begins to increase, oil prices should rise which should result in oil companies beginning to stockpile oil reserves again which in turn will add to the demand.

E. THE DECEPTIVE GLUT: VULNERABILITIES TO THE U.S.

The oil glut is deceptive because many people do not recognize the U.S. as still being in a stage of high sensitivity dependence. The conclusion of a new study of OECD's International Energy Agency emphasizes this point by stating, "the oil glut is a transitory phenomenon. It conceals a worrisome underlying trend that will be evident in several years: from the late 1980's onward, oil supplies will not be able to keep up with the demand of oil" [Ref. 146]. Dr. Elihu Bergman, Executive Director of Americans for Energy Independence, warns that the current world oil outlook is seductively attractive, particularly after nearly a decade of multiple adversities created by the different stages of the international energy crisis. The reality is that whatever the outward manifestations, the medium term oil outlook still is perilous for U.S. national energy security [Ref. 147].

It is essential that the various facets of the oil glut be examined in terms of U.S. national security interests. Oil companies in 1982 were selling less of their product at

lower prices. And the resultant reduced cash flow to the oil industry has affected the companies' ability to explore for oil. After a year of steady growth in 1981, the number of active drilling rigs in the United States had fallen by about 40 percent by mid-July 1982 [Ref. 148]. Cheaper oil prices have hampered America's push to lessen dependence on oil imports which cost an estimated 60 billion dollars in 1982. The falling price of oil will make developing large and expensive new oil fields a difficult proposition. For example, Atlantic Richfield, at a cost of $8 billion, is developing a huge new Alaska source, called the Kuparuk Field, which should be producing 250,000 barrels of oil per day by 1986 or 1987. Atlantic Richfield states they may not go ahead with this project if the price continues to fluctuate between $15 and $30 per barrel [Ref. 149].

Despite the current oversupply of oil, the industry still believes there will be shortages in the future [Ref. 150]. Oil's share of Western energy demand is not likely to drop below 31 percent by the end of the century, when world demand could outstrip supply states the International Energy Agency. World oil demand could reach 50 million to 56 million barrels a day by 1990 and 58 million to 74 million barrels per day by 2000. Consequently, world demand could outstrip world oil supplies by as much as 4 mmb/d in 1990 and by 9 mmb/d to 21 mmb/d by 2000 [Ref. 151]. The IEA noted that falling oil prices could send misleading signals to the

energy market, causing consumer and investor complacency. As demonstrated by the reduction of oil companies strategic inventories and exploration and drilling being reduced in half, the U.S. is failing to heed the long term warnings of credible energy analysis. The U.S. is not preparing itself for the next oil shortage. IEA notes that necessary actions to overcome difficulties foreseen for the late 1980's and 1990's may not be taken in time [Ref. 152].

Oil companies are selling their oil stock inventories because it is economically sound. However, there is a direct conflict between economically sound measures and what is in the national interest of the country. Oil prices will not remain at this lower level forever. If oil prices drop to the $25-a-barrel level, they would not stay there for long. Oil is a depletable resource and the price will go back to the cost of finding the replacement barrel. The replacement barrel for the U.S. is expensive.

Furthermore, the fact that there is a surplus at the moment does not guarantee that there will always be one or that the price will stay down. Saudi Arabia cannot afford to let OPEC flounder; when the Saudis felt that prices were falling uncontrollably they decided to make a very large sacrifice to ensure that the prices would rise again and OPEC would survive. The Saudis are willing to do this because of the benefits they receive from OPEC (as noted discussed in detail in Chapter IV) [Ref. 153].

Net oil imports are projected to continue at significant levels through at least 1995 in all of the scenarios presented in the Energy Information Administration 1981 Annual Report to Congress, Volume 3. The recent trend toward declining oil imports is projected to reverse. Projected net oil imports in 1985 range between 6.2 and 8.1 mmb/d compared to 5.1 mmb/d in 1981. The trend between 1985 and 1995 varies across scenarios, but in no scenario does net oil imports decline below 2.6 mmb/d [Ref. 154]. The critical warning is that oil glut or not, energy cannot be dismissed from our national agenda. An energy supply artificially expanded by recession simply will not support economic recovery [Ref. 155].

Two recent studies forecast rising demand for OPEC oil and a disappearance of the current glut, if and when Western economies start to grow briskly. One study, prepared by the Cambridge Energy Research Associated of Cambridge, Mass., foresees a possible "exploitation of demand" for OPEC oil and a resulting shortage as early as 1986, if the world in general works its way out of recession during 1983. The second report, issued, by International Energy Agency in Paris, puts the period of acute shortage toward the end of this century, assuming that OPEC members, other third world countries, and industrialized Western nations all increase their consumption of oil [Ref. 156]. While much has happened to change our perception of the future, the nature of the

energy problem has not fundamentally changed. There remain certain basic realities that we cannot afford to ignore. One fact of paramount importance is that the U.S. has substantially reduced its dependence on foreign oil over the past two years. Another is that oil imports still are high, amounting to nearly one-third of the oil consumed in this country. A third fact is that much of that oil comes from the Middle East [Ref. 157]. Given the nation's continued dependence on oil from the volatile Middle East and the fact that sensitivity dependence is still high indicates that the U.S. is still very vulnerable to oil supply disruptions [Ref. 158].

Despite the present oil glut, the danger remains of a sudden cutoff of oil supplies which would imperil the economies and security positions of the United States and its allies. Because of our scale of energy consumption, the U.S. would ultimately bear the brunt of a cutoff. Indeed, insofar as the prevailing surplus conditions lead us to relax efforts on oil conservation and development of alternate fuels, the glut increases rather than diminishes our vulnerability in the event of a major oil disruption [Ref. 159].

The market environment and the related physical conditions of oil supply and demand are not the controlling and relevant determinants of reliable oil availability. The

key factor in the oil equation is the political environment prevailing on the Persian Gulf. Sudden changes in this unpredictable and volatile environment would create interruptions in the oil marketplace that would impose serious consequences [Ref. 160].

IV. CONTINGENCIES AS A RESULT OF OIL DEPENDENCE

A. INTRODUCTION

This chapter will examine the potential threats of oil supply disruptions from the Middle East oil producing countries. Three mechanisms of supply disruption can be identified: 1. Deliberate manipulation by producers motivated by potential political gain or profit (as in 1973-1974). 2. Soviet interference with or influence over oil supplies. 3. Non-Deliberate: Reduction in supply as a result of conflict among governments in the region which interferes with oil production or shipments (i.e., a conflict between Iran and Saudi Arabia). Or a reduction in supply as a consequence of loss of governmental control and internal chaos (i.e. Iran in 1979).

B. CONTINGENCIES: DELIBERATE USE OF OIL AS A POLITICAL WEAPON

Saudi Arabia as one of the founders of OPEC and traditional OPEC leader is the key to the question, will OPEC use oil as a political weapon in the future? The reason Saudi Arabia is the Middle East leader is because it sits atop of the largest known reserves of oil in the world. In recent years, the Saudi kingdom has been the leading exporter of oil and has generated enormous wealth. The Saudis have been able to gain prestige in the Middle East by

spreading their oil wealth to other Gulf countries and by being the leader in the stand against the U.S. in the 1973 crisis. Saudi Arabia also derives its influence in the Middle East and the world energy market from its ability to vary rates of oil production from a low about 3 million bpd to a maximum of over 10 million bpd.

Two questions arise: is it in Saudi Arabia's interest to support OPEC and if it is should the Saudis encourage or discourage the use of the OPEC oil weapon? It is in Saudi Arabia's interest to continue to support OPEC. The major reasons for Saudi Arabia backing OPEC would be the long range political, economic, and prestige generated by OPEC's continued success.

One of Saudi Arabia's long range reasons for backing OPEC is political. In general, the regional effects of oil wealth has been a deradicalization of the Middle East governments [Ref. 161]. This more conservative trend has tended to give the region more stability and is a direct result of OPEC which has generated enormous revenues. With a successful OPEC stabilizing oil prices, workers and money have a greater propensity to flow from one country to another. Despite the efforts of political leaders to thwart attempts of unity, this economic integration spills over to political integration.

In sum it is important for Saudi Arabia to have OPEC continue as a viable institution because OPEC enhances oil

wealth which is linked to an increase in economic integration that tends to cause political integration and stability. Without the cooperation of OPEC, the threat of intense price cutting and competition for oil wealth would cause an increase instability in the Middle East which would not be in Saudi Arabia's national interest.

Economically without OPEC it is quite possible that the situation could reverse back to the time when oil companies were exploiting the oil producing countries at will. Saudi Arabia remembers well the Iranian experience in 1950-1951, and the Arab embargo of 1956 in which the oil companies were very successful in offsetting lower production on one country by a larger offtake from the others.

Additionally the Saudis remember the oil companies strategy in 1959 when faced by a glut in the market they reduced posted prices in hopes of driving off independent competitors and improving their own profit intake.

OPEC has been most important in influencing oil prices from decreasing as they did in 1959 when the oil companies reduced the posted price. Without the actions OPEC took in 1973, it was predicted that OPEC's output at the implied constant real price of crude was expected to reach 48.5 million b.p.d. by 1980. Because of OPEC, the OPEC production in 1980 was only 26.9 million b.p.d. OPEC is necessary to help ensure that Saudi Arabia will be able to help mitigate future exploitation.

The Saudis could lower its prices and increase production anytime it wanted to. The reason it doesn't is because OPEC serves as a cloak in reducing the many pressures the Saudies encounter. For example the Saudis can hide among OPEC when the U.S. puts pressure on them to reduce prices or increase production, i.e., the same cloak principle applies if the PLO is pressuring them.

The existence of OPEC continues to generate prestige for Saudi Arabia. They gained prestige in the eyes of the Arab world for standing up to the U.S. concerning Israel by financially supporting Egypt in 1973. Even though they did not win the war, they at least tried which gave them prestige in the Arab world. Saudi Arabia has continued to maintain its prestige in the Arab world by spreading its oil wealth to other countries. A successful OPEC would ensure at least a moderate price which would allow the Saudis to continue to gain the necessary revenue to support the spreading of oil wealth. Saudi Arabia assumes that if OPEC folds their ability to earn the same revenues would diminish and consequently their spreading of oil wealth would decrease thus decreasing their prestige.

The Saudis present role in supporting OPEC is very likely to enhance their prestige even more. The Saudis have been very reluctant to support the tremendous OPEC price hikes that could possibly cause what is being experienced today, an oil glut. The Saudis have argued for a

moderate policy with the long range goals of gradual price hikes that are not associated with disruptions and crisis. The Saudis have also warned that too high of price would enhance development of synthetic fuels. Therefore when OPEC emerges from their present crisis, it is very possible Saudi Arabia will also emerge with greater prestige for having seen the pitfalls of not following a moderate policy.

