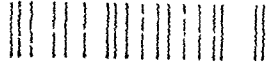


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**THE STRATEGIC PETROLEUM RESERVE:
AN ANALYSIS OF ITS PURPOSE, HISTORY AND FINANCING**

by

WILLIAM ROBERT STANLEY, JR., B.S.

THESIS

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

MASTER OF ARTS

THE UNIVERSITY OF TEXAS AT AUSTIN

May 1994

**THE STRATEGIC PETROLEUM RESERVE:
AN ANALYSIS OF ITS PURPOSE, HISTORY AND FINANCING**

APPROVED BY

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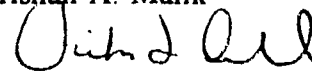
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DEDICATION

This work is dedicated to my parents, who taught me to never turn down a chance to further my education, to Colonel Niels P. Biamon, who taught me that hard work and perseverance pay off, and to the United States Army, who made all of this possible.

ACKNOWLEDGEMENTS

I would like to acknowledge Dr. W. C. J. van Rensburg for his support, constructive criticism, and the helpful suggestions he provided throughout this experience. To Dr. Arnold and Dr. Malik, I give thanks for their time and effort in seeing this thesis through to the end. The other members of the EMR program were supportive and a lot of fun, I hope to see them again in the future and wish them well.

ABSTRACT

THE STRATEGIC PETROLEUM RESERVE: AN ANALYSIS OF ITS PURPOSE, HISTORY AND FINANCING

by

WILLIAM ROBERT STANLEY, JR., M.A.

The University of Texas at Austin, 1994

SUPERVISOR: W. C. J. VAN RENSBURG

The United States Strategic Petroleum Reserve (SPR) was established by the passing of the Energy Policy and Conservation Act on December 22, 1975. It acts as the U.S.'s first line of defense against oil supply disruptions, both foreign and domestic. As of September 1993, the SPR contained 585.7 million barrels of crude oil. Since the program's inception, the nation has enthusiastically endorsed the SPR program; however, many questions remain concerning its funding and future. These questions are discussed and analyzed in the pages that follow.

It is important to understand the U.S.'s dependence on imported crude oil and therefore its vulnerability to a disruption in the supply of that oil. In 1992, the U.S. relied on foreign sources for 45 percent of its oil requirements. The U.S. economy is dependant upon oil for its growth, but is it susceptible to a supply disruption? The U.S. is somewhat vulnerable to oil supply disruptions and will become more dependent on foreign oil if current consumption continue. If oil supplies were spread evenly throughout the world, the U.S. would not be as subject to disruptions as it is now; however, oil supplies are concentrated in only a few areas, particularly the Middle East. The SPR acts as the initial buffer in the event of an oil supply disruption, but this has not always been the case.

The SPR plan, published in 1976 (and subsequently amended), established the SPR's size, drawdown capability, petroleum types stored, oil acquisition plan, storage method used, reserves types, SPR use, development schedules, costs, and economic impacts. The initial plan called for a reserve of 500 million barrels of crude oil stored in salt domes that was capable of being drawdown at 3.3 million barrels per day. Crude would be the only type of petroleum stored with one third being low sulfur and the remainder being high sulfur. Normal federal procurement procedures would be used to purchase oil for the reserve. Parameters for a drawdown were established, but no formal distribution plan was written in the initial plan. The cost for completing the SPR was estimated at \$8 billion.

Historically, the SPR has had a colorful past. It has experienced management problems, construction delays and been required to stop all oil purchases several times. The majority of the management and operational problems have been solved. The program has been amended four times and its budget has been changed almost yearly since its inception. With the exception of inadequate funding, the SPR now operates fairly efficiently and provides sufficient protection against major oil supply disruptions.

Financing of the reserve has always been a major source of debate. Everyone agrees that the program is necessary, but no one wants to pay for the reserve. The different financing methods examined for the SPR include: bonds; taxes and fees; asset sales; futures and options sales; the leasing of oil; mandatory oil contributions; private contributions; swaps; and other traditional financing methods. Currently, the SPR is financed by U.S. Government debt through the normal budgeting process. The problem with this process is that it has not provided adequate funding for the completion of the reserve.

The SPR has five active storage facilities and one marine terminal, located in Louisiana and Texas. These facilities are connected to pipelines that supply domestic refineries which in turn produce the majority of the nation's petroleum products. The SPR has a combined storage capacity of 750 million barrels and can drawdown and distribute up to 3.5 million barrels of crude oil per day.

The SPR also plays a key role in the U.S.'s participation in the International Energy Agency. It provides the bulk of the stockpile for 90 days of import protection required by the agreement.

In the future, the SPR could be expanded in size and scope. Expansion of the SPR to a capacity of one billion barrels has been required by law, and preliminary studies have been conducted to plan the expansion. The program could also be expanded by including petroleum products and by requiring oil companies to maintain petroleum stocks as an Industrial Petroleum Reserve. The SPR could also be used to control oil prices, to lessen the effects of domestic supply disruptions and as a stockpile for the Department of Defense during times of war.

In order for the SPR to reach its full potential, it requires funding at a higher level, changes in its sales methods, and increased capacity as a function of U.S. imports. The SPR provides the U.S. with a solid first line of defense against any future short term oil supply disruptions.

TABLE OF CONTENTS

Acknowledgements	v
Abstract	iv
Table of Contents	ix
List of Tables	.xiii
List of Figures	.xiv
Chapter I	
Introduction	1
Chapter II	
United States Dependency and Vulnerability	5
Dependence versus Vulnerability	5
U.S. Import and Production History and Future Trends	8
History	8
Future Trends	10
Domestic Production	10
Imports	10
History of Crude Oil Supply Disruptions	13
Arab Oil Embargo	13
Iranian Revolution	16
Iran-Iraq War	17
Persian Gulf War	18
Importance of OPEC and the Middle East	19
OPEC	22
The Middle East	22
Methods of Reducing Import Vulnerability	23
Reducing Oil Use	25
Alternative Fuels	27
Increased Domestic Production	28
Diversity of Supply	28
Stockpiling	29
Conclusions	31
Chapter III	
The Strategic Petroleum Reserve Plan	37
Background	37

	x
Legislative Directives	37
Major Features of the SPR Plan	38
Size and Capability	38
Size	40
Capability	40
Types of Petroleum	42
Oil Acquisition	42
Storage	43
Storage Types Evaluated	44
Conventional Steel Tanks	44
Tanker Storage	44
Lagoons and Rubber Bags	46
Depleted Oil Reservoirs	46
<i>In-situ</i> Storage	46
Solution Mined Salt Domes	46
Conventional Mines	47
Storage Type Selected	47
Reserves	48
Regional Petroleum Reserves	48
Industrial Petroleum Reserve	48
Distribution Plan	50
Trigger Mechanism	50
Drawdown Rate	51
Pricing	51
Allocation and Regulatory Controls	51
Transportation	51
Management and Operations	52
Development Schedule	52
Costs and Economic Impacts	54
Costs	54
Land Acquisition	54
Construction of Storage Facilities	54
Oil Acquisition and Transportation	56
Operations	56
Administration	56
Economic Impacts	56
Conclusions	57
Chapter IV	
The Strategic Petroleum Reserve History	59
Legislative	59
Program Legislation	59
Amendments	63

	xi
Size and Fill Rate	64
Size	64
Fill Rate	65
Budgeting	70
Persian Gulf War	75
Conclusion	77
Chapter V	
Financing Alternatives	82
Bonds, Taxes and Fees, Selling Assets and Futures/Options	82
Bonds	82
Taxes and User Fees	83
Asset Sales and Receipts	84
Futures and Options	87
Leasing, Mandatory Contributions and Private Contributions	87
Leasing or Renting	87
Mandatory Contributions	89
Private Contributions	90
SPR Corporation	91
Other Options	92
Swaps with Oil Producing Countries	92
Altering the Budgeting Process	92
Conclusion	93
Chapter VI	
Strategic Petroleum Reserve Infrastructure, Distribution Plan and Capabilities	98
Infrastructure	98
Byran Mound	98
Big Hill	102
West Hackberry	103
Bayou Choctaw	103
Weeks Island	104
St. James Terminal	104
Distribution Plan	105
Competitive Sales Procedure	105
Alternative Sales Procedure	106
SPR Capabilities	108
Conclusions	111

Chapter VII

The Strategic Petroleum Reserve and the International Energy Agency	.115
The International Energy Agency	.115
The Oil Sharing Provision	.118
Drawbacks and Benefits	.119
Drawbacks	.119
Benefits	.121
The Role of the SPR in the IEA	.122
Conclusion	.123

Chapter VIII

The Future of the Strategic Petroleum Reserve	.126
Expanding the Strategic Petroleum Reserve	.126
Industrial Petroleum Reserves	.129
Strategic Product Reserves	.130
Uses	.132
Control Prices	.132
Domestic Supply Interruption	.133
Defensive Stockpile	.133
Conclusion	.134

Chapter IX

Conclusions and Recommendations	.138
Bibliography	.143
Vita	.150

LIST OF TABLES

Table 2-1: Petroleum Supply with Predictions to 2010	11
Table 2-2: Major World Oil Supply Disruptions	14
Table 3-1: Oil Supply Interruption Scenarios	39
Table 3-2: Estimated Daily Shortfall	41
Table 3-3: Summary of Alternative Storage Facilities	45
Table 3-4: Distribution of Costs Summary	55
Table 4-1: Comparison of FEA Estimates and Actual Oil Prices	71
Table 4-2: Strategic Petroleum Reserve Appropriations	72
Table 5-1: Attributes vs. Financing Concepts	94
Table 6-1: SPR Storage and Distribution Capacity by Site	101
Table 6-2: Current Drawdown and Distribution Capabilities	110
Table 6-3: Strategic Petroleum Reserve Crude oil Streams	110

LIST OF FIGURES

Figure 2-1: U.S. Crude Oil Production and Imports	6
Figure 2-2: Average Annual Price of Crude Oil	9
Figure 2-3: Percentage of U.S. Oil Consumption Supplied by Net Imports, 1975-2010	12
Figure 2-4: Percentage of U.S. Imports Provided by OPEC	20
Figure 2-5: Distribution of Oil Reserves 1992	21
Figure 2-6: Percentage of U.S. Imports Provided by Middle Eastern Countries	24
Figure 2-7: Petroleum Use by Sector	26
Figure 3-1: Federal Energy Administration Regions	49
Figure 3-2: Major Implementation Actions	53
Figure 4-1: Strategic Petroleum Reserve Oil Fill History	66
Figure 4-2: Strategic Petroleum Reserve Oil Fill History	68
Figure 4-3: Strategic Petroleum Reserve Annual Funding	73
Figure 4-4: Strategic Petroleum Reserve Cumulative Funding	74
Figure 6-1: SPR Pipeline and Marine Distribution Capabilities	99
Figure 6-2: Strategic Petroleum Reserve Storage Sites	100
Figure 6-3: Strategic Petroleum Reserve Drawdown/Distribution Capability	109
Figure 8-1: SPR Current and Candidate Sites	127

CHAPTER I

INTRODUCTION

Petroleum's importance to the United States' security was recognized near the turn of the century. In 1912, the Naval Petroleum Reserve (NPR) was established by executive order to ensure the supply of oil for the nation's defense and was essentially the first national oil stockpile. The United States (U.S.) began a strategic and critical minerals stockpile program in 1939 to prevent the disruption of the supply of raw materials during wartime. Petroleum was not included in the program primarily due to the U.S. being a net exporter at the time. However, after World War II, U.S. oil import dependence began to grow.¹

In 1957, President Eisenhower instituted import quotas using the authority of the Trade Agreements Extension Act of 1955 (PL84-86). The quota system remained in effect until 1973, when increasing import prices, controlled domestic prices and full capacity domestic production made the system unworkable.² In 1970, a study showed that U.S. dependence on imported crude oil was serious enough to consider developing an emergency oil stockpile. President Nixon initially considered such a program too expensive an undertaking.³

The United States' import dependence did not manifest itself as a major problem until the 1973-74 Arab oil embargo. The embargo against the U.S. was a result of the U.S.'s support of Israel during the Arab-Israeli war. The Arab oil embargo was the first successful use of oil as a weapon.⁴ The oil embargo had severe economic impacts and emphasized our growing dependence on foreign imports. World oil prices increased by a factor of four between September 1973 and January 1974, even though less than ten percent of the world oil supply was affected. The impacts of the supply interruption included a loss to the gross national product (GNP) of 35 to 45 billion dollars and a loss of approximately 500,000 jobs. Losses in the United States directly related to the embargo totaled 10 to 20 billion dollars.⁵

The United States and the rest of the world realized that future supply interruptions had the potential for even greater economic impact. Due to these concerns, the U.S. and twenty-one other countries formed the International Energy Agency (IEA) in 1974. The IEA agreement committed the U.S. to maintaining emergency reserves equal to at least 60 days

supply of crude oil imports. Additionally, Congress enacted the Energy Policy and Conservation Act (EPCA) on December 22, 1975, requiring the creation of a Strategic Petroleum Reserve (SPR) of no less than 150 million barrels and no more than one billion barrels of crude oil.

The purpose of the SPR is to stabilize the national and international petroleum situation by⁶:

- easing initial problems and impacts of a program to reduce energy import dependence resulting from an embargo;
- reducing the economic, foreign policy and national security impact of a crude oil supply disruption;
- assisting in the interests of the United States and the IEA member countries;
- and reducing the probability of an oil embargo by forcing greater economic losses on the country or countries imposing an embargo.

Initially, the SPR's capacity was set at 500 million barrels (MMB), but due to increasing import dependence, this was quickly increased to 750 MMB (its current capacity). The 1990 EPCA amendments have increased the SPR goal to 1 billion barrels.

The SPR is designed to cope with three different interruption scenarios. These scenarios are⁷:

- a total oil embargo against the U.S. in which the embargoing countries would reduce all oil exports to other countries by 25 percent;
- a total oil embargo of the U.S. in which the embargoing countries would reduce all oil exports to other countries by 50 percent;
- or an interruption in which military operations would cut off shipments of oil from major oil fields to all importing nations. This would result in a worldwide oil shortage.

The nation has enthusiastically endorsed the SPR program; however, funding has prevented it from being developed to the required stock levels. Is the SPR still a valid program for protecting against supply disruptions? In light of the current federal budget crisis, what are the options available for fully funding the program? Can the program meet all of the goals set forth in the SPR plan? What is the future of the SPR? What can the

government do to ensure that future disruptions are avoided or their effects reduced? There is no doubt that the SPR will play a pivotal role in reducing any future oil shocks.

Since the establishment of the Strategic Petroleum Reserve, the program has gone through many growing pains and has become the world's largest oil stockpile. There has been continued debate on what the optimal size of the SPR should be, how it should be financed, when and how it should be used, whether or not to develop regional product reserves and how and if the SPR oil should be shared with other countries. This thesis examines each of these questions and provides some comments and recommendations that may help to make the SPR a more effective strategic tool.

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CHAPTER II

UNITED STATES DEPENDENCY AND VULNERABILITY

Webster's Dictionary defines dependance as reliance on another for support, and vulnerability as the state of being open to attack or damage. The United States (U.S.) is dependant upon oil imports to fulfill its total crude oil requirements; the U.S.'s industries and economy are vulnerable to oil supply disruptions. The Strategic Petroleum Reserve (SPR) was developed primarily to reduce the U.S.'s vulnerability to crude oil supply interruptions. This chapter examines the distinction between dependance and vulnerability, the reasons for wanting to reduce vulnerability and events that have precipitated continued interest in the SPR. Additionally, methods for reducing vulnerability are discussed.

DEPENDENCE VERSUS VULNERABILITY

The United States' oil import dependance is measured as the percentage of total consumption that is met by imported oil. In 1992, the U.S. imported approximately 45 percent of its oil requirements (see figure 2-1).¹ The percentage of oil imported is expected to continue to rise in the foreseeable future. Oil import dependence alone does not imply that the U.S. is vulnerable to an oil supply disruption. Vulnerability is a function of the degree and nature of the oil import dependence, and its potential adverse effects on the economic and social welfare of the country. These potentially harmful effects include a severe disruption in the oil supply, increased prices for oil and other goods and services, the duration of the interruption, and the likelihood of a disruption.² The U.S. is clearly dependant on foreign oil, but is it vulnerable?

Dependence on imported oil, in and of itself, does not mean that vulnerability exists. If the dependence occurs in a stable, apolitical world environment, then vulnerability is not a problem.³ If import sources are secure, and the tax on oil imports is equal to the difference between social costs and the market price, then dependence on imported oil would be economically efficient. In general, it is economically preferable to import additional oil as

U.S. CRUDE OIL PRODUCTION AND IMPORTS

BARRELS PER YEAR

□ Production □ Imports

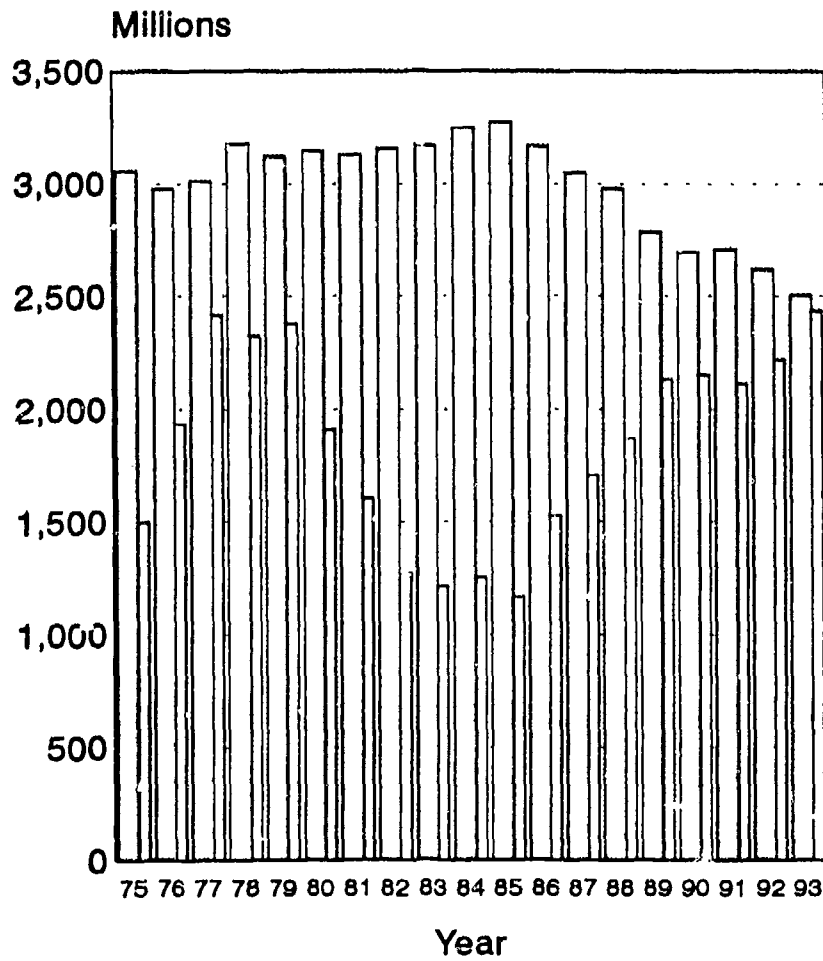


FIGURE 2-1'

long as the price of the imported oil is less than the cost of domestically produced additional oil; therefore, dependence is not necessarily a problem.⁵

Oil use in the U.S. is an integral part of the economy. It is used to heat homes, offices, and schools; to generate electricity; and to fuel the buses, cars and trucks that move people and things throughout the U.S. Any major oil supply disruption will bring hardship and deprivation to U.S. citizens. Historically, oil supply disruptions have impacted the U.S. economy greatly.

In 1987, the National Petroleum Council estimated that the 1973 Arab Oil Embargo caused a reduction in real GNP of 2.7 percent and that the 1979 Iranian Revolution resulted in a drop of 3.6 percent in real GNP. Additionally, the 1979 interruption deepened a worldwide recession. Future oil disruptions will continue to pose a significant threat to the U.S. economy. The U.S.'s growing dependence on imported oil, especially from the politically unstable Middle East, is a cause for concern for several reasons:⁶

- greater oil import reliance magnifies the impact of any oil disruption;
- oil imports contribute to the U.S. balance of payments deficit;
- threat of potential economic and social dislocations that would accompany a major oil disruption could constrain foreign policy, national security and military options;
- availability of cheap imported oil in the U.S. is a powerful financial disincentive for oil conservation investments in efficiency and alternative energy sources or the development of higher cost domestic oil.

Past and current low oil prices have been advantageous for American businesses and consumers outside of the oil industry. Low prices undermine domestic oil joint ventures, energy efficiency efforts and the energy industry as a whole. There are strong arguments that the current price of oil does not reflect the true social and economic costs.⁷ What can be done to reduce the U.S.'s vulnerability to an oil shock? Even if the U.S. could eliminate oil imports, it may still be vulnerable to oil supply disruptions in other parts of the world due to our allies and trading partners being net importers of oil.⁸

U.S. IMPORT AND PRODUCTION HISTORY AND FUTURE TRENDS

HISTORY

On August 27, 1859, "Colonel" Edwin Drake struck oil near Titusville, Pennsylvania and the American oil industry was born. Since that first well was drilled, U. S. production of crude oil continued to increase until it peaked in 1970 at an average of 11.3 million barrels per day. Although, the U.S. produced half of the world's oil until the early 1950's; in 1948, the U.S. became a permanent net importer of crude oil. Additionally, it had enough unused production capacity to produce oil for export during emergencies. This oil was more expensive than oil from the Middle East and could not compete with Middle Eastern oil except under emergency conditions.⁹

During the 1950's, the U.S. Government became concerned with the U.S.'s growing reliance on imported oil and, as a result of these concerns, placed restrictions on imported oil. In 1968, the U.S. State Department notified U.S. allies and trading partners that the U.S. no longer had any surge crude oil production capacity for use during possible oil supply disruptions (as it had during the 1957 Suez Crisis and the 1967 Arab-Israeli War). Import restrictions remained in place until 1973, when the production capacity in the U.S. reached its peak and spot shortages began to appear due to the import restrictions. Once crude oil import restrictions had been lifted, imports (as a percentage of consumption) increased from 24 percent in 1970 to 46 percent in 1977.¹⁰ After the Arab oil embargo in 1973, the U.S. moved away from importing its oil from the Middle East and diversified its import sources. However, in recent years Middle Eastern oil has increased its share of total imports (a more detailed discussion can be found later in this chapter) to the U.S. Due to increased domestic production, conservation measures, and higher prices, import levels fell until 1986, when the price of oil fell dramatically (see figure 2-2). Since 1986, the percentage of crude oil imported has been increasing. In 1990, the U.S. obtained 42 percent of its oil needs from foreign sources (see figure 1 in the previous section).¹¹ There is little doubt that the U.S. will become increasingly dependant on Middle Eastern oil.

AVERAGE ANNUAL PRICE OF CRUDE OIL

U.S. AND SAUDIA ARABIAN LIGHT (SA) AVERAGE WELLHEAD AND CRUDE OIL PRICE

◄ U.S. Current \$ + U.S. Constant 1982 \$ * SA CURRENT \$ ■ SA CONSTANT 1982 \$

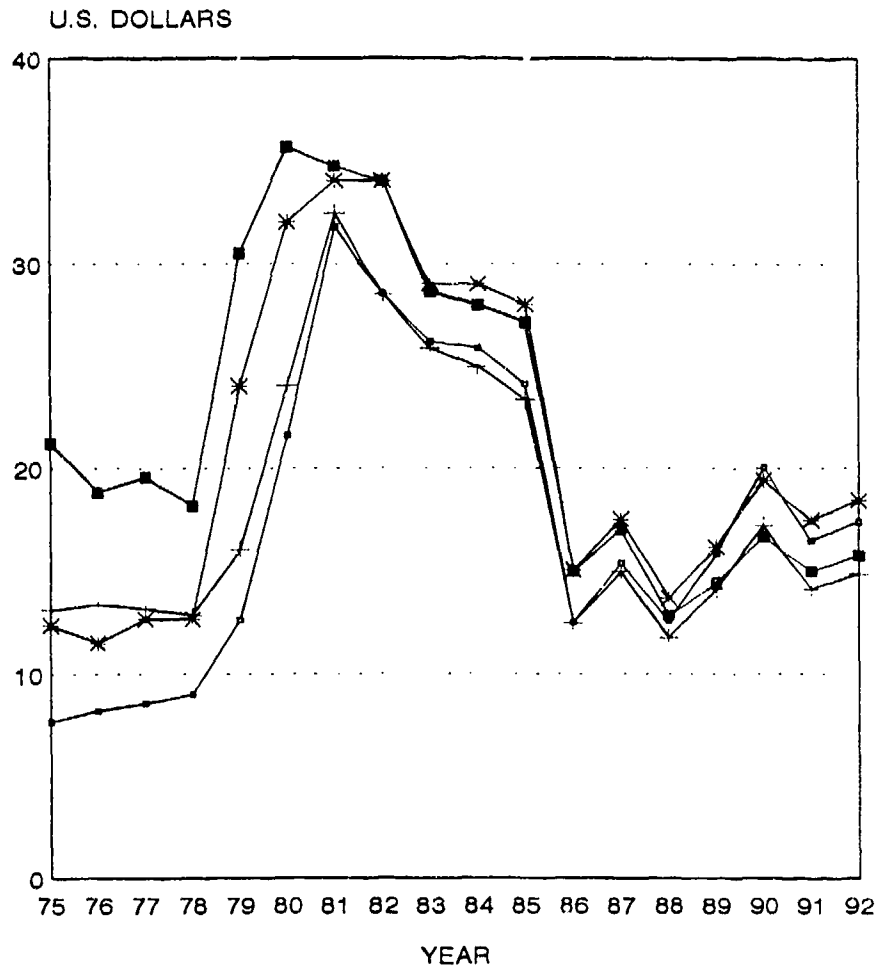


FIGURE 2-2¹²

FUTURE TRENDS

Crude oil production in the U.S. fell to 6.86 million barrels per day in 1993, continuing the gradual decline in domestic crude oil production from the 1970 peak of 11.3 million barrels per day. The marked decline in domestic crude oil production since 1985 is a result of the dramatic fall in oil prices in 1985-86 from 26 dollars per barrel to 11 dollars per barrel. Since the decline, average crude oil prices gradually increased, peaking in 1990 at an average price of 20.03 dollars per barrel. Since the 1990 peak, crude oil prices have fallen to an average of 14.40 dollars per barrel in 1993. The Energy Information Administration (EIA) does not expect crude oil prices to reach 1985 levels for almost twenty years.¹³

Domestic Production

U.S. average daily crude oil production has declined by approximately 300,000 barrels per day per year since 1985. Crude oil production is expected to continue to decline at a rate of 0.9 percent annually if oil prices are high or at a rate of 2.8 percent annually if oil prices are low (see Table 2-1). Offshore production is expected to decline until 1994, when large offshore projects in the Pacific are scheduled to begin. After Pacific production is on line, offshore production is expected to begin declining gradually until the turn of the century. Future offshore production trends are dependant upon environmental restrictions affecting leases. Projections do not include possible leases within the Arctic National Wildlife Refuge (ANWR). Without ANWR, Alaskan production is expected to fall by 2 to 6.9 percent per year dependant on whether crude oil prices are high or low.¹⁴

Imports

U.S. demand for petroleum products is expected to grow between 0.6 and 1.4 percent per year. This growth would result in U.S. demand (for all petroleum requirements, foreign and domestic) by the year 2000 of 17.9 to 19.5 million barrels per day, and by 2010 between 19.3 and 22.4 million barrels per day. In 1993, U.S. demand was approximately 17.2 million barrels per day. The overall growth in demand coupled with the decline in domestic petroleum production will lead to a greater dependance on imported crude oil and refined

TABLE 2-1¹⁵
PETROLEUM SUPPLY WITH PROJECTIONS TO 2010
 (Quantities in Million Barrels per Day)

YEAR	1990	REFERENCE			HIGH OIL PRICE			LOW OIL PRICE		
		2000	2005	2010	2000	2005	2010	2000	2005	2010
WORLD OIL PRICE (1990 DOLLARS PER BARREL)	21.78	26.40	30.50	33.40	31.80	36.90	40.20	17.90	20.10	22.60
DOMESTIC PRODUCTION: CRUDE OIL	7.35	5.91	5.62	5.51	6.72	6.37	6.14	4.71	4.30	4.16
DOMESTIC PRODUCTION: OTHER	1.64	1.90	2.05	2.06	1.92	2.05	2.06	1.89	1.95	1.97
NET IMPORTS (INCLUDING SPR)	7.16	9.8	10.9	11.6	8.5	9.5	10.2	12.1	14.4	15.4

