Petroleum Inventories and Storage Capacity

An Interim Report of the
National Petroleum Council
November 1983

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Theodore A. Burtis, Chairman, Committee on Petroleum Inventories and Storage Capacity

NATIONAL PETROLEUM COUNCIL

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INTRODUCTION

At the request of the Secretary of Energy, the National Petroleum Council (NPC) undertook this update of Volume II, Inventory and Storage, of its 1979 report, Petroleum Storage & Transportation Capacities. The Secretary's request specified that:

> Your new study should update the analysis of the minimum operating levels for crude oil, motor gasoline, distillate fuel oil, and residual oil, as well as update the estimates of total storage capacity and the quantity of crude oil and refined petroleum products available for use. Other aspects of the overall U.S. petroleum inventory and storage system should be discussed as appropriate.

(See Appendix A for the Secretary's request letter and a description of the NPC.)

In response to the Secretary's request, the NPC established the Committee on Petroleum Inventories and Storage Capacity, chaired by Mr. T. A. Burtis, Chairman of the Board and Chief Executive Officer, Sun Company, Inc. Mr. J. Erich Evered, Administrator, Energy Information Administration (EIA), was designated Government Cochairman of the Committee by the Secretary of Energy. The Committee is assisted by a Coordinating Subcommittee and one Task Group. (See Appendix B for the membership rosters of the Committee and Subgroups.)

The NPC has prepared nine inventory studies for the federal government since 1948 for use in emergency preparedness planning. The principal objective of the first seven studies was to determine the amount of petroleum inventory in the primary distribution system that is available for use in an emergency, as well as the total storage capacity in that system. In the two most recent studies, 1974 and 1979, the NPC also estimated the minimum operating inventory for crude oil and certain petroleum products, i.e., the inventory level below which operating problems and shortages would begin to appear in a defined distribution system. The 1979 study also estimated the amount of storage capacity in the secondary distribution system and the tertiary storage segment.

As in the past, the primary distribution system is the principal focus of this study. However, due to the magnitude of storage in the secondary distribution system and tertiary storage segment and its potential impact on the primary system, the NPC in this study is examining in greater depth the storage capacity of the secondary system and the tertiary segment.

The NPC is presenting its report in two parts. This interim report presents the Council's analysis and conclusions with respect to the inventory and storage capacity of the primary

distribution system. The NPC's final report, to be completed in the spring of 1984, will also include data on the secondary distribution system and the tertiary storage segment and a more detailed discussion of the interrelationships among the distribution systems and the tertiary storage segment. A brief discussion of the primary and secondary distribution systems and the tertiary storage segment is contained in Chapter One of this report.

To develop the data on the primary distribution system for this report, the NPC surveyed the companies that report primary inventory data to the EIA. An independent public accounting firm, Price Waterhouse, received and tabulated the survey results under contract to the NPC. (See Appendix C for a copy of the survey questionnaire, Appendix D for the tabulated survey returns, and Appendix E for the study methodology). The survey results are highlighted in the Executive Summary and are discussed in more detail in Chapter Two, "Analysis of Changes in the Petroleum Distribution Systems, 1978-1983: Primary Distribution System."

The petroleum inventories and storage capacities covered by the survey do not include the Strategic Petroleum Reserve (SPR) (see Appendix F) or crude oil and products located in U.S. possessions and territories and in transshipment facilities in the Caribbean (see Appendix G). Also, the survey covered only crude oil and the principal fuel products; thus, the survey totals cited in this study should not be extrapolated to include the other petroleum products.

EXECUTIVE SUMMARY

The principal objectives of this study were to estimate the minimum operating inventory for crude oil and the principal petroleum products in the primary distribution system, analyze the volumes of inventory that the system held on September 30, 1982, and March 31, 1983, and determine the amount of storage capacity in the system. An analysis of the data received from the 1983 NPC Survey of Petroleum Inventories and Storage Capacities indicates that both the minimum operating inventories and the volumes of inventory held in the system have declined since the 1979 NPC study. These decreases are due primarily to the reduced levels of demand experienced by the industry, which have caused structural changes in the distribution system, and higher raw material and operating costs, which result in increased costs of storing products.

The minimum operating inventory is defined as the inventory level below which operating problems and shortages would begin to appear in a defined distribution system. The reductions in the minimum operating inventories are attributed principally to structural changes caused by refineries, pipelines, and tankage being taken out of the distribution system because of reduced levels of demand. The NPC estimates of the 1979 and 1983 minimum operating inventories for crude oil and the principal petroleum products are compared below:

NPC Minimum Operating Inventory Estimates, 1979 and 1983
(Millions of Barrels)

	1979	1983			Decrease in
	Total U.S.	PADDs I-IV	PADD V	Total U.S.	Total U.S., 1979-1983
Crude Oil*	290	215	70§	285	5
Motor Gasoline	210	176	24	200	10
Kerosine	35	5	¶	5	5
Kero-Jet Fuel		20	5	25	
Distillate Fuel Oil	125	97	8	105	20
Residual Fuel Oil	60	34	6	40	20
Total of Crude Oil and Products Surveyed	720	547	113	660	60

*Excludes SPR.

§All Alaskan crude oil in transit by water is included in PADD V.

¶Less than 0.5 million barrels.

The total levels of inventories held in the system have also been reduced since the 1979 study. The major reason for this reduction is lower demand for petroleum products by consumers, caused by higher prices and conservation efforts. Other factors that have led to decreased inventory levels are reduced petroleum imports, the perceived security of world supply of crude oil and petroleum products, and the higher cost of storing petroleum products.

The NPC also examined the concept of days' supply of inventory. Since minimum operating inventory levels do not decline proportionally with demand and are not available for use without causing shortages, days' supply of inventory calculations based on total inventory do not present a valid indication of the adequacy of inventory levels. A more appropriate way to assess the adequacy of inventory levels is to look at how much inventory above the minimum required to run the system is available:

$$\frac{\text{total inventory - minimum operating inventory}}{\text{current demand}} = \text{days' supply of inventory above minimum}$$

By this method, March 31, 1983, data for gasoline would indicate 3.5 days' supply of that product, as displayed below, compared with 33 days' supply when calculated based on total inventory.

$$\frac{224 \text{ MMB} - 200 \text{ MMB} = 24 \text{ MMB}}{6.8 \text{ MMB/D}} = 3.5 \text{ days' supply of inventory above minimum.}^{1}$$

$$\frac{224 \text{ MMB}}{6.8 \text{ MMB/D}} = 32.7 \text{ days' supply of total inventory}^{2}$$

Presented on the next page is a comparison of the days' supply of inventory for March 31, 1978 and 1983, when calculated based on total inventory and on inventory above minimum. Although the days' supply of inventory above minimum is obviously a lower number than days' supply of total inventory, it is a better measure of available supply and more useful for emergency preparedness planning purposes. A seemingly low number of days' supply above minimum should not be of concern in times of normal operations. The flexibility inherent in the petroleum supply and distribution systems, together with ample crude oil supply, refining capacity, and transportation facilities, ensure the

[1] MMB = million barrels; MMB/D = million barrels per day.
[2] Calculated on an unrounded basis.

ability of the systems to meet product demand over time. While total inventories have decreased since 1978, the table below shows that the amount of inventory above minimum (in terms of days' supply) is generally consistent with the 1978 level.

Days' Supply Of Inventory

	March 31, 1978		March 31, 1983	
	Total Inventory	Inventory Above Minimum§	Total Inventory	Inventory Above Minimum¶
Crude Oil*	24.3	3.9	32.3	6.6
Gasoline	35.8	6.8	32.7	3.5
Distillate Fuel Oil	33.6	3.1	40.9	4.7

*Excludes the SPR, which on March 31, 1983, held 312 million barrels or 154 days' supply of crude oil imports.

§The NPC's 1979 estimate.

¶The NPC's 1983 estimate.

It should be noted that, in addition to the days' supply of crude oil inventory above minimum, approximately two-thirds of the crude oil supplied to refineries is now from domestic sources. Thus, in the event of a supply disruption, the majority of the crude oil inputs to refineries would continue, ensuring uninterrupted, if somewhat reduced, product supply. The SPR stocks are also intended for use in times of severe oil supply disruption.

Survey results indicate that the total storage capacity in operation in the distribution system for crude oil and the principal products is less than that in 1979, for three main reasons: reductions in crude oil and product demand, causing refinery and terminal shutdowns and tankage consolidation; deletion from service of tankage that was not retrofitted to meet environmental regulations; and physical deterioration of tankage. Tankage idle but available within 90 days, tankage in operation, and tankage under construction together provide an estimate of the total tankage available to the system. The shell capacity of this tankage is presented on the following page.

Although the idle tankage can be restored to service, much of it is dispersed in relatively small volumes across the nation. Therefore, reliance on any substantial part of this tankage for emergency preparedness planning purposes is not practical.

Shell Capacity of Tankage in Operation and Tankage Under Construction, 1978 and 1983
(Millions of Barrels)

	March 31, 1978		March 31, 1983	
	Tankage In Operation	Tankage Under Construction*	Tankage In Operation	Tankage Under Construction
Crude Oil§	462*	12	504	10
Gasoline	464	5	458	3
Kerosine	86	1	21	1
Kero-Jet Fuel			68	¶
Distillate Fuel Oil	336	3	297	1
Residual Fuel Oil	156	1	144	4
Total of Crude Oil and Products Surveyed	1,504	22	1,492	19

*Data for September 30, 1978.

§Excludes SPR. Also excludes all lease stocks tankage in 1978 and a portion of the lease stocks tankage in 1983. Lease stocks inventory volumes were 19 million barrels in 1983 and 11 million barrels in 1978.

¶Less than 0.5 million barrels.

Potentially Available Tankage
(Millions of Barrels)

	Idle But Can Be Reactivated Within 90 Days	
	Meets Environmental Regulations	Requires Environmental Waivers
Crude Oil	13	3
Gasoline	7	¶
Kerosine	1	¶
Kero-Jet Fuel	3	¶
Distillate Fuel Oil	17	1
Residual Fuel Oil	12	1
Total of Crude Oil and Products Surveyed	53	6

¶Less than 0.5 million barrels.

The table below compares the percentage utilization of tank capacity over the 35-year history of the NPC series of inventory reports. Inventory in tankage has averaged about 46 percent of storage capacity over the period. This average continues over time because individual tanks fluctuate between the minimum and maximum operating levels due to the operating cycle; at any one time the industry-wide utilization is about 50 percent.

Percentage Utilization of Tank Capacity -- 1948-1983

Survey Date	Inventory as a Percentage of Tank Capacity
March 31, 1948	42
June 30, 1950	45
March 31, 1952	45
March 31, 1954	48
March 31, 1957	45
September 30, 1962	50
September 30, 1969	53
September 30, 1973	48
September 30, 1978	48
March 31, 1983	40

The 8 percentage point decrease in tank utilization in 1983 versus 1978 may reflect the impact of the following factors: the declining demand for petroleum, increased spare refining capacity, and higher costs of holding inventories. It is expected that some storage capacity reported in the 1983 Survey will be deactivated, which will tend to return the percentage utilization figure closer to the 46 percent historical average.

In the course of this study, the following topics not examined in the previous report were identified as factors in this analysis of inventories and storage capacity: refinery utilization; the availability of naphtha-type jet fuel; the impact of the SPR on private inventory levels; and the petroleum futures markets. These topics are briefly discussed below.

The NPC sought to quantify the changes in stock levels due to spare refining capacity, which allows refiners more flexibility to change product yields seasonally. The Survey results were inadequate to quantify the impact of spare refining capacity on inventory levels; the NPC believes, however, that spare refining capacity is a factor in the observed decrease in inventory levels.

Because of the strategic nature of naphtha-type jet fuel, stocks normally in storage and stocks of components that could be immediately made available as naphtha-type jet fuel were also surveyed. The Survey results show that, on March 31, 1983, the normal stocks of naphtha-type jet fuel could have been increased

by more than half by blending jet fuel components in storage into finished jet fuel. This increase in the production of jet fuel could not occur without a reduction in the production of other products, given a fixed amount of crude oil.

The Survey also asked if the existence of the SPR contributed to a decrease in stock levels. With only one exception, the response was that the SPR did not impact a company's decision to hold inventories.

A concern exists that in the event of a supply shortage, some companies may rely on the futures market for delivery of wet barrels (the physical commodity), only to find that the wet barrels may not be available. The NPC Survey results suggest that, at this time, petroleum futures do not have a significant effect on the level of inventories held at the primary level. The probable current impact of the petroleum futures market on secondary inventory levels will be discussed in more detail in the NPC's final report, Petroleum Inventories and Storage Capacity, to be completed in the spring of 1984.

The petroleum distribution systems are complex, integrated networks of refining, storage, and transportation facilities that supply products across the nation. The systems are also flexible and dynamic, changing to meet different supply situations and demand requirements.

Chapter One

OVERVIEW OF THE PETROLEUM DISTRIBUTION SYSTEMS AND THE ROLE OF INVENTORY AND STORAGE CAPACITY

The U.S. petroleum distribution systems are composed of the systems of terminals, refineries, pipelines, tankers, barges, tank cars, tank trucks, and other storage facilities that move crude oil from its source, convert the crude oil into useful products, and deliver those products to consumers' facilities. All elements of these systems incorporate storage to hold inventory. As an introduction to the analysis of changes in the petroleum distribution system presented in Chapter Two, this chapter presents an overview of the petroleum distribution systems and the role of inventory and storage capacity within those systems.

THE PETROLEUM DISTRIBUTION SYSTEMS

As shown in Figures 1 and 2, the petroleum distribution systems are composed of the primary distribution system, the secondary distribution system, and the tertiary storage segment. The primary system gathers crude oil, transports it to refineries, refines it into products, and delivers those products in bulk to the secondary distribution system or, in some cases, directly to the storage of large end-users. The secondary system distributes these bulk quantities in smaller lots to the receiving tanks of the end-users. The tertiary segment is simply the inventory and storage capacity held by all end-users, a common example of which is the tank of the family car and the gasoline it contains. The inventory behavior of the secondary system and tertiary segment has a significant impact on the ability of the primary system to operate smoothly. Each of these systems is described in more detail in the following sections.

Primary Distribution System -- Crude Oil

The primary crude oil distribution system begins with a lease tank in which domestic oil from a producing well is accumulated. Small pipeline gathering systems, tank cars, tank trucks, and barges collect the crude oil from these lease tanks and deliver it into intermediate storage for further movement to refining facilities or directly to refineries. Crude oil imports from foreign sources enter the primary system via tankers at marine terminals and refineries; they enter via pipeline and overland from Canada. Export of domestic crude oil is restricted by law.

Major crude oil pipeline systems crisscross the United States, linking gathering systems in producing areas with storage terminals and refineries. Large-diameter pipelines, called trunklines, move large volumes of oil between major points or to

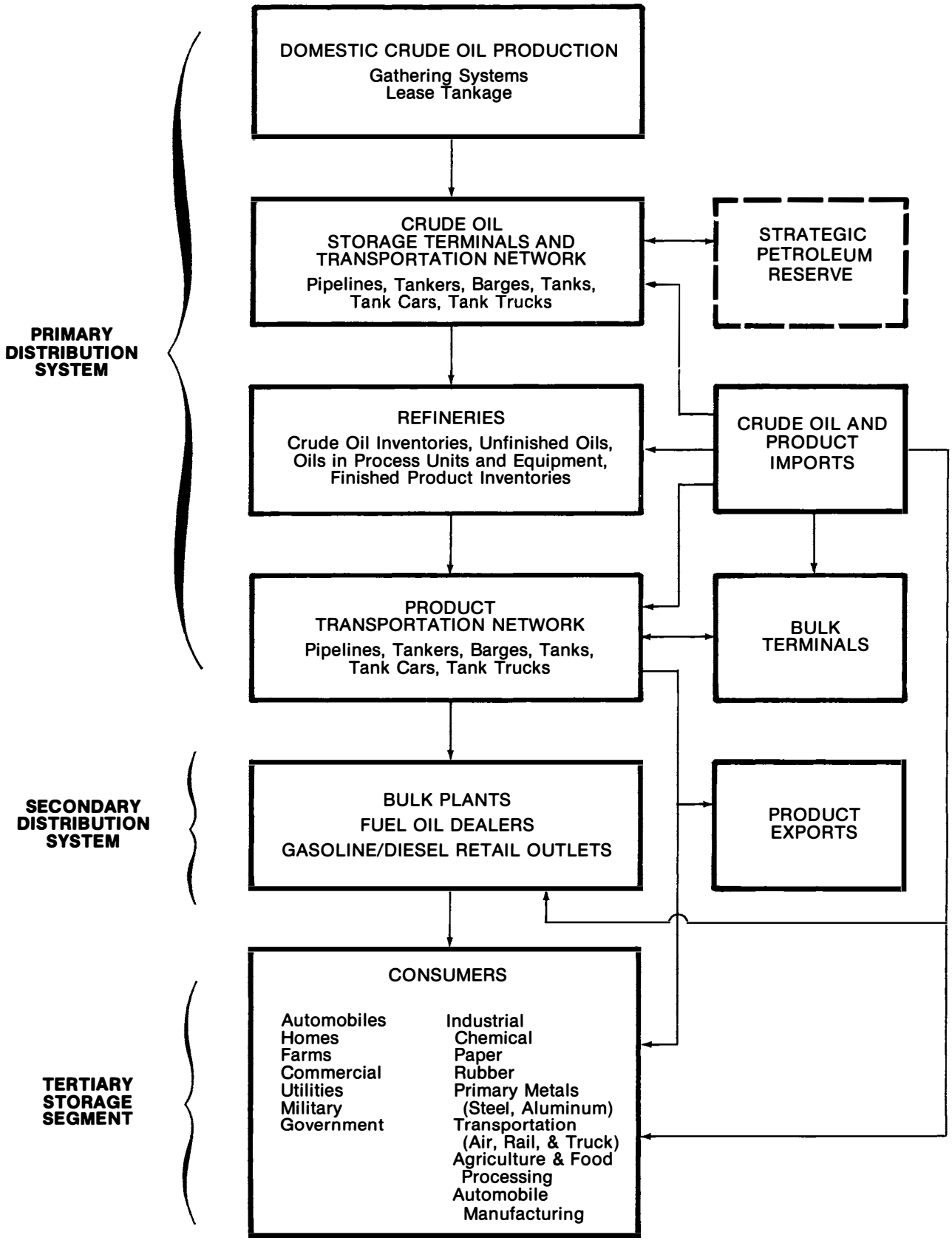

Figure 1. The Petroleum Distribution Systems.

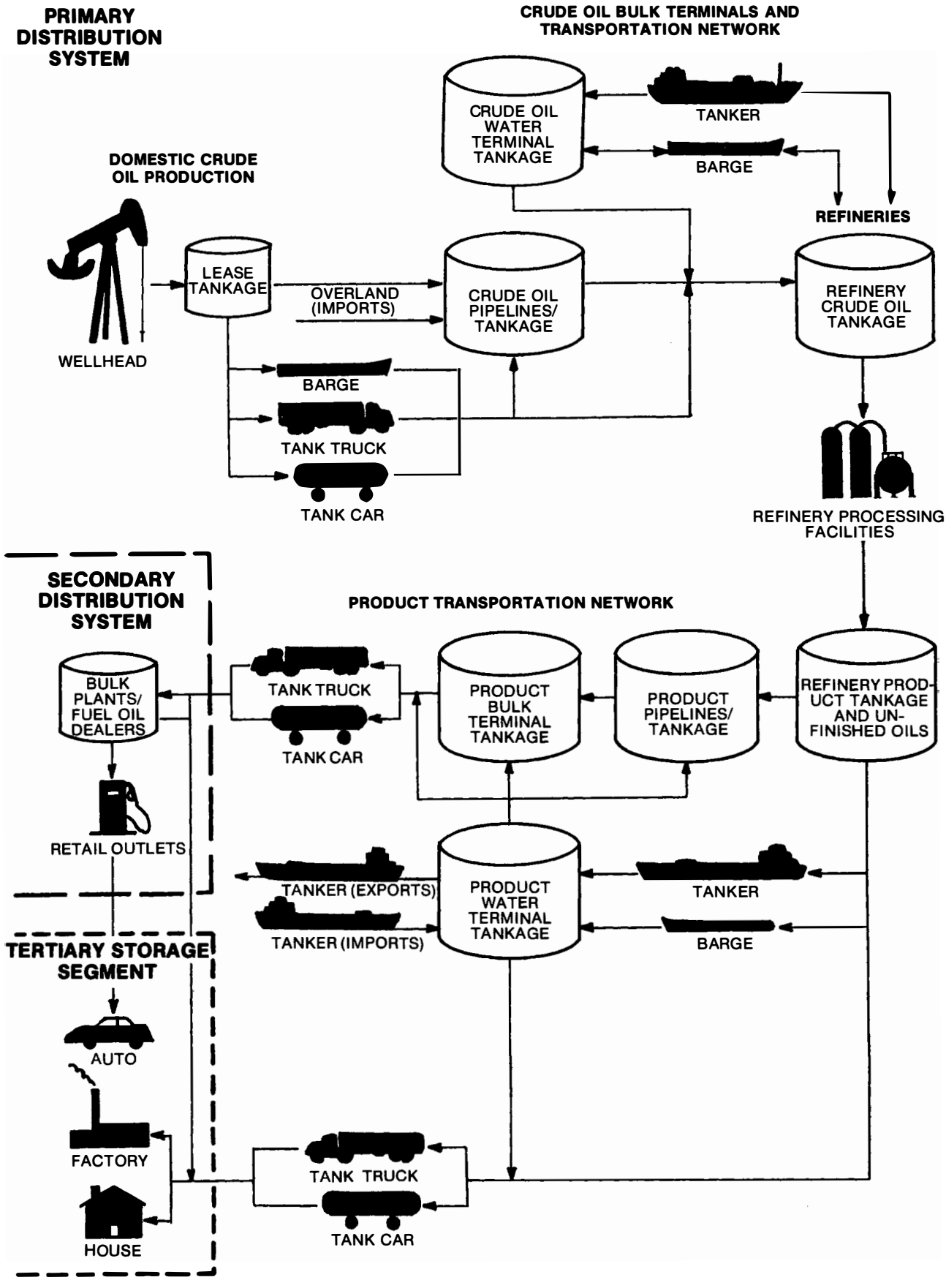

Figure 2. Simplified Diagram of the Petroleum Distribution Systems.

terminals. Smaller branches then move crude oil from those locations to refineries. Trunklines are generally routed through focal points, or hubs, where a number of pipelines converge. At such points, transfers of crude oil to carriers with other destinations may be made. Examples of such locations are Midland and Odessa, in western Texas; Longview, in eastern Texas; Cushing, Oklahoma; Fort Laramie and Guernsey, Wyoming; and Patoka, Illinois. A large amount of storage capacity is required at these points to enable the crude oil to be brought into the area from numerous producing regions, and to permit the segregation, batching, and storing that supports the continuous movement of oil through the system.

Large amounts of storage capacity are also needed at marine terminals to permit arriving tankers to promptly discharge their cargoes. This storage requirement applies also to refineries that accept marine shipments directly.

Because there are substantial variations in quality among crude oils, a transportation system generally segregates them for movement and delivery. Segregation requirements, determined by quality characteristics that include sulfur content, specific gravity, asphalt content, pour point, and suitability for lube oil manufacturing, are usually dictated by the particular needs of the refineries being served. Tankage is required at refineries to receive and hold crude oil supplies by grade prior to processing.

Crude oil stored by the U.S. government in the SPR enters the Reserve through the primary distribution system, and will move again through the primary system in the event of a drawdown. A summary of the role of the SPR is contained in Appendix F. There is also a significant volume of storage in the Caribbean at tanker transshipment terminals and the refineries of several U.S. oil companies. These facilities are discussed in more detail in Appendix G.

Primary Distribution System -- Products

Once crude oil is delivered to a refinery, it is converted into various products, including motor gasoline, kerosine, jet fuel, distillate fuel oil, and residual fuel oil. Tankage is required at refineries to hold both unfinished oils and finished product inventories.

Products leave the refinery and enter the primary product distribution system, which consists of facilities that are similar to those in the crude oil distribution system, such as product pipelines, barges and tankers, and bulk terminals that store product for further distribution. Imports and exports of products also flow through the primary product distribution system.

While products are still in refinery tanks, there is usually a choice as to the location to which the products may move and the mode of transportation. Once a product is on its way, it is

committed to the geographic area to which it is directed, although some delivery options remain. For example, the Colonial Pipeline, which extends from the Houston-Beaumont, Texas, area to the New York Harbor area, and passes through the Baton Rouge, Atlanta, Greensboro, Richmond, Washington, Baltimore, and Philadelphia areas, can deliver products at any station along its route. Storage capacity for each of the products carried is provided at bulk terminals along the route.

The terminus of the primary product distribution system is usually a bulk terminal -- a non-consumer facility that, by DOE's definition, has storage capacity of 50,000 barrels or more or receives products directly by barge, tanker, or pipeline. Products leave the primary system from these bulk terminals and, at this point, the ability to divert a product to a different geographic location becomes much more limited.

Secondary Distribution System

The secondary distribution system receives products from the primary system and delivers these products in smaller quantities to consumers. It consists of bulk plants, non-consumer facilities that have less than 50,000 barrels of storage capacity served only by tank car or truck, and all reseller storage including tankage at individual truck and automobile gasoline/diesel retail outlets, as well as all fuel oil dealers.

Tertiary Storage Segment

All products held by end-users are in the tertiary storage segment. Once products move into this segment, there is little ability to relocate them.

Substantial inventory and storage capacity exist in the tertiary segment. Common examples include gasoline in automobile tanks, heating oil in residential storage, residual and distillate fuel oil stocks at utilities, and fuel oil stocks in storage for agriculture, transportation, and general industry.