Saudi Arabia's present support for OPEC will also maintain the prestige with the U.S. As demonstrated earlier, a viable OPEC allows a greater economic cooperation in the Middle East and also allows the Saudis to generate the necessary revenues to continue the spreading of their oil wealth. If OPEC fails, it could cost the U.S. alot more in security arrangements. For example, in the Iraq-Iran war, if Saudi Arabia was not able to support Iraq, the U.S. might have to support Iraq more directly which might not be possible with the constraints of Congress. In effect, the Saudis realize that they are not only ensuring the stability of the region but they are also doing a service to the U.S. by supporting Iraq which in turn maintains the Saudi prestige with the U.S.

Saudi Arabia has come under heavy pressure from Arab radicals to use the oil weapon for the PLO cause. Saudi Arabia has been careful to avoid using the oil weapon because it would lower the prestige it has gained with the

U.S. (and might not be effective with the formation of I.E.A. and strategic stockpiling efforts). However, it does not want to lose the prestige of the Arab world by reducing the possibility of using the oil weapon with a statement saying that the Saudis are unlikely to support using oil as a leverage because it is not in their best interest. The point here is that the Saudis might not ever want to use the oil weapon again but to maintain the Arab prestige they must at least appear to be able to make a credible threat against the U.S.

In sum, it is very unlikely that Saudi Arabia would support the use of the oil weapon in the future even though they continue to support OPEC. Therefore, the threat of a deliberate interruption of Middle East oil for political or monetary gain is not likely.

C. CONTINGENCIES: DELIBERATE SOVIET INTERVENTION

One of the most complex issues the allies face is how to deal with the energy problem that the Soviet Union and Eastern Europe are certain to face, in a way that minimizes the danger to European and Middle Eastern security. No one doubts that the Soviet petroleum, coal, and nuclear industries face formidable problems, and no one knows if the Soviet Union can solve these problems quickly enough. That the Soviets will experience a shortfall in domestic oil production is almost certain. How large a shortfall is a matter for intense speculation [Ref. 162].

The critical policy questions confronting the U.S. government and its major allies center on what actions they should take if the Soviet energy situation transforms the USSR from a sizable oil exporter (3 mmb/d) to a net oil importer. According to Center Intelligence Agency estimates, the Soviet Union has vast reserves of energy including proved oil reserves of 33.5 billion barrels, roughly the same as proved U.S. reserves [Ref. 163]. In a series of reports that began in 1977, the CIA startled the international energy community by projecting that the Soviet Union would cease being a sizable net oil exporter and become a sizable net oil importer by 1985. These predictions have yet to come to pass but seemed influential in stimulating the Soviets to conserve and accelerate oil production in Western Siberia.

Despite a new Spring 1981 CIA estimate, which revised prior 1985 "low range" output figures from 8-10 mmb/d to 10-11 mmb/d, the Communist bloc's energy future is still uncertain. The announcement by the USSR that 1981 oil exports to Western Europe would be reduced by 20-25 percent was a clear indication of a desperate energy situation [Ref. 164].

The level of Soviet energy production in the 1980's will greatly affect global security. One solution for the Soviets is to obtain oil from the Persian Gulf. As oil production in the USSR slides toward 10 mmb/d, Western

intelligence services should expect increased covert activity in the Persian Gulf region and North Africa and gradually increasing Soviet naval movements in the northwest quadrant of the Indian Ocean [Ref. 165].

The Soviets not only have the option of invading the Persian Gulf but also using a low level intervention, perhaps through surrogates, to accomplish control over the Persian Gulf region, i.e., the Iranian Tudeh Party (especially in Southwest Iran), could effectively be used.

Secretary of Defense Weinberger, has declared that one of the most important "geopolitical realities" for the United States is "our dependence of foreign oil sources." He added, "The umbilical cord of the industrialized free world runs through the Strait of Hormuz into the Arabian Gulf and the nations which surround it. That area...is and will be the fulcrum of contention in the future" [Ref. 166]. The Soviet threat to move into the Persian Gulf region is a possibility and U.S. planners have developed the Rapid Deployment Force as a deterrent. However, U.S. planners have yet to develop a deterrent against the most likely threat to Middle East oil supplies, i.e., non deliberate oil crisis.

D. CONTINGENCIES: NON DELIBERATE

The most viable threat to an interruption of Middle East oil is a non deliberate action. One danger concerns the

internal stability of the key oil-producing countries. A recent report warned, "There are at least half a dozen countries in the area whose regimes must be regarded as precarious in a ten-year perspective" [Ref. 167]. Certainly, instability in key oil producers threatens both oil supply and regional equilibrium. Revolutions, terrorism, coups, or social upheavals that give way to anti-Western regimes pose a threat to the West. Such changes would add to the "hostile oil," oil produced by countries fundamentally antagonistic to the West [Ref. 168].

The second danger is regional conflict, for the rivalries in the area are many and varied--the Arabs versus Israel, Iran versus Iraq, Syria versus Iraq, Egypt versus Libya, South Yemen versus Saudi Arabia, Christians versus Moslems in Lebanon, radical versus traditional, Sunni versus Shi'ite, and so on. These rivalries can result in hostilities, which can threaten the oil supply and which can set off the trigger that draws the superpowers into conflict. The vast influx into the region of advanced weaponry, the best that East and West have to offer, has added to the volatility [Ref. 169]. Accidents or sabotage could lead to a sudden loss of oil production. In May 1977 a fire at Abqaiq, Saudi Arabia, very nearly caused the loss of several million bpd for as much as one year [Ref. 170].

Accidents, sabotage, regional conflict and instability of regimes are the greatest threat to oil supplies. These

non deliberate contingencies can come at any time and are very unpredictable. Thus the need to be prepared for supply interruption is critical because it could come without warning.

V. LINKAGE BETWEEN U.S. GOALS AND POLICIES

A. INTRODUCTION

This chapter will focus on the U.S. national goals and the linkage between goals and policy. Stalking the United States of the 1980's is an illusion that threatens the economic stability and security interests of this country and indeed the world far more than the global aggrandizement of Soviet power. The illusion has touched all regions of the country and all socioeconomic classes, transcending partisan politics and reaching into the highest levels of the executive and legislative branches of government and the boardrooms of domestic and international corporations. It is the illusion that the energy crisis is essentially behind us and that we can relax and let market forces solve our energy dilemma [Ref. 171]. The theme of this chapter is that even though our leaders have made the link between energy and national security, our present energy policies still leaves the United States unprepared for oil import disruptions.

B. STATEMENT OF NATIONAL GOALS

President Reagan has stated, "Our National Energy policy dictates that one of government's chief energy roles is to guard against sudden interruption of energy supplies...We

will ensure that our people and our economy are never again held hostage by the whim of any country or cartel" [Ref. 172].

The United States has become increasingly dependent on oil as a major supplier of U.S. energy needs. During the last decade there has been a large increase in U.S. dependence on oil from the Middle East and African nations. In 1970, oil from these nations made up 10 percent of U.S. imports and 2 percent of total petroleum supplies. By 1980, this share had grown to about 50 percent of imports and nearly 25 percent of total supplies. Unfortunately, military conflicts, terrorism, and political instability have been commonplace in these areas and pose a well recognized threat to oil exports. Four disruptions in oil exports from the Middle East within the past eight years bear witness to this danger: A politically motivated, selective embargo by Arab oil exporters beginning in late 1973, the loss of Iranian oil exports due to internal turmoil both in 1978 and in 1979, and Iraq-Iran war in 1980-1981 [Ref. 173].

As a result of U.S. dependence on insecure oil supplies from the Middle East, the national goal of U.S. energy policy since the early 1970's has been to reduce U.S. vulnerability to an interruption in oil supplies.

Thus the primary focus of U.S. energy policy development, beginning with Project Independence in 1973 through passage of the Energy Security Act of 1980, has been on reducing

import dependence. Despite these important efforts, energy analysts now generally agree that, due to the lead times involved, the nation will still remain dependent on substantial volumes of oil imports for at least the next decade or two. Moreover, even if the nation could somehow achieve independence from imports, U.S. allies and major trading partners would still be heavily dependent on imported oil. Economic links and oil sharing agreements with these nations would make it highly unlikely that the United States could escape the effects of a major world oil supply disruption [Ref. 174].

In broad terms, the national goals concerning energy security are quite adequate. All our leaders have recognized that oil security is one of our nation's highest priorities. The continuing major problem facing our leaders is determining the degree of energy security needed to ensure that our national goals are met. It is my premise that the critical link between our national energy goals and policies has not been achieved. Furthermore, the policies needed to cement a strong bond for this critical link have yet to be implemented because the U.S. fails to recognize that it is still very vulnerable to oil supply disruptions. Present administration policies will never address these vulnerabilities sufficiently because they rely on market forces which economically will not support expensive alternative energy developments. Energy security can be assured

if one is willing to pay the price. It is my contention that an effective compromise can be employed which incorporates market forces to a degree, but also allows the development of pilot plans in synthetic fuels which take as long as seven to ten years to mature.

C. U.S. PRESENT STRATEGY: WHAT PROPELS IT?

The present Reagan administration's energy security policy is heavily reliant on market forces. The administration believes that it is time to refocus world attention on the ability of market forces to locate supplies of energy and deliver them to consumers. The administration believes that the oil market is no different than any other market. A State Department summary on U.S. energy strategies states, "the United States will rely to maximum extent possible on market forces to solve problems. Permitting producers and consumers to exercise their own ingenuity and market preferences in responding to supply interruptions may seem painful in the short term, but we believe it will substantially reduce medium and longer term damage to economic welfare" [Ref. 175].

However, the administration does recognize the need to have some exceptions to their hands off approach. The government must assume at least partial responsibility for stockpiling emergency oil supplies. The State Department states, "For military, political, and economic reasons, we

cannot afford to "run out" of this indispensable commodity, no matter how remote the possibility may seem" [Ref. 176].

D. IS THE MARKET FORCES APPROACH ENSURING U.S. SECURITY?

On March 7, 1983, Energy Secretary Donald Hodel said that the Reagan administration's reliance on free market supply and demand may not be sufficient to meet an energy crisis. Hodel stated, "officials are concerned about the ability of the emergency (petroleum) resources to function without some legislative assistance" [Ref. 177]. Committee Chairman Senator James McClure of the Senate Energy and Natural Resources Committee expressed skepticism about the administration's ability to deal with a disruption of imported petroleum. Senator McClure also stated that he was heartened by Hodel's remarks because it was the first time the administration had publicly conceded that more than its free market approach may be necessary. Backed by a General Accounting Office report accusing the administration of having no real standby plans to counter an energy crisis, McClure said he did not think a crisis could be solved by allowing market forces to determine price and availability of fuel [Ref. 178].