PERCENTAGE OF U.S. OIL CONSUMPTION SUPPLIED BY NET IMPORTS, 1975-2010

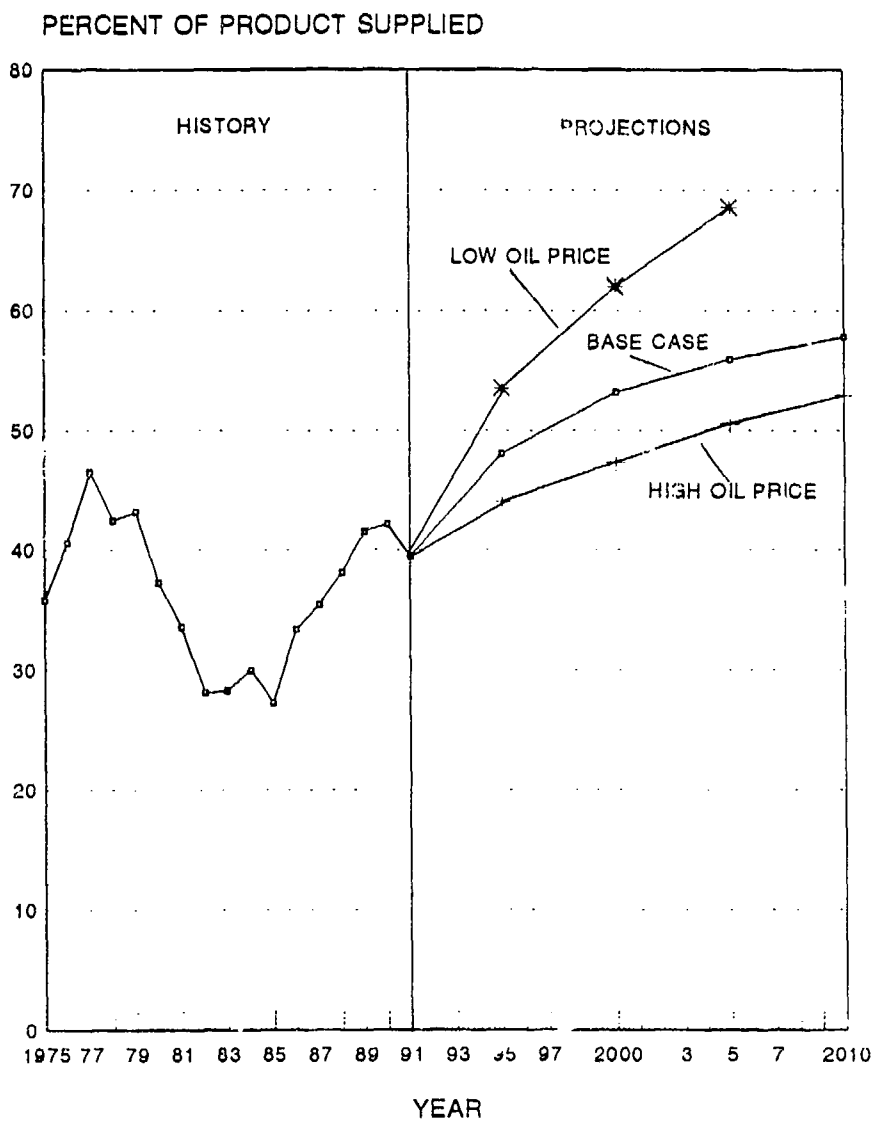


FIGURE 2-3¹⁶

products. Import levels are expected to rise from 7.5 million barrels per day in 1993 to between 10.2 and 15.4 million barrels per day in 2010, imports being highest when prices are low. This will make the U.S. net oil import dependant for 53 to 69 percent of U.S. petroleum demand (see figure 2-3).¹⁷

The majority of petroleum imports to the U.S. will be as crude oil versus refined products. Refined product imports, however, will increase at a greater rate than crude imports (without exceeding crude oil imports). Any additions to U.S. refining capacity are expected to come from additions to existing refineries or the reactivation of capacity that has been shut down. In order to maintain existing refining capacity, domestic refineries need to make significant investments in pollution reduction, adjust to changing product streams, and find financing for the required investments.¹⁸

HISTORY OF CRUDE OIL SUPPLY DISRUPTIONS

All of the major crude oil supply disruptions in recent history (see Table 2-2) have come from one region, the Persian Gulf. The Arab Oil Embargo, Iranian Revolution, Iran-Iraq War and the Persian Gulf War all centered in the Persian Gulf region. The region is politically unstable and prone to major and minor conflict. Saudi Arabia is the most stable country in the region and Iraq, its neighbor to the north, is considered one of the most unstable countries in the world.¹⁹ This region contains over 60 percent of the world's known crude oil reserves and any future disruptions are likely to occur in this inherently unstable area. It is important to examine past supply disruptions in order to prepare for future disruptions.

ARAB OIL EMBARGO

In the 1950's, the multinational oil companies unilaterally lowered the posted price of Middle Eastern oil several times. The budgets and economies of major oil producing countries (Iran, Kuwait, Saudi Arabia and Venezuela) suffered the negative impacts of the price cuts. As a direct result of the unilateral price cuts, representatives from Iran, Iraq, Kuwait, Saudi Arabia and Venezuela met on September 10, 1960 in Baghdad to "coordinate and unify the petroleum policies of the producer countries."²⁰ So began the Organization of

TABLE 2-2¹¹
MAJOR WORLD OIL SUPPLY DISRUPTIONS

DATES	EVENT	SIZE OF SHORTFALL (MMB/D)	WORLD OIL CONSUMPTION (MMB/D)	PERCENT OF WORLD CONSUMPTION	PERCENT CHANGE IN OIL PRICES	DURATION (MONTHS)
OCTOBER 1973 - MARCH 1974	OCTOBER ARAB-ISRAELI WAR	1.6	58.2	2.75	+276.0	5
NOVEMBER 1978 - APRIL 1979	IRANIAN REVOLUTION	3.7	65.1	5.86	+82.4	6
OCTOBER 1980 - JANUARY 1981	OUTBREAK OF IRAN-IRAQ W.P.	3.0	60.4	4.97	+9.8	3
AUGUST 1990 - FEBRUARY 1991	PERSIAN GULF WAR	4.9	60.3	8.10	+126.0	7

Petroleum Exporting Countries (OPEC). The significance of this event would be lost to the world until the early 1970's.

The Arab-Israeli Six Day War began on June 5, 1967. On June 6, the Arab oil ministers called for an oil embargo against the countries friendly toward Israel. Oil production in the Arab countries was reduced sixty percent by June 8. The Organization for Economic Cooperation and Development (OECD) oil committee and the major oil companies were able to adjust for the production losses by reorganizing the distribution of oil, drawing from existing stocks, and inducing a surge in U.S. domestic production of almost a million barrels per day. By July 1967, the first Arab Oil Embargo was a dismal failure and by September 1967 the embargo was lifted. The biggest losers were the countries that instigated the embargo. They lost substantial revenues and contributed to the increasing debt of the region.²²

The United States lost all of its crude oil surge production capacity (which the OECD had counted on in the past) by early 1970. As a result, the U.S. lifted its import quotas in 1973. Oil imports jumped from 3.2 million barrels per day in 1970 to 6.2 million barrels per day by the summer of 1973. Much of the new imported oil was coming from the Persian Gulf region. U.S. surge capacity had disappeared and as a result, the world became more vulnerable to a possible oil embargo.²³

During the early 1970's, OPEC began exerting greater influence over the major oil companies in terms of production levels and price setting capability. OPEC members demanded and received equity positions in their oil fields. In October 1973, OPEC unilaterally raised the price of Saudi marker crude from \$3.01 to \$5.12 per barrel, an increase of over seventy percent. OPEC now controlled the price of oil.²⁴

Early in the morning on October 6, 1973 Egypt and Syria launched a surprise attack on Israel and so began the Yom Kipper War. In order to show support for Egypt, the Organization of Arab Petroleum Exporting Countries (OAPEC, a sub-group within OPEC), led by Saudi Arabia, began an embargo of Israeli allies. On October 20, in retaliation for U.S. Israeli aid proposals, Saudi Arabia and the other Arab oil producing countries cut off all shipments of oil to the U.S.²⁵ By January 1974, U.S. imports fell by 2.7 million barrels per

day. Crude oil spot market prices went from \$2.70 in the third quarter of 1973 to \$13.00 per barrel in the first quarter of 1974. Economists estimated that the crude oil price increases reduced the real gross national product of the U.S. by seven percent (on an annual basis) in the first quarter of 1974. Many believe that the price increases were the primary cause of the deep recession that extended into 1975.²⁶

The 1973-74 oil embargo motivated the U.S. to take countermeasures against current and future crude oil supply disruptions. On November 7, 1973, President Nixon called for voluntary conservation, deregulated natural gas prices, announced Project Independence and asked for authority to allocate certain petroleum products. Project Independence was a national effort to achieve energy self sufficiency by 1980. By November 1974, it was clear that self sufficiency was an unrealistic goal; subsequently, the focus of Project Independence was changed to reducing the vulnerability of the U.S. oil market to disruptions. The most significant achievements of the Nixon-Ford administration after the embargo were getting Congress to approve the Alaskan oil pipeline and the setting of fuel efficiency standards for the automobile industry. The culmination of these early efforts was the passage of the Energy Policy and Conservation Act (PL94-163, EPCA) which, among other things, established the Strategic Petroleum Reserve (SPR).²⁷

IRANIAN REVOLUTION

The period following the 1973-74 oil embargo was marked by the growing complacency of the OECD countries. Production from Alaska and the North Sea was increasing and economic growth (and demand) was slow. During the period between 1975 through 1978 OPEC production actually fell by 18 percent. Analysts were predicting that a glut of oil would cause the price to decline in real terms through the 1990's. The U.S. steadily increased its imports from the OPEC countries. The effects of crude oil price increases had not been fully felt by the U.S. public due to price controls; therefore conservation measures that had been successful in Europe were largely unsuccessful in the U.S.

U.S. foreign policy in the Persian Gulf region depended upon the Shah of Iran maintaining stability in the region. On New Years Eve, December 31, 1977, President Carter

gave the following toast to the Shah: "Iran under the great leadership of the Shah is an island of stability in one of the more troubled areas of the world."²⁸ Less than a year later, Iranian oil workers cut off exports and the Shah was exiled. The cut off of Iranian exports amounted to a loss of five million barrels of oil per day; the world's export markets went from a small surplus of world production to a shortage. Even after Saudi Arabia increased production, the net result was a shortfall of 1.5 to 2 million barrels per day. The price of Saudi marker crude rose to \$18.34 from the just-set December 1978 price of \$13.34 per barrel. OPEC producers began cancelling long-term contracts by invoking *force majeure* clauses and immediately reselling the same crude to the same customer at the higher spot market price.²⁹

Saudi Arabia lost control of the world oil market as a result of the shortages from the Iranian Revolution. The new leader of Iran, the Ayatollah Khomeini, made it clear that Iran's oil production would not return to its former levels. Saudi Arabia attempted to regain control of the market by boosting its production to 9.5 million barrels per day (BOPD) through the end of 1979 and the beginning of 1980 in order to lower world prices. OPEC members continued to raise their official prices in spite of increased Saudi production, reduced world consumption, and high inventories. The increased price of oil stimulated petroleum exploration, but had a negative effect on the world economy, which was already weakened by inflation.

The Iranian Revolution demonstrated the important role that control of the oil fields played in the internal politics of the producing countries. Oil fields became prime targets for political dissidents. Additionally, it showed that the major industrial nations were unable or unwilling to cooperate in exercising control over the increasing oil prices.³⁰

IRAN-IRAQ WAR

In September 1980, Iraqi troops attacked across the Shatt-al-Arab into Iran, thus beginning the eight year Iran-Iraq War (the oil supply "crisis" it caused lasted for approximately three months). The initial effect on the world oil market was a loss of 3.4 million BOPD of crude oil production. It is important to know the state of the world's oil supply just prior to the attack to understand the impacts of the conflict. Commercial crude

oil stocks were about 500 million barrels above normal operating levels and worldwide consumption trends were declining at a rate of five percent per annum. Additionally, there was significant unused production capacity available.³¹

OPEC's marker price for crude increased by only ten percent to \$32 per barrel, although spot market prices reached \$40 per barrel in November 1980 and early January 1981. In 1979, the International Energy Agency (IEA) established a registry of all crude oil transactions. Armed with information from the registry, IEA member governments were able to persuade oil companies not to repeat the panic buying and inventory building that characterized the Iranian Revolution supply disruption. The high private inventories made it easier to persuade the oil companies to control their crude oil purchases. By the end of January 1980, crude oil prices started to decline, marking the end of the crisis.³²

The OECD and U.S. economies suffered income losses of approximately six percent during 1980-81 as a result of the Iranian Revolution and the Iran-Iraq War. Losses included direct transfers to the Middle East, inflation caused by petroleum price hikes, and government policies implemented to control inflation.³³

PERSIAN GULF WAR

The period after the outbreak of the Iran-Iraq War was marked by decreasing oil prices, lower inflation and decreases in U.S. demand for imported oil until the price crash of 1986. World crude oil prices fell from \$28.00 in 1985 to \$15.05 in 1986. Crude oil imports increased as a result of the price crash. U.S. import dependence steadily grew from 33 percent in 1986 to 44 percent in 1989. OPEC's share of U.S. imports experienced a similar rise from 51 percent in 1986 to 58 percent in 1989 (the Middle Eastern countries' share rose from 19 percent to 30 percent over the same period).³⁴

On August 2, 1990, after a massive troop build-up on the Kuwaiti border, Iraq attacked and later occupied Kuwait. Immediately following the invasion, President Bush froze Iraqi and Kuwaiti assets in the U.S., banned trade with Iraq and worked through the United Nations to condemn Iraq's aggressive actions. President Bush assembled a coalition of nations for the defense of Saudi Arabia and committed U.S. air, ground and naval forces by August 12, 1990.

The invasion and resulting sanctions removed 4.3 million barrels per day from the world oil market. World oil prices increased from \$16.45 per barrel in July 1990 to an average of \$32.98 per barrel in October 1990. West Texas Intermediate (WTI) crude oil prices peaked on October 11, 1990 at over \$41 per barrel.³⁵

Increased production from other OPEC (3.5 million barrels per day) and non-OPEC (.5 million barrels per day) countries calmed world oil markets. By November, more oil was available on the world market than was available prior to the Iraqi invasion. Oil prices began to subside, with WTI dropping to approximately \$25 per barrel in mid-December.

Oil prices began to creep upward again as President Bush's January 16, 1991 deadline for Iraqi withdraw drew near. By mid-January the price for WTI had risen to \$32 per barrel. On January 17, 1991 oil prices fell with the onset of successful air operations against Iraq, spot prices fell to \$21 per barrel. The success of military operations against Iraq and surplus commercial oil stocks (205 million barrels above average) were major contributors to the decline in oil prices. Additionally, the International Energy Agency (IEA) helped calm market fears by making emergency supplies available, if needed, of up to 2.5 million barrels per day. The Persian Gulf War was the first oil supply disruption during which the U.S. Strategic Petroleum Reserve was available for use as part of the IEA response. SPR sales helped to calm world oil market fears of a crude oil shortfall.

IMPORTANCE OF OPEC AND THE MIDDLE EAST

The United States has diversified its crude oil import sources over the past 20 years. However, OPEC countries still provide over 50 percent of the petroleum imported to the U.S. (see figure 2-4). Major sources of U.S. imports are Saudi Arabia, Venezuela, Nigeria (OPEC countries), Canada and Mexico.³⁶ OPEC controls 77 percent of the world's known oil reserves, 42 percent of the world's crude oil production, and 40 percent of the known natural gas reserves. The Middle East, primarily the area near the Persian Gulf, has two thirds of the world's oil reserves (see figure 2-5). It is easy to see the importance of the region for future oil supplies.³⁷

PERCENTAGE OF U.S. IMPORTS PROVIDED BY OPEC

□ CRUDE IMPORTS

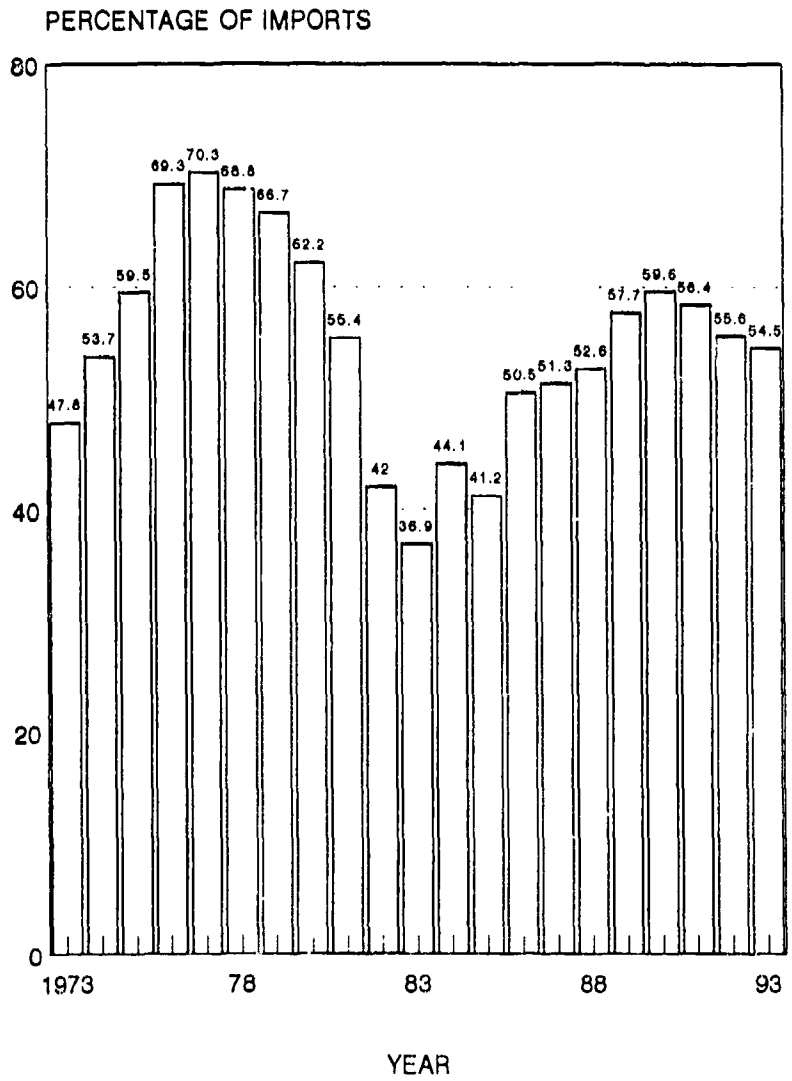


FIGURE 2-4³⁸

DISTRIBUTION OF OIL RESERVES 1992

THOUSAND MILLION BARRELS

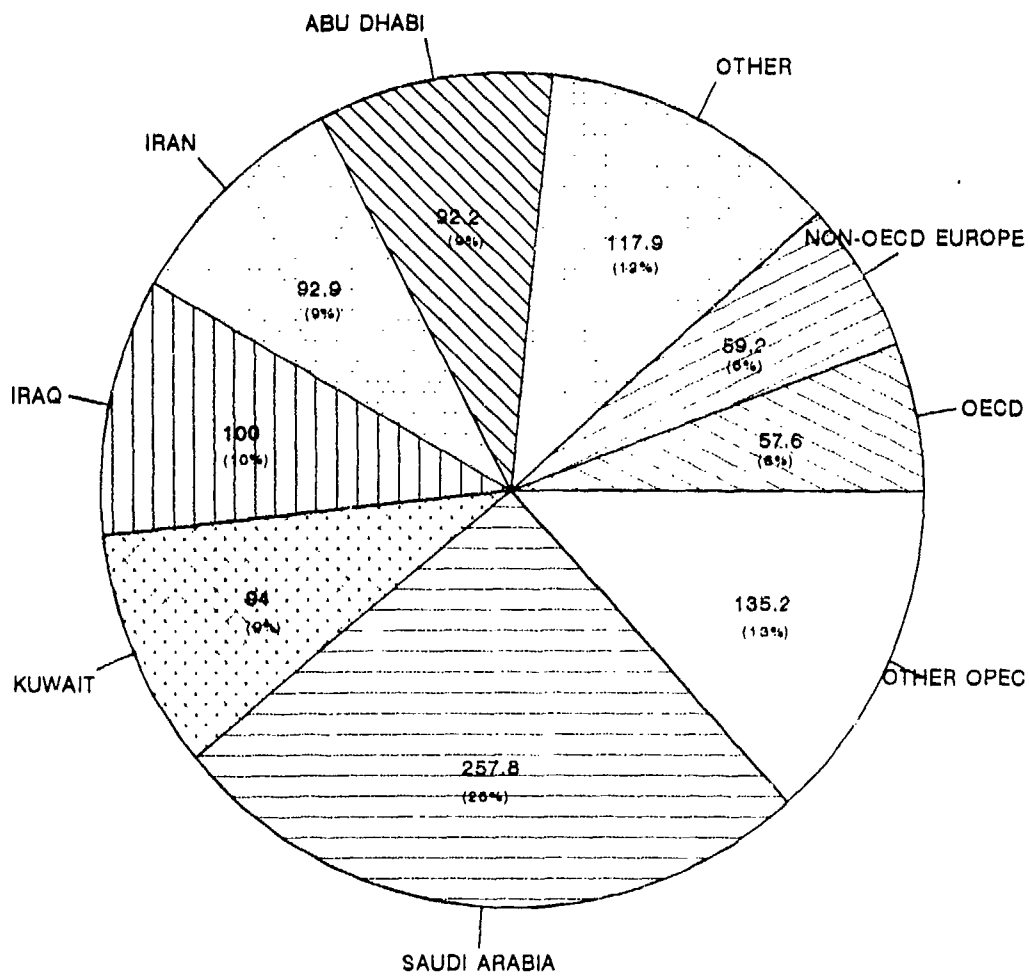


FIGURE 2-5³⁹

OPEC

U.S. import dependence on OPEC has varied between a low of about 40 percent to a high of just over 70 percent. In 1993, U.S. dependence on OPEC stood at just over 54 percent of total imports. Western Europe and Japan are more dependent on the OPEC countries than the U.S. OPEC controls all of the world's discretionary production capacity and, in general, exercises some control over the price of crude oil.⁴⁰ These factors combine to make OPEC, potentially, a very strong organization.

Currently and in the recent past, OPEC has experienced some difficulty setting and enforcing production quotas on its members in order to balance the oil supply market. Crude oil production outside OPEC has been falling (by one million barrels per day in 1992) and the trend is expected to continue into the foreseeable future. This means that OPEC will begin to control greater portions of the world oil market. Worldwide petroleum demand is rising in both the OECD and in the Third World countries. Rising demand and falling non-OPEC production will make it easier for OPEC to control the world's supply of oil in the not too distant future.⁴¹

Many sources are ready to predict the demise of OPEC, saying that OPEC will never regain the control of the oil market that they had in the late 1970's and early 1980's. OPEC may indeed become smaller as the countries with low oil reserves withdraw from the organization in the future. This will only serve to increase member cohesion and make the organization stronger. With fewer countries involved, it may be easier to reach agreements and gain greater control of the oil market.⁴² As non-OPEC production reaches its maximum capacity and world demand rises, the world will have only one place to go for additional oil: OPEC. The predictions of OPEC's demise may have been premature.

The Middle East

The Persian Gulf War showed that the world considered an uninterrupted supply of oil from the Middle East of the utmost importance. The U.S.-led coalition sent in excess of 500,000 of their soldiers, sailors, airmen and marines to drive Iraqi forces out of Kuwait and "restore friendly control" of the oil supply. It is clear that the oil from the Persian Gulf

region must continue to flow.

Saudi Arabia, Kuwait, Iraq, Iran, Abu Dhabi, Oman, Qatar and the United Arab Emirates (UAE) are exporting or have previously exported significant quantities of oil. The Middle East contains the majority of the world's known crude oil reserves. In 1989, the region supplied nearly one quarter of the world's oil. Some experts predict that by 2010, the Middle East will provide in excess of forty percent of the world's oil requirements.⁴³

The United States has been importing oil from the Middle East since the late 1940's. In 1977, U.S. imports, as a percentage of total imports, from the Middle East peaked at 37.7 percent. Since 1977, imports from the area declined until 1984, when they reached 7.7 percent, and have since been steadily increasing (see figure 2-6). Imports from the Middle East are expected to continue to increase in the future.⁴⁴

Saudi Arabia and the other large producers in the Middle East continue to add production capacity. Additionally, non-OPEC producers in the region are beginning to contribute a greater share of the oil exported from the Middle East. At the current reserve to production ratios, the Middle East has more than ninety years of supply remaining, as compared to just over forty years for Latin America, the next largest producer.⁴⁵ It is clear that the world will continue to come to the Middle East for oil for a long time.

METHODS OF REDUCING IMPORT VULNERABILITY

The U.S. is in an interesting position. It is less vulnerable today than it was ten years ago in the event of a supply disruption and the ability of oil importing countries (including the U.S.) to respond to a supply disruption has improved.⁴⁶ As a result of improved efficiency in all sectors and fuel switching in electric utilities, industry, and the residential and commercial sectors, the U.S. was able to reduce its dependence upon foreign oil supplies. Further reductions in oil use will be more difficult and as a result, the U.S.'s ability to easily reduce oil use in the future has decreased. How can the U.S. reduce its vulnerability to oil supply disruptions?

PERCENTAGE OF U.S. IMPORTS PROVIDED BY MIDDLE EASTERN COUNTRIES

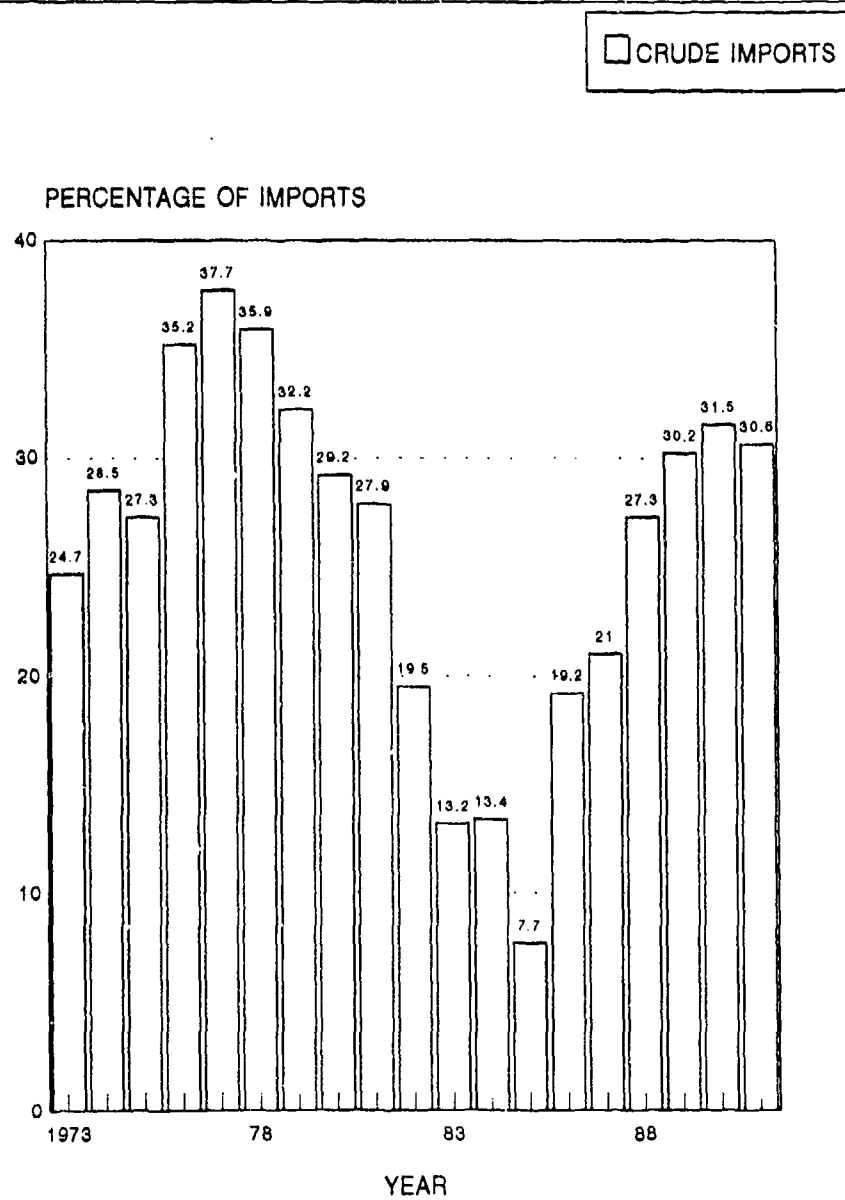


FIGURE 2-6⁴⁷

Increasing the security of supply of the world oil market would reduce vulnerability but would be extremely difficult, if not impossible, to achieve. Therefore, the U.S. needs to explore other options to help solve this problem. Finding areas where oil use reductions can be achieved, finding and using alternative fuels, increasing domestic production and diversifying oil sources of supply are some of the alternatives that are being examined in this section. Additionally, stockpiling can be used to reduce vulnerability. The various methods of reducing vulnerability are not cheap or easy. None of the methods discussed can solve the U.S.'s vulnerability problem by themselves. They must be used together.