THE ROLE OF INVENTORY AND STORAGE CAPACITY IN THE PRIMARY PETROLEUM DISTRIBUTION SYSTEM

The functioning of inventories and storage capacity in the primary petroleum distribution system is best understood by examining the following categories, each of which plays an important role in the operation of the overall system (see Figure 3):

- Unavailable inventory
- Working inventory
- Minimum operating inventory
- Operating space
- Maximum operating inventory
- Contingency space
- Unavailable space.

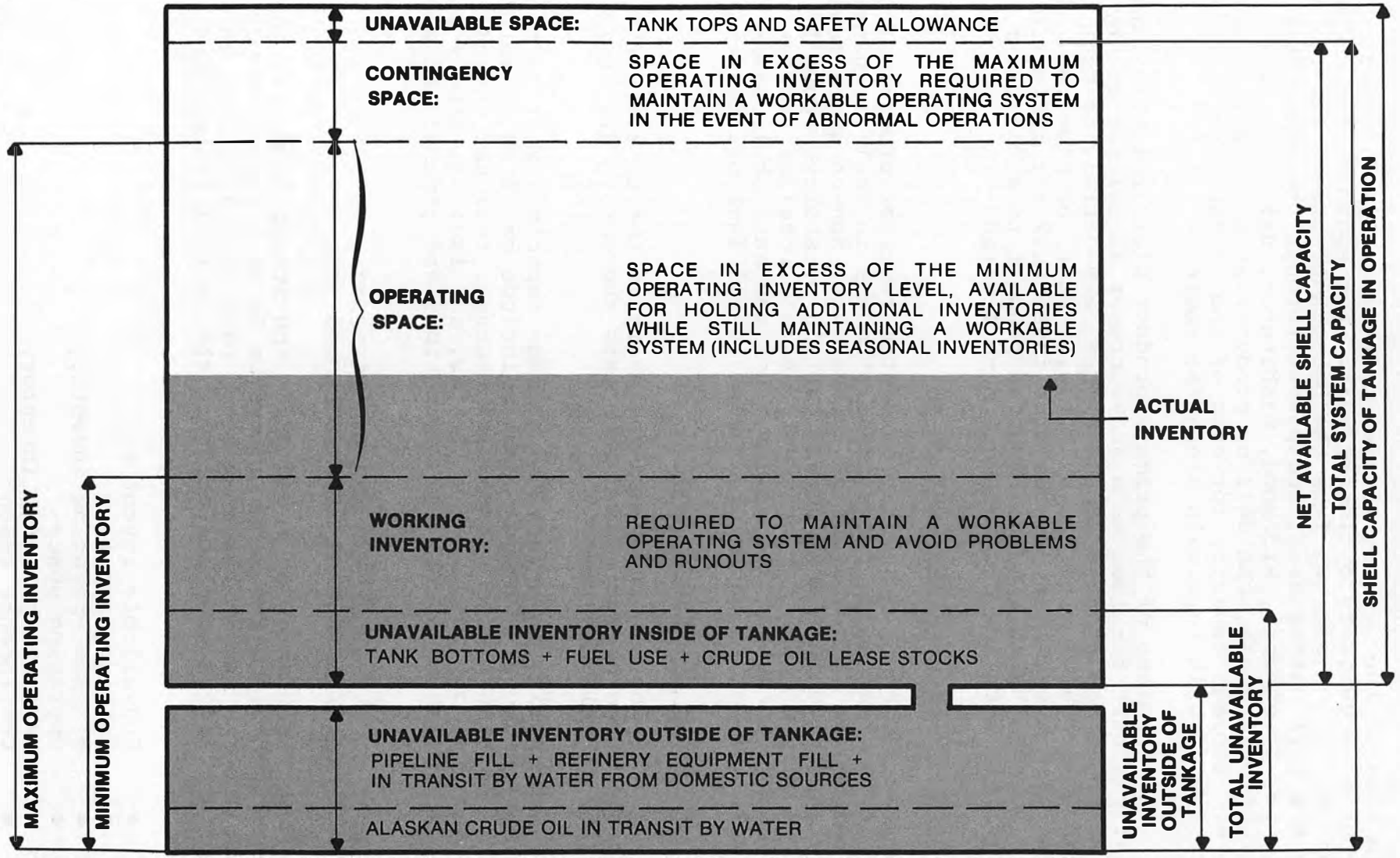

Figure 3. Simplified Diagram of Terms Describing Petroleum Inventories and Storage Capacities in the Primary Distribution System.

The categories of unavailable inventory (equipment fill and tank bottoms) and working inventory (inventory above unavailable necessary to support the operating cycle) together constitute what is called the minimum operating inventory. The space available for maximum operating inventory is the total capacity of the system less the unavailable space (tank tops and safety allowance) and the contingency space (the empty space reserved to allow for smooth operations when inventories approach upper levels). The purpose of unavailable inventory, working inventory, minimum operating inventory, operating space, and maximum operating inventory is discussed in greater detail in this section.

Unavailable Inventory

Unavailable inventory is oil contained in pipelines, refinery equipment, and tank bottoms. It also includes inventory in transit by truck, tank car, barge, or tanker from domestic sources, as well as fuel set aside for use within the system and crude oil lease stocks. Three principal components of this inventory category are:

- Pipeline fill -- Pipeline systems must be filled initially to operate, and an equivalent volume of crude oil or product must remain in the line, unavailable for consumption, as long as the line is in normal operation.

- Refinery fill -- Similarly, refinery equipment is filled to design levels with crude oil and various unfinished petroleum fractions. As the oil is processed, new oil is added, resulting in the unavailability of the inventory volume within the process equipment as long as the refinery is in operation.

- Tank bottoms -- Storage tanks in most cases are designed so that they cannot be totally emptied by the normal suction piping. This design prevents residue and water, which settle at the bottom, from being introduced into the crude oil or product streams. Sufficient oil also must be kept in floating roof tanks to keep the roof floating for safety reasons. Floating roof tanks are designed in such a way that the roof moves up and down with the level of oil in a tank. This feature prevents air from entering the tank as the tank is pumped out and minimizes hydrocarbon emissions from the tank as the tank is filled. Tanks of this type are not permitted to reach a level that would allow the floating roof legs to touch the tank bottom. Otherwise, air could be drawn into the tank, creating a safety hazard.

None of the inventory volumes cited above, plus inventory in transit by water, rail, or truck, fuel set aside for use within

the system, and crude oil lease stocks, can ever be used unless the facility or transportation mode concerned is shut down. This inventory is not available to the consumer and is classified as "unavailable."

Working Inventory

Working inventory is the quantity of crude oil and refined products above the unavailable inventory in the petroleum distribution system that is needed to keep the system functioning normally. It is the additional inventory necessary to support the operating cycle, handle unavoidable operating interruptions, and facilitate blending of products to their final specifications. For all practical purposes, working inventory is also unavailable without exposing the system to supply disruptions.

- Operating cycles -- Crude oil is typically delivered to a refinery by pipeline or tanker. The rate of crude oil delivery normally does not match the rate at which the refinery processes the crude. For example, a tanker might discharge its entire cargo in a two-day period, while the refinery might take 10 days to process that cargo. A varying quantity of crude oil inventory is held as a result of this imbalance. Immediately after the tanker has off-loaded, crude oil inventory in tankage is high. The inventory is gradually reduced as the refinery processes the crude oil and awaits the next delivery. Storage capacity must be provided for the maximum crude oil delivery, although actual inventories will average substantially less than capacity.

  Product deliveries from a refinery operate in a cycle similar to that described above. Products manufactured in a refinery generally accumulate at slower rates than the outbound transportation facilities require. Sufficient working inventory must be on hand at all times to meet transportation system needs. For example, barge shipments of products from a refinery generally require that sufficient inventory be on hand to load a barge in less than a day. Batch shipments into pipelines are a similar example. Inventory will therefore be lowest just after a shipment, and then will gradually increase as the next shipment is accumulated from refinery production.

- System interruptions -- Delivery of crude oil to a refinery and shipment of products are subject to interruptions due to unavoidable but recurring events. Inventory of both crude oil and products is held to protect against the consequences of these interruptions. For example, to protect against an immediate crude oil runout caused by a pipeline shutdown or a tanker delay, some additional crude oil will always be held in the refinery. This inventory is held not only

because economics dictate continuous refinery operations, but also because it is undesirable to shut down a refinery instantly and sufficient oil must be on hand to provide for a safe and orderly shutdown. In addition, in the event of a refinery shutdown, sufficient inventory of finished product is required to continue to supply customers until the refinery is back in operation.

- Blending of products -- Various unfinished products must be accumulated until sufficient quantities are available for blending in specific proportions to make finished products, such as different grades of gasoline and fuel oils.

Minimum Operating Inventory

Minimum operating inventory is the level of inventory that is necessary to maintain smooth operations and avoid runouts and below which operating problems and shortages would begin to appear in a defined distribution system. It is composed of unavailable inventory and working inventory and is normally not available for sale. The minimum operating inventory is a concept, not a precisely measurable quantity, that can be estimated more accurately for a company than for the industry as a whole.

A company's minimum operating inventory is a function of many factors, including the location of both its supply and demand, the level of its demand, the availability of transportation and refining facilities, the mode of transportation, and the availability, size, and location of tankage. Its actual inventory may, at times, go below the minimum operating level. In that situation, a company may be able to avoid serious problems by special supply purchases or by a last-minute exchange with another company, but only if these additional supplies are available. Due to the costs and risks involved, companies do not plan to draw down stocks below minimum operating inventories in the course of normal operations.

On an industry basis, estimating the minimum operating inventory requires a complex and very difficult judgment. The sum of each company's minimum operating inventory may not truly represent the minimum operating inventory for the industry, because it is unlikely that all operators will reach their minimum operating levels simultaneously. Thus, one or more companies can incur shortages and runouts before the estimated minimum operating inventory for the total industry is reached.

Operating Space

Although there are many purposes for inventory levels within the "operating space," this discussion will focus on two primary elements:

- Seasonal demand -- Consumption of gasoline is greatest in summer months and heating oil consumption is greatest

in winter months. Generally, refineries cannot change the mix of gasoline and heating oil sufficiently to balance production with demand during a given season. As a result, excess distillate fuel oil production in the summer may be held for winter demand, and excess gasoline production in the winter may be held for summer demand. This inventory is held in both the primary and the secondary distribution system to supply the shortfall between production capacity and peak demand. The amount of this inventory varies with individual company demand requirements and business expectations.

- Planned maintenance periods -- A company must build up product inventories prior to a planned refinery shutdown for maintenance purposes to permit regular deliveries to customers during the shutdown. In a like manner, crude oil will continue to be delivered while the refinery is shut down, causing crude oil inventories to build in that system during the same period.

Other factors affecting inventory levels within the operating space are price expectations and perceived security of supply.

Maximum Operating Inventory

Maximum operating inventory is the maximum quantity that could be stored in a defined distribution system while still maintaining a workable operating system. The empty tank space above maximum operating inventory is the unavailable space (tank tops and safety allowance) and contingency space required for periods of high inventories to smooth out the operating cycles and to permit inventory buildups during interruptions of refinery or other distribution facility operations. For example, if a products pipeline system fed by a refinery fails and the refinery tankage is full, the refinery runs the risk of shutdown. Contingency space reduces that risk. Like minimum operating inventory, maximum operating inventory is a concept, not a precisely measurable quantity.

SUMMARY

The petroleum distribution systems are complex, integrated networks of refining, storage, and transportation facilities that supply products across the nation. In 1982, the systems delivered to consumers 5.9 billion barrels of petroleum products.

The systems are also dynamic, changing to meet different supply situations and demand requirements. The structural and operational changes in the primary petroleum distribution system that have occurred since the NPC's 1979 report are discussed in Chapter Two. The secondary distribution system and the tertiary storage segment will be discussed in greater detail in the Council's final report, Petroleum Inventories and Storage Capacity, to be completed in the spring of 1984.

Chapter Two

ANALYSIS OF CHANGES IN THE PETROLEUM DISTRIBUTION SYSTEMS, 1978-1983

PRIMARY DISTRIBUTION SYSTEM

INTRODUCTION

The U.S. petroleum industry has experienced significant economic and structural changes since the previous NPC report. Changes in product demand levels and crude oil and product prices have influenced the amount of inventory held in the primary distribution system. Decreased demand levels have caused, and are continuing to cause, fundamental structural changes in the U.S. refining, supply, and distribution systems, and the NPC 1983 estimated minimum operating inventory levels have been reduced from the 1979 levels to reflect these changes. The structural changes have also affected the maximum operating inventory levels, although the Council has not estimated this upper limit.

This chapter examines historical data that reflect demand and economic changes on the industry over the 1978-1982 period and changes in the minimum operating, maximum operating, and total inventory levels, total storage capacity, and tankage utilization.

HISTORICAL DATA AFFECTING PETROLEUM INDUSTRY OPERATIONS, 1978-1982

Petroleum Product Demand, 1978-1982[1]

The decline in U.S. petroleum demand in the 1978-1982 period has been significant for most products, as indicated in Table 1. That overall trend continued through mid-year 1983. The decline occurred as higher prices encouraged fuel conservation and switching to other fuels, the economic recession reduced industrial consumption of all fuels, and federal conservation requirements, such as improved fuel efficiency for new car fleets, lowered fuel usage.

Influence of Prices on Demand

The prices of crude oil and petroleum products rose dramatically from 1978 to 1981, but have since decreased slightly

[1]The data in this section represent demand upon the primary system.

TABLE 1

U. S. Petroleum Product Demand, 1978-1982
(Millions of Barrels per Day)

	1978	1979	1980	1981	1982	Percentage Decrease, 1978-1982*
Motor Gasoline	7.4	7.0	6.6	6.6	6.5	12
Kerosine	0.2	0.2	0.2	0.1	0.1	26
Kero-Jet Fuel	0.9	0.9	0.9	0.8	0.8	6
Distillate Fuel Oil	3.4	3.3	2.9	2.8	2.7	22
Residual Fuel Oil	3.0	2.8	2.5	2.1	1.7	43
Other	3.9	4.3	4.1	3.6	3.4	13
Total§	18.8	18.5	17.1	16.1	15.3	19

*Calculated on unrounded data.
§Totals may not sum due to independent rounding.

Source: Energy Information Administration, Petroleum Supply Annual, 1982 and 1983; and Petroleum Statement, Annual, 1978-1980.

(see Table 2). In 1978-1979, the revolution in Iran caused a reduction in Iranian oil production and a shortfall in world oil supplies. The subsequent Iran-Iraq war continued to limit production from those countries. The world price of oil increased from a $12.70 per barrel official price for Arabian Light crude oil in 1978 to $34.00 per barrel in 1981, and has subsequently decreased to $29.00 per barrel in early 1983. In 1978, domestic crude oil and gasoline prices were subject to federal price controls, which held them below then-current world prices. Although U.S. petroleum prices were permitted to phase up to world levels commencing in 1979, complete decontrol did not occur until January 1981. General indications of U.S. crude oil and wholesale product prices since the 1979 NPC study are shown in Table 2. These higher costs for oil encouraged conservation of petroleum fuels in all sectors, as shown in Table 3.

As the price of petroleum products rose, other fuels became more economic and consumers switched to those other fuels. In the residential and commercial sector, consumers switched from oil to natural gas and electricity. Industrial users conserved on all fuels and also switched from oil to natural gas, coal, and electricity. The recent recession further reduced the demand for energy. Table 4 illustrates the shift in U.S. consumption of energy by type of energy since 1978.

Impact of Government Actions on Demand

The demand for some fuels was also affected by regulatory constraints on the normal demand for products. As an example of

TABLE 2

U.S. Petroleum Prices -- Annual Average, 1978-1982

	1978	1979	1980	1981	1982	Percentage Increase, 1978-1982
U.S. Refiner Crude Oil Acquisition Cost ($/bbl)	12.46	17.72	28.07	35.24	31.87	156
New York Harbor Regular Gasoline (¢/gal.)	42.8	85.4	92.4	98.9	90.9	112
New York Harbor #2 Distillate Fuel Oil (¢/gal.)	37.1	74.8	78.9	96.1	90.9	145
New York Harbor 1% Sulfur Low Pour Residual Fuel Oil ($/bbl)	12.57	20.83	24.8	30.65	28.19	124

Source: Crude oil acquisition cost: Energy Information Administration, Monthly Energy Review, June 1983. Others: Platt's Oil Price Handbook and Oilmanac, annual issues.

TABLE 3

U.S. Petroleum Consumption by Sector, 1978-1982*
(Millions of Barrels of Oil Equivalent per Day)

	1978		1979		1980		1981		1982		Percentage Decrease, 1978-1982
	Quantity	%	Quantity	%	Quantity	%	Quantity	%	Quantity	%	
Industrial (Includes Agriculture)	4.8	25	5.3	29	4.8	28	4.2	26	4.0	26	17
Residential/ Commercial	2.0	11	1.7	9	1.5	9	1.3	8	1.3	9	35
Transportation	10.0	53	9.9	53	9.5	55	9.5	59	9.2	60	8
Electricity Generation	2.0	11	1.6	9	1.3	8	1.1	7	0.8	5	60
Total§	18.9	100	18.5	100	17.0	100	15.9	100	15.1	100	19

*Converted from quadrillion BTU using factor of 5.5 million BTU/barrel.
§Totals may not sum due to independent rounding.

Source: Energy Information Administration, Monthly Energy Review, June 1983.

TABLE 4

U.S. Energy Consumption by Type of Energy, 1978-1982*
(Millions of Barrels of Oil Equivalent per Day)

	1978		1979		1980		1981		1982		Percentage Change 1978-1982
	Quantity	%	Quantity	%	Quantity	%	Quantity	%	Quantity	%	
Oil	18.8	48	18.5	47	17.0	45	15.9	43	15.1	43	-19
Natural Gas	10.0	26	10.3	26	10.2	27	9.9	27	9.2	26	- 9
Coal	6.9	18	7.5	19	7.7	20	8.0	22	7.7	22	+22
Nuclear	1.5	4	1.4	4	1.4	4	1.5	4	1.5	4	0
Other	1.7	4	1.6	4	1.6	4	1.6	4	1.8	5	+ 6
Total§	38.9	100	39.3	100	37.7	100	36.9	10	35.3	100	- 9

*Converted from quadrillion BTU using factor of 5.5 million BTU/barrel.
§Totals may not sum due to independent rounding.

Source: Energy Information Administration, Monthly Energy Review, June 1983.

a direct effect on consumption, gasoline demand declined due in part to government new car mileage requirements, which resulted in an increase in the average miles per gallon (mpg) of the car fleet from 14.1 mpg in 1978 to 15.5 mpg in 1981, and also in part to a slight decrease in the average miles driven per car.

Structural Changes in the Petroleum Industry

While analysts disagree as to how much of the U.S. petroleum demand decline is structurally permanent compared to that caused by cyclical events such as the economic recession and the impact of temporary government programs, declining demand has, nevertheless, resulted in structural changes in U.S. refining, supply, and distribution patterns. Due to decreased demand for petroleum products, the United States has an excess of refining, pipeline, and tankage capacity.

U.S. crude oil refinery runs declined by 3.0 MMB/D to 11.8 MMB/D between 1978 and 1982. U.S. operable refining capacity, however, continued to increase, peaking at 18.6 MMB/D as of January 1981, but subsequently declined to 16.8 MMB/D by January 1983. However, the actual operating capacity in January 1983 was only 14.9 MMB/D (see Appendix H). The volume of crude oil and petroleum products transported by pipeline decreased from 586 billion ton miles to 564 billion ton miles over the 1978-1981 period (1981 is the last year for which data are available). As discussed later in this chapter, tankage utilization has decreased by 8 percentage points over the 1978-1982 period.

As product demand declined, individual companies within the industry sought ways to reduce inventory requirements and to shut down unneeded or underutilized facilities. Options available to individual companies included increased use of supply and distribution exchange agreements and terminal throughput agreements. In an exchange agreement, one company agrees to supply product to another at one location and to receive product at a different location. If a company can receive product by exchange, that company may need fewer facilities to supply product at a certain location. The exchange agreement allows the supplier of the product to increase the utilization of his tankage. In the case of throughput agreements, two or more companies may have terminals in the same location. As demand declines, one of the companies may decide to close its terminal and pay another company for the use of its facilities. In other cases, companies may decide to withdraw from markets in which the demand has declined to the point that operations are uneconomic. For example, several companies have announced withdrawals from the retail gasoline business in various parts of the country. As those withdrawals occur, some tankage is no longer used and the use of the remaining companies' tankage increases. These changes in the refining, supply and distribution, and marketing of refined products have led to changes in the minimum operating inventory required in the primary distribution system, as described below.

MINIMUM OPERATING INVENTORY LEVELS, 1979 AND 1983

Definition

The industry-wide minimum operating inventory is the inventory level below which operating problems and shortages would begin to appear in a defined distribution system. (See Chapter One for a description of inventory terms.) Minimum operating inventory includes pipeline fill, tank bottoms, and other unavailable inventory, plus the amount of working inventory needed to keep the distribution system operating without supply disruptions. Much of this inventory is in the unavailable category. Thus, as demand for a product declines, its minimum operating inventory would not be expected to decline proportionally. Unavailable inventory will only decline if demand has been reduced to the extent that some refineries and pipelines no longer need to operate and are removed from the system, and/or tankage utilization has become so low that some tankage is idled. Inventory held above minimum will vary more proportionally with changes in demand, price, interest rates, and security of supply.

Changes in the Minimum Operating Inventory Levels, 1979 and 1983

The estimated minimum operating inventory levels for crude oil and the petroleum products surveyed in this study are lower than those reported in the 1979 study, as shown in Table 5.

TABLE 5

Minimum Operating Inventory Estimates, 1979 and 1983
(Millions of Barrels)

	1979	1983			Decrease in
	Total U.S.	PADDs I-IV	PADD V	Total U.S.	Total U.S., 1979-1983
Crude Oil*	290	215	70§	285	5
Motor Gasoline	210	176	24	200	10
Kerosine	35	5	¶	5	5
Kero-Jet Fuel		20	5	25	
Distillate Fuel Oil	125	97	8	105	20
Residual Fuel Oil	60	34	6	40	20
Total of Crude Oil and Products Surveyed	720	547	113	660	60

*Excludes SPR.

§All Alaskan crude oil in transit by water is included in PADD V.

¶Less than 0.5 million barrels.

These reductions in minimum operating inventory levels are largely attributable to a decline in demand for petroleum products fostered by a decrease in general economic growth, a significant increase in the price of petroleum, and consumer conservation practices and fuel switching. The decline in demand for petroleum products has caused, and is continuing to cause, fundamental structural changes in the refining, supply, and distribution patterns of the U.S. petroleum industry. These industry changes appear to be dynamic, as product demand patterns are still changing. As a result, minimum operating inventory is a dynamic, rather than static, figure that will continue to change in response to factors affecting the industry.

Methodology Used in Estimating the 1983 Minimum Operating Inventory Levels

As in previous NPC estimates of the minimum operating inventory levels, the 1983 estimates were developed through a decision-making process in which individual judgments were discussed in the context of operating experience and relevant statistical data in order to develop a consensus judgment. The statistical data used are: (1) the sum of the individual company minimum operating inventories as reported to the 1983 NPC Survey; (2) the industry-wide estimates of minimum operating inventory levels as reported to the 1983 NPC Survey;[2] and (3) historical inventory data. The NPC Survey data are reported in Appendix D; the historical inventory data are shown in Appendix I.

The historical inventory data provide a means of testing the reasonableness of the previous minimum operating inventory levels, by determining whether any spot shortages or distribution problems occurred when stocks were above or below the 1979 NPC minimum operating inventory levels. Those problems can then be explained in the context of the minimum operating inventory changes since that last study.

Crude Oil

Because total crude oil inventories have been above the minimum operating inventory level at all times since the last survey and no significant physical shortages have developed (despite the worldwide shortfall following the Iran-Iraq war in 1978-1979), no physical test of the 1979 minimum operating inventory has occurred. Both the sum of the individual company responses, when adjusted for unreported crude oil lease stocks and Alaskan crude oil in transit by water, and the average of industry-wide estimates, when compared with similar data from the 1979 Survey suggest the modest reduction in the crude oil minimum operating inventory estimate from the 290 million barrels level in 1979 to 285 million barrels in 1983.

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[2]These estimates were used for general reference only, as only a few estimates were reported.

The 1983 minimum operating inventory estimate includes slightly over 30 million barrels of Alaskan crude oil in transit by water, the majority of which were not included in the 1979 estimate. The addition of 41 million barrels of crude oil storage capacity would also tend to increase the minimum operating inventory estimate. These increases, however, are believed to have been more than offset by the effect of refinery closures, the reduced quantities of imported crude oil processed, and reduced refinery runs. Imported crude oil generally moves in batch sizes five to 10 times greater than domestic crude oil and hence has a larger effect on the working inventory component of minimum operating inventory.

Motor Gasoline

While motor gasoline inventories on a national basis have not dipped below the 1979 estimate of minimum operating inventory, gasoline inventories came close to the minimum operating inventory in the spring of 1982 and again in 1983. At those times, some companies announced temporary localized allocations of motor gasoline at the primary distribution level, which appear to have been more a result of inventories being rapidly drawn from primary into secondary and tertiary levels as a result of expectations of increasing prices, rather than actual physical shortages. No significant regional shortages developed in the primary distribution system. As a result of this experience and the survey results, the minimum operating inventory for motor gasoline has been reduced from 210 million barrels to 200 million barrels.