Whatever the outstanding fanciful notions about the capabilities of the marketplace, the marketplace cannot provide an emergency preparedness system. The market environment and the related physical conditions of oil supply and

demand are not the controlling and relevant determinants of reliable oil availability. The key factor in the oil equation is the political environment prevailing on the Persian Gulf [Ref. 179]. F. Henry M. Schuler, director for energy planning and development in the Washington national affairs office of Deloitte Haskins and Sells, states, "I am convinced that the international energy market is not governed by the commercial and competitive forces that are customarily attributed to a free market. Therefore, I am concerned that total neglect--no matter how benign--will also impede development of domestic resources" [Ref. 180]. Schuler goes on to say that reliance on a free market presupposes that the market is governed by economic and commercial considerations enshrined in the law of supply and demand, i.e., the rule of price optimization by a rational monopolist. These traditional verities lend themselves nicely to computer modeling, but they have little influence outside of the spot market that represents only a tiny portion of the international energy market. The international oil market lacks at least three characteristics associated with a free or competitive market: its driving forces are largely political rather than commercial; access to entry is often limited by discriminatory restrictions; and free competition is thwarted by foreign government subsidization of national oil companies. Schuler concludes his argument by stating that, "In my judgment, these flaws

are so significant that U.S. national security interest cannot be protected through a policy of benign neglect toward the energy market" [Ref. 181].

As demonstrated, market forces is what is propelling U.S. national interest in the world oil market. It is apparent that the administration believes market forces will work because it assumes world free market exist. Unfortunately, U.S. energy security is based upon an assumption which is not true.

An excellent example of the inadequacy of relying on market forces to ensure U.S. security is the continued production of the Naval Petroleum Strategic Reserves. The basic problem hinges on the relative importance one attaches to strategic value versus economic benefits. In terms of linking policies to goals, one can ask the question, Is the continued production of the Naval Petroleum Strategic Reserves in the national interest?

The Naval Petroleum and Oil Shale Reserves were established early in this century as an emergency source of petroleum for the U.S. Navy. Very little developmental activity occurred until World War II when the largest Petroleum Reserve, Elk Hills in California, was activated to supply oil for the Navy's Pacific Campaign, reaching a production level of 65,000 barrels per day. After the war, it was deactivated and all of the Reserves remained essentially inactive and shut in until the Arab oil Embargo

of 1973-74 prompted Congressional authorization of funding for their full development. Then in 1976, with developmental work in progress, Congress passed the Naval Petroleum Reserves Production Act which contained several significant provisions. It authorized and directed the Secretary of the Navy to place the Reserves on production at the maximum efficient rate for a period of six years, with the petroleum to be sold competitively on the open market. The major reason for production was to generate revenues which would fund development costs of placing the reserves in full operating capacity. The actual revenues were sent to the Treasury Department which then allocated the money for development [Ref. 182].

During this six year period, the goal of placing the reserves in full operating capacity was achieved and by 1981 production peaked at over 180,000 billion barrels and production capacity.

In 1981, the Reagan administration had to make a decision as to whether to discontinue to pump the nation's Strategic oil reserve that now was prepared to provide insurance against U.S. vulnerability by its capability to augment domestic oil production during an oil crisis or war situation.

The strategic value of Naval Petroleum Reserve number 1, (Elks Hills), is without question. In the vernacular of the petroleum industry, it is a "giant" field with remaining

recoverable oil reserves of more than 1.25 billion barrels and a production capacity in the United States second only to Prudhoe Bay in Alaska. It clearly has the potential, therefore, to provide the Nation with a significant strategic reserve of petroleum if production is shut in [Ref. 183].

It should be noted that the Naval Strategic Oil Reserve was designed to serve the purpose of protecting the Nation during a major oil interruption. During Wartime, a sever interruption would impact the Nation's ability to sustain a conventional military action, and without a shut in ready reserve capacity for emergency oil production, might place the U.S. in a position of terminating the action prematurely before strategic goals are met or escalating to a nuclear war [Ref. 184]. During peacetime, a sever interruption could cause economic and social hardship on the Nation, and reduction of military training and readiness. The intent of the Naval Strategic Reserve is to ensure that the military forces have adequate petroleum supplies available and to sustain the military during peacetime interruptions. The NPR is designed to offer a substantial complement to the Strategic Petroleum Reserve [Ref. 185].

The Navy recommended to reduce or shut in production on the NPR. However, the President decided to keep pumping the reserves. The House and Senate Armed Services Committees

and the House Energy Committee held hearings to review the President's decision to continue to pump the NRP for another three years. As a result of the hearings, the House Armed Services Committee approved a resolution to shut in the reserves. That resolution was referred to the Rules Committee and never came to a floor vote as a result of heavy lobbying by the administration and the California Congressional delegation. Accordingly, the Petroleum Reserves will be produced at least until April 1985 which further degrades the NPR defense emergency capability [Ref. 186].

The reason the NPR were allowed to continue to produce is economical. The revenues of the Reserves goes to the Treasury and offsets the Federal budget. The Reagan administration estimated that shutting in the NPR would result in a loss of $.9 billion in FY 1982, $1.6 billion in FY 1983, and $1.3 billion in FY 1984. Including the effects of inflation, the revenue loss would approximate $4.5 billion over this period [Ref. 187].

The Department of Energy stated that the potential benefits of shutting in of the NPR-1 is not in the national interest because the potential benefits during an oil supply interruption to supplement the drawdown of the Strategic Petroleum Reserves measured against the economic benefits is not cost effective [Ref. 188].

The market forces approach to national security is ineffectual because one cannot measure the utility or cost effectiveness of protecting one's national interest in dollars until one neglects to prepare. Then the consequences can be measured in dollar amounts, but it will be too late to prepare for vulnerabilities once they are occurring.

By continuing to pump our Strategic Reserves and raising money for the national debt, we are neglecting a major problem which will have to be faced soon. That is by pumping our reserves less imported oil comes into the country. As the reserves are depleted, the country will have to depend on greater amounts of imports to meet the country's needs that are being supplied in part by the continued production of the reserves. Instead of looking at the strategic consequences of this practice, the administration is only concentrating on a short-term cost effectiveness which is falsely leading the country to believe that its vulnerability has been reduced when in fact the country is more vulnerable because it is depleting its Strategic Oil Reserves and soon will be depending on more imports.

E. UNITED STATES REMAINS UNPREPARED FOR OIL IMPORT DISRUPTIONS

A General Accounting Office report stated, "The U.S. Government is almost totally unprepared to deal with

disruptions in oil imports. Oil import disruptions such as the 1973 oil embargo and the 1979 Iranian shortfall pose a significant threat to national security, and the lack of effective contingency planning and program development to date is serious and requires immediate attention. The Government must make a determined commitment to emergency preparedness now, while oil markets are slack, to prepare for any future disruption" [Ref. 189].

With the exception of the recent buildup of the Strategic Petroleum Reserve, the United States is no better prepared to deal with significant disruptions in oil imports than it was during the 1973 oil embargo [Ref. 190]. The Nation's almost total lack of emergency preparedness requires immediate attention. The GAO report states, the inadequate state of the Nation's emergency preparedness eight years after the 1973 embargo is a serious problem requiring immediate attention. We believe the Federal Government should take prompt and concerted action to counter this serious potential threat to national security [Ref. 191].

The basic objective of the GAO study was to evaluate the present U.S. energy preparedness planning for oil import disruptions. As a benchmark, 3 mmb/d was selected as an oil supply disruption amount. Three mmb/d was selected because it would trigger the use of the IEA emergency oil sharing system. The United States is a member of the IEA and has important obligations to it which significantly affect the

design and operation of all U.S. contingency programs. The conclusion of this shortfall is that the United States would be lucky to offset one-third of the shortfall with programs now in hand. Even more depressing is the fact that several of the estimates which account for the modest offsets are optimistic [Ref. 192]. A summary of the present deficiencies are as follows:

1. Surge oil production: No plan has been prepared and several legal constraints must be removed.

2. Strategic Petroleum Reserve: Although oil is now being acquired at a reasonable rate, we have too little oil in the SPR and have not developed an adequate plan for SPR oil acquisition and use.

3. Private Stocks: The Government has not finalized plans prepared for managing stock drawdown.

4. Oil-to-gas switching: Some progress has been made, but the plan still has significant weaknesses.

5. Oil-to-coal switching: An effective plan is not even close to completion.

6. Federal Demand Restraint: The current Federal plan is totally inadequate and the legal framework for demand restraint is impractical.

7. International emergency reserves: Members of the IEA, including the United States, do not have nearly adequate emergency reserves.

8. International oil sharing: The present system holds promise but is too narrowly focused and is also plagued by implementation problems

Conclusion: Could the U.S. cope with a 3 mmb/d shortfall today? No! The U.S. is still grossly unprepared [Ref. 193]. The Federal Government does not presently have an emergency plan adequate to cope with a sudden and substantial shortage

of imported oil. As a result, measures taken in the wake of a shortfall are likely to be ad hoc, experimental, full of interagency confusion, and poorly coordinated with emergency measures undertaken by the States [Ref. 194].

F. STRATEGIC STOCKPILING: THE DOD IS STILL VULNERABLE

In order to diminish U.S. vulnerability to the effects of a severe oil supply interruption and to carry out U.S. international energy commitments, the Energy Policy and Conservation Act authorized the creation of an SPR to store up to 1 billion barrels of crude oil.

The stockpiling of emergency reserves is meant to deter the intentional cutoff for oil supplies to the United States; more important, its purpose is to lessen the shock of a disruption, to maintain the viability of the national economy in the absence of critical oil imports. Unfortunately SPR has run into more than its share of problems, chief among them a recurrent tendency to stop filling it or to fill it at a slower rate [Ref. 195].

However, there is serious doubt that the SPR could maintain the viability of the national economy in the absence of critical oil imports and simultaneously support the needs of the DOD. Captain G. R. Gilmore, Director, Naval Petroleum and Shale Reserves and Emergency Preparedness, recently expressed his concern by stating, "As Director, Naval Petroleum and Oil Shale Reserves, I am especially

concerned that sufficient fuel may not be available to meet our national defense requirements during a wartime situation [Ref. 196]. Captain Gilmore was referring to the grave situation in which all the Naval Petroleum Reserves are producing at their maximum efficient rates with the revenues going to the treasury coupled with the inability of the SPR to handle DOD needs during a major conflict.

The Strategic Petroleum Reserve is not designed to meet military needs effectively; it is not available for wartime use unless there is a severe petroleum supply disruption; and it will not be large enough to meet both civilian and military needs in the event of an oil supply disruption associated with a major war [Ref. 197].