REDUCING OIL USE

One of the most obvious ways of reducing import dependence and vulnerability is to use less oil. Prior to reducing petroleum consumption, one must know where and in what quantities fuel is consumed (see figure 2-7). In 1991, the transportation sector accounted for approximately 65 percent of the oil used in the U.S.; this figure is expected to increase in the future. Industrial and residential oil consumption has been relatively steady for the last ten years (averaging 26 and 8 percent respectively).⁴⁸ The transportation sector appears to have the greatest potential for increased conservation/reduction in petroleum use.

Since the first major oil shocks of the 1970's, the greatest oil savings have come from fuel switching in electric utilities, industry, residential and commercial sectors, and from increased efficiency in all sectors. The transportation sector offers the most attractive options for oil savings. Improving the fuel economy of automobiles and trucks, reducing the number of miles driven, and switching to alternative transportation fuels can help to reduce the amount of fuel used in this sector. Average new car fuel efficiency has risen from 26 miles per gallon (MPG) in 1983 to 28 MPG in 1988. During the same period, average automobile fuel efficiency (average of all autos on the road, old and new) went from 17 MPG to 20 MPG. However, the number of cars and the number of miles driven per car have increased during the same period. The net result is that fuel consumption has been increasing since 1983.

PETROLEUM USE BY SECTOR

PERCENT OF TOTAL

□ TRANSPORTATION □ INDUSTRIAL □ RESIDENTIAL ■ UTILITIES

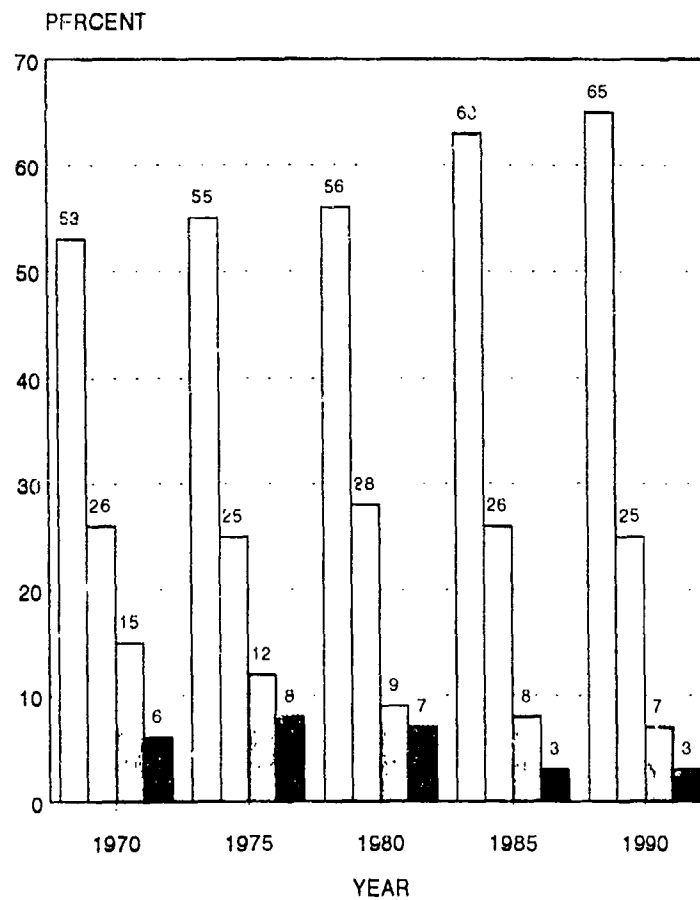


FIGURE 2-7⁴⁹

The government could assist in lowering fuel consumption in the transportation sector by several means. First, it could provide incentives to get older and less efficient vehicles off the road. Second, the fastest growing sector of the U.S. automobile market is for light duty pick-up trucks, minivans and vans. These vehicles do not have to meet the same standards for fuel efficiency as cars. Substantial savings may be possible if the fuel efficiency standards for this sector of the automobile industry are increased. Third, according to the Office of Technology Assessment (OTA), there is substantial potential for improving fuel economy using existing technology. The OTA estimates that new car MPG averages could reach 37 MPG by 2001 using the technology that is currently available. Finally, the pricing of fuel has a great impact on the number of miles driven. Today's low fuel prices actually encourage consumption. Additional taxes on automobile fuel could substantially lower the number of miles per car driven, thereby lowering the amount of fuel used by the transportation sector.⁵⁰

ALTERNATIVE FUELS

There are several alternative fuels that have the potential for reducing petroleum use in the transportation sector. With improvements in technology, compressed natural gas, methanol and biomass fuels could be substituted for a significant fraction of the fuel consumed today. Solar and nuclear (hydrogen fuel cells) energy are also a possibility, but major technological breakthroughs are required to make these alternatives economically viable options (these are very long term solutions).

Electric vehicles could also provide some fuel savings. Currently, this option is limited by battery technology. Technological breakthroughs are expected in battery technology, due in part to recent legislation in California. The legislation requires development of "ultra-low polluting" vehicles by the year 2000; other states are considering enacting similar laws.

Coal-based liquid fuels are also an alternative to petroleum based fuels. Coal-based fuels are significantly more expensive than natural gas based fuels. Continued development of coal fuel production processes have lowered costs and they may be able to economically compete with fuels made from natural gas in the future. Environmental concerns about coal use would require further development of clean coal technologies prior to coal's use as a transportation

fuel. Large U.S. coal reserves make this a particularly attractive alternative, if an environmentally sensitive one.⁵¹

INCREASED DOMESTIC PRODUCTION

Increased domestic oil production would be mainly in response to increases in crude oil prices, and would require major changes in U.S. policy. There is potential for increased production through the use of enhanced oil recovery technologies, opening new areas to exploration and production, and changing tax laws to give companies incentive to explore. The potential for increased production is not very great: experts estimate that 80 percent of U.S. oil has been discovered.⁵² The best that can be realistically hoped for is stabilized production or slowed decline in production.

Significant quantities of conventional mobile oil remain to be recovered in existing oil fields. The greatest potential for increased production comes from enhanced oil recovery (EOR) used in these complex reservoirs. EOR's use is dependant upon economics: at current oil prices, EOR techniques are not economically attractive. Higher oil prices and continued improvements in technology may serve to expand exploration and development of existing oil fields.⁵³

Increased environmental regulation has placed potential oil reserves on federal lands off limits. Off shore areas in California and Florida, as well as the Arctic National Wildlife Refuge (ANWR) and other frontier areas are closed to exploration and development. ANWR has the greatest potential for the development of major new oil fields in the U.S. In 1991, the Department of the Interior estimated that ANWR has a 46 percent chance of containing economically recoverable oil, with an average estimated oil volume of 3.6 billion barrels⁵⁴ Even under ideal conditions, it would take over ten years for production to begin if oil is found.

DIVERSITY OF OIL SUPPLY

In the past, the U.S. has imported over 70 percent of its oil requirements from OPEC. From 1977 to 1983, imports from OPEC declined and imports from other sources increased

from just less than 30 percent to 62 percent.⁵⁵ Since 1983, OPEC's share of U.S. imports have steadily increased to 54.5 percent in 1993 and are expected to continue increasing in the future.⁵⁶ How can the U.S. diversify its oil supply?

The benefits of diversity of supply are clear. By not being overly dependent on any single country, organization, or area of the world, the potential for a major supply disruption in the U.S. is reduced. The U.S. imports refined products from a large number of sources and a complete disruption from any one source will not have an impact on the supply or the economy. Crude oil imports are fairly concentrated from a limited number of sources. The U.S. could encourage exploration in developing countries such as Argentina, Colombia, and other South American countries. Discoveries made in these areas could potentially increase the number of oil sources for the U.S.

Unfortunately, declines in production are expected to continue in the U.S. and other OECD countries; Russian production is expected to continue its decline for at least 10 more years. OPEC countries control more than 70 percent of the known oil reserves and will continue to supply a growing amount of the oil imported to the U.S. in the future.

STOCKPILING

Stockpiling is not a long term solution; rather, it is short term protection against a crude oil supply disruption. The other methods discussed thus far are long term solutions that may have economic, political or technological problems associated with them. Crude oil stockpiling can be as simple as shutting-in a producing well (*in-situ* stockpiling) or as complex as storing oil in above ground or below ground storage facilities.

Governments and private businesses both have reasons for stockpiling crude oil. Private stockpiles are held to:⁵⁷

- accommodate uneven arrival of deliveries;
- cope with seasonal shifts in demand;
- take advantage of short-term crude oil price fluctuations.

Private stockpiles are generally held to benefit the company, with little regard for societal benefits or detriments.

Governments stockpile for very different reasons, including:⁵⁸

- reducing the cost of a supply disruption;
- expanding the range of foreign policy options the government can pursue;
- enhancing military flexibility by reducing cost to the government;
- discouraging embargoes;
- reducing private stockpiling at the outset of a disruption;
- reducing the political panic that could lead to price controls and mandatory allocations.

The primary goal of government stockpiling is to reduce the overall social costs of dependence upon foreign oil.

Private firms cannot be counted on to stockpile the amount of oil that is socially optimal. Stockpiling is expensive and there is the ever present fear that the government would not allow the firm to sell the oil to the highest bidder (thereby gaining "windfall profits"). Because there are disincentives for private oil stockpiles, government action is necessary to build and maintain an adequate stockpile of oil (in addition to existing private stockpiles).

Stockpiles can be maintained in different ways. *In-situ* stockpiling is a method that may be desirable if a country has large oil fields and excess production capacity. The oil field has to be fully developed and then shut in until its production is needed. There are several problems with this technique:⁵⁹

- the entire field must be owned by the stockpiler, otherwise an adjacent well could drain the reservoir;
- the site must be near transportation infrastructure;
- equipment and personnel must be kept trained and maintained (which is very expensive);
- large amounts of reserves are removed from current production;
- technical considerations prevent extraction of more than one-eighth of a reservoir in a year.

The U.S. has had an *in-situ* stockpile since the turn of the century: the Naval Petroleum Reserve (NPR). The NPR has had producing fields since its inception in 1912 and is currently being sold (both the crude and the rights to the different fields). *In-situ* reserves are

not as flexible as reserves using other storage methods.

The U.S. has investigated several different methods for storing reserves. These include: storage of crude in unused tankers, above ground storage in steel tanks, below ground storage in concrete tanks, and storage in leached or mined underground salt caverns. These storage options are more flexible in that they can be quickly drawn down and utilized whenever a supply disruption occurs. Estimated storage costs range from a low of four dollars per barrel for salt domes to a high of 12 dollars per barrel for steel tanks. The costs of oil stockpiling include:⁶⁰

- Direct costs:
 - storage facility and transportation infrastructure construction and maintenance;
 - oil purchase cost;
- Indirect costs:
 - possible increase in world oil prices caused by the increased demand;
 - potential producer backlash against the stockpiling government;
 - discouragement of private stockpiling.

Historically, stockpiles have proven beneficial during past supply disruptions. At the outbreak of the Iran-Iraq War, private stockpiles were at historically high levels. When the war began and 3.6 million BPOD of production was lost, price fluctuations were much smaller than during the 1973 Arab Oil Embargo (a loss of 1.6 million BPOD). This was a direct result of the drawdown of then excess private stocks.⁶¹

CONCLUSIONS

This chapter examined U.S. dependence and vulnerability on imported oil, the history of oil supply disruptions, and the importance of OPEC and the Middle East. Additionally, some of the methods that can be used to reduce dependence and vulnerability were discussed. Data provided in this chapter suggest that the U.S. is dependant on foreign oil and, more importantly, vulnerable to a major supply disruption.

The U.S. is becoming increasingly dependent on oil supplies from OPEC and the Middle

East. Available data indicate that future growth in U.S. demand for oil will be met by OPEC and the Middle East. This will lead to increased U.S. vulnerability. The major oil producing countries are increasingly unstable politically; hence, the U.S. must develop ways to protect itself from any future oil supply disruptions. In the very near future, the U.S. is expected to import more than 50 percent of its crude oil needs. As a result, the need for a coherent energy policy has never been greater.

The long term outlook for the domestic petroleum industry is rather dismal. Decreased exploration, drilling and production rates have led to negative reserve replacement rates and increasing dependence on foreign oil. In order to diversify the oil supply, the U.S. needs to open more government lands for exploration and production while encouraging exploration in the relatively unexplored South American countries. Increased world oil supplies from outside the Middle East can only benefit the U.S.'s energy security.

Conservation has led to significant energy savings in the past. With today's low oil prices, it is unlikely that increased conservation will take place. Increased oil prices would benefit the oil industry, increase conservation and make alternative fuels more attractive. Regardless, the U.S. needs to continue to research alternative fuel technologies, especially those using coal.

Coal's potential is tempered by the environmental problems with using coal. Coal liquification is one of the few ways of making a viable liquid transportation fuel. Improvements in clean coal technologies may make this option more palatable to the environmentalists and the environment. Regardless of the economic attractiveness of a new fuel source, its cost and availability will be determined by environmental concerns.

The best time to reduce vulnerability is before a crisis can strike. Currently, it is popular to label everything a crisis. Prior planning can prevent the devastating effects of another energy crisis. The cornerstone of the U.S. energy policy is the Strategic Petroleum Reserve. It provides interim protection against a supply disruption. The next chapter outlines the Strategic Petroleum Reserve Plan.

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CHAPTER III

THE STRATEGIC PETROLEUM RESERVE PLAN

The Energy Policy and Conservation Act (EPCA) (Public Law 94-163) was signed into law on December 22, 1975. The EPCA directed the Federal Energy Administration (FEA) (the precursor to the Department of Energy) to create the Strategic Petroleum Reserve (SPR) Office. The FEA and the SPR Office were given the responsibility of submitting to Congress a detailed SPR implementation plan within one year. Excluding cost and schedule estimates, the SPR program continues to closely resemble the original plan.¹ This chapter examines the original plan and uses the plan as the primary reference.

BACKGROUND

Following the Arab Oil Embargo, the public and the U.S. government recognized the need to prepare a defense against future oil disruptions. The U.S. government made a formal commitment to the International Energy Program (IEP), along with many of the other energy-importing countries, to establish an emergency oil storage program. President Ford's January 1975 State of the Union Address proposed the Energy Independence Act that provided for the Strategic Petroleum Reserve. As a result, the Senate and the House of Representatives passed the EPCA. Title I, Part B, sections 151-166 required/authorized the creation of the Strategic Petroleum Reserve.²

LEGISLATIVE DIRECTIVES³

The EPCA (sections 151 and 154) required the reserve to have a storage capacity of at least 150 million barrels of petroleum and one billion barrels at most. The capacity was to be determined by using the highest volume of crude oil imported into the U.S. during three consecutive months in the 24 months prior to December 22, 1975 (500 million barrels imported between August and October 1975). The act required the SPR to be filled by

December 22, 1982. Additionally, the SPR was to be 10 percent full within 18 months of the EPCA's enactment, 25 percent within 36 months, and 65 percent within 60 months.

An Early Storage Reserve (ESR) was required as a part of the SPR (sections 151, 154 and 155). The ESR was to protect against any near-term supply interruptions and fulfill obligations to the IEP. The size of the ESR was to be 150 million barrels of oil. This reserve was to be full by December 22, 1978. If there were conflicts between the ESR and the SPR plans, the SPR plan had priority.

Discretionary authority was granted to establish an Industrial Petroleum Reserve (IPR) as part of the SPR (section 156). Specifically, the EPCA authorized the Federal Energy Agency (FEA) to require importers and refiners to maintain readily available inventories of petroleum products equal to three percent of the amount of oil imported by the company in the previous calendar year.

The EPCA also required the plan to provide for the establishment of Regional Petroleum Reserves (RPR) (section 157). RPRs would be readily accessible to any FEA region in which imports were used to fill more than 20 percent of the residual fuel oil or refined product demand during the preceding 24 months. Additionally, the FEA was given authority to use crude oil in the RPR if there would be no delay in satisfying the goal of the RPR and if crude oil was more economic or efficient.

MAJOR FEATURES OF THE SPR PLAN

The SPR plan includes several unique features. This section examines: size and drawdown capability; petroleum types stored; oil acquisition plan; storage methods employed; reserve types; SPR use development schedules; and costs and economic impacts.

SIZE AND CAPABILITY⁴

Two basic scenarios were examined to assist the FEA in determining the size and drawdown capability of the SPR (table 3-1). Scenario #1 assumed that embargoing

TABLE 3-1⁵
OIL SUPPLY INTERRUPTION SCENARIOS
(Million Barrels per Day)

<u>Assumptions</u> <u>(MMB)</u>	<u>Demand</u>	<u>Domestic</u> <u>Supply</u>	<u>Imports</u>	<u>Potential Oil Reserve Size</u>	
				<u>Losses (MMB)</u>	<u>Needed</u>
1980 "Low"	18.7	12.3	6.4		
1980 "High"	19.8	12.3	7.5		
<u>SCENARIO #1</u>					
1985 "Low"	20.2	12.9	7.3		
6 months				342	265
9 months				513	275
1985 "High"	22.2	11.8	10.4		
6 months				486	445
9 months				729	521
<u>SCENARIO #2</u>					
1985 "Low"	20.2	12.9	7.3		
6 months				612	600
9 months				918	744
1985 "High"	22.2	11.8	10.4		
6 months				828	869
9 months				1242	1120

countries would reduce their exports by 25 percent and eliminate their exports to the U.S. altogether. The net result would be a loss to the U.S. of 3.7 million barrels per day (MMB/D). Additionally, there would be no excess capacity or surge capacity from the non-embargoing countries. After IEP emergency allocations, the U.S.'s daily shortfall would be 1.7 MMB/D, assuming the estimated 1980 "high" import level.

Scenario #2 assumed that the embargoing countries would likewise eliminate all exports to the U.S. while reducing total exports by 50 percent. Daily U.S. imports would be reduced by 3.7 MMB/D. After IEP emergency allocations, the daily shortfall in the U.S. would be 3.3 MMB/D, again assuming the estimated 1980 "high" import level.

Size

The FEA estimated the potential vulnerability of the U.S. under different supply interruption scenarios. This was done to determine the desirability of a smaller or larger SPR. They determined that a small SPR would not reduce U.S. vulnerability, even though it was attractive from a cost-benefit point review. A large (greater than the 500 million barrels specified in the EPCA) SPR would be beneficial only if there was high probability of import levels greater than 10 million barrels per day by 1985.

The SPR Plan recommended to retention of the 500 MMB goal. The FEA determined that a 500 MMB reserve would provide adequate protection of import levels of up to approximately 7.5 MMB/D. This stock level would provide cost effective protection for a wide range of interruptions. Additionally, the SPR size could be increased or decreased in the future if import trends indicated that it would be beneficial.

Capability

The drawdown capability is also crucial in determining the effectiveness of the SPR. The FEA determined that a maximum drawdown capability of 3.3 MMB/D was adequate for a 500 million barrel reserve. Drawdown of the ESR was to occur over 150 days. Using this forecast, planners determined that a drawdown rate of 3.3 MMB/D would provide adequate protection (see table 3-2).

TABLE 3-2⁶
ESTIMATED DAILY SHORTFALL (MMB/D)

<u>Scenario Number</u>	<u>1980 Low Imports</u>	<u>1980 High Imports</u>	<u>1985 Low Imports</u>	<u>1985 High Imports</u>
1	1.7	1.7	1.9	2.7
2	2.8	3.3	3.4	4.6

If imports reached a level exceeding 7.5 MMB/D, then the 3.3 MMB/D drawdown rate would be inadequate. The SPR Plan recommended that the drawdown capability and the size of the SPR be reviewed periodically to insure that the SPR could continue to provide adequate protection. Any increases in SPR size could also provide increases in the SPR's drawdown capability.

TYPES OF PETROLEUM⁷

The SPR plan only included crude oil for storage in the reserve. Crude oil was chosen because it would provide greater product production and delivery flexibility and has greater long term storage stability than other petroleum products. Additionally, the U.S. had adequate refining capacity to meet its refined product requirements and could easily replace any lost refined product imports.

Approximately 60 percent of the stored crude oil was to be of an intermediate gravity (32 to 36 degrees API) with a sulfur content of 1.0 to 1.9 percent (sour crude). The remaining crude would be one or two types of low sulfur (less than 0.5 percent) crude oil with intermediate to light gravities. The mix of crude oils chosen would insure that refineries received acceptable replacement crude oil at the least cost to the government.

Refined products would not be included in the SPR due to their excessive cost and relatively short shelf lives. Additionally, refined products would not provide adequate flexibility in responding to different oil supply disruption scenarios.

OIL ACQUISITION⁸

SPR planners recognized that the acquisition of oil for the SPR would represent an incremental increase in demand for imported oil. The FEA wanted to minimize the impact on the market price of oil and the world oil supply. Therefore, SPR oil would be purchased through normal federal procurement procedures. Contract awards would be based on the impact to the economy, total cost to the government, availability of adequate quantities of the desired oil, delivery flexibility, reliability of deliveries from foreign sources, capability of suppliers, environmental impacts, and the impact on world oil supplies.

This procurement procedure was expected to allow the government to consider offers from all potential sellers, both foreign and domestic. It would also allow for the purchase of oil at or near the domestic market price for oil. The FEA intended to use the authority granted in the Emergency Petroleum Allocation Act to take advantage of domestic price controls on imported oil. Additionally, the procedure would minimize the impact on the domestic oil industry.

The FEA considered several alternatives for procuring oil. They considered purchasing oil at the world market price, using royalty oil from government oil leases, and using oil from the Naval Petroleum Reserve (NPR). Purchasing oil at the world market price was considered too costly and was therefore not recommended. Royalty oil was rejected because it would not provide a sufficient amount of oil for the reserve. Additionally, using royalty oil would have too great an impact on the small refiners that are dependant on royalty oil.

NPR oil was rejected for several reasons. First, it would cost (as a result of lost government revenues) more than the national average composite price for crude oil. NPR oil was not subject to federal price controls. Second, only the Stevens Zone oil from the Elk Hills Reserve met the SPR crude specifications; however, it could not provide the required amount of oil for the SPR. Finally, higher transportation costs would result from moving the oil from the West Coast to the storage sites in the Gulf Coast. If NPR oil were used, oil swaps (e.g. a West Coast refiner receives NPR oil and buys oil for delivery to the SPR) would have to be negotiated to lower the costs of the crude oil stored.

STORAGE⁹

Several different storage methods are evaluated in the SPR Plan. The plan evaluated conventional steel tanks, tanker storage, artificially created lagoons, and rubber bags, depleted oil reservoirs and *in-situ* storage, solution-mined caverns in salt and conventional salt mines.

Potential SPR storage facilities and sites were selected based on several criteria. First, the site had to be structurally sound and technologically feasible and suitable for crude oil storage. Second, some of the sites had to have existing capacity available in order to establish the ESR. The existing sites also had to have the potential for expansion to meet the needs

of the SPR Plan. Third, the sites selected needed to be near existing distribution systems. This would maximize the flexibility and minimize the response time of the SPR to an interruption in supply. Fourth, each site was evaluated in terms of its potential environmental impact on the surrounding area. Fifth, sites were evaluated for their security and safety. Key elements of the evaluation were: security from fire, natural disaster, safety, and security. Finally, facility types and storage sites were evaluated on their cost of acquisition, development and operation (see table 3-3).

Storage Types Evaluated

Conventional Steel Tanks

Conventional steel storage tanks, while feasible, would initially utilize over 3300 acres of land to store 150 million barrels of oil for the ESR. The availability of land near existing transportation infrastructure was a limiting factor. There were also environmental concerns about potential air and water pollution from such a large number of tanks. Steel tanks are susceptible to damage and degradation (e.g. corrosion) and thus present a significant fire, explosion, and environmental hazards.

The primary reason steel tanks were not chosen were their cost. New tank farm construction costs varied from \$8.00 to \$12.00 per barrel. Additionally, the material required to build such a facility may strain the materials and labor market, further increasing costs.

Tanker Storage

The use of idle crude oil tankers was also considered as a storage alternative for the SPR. This method was rejected due to its costs, potential for sabotage, environmental hazards, and high operational requirements. The government would have to purchase foreign vessels, refit them and find a suitable secure location to store the tankers. Minimum costs associated with this alternative were \$6.00 per barrel, not including additional security costs.

TABLE 3-3¹⁰
SUMMARY OF ANALYSIS OF ALTERNATIVE STORAGE FACILITIES

	SOLUTION MINED CAVERNS	CONVENT- IONALLY MINED CAVERNS	STEEL TANKS	TANKERS	LAGOONS/ RUBBER BAGS	OIL RESERVOIRS	<i>IN-SITU</i>
TECH FEASIBILITY AND SUIT ABILITY FOR STORAGE	YES	YES	YES	UNK	UNK	NO	YES
ADEQUATE STORAGE CAP ON A TIMELY BASIS	YES	YES	PART	UNK	UNK	NO	PART
CLOSE TO DISTRIBUTION SYSTEM	YES	YES	YES	YES	UNK	NO	PART
ENVIRONMENTAL IMPACT	LOW	LOW	HIGH	HIGH	HIGH	LOW	LOW
SECURITY	GOOD	GOOD	POOR	VERY POOR	POOR	GOOD	GOOD
COST PER BARREL					OVER		OVER
EXISTING	\$1.10 - \$1.75	\$0.90 - \$1.50	\$8.00 -	OVER	\$15.00	OVER \$45	OVER \$100
NEW	\$1.35 - \$2.15	\$6.00 - \$9.00	\$12.00	\$6.00	UNK		

Note: UNK - uncertain; PART - partially

Adapted from Table IV-1, p. 75, *Strategic Petroleum Reserve Plan*

Lagoons and Rubber Bags

The use of rubber bags and artificially created lagoons involve the use of synthetic materials as storage containers for the oil. This system offered considerable flexibility but involved an unproven technology. Lagoons and rubber bags had potential cost advantages over conventional steel storage tanks; otherwise, it had the same drawbacks as conventional storage. These factors, in conjunction with their high cost, were instrumental in this plan's rejection.

Depleted Oil Reservoirs

This method was rejected due to its impracticality. SPR oil would have to be available for withdraw and rapid, efficient distribution. A reservoir in which the reservoir pressure had not been depleted was a major requirement. Additionally, fill and withdrawal rates would be limited when compared to those for both types of salt cavern storage. Also, there would be excessive losses of oil in the reservoir (i.e. not all of the oil injected could be withdrawn).

In-situ Storage

In-situ storage, as discussed in chapter II, has many problems. The primary reason it was rejected by the FEA as an SPR storage method was its cost and very slow petroleum withdrawal rate.

Solution Mined Salt Domes

Caverns leached in salt for the storage of crude oil had been used in France, Germany and the U.S. for many years. The FEA determined that there were leached caverns available for sale to the government with a combined storage capacity of over 300 million barrels of crude oil. These caverns were located in the Gulf Coast Region, the only basin containing a significant number of salt domes in the continental U.S. near oil refineries and petroleum transportation networks.

Caverns leached in salt domes could provide a relatively low cost storage alternative. Existing caverns could be developed for approximately \$1.30 per barrel stored and new

caverns could be leached for approximately \$1.50 per barrel stored. These development costs are significantly lower than development costs for the other storage methods examined. Solution mined caverns would have little to no impact on the environment and are safe and secure.

Conventional Mines

Crude oil has been successfully stored in conventional mines in Europe and South Africa. The U.S. has over 20,000 operating or abandoned mines that could be considered for use. Coal mines were considered, but were determined to be uneconomical or unsafe. The FEA located several conventional salt mines in the Gulf Coast area that were suitable for crude oil storage. The conventional salt mines available had storage capacities in excess of 150 million barrels and were near existing petroleum distribution facilities. The major problem with the conventional salt mines was the lead time required to adequately prepare them for crude oil storage.

Existing salt mines could be converted to crude oil storage for between \$0.50 to \$1.10 per barrel stored, making it one of the least costly methods. This method would have a low impact on the environment. New mines were not considered due to their three-year construction lead times.

Storage Type Selected

The SPR plan recommends that crude oil be stored underground in existing conventional salt mines and in leached caverns in salt domes. Preliminary studies indicated that storage in salt domes and salt mines would provide flexibility, have the least impact on the environment and cost the least of the options considered. The storage facilities would be located in the Gulf Coast region, close to existing transportation infrastructure and refineries. The plan does not specify exact sites, but identifies many potential areas that meet the site selection criteria.