Kerosine and Kerosine-Type Jet Fuel

The actual inventories for kerosine and kerosine-type jet fuel on a national basis have not fallen below the minimum operating inventory levels established in the 1979 study and no actual shortages were known to exist for these products during the 1978-1983 period. Hence, no critical test of the 1979 minimum operating inventory figures has occurred. Based on this operating experience and the decreased sum of the individual company minimum operating inventories, the NPC's previous estimate of the kerosine and kerosine-type jet fuel minimum operating level has been decreased from 35 million barrels to 30 million barrels.

Distillate Fuel Oil

Distillate fuel oil inventories fell well below the minimum levels in the spring of 1982 and the spring of 1983. Spot shortages occurred in the spring of 1982 because April was an unseasonably cold month. In 1983, inventories were tight, but shortages did not occur on a widespread basis. Inventories actually fell slightly below the 1983 minimum operating inventory estimate level, but only after the heating season when the demand was low. The sum of the individual company minimum operating inventories and the fact that inventories have been below the

minimum operating inventory without widespread shortages support the Council's reduction of the minimum operating inventory estimates from 125 million barrels to 105 million barrels.

Residual Fuel Oil

The residual fuel oil market is still undergoing significant changes that affect working inventory requirements and, therefore, the residual fuel oil minimum operating inventory estimate deserves less confidence than that of the other products. Residual fuel oil inventories have been below the 1979 estimate of minimum operating inventory for most of 1982 and 1983. Shortages have not occurred; however, the market has been very tight, with inventories at about 45 million barrels. The strong reliance on residual fuel oil imports and the significant reduction in residual fuel oil demand due to decreased economic activity and fuel switching support the large reduction in minimum operating inventory for residual fuel oil from 60 million barrels to 40 million barrels. A change in the level of economic activity could have an impact on the minimum operating inventory level for residual fuel oil.

Days' Supply of Inventory Calculations

Since minimum operating inventory levels do not decline proportionally with demand and are not available for use without causing shortages, days' supply of inventory calculations based on total inventory do not present a valid indication of the adequacy of inventory levels. A more appropriate way to assess the adequacy of inventory levels is to look at how much inventory above the minimum required to run the system is available:

$$\frac{\text{total inventory - minimum operating inventory}}{\text{current demand}} = \text{days' supply of inventory above minimum}$$

By this method, March 31, 1983, data for gasoline would indicate 3.5 days' supply of that product, as displayed below, compared to 33 days' supply when calculated based on total inventory.

$$\frac{224 \text{ MMB} - 200 \text{ MMB} = 24 \text{ MMB}}{6.8 \text{ MMB/D}} = \text{3.5 days' supply of inventory above minimum}$$

$$\frac{224 \text{ MMB}}{6.8 \text{ MMB/D}} = \text{32.7 days' supply of total inventory}^3$$

[3] Calculated on an unrounded basis.

Presented below is a comparison of the days' supply of inventory for March 31, 1978 and 1983, when calculated based on total inventory and on inventory above minimum:

Days' Supply Of Inventory

	March 31, 1978		March 31, 1983	
	Total Inventory	Inventory Above Minimum§	Total Inventory	Inventory Above Minimum¶
Crude Oil*	24.3	3.9	32.3	6.6
Gasoline	35.8	6.8	32.7	3.5
Distillate Fuel Oil	33.6	3.1	40.9	4.7

*Excludes the SPR, which on March 31, 1983, held 312 million barrels or 154 days' supply of crude oil imports.

§The NPC's 1979 estimate.

¶The NPC's 1983 estimate.

Although the days' supply of inventory above minimum is obviously a lower number than days' supply of total inventory, it is more indicative of available supply and useful for emergency preparedness planning purposes. A seemingly low number of days' supply above minimum should not be of concern in times of normal operations. The flexibility inherent in the petroleum supply and distribution systems, together with ample crude oil supply, refining capacity, and transportation facilities, ensure the ability of the systems to meet product demand over time. While total inventories have decreased since 1978, the table above shows that the amount of inventory above minimum (in terms of days' supply) is generally consistent with the 1978 level.

It should be noted that, in addition to the days' supply of crude oil inventory above minimum, approximately two-thirds of the crude oil supplied to refineries is now from domestic sources. Thus, in the event of a supply disruption, the majority of the crude oil inputs to refineries would continue, ensuring uninterrupted, if somewhat reduced, product supply. The SPR stocks are also intended for use in times of severe oil supply disruption.

TOTAL INVENTORY LEVELS, 1979 AND 1983

The total inventory level of crude oil plus the principal products has decreased since the previous study, as shown in Table 6. This reduction has occurred in Petroleum Administration for Defense Districts (PADDs) I-IV. The aggregate amount of inventory actually held above minimum operating inventory levels has remained relatively constant.

TABLE 6

Total Inventory of Crude Oil and the Principal Products
(Millions of Barrels)

	March 31, 1978			March 31, 1983§		
	PADDs I-IV	PADD V	Total U.S.	PADDs I-IV	PADD V	Total U.S.
Crude Oil*	279.7	65.7	345.5	272.0	86.2	358.2
Motor Gasoline	235.7	23.9	259.6	198.2	25.8	223.9
Kerosine	11.5	0.4	11.9	8.6	0.3	8.9
Kero-Jet Fuel	19.5	6.7	26.2	28.4	6.5	34.9
Distillate Fuel Oil	126.3	11.5	137.8	107.6	11.1	118.7
Residual Fuel Oil	48.9	13.4	62.4	37.4	8.9	46.3
Total of Crude Oil and Products Surveyed¶	721.6	121.7	843.3	652.1	138.8	790.9

	September 30, 1978			September 30, 1982		
	PADDs I-IV	PADD V	Total U.S.	PADDs I-IV	PADD V	Total U.S.
Crude Oil*	265.5	55.7	321.2	258.4	82.3	340.7
Motor Gasoline	191.0	25.5	216.5	205.9	27.7	233.6
Kerosine	15.9	0.3	16.1	9.6	0.2	9.8
Kero-Jet Fuel	22.6	6.8	29.3	27.2	6.2	33.3
Distillate Fuel Oil	209.7	10.9	220.7	151.1	10.1	161.2
Residual Fuel Oil	68.1	13.2	81.3	51.4	10.4	61.8
Total of Crude Oil and Products Surveyed¶	772.7	112.4	885.1	703.6	136.9	840.5

*Excludes SPR. Alaskan crude oil in transit by water is included in PADD V.

§Includes resubmissions to EIA as of August 10, 1983.

¶Data on inventories in 1978 differ from those published in the NPC's 1979 report. They were changed to reflect final EIA data and to make them comparable to 1982-1983 data. Motor gasoline stocks data represent finished motor gasoline and motor gasoline blending components. Aviation gasoline is excluded. Totals may not add due to independent rounding.

Source: Data reported to EIA on Forms EIA-810-813 in 1983, Forms EIA-87-90 in 1982, and Forms FEA-P320-P323 in 1978.

The amount of inventory held in the primary system above minimum operating inventory is largely determined by the level of product demand, price expectations, the cost of storing products or crude oil, and the perceived security of crude oil and product supply, as well as the seasonal storage and maintenance factors discussed in Chapter One.

Product Demand

The most obvious reason for reducing stocks held above minimum operating inventory is lower product demand. For example, if a company determines that it is desirable to hold seven days' supply above minimum operating inventory, its inventory requirement falls by 70 thousand barrels if demand declines from 60 thousand barrels per day to 50 thousand barrels per day.

In addition, the products historically exhibiting the greatest seasonality of demand (distillate fuel oil and residual fuel oil) are becoming less seasonal. As seasonality declines, less product must be held in inventory to ensure supplies during peak periods of demand. Demand and inventory levels for the surveyed products for the years 1978-1983 are found in Appendix I. The figures show the reductions in the seasonality effect for these products.

Price Expectations

As noted above, inventory held above minimum is stored primarily to meet demand. In a free market environment, a company's expectations regarding future petroleum prices also influence the level of its inventory held. For example, as supply and demand come into closer balance, prices generally tend to hold firm or increase. A company may therefore operate its distribution system with higher overall inventories. Conversely, as the spread between supply and demand widens, prices tend to hold firm or weaken and a company may reduce inventory levels. For example, lower worldwide demand experienced in late 1982 and early 1983 created significant downward price expectations in the spring of 1983; accordingly, companies were lowering their overall inventory levels.

The Cost of Storing Product

The higher prices of oil and levels of interest rates since 1978 have made the cost of holding inventory very high. The estimated cost of holding one gallon of gasoline in inventory in 1978 was about 4¢ per gallon per year; in 1981, 19¢ per gallon per year; and in 1982, 14¢ per gallon per year. As shown in Table 7, the estimated total annual holding and tankage cost of gasoline has doubled from 1978 to 1983. Thus, firms in the petroleum industry tried to manage their inventories so that no more than required levels were held.

TABLE 7

Estimated Gasoline Storage Cost -- 1978, 1981, and 1982

	1978	1981	1982
Product Value (¢/gal.)*	42.3	98.9	90.0
Interest Rate (%)§	9.06	18.87	14.86
Holding Cost (¢/gal./yr)	4	19	14
Tankage Cost (¢/gal./yr)¶	6	7	7
Total Storage Cost (¢/gal./yr)	10	26	21

*Source: Platt's Oil Price Handbook and Oilmanac, 1983.
§Average prime rate for year, as cited in The Federal Reserve Board Bulletin.
¶Estimated cost of commercial storage space.

Security Of World Crude Oil and Product Supply

Perceived security of world crude oil and product supply is another factor in determining how much inventory is held above minimum operating inventory levels. Today's concerns about short-term security of supply have eased significantly since the 1979 NPC report, principally because the world crude oil supply, which was tight in 1978, is now in oversupply due to increases in non-OPEC production and reduced worldwide petroleum demand. OPEC production of crude oil and natural gas liquids in 1982 was 19.8 MMB/D, down 35 percent from 1978, while non-OPEC production had increased 18 percent, to 22.2 MMB/D. The dependence of the United States on net petroleum imports fell to 27 percent in 1982 (excluding SPR fill) from 43 percent in 1978. While imports are currently low compared with 1978 levels, many forecasters predict that U.S. import requirements will increase again over the longer term.

Strategic Petroleum Reserve

The SPR held 312 million barrels of crude oil as of March 31, 1983. That reserve is held by the U.S. government to reduce major adverse impacts on the national economy and for national security reasons by providing supplies to help offset future crude oil disruptions in emergency circumstances. Although the SPR may be regarded by some as providing security of supply, with only one exception, individual refiners responded to the NPC Survey that they do not take the SPR into account when determining their individual inventory levels (see Appendix D).

Spare Refining Capacity

Another type of security of product supply is provided by low refinery utilization. A disruption in one refinery's

operations can be offset by increased throughput in other refineries. Total refinery runs can be raised to respond to low industry inventory situations in relatively short periods, provided crude oil is available. Low refinery utilization also allows refiners more flexibility to change product yields seasonally. In 1978, refiners had to run refineries at high utilization levels to meet gasoline demand year round. Distillate inventory had to be built up beginning in the summer to ensure available winter supplies. Because of the decline in demand and the reduced seasonality of gasoline and distillate fuel oil, refiners have a greater ability to adjust crude oil runs and shift yields to meet seasonal demands, rather than holding higher product inventory. The results of the 1983 NPC Survey indicate, however, that current inventory levels are not greatly influenced by spare refining capacity. (See Appendix H for a historical perspective on refining capacity utilization.)

Petroleum Futures Markets[4]

Petroleum futures (as traded on the New York Mercantile Exchange, the Chicago Board of Trade, and the London International Petroleum Exchange) may be perceived by some companies as a way to reduce inventory and ensure supplies. The results of the 1983 NPC Survey suggest that at the present time petroleum futures do not have a significant effect on the level of inventories held in the primary system. However, a concern exists that in the event of a supply shortage, some companies may rely on the futures markets for delivery of wet barrels (the physical commodity), only to find that the wet barrels may not be available. The buying company may find that it has financial security but no physical delivery of needed crude oil or products.

Naphtha-Type Jet Fuel

The stock level of naphtha-type jet fuel presents a misleading impression of the availability of that fuel. In the 1983 NPC Survey, data were requested regarding normally dedicated stocks in storage on March 31, 1983, and stocks that could have been dedicated immediately with little or no processing other than mechanical blending. Industry reported that 6.8 million barrels of naphtha-type jet fuel were held, and an additional 3.7 million barrels of unfinished oils, blending components, special naphthas, and naphtha of less than 400°F end-point could have been dedicated immediately to production of naphtha-type jet fuel, thereby increasing the stocks in storage by more than half (see Appendix D). This increase in the production of jet fuel would cause a reduction in the production of other products, given a fixed amount of crude oil.

4The impact of the futures markets on inventory levels will be discussed in greater detail in the NPC's final report, Petroleum Inventories and Storage Capacity, to be completed in the spring of 1984.

MAXIMUM OPERATING INVENTORY

The maximum operating inventory is the maximum quantity that could be stored in a defined distribution system while still maintaining a workable operating system.

The NPC recognizes that the limits of the industry-wide maximum operating inventories have not been tested in the same sense as have the minimum operating inventories. Therefore, the NPC does not believe that it can estimate valid limits for maximum operating inventories on an industry-wide basis. Further, the NPC is concerned that a quantification of the maximum limits would imply the same degree of confidence as is inherent in the minimum limits.

The actual survey results of the sum of the individual company maximum operating inventory levels and the industry-wide estimates are shown in Appendix D. The NPC urges that caution be used in the interpretation of these data. Consideration of these data should take into account facility location and access to transportation networks, refining centers, and markets, which impact the upper limits of petroleum industry operations.

TOTAL STORAGE CAPACITY

Total capacity of tankage in operation and tankage under construction in 1978 and 1983 are shown in Table 8. The grand total of both categories of storage capacity for crude oil and the products surveyed has declined since the previous report.

Tankage for crude oil has increased since the previous report. While the closure of a number of refineries since that time decreased crude oil tankage, that reduction was more than offset by the activation of the Louisiana Offshore Oil Port and other refining and storage facilities. In addition, concerns for security of supply during the early part of this period may have prompted companies to construct crude oil tankage or convert product tankage to crude oil tankage.

Tankage for motor gasoline and kerosine remained fairly constant from 1978 to 1983. Tankage for distillate and residual fuel oils declined significantly over the 1978-1983 period, due primarily to decreased consumption and seasonality of demand.

The total tankage on March 31, 1983, is less than on September 30, 1978, for three primary reasons: reduction in crude oil and product demand, causing refinery and terminal shutdowns and tankage consolidation; deletion from service of tankage that was not retrofitted to meet environmental regulations; and physical deterioration of tankage. To bring some of that tankage back into service, environmental regulations would have to be waived or tankage systems would have to be updated. Tankage idle but available within 90 days' notice is

TABLE 8

Shell Capacity of Tankage in Operation and Tankage Under Construction, 1978 and 1983
(Millions of Barrels)

	March 31, 1978		March 31, 1983	
	Tankage In Operation	Tankage Under Construction*	Tankage In Operation	Tankage Under Construction
Crude Oil§	462*	12	504	10
Gasoline	464	5	458	3
Kerosine	86	1	21	1
Kero-Jet Fuel			68	¶
Distillate Fuel Oil	336	3	297	1
Residual Fuel Oil	156	1	144	4
Total of Crude Oil and Products Surveyed	1,504	22	1,492	19

*Data for September 30, 1978.

§Excludes SPR. Also excludes all lease stocks tankage in 1978 and a portion of the lease stocks tankage in 1983. Lease stocks inventory volumes were 19 million barrels in 1978 and 11 million barrels in 1983.

¶Less than 0.5 million barrels.

shown in Table 9. This tankage, the tankage in operation, and tankage under construction together provide an estimate of the total tankage available to the system.

Although the idle tankage can be restored to service, much of it is dispersed in relatively small volumes across the nation. Therefore, reliance on any substantial part of this tankage for emergency planning purposes is not practical.

Table 10 compares the percentage utilization of tank capacity over the 35-year history of the NPC series of inventory reports. Inventory in tankage has averaged about 46 percent of storage capacity over the period. This average continues over time because individual tanks fluctuate between the minimum and maximum operating levels due to the operating cycle; at any one time the industry-wide utilization is about 50 percent.

The 8 percentage point decrease in tank utilization in 1983 versus 1978 may reflect the impact of the following factors: the

TABLE 9

Potentially Available Tankage
(Millions of Barrels)

	Idle But Can Be Reactivated Within 90 Days	
	Meets Environmental Regulations	Requires Environmental Waivers
Crude Oil	13	3
Gasoline	7	¶
Kerosine	1	¶
Kero-Jet Fuel	3	¶
Distillate Fuel Oil	17	1
Residual Fuel Oil	12	1
Total of Crude Oil and Products Surveyed	53	6

¶Less than 0.5 million barrels.

TABLE 10

Percentage Utilization of Tank Capacity -- 1948-1983

Survey Date	Inventory as a Percentage of Tank Capacity
March 31, 1948	42
June 30, 1950	45
March 31, 1952	45
March 31, 1954	48
March 31, 1957	45
September 30, 1962	50
September 30, 1969	53
September 30, 1973	48
September 30, 1978	48
March 31, 1983	40

declining demand for petroleum, increased spare refining capacity, and higher costs of holding inventories. It is expected that some storage capacity reported in the 1983 Survey will be deactivated, which will tend to return the percentage utilization figure closer to the 46 percent historical average.

Appendices

THE SECRETARY OF ENERGY
WASHINGTON, D.C. 20585

November 3, 1982

Mr. John F. Bookout
Chairman
National Petroleum Council
1625 K Street, N.W.
Washington, D. C. 20006

Dear Mr. Bookout:

The National Petroleum Council (NPC) is currently working on two important studies at my request. The first concerns Third World Petroleum Development and the second is an update of the Council's 1976 study on Enhanced Oil Recovery. I would also like the Council's advice on several aspects of the nation's petroleum inventory and storage system.

In 1979, the NPC conducted a study of inventories and storage capacities. The principal objectives of that study were to analyze current inventories, estimate minimum operating inventory levels, and determine the total storage capacity of the primary petroleum distribution system. Since the report was based on 1978 data and since the United States (U.S.) petroleum situation has significantly changed in the past few years, an update of that report is deemed necessary at this time.

I, therefore, request the NPC to undertake a comprehensive study that will update the 1979 report. In particular, your new study should update the analysis of the minimum operating levels for crude oil, motor gasoline, distillate fuel oil, and residual oil, as well as update the estimates of total storage capacity and the quantity of crude oil and refined products available for use. Other aspects of the overall U.S. petroleum inventory and storage system should be discussed as appropriate.

For the purposes of this study, I will designate J. Erich Evered, Administrator, Energy Information Administration, to represent me and to provide the necessary coordination between the Department of Energy and the National Petroleum Council.

Sincerely,

James B. Edwards

James B. Edwards

BACKGROUND INFORMATION ON THE NATIONAL PETROLEUM COUNCIL

In May 1946, the President stated in a letter to the Secretary of the Interior that he had been impressed by the contribution made through government/industry cooperation to the success of the World War II petroleum program. He felt that it would be beneficial if this close relationship were to be continued and suggested that the Secretary of the Interior establish an industry organization to advise the Secretary on oil and natural gas matters.

Pursuant to this request, Interior Secretary J. A. Krug established the National Petroleum Council on June 18, 1946. In October 1977, the Department of Energy was established and the Council's functions were transferred to the new department.

The purpose of the NPC is solely to advise, inform, and make recommendations to the Secretary of Energy on any matter, requested by him, relating to petroleum or the petroleum industry. Matters which the Secretary of Energy would like to have considered by the Council are submitted as a request in the form of a letter outlining the nature and scope of the study. The request is then referred to the NPC Agenda Committee which makes a recommendation to the Council. The Council reserves the right to decide whether or not it will consider any matter referred to it.

Examples of recent major studies undertaken by the NPC at the request of the Department of the Interior and the Department of Energy include:

- U.S. Energy Outlook (1971, 1972)
- Potential for Energy Conservation in the United States: 1974-1978 (1974)
- Potential for Energy Conservation in the United States: 1978-1985 (1975)
- Ocean Petroleum Resources (1975)
- Petroleum Storage for National Security (1975)
- Enhanced Oil Recovery (1976)
- Materials and Manpower Requirements (1974, 1979)
- Petroleum Storage & Transportation Capacities (1974, 1979)
- Refinery Flexibility (1979, 1980)
- Unconventional Gas Sources (1980)
- Emergency Preparedness for Interruption of Petroleum Imports into the United States (1981)
- U.S. Arctic Oil & Gas (1981)
- Environmental Conservation -- The Oil and Gas Industries (1982)
- Third World Petroleum Development: A Statement of Principles (1982)
- Petroleum Inventories and Storage Capacity -- An Interim Report (1983)

The NPC does not concern itself with trade practices, nor does it engage in any of the usual trade association activities. The Council is subject to the provisions of the Federal Advisory Committee Act of 1972.

Members of the National Petroleum Council are appointed by the Secretary of Energy and represent all segments of petroleum interests. The NPC is headed by a Chairman and a Vice Chairman, who are elected by the Council. The Council is supported entirely by voluntary contributions from its members.

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Price Waterhouse

OFFICE OF GOVERNMENT SERVICES

1801 K STREET, N.W.
WASHINGTON, DC 20006
202 296-0800

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

We have been engaged by the National Petroleum Council to receive and process the responses to this survey of petroleum inventories and storage capacities. Upon receiving the survey responses, Price Waterhouse will review them for reasonableness and completeness. The name and address of your company contact are requested in case clarification of your response is necessary during this process. After the initial review, company identifications will be removed and individual responses will be coded. Thereafter, data transcription and processing will be by code number only so that data cannot be associated with an individual company.

Individual company data will not be released to industry or government representatives. Price Waterhouse will provide data to the National Petroleum Council only in an aggregated form, and then only when sufficient responses have been obtained to preclude disclosure of individual company data. The original data forms will be destroyed at the completion of the study.

Price Waterhouse

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

Reporting Company: _____

Address: _____

_____

_____ Zip Code: _____

Person in reporting company to be contacted if questions arise:

_____

Phone: (____) _____

Code: _____
(Price Waterhouse Use Only)

Please check for each questionnaire that you have provided data:

____ Questionnaire No. 1	____ Questionnaire No. 4	____ Questionnaire No. 7
____ Questionnaire No. 2	____ Questionnaire No. 5	____ Questionnaire No. 8
____ Questionnaire No. 3	____ Questionnaire No. 6	____ Questionnaire No. 9

Please return this booklet by July 8, 1983, to:

Price Waterhouse
OGS, Suite 701
1801 K Street, N.W.
Washington, D.C. 20006

INTRODUCTION

At the request of the U.S. Department of Energy (DOE), the National Petroleum Council has agreed to update its 1979 study of petroleum inventories and storage capacities in the United States. The study has two primary objectives:

1) To determine how much of the U.S. petroleum inventory reported monthly to the Department of Energy is required for normal operation of the petroleum distribution system itself and is therefore not available for delivery to consumers.

2) To determine the total primary storage capacity and that portion required for normal industry operations.

The enclosed questionnaires are designed to provide the National Petroleum Council with the information it requires to respond to DOE's request. These questionnaires request information on primary inventories and storage capacities relating to crude oil and the principal refined products. Most of the inventory data being requested have already been reported to DOE by your company. These data will provide a measure of the response to the survey and assist you in remaining within the scope of the instructions for the questionnaires.

The National Petroleum Council has retained the services of the certified public accounting firm of Price Waterhouse to collect and aggregate the data reported in this survey. Individual company data will not be released to industry or government representatives. Price Waterhouse will provide data to the National Petroleum Council only in an aggregated form, and then only when sufficient responses have been obtained to preclude disclosure of individual company data. The original data forms will be destroyed at the completion of the study. A statement from Price Waterhouse regarding its data collection and processing methodology is enclosed with this mailing.

GENERAL INSTRUCTIONS

1. Reporting of Data

a. Report all figures in **thousands** of 42-gallon barrels.

b. Report on a company-wide basis; i.e., submit only one response for your company's primary operations. (See enclosed list of locations for which you submit monthly reports to DOE.)

c. Report information in a manner consistent with your Petroleum Supply Reporting System (PSRS) reports filed with DOE on current forms EIA-810 (Monthly Refinery Report), EIA-811 (Monthly Bulk Terminal Report), EIA-812 (Monthly Product Pipeline Report), EIA-813 (Monthly Crude Oil Report), and the counterpart forms that were in use on September 30, 1982. That is,

—Report on a custody basis regardless of ownership of the inventories or facilities.

—In the case of jointly owned tankage or pipelines, data should be provided by the operator.

—Report inventories less basic sediment and water (BS&W) corrected to 60°F.

d. Definitions—The definitions for crude oil and petroleum products that should be used in the survey must be consistent with those of DOE's Petroleum Supply Reporting System, except for the definition of motor gasoline, for which respondents to this survey should aggregate finished leaded gasoline (Product Code 132 in PSRS—includes leaded gasohol), finished unleaded gasoline (Product Code 133 in PSRS—includes unleaded gasohol), and motor gasoline blending components (Product Code 134 in PSRS).

e. Crude oil data—Report as of March 31, 1983. Only one reporting date for crude oil has been chosen because crude oil inventories are not seasonal.

f. Refined product data—Report refined product stocks only for locations that were reported to DOE on September 30, 1982, and March 31, 1983, in your regular **monthly** reports to DOE as described under (c) above. Two reporting dates for the principal products have been chosen to better define the seasonal changes in inventories, and to reflect seasonal shifts in tank utilization.

Report for the following principal products:

—Motor gasoline, including blending components

—Kerosine

—Kerosine-type jet fuel

—Distillate fuel oil, including No. 4 fuel oil

—Residual fuel oil

More limited data are to be reported for naphtha-type jet fuel. Due to the nature of the product and its strategic importance in national defense, information is needed on minimum operating inventories and on the volume of additional supplies that might be made available to satisfy a rapid increase in demand.