Unfortunately, the Strategic Petroleum Reserve, as it is now being developed, does not reflect any specific needs of the DOD. The SPR clearly is designed to be a civilian reserve, and is not capable of meeting DOD needs in most national security emergencies [Ref. 198]. The SPR size has been determined primarily on the basis of the economic benefits of the Reserve in responding to a disruption of oil imports; non-economic national security benefits have been given little or no consideration in setting the size of the SPR [Ref. 199]. It has not been sized to meet the national security needs of the country in the event of a less likely, but more devastating, severe oil supply disruption associated with a major war. SPR size decisions have not recognized

the non-economic benefits or a reserve, including saving lives, reducing panic, providing foreign policy flexibility, and protecting our freedoms.

The availability of adequate quantities of DOD petroleum products was renewed during and after the 1979 Iranian disruption. During this period it became difficult for DOD to purchase petroleum as needed, and oil prices far exceeded amounts in DOD budgets for petroleum. As a result of this experience, a portion of Naval Petroleum Reserves production was provided to DOD to help meet their continuing requirements, but only about a third of DOD's peacetime requirements can be met from current NPR production [Ref. 200]. DOD is currently using approximately 490,000 barrels per day of fuel and of this amount, is buying and trading 130,000 b/d of crude oil from the NPR [Ref. 201]. The DOD acquires the rest of its oil needs by buying oil on the open market with some of this oil coming from oil imports. This is a major point because DOD assumes that the oil they acquire from the SPR will be supplemented with oil imports. This assumption may be just wishful thinking in the event of a major conflict.

As noted, the Department of Defense and its operating contractors consume approximately 0.5 million barrels per day (mmb/d) of petroleum products, under normal peacetime conditions. In the event of a major conventional war, DOD petroleum usage could increase to 1.5 mmb/d or higher.

An assured supply of petroleum products when needed is essential for maintaining military response readiness and to permit effective prosecution of any military operation [Ref. 202]. A major war in the Persian Gulf area could create this situation whereby DOD petroleum requirements would increase to over 1.5 mmb/d in conjunction with the loss of up to 20 mmb/d in world oil production by countries in the area [Ref. 203]. U.S. allies, including Japan, Germany, and France, would suffer very large reductions in their total oil supplies because of their heavy dependence on oil imports.

At the same time, a war could increase oil demand by the United States and its allies by up to 2 mmb/d. This could result in an almost complete loss of oil imports for the U.S. if we were to share available world oil supplies with Europe, Japan and other countries on some equitable basis. The U.S. could lose about 5 mmb/d of oil imports, as well as being faced with an increase in demand of 1 mmb/d for defense activities [Ref. 204].

With such a loss, a 750 million barrel SPR with a maximum drawdown capability of less than 4.5 mmb/d would not be able to meet daily demands for oil to avoid a severe disruption of society, and the full reserve could be depleted in about six months. As the oil shortage deepened, there would be increasing conflict between military and civilian demands for available oil. The lack of an adequate oil

reserve could increase pressures on decision makers to take more drastic military action than would otherwise be desired, or to reach a settlement of the conflict in a way which seriously damages long-term U.S. interests. In sum, the size of the SPR is inadequate to meet DOD needs [Ref. 205].

Even if the SPR were to be large enough to meet national security needs, the civilian character of the reserve would seriously limit its usefulness for defense purposes. For example, the SPR authorizing legislation allows drawdown of the SPR only if there is a "severe petroleum supply disruption." The current SPR authority would not permit use of the SPR to support increased defense needs even during a major war, if there were not a severe supply disruption [Ref. 206]. There also are likely to be difficulties in gaining access to the SPR oil even when its use by DOD is authorized, because of administrative delays in selling the oil or due to competition with other users for access to available pipeline and tanker dock space [Ref. 207].

Although DOD theoretically could use the Defense Production Act authorities to meet all of its petroleum needs in the private market, such an approach will result in increasing conflict between military and civilian demands for petroleum as oil supplies shrink during a severe war/disruption crisis. The lack of an adequate oil reserve could increase pressures on decision makers to resolve the

crisis quickly, by taking more drastic military action than would otherwise be desired, or by reaching a settlement of the conflict in a way which seriously damages long-term U.S. interest [Ref. 208].

In addition to the limitation on when the SPR can be used, there may be the following problems in using SPR oil to meet defense needs during wartime: 1. There may be delays in obtaining a Presidential decision to use the SPR in view of the multiple and conflicting pressures facing the President regarding SPR use. 2. There may be delays or problems due to indecision regarding the method of selling the oil, including the method of establishing the sales price and determining who will receive the oil. 3. There may be delays in gaining access to the oil because DOD would be competing with other users for access to docks and/or pipelines to move the oil to refineries. It is difficult to anticipate the problems that might arise in attempting to use the SPR to meet DOD needs, but it is clear that DOD would lack control over the use of the SPR that they would gain with a designated, separate, single-purpose, defense reserve [Ref. 209].

G. PROPOSED NEW ENERGY POLICY TO MEET OUR NATIONAL INTEREST

The effort should be made to develop alternative sources of energy, primarily synthetic fuels (shale oil). Given the long lead time needed to develop advanced synthetic fuel

technologies, the process should begin now. National security alone dictates moving forward, for aside from the eventual exhaustion of oil supplies (and other fossil fuels) there remains the danger of becoming hostage to another politically motivated oil cutoff.

The U.S. is vulnerable to another oil interruption and with its present free market approach is also unprepared to deal with this interruption. A much broader approach needs to be taken which will ensure that the national interest of the country is adequately being met. An immediate investment in the shale oil program will do much to alleviate the vulnerability the U.S. now faces.

VI. PROPOSED STRATEGY TO REDUCE U.S. VULNERABILITY

A. RECOGNITION OF THE PROBLEMS: SHORT TERM AND LONG TERM

1. Short Term Problem

A detailed examination of the U.S. response to the 1973-74 and 1979-80 oil crises followed by a critical look at the present oil glut and inadequacies of the free market approach to energy security was to demonstrate the serious concern one should have about U.S. energy emergency preparedness. Unfortunately, the recent OPEC developments of lowering the base price of crude oil encourages complacency with the prevailing surplus conditions. The glut may well prove to be a setback in the effort to ensure U.S. energy security.

In light of this growing optimism, the U.S. is still vulnerable to oil supply interruptions and response preparedness programs are not comprehensive enough to cope with future oil crises. The present emergency programs do not addquately cope with the inability of the economy and the DOD to adjust rapidly to major oil interruptions without substantial losses to the economy and efficiency to the DOD. Obviously the development of adequate levels of petroleum stocks that can be drawn down in an emergency is one of the most direct and effective solutions to the problem because it reduces the size of the adjustment required.

The SPR in theory is the answer to adjusting rapidly to oil supply disruptions. In addition to the SPR if matters are grave enough, the government could go to a rationing program and even nationalize domestic oil production to meet both DOD and civilian needs. As noted earlier, the SPR is presently dedicated to civilian needs. To utilize SPR oil, DOD must convince Congress it is necessary to acquire oil from the SPR using the Defense Allocation Act. Without question, if the situation merits it, Congress would allocate oil from the SPR to DOD. The problem is the time element involved.

During a major crisis, the most important logistic response is immediate surge production. Drawdown capability of established reserves must be able to meet the needs of DOD and civilian sector immediately. Nationalizing oil companies and rationing do not solve the surge production problem.

In sum, during the oil glut, the public and government has grown complacent and as a result are failing to recognize that the U.S. lacks the capability to adjust rapidly to oil interruptions. Compounding this problem is the reliance of the present administration on the free market forces to ensure U.S. security. Free market forces do not address surge production capacity.

2. Long Term Problem

The second major problem is limiting or reducing oil vulnerability altogether. This is a strategic consideration which must include in its calculus the following variables: 1. Predictable oil supply (domestic and foreign) 2. World oil resources 3. U.S. and world economic growth 4. Alternatives to oil.

One of the major constraints in defining oil in the national interest is considering all four of the variables. The problem lies in the nature of the variables in that they require long-term forecasting and unfortunately the accuracy of these forecasts is not as high as one would like. However, this does not preclude the government from its responsibilities for developing long-term strategic plans.

A second major constraint in developing strategic plans is the present administration's adherence to the free market forces, i.e., we depend on the market to allocate our oil resources on a supply and demand sliding scale. This approach has precluded the U.S. from developing its shale oil reserves to reduce its long-term vulnerability. Shale oil is a synthetic fuel in which the U.S. has some of the largest reserves in the world. The U.S. has yet to develop these resources because the OPEC cartel led by Saudi Arabia has purposely kept the cost of their crude oil below the cost effective point of producing shale oil.

B. PROPOSED STRATEGY FOR REDUCING U.S. OIL VULNERABILITY

1. Introduction

The U.S. should pursue some strategic plan which incorporates the immediate development of these shale oil reserves. Due to the lead time of five to seven years involved, immediate construction should begin. Realizing that if these plants are started today, by the time they are finished in 5 to 10 years they might be cost effective in terms of future oil prices and will be on line to provide oil during an oil crisis. Therefore one must be able to prove there is a direct need for these plants today. I realize that this is an indirect way of satisfying the long term national interest of the country. However, the immediate constraints are a very real obstacle and must be considered in the attainment of our goal. The following strategic plan that will be proposed addresses both the short term and long term problems previously mentioned.

2. Attainment Strategy

The following strategy addresses the need to solve the short term problem of lack of surge production. This proposed strategy not only addresses the short term problem but is also the fundamental solution to the long term problem.

The proposed strategy deals with the short term problem of solving the lack of surge production capability. The strategic plan involves converting the Naval Petroleum

and Oil Shale Reserves into a Defense Petroleum Reserve (DPR) which would be readily usable for national security purposes during emergencies. This strategic plan meets the need of solving the shortfall of the DOD depending upon the SPR and also of the present policy of continuing production of the Elk Hills Reserve.

As demonstrated, a Defense Petroleum Reserve is needed to provide an assured source of petroleum of DOD activities during emergencies, such as military conflicts which could disrupt the supply of oil from the Persian Gulf region. The Strategic Petroleum Reserve is not designed to meet military needs effectively; it is not available for wartime use unless there is a severe petroleum supply disruption; and it will not be large enough to meet both civilian and military needs in the event of an oil supply disruption associated with a major war.[3]

The DOD and its operating contractors consume approximately 0.5 mmb/d of petroleum products, under normal peacetime conditions. In the event of a major conventional war, DOD petroleum usage could increase to 1.5 mmb/d or higher. An assured supply of petroleum products when needed is essential for maintaining military response readiness and

---

[3]This section draws heavily on a conceptual plan developed for Captain Gordon Gilmore, head of the Naval Strategic Petroleum Reserve. The plan is unpublished by Gilmore, Hystad, and Ass. December 1982.

to permit effective prosecution of any military operation. As demonstrated in Chapter V, section F, the surge capacity of the SPR is not designed to meet both the DOD and civilian needs during time of war. With the surge capacity of the Naval Petroleum Reserves presently diminished because of present continued production, my attainment strategy is the development of a DOD reserve.