RESERVES¹¹

The EPCA requires that the SPR Plan provides for Regional Petroleum Reserves (RPR) and gives the FEA discretionary authority to create an Industrial Petroleum Reserve (IPR). The SPR plan did not recommend the establishment of RPR's nor IPR's: the reasons are examined in the following sections.

Regional Petroleum Reserves (RPR)

FEA Regions 1 through 4 (figure 3-1) met the qualifications for an RPR. However, the FEA determined that an SPR located in the Gulf Coast region would provide readily accessible crude oil supplies to all areas in the continental U.S. in the event of a petroleum supply interruption. It was concluded that the centralized reserve would provide adequate protection to noncontiguous areas of the U.S. The plan stated that there was sufficient transportation and refining capacity available to distribute and refine SPR crude oil. The availability of crude oil and refined product inventories in the continental and noncontiguous areas of the U.S., as well as imports in transit, would provide an adequate buffer until SPR oil reached the affected areas.

A centrally held reserve would insure that each area of the country would receive an equitable share of available crude and refined oil products. An allocation program would be designed to assure that all residual oil and refined products would be produced and allocated fairly throughout the country. The allocation program would include continued imports and domestic production as well as SPR oil.

Storage of SPR oil in other regions and noncontiguous areas would decrease the flexibility of the reserve. Additionally, potential environmental problems would be compounded while increasing the cost of the SPR program. Depending on the type of storage utilized, the costs could be as much as four times higher than the cost of storage in salt domes.

Industrial Petroleum Reserve (IPR)

In the SPR plan, the FEA did not chose to exercise its discretionary authority to establish an IPR. Analysis showed that an IPR has no clear advantages as a method of developing a

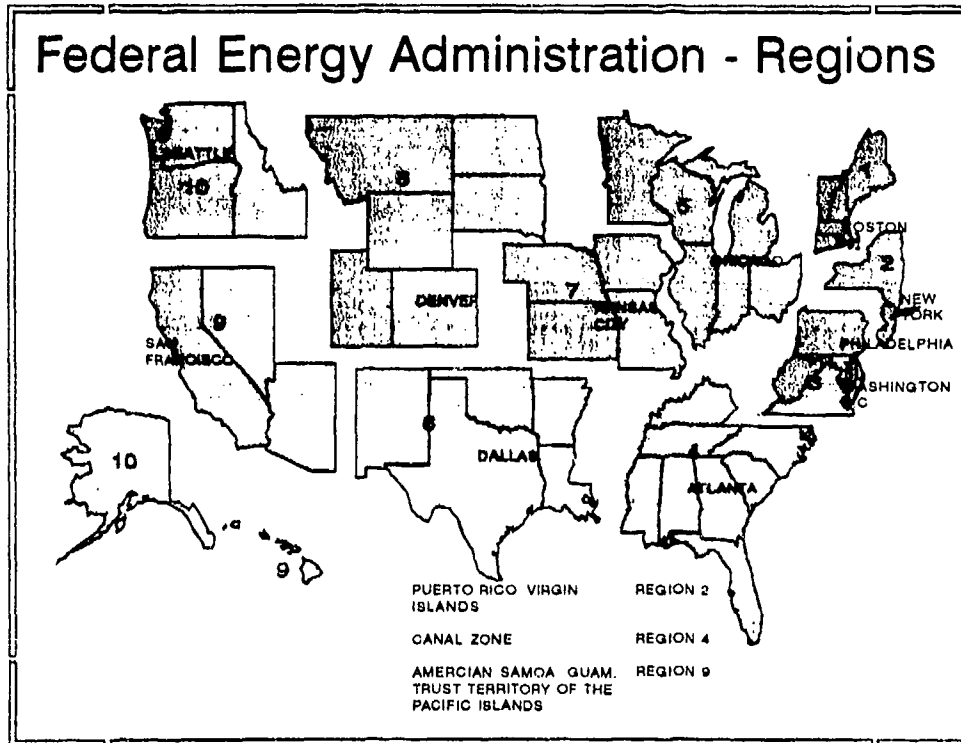


FIGURE 3-1¹²

Strategic Petroleum Reserve. An IPR would have higher cost to the public, greater environmental impact, potential legal problems and be more difficult to administer than a centralized reserve.

The major reasons given in the plan for not using an IPR include:

- an IPR would not accelerate the development of an SPR;
- any regional protection provided by an IPR could be achieved more efficiently and effectively with a centralized government owned SPR;
- an IPR would result in higher costs to the national economy;
- implementing an IPR could delay the SPR program due to legal challenges, and might cause environmental and administration problems;
- an IPR might have adverse impacts on the competitive environment in the petroleum industry and upon individual firms;
- shifting the costs of an SPR from the government to the petroleum industry and petroleum consumers is the only advantage of an IPR, but does not represent any savings to the U.S. economy.

The SPR plan advised Congress that the FEA would continue to analyze alternative financing methods. Any financing method that is determined to be better than the current method could be implemented by a Congressional amendment to the plan.

DISTRIBUTION PLAN¹³

FEA officials felt that the SPR distribution plan should be an integral part of a more comprehensive national energy emergency plan. This would ensure that the SPR distribution plan would be consistent with U.S. national goals and objectives. The SPR plan does not outline a detailed distribution, but gives six key elements for the distribution and drawdown of the SPR.

Trigger Mechanisms

Only the President can decide to use the SPR. The FEA would develop contingency plans for different disruption scenarios; recommendations on the reserve's use would be given

to the President within ten days of an apparent need for the SPR. SPR planners considered it unwise to specify precise conditions for SPR use because of the large number of variables that might affect the decision. Also, if precise conditions were known, they might be manipulated by producer countries. Therefore, it is to the U.S.'s advantage to have no specific triggering mechanisms.

Drawdown Rate

Drawdown rates would be dependent on the both supply shortfall caused by an interruption and the duration of the interruption. The SPR could be depleted at its maximum drawdown rate to minimize the initial economic effects of a disruption. Rates would be adjusted based on the other contingency measures taken at that time (e.g., conservation, and rationing).

Pricing

SPR oil sales prices would be determined based on, among other things, the nature of the interruption, amount of oil in storage, energy conservation objectives, and provisions for replacing SPR oil. Additionally, the price would minimize the adverse impacts on the economy. The plan does not specify a specific price for SPR oil.

Allocation and Regulatory Controls

Allocations and regulatory control would be consistent with the Emergency Petroleum Allocation Act and the Energy and Policy Conservation Act. The plan states that a distribution plan would be developed to assure that SPR oil is equitably distributed and that product demands are met. The FEA guaranteed that no region would bear more than its fair share of the economic impact of the interruption.

Transportation

Transportation of SPR oil would be the responsibility of the private sector (i.e. the petroleum industry). The FEA would be responsible for ensuring that port and pipeline

facilities in the area of the storage sites would be available to drawdown the SPR at its maximum rate. This could include a waiver of the Jones Act requirement to permit the use of foreign flag tankers if adequate U.S. flag tankers were not available.

Management and Operations

The SPR Office would provide monitoring, security, drawdown scheduling, financial audits and handling of fees to ensure rapid response and efficient functioning during drawdown and distribution.

DEVELOPMENT SCHEDULE¹⁴

As stated earlier, the EPCA provided a fill schedule based on percent fill. The SPR plan proposed the following fill schedule, based on the EPCA plan:

- 50 million barrels (MMB) or 10 percent, by June 22, 1977;
- 150 MMB by December 22, 1978;
- 325 MMB or 65 percent, by December 22, 1980; and
- 500 MMB or 100 percent, by December 22, 1982.

The FEA recommended following the schedule outlined in the EPCA based on an analysis of potential interruptions during the SPR development period.

Developing an SPR of this size was a complicated undertaking. Figure 3-2 is a flow chart of the major events or objectives that had to be accomplished to implement the SPR Plan.

The FEA presented many of the problems that could occur during the development of the SPR. One of the major obstacles was developing and getting approval of Environmental Impact Statements (EISs) for any and every candidate site. On average, it took 13 months to develop and prepare a final EIS for a site. Delays in getting EISs approved would delay any fill schedule. Obtaining the necessary permits for construction and other development activities could also delay the project. Approval would have to come from Federal, state and local agencies as well as private organizations.

Procurement of construction supplies and equipment requires long lead times. Any delay in their delivery would cause a delay in the completion of the reserve site. Other factors that

MAJOR IMPLEMENTATION ACTIONS

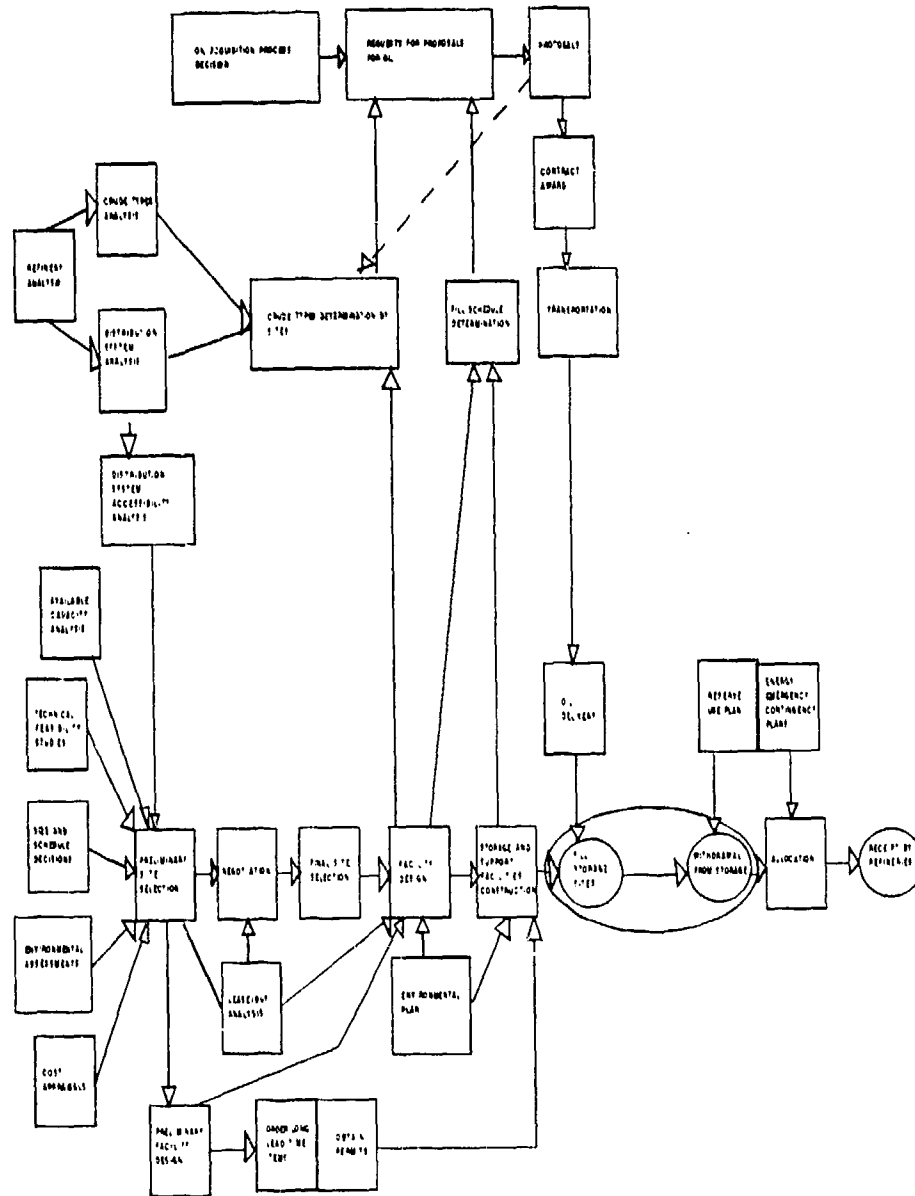


FIGURE 3-2¹⁵

could delay completion include adverse weather conditions, lack of bids to perform the required construction work, compliance with applicable procurement, real estate acquisition, and other regulatory laws.

COSTS AND ECONOMIC IMPACTS¹⁶

Costs

The estimated cost for a 500 MMB reserve was between \$7.5 and \$8 billion. Eighty-nine percent of the estimated cost was for the purchase and transportation of crude oil, and eight percent was for construction of facilities. The remaining two percent was ear-marked for filling, maintaining and managing the SPR (table 3-4).

The cost estimates were limited to federal expenditures and did not include the cost to the U.S. economy or the net cost to the Federal Budget. The major cost areas studied in the plan were land acquisition, construction of storage facilities, oil acquisition and transportation, operations and administration.

Land Acquisition

Estimated land acquisition costs included the land where the facilities would be located, pipeline right-of-way, pump station sites, dock sites and the salt domes/mines themselves. Property would be leased, purchased or condemned, if necessary. Land acquisition costs were estimated to be between \$0.23 to \$0.50 per barrel for the first 240 MMB capacity and \$0.10 to \$0.15 per barrel for the remaining 260 MMBs.

Construction of Storage Facilities

Estimated construction costs covered all activities required for the design and building of the storage facilities. Included in the costs were all contract services and equipment, storage space, pipelines, docks, terminals, tank farms, brine disposal systems, raw water, electricity, instrumentation and controls required for the projects. Construction costs were estimated at

TABLE 3-4¹⁷
DISTRIBUTION OF COSTS SUMMARY
(Dollars in Millions)

Category	150 MMB Program		Expansion to 500 MMB		500 MMB Program	
	Dollars	Percent	Dollars	Percent	Dollars	Percent
Sites	58.1*	2.6	26.0	0.5	84.1	1.1
Construction	242.3	10.9	364.0	6.6	606.3	7.9
Oil Acquisition	1,719.0	77.7	4,640.1	84.7	6,359.1	82.6
Operations [#]	9.2	0.4	66.3	1.2	75.5	1.0
Administration	32.6	1.6	34.3	0.6	66.9	0.9
Cargo Preference	150.0	6.8	350.0	6.4	500.0	6.5
TOTAL	2,211.2	100.0	5,480.7	100.0	7,691.9	100.0

*Dollars shown provide for a storage capacity of 240 MMB.

[#]Operations cost during expansion over 150 MMB includes standby costs at completed sites and fill costs at new sites.

approximately \$242 million (approximately \$0.10 per barrel) for the first 240 MMB capacity and \$1.40 per barrel for the remaining 260 MMBs.

Oil Acquisition and Transportation

Crude oil purchases represented approximately 90 percent of the estimated total costs for the SPR. Following Federal procurement laws, oil was to be purchased at approximately the national composite average price, with U.S. sellers participating in a modified Crude Oil Entitlements Program as authorized by the Emergency Petroleum Allocation Act. Under the Cargo Preference Act (Jones Act) 50 percent of all cargo purchased overseas would have to be transported by American flag vessels if such vessels are available. This requirement would raise transportation costs.

Operations

Actions required to maintain and fill the SPR are included in this cost category. Estimates include funding for three shifts, 24 hours per day, seven days per week. Once the SPR site had been filled, only security and maintenance personnel would be required. Filling operations were estimated at between \$0.13 and \$0.18 per barrel and maintenance costs would be less than \$0.01 per barrel per year. Refill costs would be approximately \$0.03 per barrel lower than fill costs due to the system already being operational.

Administration

These costs cover all direct costs involved in planning all aspects of the SPR, including economic and environmental assessments, as well as salaries for Federal employees working on the project. Estimated administrative and management costs were expected to average \$9 million per year for the first seven years of the program.

Economic Impacts

The SPR program was not expected to have any major impact on the economy of the U.S. Developing the SPR would increase the demand for necessary supplies and equipment without

causing price increases. Slight increases in the Gross National Product (GNP) and employment would be expected, as compared to increases without developing the SPR. The maximum impact on the GNP was expected to occur in 1978 and 1979, when the SPR program could increase the GNP by 0.15 percent and increase employment by 0.07 percent.

World oil prices were not expected to be affected by SPR oil purchases. The maximum planned fill for any 12 month period is 200 MMB, or slightly less than one percent of world wide annual oil production. The average annual procurement was expected to be 100 MMB per year, or less than 0.5 percent of worldwide annual production. The FEA planned to monitor the oil market and make purchases so as to minimize the effect on world oil prices.

CONCLUSIONS

The FEA developed a relatively detailed plan for the SPR in a short period of time. The basics of the plan have held up very well over the test of time. The details that are missing from the plan and the ambitious fill schedule would eventually cause the SPR Office and the Department of Energy (DOE) trouble during the SPR's development (this is examined in greater detail in the next chapter). The oil acquisition cost estimates would prove to be very low, but were realistic when they were made. The designers of the SPR had come up with a solid plan for the largest man-made petroleum reserve in the world.

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CHAPTER IV

THE STRATEGIC PETROLEUM RESERVE HISTORY

The United States Strategic Petroleum Reserve (SPR) has been subjected to intense debate concerning its funding, size and fill rates. In spite of past difficulties, the SPR has become the largest petroleum stockpile in the world.¹ Initially, there were problems with the SPR's management, the SPR plan's implementation, and the initial budget estimates for the SPR. Many of these stumbling blocks have been resolved but budget problems still remain. The remainder of this chapter examines the legislative, fill rate and budgeting history of the SPR and the use of the SPR during the Persian Gulf War.

LEGISLATIVE HISTORY

There have been several legislative actions taken in the name of the SPR, primarily concerning its fill rate, size and funding. Much of the legislation resulted from Congress trying to correct problems, real or perceived, it had found in the development of the SPR. In some cases, legislation was designed to force the Department of Energy (by way of the President) to continue filling the reserve rather than cut the program as part of budget reductions. These actions have taken the form of program legislation and amendments to the SPR plan.

PROGRAM LEGISLATION

The Energy Policy and Conservation Act (EPCA) stipulated that a reserve of up to one billion barrels of petroleum products, but no less than 150 million barrels, be constructed to reduce the impact of a severe energy supply interruption. Additionally, the SPR was to carry out U.S. obligations under the International Energy Program.²

On June 30, 1980, the EPCA was amended regarding the SPR by title VIII of the Energy Security Act (Public Law 96-294). This act established a minimum fill rate for the SPR of 100,000 barrels per day and precluded the sale of Naval Petroleum Reserve Number 1 (NPR 1) Elk Hills, California, crude oil except to fill the SPR. Once SPR inventories reached 500

million barrels (MMB) or the SPR was being filled at the minimum fill rate, NPR 1 oil could be sold.³

SPR funding was placed off-budget on August 13, 1981, by the Omnibus Budget Reconciliation Act of 1981 (Public Law 97-35). Public Law 97-35 created an SPR Petroleum Account as a method for financing the acquisition and transportation of reserve oil without including the expenditures in the Federal Budget. Additionally, the Act required that quarterly reports on the SPR's progress be filed and that a study on the ultimate size of the reserve be submitted.⁴

In 1982 the SPR minimum fill rate requirements were established by the Energy Emergency Preparedness Act of 1982 (Public Law 97-229). This law also authorized the acquisition of interim storage facilities and required a series of reports on SPR use.⁵

The Energy Policy and Conservation Amendments Act of 1985 (Public Law 99-58) was passed into law on July 2, 1985, thereby extending the SPR Program provisions until June 30, 1989. Additionally, it directed the Secretary of Energy to conduct a test of the SPR using 1.1 MMB of SPR oil to evaluate the drawdown capability of the reserve.⁶

On August 15, 1985, Congress amended the ECPA with the Supplemental Appropriations Act for Fiscal Year 1985 (Public Law 99-88). The amendment provided for a lower minimum fill rate for the SPR in any year in which the SPR reached a 500 MMB level. Public Law 99-88 also provided funding for the continued development of the SPR through 1986. Additionally, it provided for increasing the amount of crude oil in storage in the SPR by 11 MMB to a total of 500 MMB by the end of fiscal year 1986 (September 30, 1986). This was accomplished this when the \$271 million deferral of funds appropriated for the SPR Account and the disapproval of \$290 million of the \$827 million deferral of appropriations for the SPR Account were not approved.⁷ The SPR account was returned to the Federal Budget by the Continuing Appropriations Bill for Fiscal Year 1986 (Public Law 99-190). The amendment provided \$112,365,000 for the continued development of the SPR to 750 MMB's. Additionally, it authorized the Department of Energy to trade surplus agricultural products in Government stockpiles for crude oil for the reserve.

The Food Security Act (Public Law 99-198) was signed into law on December 23, 1985 by President Reagan. Public Law 99-198 authorized the exchange of non-surplus agricultural goods for crude oil. This would allow for the exchange of crops for SPR crude, thus authorizing an alternative financing method.⁸

The minimum fill rate for the SPR was set at 35,000 barrels per day (BPD) by the Omnibus Reconciliation Act of 1985 (Public Law 99-272). This fill rate was to continue through fiscal year (FY) 1988.⁹

The Urgent Supplemental Appropriations Act of 1986 prevented the deferral of \$41.2 million of FY 1986 appropriations for storage development, distribution enhancements and program management. Additionally, the deferral of \$577.5 million of SPR funds, consisting of \$549.6 million from 1985 appropriations and \$27.9 million from receipts deposited as a result of an SPR test sale in December 1985 and January 1986, was averted.¹⁰

On October 21, 1986, President Reagan signed the Omnibus Reconciliation Act of 1986 (Public Law 99-509). This piece of legislation required that the SPR be filled at a minimum rate of 75,000 BPD until at least 750 MMB were in storage. If the minimum fill rate has not been met, the sale or disposal of crude oil from Naval Petroleum Reserve 1 (NPR 1) would therefore be restricted.¹¹

Public Law 100-531, effective October 28, 1988, authorized the SPR protective force to carry firearms while performing their official duties. Additionally, the legislation authorized the protective force to make arrests without warrants and made trespassing on SPR property a Federal offense.¹²

On June 30, 1989, the authority for the SPR (and other sections concerning the SPR) contained in the ECPA was extended to April 1, 1990 by Public Law 101-46. Public Law 101-46 also required that the Department of Energy submit a report to Congress on alternate financing methods for oil acquisition by February 1, 1990. Additional short term extensions to the SPR authorities were granted on April 1 and August 15, 1990.¹³

The Energy Policy and Conservation Act Amendments of 1990 (Public Law 101-383) extended the SPR portion of the ECPA until September 30, 1994. This legislation contained provisions that amended drawdown authorities and expanded the ultimate size of the reserve

to one billion barrels. Additionally, it authorized the test sale of 5 million barrels, provided for a three year refined product storage test, and authorized the SPR office to contract for petroleum and facilities owned by others.¹⁴

On November 5, 1990, the FY 1991 appropriations of the Department of the Interior and Related Agencies was ratified (Public Law 101-512). It included \$200.6 million for the development, operations and management of the SPR while providing for an advanced appropriation authority of \$196.2 million for acquisition and transportation of oil for the SPR in FY 1992. This law also required that the FY 1991 receipts in excess of \$638 million from NPR's 1, 2, and 3 be deposited in the SPR Account, to be utilized in the purchase of more oil for the SPR. Further, Public Law 101-512 states that no funds from this or any other Act could be used for the leasing of crude oil from a foreign government or foreign state owned oil company, except as allowed by procedures outlined in the amended EPCA.¹⁵

The Department of the Interior and Related Agencies Appropriations Act, 1993 (Public Law 102-381), provided \$176.2 million for the operation and management of the SPR. A portion of the funds for management and operations was to come from a transfer of \$125.6 million from the SPR Petroleum Account (funds derived from SPR sales during the Persian Gulf War). Additionally, the Act set an outlay cap of \$137 million on funds in the SPR Petroleum Account. The total funds available for obligation in the SPR Petroleum Account in FY 1993 were \$532.5 million.¹⁶

The Department of Defense Appropriation Act, 1993 provided \$125.6 million for acquisition of crude oil by the DOE (in the name of the DOD) for storage in the SPR. Also, the DOE was authorized to transfer up to \$700,000 to the SPR account to cover the maintenance and operations costs associated with the storage of additional crude oil. As a result of the passage of this law and others, up to \$262.6 million could be spent to acquire SPR oil in FY 1993.¹⁷

The Energy Policy Act of 1992 (Public Law 102-486) included the following provisions:¹⁸

- added new conditions for SPR drawdown in emergency situations involving a supply reduction of significant size and length with severe price increases that will likely cause a major adverse impact on the U.S. economy;
- increased the SPR to one billion barrels;

- permitted the Secretary of Energy to make payments in advance for delivery of petroleum products not owned by the U.S., for storage in unused SPR facilities;
- authorized the President to acquire stripper well oil at competitive prices to fill the SPR;
- amended the eligibility criteria for a Regional Petroleum Reserve;
- required a study of the implications of the unique vulnerabilities of insular areas to an oil supply disruption;
- required a study on the use of futures and options to protect against unexpected increases in the cost of petroleum by the actions of government and private enterprises, including the SPR.

AMENDMENTS

In the seventeen years since its inception, the Strategic Petroleum Reserve Plan has only been amended five times. The first three amendments were enacted within three years of the approval of the initial plan (April 18, 1977). The SPR Plan was amended a fourth time at the end of 1982 and was not amended again until 1990. The following paragraphs examine the changes instated by the amendments.

Effective June 20, 1977, Amendment No. 1 to the SPR plan accelerated the fill schedule for the SPR. It established a goal of 250 MMB in SPR storage by December 22, 1978 and 500 MMB by December 1980.

Amendment No. 2, effective June 13, 1978, increased the size of the SPR from 500 MMB to one billion barrels of stored oil. The amendment outlined plans to store 750 MMB of crude oil in SPR facilities. Decisions concerning the storage methods or the timing of the remaining 250 MMB increase were not made at the time.¹⁹

Amendment No. 3 is the distribution plan that the DOE submitted to Congress for the SPR. It became effective on November 15, 1979 in accordance with the provisions of the EPCA. The plan described methods for drawdown and distribution of SPR crude oil from the five existing storage sites.²⁰

Amendment No. 4 established a new drawdown plan for the SPR as required under the Energy Emergency Preparedness Act of 1982. The amendment specified procedures for the

drawdown, sale and distribution of petroleum from the SPR. Amendment No. 4 supersedes Amendment No. 3.²¹

The final amendment proposed for the SPR plan was a result of the 1990 amendments to the Energy Policy and Conservation Act. The legislation required DOE to amend the SPR to prescribe plans for completion of the one billion barrel storage capacity.²²

SIZE AND FILL RATE

Some of the Strategic Petroleum Reserve Program's biggest problems have been determining its size and corresponding fill rate. The original SPR plan specified a 500 MMB reserve; however, less than one year after the plan had been approved by Congress, it was amended to increase the size of the reserve to one billion barrels (Amendment No. 2). Congress directed a change in the fill schedule even sooner - less than three months after the plan had been approved. Currently, the capacity of the reserve is 750 MMB; there were 585.7 MMB of oil in the reserve as of November 15, 1993.²³ Even with the apparent success of the program, Congressional Hearings are held periodically to evaluate the different aspects of the SPR.

SIZE

The EPCA gave the FEA (Federal Energy Agency) considerable freedom in determining the size of the SPR. As stated earlier, the law stated that the SPR contain between 150 million and one billion barrels of petroleum products.²⁴ The SPR Plan's original size proposal was based on preliminary studies that examined the cost/benefit tradeoffs of various SPR sizes. Due to the complexity in determining the "optimal size" of the reserve (if there is one), there has been considerable debate concerning the SPR's size.

The size of the SPR was determined by incorporating several factors, all of which were estimates or based on probabilities. Key factors included:²⁵

- when the next oil supply disruption would occur and how severe would it be;
- to what degree would the U.S. be dependent upon imported oil;
- can other energy types be substituted for oil and to what degree;

- how long will the supply disruption last?

Another set of factors that played an important role in determining the size of the SPR are the benefits/drawbacks associated with having a government stockpile of oil. These factors include:²⁶

- stabilizing effects of a stockpile on public confidence during a oil supply disruption;
- concern that private industry has a disincentive to maintain sufficient stocks as a result of the SPR;
- potential removal of disincentives for private stockpiling since the government has an adequate stockpile and will not impound private stocks;
- an adequate oil stockpile gives the President increased flexibility in achieving U.S. foreign policy objectives during an oil supply disruption;
- a large petroleum stockpile acts as a deterrent against potential oil embargoes;
- adequate stockpiling by the U.S. and its allies may provide a calming effect on energy markets;
- an adequate reserve insures the availability of petroleum supplies in support of defense, industrial, and essential civilian requirements during wartime.

Many, if not all, of these benefits are not easily quantifiable.