2. Report by Petroleum Administration for Defense Districts (PADDs)

a. Data for Puerto Rico, the U.S. Virgin Islands, Guam, and the Hawaiian Foreign Trade Zone **should not be reported,** except for Alaskan crude oil in transit by water to the above locations (see line item instructions for Line 15).

b. Information will be collected on a PADD basis, with PADD I subdivided into three areas for all refined products. PADD I is **not** subdivided for crude oil. Respondents should use the table below to determine the PADD classification for each state in which they have operations.

c. Data for crude oil are also reported on a Total U.S. basis as well as by PADD to provide for reporting of Alaskan crude oil in transit by water.

d. Respondents with operations in the New England, Central Atlantic, and Lower Atlantic states should submit their data as PADD IA, PADD IB, and PADD IC, respectively.

e. State/PADD classifications:

PADD I

New England (PADD IA)
- Connecticut
- Maine
- Massachusetts
- New Hampshire
- Rhode Island
- Vermont

Central Atlantic (PADD IB)
- Delaware
- District of Columbia
- Maryland
- New Jersey
- New York
- Pennsylvania

Lower Atlantic (PADD IC)
- Florida
- Georgia
- North Carolina
- South Carolina
- Virginia
- West Virginia

PADD II

- Illinois
- Indiana
- Iowa
- Kansas
- Kentucky
- Michigan
- Minnesota
- Missouri
- Nebraska
- North Dakota
- Ohio
- Oklahoma
- South Dakota
- Tennessee
- Wisconsin

PADD III

- Alabama
- Arkansas
- Louisiana
- Mississippi
- New Mexico
- Texas

PADD IV

- Colorado
- Idaho
- Montana
- Utah
- Wyoming

PADD V

- Alaska
- Arizona
- California
- Hawaii, excluding Foreign Trade Zone
- Nevada
- Oregon
- Washington

3. Do not report data in the shaded areas of Questionnaires 1–7.

4. Completing Questionnaires 1–6

Specific line item instructions are provided for these questionnaires, beginning on Page 5.

5. Completing Questionnaire 7

It is possible that the sum of the companies' assessments of their own minimum and maximum operating inventories (Lines 2 and 21 on Questionnaires 1–6) will not accurately reflect the entire petroleum industry's minimum or maximum operating inventory. If your company analyzes industry levels, provide your estimate of the minimum and maximum operating inventories of the U.S. petroleum industry. Enter estimates for PADDs I–IV, PADD V, and Total U.S., if available. If your company does not have some of the estimates requested in this questionnaire, leave those sections blank.

(Refer to specific instructions on the face of the questionnaire.)

6. Completing Questionnaire 8

Because of the strategic nature of naphtha-type jet fuel, DOE requires certain limited information about this petroleum product.

The information requested concerning the Strategic Petroleum Reserve will help the National Petroleum Council's Committee on Petroleum Inventories and Storage Capacity to better understand changes in U.S. petroleum inventories.

(Refer to specific instructions on the face of the questionnaire.)

7. Completing Questionnaire 9

The petroleum futures markets are increasing in prominence and may have a significant influence on such operating decisions as refinery runs, pipeline movements, and inventory management. This questionnaire attempts to ascertain the possible impact of futures markets on inventories.

8. Other Instructions

a. Disregard those questionnaires in the survey booklet that are not applicable to your company's operations, but return the booklet intact.

b. Complete the cover page, leaving the code line blank, and send the completed questionnaire in the envelope provided by July 8, 1983, to:

Price Waterhouse
OGS, Suite 701
1801 K Street, N.W.
Washington, D.C. 20006

c. Any questions regarding this questionnaire should be addressed to:

Joan Walsh Cassedy
Committee Coordinator
National Petroleum Council
1625 K Street, N.W.
Washington, D.C. 20006
(202) 393-6100

An extra copy of this questionnaire is enclosed for your convenience.

Line 1. Total Inventory Reported to the Department of Energy

For crude oil, aggregate by PADD the inventories you report on Forms EIA-810 and EIA-813 as of March 31, 1983, except Alaskan crude oil in transit by water (Product Code 092 on Form EIA-813), which should **not** be included in this line entry.

For refined products, aggregate by PADD (sub-PADD in PADD I) the inventories you report on Forms EIA-810, 811, and 812 as of March 31, 1983, and the counterpart forms that were in use on September 30, 1982. Do **not** report data for U.S. territories and possessions.

Line 2. Minimum Operating Inventory

Data related to minimum operating inventory should be reported using your best estimates. These estimates should be on a custody basis and, therefore, **consistent with the number you report as actual inventory.** Do not include Alaskan crude oil in transit by water in your minimum operating inventory estimates. Data relating to minimum operating inventory are to be reported on a "system basis" for each product; that is, only in columns labeled Total PADDS I–IV, PADD V, and Total U.S., as specified on each questionnaire.

Runouts and shortages are likely to occur if inventory falls below the minimum operating level. This inventory is not available for consumer use because it is either "unavailable" or "required working" inventory.

"Unavailable" inventory includes:

— Pipeline fill (Line 7)
— Refinery lines and operating equipment fill (Line 8)
— Oil in transit by water from domestic sources (ex Alaska) (Line 9)
— Tank bottoms (Line 11)
— Plant fuel and pipeline prime mover fuel (Line 12)
— Lease stocks (Line 13)
— Alaskan crude oil in transit (Line 15).

"Required working" inventory includes stocks necessary to:

— Facilitate blending to meet product specifications
— Support the normal operating cycle of shipments/receipts (e.g., pipeline tenders)
— Handle unavoidable but recurring emergencies (e.g., pipeline failure, extreme weather conditions that affect waterborne movements).

The minimum operating inventory for a single company is a function of numerous factors, including the location of both its supply and demand, the current level of demand, the availability of transportation and refining facilities (e.g., refinery closures), the modes of transportation available (e.g., pipeline transportation cycles), the location of tankage (e.g., bulk terminal closures), and the cost of capital.

Line 3. Difference (Line 1 Minus Line 2) or Total Inventory Minus Minimum Operating Inventory

A positive difference would indicate that you had oil in storage above that needed to meet minimum operating requirements. A negative difference would indicate that you were below the minimum level and, hence, incurring operating problems. This difference may be zero, indicating that actual inventory was the amount needed to meet minimum operating needs.

Positive differences should be accounted for in Lines 4, 5, and 6, below.

Line 4. Seasonal Inventory

The amount on Line 3 that is seasonal inventory; that is, inventory that is not immediately needed to support current demand levels, but is maintained in anticipation of higher (seasonal) demand levels that cannot be met with then-current manufacturing or transportation capabilities. Seasonal inventories need not be stored in swing tankage.

Line 5. In Anticipation of Planned Maintenance

The various functions performed within the supply system extensively utilize sophisticated mechanical equipment. Such equipment must be refurbished regularly. Accordingly, companies generally plan for and manage stock levels in order to ensure continued supply to meet demand while equipment is under maintenance. Respondents should enter the amount of any stocks so dedicated as of the reporting dates for the various products.

Line 6. Normal Operating Inventory

The inventory considered by your company to be held as part of the normal operating inventory, either due to specific operating directives or changes in demand, production, or facilities. This inventory has not been allowed for in your minimum operating inventory (Line 2).

Line 7. Pipeline Fill

Inventory located between the shipping and receiving tanks on a pipeline system.

Line 8. Refinery Lines and Operating Equipment Fill

Inventory within the refinery lines and operating equipment (excluding tanks) that is required for the refinery processing system to function normally.

Line 9. In Transit by Water from Domestic Sources (Excluding Crude Oil from Alaska), Including Domesticized Foreign Oils in Transit

Include all stocks reported on Line 1 that were in transit by water to bulk terminals and refineries, excluding crude oil in transit by water from Alaska reported on Form EIA-813. Include stocks of domestic origin, and stocks of foreign origin that have entered through U.S. Customs—i.e., domesticized foreign oils.

In-transit inventory should only be reported in the same amounts and on the same basis as reported to DOE.

Line 10. Subtotal: Unavailable Inventory Outside of Tankage

This line is the sum of the data on Lines 7, 8, and 9.

Line 11. Tank Bottoms

Inventory that falls below the normal suction line of the tank. For floating roof tanks, the amount required to keep the legs of the roof from touching the tank bottom.

Line 12. Plant Fuel and Pipeline Prime Mover Fuel

Stocks set aside as plant fuel or pipeline prime mover fuel.

Line 13. Lease Stocks (Complete on Questionnaire 1 Only)

Include all lease stocks reported on Line 1 (Product Code 057 on Form EIA-813).

Line 14. Total

This line is the sum of the data on Lines 10, 11, 12, and 13.

Line 15. Alaskan Crude Oil In Transit by Water (Complete on Questionnaire 1 Only)

Include all stocks of Alaskan crude oil in transit by water that you reported to DOE on Form EIA-813 (Product Code 092) as of March 31, 1983. These stocks are not to be included in Lines 1, 2, and 21 (see line item instructions for Lines 1, 2, and 21).

Although Form EIA-813 requests this information on a U.S. basis only, please report on this line not only the amount reported to EIA for the Total U.S., but also your best estimate of the intended destination, differentiating between PADDs I-IV and PADD V.

Please include in your estimate for PADDs I-IV the volume of Alaskan crude oil in transit to Puerto Rico and the Virgin Islands, and in your estimate for PADD V the volume in transit to the Hawaiian Foreign Trade Zone and Guam.

Line 16. Shell Capacity of Tankage in Operation

The design capacity of operating tanks located at refineries, bulk terminals, pipeline tank farms, and producer leases. Include capacity of swing tankage; ensure that swing tankage is included in only one product or crude oil category for each date. Tankage that was idle—for reasons other than programmed maintenance with plans for immediate return to service—on September 30, 1982, and/or March 31, 1983 (in the case of refined products) or March 31, 1983 (in the case of crude oil) should not be reported on this line.

Line 17. Tank Tops and Safety Allowance

The portion of the shell capacity at the top of the tank that is not utilized for oil storage. This includes the safety allowance that is needed to protect personnel and property from damage that could result from thermal expansion and/or overfilling the tanks.

Line 18. Subtotal: Net Available Shell Capacity

This line is the difference between Lines 16 and 17.

Line 19. Unavailable Inventory Outside of Tankage

Repeat the data that were reported on Line 10. **Do not** include the data reported on Line 15, which will be handled separately by the NPC.

Line 20. Total Operating System Capacity

This line is the sum of Lines 18 and 19.

Line 21. Maximum Operating Inventory

Report your best estimates of your maximum operating inventory. These estimates should be on a custody basis and, therefore, **consistent with the number you report as actual inventory.** Do not include Alaskan crude oil in transit by water in your maximum operating inventory estimates. Report maximum operating inventory on a "system basis" for each product; that is, only in columns labeled Total PADDs I-IV, PADD V, and Total U.S., as specified on each questionnaire.

If inventory were to go above this level, there would not be enough empty space in the system to allow it to keep operating without a slowdown or interruption in the system. Space above this level is not available for storage because it is needed to maintain a workable operating system.

The maximum operating inventory represents the maximum quantity that could be stored in the assigned tankage and in other parts of the system such as pipelines, refinery lines, or in transit (unavailable inventory outside of tankage, Line 10) while still maintaining a workable operating system.

Line 22. Shell Capacity of Idle Tankage

The design capacity of tankage that was idle on March 31, 1983, for reasons other than programmed maintenance with plans for immediate return to service (included in Line 16). Line 22 tankage would be available for service within 90 days following little or no maintenance work (for example, cleaning, painting), and within existing environmental constraints.

Capacity should be reported in the same service as at the time of idling.

Line 23. Shell Capacity of Idle Tankage (Environmentally Restricted)

The design capacity of tankage that was idle on March 31, 1983, and would require environmental waiver or modification to be available for service within 90 days. Capacity should be reported in the same service as at the time of idling.

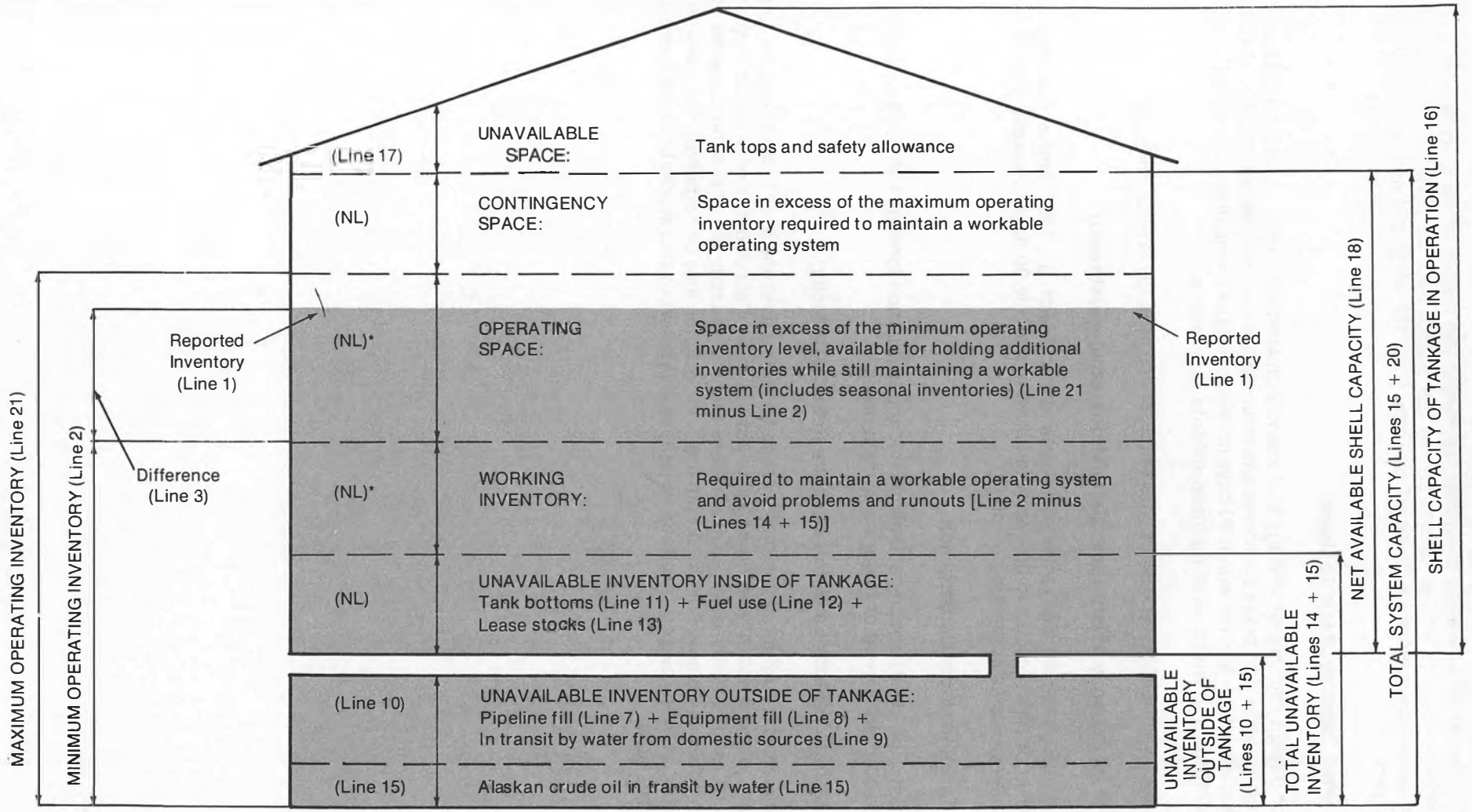
Line 24. Tankage Under Construction

The design shell capacity of tankage under construction (ground has been broken and the construction contract signed or major equipment ordered).

Line 25. Change in Stock Level Due to Spare Refining Capacity

Estimate the additional volume of seasonal stocks (see line item instructions for Line 4) that would be required if spare refining capacity did not exist. Respondents who do not adjust their seasonal stock requirements as a result of spare refining capacity are requested to **enter zero rather than leave this line blank.** For Questionnaire 1, this volume may be negative [indicate with ( )] for refiners who have increased crude oil stocks relative to refined product stocks because spare refining capacity is available.

SCHEMATIC OF TERMS DESCRIBING PETROLEUM INVENTORIES AND STORAGE CAPACITIES REQUESTED IN NPC QUESTIONNAIRES 1–7



*NL: No line referenced in the questionnaires

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

CRUDE OIL

QUESTIONNAIRE NO. 1

As of March 31, 1983
(Report All Figures in **Thousands of Barrels**)

DESCRIPTION	(1) PADD I	(2) PADD II	(3) PADD III	(4) PADD IV	(5) Total PADDS I-IV	(6) PADD V	(7) Total U.S.
(Deal only with those end-of-the-month stocks reported to the Department of Energy on Forms EIA-810 and EIA-813).	(1,000 bbl)	(1,000 bbl)	(1,000 bbl)	(1,000 bbl)	(1,000 bbl)	(1,000 bbl)	(1,000 bbl)
A. CRUDE OIL INVENTORY							
1. Total inventory reported to the Department of Energy							
2. Minimum operating inventory							
3. Difference (Line 1 minus 2)							
If not zero, estimate what volume was:							
4. Seasonal inventory							
5. In anticipation of planned maintenance							
6. Normal operating inventory							
Memo Item: Unavailable inventory							
7. Pipeline fill							
8. Refinery lines and operating equipment fill							
9. Oil in transit by water from domestic sources (ex Alaska)							
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)							
11. Tank bottoms							
12. Plant fuel and pipeline prime mover fuel							
13. Lease stocks							
14. Total (Lines 10, 11, 12, and 13)							
15. Alaskan crude oil in transit by water							
B. STORAGE CAPACITY ASSIGNED TO CRUDE OIL							
16. Shell capacity of tankage in operation							
17. Tank tops and safety allowance							
18. Subtotal: Net available shell capacity (Line 16 minus 17)							
19. Unavailable inventory outside of tankage (from Line 10 above)							
20. Total operating system capacity (Lines 18 and 19)							
21. Maximum operating inventory							
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY							
22. Shell capacity of idle tankage							
23. Shell capacity of idle tankage (environmentally restricted)							
24. Tankage under construction							
D. OTHER							
25. Change in stock level due to spare refining capacity							

Code: _____
(Price Waterhouse Use Only)

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

MOTOR GASOLINE, INCLUDING BLENDING COMPONENTS

QUESTIONNAIRE NO. 2

As of September 30, 1982, and March 31, 1983
(Report All Figures in **Thousands of Barrels**)

DESCRIPTION	(1) PADD IA		(2) PADD IB		(3) PADD IC		(4) PADD II	
(Deal only with those end-of-the-month stocks reported to the Department of Energy on Forms EIA-810, EIA-811, and EIA-812).	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)
A. MOTOR GASOLINE INVENTORY, INCLUDING BLENDING COMPONENTS								
1. Total inventory reported to the Department of Energy								
2. Minimum operating inventory								
3. Difference (Line 1 minus 2)								
If not zero, estimate what volume was:								
4. Seasonal inventory								
5. In anticipation of planned maintenance								
6. Normal operating inventory								
Memo Item: Unavailable inventory								
7. Pipeline fill								
8. Refinery lines and operating equipment fill								
9. Oil in transit by water from domestic sources (ex Alaska)								
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)								
11. Tank bottoms								
12. Plant fuel and pipeline prime mover fuel								
13. Lease stocks								
14. Total (Lines 10, 11, 12, and 13)								
15. Alaskan crude oil in transit by water								
B. STORAGE CAPACITY ASSIGNED TO MOTOR GASOLINE, INCLUDING BLENDING COMPONENTS								
16. Shell capacity of tankage in operation								
17. Tank tops and safety allowance								
18. Subtotal: Net available shell capacity (Line 16 minus 17)								
19. Unavailable inventory outside of tankage (from Line 10 above)								
20. Total operating system capacity (Lines 18 and 19)								
21. Maximum operating inventory								
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY								
22. Shell capacity of idle tankage								
23. Shell capacity of idle tankage (environmentally restricted)								
24. Tankage under construction								
D. OTHER								
25. Change in stock level due to spare refining capacity								

Code: _____
(Price Waterhouse Use Only)

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

MOTOR GASOLINE, INCLUDING BLENDING COMPONENTS

QUESTIONNAIRE NO. 2

As of September 30, 1982, and March 31, 1983
(Report All Figures in **Thousands of Barrels**)

DESCRIPTION	(5) PADD III		(6) PADD IV		(7) Total PADDS I-IV		(8) PADD V	
(Deal only with those end-of-the-month stocks reported to the Department of Energy on Forms EIA-810, EIA-811, and EIA-812).	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)
A. MOTOR GASOLINE INVENTORY, INCLUDING BLENDING COMPONENTS								
1. Total inventory reported to the Department of Energy								
2. Minimum operating inventory								
3. Difference (Line 1 minus 2)								
If not zero, estimate what volume was:								
4. Seasonal inventory								
5. In anticipation of planned maintenance								
6. Normal operating inventory								
Memo Item: Unavailable inventory								
7. Pipeline fill								
8. Refinery lines and operating equipment fill								
9. Oil in transit by water from domestic sources (ex Alaska)								
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)								
11. Tank bottoms								
12. Plant fuel and pipeline prime mover fuel								
13. Lease stocks								
14. Total (Lines 10, 11, 12, and 13)								
15. Alaskan crude oil in transit by water								
B. STORAGE CAPACITY ASSIGNED TO MOTOR GASOLINE, INCLUDING BLENDING COMPONENTS								
16. Shell capacity of tankage in operation								
17. Tank tops and safety allowance								
18. Subtotal: Net available shell capacity (Line 16 minus 17)								
19. Unavailable inventory outside of tankage (from Line 10 above)								
20. Total operating system capacity (Lines 18 and 19)								
21. Maximum operating inventory								
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY								
22. Shell capacity of idle tankage								
23. Shell capacity of idle tankage (environmentally restricted)								
24. Tankage under construction								
D. OTHER								
25. Change in stock level due to spare refining capacity								

Code: _____
(Price Waterhouse Use Only)

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM STORAGE CAPACITIES AND INVENTORY AVAILABILITY IN THE UNITED STATES

KEROSINE

QUESTIONNAIRE NO. 3

As of September 30, 1982, and March 31, 1983
(Report All Figures in **Thousands of Barrels**)

DESCRIPTION	(1) PADD IA		(2) PADD IB		(3) PADD IC		(4) PADD II	
(Deal only with those end-of-the-month stocks reported to the Department of Energy on Forms EIA-810, EIA-811, and EIA-812).	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)
A. KEROSINE INVENTORY								
1. Total inventory reported to the Department of Energy								
2. Minimum operating inventory								
3. Difference (Line 1 minus 2)								
If not zero, estimate what volume was:								
4. Seasonal inventory								
5. In anticipation of planned maintenance								
6. Normal operating inventory								
Memo Item: Unavailable inventory								
7. Pipeline fill								
8. Refinery lines and operating equipment fill								
9. Oil in transit by water from domestic sources (ex Alaska)								
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)								
11. Tank bottoms								
12. Plant fuel and pipeline prime mover fuel								
13. Lease stocks								
14. Total (Lines 10, 11, 12, and 13)								
15. Alaskan crude oil in transit by water								
B. STORAGE CAPACITY ASSIGNED TO KEROSINE								
16. Shell capacity of tankage in operation								
17. Tank tops and safety allowance								
18. Subtotal: Net available shell capacity (Line 16 minus 17)								
19. Unavailable inventory outside of tankage (from Line 10 above)								
20. Total operating system capacity (Lines 18 and 19)								
21. Maximum operating inventory								
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY								
22. Shell capacity of idle tankage								
23. Shell capacity of idle tankage (environmentally restricted)								
24. Tankage under construction								
D. OTHER								
25. Change in stock level due to spare refining capacity								

Code: _____
(Price Waterhouse Use Only)

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM STORAGE CAPACITY AND INVENTORY AVAILABILITY IN THE UNITED STATES

KEROSINE

QUESTIONNAIRE NO. 3

As of September 30, 1982, and March 31, 1983
(Report All Figures in **Thousands of Barrels**)

DESCRIPTION	(5) PADD III		(6) PADD IV		(7) Total PADDS I-IV		(8) PADD V	
(Deal only with those end-of-the-month stocks reported to the Department of Energy on Forms EIA-810, EIA-811, and EIA-812).	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)
A. KEROSINE INVENTORY								
1. Total inventory reported to the Department of Energy								
2. Minimum operating inventory								
3. Difference (Line 1 minus 2)								
If not zero, estimate what volume was:								
4. Seasonal inventory								
5. In anticipation of planned maintenance								
6. Normal operating inventory								
Memo Item: Unavailable inventory								
7. Pipeline fill								
8. Refinery lines and operating equipment fill								
9. Oil in transit by water from domestic sources (ex Alaska)								
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)								
11. Tank bottoms								
12. Plant fuel and pipeline prime mover fuel								
13. Lease stocks								
14. Total (Lines 10, 11, 12, and 13)								
15. Alaskan crude oil in transit by water								
B. STORAGE CAPACITY ASSIGNED TO KEROSINE								
16. Shell capacity of tankage in operation								
17. Tank tops and safety allowance								
18. Subtotal: Net available shell capacity (Line 16 minus 17)								
19. Unavailable inventory outside of tankage (from Line 10 above)								
20. Total operating system capacity (Lines 18 and 19)								
21. Maximum operating inventory								
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY								
22. Shell capacity of idle tankage								
23. Shell capacity of idle tankage (environmentally restricted)								
24. Tankage under construction								
D. OTHER								
25. Change in stock level due to spare refining capacity								