Developing a DPR would serve two purposes: 1. The DPR would be used by DOD in national emergencies without using the SPR. 2. Development of DPR for use as tactical reserve in peacetime, to minimize the cost of oil to DOD, and also for use in emergencies.

The first purpose is that the use of the DPR during times of national emergencies is appropriate due to the possibility that the SPR is not large enough to meet wartime surge production for military as well as civilian needs. Additionally there is likely to be administrative and logistics delays or problems in using the SPR to meet DOD needs if such use is necessary.

The second purpose is that using the DPR as a tactical reserve in peacetime and to minimize the cost of oil to DOD is cost effective. DOD currently is spending about $7 billion per year for petroleum. It now must purchase oil virtually on a day to day basis to meet continuing needs. At times it must purchase oil when the market is tight and spot prices are very high, and it can not take special

advantage of low prices because it does not have extensive low cost storage space in which oil can be stockpiled for use when prices are high. Most suppliers are unwilling to enter into long-term fixed price contracts with DOD, because of the instability of world oil prices.

Fluctuations in world oil prices in the past four years indicate that there is a potential for substantial savings in DOD petroleum purchases with effective use of a stockpile system. For example, imported crude oil costs rose from an average of $14.57 per barrel in late 1978, to an average of $38.25 per barrel in the first six months of 1981. Oil stored at 1978 prices and used in the first six months of 1981 would have resulted in savings of about $14.20 per barrel, assuming a 10 percent discount rate. Such savings would have far exceeded the cost of stockpiling oil in underground storage, and use of oil stocks during that period would have reduced demand pressures on world market prices.

The price increase between 1978 and 1981 may have been very exceptional, but price fluctuations of a dollar or two a barrel are very common. The ability to purchase excess spot market cargoes at a dollar or two below long term contract rates and place that oil in temporary storage could help pay for the cost of an underground storage system developed primarily for use in emergencies. The incremental cost of developing a storage system that could be used as an

operational reserve would be small; during the years of developing salt cavern storage, the withdrawal of oil would help expand the size of the caverns at minimal incremental costs.

The incremental cost of using storage facilities for an operational reserve as well as an emergency reserve is estimated to be about $.50 per barrel, to cover the cost of moving oil into and out of the storage site. Assuming that oil placed in temporary storage could be purchased for an average of $2.00 per barrel below normal market rates, and that the oil remained in storage for an average of three months, the temporary storage could provide net benefits of $.70 per barrel, assuming a 10 percent discount rate.

It is noted that it would not be cost effective to develop a storage system solely to take advantage of normal fluctuations in oil prices. If a discount rate of 10 percent assumed, the cost of money and storage facilities would exceed likely savings in oil cost. The point is that over the long run having a DPR would allow the DOD to take advantage of price fluctuations which in turn would allow substantial savings. However, it should also be noted that the development of the DPR is not solely on the benefit that it would reduce cost but more important that it would serve the national interest to reduce vulnerability to lack of adequate surge production.

What is the situation if a separate DPR is not developed? Without a separate military oil reserve, DOD would need to rely primarily on open market purchases to obtain the bulk of its oil during emergencies as well as in peacetime. It may obtain a small portion of its supply from any continuing NPR production, but available supplies from the NPR will dwindle to almost nothing by the end of the century. DOD could employ the Defense Production Act to try to obtain supplies if the market does not respond. But direct participation in the oil market to bid supplies away from other potential users is likely to be the most successful means of obtaining supplies when needed, if a separate reserve is not available. Because of the limitations on use of the SPR, and the likely difficulties in obtaining SPR oil directly for military use on a timely basis, DOD could not rely on using the SPR for either its emergency needs or for peacetime requirements.

This option will require that DOD be prepared to pay whatever price is necessary to purchase its oil needs. A "budget reserve" to cover higher than expected oil prices may be desirable if a DPR is not developed. If there are no major military conflicts associated with a disruption of oil imports, and no further sudden large increases in oil prices, this option may be the lowest cost means of meeting DOD requirements. However, if there are future military conflicts associated with a disruption of oil imports, this

option will contribute to sever escalation of oil prices and disruptions of our economy and society. It also is likely to increase pressures to reduce military use of oil, or to attempt high risk solutions to the crisis in order to bring a quick end to the problem.

In sum, a reserve of petroleum for defense use could have critical value in the event of a major military conflict, with or without an associated disruption of oil imports. It could be particularly critical in the event of an extended war in the Persian Gulf area that destroyed major oil production and transportation facilities.

The SPR cannot be relied upon to meet DOD needs, because of its limited size, restrictions on its use, and the lack of DOD control over its use. Developing a DPR to meet the needs that are not fulfilled by the SPR will have benefits that cannot be measured solely in economic terms; the desirability of an oil reserve available to the military should be measured in the same way as other national security systems, including estimates of its benefits in saving lives, reducing fear, and protecting our freedom. Therefore, the decision on whether to develop a DPR should be made by the President and the Congress based on their experienced judgment of the national security benefits of such a reserve. The decision should not be based solely on an economic analysis of the issue, as has been the case with the SPR.

If a DPR were developed for emergency use, the storage facilities also could be used as an operational reserve with very little incremental cost. This could reduce the cost of oil to DOD as well as minimizing federal budget and fiscal problems.

C. BENEFITS OF CONVERTING THE NP&OSR INTO DOD RESERVE

There are two means of developing an emergency defense petroleum reserve, other than converting the NP&OSR. One alternative to converting the NPR to a ready defense reserve would be for DOD to develop a petroleum reserve for its needs without using NPR revenues. NPR production would continue and the revenues would be provided to the Treasury. A second alternative would be to shut in the Naval Reserves and use them for surge production in emergencies to help meet DOD needs.

With the free market forces constraints in mind, the first alternative is unlikely because the present administration would not finance a separate DOD reserve in addition to the NP&OSR it now has. It would not be cost effective.

Additionally, development of an independent reserve that is not associated with the NP&OSR would be subject to annual budget decisions by OMB and the Congress, which would highlight the budgetary concerns and minimize the national security considerations. The uncertainty resulting from the annual budget process would make effective long term

planning extremely difficult. The long term nature of the program makes it critical to have a meaningful long range plan for facility development, fill, use and refill.

Without tying the DPR development to the availability of NP&OSR revenues, there would be no built-in constraint on DOD regarding its plans for the reserve. This could result in much greater budget uncertainty for OMB and Congress, as well as greater total expenditures for the program. A failure to tie NPR activities to DPR development will result in continuation of the lack of a rational basis for NP&OSR investment and production decisions. Recent decisions regarding the NPR have been dominated by OMB's interest in maximizing near-term net revenues because there has been no other mission for NPR. The original purpose of the NP&OSR, to assure petroleum supplies for naval forces, as well as the more recent objective of reducing U.S. dependence on imported oil, has been lost to the pressure to reduce budget deficits. Without any objective for the NP&OSR except to maximize near-term net revenues, there is no basis for rational decisions on the long term exploitation of the reserves, such as decisions regarding enhanced recovery or oil shale development.

The second alternative of shut-in production of the NPR to achieve a DPR would have two problems. The first problem is that all the revenues (1.6 billion dollars) would end to the treasury. This adverse budgetary impact is a major

constraint that would probably prevent the NPR from being completely shut-in. However, using portions of the 1.6 billion revenue from the NPR to convert the NP&OSR to a DPR is a less of a constraint that possibly would be accepted by OMB.

The second problem is that an immediate shut-in of the NPR would provide only a small fraction of the national security protection of a DPR. While a DPR could provide a drawdown rate of 1.5 mmb/d or higher, a shut-in NPR could provide only about 0.1 mmb/d. A DPR could be built to provide a total ready reserve of 300 mmb, 400 mmb, or more while a shut-in NPR could provide an effective reserve of only about 40 mmb during a year of production.

Another major constraint of shutting in the NPR is the powerful California delegations influence in the House Rules Committee. In October 1981, the House Armed Services Committee approved a resolution to shut in the Reserves. That resolution was referred to the Rules Committee and never came to a floor vote as a result of the heavy lobbying by the California delegation. Therefore the NPR were not allowed to be shut in [Ref. 210].

In sum, the primary advantages of converting the NP&OSR rather than developing a DPR independently are that it will provide a basis for rational decisions about the long term exploitation of the Naval Petroleum and Oil Shale Reserves, and provide built-in incentives for efficient DPR development.

Converting the NP&OSR to a ready reserve clearly provides much greater national security protection than shutting in the NPR fields for use only in emergencies, and will have a less of a budget constraint from OMB than if the NPR were shut-in completely. As already demonstrated, the administration has already decided not to shut in the NPR for its intended use as a strategic reserve because of the adverse budgetary impacts of all revenues to the Treasury ending. As demonstrated in the previous section, relying on the SPR could not assure an adequate supply of petroleum to DOD for all emergency needs. The solution then is to use some of the revenues that the NPR is presently generating and use these revenues to develop and build a DOD reserve that is connected to the NP&OSR. This would be the most cost effective way of ensuring a strategic reserve exists for the DOD and allows the government to continue to receive revenues from the sale of Naval Petroleum Reserves.

D. STORAGE SIZE AND DRAWDOWN CAPABILITY OF DPR

The DPR should be adequate to meet all DOD petroleum needs during a severe conventional war which is estimated to be 600 mmb/d of crude oil. The purpose to be served by a reserve of this size include the objective of assuring adequate oil supplies for military activities during a war, without taking supplies away from civilian use in the event of an associated loss of oil from major porducing countries.

This would help avoid pressures to find a quick but undesirable solution to the conflict in order to reduce the economic and social impacts of a sharp reduction in oil supplies. A reserve of this size also would serve the objectives of providing a ready supply of oil for the military during a major war without a disruption of oil imports, by avoiding the problems in attempting to purchase an additional 1 mmb/d on the open market. The SPR would not be available for use to help meet DOD needs if there were not a severe supply disruption. This reserve size also could be used to meet peacetime DOD needs in the event of a disruption of its normal source of supplies, in order to avoid the need to compete on the open market for its supplies or use the cumbersome *Defense* Appropriation Act procedures.

DOD estimates that total refined product use could exceed 1.5 mmb/d during a major conventional war. Assuming that DOD has a refined product stockpile of 30 days of supply, about 500 mmb of refined product stocks would be needed to provide supplies for one year. If crude oil is stored rather than products, about 1.2 barrels of crude would be needed to obtain each barrel of the type of refined products required by DOD, based on recent differentials between crude oil and wholesale product prices. Therefore, a reserve of about 600 mmb of crude oil would be required. The drawdown capability of the reserve under this option should be about

1.8 mmb/d if crude oil is stored to be exchanged for 1.5 mmb/d of refined products for DOD use. Facilities would cost about $3.0 billion for a 600 mmb reserve.