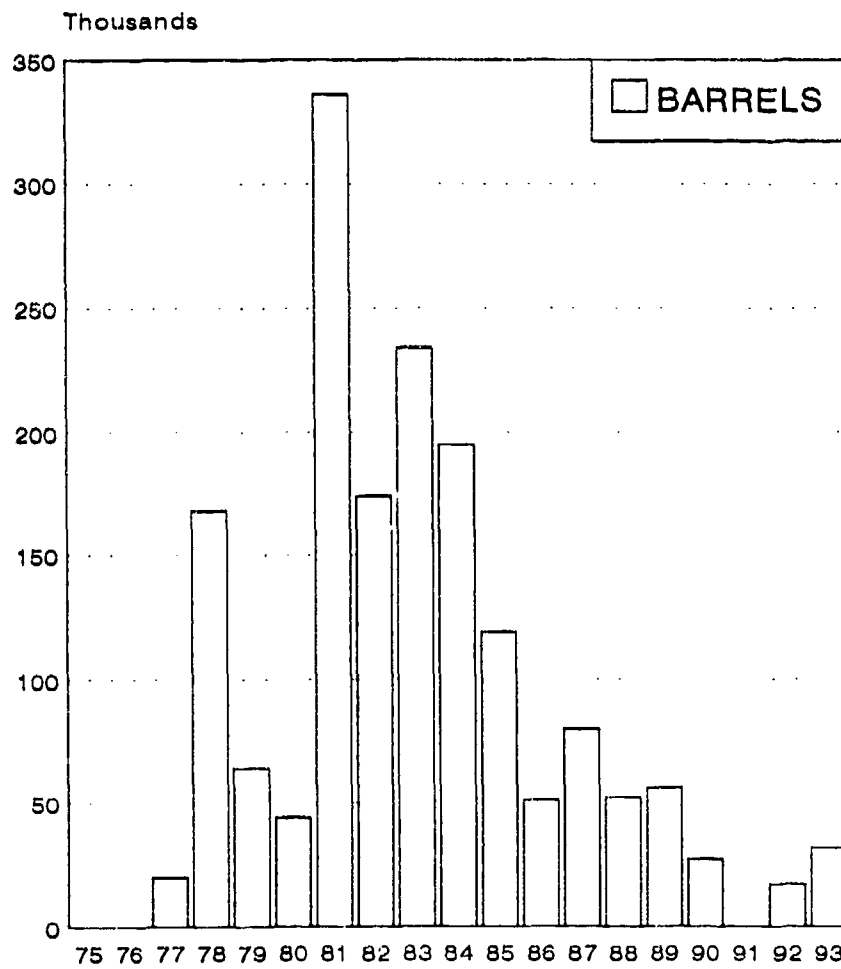
The SPR was developed to combat possible uncertainties in the U.S. petroleum supply picture. The U.S. Department of Energy has performed extensive cost/benefit analyses where many factors were varied, including assumptions about the timing of a disruption, the length of the disruption, supply and demand elasticities, and the rate of government and private sector oil stock drawdown. In May 1982, in response to the Omnibus Budget Reconciliation Act of 1981, the DOE presented its most detailed study of the SPR and recommended a 750 MMB size reserve. The report also provided for incremental changes in size to a maximum of 1.25 billion barrels (situation dependent).

FILL RATE

The fill rate of the SPR has been sporadic at best (see figure 4-1). Congress has tried to legislate the SPR fill rate with moderate success. Since 1986, the SPR has met its mandated

STRATEGIC PETROLEUM RESERVE OIL FILL HISTORY

AVERAGE DAILY FILL RATE IN BARRELS PER DAY



FILL STARTED IN 1977; 1991 FILL SUSPENDED DUE TO GULF WAR

FIGURE 4-1²⁷

fill rate only once. The major cause of the fill rate problems has been budget constraints. Additionally, the President has periodically asked for moratoriums or reductions of SPR purchases in response to different world events. While the SPR now has over 500 MMB of oil in storage, it did not reach this mark until 1986 (see figure 4-2), a full four years after the original target date.

The initial filling of the SPR was delayed for several reasons. First, the SPR Office was poorly organized and initially lacking in the managerial and technical expertise required to accomplish the SPR's mission. As with all government programs, the flexibility to make changes in personnel was extremely limited. Additionally, the ability to attract the most qualified personnel was hindered due to the civil service's limited ability to reward or compensate workers based on their ability.²⁸

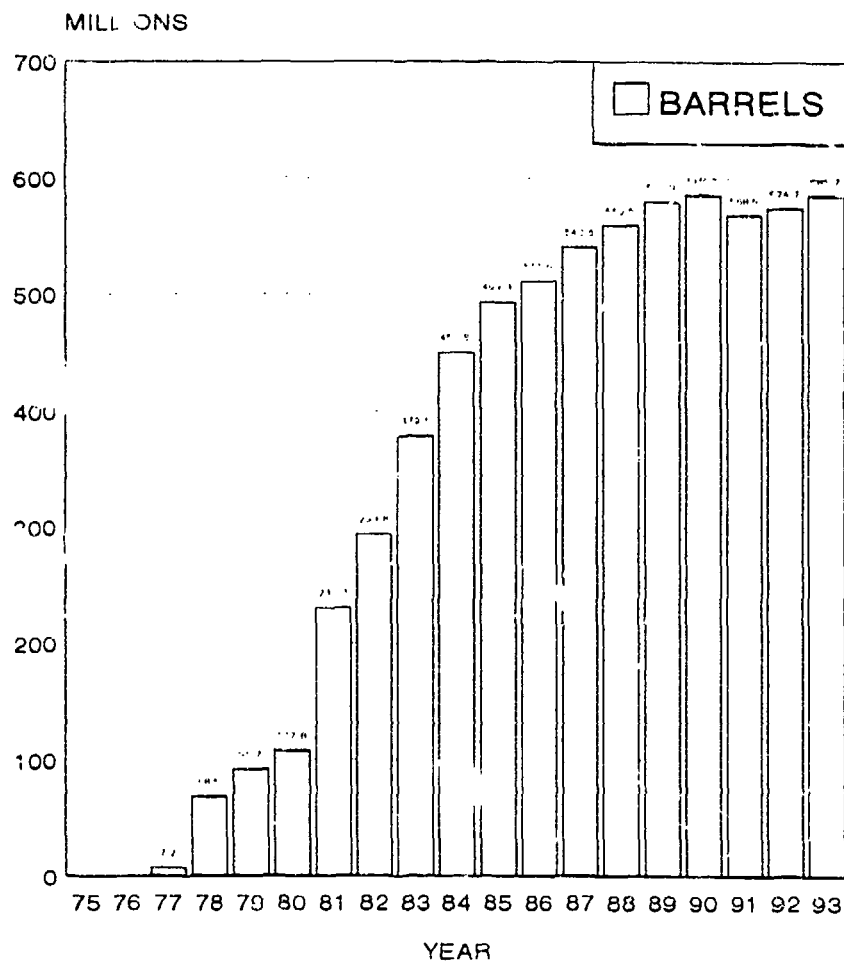
Second, the SPR Office (SPRO) began project execution during the strategic planning stage. This resulted in a lack of standardization and additional maintenance problems that contributed to cost overruns and construction delays. Third, the Washington staff of the FEA initially let all of the procurement contracts. The staff was too small and inexperienced to contract effectively, resulting in further delays and additional costs. Fourth, Congress accelerated the schedule for completion of the SPR. The new schedule was unrealistic in light of the problems the program was already experiencing. Further, scarce human resources were diverted from facilities and program design, forcing the SPRO to gamble between cost and schedule adherence and generally caused a loss of credibility in the SPRO.²⁹

Fifth, the SPRO devoted great amounts of time to meeting environmental regulations and obtaining environmental permits. Various permits had to be obtained from the Corps of Engineers, the Environmental Protection Agency (EPA), and state and local regulatory agencies. There was also significant opposition to the SPRO's use of the federal government's eminent domain powers. All of the phase I sites were obtained through condemnation.³⁰

Finally, the SPRO lost personnel when the DOE was formed in October 1977. The lost personnel could not be replaced due to an Office of Management and Budget mandated hiring freeze. The DOE's priorities were different than the FEA's. Previously, meeting the development schedule was the SPRO's priority; under the DOE, avoiding cost overruns

STRATEGIC PETROLEUM RESERVE OIL FILL HISTORY

YEAR END INVENTORY IN MILLIONS OF BARRELS



FILL STARTED IN 1977; 1991 INVENTORY DECREASE DUE TO SALES DURING THE GULF WAR
1993 - AS OF SEPTEMBER 30, 1993

FIGURE 4-2³¹

became a priority.³² The combination of the factors listed above seriously impaired the SPRO's ability to meet the initial required fill rate.

The majority of the management problems in the SPRO were solved after retired Air Force General DeLuca was appointed the head of the SPRO. By the end of 1979, the SPRO had reached a level of competence that would enable it to meet the demands of implementing the SPR Plan.³³

In May 1979, the DOE and the Defense Fuel Supply Center (DFSC) (the petroleum purchasing agent for the SPR) ceased purchasing oil for the SPR as a result of the Iranian Revolution. The last delivery of oil in 1979 occurred in August; money allotted for the purchase of new oil was not included in the SPR's budget until 1981. However, the option of purchasing oil in 1980 was left open.³⁴

The Energy Security Act of 1980 approved on June 30, 1980, authorized the resumption of petroleum purchases for the SPR and specified a minimum fill rate of 100,000 barrels per day. From June 1980 through 1985, the SPR maintained average daily fill rates of above 100,000 barrels per day. In the FY 1987 budget submitted on February 3, 1986, the Reagan Administration proposed a moratorium on SPR oil fill when the SPR inventory reached 499 MMB. Additionally, the administration proposed to defer all SPR funds, other than those required to implement the moratorium policy. Congress was able to push the Omnibus Reconciliation Act of 1985 through, as discussed previously, that required the SPR to maintain a minimum fill rate of 35,000 BPD until the SPR inventory level reached 527 MMB. In April of the same year, the President signed Public Law 99-349, restoring the funding to the SPR for 1986. As a result of the Congress's efforts, the SPR maintained an average fill rate of 47,000 barrels per day in FY 1986.³⁵

In October 1986, Public Law 99-509 was passed, thus raising the minimum average fill rate for the SPR to 75,000 BPD. This minimum fill rate was met in FY 1987 and has not been met since. The main reasons for the shortfall in 1988 and 1989 were budgetary constraints and concern over the U.S. national debt. Because of the Persian Gulf War, SPR sales were suspended, effective August 2, 1990. Prior to that date, the average daily fill rate for 1990 was slightly less than 36,000 barrels per day.³⁶ In 1991, the SPR's capacity reached

750 MMB. Crude oil purchases for the SPR were not reinstated until the second quarter of FY 1992 (January 1992). The majority of the crude oil delivered to the reserve during the past two years has been from NPR-1. The average fill rate for 1992 and 1993 were approximately 17,000 and 41,000 BPD respectively. Projections for the 1994 fill rate were estimated at 31,300 barrels per day.³⁷

BUDGETING

The FEA originally estimated that a 500 MMB Strategic Petroleum Reserve would cost between \$7.5 and \$8.0 billion. Approximately 90 percent of the cost was earmarked for oil acquisition.³⁸ The estimated costs were based on a forecasted national composite average price for crude oil and the assumption that there would be no increases in the world oil price by major producing countries (table 4-1).³⁹ The assumptions and figures used by the FEA in developing the SPR plan proved to be incorrect. The actual cost of reaching the 500 MMB inventory level was over \$15 billion for the petroleum alone.

SPR funding/appropriations through 1993 totaled over \$20 billion (table 4-2), and it has been estimated that another \$3.5 billion is required to fill the reserve to 750 MMB. These figures do not include the future expansion of the SPR to a 1 billion barrel capacity.⁴⁰

The SPR is financed by yearly budget appropriations (figures 4-1 and 4-2).⁴¹ This system is not very efficient and does not allow for the flexibility the SPR needs in order to minimize the cost of oil for the SPR. When yearly fill rates are compared to yearly average prices for crude oil, one finds that the greatest volumes of oil have been purchased when the price for crude oil was high. The average landed cost for crude oil in the U.S. from 1981-1985 (average daily purchases of 217,000 barrels) was approximately \$30.75 per barrel. The average landed price for crude oil from 1986-1992 was approximately \$17.11, yet SPR purchases (excluding the 1990-1991 Persian Gulf War moratorium) averaged approximately 47,000 barrels per day.⁴² This simple analysis clearly shows that the U.S. Government has been being penny-wise and pound-foolish.

The previous section on legislative actions outlines of the SPR's funding history. The SPR's crude oil is an asset for the U.S., but this opinion is not generally recognized in the

TABLE 4-1⁴³
COMPARISON OF FEA ESTIMATES AND ACTUAL OIL PRICES
 (Current Dollars)

YEAR	SPR COST PER BBL ESTIMATES	ACTUAL AVG. U.S. WELLHEAD PRICE	ACTUAL AVG. LANDED COST OF IMPORTS
1977	11.02	8.57	14.36
1978	11.62	9.00	14.35
1979	12.71	12.64	21.45
1980	13.40	21.59	33.67
1981	13.40	31.77	36.47
1982	13.40	28.52	33.18
1983	13.40	26.15	28.83
1984	13.40	25.88	28.54
1985	13.40	24.09	26.67
1986	13.40	12.51	13.49

TABLE 4-2⁴⁴
STRATEGIC PETROLEUM RESERVE APPROPRIATIONS
(thousands of dollars)

Fiscal Year	Petroleum Acquisition and Transportation	Storage Facilities Development and Operations	Management ¹	Total
1976	\$ 0	\$ 300,000	\$ 13,975	\$ 313,975
1977	440,000	0	7,824	447,824
1978	2,703,469	463,933	14,704	3,182,106
1979	2,885,670	103,290	18,111	3,007,071
Reprogramming	<u>-529,214</u>	<u>529,214</u>	<u>0</u>	<u>0</u>
	2,356,456	632,504	18,111	3,007,071
1980	-2,000,000 ²	0	0	-2,000,000
Reprogrammings:				
Number 1	-20,391	0	20,391	0
Number 2	<u>-1,881</u>	<u>0</u>	<u>1,881</u>	<u>0</u>
	-2,022,272	0	22,272	-2,000,000
1981	2,688,282 ³	82,834	19,391	2,790,507
Entitlements	542,146	0	0	542,146
Reprogrammings:				
Number 1	-18,000	18,000	0	0
Number 2	<u>-7,334</u>	<u>7,334</u>	<u>0</u>	<u>0</u>
	3,205,094	108,168	19,391	3,332,653
1982	3,684,000	171,356	20,076	3,875,432
Reprogramming	<u>-4,300</u>	<u>4,300</u>	<u>0</u>	<u>0</u>
	3,679,700	175,656	20,076	3,875,432
1983	2,074,060	222,528	19,590	2,316,178
1984	650,000	142,357	16,413	808,770
1985	2,049,550	441,300 ⁴	17,890 ⁴	2,508,740
1986	0	94,015	13,518	107,533
Reprogramming	<u>-12,964</u>	<u>12,964</u>	<u>0</u>	<u>0</u>
	-12,964	106,979	13,518	107,533
1987	0	134,021	13,412	147,433
1988	438,744	151,886	12,276	602,906
1989	242,000	160,021	13,400	415,421
1990	371,916 ⁵	179,530	12,953	564,399
1991	566,318 ⁶	187,728	12,846	766,892
1992	88,413 ⁷	171,678	13,184	273,475
1993	-125,625 ⁸	161,542 ⁸	14,192	50,109
DOD Transfer	<u>124,925⁹</u>	<u>700⁹</u>	<u>0</u>	<u>125,625⁹</u>
TOTAL	\$16,704,859 ⁹	3,739,831 ⁹	276,227	20,720,917 ⁹

¹ Excludes funds appropriated to the other DOE accounts but used to finance aspects of SPR program management. ² Rescission. ³ Included in supplemental appropriations of \$1,305,000,000. ⁴ Included in FY 1984 second supplemental appropriations. ⁵ Includes indefinite appropriation for excess NPR receipts of \$6,050,529. ⁶ Includes \$122,680,683 proceeds from the Test Sale carried out in the fall of 1990, proceeds from the Desert Storm drawdown of \$315,424,985 and \$19,755,064 in FY 1991 excess NPR receipts plus the FY 1991 advance appropriation of \$108,457,000. ⁷ Net of an FY 1992 advance appropriation of \$196,188,000 and the FY 1992 appropriation of \$14,910,000 less the \$122,685,000 transferred to the SPR appropriation (89X0218 91). ⁸ Transferred \$125,625 from the SPR Petroleum Account to the SPR Account. ⁹ DOD transferred a total of \$125,625,000 to DOE for oil acquisition and storage costs for the DOD-SPR. Neither the oil acquired nor the cost of acquisition or storage is counted in the total SPR inventory or appropriations.

STRATEGIC PETROLEUM RESERVE ANNUAL FUNDING
 STORAGE FACILITIES DEVELOPMENT/OPERATION & PETROLEUM ACQUISITION TRANSPORTATION

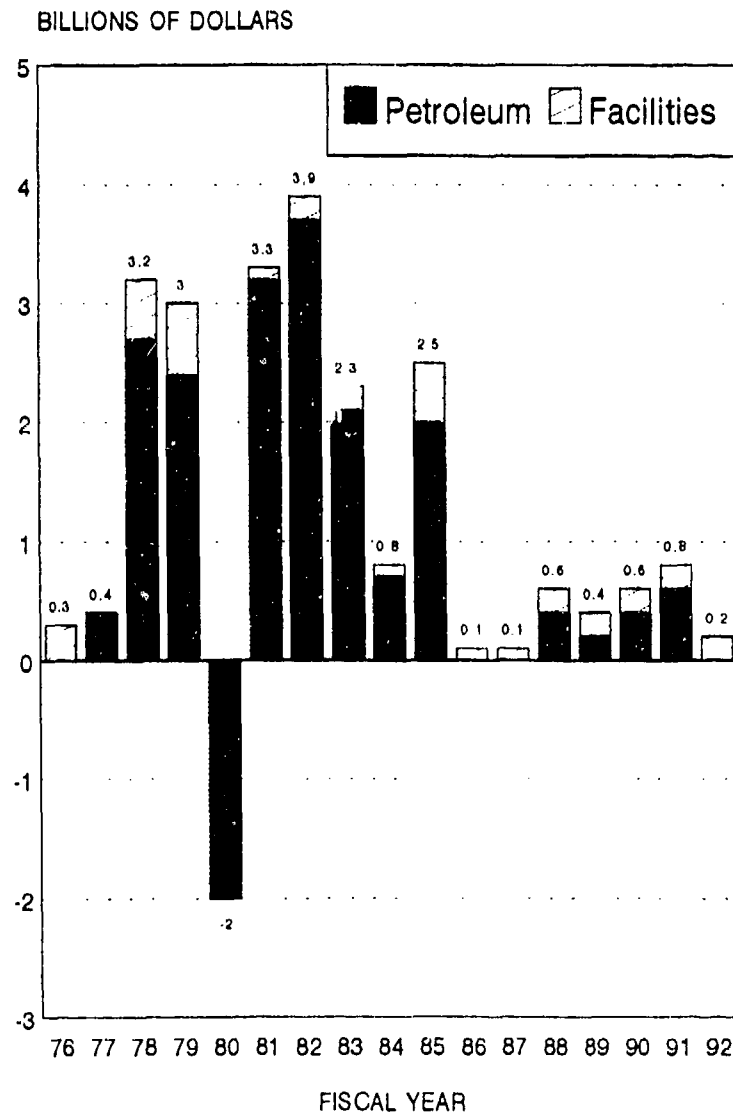


FIGURE 4-3⁴⁵

STRATEGIC PETROLEUM RESERVE CUMULATIVE FUNDING
STORAGE FACILITIES DEVELOPMENT/OPERATION & PETROLEUM ACQUISITION TRANSPORTATION

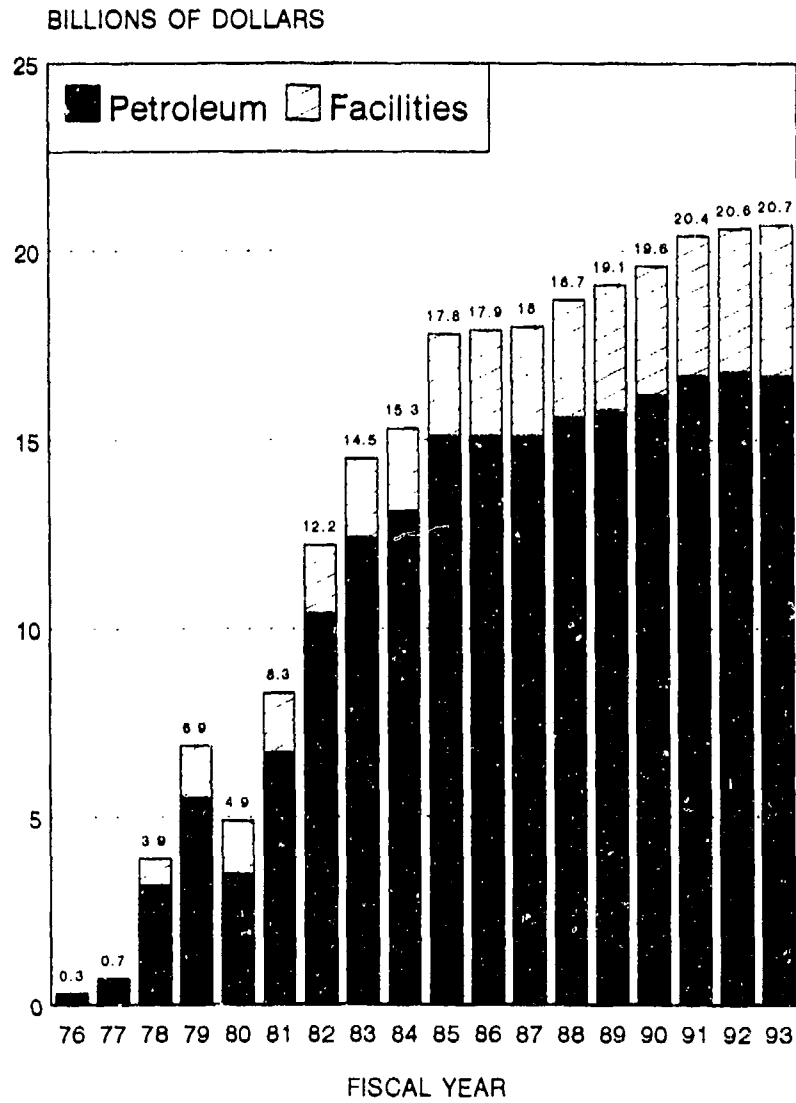


FIGURE 4-4⁴⁶

budgeting process: therefore, SPR expenditures for oil are added to the national debt. If SPR crude oil was recognized as an asset, funding could be increased.

PERSIAN GULF WAR

Soon after the August 2, 1990 attack of Kuwait by Iraq, there was a steep increase in the price of oil. Prices at gas stations rose almost immediately in response to lost Iraqi and Kuwaiti oil. By August 7, there were calls from Congress to use the SPR to calm the markets and lower the price of crude oil. The Bush Administration resisted these calls, preferring to use the SPR for specific physical shortages.⁴⁷ This stand-off caused intense debate in Congress and in the press that primarily centered on when and how to use the SPR, how to tax windfall profits, and when and if to implement price controls.

Because of intense pressure to use the reserve, on September 26, 1990, President Bush announced his decision to sell five million barrels of SPR oil in order to test the reserve.⁴⁸ The DOE issued a formal notice of the sale on September 28, 1990, of 2.2 million barrels of low sulfur "sweet" crude and 3.8 million barrels of high sulfur "sour" crude oil. The sale used an experimental indexing formula that indexed the purchase price at the time of delivery to a mix of crude oil spot prices. The reference crudes were based on a composite of West Texas Intermediate, Alaskan North Slope, and Louisiana Light for sweet crude oils and West Texas Sour, Alaskan North Slope and Louisiana Light for sour crude oils.⁴⁹ The DOE received 40 bids, they selected eleven companies to receive a total of just under 4 million barrels of SPR oil. Amoco submitted the highest bid and received 1.12 MMB of sweet crude at \$39.06 per barrel.⁵⁰

Deliveries began on October 19th and were completed by December 2. The total receipts from the sale were \$122,648,692. The sale's cost to the government, excluding the replacement costs for acquiring and storing crude oil, was \$1,988,280. Additional costs included required maintenance, electrical power requirements, and throughput charges at the Sun Terminal.⁵¹

There were several problems with the test sale. First, it was not large enough to drive crude oil prices down (SPR oil sold accounted for only 0.5 percent of U.S. demand). The

DOE could not sell all of the oil offered because the amount of sweet crude offered made up too small a fraction of the total amount of oil for sale, thus not meeting the demand of the buyers. Second, it took too long to evaluate letters of credit and qualify buyers. Third, no oil was shipped by tanker, a requirement for any large scale sale, and the sale identified a potential shortage of American flagged tankers (required by the Jones Act). One of the most disturbing results was that SPR oil was sold at a loss to the government. The average loss to the government was at least \$2.70 per barrel. The average cost to the government for the oil sold was \$32.37. When storage and facilities costs were added, and the average barrel cost \$34.07. This does not include interest paid on the money borrowed to pay for the SPR. The positive result of the sale was that if the 2/3 sour and 1/3 sweet formula was followed, the proceeds of the sale could purchase up to 5.5 million barrels of oil at December 1990 prices.⁵²

There continued to be discussions urging the President to use the SPR if war broke out between the coalition forces and Iraq. On January 16, 1991, President Bush announced the release of 33.75 million barrels of SPR oil for sale as part of a coordinated effort of the IEA countries. The sale announcement was praised by the oil industry and the press as a very astute policy. By January 21, oil prices fell by more than \$10 per barrel and the sale of SPR oil was termed an option, not an obligation, by the DOE.⁵³ The DOE then proceeded with the sale and received bids from 26 companies for 44.8 million barrels of SPR crude offering an average bid price of \$27.08 for light sweet crude and \$25.06 for light sour crude.⁵⁴ As a result of the weak demand for the SPR's sour crude (low price bids), the DOE cut the total amount of the sale in half to 17.35 million barrels and increased the amount of sweet crude offered in the sale.⁵⁵

Bids were accepted from 13 buyers; shipments of SPR crude began on February 5, 1991 and were completed by March 31. The final sale prices averaged approximately 33 percent below the bid prices as a result of the downward adjustments of the indexing system used for selling the crude, thereby resulting in an average sale price of approximately \$18.60 for sweet crude and \$16.90 for sour crude. The drawdown required 67 separate shipments from 3 SPR storage sites.⁵⁶ The drawdown of the SPR showed it to be an effective insurance policy.

CONCLUSION

The SPR has had an active history. Once the initial management and planning problems had been solved, the SPR program progressed smoothly in light of its budget limitations. It is very likely that the SPR will continue to be the target of Congressional and Presidential budget cutters. With average fill rates projected at lower than 20,000 barrels per day it will take more than 22.5 years to fill the existing capacity of the reserve; at 100,000 barrels per day, it would take until 1997 to fill the SPR's current capacity. At an average of \$20 per barrel it would cost another \$3.5 billion to fill the SPR to 750 MMB. In light of the current budget deficit, it is unlikely that the SPR will ever be fully funded using current financing methods.

Since the program was started in 1977, the SPR has grown into a viable 585+ MMB reserve. It was shown that the SPR had a calming effect on oil markets during the Persian Gulf War. If additional funding can be found, continued development of the SPR to a one billion barrel capacity could begin and the fill rate accelerated so that the SPR can become capable of providing the 90 day supply buffer required by the IEA. The next chapter examines some of the methods that could provide the additional funding required to complete the SPR.

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CHAPTER V

FINANCING ALTERNATIVES

Since the beginning of the SPR program there has been debate over how it should be funded. Congress has examined alternative financing methods almost every year since the program's inception. The program was initially funded as an "on budget" program by Congressional Appropriations, supported by existing taxes and by borrowed funds from the U.S. Treasury. SPR crude oil funding was done "off budget" for a short period until it was placed back "on budget" by the Gram-Rudman-Hollings Balanced Budget Act. On-budget methods include financial support from taxes, sales of government bonds, and the borrowing of funds from the treasury. All of these methods require Congressional Appropriations and are reported in the Federal Budget.

There have been many alternative financing methods proposed over the years. They fall into three broad areas:¹

- Increase government revenues by selling bonds, increasing taxes or fees, selling government assets, or selling futures or options contracts.
- Acquire oil by leasing/renting, mandatory contributions or providing incentives for private contributions.
- Set up the SPR as a government corporation or trust.

This chapter examines alternatives in each of these areas concerning the government's acquisition and financing costs, the effect on the national debt, and other considerations such as who controls and pays for the crude oil injected into the SPR.