Code: _____
(Price Waterhouse Use Only)

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

KEROSINE-TYPE JET FUEL

QUESTIONNAIRE NO. 4

As of September 30, 1982, and March 31, 1983
(Report All Figures in **Thousands of Barrels**)

DESCRIPTION	(1) PADD IA		(2) PADD IB		(3) PADD IC		(4) PADD II	
(Deal only with those end-of-the-month stocks reported to the Department of Energy on Forms EIA-810, EIA-811, and EIA-812).	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)
A. KEROSINE-TYPE JET FUEL INVENTORY								
1. Total inventory reported to the Department of Energy								
2. Minimum operating inventory								
3. Difference (Line 1 minus 2)								
If not zero, estimate what volume was:								
4. Seasonal inventory								
5. In anticipation of planned maintenance								
6. Normal operating inventory								
Memo Item: Unavailable inventory								
7. Pipeline fill								
8. Refinery lines and operating equipment fill								
9. Oil in transit by water from domestic sources (ex Alaska)								
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)								
11. Tank bottoms								
12. Plant fuel and pipeline prime mover fuel								
13. Lease stocks								
14. Total (Lines 10, 11, 12, and 13)								
15. Alaskan crude oil in transit by water								
B. STORAGE CAPACITY ASSIGNED TO KEROSINE-TYPE JET FUEL								
16. Shell capacity of tankage in operation								
17. Tank tops and safety allowance								
18. Subtotal: Net available shell capacity (Line 16 minus 17)								
19. Unavailable inventory outside of tankage (from Line 10 above)								
20. Total operating system capacity (Lines 18 and 19)								
21. Maximum operating inventory								
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY								
22. Shell capacity of idle tankage								
23. Shell capacity of idle tankage (environmentally restricted)								
24. Tankage under construction								
D. OTHER								
25. Change in stock level due to spare refining capacity								

Code: _____
(Price Waterhouse Use Only)

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

KEROSINE-TYPE JET FUEL

QUESTIONNAIRE NO. 4

As of September 30, 1982, and March 31, 1983
(Report All Figures in **Thousands of Barrels**)

DESCRIPTION	(5) PADD III		(6) PADD IV		(7) PADDS I-IV		(8) PADD V	
(Deal only with those end-of-the-month stocks reported to the Department of Energy on Forms EIA-810, EIA-811, and EIA-812).	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)
A. KEROSINE-TYPE JET FUEL INVENTORY								
1. Total inventory reported to the Department of Energy								
2. Minimum operating inventory								
3. Difference (Line 1 minus 2)								
If not zero, estimate what volume was:								
4. Seasonal inventory								
5. In anticipation of planned maintenance								
6. Normal operating inventory								
Memo Item: Unavailable inventory								
7. Pipeline fill								
8. Refinery lines and operating equipment fill								
9. Oil in transit by water from domestic sources (ex Alaska)								
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)								
11. Tank bottoms								
12. Plant fuel and pipeline prime mover fuel								
13. Lease stocks								
14. Total (Lines 10, 11, 12, and 13)								
15. Alaskan crude oil in transit by water								
B. STORAGE CAPACITY ASSIGNED TO KEROSINE-TYPE JET FUEL								
16. Shell capacity of tankage in operation								
17. Tank tops and safety allowance								
18. Subtotal: Net available shell capacity (Line 16 minus 17)								
19. Unavailable inventory outside of tankage (from Line 10 above)								
20. Total operating system capacity (Lines 18 and 19)								
21. Maximum operating inventory								
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY								
22. Shell capacity of idle tankage								
23. Shell capacity of idle tankage (environmentally restricted)								
24. Tankage under construction								
D. OTHER								
25. Change in stock level due to spare refining capacity								

Code: _____
(Price Waterhouse Use Only)

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

DISTILLATE FUEL OIL, INCLUDING NO. 4 FUEL OIL

QUESTIONNAIRE NO. 5

As of September 30, 1982, and March 31, 1983
(Report All Figures in **Thousands of Barrels**)

DESCRIPTION	(1) PADD IA		(2) PADD IB		(3) PADD IC		(4) PADD II	
(Deal only with those end-of-the-month stocks reported to the Department of Energy on Forms EIA-810, EIA-811, and EIA-812).	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)
A. DISTILLATE FUEL OIL INVENTORY								
1. Total inventory reported to the Department of Energy								
2. Minimum operating inventory								
3. Difference (Line 1 minus 2)								
If not zero, estimate what volume was:								
4. Seasonal inventory								
5. In anticipation of planned maintenance								
6. Normal operating inventory								
Memo Item: Unavailable inventory								
7. Pipeline fill								
8. Refinery lines and operating equipment fill								
9. Oil in transit by water from domestic sources (ex Alaska)								
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)								
11. Tank bottoms								
12. Plant fuel and pipeline prime mover fuel								
13. Lease stocks								
14. Total (Lines 10, 11, 12, and 13)								
15. Alaskan crude oil in transit by water								
B. STORAGE CAPACITY ASSIGNED TO DISTILLATE FUEL OIL								
16. Shell capacity of tankage in operation								
17. Tank tops and safety allowance								
18. Subtotal: Net available shell capacity (Line 16 minus 17)								
19. Unavailable inventory outside of tankage (from Line 10 above)								
20. Total operating system capacity (Lines 18 and 19)								
21. Maximum operating inventory								
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY								
22. Shell capacity of idle tankage								
23. Shell capacity of idle tankage (environmentally restricted)								
24. Tankage under construction								
D. OTHER								
25. Change in stock level due to spare refining capacity								

Code: _____
(Price Waterhouse Use Only)

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

DISTILLATE FUEL OIL, INCLUDING NO. 4 FUEL OIL

QUESTIONNAIRE NO. 5

As of September 30, 1982, and March 31, 1983
(Report All Figures in **Thousands of Barrels**)

DESCRIPTION	(5) PADD III		(6) PADD IV		(7) PADDS I-IV		(8) PADD V	
(Deal only with those end-of-the-month stocks reported to the Department of Energy on Forms EIA-810, EIA-811, and EIA-812).	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)
A. DISTILLATE FUEL OIL INVENTORY								
1. Total inventory reported to the Department of Energy								
2. Minimum operating inventory								
3. Difference (Line 1 minus 2)								
If not zero, estimate what volume was:								
4. Seasonal inventory								
5. In anticipation of planned maintenance								
6. Normal operating inventory								
Memo Item: Unavailable inventory								
7. Pipeline fill								
8. Refinery lines and operating equipment fill								
9. Oil in transit by water from domestic sources (ex Alaska)								
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)								
11. Tank bottoms								
12. Plant fuel and pipeline prime mover fuel								
13. Lease stocks								
14. Total (Lines 10, 11, 12, and 13)								
15. Alaskan crude oil in transit by water								
B. STORAGE CAPACITY ASSIGNED TO DISTILLATE FUEL OIL								
16. Shell capacity of tankage in operation								
17. Tank tops and safety allowance								
18. Subtotal: Net available shell capacity (Line 16 minus 17)								
19. Unavailable inventory outside of tankage (from Line 10 above)								
20. Total operating system capacity (Lines 18 and 19)								
21. Maximum operating inventory								
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY								
22. Shell capacity of idle tankage								
23. Shell capacity of idle tankage (environmentally restricted)								
24. Tankage under construction								
D. OTHER								
25. Change in stock level due to spare refining capacity								

Code: _____
(Price Waterhouse Use Only)

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

RESIDUAL FUEL OIL

QUESTIONNAIRE NO. 6

As of September 30, 1982, and March 31, 1983
(Report All Figures in **Thousands of Barrels**)

DESCRIPTION	(1) PADD IA		(2) PADD IB		(3) PADD IC		(4) PADD II	
(Deal only with those end-of-the-month stocks reported to the Department of Energy on Forms EIA-810, EIA-811, and EIA-812).	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)
A. RESIDUAL FUEL OIL INVENTORY								
1. Total inventory reported to the Department of Energy								
2. Minimum operating inventory								
3. Difference (Line 1 minus 2)								
If not zero, estimate what volume was:								
4. Seasonal inventory								
5. In anticipation of planned maintenance								
6. Normal operating inventory								
Memo Item: Unavailable inventory								
7. Pipeline fill								
8. Refinery lines and operating equipment fill								
9. Oil in transit by water from domestic sources (ex Alaska)								
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)								
11. Tank bottoms								
12. Plant fuel and pipeline prime mover fuel								
13. Lease stocks								
14. Total (Lines 10, 11, 12, and 13)								
15. Alaskan crude oil in transit by water								
B. STORAGE CAPACITY ASSIGNED TO RESIDUAL FUEL OIL								
16. Shell capacity of tankage in operation								
17. Tank tops and safety allowance								
18. Subtotal: Net available shell capacity (Line 16 minus 17)								
19. Unavailable inventory outside of tankage (from Line 10 above)								
20. Total operating system capacity (Lines 18 and 19)								
21. Maximum operating inventory								
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY								
22. Shell capacity of idle tankage								
23. Shell capacity of idle tankage (environmentally restricted)								
24. Tankage under construction								
D. OTHER								
25. Change in stock level due to spare refining capacity								

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

RESIDUAL FUEL OIL

QUESTIONNAIRE NO. 6

As of September 30, 1982, and March 31, 1983
(Report All Figures in **Thousands of Barrels**)

DESCRIPTION	(5) PADD III		(6) PADD IV		(7) PADDS I-IV		(8) PADD V	
(Deal only with those end-of-the-month stocks reported to the Department of Energy on Forms EIA-810, EIA-811, and EIA-812).	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)	Sept. 30 (1,000 bbl)	Mar. 31 (1,000 bbl)
A. RESIDUAL FUEL OIL INVENTORY								
1. Total inventory reported to the Department of Energy								
2. Minimum operating inventory								
3. Difference (Line 1 minus 2)								
If not zero, estimate what volume was:								
4. Seasonal inventory								
5. In anticipation of planned maintenance								
6. Normal operating inventory								
Memo Item: Unavailable inventory								
7. Pipeline fill								
8. Refinery lines and operating equipment fill								
9. Oil in transit by water from domestic sources (ex Alaska)								
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)								
11. Tank bottoms								
12. Plant fuel and pipeline prime mover fuel								
13. Lease stocks								
14. Total (Lines 10, 11, 12, and 13)								
15. Alaskan crude oil in transit by water								
B. STORAGE CAPACITY ASSIGNED TO RESIDUAL FUEL OIL								
16. Shell capacity of tankage in operation								
17. Tank tops and safety allowance								
18. Subtotal: Net available shell capacity (Line 16 minus 17)								
19. Unavailable inventory outside of tankage (from Line 10 above)								
20. Total operating system capacity (Lines 18 and 19)								
21. Maximum operating inventory								
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY								
22. Shell capacity of idle tankage								
23. Shell capacity of idle tankage (environmentally restricted)								
24. Tankage under construction								
D. OTHER								
25. Change in stock level due to spare refining capacity								

Code: _____
(Price Waterhouse Use Only)

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

QUESTIONNAIRE 7

ESTIMATED MINIMUM AND MAXIMUM OPERATING INVENTORIES FOR THE ENTIRE U.S. PETROLEUM INDUSTRY

Complete this questionnaire only if your company analyzes industry inventory levels. (See NOTE, below.)

As of September 30, 1982, and March 31, 1983
(Report All Figures in **Thousands of Barrels**)

	Estimated Operating Inventories for the Entire U.S. Petroleum Industry											
	Minimum (1,000 bbl)						Maximum (1,000 bbl)					
	September 30, 1982			March 31, 1983			September 30, 1982			March 31, 1983		
	PADDS I-IV	PADD V	TOTAL U.S.	PADDS I-IV	PADD V	TOTAL U.S.	PADDS I-IV	PADD V	TOTAL U.S.	PADDS I-IV	PADD V	TOTAL U.S.
1. Crude oil												
2. Motor gasoline, including blending components												
3. Kerosine												
Kerosine-type jet fuel												
Total												
4. Distillate fuel oil, including No. 4 fuel oil												
5. Residual fuel oil												
6. Naphtha-type jet fuel												

NOTE: It is possible that the sum of the companies' assessments of their own minimum and maximum operating inventories (Lines 2 and 21 on Questionnaires 1–6) will not accurately reflect the entire petroleum industry's minimum or maximum operating inventory. If your company analyzes industry levels, provide your estimate of the minimum and maximum operating inventories of the U.S. petroleum industry. Enter estimates for PADDS I-IV, PADD V, and Total U.S. If your company does not have certain of the estimates requested in this questionnaire, leave those sections blank. If your company only performs this analysis for Total U.S., complete only those columns.

Code: _____
(Price Waterhouse Use Only)

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

As of March 31, 1983
(Report All Figures in **Thousands of Barrels**)

SECTION 1. NAPHTHA-TYPE JET FUEL

	(1) Normally Dedicated Stocks in Storage	(2) Stocks Which Could Have Been Dedicated
PART A. STOCKS		
PADD IA		
PADD IB		
PADD IC		
PADD II		
PADD III		
PADD IV		
PADD V		

PART B. MINIMUM OPERATING INVENTORY	
PADDS I-IV	
PADD V	
PART C. DESIGN CAPACITY	
PADDS I-IV	
PADD V	

Report in PART A, Column 1, stocks previously reported to DOE. This should include both specification product and any components dedicated as of March 31, 1983, and reported as naphtha-type jet fuel to DOE. (See line item instructions for Line 1 for Questionnaires 1–6). Include in Column 2 any inventory on hand (including line fill) as of March 31, 1983, categorized as unfinished oils, blending components, special naphthas, naphtha less than 400°F end-point (see DOE Form EIA-810) which your company could have made available (stocks which could have been dedicated from other products) immediately for use as naphtha-type jet fuel and not reported in Column 1. Amounts entered represent product which would meet specification with little or no processing other than mechanical blending. Do not include stocks if facility management processes (i.e., cleaning tankage) would have been required prior to your company's being able to make the product available.

Report in PART B the amount calculated in accordance with line item instructions for Line 2 for Questionnaires 1–6.

Report in PART C the design capacity normally dedicated to production, distribution, and storage of naphtha-type jet fuel consistent with Lines 18–20 in Questionnaires 1–6.

SECTION II. IMPACT OF THE STRATEGIC PETROLEUM RESERVE ON PRIVATE INVENTORY LEVELS

Total industry inventories of refined products and crude oil are currently below historical levels. Has the existence of the Strategic Petroleum Reserve contributed to a decrease in your inventories? If yes, please provide an estimate of the amount, expressed as a percentage of your total crude oil stocks as of March 31, 1983 (Questionnaire 1, Column 7).

Yes ____—____% No ____

If no, please provide your company's principal reasons:

_____

_____

_____

_____

Code: _____
(Price Waterhouse Use Only)

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

PETROLEUM FUTURES

The petroleum futures markets are increasing in prominence. Originally, non-oil futures markets (e.g., wheat, corn) were created as a hedge against price fluctuations. However, it appears that the petroleum futures markets may also have a significant influence on such operating decisions as refinery runs, pipeline movements, and inventory management. This questionnaire attempts to ascertain the possible impact of petroleum futures markets on U.S. inventories.

1) Has your firm traded in the petroleum futures markets?

_____ Yes
_____ No

If your answer is No, please go to Questions 4 and 5.

2) Which oil futures have you traded?

_____ #2 Fuel Oil/Gasoil
_____ Motor Gasoline
_____ Crude Oil

3) As a percentage of your March 31, 1983, inventories, what is the maximum open interest you have had in each commodity during the last 12 months?

#2 Fuel Oil _____% Motor Gasoline _____% Crude Oil _____%

How many contracts does this represent?

#2 Fuel Oil _____ Motor Gasoline _____ Crude Oil _____

4) If you have traded or anticipate trading in the petroleum futures market, which of the following best describes the reason? Please list in order of importance (1 through 7, with 1 being the principal reason).

_____ Physical Inventory
_____ Supplemental Outlet for Products
_____ Supplemental Source of Products
_____ Potential Profits Through Speculation
_____ Hedge Against Price Fluctuations
_____ Additional Flexibility
_____ Other

5) Has there been or do you visualize a change in your physical inventory policy or physical inventory levels due to the presence of the petroleum futures markets?

_____ Yes
_____ No

Code: _____
(Price Waterhouse Use Only)

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

CRUDE OIL

As of March 31, 1983
(Thousands of Barrels)

INVENTORY AND STORAGE CAPACITY	PADD I	PADD II	PADD III	PADD IV	Total PADDs I-IV	PADD V	Total U.S. NPC Total	Total U.S. Adjusted NPC Total
A. CRUDE OIL INVENTORY								
1. Total inventory reported by DOE	15,911	81,795	146,771	16,875	261,352	55,541	316,893	***
a. Total inventory reported to NPC	13,993	76,199	133,752	14,819	238,763	51,989	290,752	316,893
b. Percentage of line one	87.6	93.2	91.1	87.8	91.4	93.6	91.8	***
2. Minimum operating inventory					170,794	34,331	205,125	223,448
3. Difference (Line 1 minus 2)					67,969	17,658	85,627	93,275
If not zero, estimate what volume was:								
4. Seasonal inventory					783	10	793	864
5. In anticipation of planned maintenance					130	667	797	868
6. Normal operating inventory					67,056	16,628	83,684	91,159
Memo Item: Unavailable inventory								
7. Pipeline fill	110	26,177	38,064	4,174	68,525	12,404	80,929	***
8. Refinery lines and operating equipment fill	169	307	618	34	1,128	192	1,320	***
9. Oil in transit by water from domestic sources (ex Alaska)	125	424	580	0	1,129	590	1,719	***
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)	404	26,908	39,262	4,208	70,782	13,186	83,968	91,468
11. Tank bottoms	2,677	9,242	20,333	1,422	33,674	7,632	41,306	***
12. Plant fuel and pipeline prime mover fuel	5	0	0	9	14	32	46	***
13. Lease stocks	32	2,330	6,352	866	9,580	1,457	11,037	***
14. Total (Lines 10, 11, 12, and 13)	3,118	38,480	65,947	6,505	114,050	22,307	136,357	148,537
15. Alaskan crude oil in transit by water					25,114	6,052	31,166	30,631**
B. STORAGE CAPACITY ASSIGNED TO CRUDE OIL								
16. Shell capacity of tankage in operation	26,731	99,996	228,430	19,450	374,607	88,256	462,863	504,208
17. Tank tops and safety allowance	1,797	6,339	19,414	970	28,520	6,503	35,023	38,151
18. Subtotal: Net available shell capacity (Line 16 minus 17)	24,934	93,657	209,016	18,480	346,087	81,753	427,840	466,057
19. Unavailable inventory outside of tankage (from Line 10 above)	404	26,908	39,262	4,208	70,782	13,186	83,968	91,468
20. Total operating system capacity (Lines 18 and 19)	25,338	120,565	248,278	22,688	416,869	94,939	511,808	557,525
21. Maximum operating inventory					354,872	70,908	425,780	463,813*
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY								
22. Shell capacity of idle tankage	77	4,368	5,547	39	10,031	1,642	11,673	12,716
23. Shell capacity of idle tankage (environmentally restricted)	0	221	1,544	0	1,765	1,311	3,076	3,351
24. Tankage under construction	0	281	8,202	48	8,531	779	9,310	10,142
D. OTHER								
25. Change in stock level due to spare refining capacity					1,116	0	1,116	***

* Excludes Alaskan crude oil in transit, see line 15.
** As reported to EIA.
*** Not applicable.

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

MOTOR GASOLINE, INCLUDING BLENDING COMPONENTS

As of September 30, 1982
(Thousands of Barrels)

INVENTORY AND STORAGE CAPACITY	PADD IA	PADD IB	PADD IC	Total PADD I	PADD II	PADD III	PADD IV	Total PADDs I-IV	PADD V	Total U.S. NPC Total	Total U.S. Adjusted NPC Total
A. MOTOR GASOLINE INVENTORY, INCLUDING BLENDING COMPONENTS											
1. Total inventory reported by DOE				63,461	69,288	67,451	5,718	205,918	27,704	233,622	***
a. Total inventory reported to NPC	4,958	25,892	23,684	54,534	58,466	58,061	4,936	175,997	27,822	203,819	233,622
b. Percentage of line one				85.9	85.6	86.1	86.3	85.5	100.4	87.2	***
2. Minimum operating inventory								134,167	20,202	154,369	177,029
3. Difference (Line 1 minus 2)								41,830	7,620	49,450	56,709
If not zero, estimate what volume was:											
4. Seasonal inventory								2,656	282	2,938	3,369
5. In anticipation of planned maintenance								2,528	0	2,528	2,899
6. Normal operating inventory								34,162	7,054	41,216	47,266
Memo Item: Unavailable inventory											
7. Pipeline fill	60	2,507	6,063	8,630	9,159	11,118	895	29,802	1,395	31,197	***
8. Refinery lines and operating equipment fill	0	72	29	101	149	279	33	562	227	789	***
9. Oil in transit by water from domestic sources (ex Alaska)	505	500	251	1,256	229	197	0	1,682	205	1,887	***
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)	565	3,079	6,343	9,987	9,537	11,594	928	32,046	1,827	33,873	38,845
11. Tank bottoms	710	3,907	2,049	6,666	8,084	8,796	829	24,375	4,792	29,167	***
12. Plant fuel and pipeline prime mover fuel	0	0	5	5	0	0	10	15	0	15	***
13. Lease stocks											
14. Total (Lines 10, 11, 12, and 13)	1,275	6,986	8,397	16,658	17,621	20,390	1,767	56,436	6,619	63,055	72,311
15. Alaskan crude oil in transit by water											
B. STORAGE CAPACITY ASSIGNED TO MOTOR GASOLINE, INCLUDING BLENDING COMPONENTS											
16. Shell capacity of tankage in operation	9,333	53,353	43,420	106,106	106,700	104,281	11,986	329,073	57,561	386,634	443,388
17. Tank tops and safety allowance	619	4,201	2,383	7,203	7,400	8,177	767	23,547	4,841	28,388	32,555
18. Subtotal: Net available shell capacity (Line 16 minus 17)	8,714	49,152	41,037	98,903	99,300	96,104	11,219	305,526	52,720	358,246	410,833
19. Unavailable inventory outside of tankage (from Line 10 above)	565	3,079	6,343	9,987	9,537	11,594	928	32,046	1,827	33,873	38,845
20. Total operating system capacity (Lines 18 and 19)	9,279	52,231	47,380	108,890	108,837	107,698	12,147	337,572	54,547	392,119	449,678
21. Maximum operating inventory								289,846	48,672	338,518	388,209
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY											
22. Shell capacity of idle tankage											
23. Shell capacity of idle tankage (environmentally restricted)											
24. Tankage under construction											
D. OTHER											
25. Change in stock level due to spare refining capacity								0	0	0	0

*** Not applicable.

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

MOTOR GASOLINE, INCLUDING BLENDING COMPONENTS

As of March 31, 1983
(Thousands of Barrels)

INVENTORY AND STORAGE CAPACITY	PADD IA	PADD IB	PADD IC	Total PADD I	PADD II	PADD III	PADD IV	Total PADDs I-IV	PADD V	Total U.S. NPC Total	Total U.S. Adjusted NPC Total
A. MOTOR GASOLINE INVENTORY, INCLUDING BLENDING COMPONENTS											
1. Total inventory reported by DOE				55,298	68,297	66,299	8,282	198,176	25,754	223,930	***
a. Total inventory reported to NPC	3,644	22,584	21,294	47,522	56,541	54,692	6,983	165,609	24,192	189,801	223,930
b. Percentage of line one				85.9	82.8	82.5	84.3	83.6	93.9	84.8	***
2. Minimum operating inventory								133,875	20,251	154,126	181,752
3. Difference (Line 1 minus 2)								31,734	3,941	35,675	42,070
If not zero, estimate what volume was:											
4. Seasonal inventory								2,710	318	3,028	3,571
5. In anticipation of planned maintenance								474	30	504	594
6. Normal operating inventory								25,915	3,593	29,508	34,797
Memo Item: Unavailable inventory											
7. Pipeline fill	78	2,138	6,971	9,187	10,265	10,121	875	30,448	1,177	31,625	***
8. Refinery lines and operating equipment fill	0	69	29	98	133	283	33	547	227	774	***
9. Oil in transit by water from domestic sources (ex Alaska)	296	814	304	1,414	445	236	0	2,095	339	2,434	***
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)	374	3,021	7,304	10,699	10,843	10,640	908	33,090	1,743	34,833	41,077
11. Tank bottoms	688	3,925	2,088	6,701	8,691	8,401	911	24,704	4,710	29,414	***
12. Plant fuel and pipeline prime mover fuel	0	0	5	5	0	0	10	15	0	15	***
13. Lease stocks											
14. Total (Lines 10, 11, 12, and 13)	1,062	6,946	9,397	17,405	19,534	19,041	1,829	57,809	6,453	64,262	75,781
15. Alaskan crude oil in transit by water											
B. STORAGE CAPACITY ASSIGNED TO MOTOR GASOLINE, INCLUDING BLENDING COMPONENTS											
16. Shell capacity of tankage in operation	9,044	53,364	43,844	106,252	107,918	104,781	12,048	330,999	57,404	388,403	458,022
17. Tank tops and safety allowance	608	4,238	2,416	7,262	7,537	8,281	767	23,847	4,875	28,722	33,870
18. Subtotal: Net available shell capacity (Line 16 minus 17)	8,436	49,126	41,428	98,990	100,381	96,500	11,281	307,152	52,529	359,681	424,152
19. Unavailable inventory outside of tankage (from Line 10 above)	374	3,021	7,304	10,699	10,843	10,640	908	33,090	1,743	34,833	41,077
20. Total operating system capacity (Lines 18 and 19)	9,910	52,147	48,732	109,689	111,224	107,140	12,189	340,242	54,272	394,514	465,230
21. Maximum operating inventory								285,809	48,008	333,817	393,652
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY											
22. Shell capacity of idle tankage	94	659	228	981	2,254	1,926	74	5,235	736	5,971	7,041
23. Shell capacity of idle tankage (environmentally restricted)	0	0	85	85	65	50	0	115	16	131	155
24. Tankage under construction	0	0	0	0	145	2,137	0	2,282	301	2,583	3,046
D. OTHER											
25. Change in stock level due to spare refining capacity								0	0	0	0