E. OIL SHALE

The DPR is an excellent conceptual plan to solve the short term DOD problems during an oil interruption. But it is still inadequate in coping with the long term problem of reducing oil vulnerability through the development of synfuels, i.e., shale oil. Shale oil production in connection with the DPR would not only help to satisfy the short term problems but would also help to solve the long term problem.

One potential source of energy which the United States possesses in abundance is shale oil. It is a synthetic, extracted from the organic material found in oil shales. When processed, shale oil can be compared to low gravity moderate sulfur crude, and can be refined, using existing refining proceses, into petroleum products.

The shale oil deposits of the United States, which are considered potentially commercially exploitable over the next 15 to 20 years, are all located in the western part of the country. Although oil shale can be found in 30 states, one single formation, that of Green River, is thought to be "the world's largest known hydrocarbon deposit" [Ref. 211]. It is located below largely unpopulated parts of Federal lands.

The oil shale formation is believed to contain 2 trillion (2,000 billion) barrels of oil equivalent--U.S. oil needs for 300 years at current rates of consumption.

Of this, 80 billion barrels of shale oil are thought to be recoverable with current mining technology and above ground processing. The major difficulties with shale oil production are economic and environmental. The economic aspects of shale oil production are twofold: First, there are the costs of designing, building, and running a shale oil mining and processing facility; second, there is the question of product competitiveness with other forms of energy, particularly imported oil.

F. SYNTHETIC FUELS CORPORATION

The U.S. synthetic Fuels Corporation is a Federal entity of limited duration formed to provide financial assistance to eligible sponsors to undertake synthetic fuels projects. The corporation was created by the Energy Security Act, Public Law 96-294, which was signed on June 30, 1980. The Corporation is directed by law to limit its financial oil shale, coal, and tar sands hydrogen. The corporation was appropriated $17,522,000,000 dollars.

The Energy Security Act states that the purposes of the synthetic fuels program are "...to improve the Nation's balance of payments, reduce the threat of economic disruption from oil supply interruptions and increase the

Nation's security by reducing its dependence upon imported oil." The Energy Security Act set a national goal of producing the equivalent of 500,000 barrels of oil per day in synthetic fuels by 1987 and 2,000,000 barrels per day by 1992. The Corporation will provide financial assistance to projects most likely to help establish a domestic synthetic fuels industry. To qualify for assistance, sponsors of a project must demonstrate ability to undertake successful design construction and operation. Financial assistance from the Corporation is to encourage and supplement, instead of compete with or supplant, private investment capital.

G. STATUS OF SYNTHETIC FUELS PROGRAM

U.S. Synthetic Fuels Corporation faces the present dilemma of having billions of dollars to hand out and there are no takers. More than two years after its creation, the SFC has yet to spend any of the 17 billion dollars it was authorized to dole out for the development of oil.

With the world recession, oil glut, and declining petroleum prices many of the projects have been cancelled. Exxon Corporation killed the nation's most ambitious synfuels venture when it withdrew from the Colony Project, a 50,000 barrel-a-day oil shale plant near Parachute, Colorado. Ashland Oil, Inc., Standard Oil Company, and Panhandle Eastern Corporation have also pulled out. The collapse of these and other proposed projects has doomed the SFC's original goal of producing 500,000 barrels per day of

crude-oil equivalent by 1987 and 2 million barrels daily by 1992 [Ref. 212].

As a result, there has been an increasing opposition to the Synthetic Fuels Corporation existence. Since the SFC could add 13.5 billion dollars to the federal deficit by 1990, its foes--including liberals, environmentalists and fiscal conservatives--want to eliminate the agency. Representative Tom Corcoran (Rep.-Ill.) a long time opponent of government involvement in the synthetic fuels industry stated, "There is no economic basis today for synfuels to be marketable in the next decade" [Ref. 213]. With the exception of Union Oil Company, with the aid of federal price guarantees, there are no serious projects that are presently underway. The synthetic fuels corporation is basically a defunct organization that has $17 billion dollars to spend and can not do it.

H. IMMEDIATE NEED FOR DEVELOPMENT OF OIL SHALE RESERVES

The critical question is if the development of NOSR production would be helpful in converting and maintaining the Naval Reserves to a ready defense reserve? (During the past few years, the Department of Energy has been studying the feasibility and costs of producing oil from Naval Oil Shale Reserve No. 1 near Rifle, Colorado. A conceptual development plan has been prepared for the development of plants to produce up to 200,000 b/d of refinery feedstock

from shale. The analysis of this section is based on the information and estimates prepared for the conceptual plan.)

It is estimated that there are over 18 billion barrels of oil in the shale at NOSR 1. It is estimated that there are 2.3 billion barrels of oil using only shale with over 30 gallons of oil per ton, which would be the first to be developed; this would be enough to feed a 100,000 b/d plant for 70 years.

The strategic plan for shale oil would initially call for a plant with the capability to produce 20,000 b/d, with construction costs of about $1.39 billion and annual operating costs of $185 million. Expansion to a 50,000 b/d plant has an estimated additional construction cost of $1.8 billion, and annual operating costs of $320 million. A 100,000 b/d plant is estimated to cost a total of $5.7 billion for construction, and $640 million per year in operating costs. The first 20,000 b/d of capacity would come on line in 7.5 years, and output increased to 100,000 b/d in 13.5 years.

I. WOULD THE NOSR BE HELPFUL IN CONVERTING THE NPR TO DPR?

If production from the Oil Shale Reserves is not developed, revenues from the existing Naval Petroleum Reserves would permit development of a 200 mmb DPR by 1997, but any further expansion would be very slow. By 2010 the DPR would be expanded only to 261 mmb, because of the sharp

decline in net revenues from the reserves. From 2000 to 2010, fill of a DPR would average less than 10,000 b/d. The available net revenues would limit the potential maximum size of the DPR to less than 300 mmb. (As noted in section 6.4, the goal is 600 mmb/d).

One might argue that instead of developing oil shale reserves to supplement the fill of DOD Reserve, why not buy the cheap oil that is so plentiful on the market during the present oil glut. As has been demonstrated, the glut is only temporary and one should not depend on the continued availability of cheap oil in ensuring our national interest is going to be met.

If oil shale production is not developed, there would be severe limitations on the ability to refill the DPR in the event of a drawdown in the late 1990's or later. If the military reserve is drawn down during an emergency, it could be expected that DOD would pay at least prefemergency prices for the oil drawn from the reserve, but this is not likely to provide enough resources to permit a complete refill. Oil prices are likely to increase significantly during and after an emergency, so that additional resources will be needed to refill the reserve. For example, if prices increased by 25 percent during and after the emergency, only 80 percent of the drawdown could be replaced with the sale revenues. If 200 million barrels were drawn down, there would be a need to refill 40 million barrels from NPR

resources. If oil shale production were not available, it would take 11 years to refill the 40 million barrels at a rate of 10,000 b/d.

Without shale oil production, NPR revenues will dwindle down to almost nothing by 2010. It would not be possible to continue a viable DPR expansion program, and there would be virtually no capability to refill the DPR to its former level in the event of a drawdown.

In sum, the long-term viability of an NPR/DPR conversion program, including the ability to expand the DPR beyond 250 mmb and to refill the DPR after a drawdown, depends on revenues from oil shale production. Without oil shale production, the program will fade away. The major assumption here is that as NPR are depleted, the NOSR begin to pick up the slack. It should be noted that for the NOSR to make a profit, the price of crude oil will have to rise again. This is a calculated risk however, this should not prevent the government from going ahead with the plan. The initial oil shale production is slated for 1990, if started in 1983, when the economics of oil shale production are likely to be very different than they are today.

J. CONSTRAINTS: FUNDING THE DEVELOPMENT OF OIL SHALE

Although oil shale production is not attractive to the government and to private investors at the present time, this should not preclude the government from considering

development of the oil shale reserves. The government has already established the Synthetic Fuels program which has yet to spend any of its 17 billion dollars to date. The Synthetic Fuels Corporation should encourage private industry to develop the Navy's oil shale reserves. The money has already been appropriated for such a development and the need has been established for oil shale production. Fortunately, such a situation should meet with approval of an administration that has based our national security on the free market forces.

The strategic long term payoffs of such a plan would be that an oil shale production plant has been constructed during a time that oil seemed plentiful yet would be in great demand with short supplies in a few years. Due to the long lead times of developing oil shale plants, the U.S. would be in a perfect position to cope with future oil supply disruptions because it had the foresight to plan strategically.

K. WHAT IF OIL PRICES REMAIN LOW AND THE GLUT CONTINUES?

Developing shale oil to supplement the fill of the DPR is predicated on the assumption that shale oil will be profitable to produce within ten years. This will only be achieved if the oil glut disappears and oil prices rise again. If the oil glut does not disappear than two alternatives are proposed which will still allow development of the shale oil.

Shale oil production facilities should begin construction immediately. In the meantime the NPR should continue production to fund the shale oil construction. Once the plant is completed, and if oil prices are as low as they are in the Spring of 1983, shale oil production should be reduced to a minimum to maintain the plants functional ability. The purpose of this would be to retain the capability to bring the plant on full production in short notice to meet emergencies.

Secondly, the NPR production should be converted to fill the DPR and cheap oil should be purchased on the open market to supplement the fill. Once the desired level of 600 million barrels has been reached, then the NPR should be shut in.

As prices rise, shale oil production can be increased as it becomes economically feasible to do so.

VII. CONCLUSION

This paper has analyzed the continuing threat of a serious oil supply disruption and has determined that the U.S. is still unprepared to meet a major interruption of oil imports. The present oil glut was analyzed and determined to be short range in nature. Unfortunately, the glut has created a complacency attitude that has tended to cloud the U.S. ability to effectively cope with an oil supply disruption.

The present administration's free market approach to energy security was demonstrated to be ineffective in adequately preparing both the DOD and civilian sector for an oil crisis. Strategic stockpiling was found to be inadequate because the DOD was still vulnerable due to the inability of the SPR to meet DOD surge capacity needs. As a result, a new long term strategic plan was proposed to cope with this problem.

The strategic plan involves using revenue from the NPR and the Synthetic Fuels Corporation to convert the Naval Petroleum and Oil Shale Reserves into a Defense Petroleum Reserve. Not only would the DPR solve the surge capacity problem for the DOD, but it would also be used as a tactical reserve in peacetime which would tend to reduce the amount of money needed to purchase oil in the long term.

The development of the shale oil reserves is a necessary requirement in assuring that the DPR can be adequately refilled after a large drawdown and serves the long range purpose of being able to exploit shale oil in a timely fashion when there is a large demand for oil and a small supply.

The U.S. national interest can best be served by having a strategic plan which calls for a DPR and allows the immediate development of shale oil reserves in order that the U.S. can mitigate to the greatest degree possible effects of a future oil crisis.

LIST OF REFERENCES

1. "OPEC Knuckles Under," Time, p. 46, 28 March 1983.