BONDS, TAXES AND FEES, SELLING ASSETS AND FUTURES/OPTIONS

BONDS

One method of financing the SPR is the issuance of conventionally structured bonds. The SPR Office would sell the bonds to the Federal Financing Bank (FFB). The FFB borrows the funds to pay the SPR Office from the U.S. Treasury. The U.S. Treasury then issues treasury

debt instruments to obtain the required amount of money. This method only affects the financing of crude oil, not how it is purchased.

A second method is the sale of indexed bonds. These bonds would be based on the value of the oil in the SPR. As the value of the oil in the SPR changes, the face value of the bond changes. Because the face value of the bond is linked to oil prices, the bonds will pay lower interest rates than those of conventional bonds. As long as the price of oil continues to rise, the net cost to the government is lower using indexed bonds. If, however, the price of oil decreases, the government stands to lose a substantial amount of money.

Both bond proposals have no initial effect on the U.S. national debt because they substitute one form of debt for another. Long term index bonds could either increase or decrease the national debt, depending on the market price of crude oil.² The acceptance of oil indexed bonds in the market is uncertain. Consideration would also have to be given to how the bonds interact with an SPR drawdown (e.g., bond call options, bond for SPR oil swaps and underwriting institutions). Additionally, these both types of bonds would entail limited government liability that could be affected by possible government imposed oil price controls (conflict of interest problems)³. Since there is no apparent benefit to the government or the public, funding should continue using the current financing methods.

TAXES AND USER FEES

A tax is a revenue source that theoretically takes money from everyone to fund government activities; a user fee is a revenue source derived from those who directly benefit from a government activity.

An additional tax on gasoline and other petroleum products has been proposed as a funding option for the SPR. This tax is assessed at the point of consumption: i.e., at the gas pump. Many believe that the tax would provide a large, predictable, and adjustable source of funding. Additionally, the increase in the price of gasoline may result in the added benefit of reduced consumption and reduced overall dependence on imported oil. In 1989, a \$0.12 per gallon tax would have provided a tax revenue of one billion dollars.

Taxing imported crude oil and other imported petroleum products has also been proposed as a solution to the SPR's funding problems. A fixed or variable per-barrel-tax would be paid to the government. Fixed taxes provide a more predictable revenue stream because the tax rate remains constant; revenue is based on the number of barrels imported. Variable tax rates would be controlled by the import level or by the price of oil to produce constant revenue. This method would initially apply the tax to businesses that would benefit most from the SPR, (e.g., oil importers). Additionally, more domestic production might be encouraged as a result of more competitively priced domestic oil.

Consumers eventually pay for all of the tax proposals through increased prices at the point of consumption. The first proposal does nothing to encourage domestic production and will do nothing to halt or slow the decline of the U.S. oil industry. The only benefit would be a temporary reduction in oil consumption (assuming the oil price does not change) until the public adjusts to higher gasoline prices (as they did during the 80's). The second proposal rewards the use of domestically produced crude oil and, as prices for crude oil rise, would encourage additional domestic exploration and production. Both tax methods would provide sufficient income to fully finance the SPR.⁴ Once the SPR is filled and its future maintenance funded, the tax could be eliminated or applied to the national debt.

ASSET SALES AND RECEIPTS

The Government Accounting Office (GAO) has studied the sale or reallocation of different government assets to finance the SPR. These assets include:⁵

- the Naval Petroleum Reserve (NPR);
- non-revenue producing assets;
- crediting receipts from U.S. federal oil and gas leases to a revolving fund to finance SPR purchases;
- using NPR sales directly for SPR purchases;
- selling equity certificates in SPR oil.

The Naval Petroleum Reserve is a group of oil fields owned and operated under the control of the government. NPR oil is sold on the commercial market; the government is currently selling portions of the NPR. One of the conditions of the sale stipulates that the buyer provides the SPR with up to 50,000 barrels of oil per day for a finite period. This requirement is expected to be the only device available for providing oil to the SPR in 1994. While this provides oil for the SPR, it denies other government agencies access to the receipts from NPR sales and NPR oil that they have enjoyed in the past. The net result is that the government's debt level is not significantly changed. Benefits from this option include the SPR being filled, the net present value of the SPR is increased, and there is insurance against a future oil supply disruption.⁶ It would take advantage of current oil prices while avoiding adverse impacts on the oil market or the current supply of oil.

The Sale of non-revenue generating government assets has also been proposed. Assets such as buildings and land would be sold or leased, with the proceeds financing the SPR. This option would require an extensive administrative effort to identify and approve properties for sale or lease. The political infighting that resulted from the Defense Department's base closure program is indicative of how the sales would be conducted. Additionally, it would not provide a continuous or adequate source of revenue.

The SPR could be financed using receipts from federal oil and gas leases. Revenues from the sale of royalty oil, bonuses, and rents received would be placed in a fund to pay for the SPR. This option results in royalty oil being transferred to the SPR. It would provide the billions of dollars required to manage and fill the SPR. Currently, federal oil and gas lease revenues are being used to finance other federal programs and to make payments to oil producing states; remaining funds are used to offset other government outlays.⁷

NPR revenues were used to finance the SPR in 1977. However, since 1977, revenues from the NPR have been counted as U.S. Treasury receipts and are used to offset other federal expenditures.

Selling equity (ownership) certificates in denominations of SPR oil is one of the more complicated and controversial proposed funding methods. SPR certificates would have a fixed maturity date and would be denominated in barrels of crude oil in the SPR. Ownership

of the SPR would be transferred to the private sector while proceeds from the sale of certificates would be used to buy oil for the SPR. The Government Accounting Office examined three different proposals for SPR certificates, all with fixed maturity dates.

The first proposal uses an issue price based on the average price of crude imports to the U.S. for the quarter before the date of issue. Certificates mature in ten years and are then redeemed for cash or exchanged for new certificates. Proceeds from the sale of the certificates would be used to fund oil purchases for the SPR. The redemption value of the certificates would be based on the current value of the oil, less a fee for storage and handling. The second proposal is similar to the first except the term would be shorter (no longer than seven years). A third proposal would sell fixed-price 7-year certificates at the current cost of oil, with minimum and maximum limits set on the redemption price of the certificates.⁸

The sale of certificates would provide enough funds to fill the SPR with oil (assuming a market for SPR certificates can be developed). There are several concerns over private ownership of the SPR. Investors might be foreign nations that export oil to the U.S. This would defeat one of the primary purposes of the SPR: to punish the embargoing country by denying them oil revenues. Prior to certificate issue, mechanisms would need to be developed to prevent foreign investment. Additionally, the certificates might have to be sold at a discount in order to attract investors to SPR certificates rather than other higher yield investments. Discounted certificates would increase the cost to the government in the event of a drawdown. The above mentioned options reduce both government borrowing and total financing costs, which could be higher or lower depending on the price of oil in the future.

After a careful analysis of what assets will be needed in the future, sales of disposable assets and receipts could reduce the deficit by replacing U.S. Treasury debt. Replacement costs of hastily sold assets may be higher than the receipts and benefits from the original sale. Sales of revenue generating assets (NPR oil) would initially reduce debt, but in the long term its impact is dependent upon the sale price of the asset and its future revenue potential. If the net present value of the asset is lower than its sale price, debt is lower; if the reverse is true, debt is higher.⁹

FUTURES AND OPTIONS

Selling futures and options contracts denominated in SPR oil would generate funds for filling the SPR and help organize its drawdown in the future. Futures contracts are agreements to purchase or sell a commodity in the future at an agreed upon price and date. Options give a buyer the "right" to buy a commodity or security at a specified price by a specified date. Options do not obligate the buyer whereas futures contracts do.

Futures contracts obligate the government to deliver SPR oil when the contract expires. Contracts could be written to specify delivery in the event of a disruption. The contract price would be for the expected price of oil resulting from a disruption. This would drive up the price of the futures contracts, enticing buyers to purchase futures elsewhere. This method would also defeat the government's goal of "spreading" the oil to different refiners equitably. The government has to be willing to sell futures at or near current market prices to ensure their success in the marketplace. Selling futures at normal market prices would cause the government to forgo any possible benefits of federal revenues generated from higher oil prices during a disruption.¹⁰

Options would raise some revenue for the government. This method has all of the disadvantages of futures contracts; however the amount of money needed to fully fund the SPR program would not be raised if this alternative were pursued.

LEASING, MANDATORY CONTRIBUTIONS AND PRIVATE CONTRIBUTIONS

LEASING OR RENTING

Leasing or renting oil, crude oil storage facilities, regional storage reserves and Alaskan state royalty oil have all been considered by Congress. Under each proposal, the government pays an annual fee that is less than if they had purchased the oil outright. The government would not own the oil unless it purchases the oil at the end of the lease period or uses the oil as a result of an emergency drawdown.¹¹

The government could lease oil from oil companies. The oil would be owned by the oil company but stored in SPR storage facilities. The oil would be purchased during a drawdown and distributed in accordance with the SPR distribution plan. Companies would sell the oil to the SPR at the prevailing market price. If there is no drawdown, the oil would be returned to the lessor at the conclusion of the lease of the lease could be renewed under procedures set forth in the original contract.¹²

Leasing both oil and storage facilities is another option for developing the SPR. Leases are for a specified amount of oil, at a specified location, and for a predetermined amount of time. As with leasing oil, the government has the option to purchase some or all of the oil when the lease expires or to renew the lease. This method works the same way as leasing oil except the oil is "decentralized". Additionally, there is no guarantee that the company will stay in business or react as quickly as the government may require in order to meet a supply disruption.

Regional storage reserves could be used to meet the needs of the SPR. Facilities and oil would be leased in areas and in amounts that reflect the demand for oil in that region of the country. This method encourages better utilization of existing storage facilities, development of additional storage facilities and makes distribution easier.

Alaska receives a significant amount of royalty oil from the North Slope oil fields. Under this option, Alaska would lease its royalty oil to the SPR. The lease would allow the state to claim the market price for any oil used during a drawdown or at the end of the lease period.¹³

Leasing oil from foreign countries has also been considered. Public Law No. 101-46 directed the Department of Energy to discuss leasing options with other oil producing countries. Extensive discussions were held with Kuwait prior to the Persian Gulf War concerning an oil leasing arrangement prior to the Persian Gulf War. The advantages of the plan discussed with the Kuwaitis were that the oil would be stored in the SPR free of charge and Kuwait could use the oil as collateral for loans from the U.S. Additionally, it would help deter Kuwait from embargoing the U.S. in the future: in the case of an embargo, title of the

oil would transfer to the U.S.¹⁴ The leasing discussions were never completed; however, it might be to the U.S.'s advantage to look at this option again.

All of the lease/rent options lower the initial costs to the SPR, but dramatically increase the costs during a drawdown. The U.S. would receive none of the benefits of purchasing oil at a low price and selling it at a high price. Additionally, lease/rent options would increase the national debt. Also, there is the potential for pressure from lessors and Congressmen to sell leased/rented oil prior to selling SPR oil already owned by the government so that lessors can realize additional profits. However, if the government returns the oil to the lessor during a shortage, oil costs could be reduced significantly. This method must be coordinated prior to contracting in order to achieve the distribution desired under the SPR plan.¹⁵

MANDATORY CONTRIBUTIONS

On several occasions Congress has proposed to require oil companies to provide oil to the SPR. Three proposals for mandatory contributions have been considered.

In the first proposal, every company that imports more than 75,000 barrels of crude oil per day is required to donate five days of its average daily imports. The company would be paid ten percent of the original value of the oil every year for eleven years. If a drawdown occurs prior to the end of the eleven year payoff period, the company donating the oil would be paid the difference between the market price and the amount previously paid by the government.¹⁶

The second option allows, the Secretary of Energy to exercise his authority provided by the Energy Policy and Conservation Act (EPCA) to establish an Industrial Petroleum Reserve (IPR). The Secretary has the authority to require petroleum refiners and importers to store up to three percent of their total production/imports each year. Companies would store oil in excess of the amount they require for normal operations. Companies would retain title to the oil, but would be required to comply with Presidential orders to drawdown the IPR. Companies would be expected to pass the cost of the IPR to their customers.

Finally, oil importers could be required to provide crude oil for storage in the SPR. The amount/rate that companies provide would be determined by the Secretary of Energy. The

Secretary could require an influx of oil to maintain an average fill rate of 100,000 barrels per day until the reserve contains 750 million barrels (or one billion barrels if and when the reserve size is expanded). The oil companies would retain ownership of the oil in the SPR and would be paid the market price for their oil during a drawdown. Each company would be charged storage and handling fees at the time of sale.

Under the first proposal, costs are less to the government if a drawdown does not occur within the first eleven years that the oil has been deposited. The interest rate paid on U.S. Treasury certificates is greater than the cost of the oil at the end of the payment period less 110 percent of the original cost (if the price of oil continues to rise). If a drawdown occurs during the first eleven years, it will cost the government more. In the second and third proposals, government acquisition costs are non-existent. There may be a loss of revenues if companies are allowed to deduct the cost of their contribution. There are some questions concerning the legality of requiring businesses to donate oil. These "donations" could be looked upon as seizures, which require payment under existing U.S. laws.

PRIVATE CONTRIBUTIONS

There are two proposals forwarded under this heading. The first examines trading existing SPR crude oil and the right to receive the government's future sales price for oil in exchange for private investors filling the SPR. The second proposal promotes providing tax incentives to companies in exchange for donations to the SPR.

In the first proposal, investors own the donated oil and a portion of the oil already stored in the SPR. The government would control the oil for a specific period of time or a drawdown occurs. At the end of the contracted period, the government would have to pay for the oil or release it to the investor. The second proposal allows a company to deduct the market value of their contribution from their taxable income. If the incentive was not structured this way, the company storing oil in the SPR would retain ownership of the oil.

Both of these proposals would reduce initial government expenditures. The first proposal is paid for by relinquishing future revenues from the sale of SPR oil that is already in the reserve. Additionally, at the end of the contracted period the oil would be delivered to the

contributor or bought by the the government at the prevailing market price. The cost of the oil in the reserve would now be absorbed by the government.

Congress is also concerned that private investors would realize very large profits as a result of an oil shortage. The second proposal is more favorable, since the only loss to the government would be a portion of the tax revenues the treasury could potentially receive. This loss is more than made up for by not having to purchase oil (or having to borrow money to make the purchases).¹⁷

SPR CORPORATION

Proposals to establish the SPR as a separate entity similar to the U.S. Post Office, Federal National Mortgage Association (both use off-budget financing), or the Tennessee Valley Authority (on-budget financing), have been made. The SPR Corporation could be either an on or off-budget entity. Off-budget "companies" are not included in the federal budget: they are government sponsored, but privately owned and financed.

The SPR Corporation would have control of the SPR oil and facilities, but the government would retain ownership of the oil. The company could raise funds for filling the SPR in several ways. They could charge the government a fee for storing the oil, borrow money from the FFB, or sell bonds to finance the SPR. If the SPR Corporation sells bonds, they will probably have to pay a higher interest rate than that paid on U.S. Treasury bonds. They could also sell equity certificates to raise money for additional oil purchases. The SPR corporation could also use leasing or renting proposals mentioned earlier as a financing option.

Private companies are generally more efficient than government agencies. By converting the SPR to a separate entity, costs may be reduced. The government would still experience expenditures, but would not benefit from the sale of SPR oil in the future. Additionally, there would be capital losses from transferring the physical assets to the SPR Corporation. If the SPR corporation is an off-budget entity, the reported national debt is not increased. In reality though, the government would still be using deficit spending to pay for the SPR. A separate corporation must be autonomous in order to make intelligent business decisions. This facet raises the question of who would control the SPR.

OTHER OPTIONS

SWAPS WITH OIL PRODUCING COUNTRIES

Shortly after the Persian Gulf War, the idea of letting Saudi Arabia pay their war debt to the U.S. in crude oil was proposed. The idea was heavily endorsed by several Congressional leaders, but rejected by the Bush Administration because the Saudis were going to pay their debt in cash.¹⁸ The administration later began discussions with the Saudis on providing crude oil for the SPR as payment for their war debt to the U.S., but the Saudi's put negotiations on hold due to their production being at or near capacity.¹⁹

Several oil producing countries receive aid from the United States: Mexico, Kuwait, and Saudi Arabia are good examples. Loans to these countries often have to be restructured because of the country's inability to pay their debts. The U.S. could negotiate a favorable swap deal for all the parties involved, resulting in debt reduction for the country and more oil for the SPR at substantially lower prices. Other options similar to those previously discussed in this section, could result in those countries storing oil in the SPR using the oil as collateral for loans or interest on their debt. This second option could work as a deterrent to possible oil embargoes in the future. These types of negotiations may result in the SPR purchasing oil at cost and thereby saving the U.S. a significant amount of money.

Swaps of agricultural products for oil were authorized by Public Law 99-198 (The Food Security Act, see chapter IV). The law made this a viable, though to date untried, option for filling the SPR. Surplus government stocks could be used to trade for oil with countries such as Russia. This would save storage costs while gaining oil for the SPR.²⁰

ALTERING THE BUDGETING PROCESS

Currently, the SPR receives appropriations and obligation authority from Congress on a yearly basis. The fill rate of the reserve is essentially held hostage by the budget process. At the end of fiscal year 1992, the SPR had an obligation authority of \$657.4 million but only

a spending authority of \$137 million.²¹ The yearly budget authorization spending system is inefficient and does not allow the SPR Office to take advantage of current market conditions.

The SPR Office could take advantage of changing oil prices if they had a three to five year budget horizon. The SPR Office would be granted the authority to obligate and spend funds throughout the three to five year budget. They would not be permitted to exceed the spending limits within the specified long-term budget window. With increased autonomy, the SPR Office could take advantage of today's various market mechanisms that did not exist when the program was started. This option would result in the SPR being filled at a lower cost and in a shorter amount of time.²²

CONCLUSIONS

There are positive and negative aspects to each of the financing alternatives presented. The sale of bonds or futures and options has the benefit of providing funds quickly for the SPR. Drawbacks include increased debt to the government and increased private sector ownership. Selling assets provides money, but would be a finite source of funds and could cost the government assets that might be required in the future. Taxes and user fees might provide a continuous source of revenue, but could result in increased consumer costs. The leasing of oil might initially cost less than the outright purchase of oil, but would deny the government any revenue if the oil were sold in a future crisis.

Contributions, both mandatory and private, cost the government very little if no supply interruptions occur during the first eleven years of the contribution. This method runs the risk of being constitutionally illegal and could potentially drive small refiners out of business.

Barter trades or debt swaps would provide the SPR with oil at a lower cost. They might not be able to fill the reserve and would require extensive help from the U.S. State department during negotiations. This option may result in a loss of funds to the U.S. State Department.

An SPR Corporation would provide essentially the same benefits of the programs outlined above depending on how it was funded. It could take the program off-budget and reduce some of the President's flexibility in using the SPR.

The Energy Futures Group developed a table defining attributes versus financing concepts that simplifies analysis of the different proposals (table 5-1). The preferred attributes are as follows:

TABLE 5-1:²³
ATTRIBUTES VS. FINANCING CONCEPTS

ATTRIBUTES	CONTROL PUBLIC VS. PRIVATE	REGULATION MANDATORY VS. MARKET	FINANCING SOURCE TAXPAYER VS. INVESTOR	FINANCING METHOD RECEIPTS VS. DEBT	SPR LEVEL & FILL RATE SIZE AND TIMING
FINANCING CONCEPTS					
CONVENTIONAL	PUBLIC	MARKET	TAXPAYER	RECEIPTS	MODERATE
OFF-BUDGET	MIXED	MARKET	INVESTOR	DEBT	HIGH
TAXES	PUBLIC	MARKET	TAXPAYER	RECEIPTS	HIGH
NPR RECEIPTS	PUBLIC	MARKET	TAXPAYER	RECEIPTS	HIGH
PRIVATE RESERVE	PRIVATE	MIXED	INVESTOR	N A	LOW
MANDATORY CONTRIBUTIONS	PUBLIC	MANDATORY	TAXPAYER	RECEIPTS	MODERATE
<u>OTHER:</u>					
PUT/CALL SALE	PUBLIC	MARKET	INVESTOR	BOTH	LOW
INTERNATIONAL	MIXED	MARKET	INVESTOR	DEBT	HIGH

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CHAPTER VI

STRATEGIC PETROLEUM RESERVE SALES, DISTRIBUTION PLAN AND CAPABILITY

The Strategic Petroleum Reserve (SPR) contained over 585.6 million barrels (MMB) of crude oil at the end of fiscal 1993, representing a total investment of over 20 billion dollars. This investment accounts for approximately 80 to 87 days of import protection at the 6.67 MMB per day 1993 import level. How is the SPR activated, if and when it is needed? Further, will it be able to perform at the desired level of efficiency? This chapter examines the infrastructure, distribution plan, how SPR oil is sold, and the SPR's capabilities.

INFRASTRUCTURE

The SPR facilities consist of a marine terminal at St. James, Louisiana, and five storage sites in Louisiana and Texas. The storage sites are divided into three distribution systems - the Seaway, Texoma, and Capline (figure 6-1) - and are connected by Department of Energy (DOE) pipelines to commercial and U.S. Government distribution networks. The five sites are: Bryan Mound and Big Hill in Texas; and Bayou Choctaw, Weeks Island, and West Hackberry in Louisiana (figure 6-2).¹ A sixth site, Sulphur Mines, was sold on May 10, 1993. The remaining sites have a combined storage capacity of 750 MMB.² Table 6-1 summarizes the information provided below.

BRYAN MOUND

Bryan Mound, located in Brazoria County, Texas, was purchased through condemnation in 1977 from the Freeport Mineral company. There were four brine caverns with an existing capacity of 66 MMB on the 499.47 acre site. The site's storage capacity was expanded to 226 MMB through solution mining of 16 additional 10 MMB caverns in the salt domes on the site. Expansion was completed in 1986. The site had an inventory of 216 MMB at the end of September 1993 and was available for fill and drawdown.³

STRATEGIC PETROLEUM RESERVE PIPELINE AND MARINE DISTRIBUTION CAPABILITIES

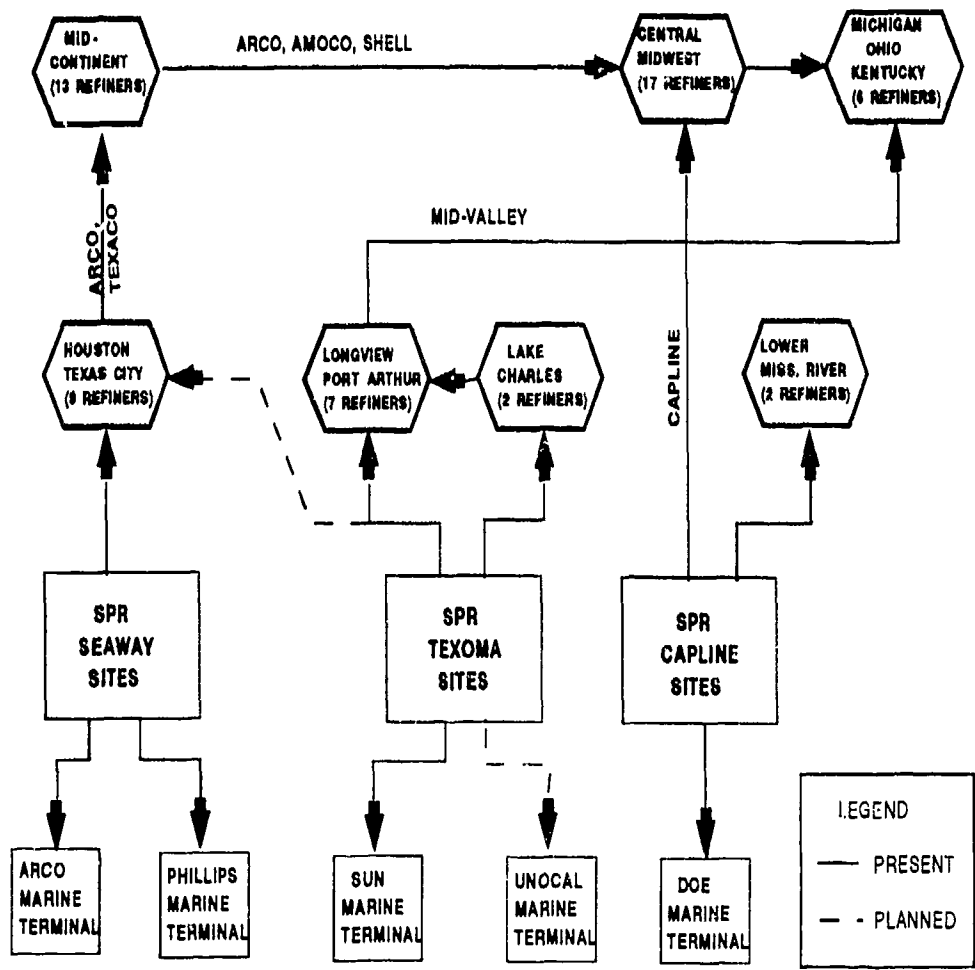


FIGURE 6-1⁴

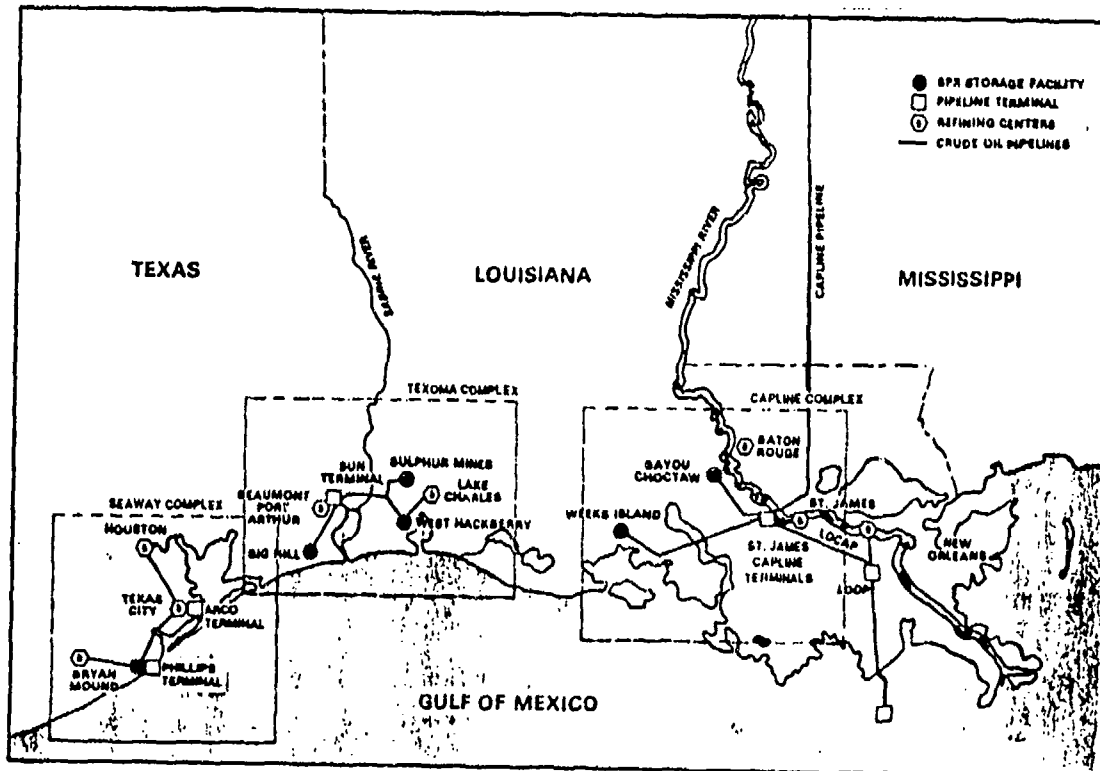


FIGURE 6-2⁵

TABLE 6-1⁶
SPR STORAGE AND DISTRIBUTION CAPACITY BY SITE
(Figures in Millions)

Storage Facility	Storage Capacity (Barrels)	Current Inventory (Barrels)	Distribution Capability (Barrels/day)	Fill Capacity Available (Barrels)
Bryan Mound	226	217	1.25	9
Big Hill	160	37	.93	123
West Hackberry	219	205	1.25	14
Bayou Choctaw	72	52	.48	20
Weeks Island	73	72	.59	1
Tanks/Pipelines	--	3	--	--
Total	750	586	4.5	167

The site includes a 36-inch diameter, 14.6 mile long brine disposal pipeline that extends 13 miles into the Gulf of Mexico. This pipeline had deteriorated and is scheduled to be replaced in 1994.⁷ Bryan Mound's oil/brine/water distribution system consists of over 101,000 feet of piping and 33 pumps. This includes four 200,000 bbl oil storage tanks, two brine ponds and an oil and brine separator. The system is designed to pump 1.14 MMB of raw water per day and dispose of 980,000 bbl of brine per day.⁸

Bryan mound is filled via a 30 inch diameter, 3.6 mile pipeline from the Phillips 66 Freeport Marine Terminal. It has a maximum designed fill rate of 240,000 bbl per day, with a sustained system rate of 180,000 bbl per day. Drawdown is accomplished via the fill pipeline to the Phillips 66 terminal.⁹