*** Not applicable.

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM STORAGE CAPACITIES
AND INVENTORY AVAILABILITY IN THE UNITED STATES

KEROSINE

As of September 30, 1982
(Thousands of Barrels)

INVENTORY AND STORAGE CAPACITY	PADD IA	PADD IB	PADD IC	Total PADD I	PADD II	PADD III	PADD IV	Total PADDs I-IV	PADD V	Total U.S. NPC Total	Total U.S. Adjusted NPC Total
A. KEROSINE INVENTORY											
1. Total inventory reported by DOE				4,294	2,877	2,404	54	9,629	209	9,838	***
a. Total inventory reported to NPC	277	1,259	1,161	2,697	2,372	1,948	37	7,054	242	7,296	9,838
b. Percentage of line one				62.8	82.4	81.0	68.5	73.3	115.8	74.2	***
2. Minimum operating inventory								3,952	134	4,086	5,507
3. Difference (Line 1 minus 2)								3,102	108	3,210	4,328
If not zero, estimate what volume was:											
4. Seasonal inventory								0	0	0	0
5. In anticipation of planned maintenance								9	0	9	9
6. Normal operating inventory								0	40	40	54
Memo Item: Unavailable inventory											
7. Pipeline fill	8	117	161	286	182	195	0	663	0	663	***
8. Refinery lines and operating equipment fill		5	1	6	5	18	2	31	2	33	***
9. Oil in transit by water from domestic sources (ex Alaska)	1	14	9	24	5	1	0	30	0	30	***
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)	9	136	171	316	192	214	2	724	2	726	978
11. Tank bottoms	26	157	109	292	267	316	4	879	41	920	***
12. Plant fuel and pipeline prime mover fuel	0	0	0	0	0	0	0	0	0	0	***
13. Lease stocks											
14. Total (Lines 10, 11, 12, and 13)	35	293	280	608	459	530	6	1,603	43	1,646	2,218
15. Alaskan crude oil in transit by water											
B. STORAGE CAPACITY ASSIGNED TO KEROSINE											
16. Shell capacity of tankage in operation	726	3,039	2,820	6,585	4,521	4,708	114	15,928	487	16,415	22,123
17. Tank tops and safety allowance	38	160	176	374	244	217	8	843	26	869	1,171
18. Subtotal: Net available shell capacity (Line 16 minus 17)	688	2,879	2,644	6,211	4,277	4,491	106	15,085	461	15,546	20,952
19. Unavailable inventory outside of tankage (from Line 10 above)	9	136	171	316	192	214	2	724	2	726	978
20. Total operating system capacity (Lines 18 and 19)	697	3,015	2,815	6,527	4,469	4,705	108	15,809	463	16,272	21,930
21. Maximum operating inventory								13,935	385	14,320	19,299
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY											
22. Shell capacity of idle tankage											
23. Shell capacity of idle tankage (environmentally restricted)											
24. Tankage under construction											
D. OTHER											
25. Change in stock level due to spare refining capacity								0	0	0	0

*** Not applicable.

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM STORAGE CAPACITY
AND INVENTORY AVAILABILITY IN THE UNITED STATES

KEROSINE

As of March 31, 1983
(Thousands of Barrels)

INVENTORY AND STORAGE CAPACITY	PADD IA	PADD IB	PADD IC	Total PADD I	PADD II	PADD III	PADD IV	Total PADDs I-IV	PADD V	Total U.S. NPC Total	Total U.S. Adjusted NPC Total
A. KEROSINE INVENTORY											
1. Total inventory reported by DOE				3,720	2,503	2,307	39	8,569	339	8,908	***
a. Total inventory reported to NPC	160	1,251	986	2,397	2,024	2,124	32	6,577	341	6,918	8,908
b. Percentage of line one				64.4	80.9	92.1	82.1	76.8	100.6	77.7	***
2. Minimum operating inventory								3,985	148	4,281	5,510
3. Difference (Line 1 minus 2)								2,592	193	2,637	3,398
If not zero, estimate what volume was:											
4. Seasonal inventory								0	0	0	0
5. In anticipation of planned maintenance								9	0	9	12
6. Normal operating inventory								0	85	85	109
Memo Item: Unavailable inventory											
7. Pipeline fill	7	175	156	338	73	218	0	629	1	630	***
8. Refinery lines and operating equipment fill		5	1	6	5	18	2	31	2	33	***
9. Oil in transit by water from domestic sources (ex Alaska)	1	7	9	17	2	1	0	20	0	20	***
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)	8	187	166	361	80	237	2	680	3	683	879
11. Tank bottoms	24	158	98	280	265	320	4	869	58	927	***
12. Plant fuel and pipeline prime mover fuel	0	0	0	0	0	0	0	0	0	0	***
13. Lease stocks											
14. Total (Lines 10, 11, 12, and 13)	32	345	264	641	345	557	6	1,549	61	1,610	2,072
15. Alaskan crude oil in transit by water											
B. STORAGE CAPACITY ASSIGNED TO KEROSINE											
16. Shell capacity of tankage in operation	589	3,073	2,546	6,208	4,339	4,833	111	15,491	688	16,179	20,822
17. Tank tops and safety allowance	34	166	149	349	236	230	7	822	40	862	1,109
18. Subtotal: Net available shell capacity (Line 16 minus 17)	555	2,907	2,397	5,859	4,103	4,603	104	14,669	648	15,317	19,713
19. Unavailable inventory outside of tankage (from Line 10 above)	8	187	166	361	80	237	2	680	3	683	879
20. Total operating system capacity (Lines 18 and 19)	563	3,094	2,563	6,220	4,183	4,840	106	15,349	651	16,000	20,592
21. Maximum operating inventory								12,990	556	13,546	17,434
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY											
22. Shell capacity of idle tankage		58	5	63	303	560	3	929	0	929	1,196
23. Shell capacity of idle tankage (environmentally restricted)						0	0	0	10	10	13
24. Tankage under construction						450	0	450	20	470	605
D. OTHER											
25. Change in stock level due to spare refining capacity								0	0	0	0

*** Not applicable.

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

KEROSINE-TYPE JET FUEL

As of September 30, 1982
(Thousands of Barrels)

INVENTORY AND STORAGE CAPACITY	PADD IA	PADD IB	PADD IC	Total PADD I	PADD II	PADD III	PADD IV	Total PADDs I-IV	PADD V	Total U.S. NPC Total	Total U.S. Adjusted NPC Total
A. KEROSINE-TYPE JET FUEL INVENTORY											
1. Total inventory reported by DOE				9,037	7,830	9,554	732	27,153	6,174	33,327	***
a. Total inventory reported to NPC	854	3,560	3,253	7,667	6,958	7,013	575	22,213	5,933	28,146	33,327
b. Percentage of line one				84.8	88.9	73.4	78.6	81.8	96.1	84.5	***
2. Minimum operating inventory								16,204	3,908	20,112	23,801
3. Difference (Line 1 minus 2)								6,009	2,025	8,034	9,508
If not zero, estimate what volume was:											
4. Seasonal inventory								80	50	130	154
5. In anticipation of planned maintenance								0	0	0	0
6. Normal operating inventory								5,929	1,586	7,515	8,894
Memo Item: Unavailable inventory											
7. Pipeline fill	48	386	444	878	733	1,621	61	3,333	300	3,633	***
8. Refinery lines and operating equipment fill	0	6	2	8	9	32	9	58	26	84	***
9. Oil in transit by water from domestic sources (ex Alaska)	92	9	46	147	72	25	0	244	0	244	***
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)	140	401	492	1,033	854	1,678	70	3,635	326	3,961	4,688
11. Tank bottoms	69	447	141	657	1,054	1,140	70	2,921	915	3,836	***
12. Plant fuel and pipeline prime mover fuel	0	0	0	0	0	0	0	0	2	2	***
13. Lease stocks											
14. Total (Lines 10, 11, 12, and 13)	209	848	633	1,690	1,908	2,818	140	6,556	1,243	7,799	9,230
15. Alaskan crude oil in transit by water											
B. STORAGE CAPACITY ASSIGNED TO KEROSINE-TYPE JET FUEL											
16. Shell capacity of tankage in operation	1,262	7,755	5,063	14,080	14,111	14,217	995	43,403	12,091	55,494	65,673
17. Tank tops and safety allowance	66	443	209	718	684	949	46	2,397	690	3,087	3,653
18. Subtotal: Net available shell capacity (Line 16 minus 17)	1,196	7,312	4,854	13,362	13,427	13,268	949	41,006	11,401	52,407	62,020
19. Unavailable inventory outside of tankage (from Line 10 above)	140	401	492	1,033	854	1,678	70	3,635	326	3,961	4,688
20. Total operating system capacity (Lines 18 and 19)	1,336	7,713	5,346	14,395	14,281	14,946	1,019	44,641	11,727	56,368	66,708
21. Maximum operating inventory								38,220	10,035	48,255	57,071
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY											
22. Shell capacity of idle tankage											
23. Shell capacity of idle tankage (environmentally restricted)											
24. Tankage under construction											
D. OTHER											
25. Change in stock level due to spare refining capacity								0	0	0	0

*** Not applicable.

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES
AND STORAGE CAPACITIES IN THE UNITED STATES

KEROSINE-TYPE JET FUEL

As of March 31, 1983
(Thousands of Barrels)

INVENTORY AND STORAGE CAPACITY	PADD IA	PADD IB	PADD IC	Total PADD I	PADD II	PADD III	PADD IV	Total PADDs I-IV	PADD V	Total U.S. NPC Total	Total U.S. Adjusted NPC Total
A. KEROSINE-TYPE JET FUEL INVENTORY											
1. Total inventory reported by DOE				9,036	6,910	11,714	774	28,434	6,460	34,894	***
a. Total inventory reported to NPC	665	3,043	3,134	6,842	5,872	9,017	556	22,287	6,209	28,496	34,894
b. Percentage of line one				75.7	85.0	77.0	71.8	78.4	96.1	81.7	***
2. Minimum operating inventory								18,590	3,880	22,470	27,503
3. Difference (Line 1 minus 2)								3,697	2,329	6,026	7,376
If not zero, estimat e what volume was:											
4. Seasonal inven tory								276	31	307	376
5. In anticipation of planned maintenance								0	0	0	0
6. Normal operating inventory								3,421	2,064	5,485	6,714
Memo Item: Unavailable inventory											
7. Pipeline fill	27	476	812	1,315	788	3,468	122	5,693	330	6,023	***
8. Refinery lines and operating equipment fill	0	8	0	8	9	103	9	129	26	155	***
9. Oil in transit by water from domestic sources (ex Alaska)	60	244	18	322	35	80	0	437	20	457	***
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)	87	728	830	1,645	832	3,651	131	6,259	376	6,635	8,121
11. Tank bottoms	68	442	137	647	970	1,055	69	2,741	896	3,637	***
12. Plant fuel and pipeline prime mover fuel	0	0	0	0	0	0	0	0	0	0	***
13. Lease stocks											
14. Total (Lines 10, 11, 12, and 13)	155	1,170	967	2,292	1,802	4,706	200	9,000	1,272	10,272	12,573
15. Alaskan crude oil in transit by water											
B. STORAGE CAPACITY ASSIGNED TO KEROSINE-TYPE JET FUEL											
16. Shell capacity of tankage in operation	1,262	7,643	5,005	13,910	14,121	14,803	970	43,804	11,907	55,711	68,190
17. Tank tops and safety allowance	66	438	205	709	683	975	45	2,412	691	3,103	3,798
18. Subtotal: Net available shell capacity (Line 16 minus 17)	1,196	7,205	4,800	13,201	13,438	13,828	925	41,392	11,216	52,608	64,392
19. Unavailable inventory outside of tankage (from Line 10 above)	87	728	830	1,645	832	3,651	131	6,259	376	6,635	8,121
20. Total operating system capacity (Lines 18 and 19)	1,283	7,933	5,630	14,846	14,270	17,479	1,056	47,651	11,592	59,243	72,513
21. Maximum operating inventory								40,449	10,102	50,511	61,825
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY											
22. Shell capacity of idle tankage	23	0	136	159	1,345	856	20	2,360	187	2,547	3,118
23. Shell capacity of idle tankage (environmentally restricted)	0	0	26	26	0	0	0	26	0	26	32
24. Tankage under construction	0	0	0	0	0	0	0	0	30	30	37
D. OTHER											
25. Change in stock level due to spare refining capacity								0	0	0	0

*** Not applicable.

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES
AND STORAGE CAPACITIES IN THE UNITED STATES

DISTILLATE FUEL OIL, INCLUDING NO. 4 FUEL OIL

As of September 30, 1982
(Thousands of Barrels)

INVENTORY AND STORAGE CAPACITY	PADD IA	PADD IB	PADD IC	Total PADD I	PADD II	PADD III	PADD IV	Total PADDs I-IV	PADD V	Total U.S. NPC Total	Total U.S. Adjusted NPC Total
A. DISTILLATE FUEL OIL INVENTORY											
1. Total inventory reported by DOE				67,950	45,569	34,033	3,534	151,086	10,110	161,196	***
a. Total inventory reported to NPC	10,882	30,263	13,403	54,548	37,176	26,561	3,078	121,363	9,894	131,257	161,196
b. Percentage of line one				80.3	81.6	78.0	87.1	80.3	97.9	81.4	***
2. Minimum operating inventory								66,286	5,899	72,185	88,679
3. Difference (Line 1 minus 2)								55,077	3,995	59,072	72,570
If not zero, estimate what volume was:											
4. Seasonal inventory								18,505	677	19,182	23,565
5. In anticipation of planned maintenance								47	0	47	58
6. Normal operating inventory								32,699	3,129	35,828	44,015
Memo Item: Unavailable inventory											
7. Pipeline fill	117	1,040	3,838	4,995	4,730	5,351	306	15,382	453	15,835	***
8. Refinery lines and operating equipment fill	0	62	6	68	59	185	28	340	66	406	***
9. Oil in transit by water from domestic sources (ex Alaska)	252	153	77	482	40	37	0	559	0	559	***
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)	369	1,255	3,921	5,545	4,829	5,573	334	16,281	519	16,800	20,639
11. Tank bottoms	1,016	2,658	818	4,492	3,770	3,394	235	11,891	1,266	13,157	***
12. Plant fuel and pipeline prime mover fuel	0	0	2	2	0	39	0	41	8	49	***
13. Lease stocks											
14. Total (Lines 10, 11, 12, and 13)	1,385	3,913	4,741	10,039	8,599	9,006	569	28,213	1,793	30,006	36,862
15. Alaskan crude oil in transit by water											
B. STORAGE CAPACITY ASSIGNED TO DISTILLATE FUEL OIL											
16. Shell capacity of tankage in operation	20,279	59,824	24,271	104,374	69,335	46,514	4,403	224,626	20,810	245,436	301,518
17. Tank tops and safety allowance	882	3,713	1,221	5,816	3,554	3,286	239	12,895	1,354	14,249	17,505
18. Subtotal: Net available shell capacity (Line 16 minus 17)	19,397	56,111	23,050	98,558	65,781	43,228	4,164	211,731	19,456	231,187	284,014
19. Unavailable inventory outside of tankage (from Line 10 above)	369	1,255	3,921	5,545	4,829	5,573	334	16,281	519	16,800	20,639
20. Total operating system capacity (Lines 18 and 19)	19,766	57,366	26,971	104,103	70,610	48,801	4,498	228,012	19,975	247,987	304,652
21. Maximum operating inventory								199,517	18,018	217,535	267,242
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY											
22. Shell capacity of idle tankage											
23. Shell capacity of idle tankage (environmentally restricted)											
24. Tankage under construction											
D. OTHER											
25. Change in stock level due to spare refining capacity								0	0	0	0

*** Not applicable.

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

DISTILLATE FUEL OIL, INCLUDING NO. 4 FUEL OIL

As of March 31, 1983
(Thousands of Barrels)

INVENTORY AND STORAGE CAPACITY	PADD IA	PADD IB	PADD IC	Total PADD I	PADD II	PADD III	PADD IV	Total PADDs I-IV	PADD V	Total U.S. NPC Total	Total U.S. Adjusted NPC Total
A. DISTILLATE FUEL OIL INVENTORY											
1. Total inventory reported by DOE				37,969	39,017	27,286	3,280	107,552	11,129	118,681	***
a. Total inventory reported to NPC	4,168	15,851	9,415	29,434	32,807	22,075	2,607	86,923	10,200	97,123	118,681
b. Percentage of line one				77.5	84.1	80.9	79.5	80.8	91.7	81.8	***
2. Minimum operating inventory								65,859	6,023	71,882	87,875
3. Difference (Line 1 minus 2)								21,064	4,177	25,241	30,806
If not zero, estimate what volume was:											
4. Seasonal inventory								1,885	958	2,843	3,474
5. In anticipation of planned maintenance								60	0	60	73
6. Normal operating inventory								17,286	2,894	20,180	24,670
Memo Item: Unavailable inventory											
7. Pipeline fill	105	1,504	2,721	4,330	5,788	4,360	316	14,794	548	15,342	***
8. Refinery lines and operating equipment fill	0	94	6	100	59	175	28	362	70	432	***
9. Oil in transit by water from domestic sources (ex Alaska)	50	422	14	486	183	49	0	718	0	718	***
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)	155	2,020	2,741	4,916	6,030	4,584	344	15,874	618	16,492	20,161
11. Tank bottoms	954	2,458	787	4,199	4,932	3,186	234	12,551	1,271	13,822	***
12. Plant fuel and pipeline prime mover fuel	0	0	1	1	0	39	0	40	10	50	***
13. Lease stocks											
14. Total (Lines 10, 11, 12, and 13)	1,109	4,478	3,529	9,116	10,962	7,809	578	28,465	1,899	30,364	37,120
15. Alaskan crude oil in transit by water											
B. STORAGE CAPACITY ASSIGNED TO DISTILLATE FUEL OIL											
16. Shell capacity of tankage in operation	19,216	55,855	23,327	98,398	69,439	48,680	4,390	220,907	21,955	242,862	296,897
17. Tank tops and safety allowance	797	3,376	1,166	5,339	3,565	3,422	241	12,567	1,409	13,976	17,086
18. Subtotal: Net available shell capacity (Line 16 minus 17)	18,419	52,479	22,161	93,059	65,874	45,258	4,149	208,340	20,546	228,886	279,811
19. Unavailable inventory outside of tankage (from Line 10 above)	155	2,020	2,741	4,916	6,030	4,584	344	15,874	618	16,492	20,161
20. Total operating system capacity (Lines 18 and 19)	18,574	54,499	24,902	97,975	71,904	49,842	4,493	224,214	21,164	245,378	299,972
21. Maximum operating inventory								192,564	18,944	211,508	258,567
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY											
22. Shell capacity of idle tankage	1,994	1,147	465	3,606	8,690	662	2	12,960	1,121	14,081	17,214
23. Shell capacity of idle tankage (environmentally restricted)	42	930	3	975	39	110	0	1,124	40	1,164	1,423
24. Tankage under construction	0	0	42	42	80	464	20	606	103	709	867
D. OTHER											
25. Change in stock level due to spare refining capacity								0	0	0	0

*** Not applicable.

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

RESIDUAL FUEL OIL

As of September 30, 1982
(Thousands of Barrels)

INVENTORY AND STORAGE CAPACITY	PADD IA	PADD IB	PADD IC	Total PADD I	PADD II	PADD III	PADD IV	Total PADDs I-IV	PADD V	Total U.S. NPC Total	Total U.S. Adjusted NPC Total
A. RESIDUAL FUEL OIL INVENTORY											
1. Total inventory reported by DOE				28,985	5,738	16,226	451	51,400	10,418	61,818	***
a. Total inventory reported to NPC	1,617	7,055	4,092	12,764	3,031	8,275	318	24,388	8,999	33,387	61,818
b. Percentage of line one				44.0	52.8	51.0	70.5	47.4	86.4	54.0	***
2. Minimum operating inventory								13,468	3,564	17,032	31,541
3. Difference (Line 1 minus 2)								10,920	5,435	16,355	30,277
If not zero, estimate what volume was:											
4. Seasonal inventory								2,127	3	2,130	3,944
5. In anticipation of planned maintenance								227	569	796	1,474
6. Normal operating inventory								8,284	4,268	12,552	23,244
Memo Item: Unavailable inventory											
7. Pipeline fill	2	3	4	9	2	1	1	13	28	41	***
8. Refinery lines and operating equipment fill	0	15	0	15	14	70	8	107	52	159	***
9. Oil in transit by water from domestic sources (ex Alaska)	48	57	0	105	48	15	0	168	0	168	***
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)	50	75	4	129	64	0	9	202	80	282	522
11. Tank bottoms	266	837	333	1,436	452	1,352	44	3,284	1,093	4,377	***
12. Plant fuel and pipeline prime mover fuel	0	159	12	171	31	204	20	426	50	476	***
13. Lease stocks											
14. Total (Lines 10, 11, 12, and 13)	316	1,071	349	1,736	547	1,556	73	3,912	1,223	5,135	9,509
15. Alaskan crude oil in transit by water											
B. STORAGE CAPACITY ASSIGNED TO RESIDUAL FUEL OIL											
16. Shell capacity of tankage in operation	4,589	15,811	11,216	31,616	9,939	19,304	1,092	61,951	24,615	86,566	160,307
17. Tank tops and safety allowance	187	1,342	641	2,170	452	1,492	55	4,169	1,520	5,689	10,535
18. Subtotal: Net available shell capacity (Line 16 minus 17)	4,402	14,469	10,575	29,446	9,487	17,812	1,037	57,782	23,095	80,877	149,772
19. Unavailable inventory outside of tankage (from Line 10 above)	50	75	4	129	64	0	9	202	80	282	522
20. Total operating system capacity (Lines 18 and 19)	4,452	14,544	10,579	29,575	9,551	17,812	1,046	57,984	23,175	81,159	150,294
21. Maximum operating inventory								51,012	17,902	68,914	127,619
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY											
22. Shell capacity of idle tankage											
23. Shell capacity of idle tankage (environmentally restricted)											
24. Tankage under construction											
D. OTHER											
25. Change in stock level due to spare refining capacity								0	0	0	0

*** Not applicable.

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

RESIDUAL FUEL OIL

As of March 31, 1983
(Thousands of Barrels)

INVENTORY AND STORAGE CAPACITY	PADD IA	PADD IB	PADD IC	Total PADD I	PADD II	PADD III	PADD IV	Total PADDs I-IV	PADD V	Total U.S. NPC Total	Total U.S. Adjusted NPC Total
A. RESIDUAL FUEL OIL INVENTORY											
1. Total inventory reported by DOE				20,605	3,587	12,753	436	37,381	8,927	46,308	***
a. Total inventory reported to NPC	1,448	4,479	2,510	8,437	2,325	7,771	396	18,929	7,795	26,724	46,308
b. Percentage of line one				40.9	64.8	60.9	90.8	50.6	87.3	57.7	***
2. Minimum operating inventory								11,568	3,706	15,274	26,471
3. Difference (Line 1 minus 2)								7,361	4,089	11,450	19,837
If not zero, estimate what volume was:											
4. Seasonal inventory								448	1	449	778
5. In anticipation of planned maintenance								149	494	643	1,114
6. Normal operating inventory								5,373	3,506	8,879	15,388
Memo Item: Unavailable inventory											
7. Pipeline fill	2	3	4	9	2	1	1	13	33	46	***
8. Refinery lines and operating equipment fill	0	15	0	15	14	71	8	108	53	161	***
9. Oil in transit by water from domestic sources (ex Alaska)	0	142	0	142	51	55	0	248	0	248	***
10. Subtotal: Unavailable inventory outside of tankage (Lines 7, 8, and 9)	2	160	4	166	67	127	9	369	86	455	789
11. Tank bottoms	274	761	327	1,362	430	1,386	42	3,220	1,147	4,367	***
12. Plant fuel and pipeline prime mover fuel	0	183	12	195	61	152	20	428	56	484	***
13. Lease stocks											
14. Total (Lines 10, 11, 12, and 13)	276	1,104	343	1,723	558	1,665	71	4,017	1,289	5,306	9,196
15. Alaskan crude oil in transit by water											
B. STORAGE CAPACITY ASSIGNED TO RESIDUAL FUEL OIL											
16. Shell capacity of tankage in operation	4,704	15,066	10,446	30,216	9,503	19,805	949	60,473	22,342	82,815	143,527
17. Tank tops and safety allowance	197	1,274	554	2,025	426	1,613	42	4,106	1,388	5,494	9,522
18. Subtotal: Net available shell capacity (Line 16 minus 17)	4,507	13,792	9,892	28,191	9,077	18,192	907	56,367	20,954	77,321	134,005
19. Unavailable inventory outside of tankage (from Line 10 above)	2	160	4	166	67	127	9	369	86	455	789
20. Total operating system capacity (Lines 18 and 19)	4,509	13,952	9,896	28,357	9,144	18,319	916	56,736	21,040	77,776	134,794
21. Maximum operating inventory								44,584	17,720	62,304	107,979
C. IDLE BUT USABLE CAPACITY/NEW CAPACITY											
22. Shell capacity of idle tankage	261	878	804	1,943	1,340	705	174	4,162	3,021	7,183	12,449
23. Shell capacity of idle tankage (environmentally restricted)	0	0	0	0	6	160	0	166	257	423	733
24. Tankage under construction	0	0	308	308	0	1,000	5	1,313	800	2,113	3,662
D. OTHER											
25. Change in stock level due to spare refining capacity								0	0	0	0