2. "The Unrigging of Oil Prices," Newsweek, p. 62, 7 March 1983.

3. "OPEC in Disarray: What it Means," Christian Science Monitor, 25 January 1983.

4. White, Donald K., "The Oil Glut: Getting Even with the Arabs," San Francisco Chronicle, February 1983.

5. Tucker, William, "The Energy Crisis is Over!" Harper's, pp. 25-36, November 1981.

6. Department of Energy, Monthly Energy Reports, pp. 38-39.

7. American Petroleum Institute, Two Energy Futures: A National Choice for the 80's, p. 11, October 1982.

8. Department of Energy, Monthly Energy Reports, pp. 38-39, March 1983.

9. U.S. Department of Energy, Reducing U.S. Oil Vulnerability Energy Policy for the 1980's, p. IV-B-6, 1980.

10. Ibid., p. IV-B-6.

11. Ibid., p. IV-B-10.

12. Department of Energy, Petroleum Supply Annual, p. 6, July 1982.

13. Time, p. 70, 18 April 1983.

14. Department of Energy, Production Decline of U.S. Surveillance Oil Fields, p. 1, August 1982.

15. Ibid., p. IV-B-12.

16. American Petroleum Institute, Reserves of Crude Oil, Natural Gas Liquids, as of December 31, 1977, p. 14, June 1978.

17. U.S. Department of Energy, Reducing U.S. Oil Vulnerability, p. 1, 10 November 1980.

18. Danielsen, Albert L., The Evolution of OPEC, p. 14, Harcourt Brace Jovanovich, Inc., 1982.

19. Ibid., p. 110.

20. American Petroleum Institute, Two Energy Futures, p. 1.

21. Conant, Melvin, The Oil Factor in U.S. Foreign Policy 1980-1990, p. 3, Lexington Books, 1982.

22. Ibid., p. 1.

23. American Petroleum Council, Emergency Preparedness for Interruption of Petroleum into the U.S., p. 2, April 1981.

24. U.S. Department of Energy, Petroleum Supply Annual, p. 4, July 1982.

25. Yergin, Daniel and Hillenbrand, Martin (Editors), Global Insecurity: A Strategy for Energy and Economic Renewal, p. 9, Houghton Miffin, 1982.

26. American Petroleum Institute, Two Energy Futures, p. 4.

27. Ibid., p. 110.

28. Krapels, Edward N., Oil Crisis Management: Strategic Stockpiling for International Security, p. 14, The John Hopkins University Press, 1980.

29. Secretary of Defense Memo to Secretary of Energy, 13 Sept 1982.

30. Ulin, Robert, Major USA, "U.S. National Security and Middle Eastern Oil," U.S. Military Review, p. 45, May 1978.

31. Ibid., p. 45.

32. Goldstein, Donald, Editor, Energy and National Security, p. 5, National Defense University, 1981.

33. Collins, Frank, Rear Admiral, USN, "Energy: Essential Element of National Security," Proceedings, December 1981.

34. Schuler, Henry, "Coping with Oil Dependence" Washington Quarterly, p. 53, Winter 1983.

35. Salisbury, David, "Synfuels Industry Still Banking on a Future Oil Crunch," Christian Science Monitor, p. 4, 1 April 1983.

36. Kessler, Richard J., The Washington Quarterly, p. 180, Spring, 1983.

37. Deese, David, and Nye, Joseph, Editors, Energy and Security, p. 271, Ballinger 1981.

38. Americans for Energy Independence, p. 3.

39. Brooks, R.A., and others, The Importance of Persian Gulf Oil, p. IV, Defense Advanced Research Agency, July 1981.

40. Nye Jr., Joseph, "Energy Nightmares" Foreign Policy, p. 132, Fall 1980.

41. U.S. Department of Energy, The World Oil Market in the 1980's: Implications for the U.S., p. XI, 1982.

42. Yergin and Hillenbrand, p. 17.

43. Conant, p. xiv and xv.

44. Ibid., p. xvi.

45. U.S. Department of Energy, Reducing U.S. Oil Vulnerability, pp. 7,10, 10 November 1980.

46. Committee on Energy and Natural Resources, United States Senate, Staff Report, The Geopolitics of Oil, December 1980.

47. Senate Hearing Committee on Energy and Natural Resources, Energy Emergency Preparedness: International and Domestic Issues S2332, p. 10, May 6, 1982.

48. Odell, Peter R., Oil and World Power, p. 11, Penguin, 1980.

49. American Enterprise Institute High School Debate Series, The Federal Government Energy Policies, p. 13, 1978.

50. Ibid., p. 13.

51. Mitchell, Edward, U.S. Energy Policy: A Primer, p. 36, American Enterprise Institute, Washington, D.C., 1974.

52. Odell, p. 36.

53. Ibid., p. 37.

54. Ibid., p. 39.

55. Mitchell, p. 39.

56. Hall, R. E., Pindyck, R.S., "The Conflicting Goals of National Energy Policy," The Public Interest, Spring 1977.

57. Kohl, Wilfrid, After the Second Oil Crisis, p. 212, Lexington Books, 1982.

58. McKie, James W., The Oil Crisis, ed. Raymond Vernon, American Academy of Arts and Sciences, 1976, p. 73.

59. Stoff, Michael, The American Petroleum Industry: The Age of Energy, ed. Williamson, Harold, Northwestern University Press, 1963, p. 509.

60. Ulin, p. 45.

61. American Enterprise Institute, The Federal Government's Energy Policies 1978-1979, p. 5.

62. Yergin and Hillenbrand, pp. 98, 99.

63. Ulin, p. 43.

64. Yergin and Hillenbrand, p. 101.

65. Vernon, p. 74.

66. Ibid., p. 74.

67. American Enterprise Institute High School Debates, The Federal Government's Energy Policies 1978-1979, p. 78.

68. Ibid., p. 29.

69. Yergin and Hillenbrand, p. 60.

70. Ibid., p. 60.

71. Mendershausen, Horst, and Nehring, Richard, Protecting the U.S. Petroleum Market Against Future Denials of Imports, p. 33, Rand, October 1974.

72. Congressional Budget Office, The World Oil Market in the 1980's: Implications for the U.S., p. 55, May 1980.

73. Monroe, Elizabeth and Mabro, Robert, Oil Producers and Consumers: Conflict of Cooperation, p. 17, American Universities Field Staff, Inc., 1977.

74. Congressional Research Service, Oil Imports: A Range of Policy Options, November 1979.

75. General Accounting Office, Iranian Oil Cutoff: Reduced Petroleum Supplies and Inadequate U.S. Government Response, p. 1, September 13, 1979.

76. Deese and Nye, p. 309.

77. American Petroleum Institute, Two Energy Futures, p. 23.

78. U.S. Department of Energy, Monthly Energy Report, p. 3, March 1983.

79. Ibid., p. 1.

80. Americans for Energy Independence, p. 2.

81. Mendershausen and Nehring, p. 6.

82. Yergin and Hillenbrand, p. 59.

83. American Enterprise Institute 1978, The Federal Government's Energy Policies 1978-1979 High School Debate Analysis, p. 56.

84. Wright, Arthur, "The Case of the U.S.: Energy as a Political Good," Journal of Comparative Economics, p. 115, 1978.

85. American Enterprise Institute, The Federal Government's Energy Policies 1978-1979, p. 57.

86. Ibid., p. 7.

87. Tucker, p. 27.

88. Ibid., p. 11.

89. Yergin and Hillenbrand, p. 105.

90. Ulin, p. 43.

91. Ibid., p. 44.

92. Deese and Nye, p. 393.

93. Wright, p. 158.

94. Ebinger, Charles, The Critical Link: Energy and National Security in 1980, p. 5, Ballinger Publishing Co., 1982.

95. U.S. Congress, Senate Energy Committee, Executive Energy Messages, 1978.

97. Ibid., p. 212.

98. Yergin and Hillenbrand, p. 106.

99. Ibid., p. 106.

100. Ibid., p. 106.

101. U.S. Federal Energy Agency, Project Independence Report, Washington, D.C., 1974.

102. Ebinger, p. 4.

103. Yergin and Hillenbrand, p. 106.

104. Ibid., p. 106.

105. U.S. Congress, Senate Energy Committee, Executive Energy Messages, 1978.

106. Yergin and Hillenbrand, p. 106.

107. Ibid., p. 108.

108. Ebinger, p. 6.

109. The National Energy Plan, issued by the White House, pp. 25-32, 29 April 1977.

110. Ebinger, p. 6.

111. Ibid., p. 7.

112. Webb and Ricketts, p. 270.

113. U.S. Department of Energy, Powerplant and Industrial Fuel Use Act Annual Report, Washington, D.C., March 1, 1980.

114. Eginer, p. 8.

115. Novik, Nimrod, and Starr, Joyce, Editors, Charles Ebinger, "Tremors in World Oil" Challenges in the Middle East, p. 74, 1982.

116. Wall Street Journal, 1 October 1978.

117. Corrigan, Richard, "On Energy Policy, the Administra- Prefers to Duck, Defer, and Deliberate," National Journal, 18 July 1981.

118. Brown, Stephen, "Reducing U.S. Vulnerability to World Oil Supply Disruptions," Economic Review, p. 4, May 1982.

119. Ramses, The State of the World Economy, p. 43, Ballinger, 1982.

120. Ibid., p. 48.

121. Ebinger, Charles, "The Energy Illusion," The Washington Quarterly, p. 116, Spring 1980.

122. Desse and Nye, p. 394.

123. Yergin and Hillenbrand, p. 3.

124. Tucker, p. 25.

125. Nye, Jr., Joseph, "Energy Nightmares," Foreign Policy, p. 149, Fall 1980.

126. Yergin and Hillenbrand, p. 102.

127. Deese and Nye, p. 6.

128. An-Nahar, "Nature of Oil Market, Effect on Policies," Financial Times, p. 13, 1983.

129. "Collapse of Oil Prices--Good News or Bad?" U.S. News and World Report, 10 January 1983.

130. Ellis, Henry B., "Why Gasoline Prices are Falling: OPEC vs. The Three Oil Mavericks," Christian Science Monitor, p. 3, 22 November 1982.

131. Ibid., p. 3.

132. "Collapse of Oil Prices--Good News or Bad?" U.S. News and World Report, 10 January 1983.

133. Cook, David T., "Consumers Cheer Cheaper Oil, But There are Trade-Offs," Christian Science Monitor, 25 February 1983.

134. "Collapse of Oil Prices--Good News or Bad?" U.S. News and World Report, 10 January 1983.

135. "Breakup of OPEC: Who's helped, Who's Hurt," U.S. News and World Report, p. 27, 7 February 1983.

136. Conant, p. 63.

137. Kohl, p. 197.

138. Ramses, pp. 35-36.

139. "Oil, Gas, and Consumers," Christian Science Monitor, 1 March 1983.