BIG HILL

Big Hill is located in Jefferson County, Texas. The 271 acre site was purchased through condemnation between November 1982 and July 1983 from three landowners (Amoco was the largest owner with 238+ acres). The site has 14 SPR developed 11.5 MMB storage caverns, for a total capacity of 160 MMB. Site development was completed in 1992.¹⁰ At the end of September 1993, Big Hill had an inventory of 37 MMB and is only available for filling.¹¹

The oil, brine, and raw water systems at the central plant, as well as the water intake on the Intracoastal Waterway, are connected by 48-inch diameter pipeline. Brine disposal utilizes a pipeline that extends three miles into the Gulf of Mexico. The combined distribution system consists of over 29 miles of pipe and 15 pumps. The raw water system is designed to pump 1.4 MMB per day, while the brine disposal rate is 1.4 MMB per day.¹²

Big Hill is filled and drawn down through a 36 inch diameter, 25 mile long pipeline from the Sun Terminal in Nederland, Texas. The site was designed to fill at a sustained rate of 280,000 bbl of crude oil per day. The designed drawdown capability is 930,000 bbl per day and has a tested capability of 400,000 bbl per day. As inventory increases, the drawdown rate will increase, eventually reaching 930,000 bbl per day.¹³

WEST HACKBERRY

The 565.36 acre West Hackberry site is located in Cameron Parish, Louisiana, and was purchased in sections by condemnation in April 1977, July 1979 and March 1980. West Hackberry originally had 49 MMB of storage capacity in five existing caverns and has since had 17 10 MMB caverns developed by the SPR Office, giving the site a total capacity of 219 MMB. Site storage capacity development was completed in 1992.¹⁴ At the end of fiscal year 1993, the site had an inventory of 205 MMB and was available for filling and drawdown operations.¹⁵

West Hackberry's oil, brine, and raw water piping system is interconnected by a 42 inch diameter, 4.5 mile long pipeline and access 10 brine disposal wells, as part of a total of over 160,000 feet of pipe and 45 pumps. A 36 inch diameter, 27 mile long brine disposal pipe extends nine miles into the Gulf of Mexico. The raw water system is designed to pump 1.45 MMB per day; the brine disposal system can pump 900,000 bbl per day.¹⁶

Caverns are filled and drawn down via a 42 inch diameter, 42.8 mile DOE pipeline running between the site and the Sun Terminal, Nederland, Texas. Stocks can also be drawn down through a 36 inch diameter, 12 mile pipeline connected to the Texas 22-inch common carrier pipeline which is in turn part of a network that includes refineries in Lake Charles, Louisiana. The designed fill rate is 225,000 bbl per day with a sustained fill rate of 175,000 bbl per day. The designed drawdown capacity is 1.25 MMB per day.¹⁷

BAYOU CHOCTAW

Bayou Choctaw is a 355.95 acre facility located in Iberville Parish, Louisiana. It was purchased through condemnation in April 1977 from numerous private owners. The site had 62 MMB of storage in five existing caverns when it was purchased and has had an additional 10 MMB developed by the SPR, giving it a total capacity of 72 MMB. Capacity expansion was completed in 1991 and there was 52 MMB in storage by the end of fiscal year 1993. The Bayou Choctaw site is currently available for fill and drawdown.¹⁸

The oil and water distribution system consists of over 50,000 feet of piping, 16 pumps, and a 100,000 bbl brine pond. Bayou Choctaw's designed raw water pumping rate was 495,000 bbl per day and it has a 110,000 bbl per day brine disposal pumping rate.¹⁹

Drawdown and fill is via a 36 inch diameter, 37.2 mile long pipeline connecting the site with the St. James Terminal. Additionally, the site can be drawn down via the Capline pipeline. Bayou Choctaw can be filled at a sustained rate of 110,000 bbl per day or can be drawn down at a rate of 480,000 bbl per day.²⁰

WEEKS ISLAND

The 382.92 acre Weeks Island site was acquired by condemnation in September 1977 from the Morton Salt Company. It is located in Iberia Parish, Louisiana. The site had a 73 MMB storage capacity split between two levels of a conventional room and pillar salt mine. This site is dedicated to sour crude oil storage and is essentially full and available for drawdown.²¹

The oil piping distribution system consists of 10 operational and one reserve submersible electric pumps to pump oil from the mines to the surface and two main line pumps to move oil to the St. James Terminal. Oil fill and drawdown is accomplished through a 36 inch diameter, 67.2 mile long pipeline running between the site and the St. James Terminal. Drawdown can also be implemented via the Capline piping. The fill rate is 350,000 bbl per day; draw down can occur at a rate of 590,000 bbl per day.²²

ST. JAMES TERMINAL

The St. James Terminal land and docks were acquired through condemnation in May and July 1978. The terminal facility consists of six storage tanks (2 MMB total capacity), tie-ins to the Bayou Choctaw and Weeks Island sites, and ties to the LOCAP (lower Capline) and Capline pipeline terminals. Oil distribution piping system consists of over 35,000 feet of pipe, five pumps, metering systems and various maintenance and control buildings. There are two docks with one berth each, capable of unloading vessels with a 123,000 long ton maximum displacement. A 42 inch diameter pipeline connects the docks to the storage tanks.

The terminal has an unloading capacity of 40,000 bbl per hour. The terminal can pump oil to the Bayou Choctaw site at a rate of 240,000 bbl per day; and to the Weeks Island site at a rate of 480,000 bbl per day. St. James Terminal has a sustained system filling capacity of 350,000 bbl per day.

DISTRIBUTION PLAN

The current SPR drawdown plan was established in 1982 by Amendment No. 4 to the SPR Plan, effective December 1, 1982. The plan was based on the Reagan Administration's commitment to use free market adjustments in response to an energy shortage as the most effective means of distributing SPR oil in the event of a shortage. It relies on market mechanisms to distribute and price available petroleum supplies. Sales of SPR oil will be made at the prevailing market price once the President releases the authority to sell SPR oil. The plan requires that at least 90 percent of the oil sold in any given month be sold on a competitive price basis, with contract awards going to the highest bidder.²³

All responsible buyers (not just domestic buyers) are eligible to bid for SPR oil. Bidders must be able to guarantee their financial and performance responsibility to pay for and take timely delivery of the SPR oil they purchase. The plan also permits the Secretary of Energy to distribute 10 percent of the SPR oil sold in any calendar month to specified buyers. The price of this oil will be the average price of SPR oil sold at the most recent competitive sale.²⁴

The SPR drawdown plan does not specify a specific trigger mechanism. The Department of Energy has been firm in its commitment to prevent the SPR from being used to manipulate oil markets. The SPR can only be used at the discretion of the President to counter a severe energy supply disruption or to meet U.S. obligations under the provisions of the International Energy Agency (IEA).²⁵

COMPETITIVE SALES PROCEDURES

The SPR sales procedure begins with a Notice of Sale that specifies the amount, characteristics, and location of the oil for sale, as well as delivery dates and procedures for submitting bids. The Notice of Sale specifies the sales provisions and financial responsibility

measures that are applicable. During a drawdown there could be a number of Notices of Sale. The initial sales, under the Standard Sales Procedures, may give bidders seven days to submit an offer. If the offer is accepted, the buyer agrees to take delivery of the oil within 30 days of the sales notice date. Due to possible relatively short lead time for SPR oil sales, the Standard Sales Provisions allows the DOE to establish a list for prospective buyers who will receive all Notices of Sale.²⁶

Once the Notice of Sale has been issued, potential buyers prepare and submit their offers. By submitting a bid, the bidder accepts all of the terms and conditions outlined in the Notice of Sale to include an offer guarantee of \$10 million or five percent of the maximum potential contract amount, whichever is less, and must offer the minimum price specified in the notice. The DOE evaluates each offer and selects the best offers. The evaluation process is such that the highest bidders can select the method by which the SPR oil is transported, within the limits of the SPR distribution systems. Specific delivery arrangements are determined at a later time with the receiving company.²⁷

The winning bidders have to present a letter of credit equal to 100 percent of the contract amount or a cash deposit equal to 110 percent of the contract value as a performance guarantee, within as little as five days of acceptance of their bid. Once financial arrangements have been made, delivery of the oil can commence. These deliveries can begin within as little as 16 days from the beginning of the sales process.²⁸

ALTERNATIVE SALES PROCEDURES

The current sales procedures have been criticized as unnecessarily slow. The system was adequate when the plan was initially developed, but the petroleum industry has undergone fundamental changes since 1982. Today's oil markets have moved away from long term contracts toward trading on spot markets and futures and options markets. The SPR's sales system does not fit in well with these fast paced trading methods. Government allocations of SPR oil have not been considered due to its being considered inefficient by both economists and the oil industry. As stated previously, it could take up to two to three weeks to conduct an SPR oil sale and drawdown. This is entirely too long and the effect the SPR

could have on oil markets might be lessened. With today's technology and the changes in the oil market itself, faster methods of conducting a sale should be implemented.

The primary problem in the current sale system is the time the government allows for oil companies to make financial decisions. The system allows bidders to take up to eight days to make a purchase decision: this is an extremely long time for these types of decisions. The oil industry regularly buys and sells cargos of crude oil in less than 15 minutes of the notice of sale. The probable result of the government's current system is that oil companies will underbid for SPR oil while actively trading for additional oil on the oil markets. Historically, commodity markets do not decline slowly into a crisis: they crash in a matter of days.²⁹

The time to conduct a sale could be reduced by using electronic and computer hardware/software that is currently available. Alternately, bidders could periodically be pre-qualified to purchase SPR oil; fax communications could be utilized to speed the sales process. These steps would reduce the time required to sell SPR oil from three weeks to three to five days. It is possible to set-up direct electronic communications links and keep the system ready at all times through periodic testing and training. It would be as simple as sending out the appropriate software to competing companies and performing exercises via modems.³⁰

Futures and options (forward sales) markets could also be used to sell SPR crude oil. These sales systems could impact future price expectations more than a direct discharge of oil. This could accomplish the goal of reducing the economic effects of an oil supply disruption on the U.S. economy more efficiently than the current system.³¹ Forward sales would provide the following advantages.³²

- eliminate subjective determinations inherent in the political decision to release SPR oil;
- reduce speculative stockpiling at the beginning of a crisis;
- provide a constant source of revenue to help finance the SPR;
- allow equal access to SPR oil by all participants regardless of size.
- increase the price dampening effect of the SPR oil sold;
- incorporate market expectations about future oil prices in a drawdown decision.

- eliminate the need for a terminal decision.

One disadvantage of forward sales would be the setting of a trigger for the contracts to be executed. The government would need to allow the release of SPR oil when a certain spot market is reached. This would reduce both the demand and the spot prices at the beginning of a reduction. Forward sales guarantee a specific price for a specific quantity of oil in the future.³³

While the effects are similar, futures and options are different types of contracts. An option contract gives the buyer the right to buy a certain quantity and grade of oil at a predetermined price for delivery at a specified location in the future. It is not an obligation for the buyer, it is an obligation for the seller to sell the oil if the buyer exercises his option. Futures are an obligation for the buyer to buy and the seller to sell a specified quantity and grade of oil (at a predetermined price at a specific time in the future) for delivery to a specified location. The purchaser pays a premium for the option or future in order to set the future price and quantity of the oil to be sold.

SPR CAPABILITIES

There is no doubt that the SPR is large enough to have a significant impact on U.S. oil markets and U.S. energy security. The SPR program has completed storage facilities for 750 million barrels (MMB) of crude oil capable of sustaining a drawdown rate of 3.5 MMB per day for the first 90 days of a drawdown (figure 6-3 and table 6-2).³⁴ Eight different crude oil streams are available for sale from the SPR in the event of a drawdown (table 6-2). The maximum distribution capability of the SPR are estimated to be 4.3 MMB per day through commercial pipelines and marine terminals (figure 6-1). There were no plans to increase the distribution capabilities as of November 1993.³⁵

The SPR, as of December 1992, is connected to 56 refiners via commercial pipelines that represent 49 percent of U.S. refining capacity. It is also connected to four marine terminals (ARCO, Phillips, Sun and DOE's St. James Terminal). These terminals have a total of 12 tanker berths and have a loading capacity of 2 MMB of SPR crude oil per day.

STRATEGIC PETROLEUM RESERVE DRAWDOWN/DISTRIBUTION CAPABILITY

INVENTORY AS OF 12/31/92

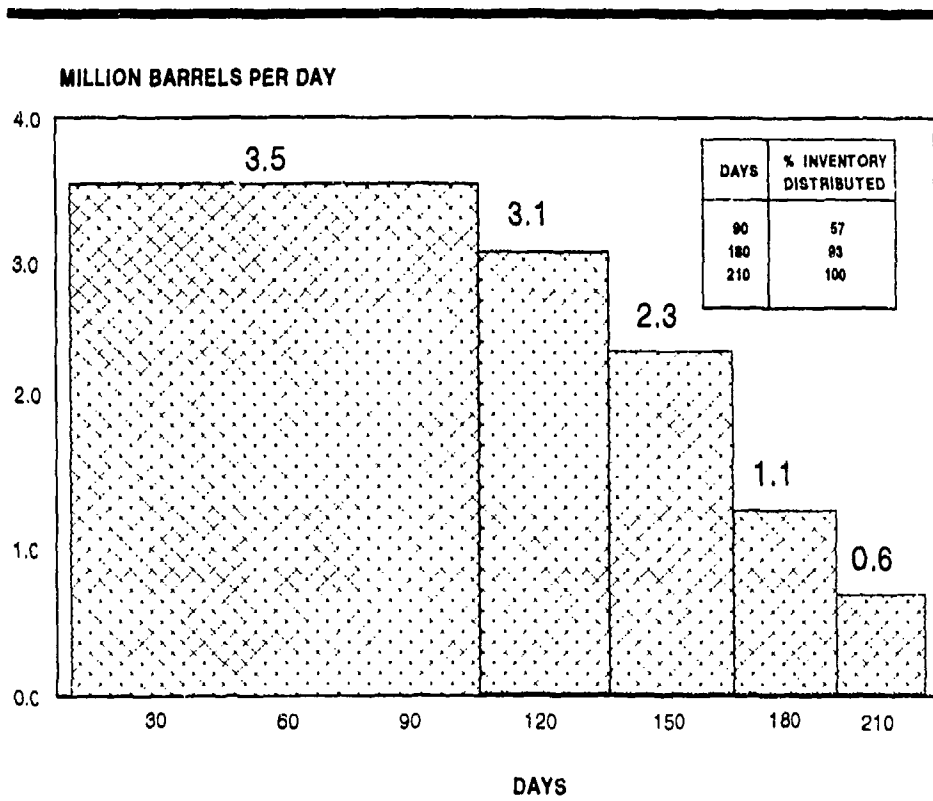


FIGURE 6-3³⁶

TABLE 6-2³⁷
CURRENT DRAWDOWN AND DISTRIBUTION CAPABILITIES
 (Thousands of Barrels Per Day)

	Drawdown	Distribution
Seaway Group	1,250	1,250
Texoma Group	1,250	1,940
Capline Group	1,070	1,070
TOTAL	3,570	4,280

TABLE 6-3³⁸
STRATEGIC PETROLEUM RESERVE CRUDE OIL STREAMS*

Crude Oil Stream	Inventory (MMB)	Typical API Gravity	Typical Sul-fur Content	Delivery Mode and Location
Seaway Group:				
Byran Mound Sweet	61.5	36.0°	0.34%	Pipeline or tankship at Phillips Terminal, Freeport, TX or Arco Terminal, Texas City, TX Tankship at Phillips Terminal
Byran Mound Sour	144.2	33.1°	1.51%	
Byran Mound Maya	11.1	22.8°	3.28%	
Texoma Group:				
West Hackberry Sweet	106.5	36.9°	0.31%	Pipeline, tankship or barge at Sun Terminal, Nederland, Tx; Pipeline at Texaco-22/DOE connection, Lake Charles, LA
West Hackberry Sour	99.9	33.7°	1.44%	
Capline Group:				
Weeks Island Sour	71.9	28.9°	1.41%	Pipeline at Capline or LOCAP Terminals, St. James, LA; Tankship at DOE's Terminal, St. James, LA
Bayou Choctaw Sweet	15.2	36.1°	0.39%	
Bayou Choctaw Sour	35.6	33.2°	1.47%	
*Data as of December 31, 1992.				

There is some concern about the drawdown capability of the SPR due to the intrusion of methane gas into the salt domes and therefore into the crude oil and geothermal heating of the oil. Currently, the SPR office believes that the drawdown rate has not been effected but, due to increased vapor pressures of the oil, it could exceed environmental emissions limits. Additionally, there is concern about potential safety hazards during drawdown. Neither of these problems appear to effect the quality of the stored oil. The combined costs of solving both of these problems is estimated at \$60 million.

CONCLUSIONS

The SPR has been tested and, although still experiencing some problems, has proven itself to be a major tool in mitigating a supply disruption. The system has been tested but not to its full capacity. However, based on the tests conducted thus far the SPR can perform up to its design capabilities. The existing infrastructure, if properly maintained, should continue to perform its function well into the future.

There has been little discussion on the distribution capacity as designed. Currently, there are no plans to expand the distribution capability of the SPR system beyond 4.3 to 4.5 MMB per day. This is a little short sighted, since as the U.S. becomes more import dependent the need for SPR oil could become proportionally greater. In 1993, the U.S. imported over 6.6 MMB of oil per day: that figure is expected to increase in the future. Therefore, the SPR could replace 65 percent of the imported oil per day in 1993. As discussed in previous chapters, U.S. dependence on Middle Eastern oil is also expected to increase in the future. If the flow of oil from this region is disrupted in the future, the SPR may not be able to adequately replace the shortfall. The DOE needs to use future oil import projections to adequately plan SPR facilities expansion to meet the growing protection requirement.

The sales procedure for the SPR also needs updating. Relatively small incremental investments could be made to automate much of the sales procedure. Pre-qualifying buyers and standing letters of credit could be implemented, thereby changing the current system very little yet speeding the procedure greatly. Additionally, more research could be done on using futures and/or options to sell additional quantities of SPR oil once the President orders SPR

sales. This would prevent disclosing an initial trigger mechanism and allow more efficient sales of SPR oil after the sales decision has been made.

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CHAPTER VII

THE STRATEGIC PETROLEUM RESERVE AND THE INTERNATIONAL ENERGY AGENCY

The 1974-74 Arab Oil Embargo made it painfully clear to oil importing countries how vulnerable they were to a major oil supply disruption. One of the major actions taken as a result of the embargo was the creation of the International Energy Agency (IEA). The U.S. was one of the founding members of the agency and passed the Energy Policy and Conservation Act (EPCA), defining how the U.S. would meet its obligations under the agreement. As previously discussed, the EPCA established the Strategic Petroleum Reserve (SPR). This chapter examines the SPR's role in the IEA, energy sharing provisions, and some of the drawbacks and benefits of participation in the IEA. First, a general discussion of the IEA is necessary to better understand the role of the SPR in the agreement.

THE INTERNATIONAL ENERGY AGENCY

The IEA was established in 1974 by 21 countries to coordinate energy planning as part of the International Energy Program. By January 1976, the agreement had been ratified by all 21 countries. It is an autonomous organization within the Organization for Economic Cooperation and Development (OECD). The organization's goals are to:¹

- better adapt with the energy supply and demand structure;
- prepare against the risk of oil supply disruptions and optimize the sharing of oil supplies during severe disruptions;
- develop alternative energy resources and increase energy efficiency through cooperative research and development programs;
- promote better relations with oil producing nations and other oil consuming countries.

The IEA countries are: Australia, Austria, Belgium, Canada, Denmark, Germany, Greece, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain,

Sweden, Switzerland, Turkey, United Kingdom and the United States.² In 1992, France and Finland began participating in the IEA bringing the total number of participating countries to 23.³

The IEA's Standing Group on Emergency Questions (SEQ) is concerned with emergency programs. This committee has the responsibility for testing and maintaining, on a standby basis, the IEA Emergency Oil Sharing System and the set-up and operation of the IEA Dispute Settlement Center. The Dispute Settlement Center is used to settle disputes between countries that may arise as a result of the oil sharing provisions during an oil crisis.⁴ The specific objectives of the IEA's emergency program are:⁵

- to forestall upward price pressures in the oil market, thereby decreasing the economic losses during a disruption;
- to respond to physical oil shortages in member countries by sharing available oil resources;
- to provide a reasonably clear outline of supply flows during a disruption to allow governments and companies to function normally during an oil supply crisis.

In addition to the formal committees, there is a voluntary group of approximately 45 oil companies (including 17 from the U.S.) that provide oil market data and help implement any emergency allocation decisions. Fifteen of these oil companies (including 6 from the U.S.) form an industry advisory board which advises the Secretariat and the Governing Board. The advisory board provides recommendations for oil allocations, transportation and information on oil industry trends. While not a managing group, the oil companies have significant influence on the decisions made by the Governing Board.⁶

Keeping in mind the objectives of the IEA, the relevant provisions of the agreement are as follows:⁷

- each country must maintain emergency reserves sufficient to replace 90 days of net oil imports: this commitment can be satisfied by oil stocks, fuel-switching, or standby oil production;
- each country must have a "pre-crisis" contingency plan for oil demand restraint, enabling emergency consumption reduction;
- each country must have a plan to allocate oil pursuant to the IEA Governing Board's allocation procedures among countries and the procedures for oil company participants: each country will have a supply right (based on a complicated formula

which includes base period consumption, domestic production and actual net imports) equal to its permissible consumption less its emergency drawdown obligation: a country's excess or shortage will determine its allocation obligation or right;

- each country must take steps to reduce consumption by seven percent and be ready to implement allocation procedures whenever the group suffers or expects to suffer a seven percent (or greater) reduction in net oil imports; if the expected reduction is greater than 12 percent, a 10 percent reduction in consumption is required;
- an individual IEA country can trigger the allocation system if it sustains or expects to suffer a seven percent or greater reduction in oil supplies;
- the base period of allocation calculations is derived from the most recent four quarters with a delay of one quarter, during an emergency the base period remains fixed; and
- prices for allocated oil are based on the prevailing price conditions for "comparable commercial transactions."

The IEA's "seven percent trigger" allows for sufficient leeway such that the oil losses resulting from 1979 Iranian Crisis, Iran-Iraq War, and the Persian Gulf War did not trigger the oil sharing plan. One must remember, however, that these crises were diminished by increased production in other oil producing nations.

Oil sharing provisions of the agreement have been tested seven times (1976, 1978, 1980, 1983, 1985, 1988, 1992).⁸ Each test resulted in improvements in the emergency procedures, training for the plan's execution and increased cooperation between the countries and oil companies involved with the IEA. During the Persian Gulf War, the IEA finalized a contingency plan to be prepared to release 2.5 million barrels of oil per day for immediate use. This marked the first time that the IEA's emergency planning and oversight capacity was used.⁹

One of the major accomplishments of the IEA has been the build up of petroleum stocks in member countries. Participating countries are allowed to meet the 90 day net oil import stock level requirement through government owned stocks, privately owned stocks, or a combination of both. In 1992, IEA governments held over 1.0357 billion barrels of oil in government controlled stocks. The member governments with the largest stockpiles were the U.S. (585.6 MMB), Japan (235 MMB) and Germany (116.5 MMB). These three

governments accounted for over 90 percent of the government controlled stocks in the IEA. Three IEA countries were net exporters of oil (Canada, Norway, and the United Kingdom). The majority of the other IEA countries' stocks are held by private companies (as may be required by the individual country's laws). Most of the IEA countries hold petroleum stocks in excess of the 90 day supply requirement.¹⁰

The IEA's stockpiling has enjoyed a significant amount of success. Abdulaziz al-Dukheil, a top Saudi oil economist, has stated that oil prices are now controlled by the Western countries and remain low in large part due to their strategic oil stockpiles.¹¹ Stockpiles have become large enough to prompt several experts, including the former executive director of the IEA, Ulf Lantzke, to suggest that the IEA develop a plan for a coordinated stock drawdown in the event of disruptions resulting in a less than seven percent loss of their petroleum supply.¹² The problem with using stockpiles for interruptions less than the current seven percent "trigger" is that there may be demand to use stockpiles to counter price fluctuations. This would be contrary to the intent of the IEA and could damage the oil market. However, as evidenced during the Persian Gulf War, potential disruptions of less than seven percent can be adequately handled through negotiations among the IEA countries without placing the oil sharing plan into full capacity operation. In 1992, the IEA conducted a major test of the oil sharing provisions, Allocation Systems Test 7, which successfully simulated the redistribution of available oil supplies.¹³

THE OIL SHARING PROVISION

The IEA's primary line of defense in the event of a major oil supply disruption is the IEP's oil sharing provisions. The system was designed to furnish governments and oil companies with comprehensive information so they may take appropriate steps to reduce the effects of any future oil supply disruptions and to cope with short-term economic losses and political strains resulting from increased competitive forces in a severely disrupted market.

Member governments and 45 reporting oil companies have agreed to participate in a detailed monthly reporting system which seems to support emergency oil sharing provisions

and allows for the monitoring of oil supplies throughout a disruption. The availability of this information:¹⁴

- gives governments a clear, comprehensive, and quantitative description of the disruption and increases confidence that the disruption is being properly handled;
- provides identical information to participating oil companies, thereby diminishing their tendency to overreact; and
- reduces public anxiety during a disruption by providing them adequate information.

The total supply available to the IEA countries will be shared roughly in proportion to each country's consumption in the previously defined base period. It is important to note that inventories are not counted as available supply under the agreement. Any shortfall between a country's actual consumption and its allocation must be made up through some combination of stock draws and demand restraints. The agreement intends to relieve pressure on international prices by limiting imports to the amount of oil on the world market available to the group as a whole, thus removing the incentive for increased competition among members.

Past experience and a series of IEA tests have shown that the international oil companies will achieve much of the reallocation on their own (assuming that the companies' parent governments do not interfere). Therefore, the IEA's reallocation program is called into action to balance surpluses and deficits. The system is based on voluntary cooperation from the oil companies and is enforced by the threat of government-mandated controls.¹⁵

The sharing program states that prices should be based on "the price conditions prevailing for comparable commercial transactions."¹⁶ If the system worked as planned, there would be little to no upward pressure on crude oil prices in the international markets. However, this is only a theory and in reality the price of oil is expected to rise.

DRAWBACKS AND BENEFITS

DRAWBACKS

The oil sharing provisions present several interesting problems. If oil sharing takes place at spot market prices, there is no need to have the sharing provisions at all because of the interchangeable nature of petroleum. Successful oil sharing requires a price subsidy equal to the difference between the world oil price and the price at which the quantity demanded

equals the IEA consumption target.¹⁷ If sharing takes place at prices below the prevailing oil price, then the country providing the oil will be subsidizing the country receiving the oil (this assumes a loss of potential revenue and/or that stocks will be sold for less money than the country paid for them). This increases the likelihood of conflict among IEA countries. As previously discussed, the founding members of the IEA realized this and set up the Dispute Settlement Center as a part of the Standing Group on Emergency Questions.¹⁸

The IEA's oil sharing system does not require demand restraint to be implemented prior to calculating the oil sharing provisions. Therefore, a country can possibly receive a greater share of oil than would be "fair" under the system. In the past, the IEA's attempts to reduce consumption in member states have failed, particularly in the U.S.

The success of oil sharing depends upon national policies that enforce price disparities among nations and create income transfers between IEA countries. Economic inefficiencies can be created if gains of countries with purchase rights are less than losses of countries with sales obligations. Individual demand for oil is not affected by oil sharing unless the individual entities decision is linked to their country's purchase right or sales obligation. Without this link, an individual could consume the quantity of oil it demanded at the world oil price, without utilizing the oil sharing plan. The inefficiencies would result in net resource and economic loss for the IEA as a group.¹⁹

Individual governments must obtain oil for sharing if they are obligated to supply oil to another country. Obligated countries have several options available to them. They can purchase oil from domestic companies, draw from their pre-existing stockpiles, or force domestic companies to sell oil to them at prices that do not justify the transfer.²⁰

The presence of price controls can also result in an individual country's experiencing an oil supply "disruption." In May 1979, for instance, Sweden requested activation of the oil sharing provision due to a reduction of 18 percent in its oil supplies. The IEA determined that oil companies were reluctant to sell to Sweden due to its system of price controls. Sweden and the oil companies were able to work out the problem and no further actions were necessary.²¹ Another potential problem is the IEA's definition of oil stocks. As previously discussed, the IEA allows governments to use some industry working inventories to meet its

90 day oil import stock level. These inventories are not well defined and could include oil in pipelines and storage tanks that is not readily accessible without causing additional disruptions in the oil supply.