*** Not applicable.

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES AND STORAGE CAPACITIES IN THE UNITED STATES

ESTIMATED MINIMUM AND MAXIMUM OPERATING INVENTORIES FOR THE ENTIRE U.S. PETROLEUM INDUSTRY

As of September 30, 1982, and March 31, 1983
(Thousands of Barrels)

	Minimum						Maximum					
	September 30, 1982			March 31, 1983			September 30, 1982			March 31, 1983		
	PADDs I-IV	PADD V	TOTAL U.S.	PADDs I-IV	PADD V	TOTAL U.S.	PADDs I-IV	PADD V	TOTAL U.S.	PADDs I-IV	PADD V	TOTAL U.S.
CRUDE OIL:												
Highest Estimate				235,000	75,000	310,000				340,000	110,000	540,000
Lowest Estimate				220,000	60,000	260,000				310,000	90,000	400,000
Average				**229,333**	**70,000**	**289,714**				**325,000**	**100,000**	**447,500**
No. of Cos. Reporting				3	3	7				2	2	4
GASOLINE (MOTOR AND AVIATION):												
Highest Estimate	190,000	25,500	210,000	190,000	24,700	210,000	320,000	40,000	409,000	320,000	40,000	424,000
Lowest Estimate	170,000	20,000	190,000	180,000	20,000	190,000	230,000	30,000	260,000	240,000	30,000	280,000
Average	**178,200**	**21,375**	**197,912**	**182,525**	**21,175**	**202,100**	**263,333**	**36,667**	**321,800**	**271,667**	**36,667**	**329,800**
No. of Cos. Reporting	4	4	6	4	4	8	3	3	5	3	3	5
KEROSINE, INCLUDES KERO-TYPE JET FUEL:												
Highest Estimate	30,000	5,900	35,000	27,200	6,000	40,000	69,000	11,000	80,000	69,000	11,000	80,000
Lowest Estimate	24,900	5,000	30,000	24,900	5,000	30,000	43,000	7,000	50,000	38,000	7,000	45,000
Average	**27,933**	**5,333**	**33,760**	**25,700**	**5,367**	**33,640**	**56,000**	**9,000**	**65,000**	**53,500**	**9,000**	**67,667**
No. of Cos. Reporting	3	3	5	3	3	5	2	2	3	2	2	3
DISTILLATE FUEL OIL, INCL. NO. 4 FUEL OIL:												
Highest Estimate	150,000	10,500	160,000	105,300	10,300	115,600	270,000	30,000	290,000	260,000	20,000	280,000
Lowest Estimate	100,000	8,000	100,000	91,000	8,000	100,000	180,000	12,000	200,000	168,000	12,000	180,000
Average	**128,400**	**9,625**	**132,137**	**97,825**	**9,325**	**104,200**	**221,000**	**20,667**	**242,000**	**214,000**	**16,000**	**228,750**
No. of Cos. Reporting	4	4	8	4	4	8	3	3	5	2	2	4
RESIDUAL FUEL OIL:												
Highest Estimate	37,300	8,000	45,300	35,000	8,000	45,000	90,000	20,000	115,000	90,000	20,000	110,000
Lowest Estimate	35,000	8,000	30,000	32,000	8,000	30,000	73,000	12,000	85,000	70,000	10,000	60,000
Average	**36,433**	**8,000**	**42,217**	**33,500**	**8,000**	**40,643**	**81,500**	**16,000**	**103,333**	**80,000**	**15,000**	**80,000**
No. of Cos. Reporting	3	3	6	3	3	7	2	2	3	2	2	4
NAPHTHA-TYPE JET FUEL:												
Highest Estimate	5,100	1,500	6,600	4,900	1,400	6,300	10,000	2,000	12,000	10,000	2,000	12,000
Lowest Estimate	4,000	1,000	2,000	4,000	1,000	2,000	6,000	2,000	6,000	6,000	2,000	6,000
Average	**4,367**	**1,167**	**4,720**	**4,300**	**1,133**	**4,660**	**8,000**	**2,000**	**8,667**	**8,000**	**2,000**	**8,667**
No. of Cos. Reporting	3	3	5	3	3	5	2	2	3	2	2	3

NOTE: The totals may not add, as each cell represents an individual estimate. In some cases, the averages will not add due to the different number of estimates in each cell that have been used to calculate the averages.

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES
AND STORAGE CAPACITIES IN THE UNITED STATES

NAPHTHA-TYPE JET FUEL

As of March 31, 1983
(Thousands of Barrels)

INVENTORY AND STORAGE CAPACITY	PADD IA	PADD IB	PADD IC	Total PADD I	PADD II	PADD III	PADD IV	Total PADDs I-IV	PADD V	Total U.S.	
										NPC Total	Adjusted NPC Total
PART A. INVENTORY											
1. Dedicated inventory reported to the Department of Energy[1]	79	424	32	535	1,747	2,418	343	5,043	1,748	6.791	***
2. Dedicated inventory reported to the NPC	64	437	0	501	1,275	1,245	324	3,345	1.122	4.467	6.791
3. Line 2 as a percentage of Line 1	81.0	103.0	0	93.6	73.0	51.5	94.5	66.3	64.2	65.8	***
4. Minimum Operating Inventory[2]								1,718	442	2,160	3.283
5. Difference[3]								1,627	680	2,307	3.508
6. Unavailable inventory[4]											
7. Memo Item: Stocks which could have been dedicated[5]	28	295	59	382	395	580	141	1,498	960	2.458	3.736
PART B. DESIGN CAPACITY[6]								4,866	1,847	6.713	10,202

[1]Includes both specification product and any components dedicated as of March 31, 1983, and reported as naphtha-type jet fuel to DOE.
[2]Consistent with the line item instructions for Line 2 on Questionnaires 1–6.
[3]Reason for positive difference not surveyed.
[4]Not surveyed.
[5]Includes any inventory on hand (including line fill) as of March 31, 1983, categorized as unfinished oils, blending components, special naphthas, naphtha less than 400°F endpoint (see DOE Form EIA-810) which the company could have made available (stocks which could have been dedicated from other products) immediately for use as naphtha-type jet fuel and not reported in Line 2. Amounts entered represent product which would meet specification with little or no processing other than mechanical blending. Does not include stocks if facility management processes (i.e., cleaning tankage) would have been required prior to making the product available.
[6]The design capacity normally dedicated to production, distribution, and storage of naphtha-type jet fuel consistent with Lines 18–20 on Questionnaires 1–6. Includes net available shell capacity of tankage in operation plus unavailable inventory outside of tankage.

IMPACT OF THE STRATEGIC PETROLEUM RESERVE ON PRIVATE INVENTORY LEVELS

Total industry inventories of refined products and crude oil are currently below historical levels. Has the existence of the Strategic Petroleum Reserve contributed to a decrease in your inventories? If yes, please provide an estimate of the amount, expressed as a percentage of your total crude oil stocks as of March 31, 1983 (Questionnaire 1, Column 7).

Yes 1 – — % No 71

*** Not applicable.

NATIONAL PETROLEUM COUNCIL
1983 SURVEY OF PETROLEUM INVENTORIES
AND STORAGE CAPACITIES IN THE UNITED STATES

PETROLEUM FUTURES

1) Has your firm traded in the petroleum futures markets?

26 Yes
117 No

2) Which oil futures have you traded?

23 #2 Fuel Oil/Gasoil
16 Motor Gasoline
5 Crude Oil

3) As a percentage of your March 31, 1983, inventories, what is the maximum open interest you have had in each commodity during the last 12 months?

Average response: #2 Fuel Oil 42% Motor Gasoline 15% Crude Oil 67%

How many contracts does this represent?

Average response: #2 Fuel Oil 443 Motor Gasoline 266 Crude Oil 166

4) If you have traded or anticipate trading in the petroleum futures market, which of the following best describes the reason? Please list in order of importance (1 through 7, with 1 being the principal reason).

Weighted Response:

Physical Inventory	3
Supplemental Outlet for Products	6
Supplemental Source of Products	4
Potential Profits Through Speculation	5
Hedge Against Price Fluctuations	1
Additional Flexibility	2
Other	7

5) Has there been or do you visualize a change in your physical inventory policy or physical inventory levels due to the presence of the petroleum futures markets?

17 Yes
117 No

STUDY METHODOLOGY

OBJECTIVE

The National Petroleum Council's 1983 Survey of Petroleum Inventories and Storage Capacities in the United States was designed to determine:

- How much of the U.S. petroleum inventory is required for normal operation of the primary petroleum distribution system and is therefore not available for delivery to consumers
- The total primary storage capacity and tankage utilization
- The impact of the following factors on primary inventories: spare refining capacity, the Strategic Petroleum Reserve, and the petroleum futures markets.

SCOPE OF THE SURVEY

The nine questionnaires in the Survey conform with EIA product definitions, with the exception of motor gasoline (see product definitions in Appendix J), to be consistent with inventory information provided monthly to the EIA.

Data for crude oil and certain refined products (motor gasoline, kerosine, kerosine-type jet fuel, distillate fuel oil, and residual fuel oil) were requested, with some data also solicited for naphtha-type jet fuel.

Two reporting dates, September 30, 1982, and March 31, 1983, were chosen for the refined products to better define the seasonal change in inventories and to reflect seasonal shifts in tank utilization. Only one reporting date was selected for crude oil and naphtha-type jet fuel because of their relative lack of seasonality.

The Survey covered the 50 states and the District of Columbia, but excluded all U.S. territories, possessions, and the Hawaiian Foreign Trade Zone.

DESCRIPTIONS OF QUESTIONNAIRES

The inventory information was requested by Petroleum Administration for Defense Districts (PADDs) with PADD I subdivided into three parts: New England (IA), Central Atlantic (IB), and Lower Atlantic (IC) states. The estimates of the respondents' minimum and maximum operating inventories and related questions

were requested by broad geographic region, i.e., PADDs I-IV aggregated and PADD V.

Questionnaires 1-6 are similar to those utilized in the 1979 NPC Survey except:

- Bureau of Mines refinery district detail was eliminated.
- Aviation gasoline was eliminated from the gasoline category because its volume was considered insignificant, while kerosine and kerosine-type jet fuel data were collected separately.
- Detailed information was requested on idle tankage.
- Information on the impact of spare refining capacity on stocks was collected.
- Data on Alaskan crude oil in transit by water were requested as a separate item.
- Data on lease stocks were collected.

On Questionnaires 1-6 respondents were requested to:

- Submit inventory information on crude oil and the refined products [including detailed information on unavailable inventories both in tankage (e.g., tank bottoms) and outside of tankage (e.g., pipeline fill)]
- Estimate their minimum and maximum operating inventories
- Provide data on:
  - -- Active shell capacity of tankage in operation
  - -- Shell capacity of idle tankage that would be available for service within 90 days following little or no maintenance work and within existing environmental constraints
  - -- Shell capacity of idle tankage that would require environmental waiver or modification to be available for service within 90 days
- Report tankage under construction
- Estimate the impact on stocks of spare refining capacity
- State the amount by which their inventories exceeded their estimated minimum operating inventories and what portion of that amount was seasonal inventory, inventory held in anticipation of planned maintenance, and normal operating inventory.

Questionnaire 7 requested respondents who analyze industry inventory levels to provide estimates of minimum and maximum operating inventories for crude oil and the surveyed refined products for PADDs I-IV, PADD V, and the total United States.

Part I of Questionnaire 8 collected selected information on naphtha-type jet fuel because of its strategic nature. This questionnaire solicited inventory information previously reported to EIA as well as information regarding the industry's ability to make additional naphtha-type jet fuel available for immediate use. Part II of this questionnaire asked if the existence of the Strategic Petroleum Reserve has contributed to a decrease in the respondent's inventory holding practices.

Questionnaire 9 collected information regarding the respondents' participation in the petroleum futures markets in an attempt to determine if the use of these markets has affected industry inventory holding practices.

Questionnaires 8 and 9 were not part of the 1979 NPC Survey.

RESPONDENTS TO THE SURVEY

The Survey was sent to refiners, bulk terminal operators, product pipeline operators, and holders of crude oil stocks that were required to file EIA Forms 810, 811, 812, and 813 as of March 1983 or the counterpart forms that were in place in September 1982. On January 1, 1983, the Energy Information Administration increased its list of operators required to complete the monthly surveys, adding 150 bulk terminal operators, 15 pipeline operators, and 30 holders of crude oil stocks, thereby increasing the potential reporting population for the NPC Survey between the September 30, 1982, and March 31, 1983, dates. Although EIA receives data from each unit of a company, the NPC collected information on a company-wide basis, requesting that each company consolidate into a single report all of the data that its units reported separately to EIA.

DISTRIBUTION AND RECEIPT OF QUESTIONNAIRES

The questionnaires were mailed by the NPC on June 7, 1983. The independent public accounting firm Price Waterhouse was contracted by the NPC to receive and tabulate the survey responses. Price Waterhouse tabulated all responses received through August 30, 1983, and transmitted the aggregated results to the NPC on September 13, 1983. In keeping with its contract with the NPC, Price Waterhouse did not release any individual company data to the NPC, the Department of Energy, or any other organization.

VALIDATION OF INDIVIDUAL COMPANY RESPONSES

A series of edit checks was employed to ensure that appropriate Questionnaire Line Items were completed, questionnaire arithmetical integrity was maintained, and questionnaire responses were reasonable.

If any of the responding companies' data failed the edit checks, Price Waterhouse contacted the company to discuss the data and made changes where appropriate. In situations in which responses to questionnaires were incomplete or obviously incorrect and the respondent failed to provide Price Waterhouse with the appropriate information, the questionnaire response was not included in the results of the Survey. In addition, data previously submitted to the Energy Information Administration by the NPC respondents that correspond to Line 1 of Questionnaires 1-6 and Section 1, Part A, Column 1 of Questionnaire 8 were provided by the Energy Information Administration to Price Waterhouse via the NPC, with the permission of the companies concerned, in order to serve as a check of the reasonableness of the inventory data submitted on the Survey.

RESULTS OF THE SURVEY

Of the 505 companies on the DOE mailing list, 461 companies to which it was applicable received the NPC Survey, of which 250, or 54 percent, responded to one or more of the questionnaires. Of the 250 responses, 23 were not usable. The 54 percent response rate is comparable to the 55 percent response to the 1979 Survey.

Of greater significance, however, is the coverage when computed on a volumetric basis, as displayed in Table E-1. As shown on Table E-1, the response coverage by category ranged from a high of 92 percent for crude oil to a low of 54 percent for residual fuel oil. These 1983 Survey responses are less than those received from the 1979 Survey, as shown in Figure E-1.

The Council evaluated these levels of response to determine whether they were adequate for use in formulating conclusions based upon the Survey results. The Council concluded that the coverage is sufficiently high to permit analysis of the results as reasonably representative of the manner in which inventory and tank capacity is managed by the primary distribution system. Therefore, responses to the NPC for key inventory and tankage items were adjusted upward by dividing by the volumetric percentage coverage so that the individual line items were representative of the EIA universe. For example, the sum of the motor gasoline responses for the individual company minimum operating inventory as of March 31, 1983, was 154,126 million barrels. To adjust to the universe, one divides 154,126 by 84.8 percent, which yields 181,752 million barrels. For crude oil, however, certain modifications to EIA data on crude oil lease stocks and Alaskan crude oil in transit by water were made prior to the adjustment in order to ensure a consistency with Line Item 1 on Questionnaires 1-6.

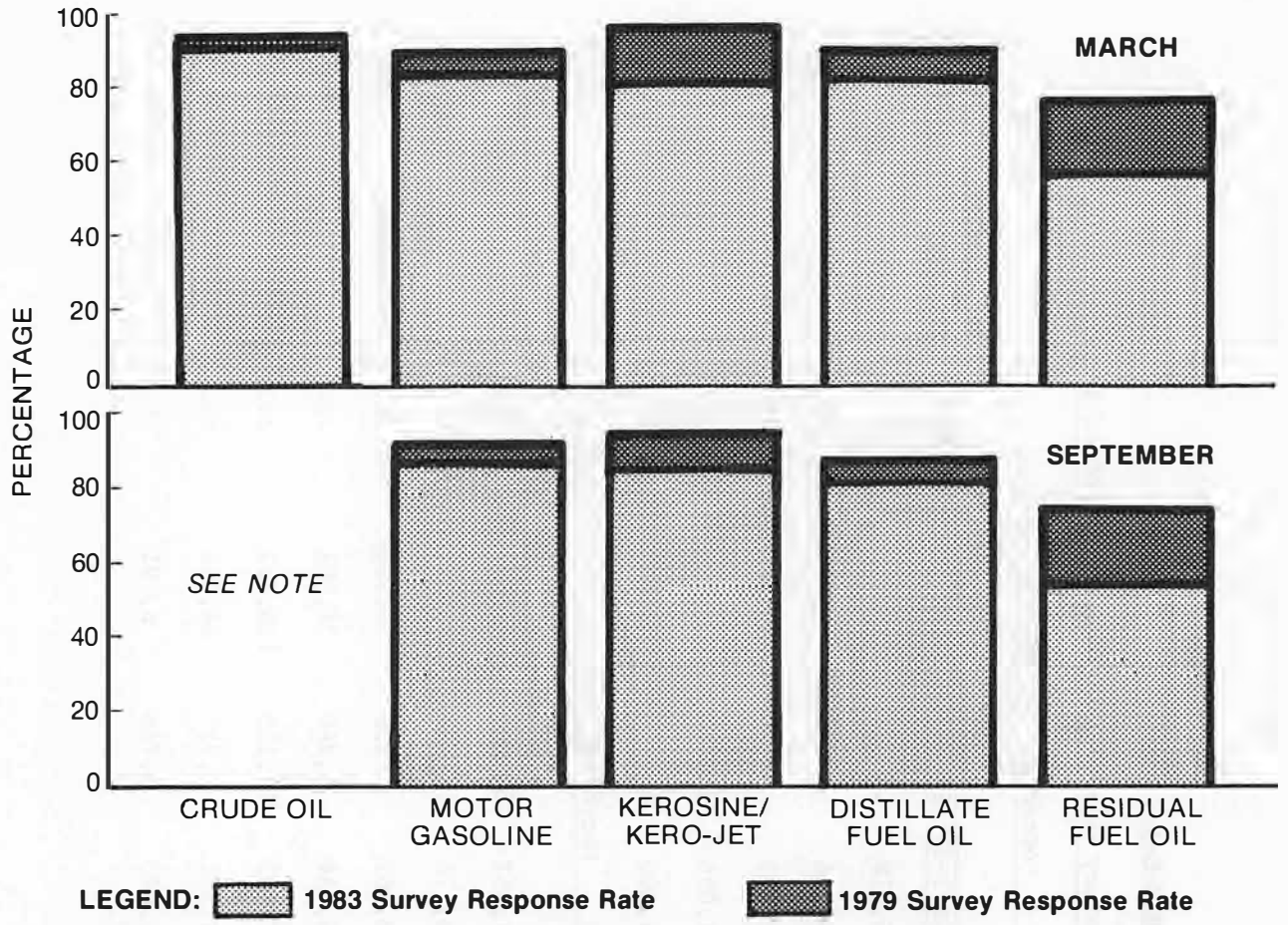
PROCEDURES USED IN ANALYZING THE SURVEY DATA

The NPC estimates of minimum operating inventory, discussed in Chapter Two, were developed through a decision-making process

TABLE E-1

Survey Responses as a Percentage of Inventory Reported to the Department of Energy

	NPC			DOE			Percentage		
	PADDs I-IV	PADD V	Total U.S.	PADDs I-IV	PADD V	Total U.S.	PADDs I-IV	PADD V	Total U.S.
September 30, 1982									
Motor Gasoline	175,997	27,822	203,819	205,918	27,704	233,622	85.5	100.4	87.2
Kerosine	7,054	242	7,296	9,626	209	9,835	73.3	115.8	74.2
Kero-Jet Fuel	22,213	5,933	28,146	27,153	6,174	33,327	81.8	96.1	84.5
Distillate	121,363	9,894	131,257	151,086	10,110	161,196	80.3	97.9	81.4
Residual Fuel	24,388	8,999	33,387	51,400	10,418	61,818	47.4	86.4	54.0
March 31, 1983									
Crude Oil	238,763	51,989	290,752	261,352	55,541	316,893	91.4	93.6	91.8
Motor Gasoline	165.609	24,192	189,801	198,176	25,754	223,930	83.6	93.9	84.8
Kerosine	6,577	341	6,918	8,569	339	8,908	76.8	100.6	77.7
Kero-Jet Fuel	22,287	6,209	28,496	28,434	6,460	34,894	78.4	96.1	81.7
Distillate	86,924	10,200	97,123	107,552	11,129	118,681	80.8	91.7	81.8
Residual Fuel	18,929	7,795	26,724	37,381	8,927	46,308	50.6	87.3	57.7
Naphtha-Jet Fuel	3,345	1,122	4,467	5,043	1,748	6,791	66.3	64.2	65.8



NOTE: Crude oil responses are for September in the 1979 survey, and March in the 1983 survey.

Figure E-1. Survey Response Rates, 1979—1983.

in which individual judgments were discussed with the aid of operating experience and relevant statistical data in order to develop a consensus estimate. The statistical data used are: (1) the sum of the individual company minimum operating inventories as reported in the 1983 NPC Survey; (2) the industry-wide estimates of minimum operating inventory levels as reported in the 1983 NPC Survey;* and (3) historical inventory data. The NPC Survey data are reported in Appendix D; the historical inventory data are shown in Appendix I.

The Council's conclusions regarding the impact on private primary inventories of spare refining capacity, the Stragetic Petroleum Reserve, and the petroleum futures markets were developed from the sum of the responses to the NPC Survey.

*These estimates were used for general reference only, as only a few estimates were reported.

THE STRATEGIC PETROLEUM RESERVE

The Strategic Petroleum Reserve Program was created by the Energy Policy and Conservation Act (P.L. 94-163), enacted on December 22, 1975. In the aftermath of the 1973-1974 Arab oil embargo, Congress declared it to be U.S. policy that a reserve of up to one billion barrels of crude oil and/or petroleum products be established to reduce the impact of disruptions in petroleum supplies or to carry out the obligations of the United States under the International Energy Program.

The SPR may not be drawn down unless the President determines that a national energy supply shortage exists that is, or is likely to be, of significant scope and duration; is of an emergency nature; may cause major adverse impact on national safety and the national economy; and results, or is likely to result, from an interruption in imported petroleum supplies or from sabotage or an act of God.

The Energy Policy and Conservation Act required submission to the Congress of an SPR plan to detail the proposals for designing, constructing, and filling the Reserve. The SPR Plan, submitted on February 16, 1977, and effective on April 18, 1977, discusses the development and implementation of the Reserve.

The schedule for filling the Reserve was accelerated by SPR Plan Amendment No. 1, submitted to the Congress on May 25, 1977. Amendment No. 2 to the SPR Plan, submitted May 18, 1978, authorized an increase in the SPR size from 500 million barrels to one billion barrels of stored oil and detailed plans for government storage of 750 million barrels. On October 31, 1979, the Distribution Plan for the SPR, Plan Amendment No. 3, was submitted to Congress. This amendment was replaced on December 1, 1982, when a new "Drawdown" (Distribution) Plan (Amendment No. 4) for the use of the SPR was transmitted to Congress. This plan, required under the Energy Emergency Preparedness Act of 1982, provides for primary use of market procedures for the drawdown, sale, and distribution of crude oil from the SPR.

The SPR program consists of the development of six crude oil storage sites and one marine terminal on the Gulf Coast of the United States. The SPR storage sites are interconnected to three major interstate crude oil distribution networks, the Seaway, Texoma, and Capline pipeline systems, and associated marine terminals.

The first 750-million-barrel storage capacity of the SPR is currently being developed in three phases. Phase I consists of the conversion of five sites with existing storage capacity of approximately 260 million barrels, one in Texas and four in Louisiana, plus a DOE marine terminal facility at St. James,

Louisiana. The Phase I sites are Bryan Mound in Texas, and Bayou Choctaw, West Hackberry, Sulphur Mines, and Weeks Island in Louisiana.

Phase II consists of the expansion of three Phase I sites to increase the SPR storage capacity by 290 million barrels. The Bryan Mound site is being expanded by 120 million barrels and the West Hackberry site is being expanded by 160 million barrels, both by leaching (solution mining) new caverns. A further 10-million-barrel capacity will be added to Phase II through acquisition of an additional existing storage cavern at Bayou Choctaw.

Phase III, consisting of approximately 200 million barrels, will involve the further expansion of existing sites and the development of a new 140-million-barrel site located at Big Hill, Texas.

As of March 31, 1983, the SPR inventory was 312 million barrels of crude oil in storage, an increase of 223 million barrels over the July 30, 1979, level reported in the previous NPC study. The SPR drawdown and distribution capability is currently 1.7 MMB/D. Upon completion of Phase II, as described in the plan and subsequent amendments, the SPR will be able to sustain a drawdown and distribution rate of up to 3.5 MMB/D.

CARIBBEAN FACILITIES

There is a significant volume of storage in the Caribbean associated with both tanker transshipment terminals and refining operations in Puerto Rico and the Virgin Islands. This storage capacity was not included in the NPC's 1983 Survey of Petroleum Inventories and Storage Capacities in the United States.