140. American Petroleum Institute, Energy Security for the U.S., Progress, Pitfalls, Potential, p. 13, September 1982.

141. U.S. Department of Energy, Short-Term Energy Outlook, p. 6, November 1982.

142. Ibid., pp. 14-15.

143. Silber, Bettina and Stern, Thomas, The Oil Glut: How Deep and How Long? pp. 4-5, Americans for Energy Independence, 1982.

144. Feith, Douglas J., "Saudi Production Cutback: An Empty Threat?" The Wall Street Journal, February 1983.

145. Department of Energy, Short-Term Energy Outlook, p. 6.

146. "The Deceptive Glut," OECD, p. 31, March 1983.

147. Bergman, Elihu, "Statement Before Committee on Energy and Natural Resources," U.S. Senate, 29 April 1982.

148. American Petroleum Institute, Energy Security for the U.S., Progress, Pitfalls, Potential, p. 40, 1982.

149. Scherer, Ron, "Prospect of Slipping Prices has Big Oil Shifting Gears," Christian Science Monitor, p. 11, 28 January 1983.

150. Ibid., p. 11.

151. Smith, Donna, "IEA Sees Oil Shortage Shortages Between 1990-2000," The Oil Daily, October 14, 1982.

152. Ibid., p. 1.

153. Jawdat, Nameer Ali, "The Recurring Energy Crisis," The Washington Quarterly, p. 75.

154. U.S. Department of Energy, Outlook for Oil Imports, p. 1, 1983.

155. Bergman, Elihu, "We Must be Independent Energy-Wise," The Cleveland Plain-Dealer, October 27, 1982.

156. Ellis, p. 3.

157. American Petroleum Institute, Energy Security for the U.S., Progress, Pitfall, Potential, p. 2, 1982.

158. Bergman, Elihu, "Statement Before Committee on Energy and Natural Resources," U.S. Senate, April 29, 1982.

159. Ibid., p. 1.

160. Ibid., p. 2.

161. Magnus, Ralph, Lecture Notes from Middle East Oil Seminar, NS 3341, Naval Postgraduate School, 24 March 1983.

162. Ebinger, Charles, The Critical Link, p. 191.

163. Ibid., p. 194.

164. Ibid., p. 202.

165. Ibid., p. 205.

166. Yergin and Hillenbrand, p. 110.

167. Kaiser, Karl, and others, Western Security: What has Changed? What Should be Done? p. 27, New York: Council on Foreign Relations, 1981.

168. Ibid., p. 22.

169. Yergin and Hillenbrand, p. 31.

170. Quandt, William B., Saudi Arabia's Oil Policy, p. 33, 1983.

171. Ebinger, Critical Link, p. xxiii.

172. U.S. Senate, Energy Emergency Preparedness: International and Domestic Issues, S-2332, p. 11, 6 May 1982.

173. Ibid., p. 1.

174. Ibid., p. 2.

175. Department of State Current Policy No. 423, U.S. Energy Strategies, p. 2, September 9, 1982.

176. Ibid., p. 2.

177. "U.S. May Not Be Ready for Fuel Crisis, Energy Chief Says," San Francisco Chronicle, p. 7, 8 March 1983.

178. Ibid., p. 7.

179. Bergman, Elihu, April 29, 1982 speech before Senate, p. 2.

180. Schuler, G. Henry, "Security in the Market?" Washington Quarterly, p. 35, Autumn 1981.

181. Ibid., pp. 36-37.

182. Gilmore, Gordon, Emergency Petroleum Reserves, U.S. Department of Energy, pp. 1-2, December 1982.

183. House, Barton R., Is Continued Production of the NPR in the National Interest? Department of Energy, p. 4, 13 August 1981.

184. Ibid., p. 6.

185. Ibid., p. 5.

186. Gilmore, p. 6.

187. U.S. Department of Energy, Report to Congress on Naval Petroleum Reserve Production, p. 4, October 1981.

188. Ibid., p. 2.

189. General Accounting Office, The U.S. Remains Unprepared for Oil Import Disruptions, EMD-81-117, p. 1, 29 September 1981.

190. Ibid., p. IV.

191. Ibid., p. 1.

192. Ibid., p. 8.

193. Ibid., p. 8.

194. Ibid., p. 12.

195. Ebinger, Critical Link, p. 89.

196. Captain Gordon Gilmore Letter to Charles Ebinger, Oct. 27, 1981.

197. Conceptual Plan, December 1982, Gilmore Hystad and Ass. (Unpublished), p. 1.

198. Ibid., p. 4.

199. Ibid., p. 11.

200. Ibid., p. 13.

201. Department of Defense Letter to Secretary of Energy, 13 September 1982.

202. Conceptual Plan, December 1982, p. 11.

203. Ibid., p. 4.

204. Ibid., p. 15.

205. Ibid., p. 15.

206. Ibid., p. 11.

207. Ibid., p. 4.

208. Ibid., p. 5.

209. Ibid., p. 16.

210. Captain Gordon Gilmore, memo, Emergency Petroleum Reserves, p. 6, 29 September 1981.

211. U.S. Federal Energy Agency, "Project Independence," p. 341.

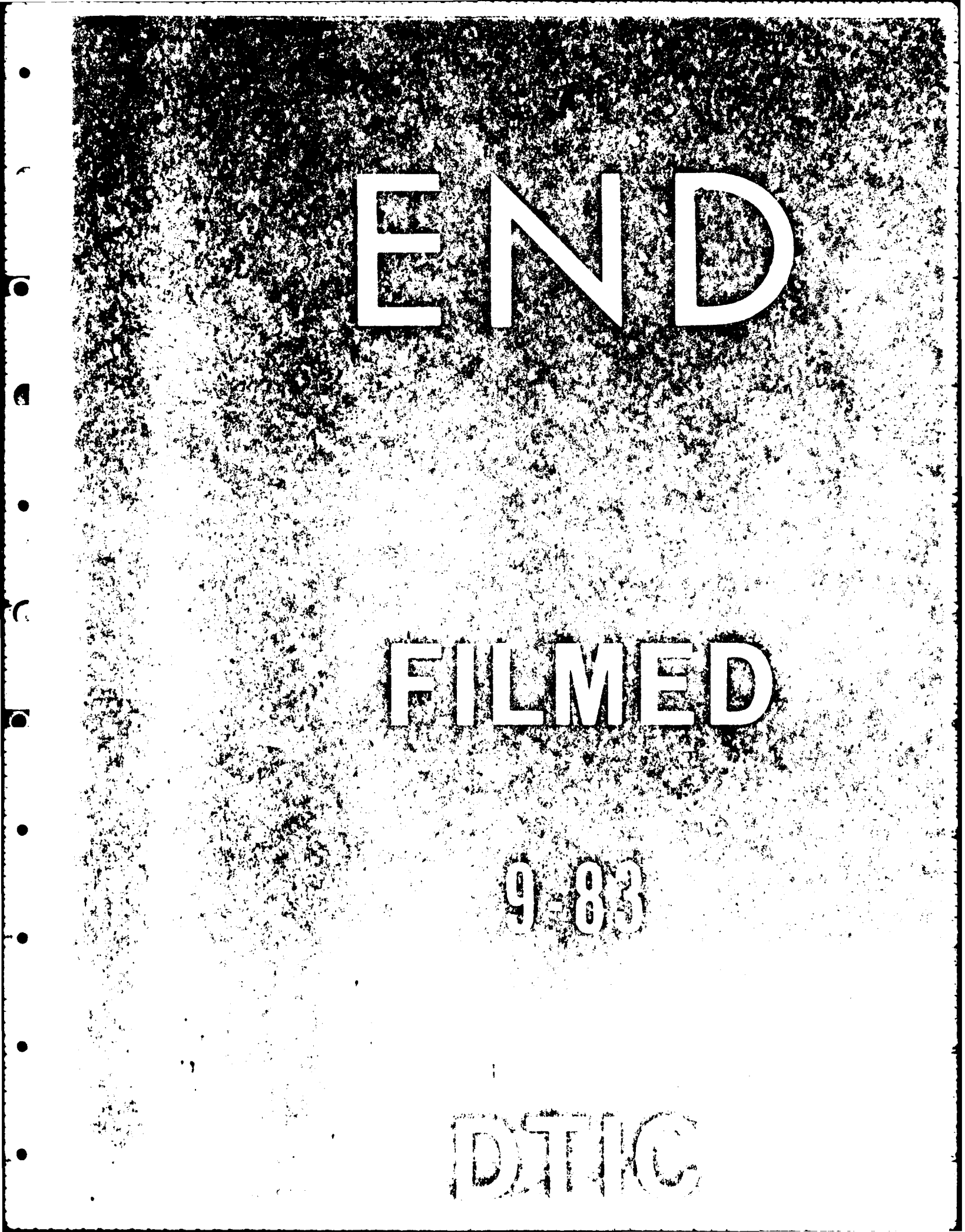
212. "Synfuels: Washington's $15 Billion Orphan," U.S. News and World Report, p. 58, 17 January 1983.

213. Ibid., p. 58.

INITIAL DISTRIBUTION LIST

		No. Copies
1.	Defense Technical Information Center Cameron Station Alexandria, Virginia 22314	2
2.	Libarary, Code 0142 Naval Postgraduate School Monterey, California 93940	2
3.	Department Chairman, Code 56 Department of National Security Affairs Naval Postgraduate School Monterey, California 93940	1
4.	Professor Michael W. Clough, Code 56Cg Department of National Security Affairs Naval Postgraduate School Monterey, California 93940	2
5.	Professor Robert L. Looney, Code 56Lx Department of National Security Affairs Naval Postgraduate School Monterey, California 93940	2
6.	Dr. Charles K. Ebinger Director, Energy and National Security Program Center for Strategic and International Studies Suite 400 1800 K Street, N.W. Washington, D.C. 20006	1
7.	Center for Naval Analyses 2000 North Beauregard Street P.O. Box 11280 Alexandria, Virginia 22311	1
8.	The Library of Congress Congressional Research Service Washington, D.C. 20540	1
9.	Commanding Officer Naval Officer Training Center Att. UIC 30465: SWOSCOLCOM (LT Terry C. Pierce, USN) Newport, Rhode Island 02840	5

		No. Copies
10.	Professor Claude A. Buss, Code 56Bx Department of National Security Affairs Naval Postgraduate School Monterey, California 93940	1
11.	Mr. Frederic J. Pierce 1232-22nd Avenue Longview, Washington 98632	1
12.	Mr. William Sisk 7 Nassau Court Novato, California 94947	1
13.	Mr. Sidney Chapin 5712 Logan Bakersfield, California 93308	1
14.	Mrs. Joan Takayama 147 North Hamilton Drive Number 204 Beverly Hills, California 90211	1


END
FILMED
9-83
DTIC