One of the most interesting problems with the oil sharing system is that IEA members account for little more than 50 percent of the world's total demand for oil (the OECD accounts for over 58 percent, the majority of whom are IEA participants).²² The IEA countries also account for the majority of the oil imported world wide. The remainder of the world is not bound by the IEA's sharing agreement. Therefore the price of oil may increase through bidding for oil against nations outside the IEA, thereby negating the benefits obtained through the oil sharing agreement. As the IEA's demand (as a percentage of the world's total demand) decreases and threat of the Third World increases, this factor might become problematic. The current financial resources of the IEA countries are considerably greater than those available to other countries; however, this may not always be the case.²³ As the Third World develops it will demand and receive a greater share of the world's oil. It is in these areas that new mineral wealth will be found; therefore, many of the smaller countries will be able to increase their wealth. As the Third World countries develop they will be able to better compete with the IEA countries.

BENEFITS

While the IEA has its limitations, it does provide several benefits to its members. One of the benefits of the agreement is that it reduces the amount of potentially detrimental competitive bidding between importing countries. It also alleviates some of the political pressures placed on the government by the population and industry to guarantee adequate supplies of oil at "reasonable" prices.²⁴

Oil companies also benefit from the IEA. Government officials with jurisdiction over the oil companies might be tempted to force these companies to divert oil supplies from other countries to fulfill the domestic requirements of their country. Under the provisions of the IEA, the allocation of oil under a country's control will be regulated and enforced by international law and is therefore difficult to alter.²⁵

Drawdowns of emergency reserves are also beneficial. Emergency reserves can be used to augment existing supplies and help reduce any shortfall during a major disruption. The additional supply available on the market will help reduce the price of oil. This provision will also result in a smaller transfer of income to producers during a disruption.²⁶

Probably the greatest benefit of the oil sharing provisions has been the large build up of oil stocks, particularly in the government sector. It has also shown to the participating nations that the benefits of cooperative action outweigh any costs incurred.²⁷

THE ROLE OF THE STRATEGIC PETROLEUM RESERVE IN THE IEA

The SPR plays a significant role in the U.S.'s participation in the IEA. U.S. policy has evolved from using the SPR as the supply of last resort to using it much earlier, at the President's discretion. The SPR will be used to substitute for demand constraints called for in the IEP and to meet the demands required under an oil sharing obligation.²⁸ Unfortunately, the SPR's ability to meet oil sharing obligations is limited by the Department of Energy, which allows for the discretionary use of stocks equal to only 10 percent of oil sales in any given month.

Losses to the domestic refining industry will be offset by proper utilization of the SPR. Oil companies will be able to bid for SPR crude oil at the prevailing market price. The price of SPR crude to IEA members has not been defined. Public outrage might result if the price of oil sold through the IEA is lower than the market price for oil paid by domestic consumers. The U.S. must work to establish a more coherent pricing policy for SPR sales as a part of its IEA obligations.

The SPR has not always followed the policies of the IEA. For example, during the early 1980's the IEA's policy was to reduce imports while reducing consumption. It was during this period that the SPR enjoyed its highest filling rates. It is important to note that while the SPR is a major component of the U.S.'s IEA policy, it is not dedicated to solely to that role.

CONCLUSION

The IEA provides an effective forum for discussion of international energy issues. These issues include provisions for managing energy supply disruptions and reacting to them in a coordinated manner. Oil stockpiles have generally increased since the IEA's inception which in turn has helped lower the price of international oil. One of the most useful functions of the IEA has been the consolidation and reporting of petroleum and energy statistics that allow for increased coordination among governments and oil companies.

The existence of the SPR is a direct result of the U.S.'s participation in the IEA. It is questionable that the U.S. stockpile would have been developed to the extent it has if it had not been for the IEA's 90 day net oil import stock requirement.

There are several drawbacks to the oil sharing provisions of the IEA. The market may be a better allocator of available oil during a major oil supply disruption. And while individual member country stockpiles may help to offset shortages domestically, there may be severe problems using them internationally. Countries that maintain large government owned stockpiles may be unfairly penalized by having to sell their stocks at a loss. While this action benefits the receiving country, it might force the selling country to spend additional funds in securing other oil sources to supply the domestic market (resulting in domestic oil prices higher than the selling price to the IEA). If the oil sharing provisions are ever activated, they could result in numerous disputes over oil that would not have been experienced if market forces had allocated the oil.

The U.S. may want to reconsider its participation in the IEA oil sharing provisions. Many economists and oil industry analysts suggest that market forces are the best allocators of oil. The SPR is currently the largest oil stockpile among the IEA countries and stands ready to fulfill its obligations as directed by the President.

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CHAPTER VIII

THE FUTURE OF THE STRATEGIC PETROLEUM RESERVE

The future of the SPR can potentially take several different courses. In one case, there is the remote possibility that because of budgetary pressures, the SPR could be sold to generate revenue and reduce the budget, much in the same way as the strategic minerals stockpile is being sold. However, the primary changes that can be expected to take place in the SPR program include: increasing the size of the reserve; integrating product reserves; using the Defense Petroleum Inventory (DPI); and changing the way the stockpile is currently used.

EXPANDING THE STRATEGIC PETROLEUM RESERVE

The Energy Policy Act of 1992 (Public Law 102-486) authorized the enlargement of the SPR to one billion barrels. Since 1992, little has been done to increase the capacity of the reserve to that level. However, five potential SPR sites have been identified: two in Texas, two in Louisiana and one in Mississippi (figure 8-1). The SPR Office anticipates that only two of the sites will be selected for development. Public hearings have been held near each candidate site and draft environmental impact statements have been submitted to the proper authorities. The final environmental impact statements are expected to be released in spring 1994.¹

John D. Shages, Director of Resource Planning for the Strategic Petroleum Reserve, stated that there were no plans to begin expansion of the reserve until the current capacity was close to being filled. He also stated that enough lead time would be allowed so that facilities would be ready to begin the filling process once the current 750 million barrel (MMB) capacity is reached. The additional storage capacity would be increased concurrently with the filling of the added capacity.²

Will a one billion barrel reserve be large enough? This is a question that has been debated in Congress since the inception of the SPR program. On the surface, the answer is

SPR CURRENT AND CANDIDATE SITES

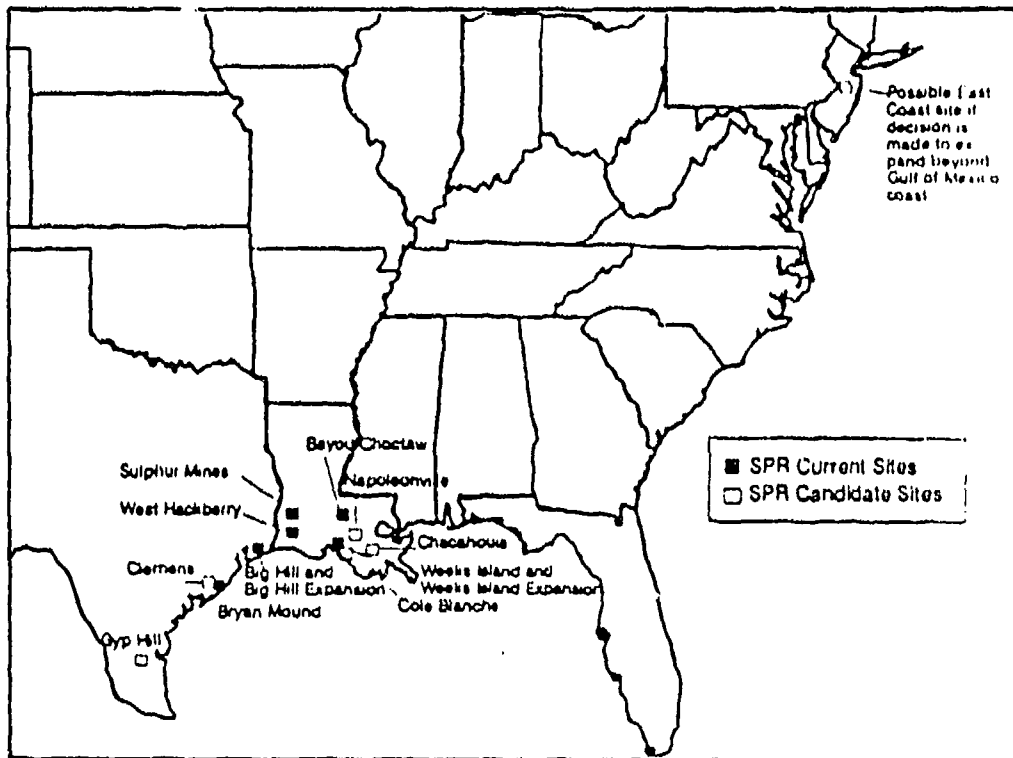


FIGURE 8-1

relatively easy: that SPR capacity and capability should increase as U.S. import dependence increases in order to maintain a 90 day oil import protection level. For example, when 1993 U.S. oil imports were 6.67 MMB per day, the SPR should have had approximately 600 MMB of oil on hand to meet the 90 days of imported oil requirement. The question then becomes when to add capacity to the reserve. The current 750 MMB capacity, if achieved, will provide 90 days of import protection for oil imports of up to 8.33 MMB per day. Prior to oil imports reaching 8.33 MMB per day, the SPR will need to be expanded. If the reserve size is expanded to one billion barrels, it would provide protection for import levels of up to 11.1 MMB per day.

The Energy Information Administration predicts that oil imports will increase to between 9.8 and 12.1 MMB per day by the year 2000, depending on the price.⁴ Lower prices translate to higher import levels. At the current fill rate, the SPR will not reach its 750 MMB capacity until well after the year 2005. If the fill rate is not increased, the capacity will not be a concern.

The Department of Energy (DOE) has argued in the past that expanding the SPR is not necessary because oil industry stocks in the U.S. can be used to meet the International Agency (IEA) 90 day import level stock requirement. The IEA reported that in 1992, the U.S. had 196 days of net import protection in its petroleum stockpiles, roughly 81 days of which are held in the SPR.⁵ In 1989, U.S. commercial stocks were estimated at one billion barrels. The problem with using commercial stocks is that 80 to 90 percent of these stocks are not available for consumption. These stocks are necessary to keep the distribution, refining and marketing systems in operation (i.e., keeping pipelines "packed," refineries producing).⁶

Any expansion of the SPR's capacity should include an expansion in its drawdown and distribution capability. Using the SPR's current distribution capabilities, it would take 210 days to drain all 750 MMB from the reserve.⁷ Increasing the drawdown and distribution capacity is necessary to provide adequate protection against an interruption as U.S. import dependence continues to increase.

One area that has not been given much attention is the mix of crude streams available from the SPR. The crude mix today is approximately two thirds high sulfur crude oil and one

third low sulfur crude oil. During test sales, which include the SPR sale during the Persian Gulf War, the DOE could not sell all of the high sulfur crude it offered for sale, because bidders wanted more low sulfur crude oil. Additionally, as environmental regulations reduce the tolerances for emissions, refiners will need to modify and/or modernize their refineries. One of the ways to reduce sulfur emissions is to change the crude oil stream process from high sulfur to low sulfur crude (this is an over simplification of the process, but illustrates the point). Therefore, the DOE may want to re-evaluate the current crude oil storage policies and fill any expansions of the SPR with high grade low sulfur crude oils.

INDUSTRIAL PETROLEUM RESERVES

One of the possible alternatives to a government owned expansion of the SPR is the development of an Industrial Petroleum Reserve (IPR). While there are several potential legal problems with this alternative, it would provide additional import protection at little to no cost to the government (assuming no tax breaks are given to the oil companies holding IPR oil). Chapter III outlined the various reasons that the Secretary of Energy has not exercised his authority to establish an IPR; however, a brief discussion is appropriate.

The IEA includes commercial stocks in its calculations of the U.S. level of import protection. These calculations essentially consider the commercial stocks as an IPR for the U.S. Thus the U.S. has a *de facto* IPR. The problem with including commercial stocks is that the government has no control over the amount of oil held in this reserve and has no distribution plan or method of emergency allocation of this "stockpile."

An IPR would require each refiner to maintain a certain amount of oil, based on their level of imports, in storage at all times. Most oil companies already do this in one form or another to compensate for variable delivery schedules. The problem an IPR would impose is that the refiners might be forced to construct additional storage facilities in order to maintain the mandated levels. Another problem with an IPR is that a company may have to deny oil to its customers in order to maintain their mandated oil stock level. Other problems with an IPR include:⁸

- decentralized storage is hard to control;

- increased potential for spills and other environmental mishaps;
- benefits the nation, but shifts costs to the oil companies;
- requires additional government bureaucracy to administer.

If Congress mandates the establishment of an IPR, they would be well advised to recommend making contributions to the SPR as an alternative. While this may be considered an undesirable method, it reduces the overall cost to society (environmental and economic) and provides for more efficient management and distribution than an IPR.

STRATEGIC PRODUCT RESERVES

Establishing Regional Strategic Product Reserves (RSPR) is another method that could be used to expand the SPR program and provide increased import security. Since the SPR program began, there has been discussion of the establishment of RSPRs. The Energy Policy and Conservation Act (EPCA) authorized the Federal Energy Administration (precursor to the DOE) to establish RSPRs. Product reserves could contain gasoline, diesel, and residual fuel oil for immediate sale to retail outlets. To date, the DOE has been able to avoid establishing RSPRs by doing studies and using common sense to calm the fears of Northeastern and Hawaiian Congressmen.

The EPCA authorized the establishment of RSPRs for any FEA region (Chapter III) in which imports were used to meet more than 20 percent of residual fuel oil or refined product demand during the preceding 2 year period.⁹ There are several valid reasons for developing RSPRs. Regionally stored product reserves could be made available on the market more quickly, thereby providing a buffer to calm the market while the SPR is being activated. Also, these reserves could be used to offset domestic fuel shortages from disasters similar to the Exxon Valdez oil spill that resulted in increased gasoline prices nationwide. Finally, as old refineries are closed for environmental and operational reasons, increased refinery utilization in the U.S. may result in product import dependence: RSPRs would protect against fuel shortages much in the same way as the SPR protects against crude oil disruptions.¹⁰

Refining capacity utilization in the U.S. was 91.7 percent and world wide refining capacity was estimated at 85.1 percent in 1993.¹¹ The majority of the refining capacity still

lies in countries historically friendly to the U.S.; however, the growth in refining capacity is in oil exporting and Third World countries.¹² This trend in increased refining capacity utilization, assuming it continues, warrants reconsideration of RSPRs for the SPR program by the DOE. For the near term, RSPRs are probably not necessary.

RSPRs would be significantly more expensive to maintain and administer than the SPR. Unlike crude oil, petroleum products will not retain certain properties when stored for extended periods of time. RSPRs would require that the government sell and purchase petroleum products on a continuing basis in order to maintain inventory with the appropriate specifications. The rotating stocks requirement would necessitate the government becoming a permanent player in the retail fuel market, a move that is opposed by the petroleum industry and most economists.¹³

The administration of RSPRs would require a significant increase in manpower. Offices would be constructed to oversee both site and sales operations. Close coordination with the central SPR office would be crucial in preventing RSPRs from entering wholesale fuel markets with sales when the market is depressed, and with purchases when the market is tight.

The cost of storing petroleum products is significantly greater than that for crude oil storage. Above or below ground tanks would be purchased or constructed. Above ground steel tanks would cost more than \$12 per barrel stored; below ground storage tanks would cost even more.

Finally, RSPRs are not as flexible as a crude oil reserve. Petroleum products cannot be easily re-refined to other products if a shortage is for a specific type of petroleum product. Crude oil is the starting point for all petroleum products and therefore can be refined to any number of products.¹⁴

Congress may find that it is more cost effective to provide tax incentives for refinery modernization and new construction than to establish RSPRs. The incentives could be structured such that refining capacity and environmental pollution reduction are both increased. An additional benefit would be that the attractiveness of imported petroleum products would be reduced.

USES

The SPR is currently used, at the discretion of the President, to offset oil shortages in the event of an oil import supply interruption. There have been discussions on expanding the uses of the SPR to include using it to control domestic crude oil prices and offset domestic supply interruptions. Additionally, the SPR functions to protect the U.S. economy and can possibly be used as a defensive stockpile, if needed.

CONTROL PRICES

In 1991, Representative Philip Sharp proposed increasing the SPR's capacity to 1.5 billion barrels and expanding its use to include reducing price spikes.¹⁵ On the surface this proposal has merit. It could reduce the impacts of rapid oil price increases on the economy and reduce the volatility of crude oil prices.

There are problems with Representative Sharp's proposal. Two of the most important unanswered questions are: What crude oil price would trigger an SPR sale? What would be considered a price spike? These questions have to be answered prior to any changes in the current program. Costs for the SPR would be increased as a result of increased administrative costs arising from probable increased usage of the reserve. During Test Sale-90 additional administrative costs totaled approximately 2 million dollars for the sale of 3.925 million barrels of oil (sales cost is slightly higher than it would be for a recurring sale as a result of deferred maintenance).¹⁶

Crude oil sold from the SPR would have to be replaced. Since the SPR would need to be ready for any price spike, the average cost of purchased oil might increase, again increasing the debt. There is no guarantee that the oil used to smooth out a price spike would be sold at a cost exceeding the price the government paid for it plus any additional costs. In general, most economists would agree that letting the market react to price changes is a more efficient and cost effective method for solving "price" crises.

DOMESTIC SUPPLY INTERRUPTIONS

The Strategic Petroleum Reserve Amendments of 1990 authorized the President authorization to drawdown the SPR in the event of any (domestic or imported) major oil supply disruption.¹⁷ The amendments also granted the President limited authority to use the SPR for shortages less than severe. This change to the SPR authorizations was as a result of the Exxon Valdez oil spill.

Using the SPR for domestic supply interruptions as well as international interruptions makes sense as long as there are no other sources available to replace the domestic oil shortages. Domestic oil generally sells at a higher price than imported oil. If imported oil can be substituted within a short period, SPR oil should not be used and the market should be given time to make the appropriate adjustments. Imported oil could probably be acquired more quickly than SPR oil, due to sales procedures for the SPR.

The President also has the authority to divert incoming shipments to the SPR in reaction to a supply shortage.¹⁸ This is a more practical method for dealing with domestic shortages. One problem is that at current SPR fill rates, the impact of the additional oil will be minor.

A combination of all three methods (increased imports, SPR oil diversions and SPR drawdown) would probably provide the optimal solution for any domestic supply interruptions lasting more than a couple of months. Using the SPR for domestic supply interruptions lasting less than two months would not be practical because of the SPR's drawdown procedures.

There is concern that the use of the SPR for domestic interruptions would be contrary to the IEA's provisions. If a domestic supply interruption was of such length and severity that the SPR would be needed, it is quite possible that the U.S. could ask for the IEA's help in handling the crisis. Therefore, the use of the SPR for domestic oil crisis would probably have little effect on the U.S.'s position in the IEA.

DEFENSIVE STOCKPILE

The SPR is authorized to store oil for the Department of Defense. This oil cannot be counted as inventory by the SPR but will instead be accounted for as the Defense Petroleum

Inventory (DPI) (commonly called the Defense Strategic Petroleum Reserve (DSPR)).¹⁹ The Secretary of Defense has control over the drawdown of DPI oil and can exercise his authority as long as it does not interfere with a drawdown of the SPR.

There is the potential that both the SPR and the DPI might require drawdown at the same time. Under the law, defense priorities are subordinate to economic priorities. If war engulfed the entire Middle East, it may necessitate the use of both the SPR and the DPI. The current law should be modified to give the DPI drawdown priority during wartime. It may also be beneficial to make changes in the SPR Program to allow for the use of SPR oil for defense purposes in the event of a major conflict. In the past, the Naval Petroleum Reserve (NPR) could be used to meet defense requirements: not so today, as it is being sold. Additionally, much of the oil in the SPR came from the NPR or was financed by sales of NPR oil.

CONCLUSIONS

The SPR continues to be a source of disputes in Congress. Some say it is too large, some too small and still others say it is just about right. In terms of IEA obligations, the SPR needs to continue accelerating its fill rate and begin plans for expansion. The DOE has begun preliminary plans for the expansion of the reserve, but has delayed construction plans until the future.

Regional Strategic Product Reserves have also been at the center of efforts to change the SPR program. The states calling the loudest for RSPRs are located in the Northeastern U.S., where periodic residual heating oil shortages are common as a result of severe winter storms. There is merit to the proposals for RSPR, but current refinery capacities do not justify the establishment of RSPRs. This is a requirement that needs continuous monitoring and may be more practical in the future.

Using the SPR to combat oil price volatility would probably create more problems than it solves. Today a crude oil price increase from \$15 per barrel to \$20 dollars per barrel might qualify as a price spike, requiring the release of SPR oil under the proposed plans. However, a price increase of this type would help the domestic oil industry by stimulating production

and possibly exploration. If the U.S. learned nothing else from the wage and price controls of the 1970's, it is that they do not work. Market forces should be used to determine the price for crude oil.

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CHAPTER IX

CONCLUSIONS AND RECOMMENDATIONS

The SPR program has constructed an effective petroleum stockpile to provide temporary protection against any potential petroleum supply disruptions. Since its inception in 1977, the SPR has grown to 585.7 million barrels of crude oil, at a cost to the U.S. of over \$20 billion. As U.S. import dependence increases, the importance of the SPR will also increase.

The oil supply to the U.S. and the rest of the world is dependent upon relatively few geographic areas, the most important of which is the Middle East. This area contains approximately two-thirds of the world's proven oil reserves. This region is politically unstable historically and therefore in constant danger of erupting in turmoil. The March 7, 1994, Oil and Gas Journal stated that more than half of the world's crude oil requirements (amounting to 33 million barrels per day (b/d)) move through 6 key tanker routes. These routes are:¹

- Strait of Hormuz (14 million b/d);
- Strait of Malacca (7 million b/d);
- Bosphorus (1.6 million b/d);
- Suez Canal (900,000 b/d);
- Rotterdam Harbor (600,000 b/d); and
- Panama Canal (500,000 b/d).

The IEA considers the likelihood of the Strait of Hormuz (in the Persian Gulf) being closed very low. However, if this route were closed or blocked for any reason, over 20 percent of the world's oil would stop moving to market. There are few, if any, alternative routes around the strait. Just over half of the U.S. imports move through the Strait of Hormuz. Therefore, the SPR's importance is even greater when considering how easy, though unlikely, it would be to disrupt half of U.S. imports.

Currently, the SPR has the capacity to hold 750 million barrels of crude oil. As stated several times throughout this thesis, it will take at least another 10 to 15 years to reach this capacity at the 1993 fill rate. This is an unacceptable situation. By the time the reserve has reached its current capacity, it is estimated that the SPR's capacity will need to be between

1 and 1.5 billion barrels if it is to provide 90 days of net import protection. This situation has been brought about primarily by budget limitations.

Several alternative financing methods have been discussed to increase funding for the SPR. The easiest to monitor and collect, in terms of meeting the desired fill rates, would be a petroleum import fee or tax. If an import fee of one dollar per barrel equivalent of petroleum were instituted and directed to the SPR fund, it would provide more than 6 million dollars per day to fund the SPR (more than \$2.1 billion per year). This tax would translate into an extra three to five cents at the gasoline pump, at the most. This revenue could fund an accelerated fill rate for the SPR at first and later finance the construction and expansion of the SPR's facilities. Once the SPR has been "fully funded," the tax could be rescinded or used to fund continued research on alternative fuels, much in the same way as the old Synthetic Fuels Corporation did.

Many will argue against a tax of this kind. However, this tax would have several potentially positive benefits. The tax would ultimately be paid by the consumer and is essentially a consumption tax. It may produce the added benefit of reduced oil consumption. Another benefit that may result from this tax is that it would make domestic oil more economically attractive and may thus stimulate additional production and exploration.

If a tax is not used to finance the reserve, U.S. Government debt financing should be continued as the primary means of financing the reserve. Other methods disguise the debt or convert the SPR into a more speculative venture. Regardless of how it is financed, financing for the SPR should increase so that the fill rate can keep the SPR at or above the IEA mandated 90 day import level.

Currently, the SPR's financing is done on a yearly basis. This is very inefficient and has resulted in the U.S. paying more for the oil contained in the SPR than was necessary. The system does not allow the SPR office to take advantage of lows in the oil market and has forced purchases when the oil market was tight. If the SPR was given a five year budget allocation, the SPR Office would have increased flexibility in purchasing oil for the SPR. It is unfortunate that the U.S. has not taken advantage of the current world oil glut to provide itself with relatively cheap crude oil to fill the SPR.

Expansion of the SPR to a one billion barrel capacity needs to begin as soon as the fill rate is great enough to fill the SPR to its current capacity within three to four years. Additionally, the SPR Program needs to be amended to provide authorization to begin long range planning for expansion based on current and future oil import levels. In this manner the program would be tied to a goal based on oil imports rather than on an arbitrary number. This policy would be more in line with IEA provisions and the stated goals of the SPR.

The types of crude oil in the reserve are currently based on a two-thirds high sulfur crude to one-third low sulfur crude formula. While this may lower the overall cost of the reserve, it may not provide domestic refineries with the proper crude oil streams. The DOE needs to conduct studies on refinery streams and adjust SPR crude oil purchases to meet the existing and future refinery requirements. It would make little sense to have a reserve that cannot be used to its fullest extent by domestic refineries during a crisis.

Drawdown procedures for the SPR are antiquated and need to be updated. The system in place today requires up to 15 days just to go through the bidding process. This is entirely too long in today's fast paced oil economy. There are several things that can be done to speed-up the system. The SPR needs to pre-qualify buyers on a periodic basis. Pre-qualification would ensure that the organization would have a confirmed level of credit and that they met all requirements under the law to purchase SPR oil. Also, the entire system needs to be converted so that the necessary transactions could be accomplished electronically. Oil companies do not require seven days to make oil purchase decisions. An electronic system could be designed to reduce the administrative burden on the companies while giving the SPR Office almost immediate turnaround in response to its Notice of Sale. These simple changes would bring the system into the twenty-first century at a very low cost.

Physical distribution of SPR oil could be delayed under current U.S. law. The Jones Act requires that at least 50 percent of government owned or purchased cargo be carried on U.S. flagged vessels. During an oil supply crisis, the SPR Office has to request a waiver to move oil if there is not an adequate number of U.S. flagged oil tankers available to transport the SPR oil that has been sold. An amendment to the act should be introduced that exempts sales

of SPR oil during an oil supply crisis. The change would reduce the administrative burden on the SPR staff and prevent any delays as a result of compliance with the Jones Act.

The SPR is the largest government owned stockpile in the world today. It acts as the U.S's first line of defense against any future oil supply disruption and has proven its effectiveness in the past. It is a valuable national asset that needs continued funding and development so that it can continue to provide adequate protection for the U.S. well into the next century.

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VITA

William Robert Stanley, Jr. was born in Alameda, California on August 3, 1962. Mr. Stanley completed his undergraduate work in May 1984 at the University of Missouri-Columbia where he received a Bachelor of Science degree in Industrial Engineering. Upon graduation, Stanley was commissioned as a Second Lieutenant and entered the Army as an Armor Officer. He was the distinguished honor graduate from his Armor Officer Basic Course in January 1985. From April 1985 to April 1988, Lieutenant Stanley served in the 3/35th Armor Battalion in Bamberg, Germany, working as a Mortar Platoon Leader, Tank Platoon Leader, and Company Executive Officer. Upon promotion to Captain, he was branch transferred to the Quartermaster Corps and sent to the Quartermaster Officer Advanced Course at Fort Lee, Va. where he graduated on the Commandant's List. He also attended the Advanced Petroleum and Water Logistics while at Fort Lee and was an honor graduate from the course. Captain Stanley then went to the Republic of Korea in January 1989 where he served as the Company Commander of the 348th Supply and Service Company until July 1990. In August 1990, he reported to Fort Bragg, North Carolina, to serve as the Petroleum Officer for the XVIII Airborne Corps and was promptly sent to Operation Desert Shield/Storm on 12 August 1990. During the war Captain Stanley's responsibilities included the planning and staff supervision of petroleum, water and food support of the 125,000+ man XVIII Airborne Corps. He returned from the war in March 1991 and continued to serve as the Corps Petroleum Officer until he was selected for advanced civil schooling at the University of Texas at Austin. Since Captain Stanley's arrival in August 1992, he has been inducted into Tau Beta Pi, the engineering honor society; Phi Kappa Phi, an interdisciplinary honor society; won second prize in the Mining and Metallurgical Society of America's Student Paper contest; and co-founded the student chapter of the Mineral Economics and Management Society at the University of Texas at Austin.

Captain Stanley's military decorations include: The Bronze Star Medal, the Meritorious Service Medal with Oak Leaf Cluster, the Army Commendation Medal with Oak Leaf Cluster, and the Army Achievement Medal with four Oak Leaf Clusters.

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This thesis was typed by the author.