Tanker transshipment terminals provide deepwater facilities into which supertankers off-load. These terminals are needed because most U.S. ports have insufficient water depth for fully loaded supertankers. Arriving ships discharge their cargo into storage at the deepwater terminal; the terminal then reloads the cargo into smaller tankers, which can off-load at U.S. ports. The total storage capacity of these transshipment terminals is estimated to be about 30-40 million barrels.

Crude oil and fuel product storage capacity in U.S. company refineries in Puerto Rico and the Virgin Islands amounts to another 45 million barrels.*

In total, there are about 80 million barrels of storage in the facilities described above. Some terminals or refineries may have excess storage capacity due to lower crude oil and product demand, but this excess capacity is not constant. Further, the tanker transshipment terminals in the Caribbean are not under U.S. control nor do they service the U.S. market exclusively, so their usefulness in times of emergency cannot be assured. While the other facilities are within U.S. territories and possessions, their value for emergency storage will depend upon the nature of the supply interruption that occurs and its effect on the operations of the individual terminals or refineries, which are factors beyond the scope of this report.

*DOE data from Energy Information Administration Form EIA-820.

HISTORICAL PERSPECTIVE ON REFINING CAPACITY UTILIZATION

As indicated in Table H-1, refining operations in the United States have undergone significant change since the 1979 NPC study. The number of operable U.S. refineries and their crude oil distillation capacity increased from 1978 until 1980; since that time, a substantial number of refineries have been shut down. In spite of this substantial reduction in refining capacity, operable refinery utilization has remained below historical levels, with year-average 1982 utilization at the 70 percent level, versus 88 percent in 1978.

TABLE H-1

Operable U.S. Refining Capacity Trends

Year	Number of Refineries at Year End*	Crude Oil Distillation Capacity at Year End (MB/D)*	Average Utilization§ (%)
1978	311	17.4	88
1979	319	18.0	85
1980	324	18.6	76
1981	301	17.9	69
1982	258	16.9	70

*Annual EIA, Refinery Capacity Surveys.
§EIA Petroleum Supply Monthly and EIA Weekly Petroleum Status Report.

EIA's definition of operable capacity includes capacity that has been shut down but can be placed in operation within 90 days. As a result of some concern that this definition overstates the capacity in actual use, and thereby understates its utilization, EIA proceeded to publish not only operable capacity, but also idle capacity and operating capacity in use, beginning in January 1983. The companies' monthly utilization rates for 1983 on both an operating and operable basis are shown in Table H-2.

It is believed that refiners may be relying on spare refining capacity and the flexibility it offers as a substitute for holding higher inventory levels. The NPC Survey results to Line Item 25 on Questionnaires 1-6, however, indicate that current inventory levels are not influenced by the spare refining capacity. (See Appendix D for the Survey results.)

TABLE H-2

U.S. Refiners' Monthly Utilization Rates:
January-June 1983

Month	Gross Inputs To Stills (MB/D)	Operable Capacity (MB/D)	Operable Utilization (%)	Operating Capacity (MB/D)	Operating Utilization (%)
Jan.	11,423	16,825	67.9	14,899	76.7
Feb.	11,000	16,823	65.4	14,413	76.3
Mar.	11,118	16,848	66.0	14,556	76.4
Apr.	11,664	16,832	69.3	14,622	79.8
May	12,060	16,837	71.6	14,589	82.7
June	12,606	16,819	74.9	14,670	85.9

Source: Energy Information Administration, Petroleum Supply Monthly, March-August 1983.

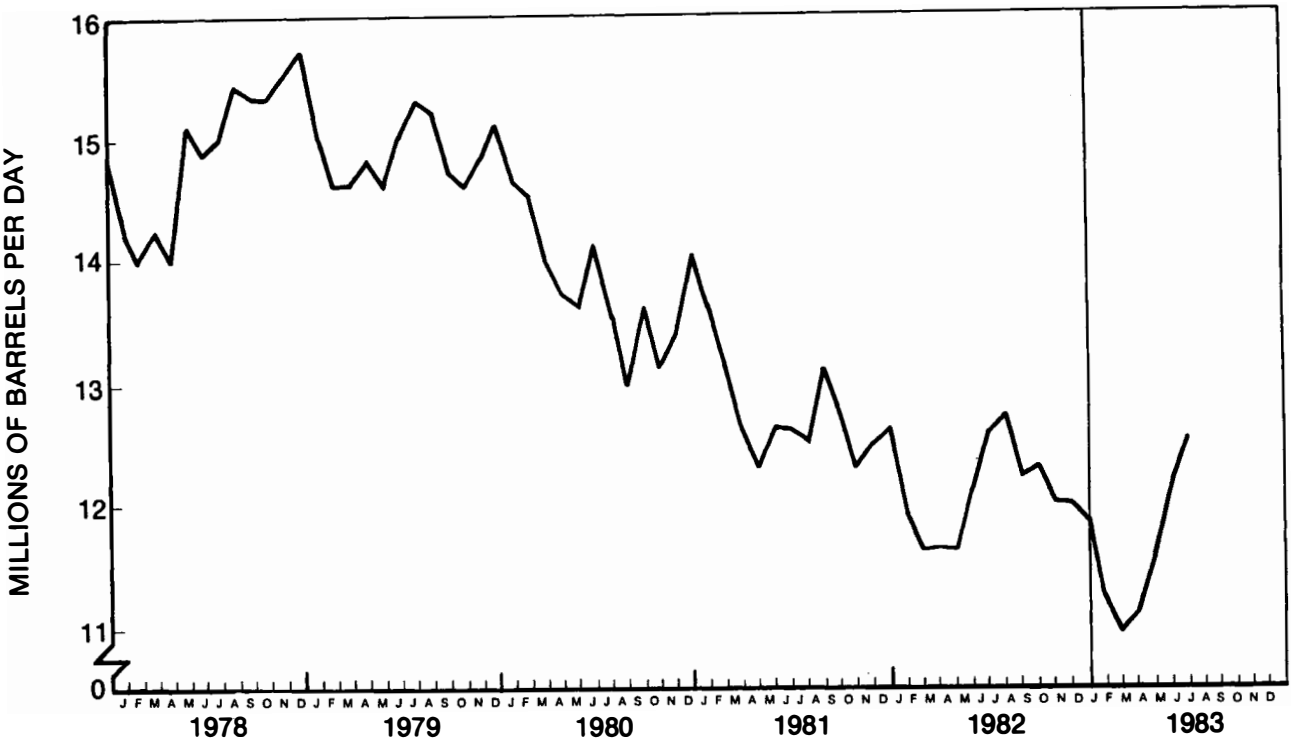


Figure I-1. Demand on Primary System for Crude Oil—Total U.S. (Millions of Barrels per Day).*

*Demand for crude oil is defined as the sum of refinery inputs, crude oil used directly as fuel oil, crude oil losses, and exports.

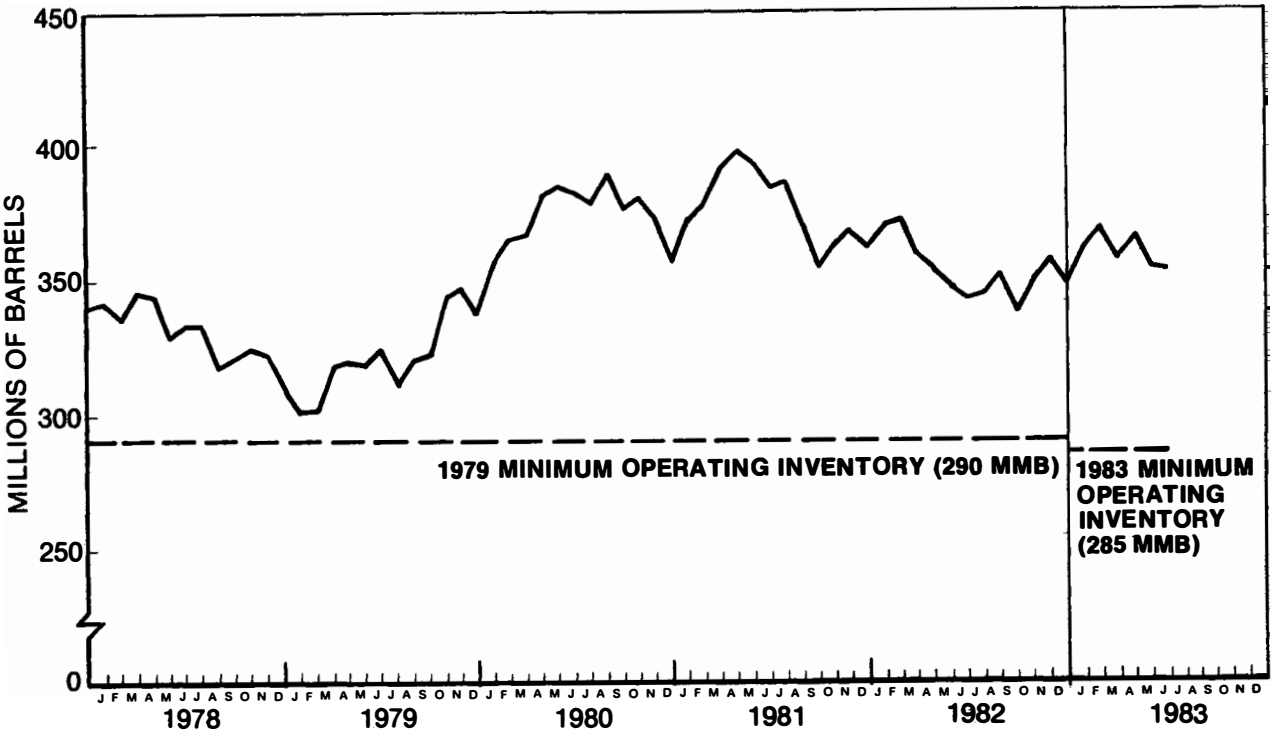


Figure I-2. Stocks of Crude Oil—Total U.S., Excluding SPR (Millions of Barrels).

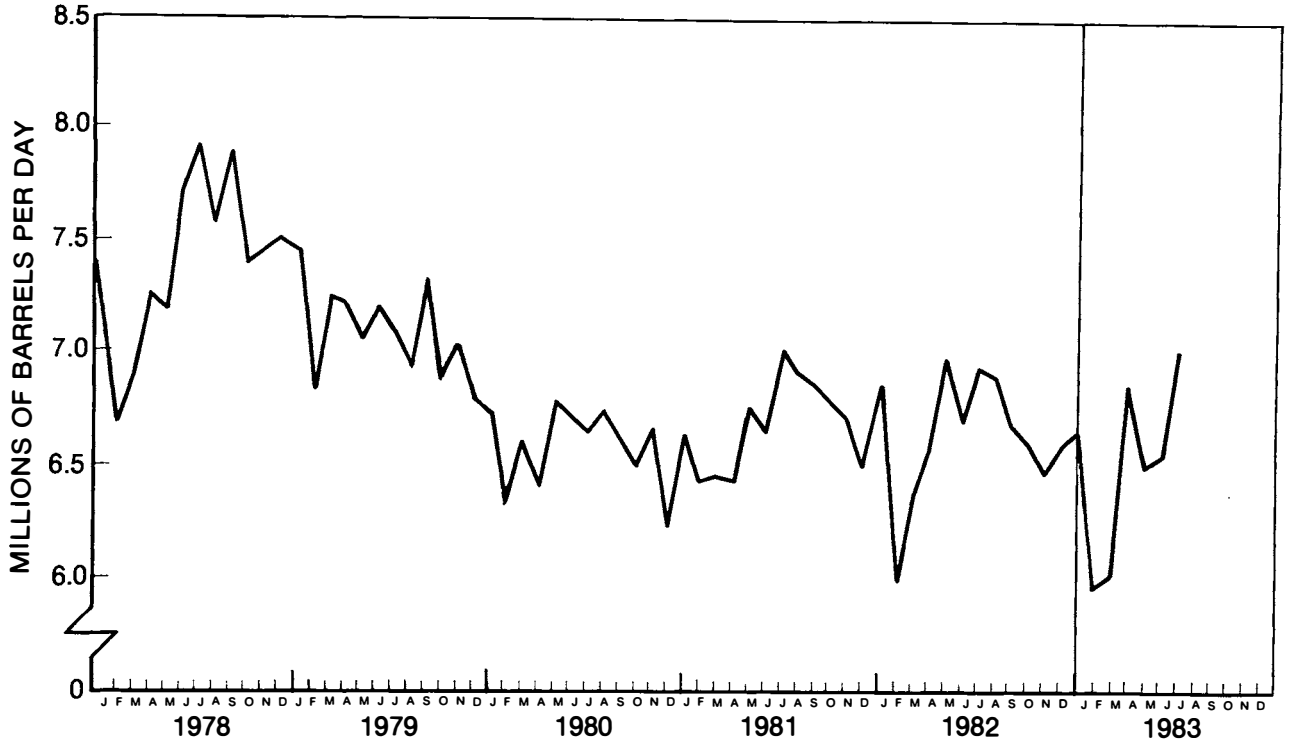


Figure I-3. Demand on Primary System for Motor Gasoline—Total U.S. (Millions of Barrels per Day).

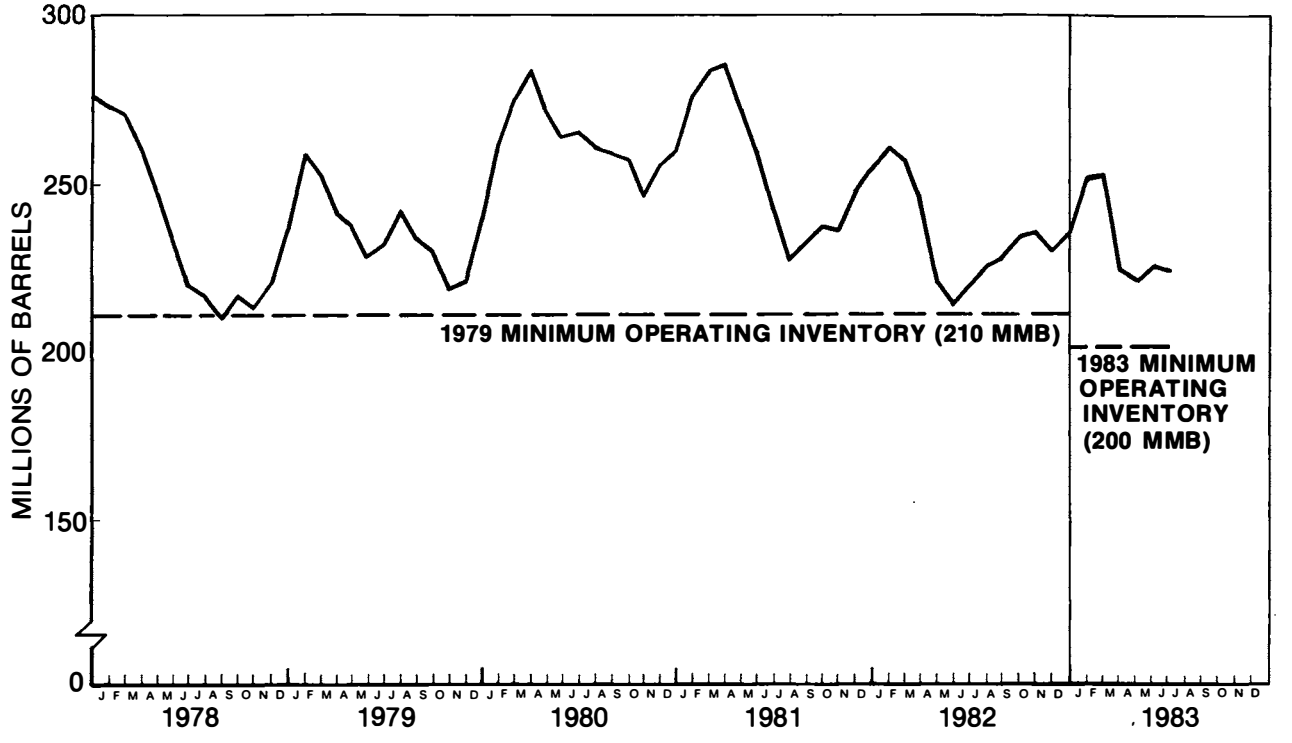


Figure I-4. Stocks of Motor Gasoline—Total U.S. (Millions of Barrels).

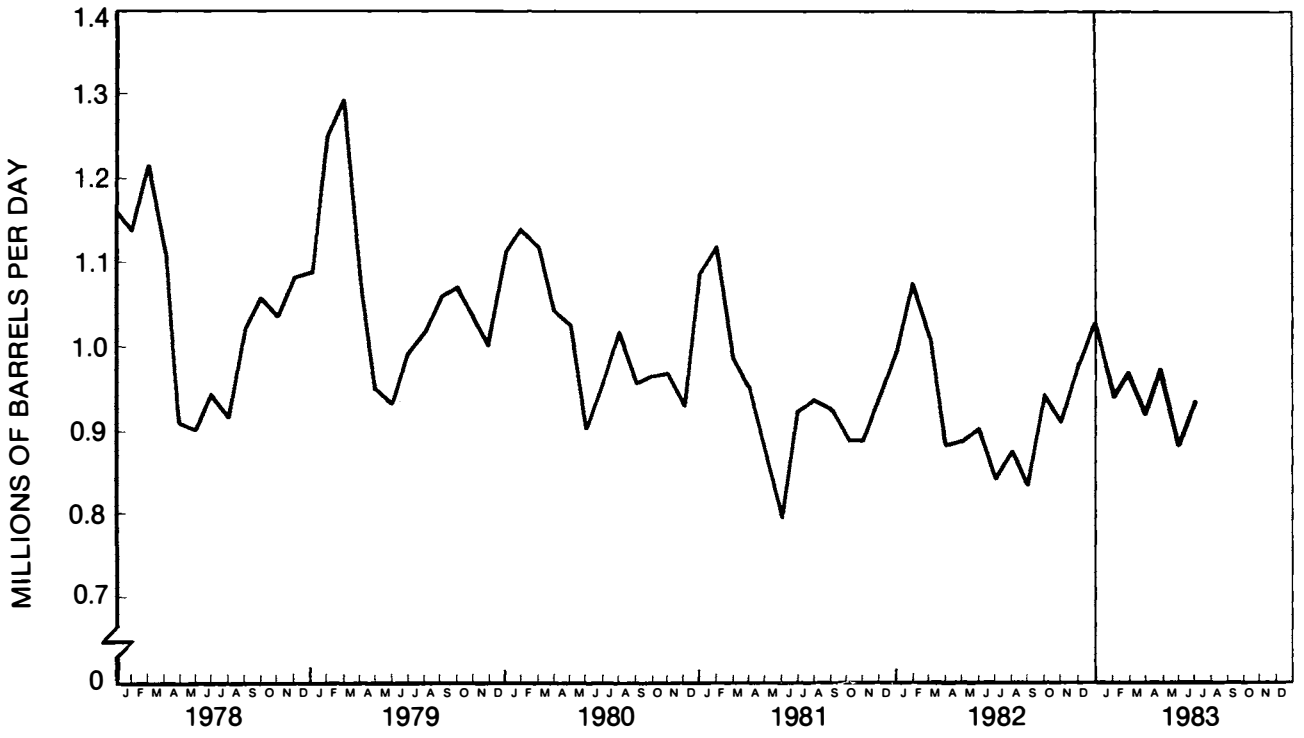


Figure I-5. Demand on Primary System for Kerosine and Kerosine-Type Jet Fuel—Total U.S. (Millions of Barrels per Day).

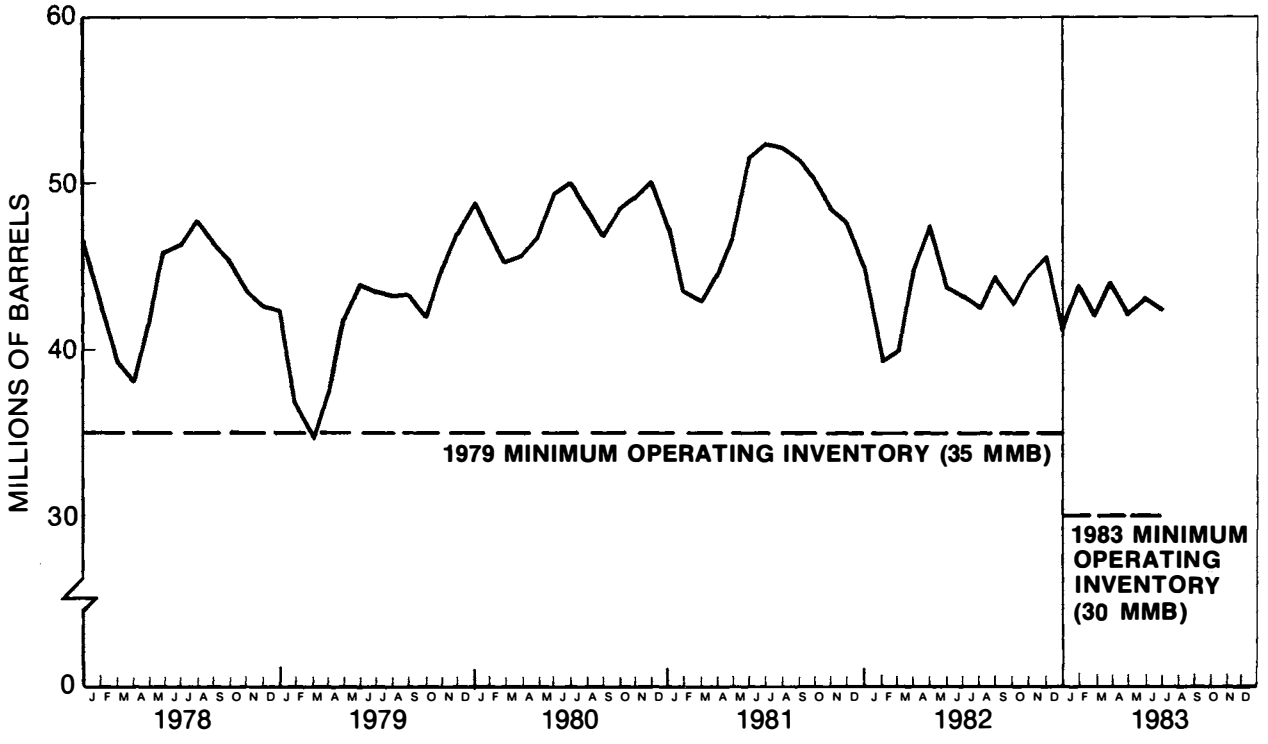


Figure I-6. Stocks of Kerosine and Kerosine-Type Jet Fuel—Total U.S. (Millions of Barrels).

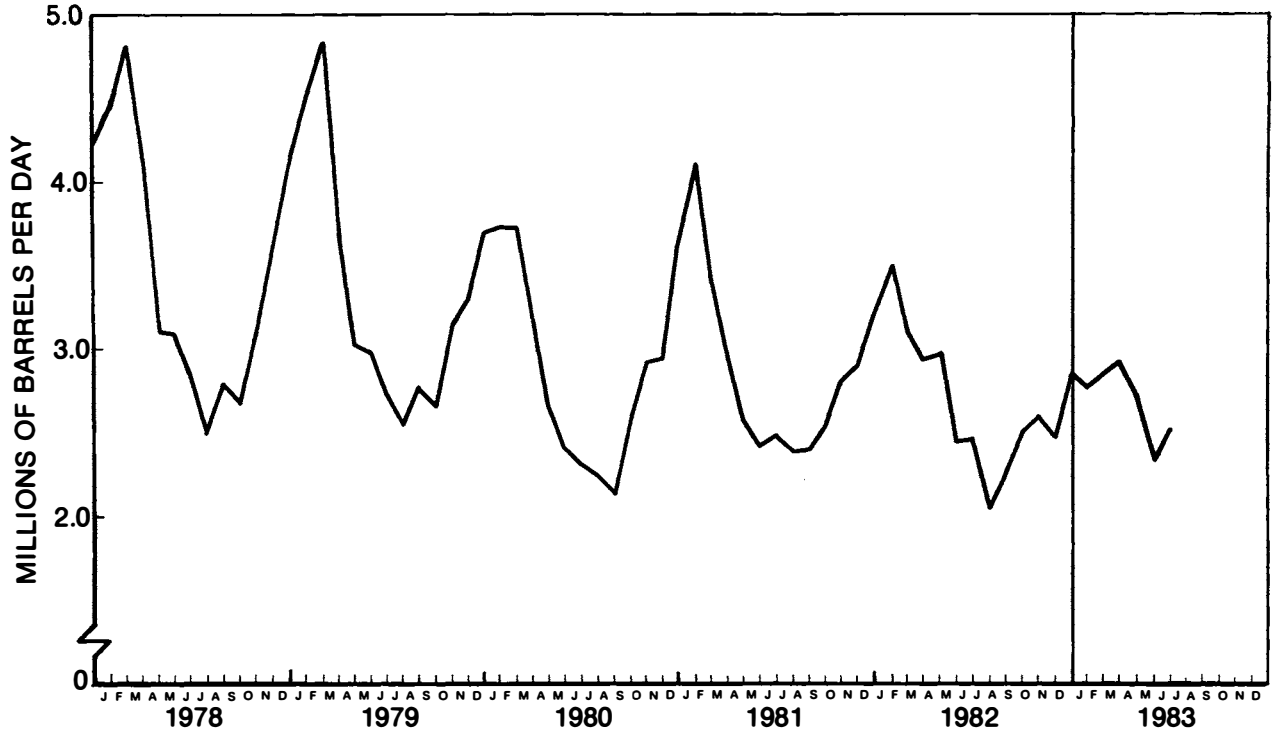


Figure I-7. Demand on Primary System for Distillate Fuel Oil—Total U.S. (Millions of Barrels per Day).

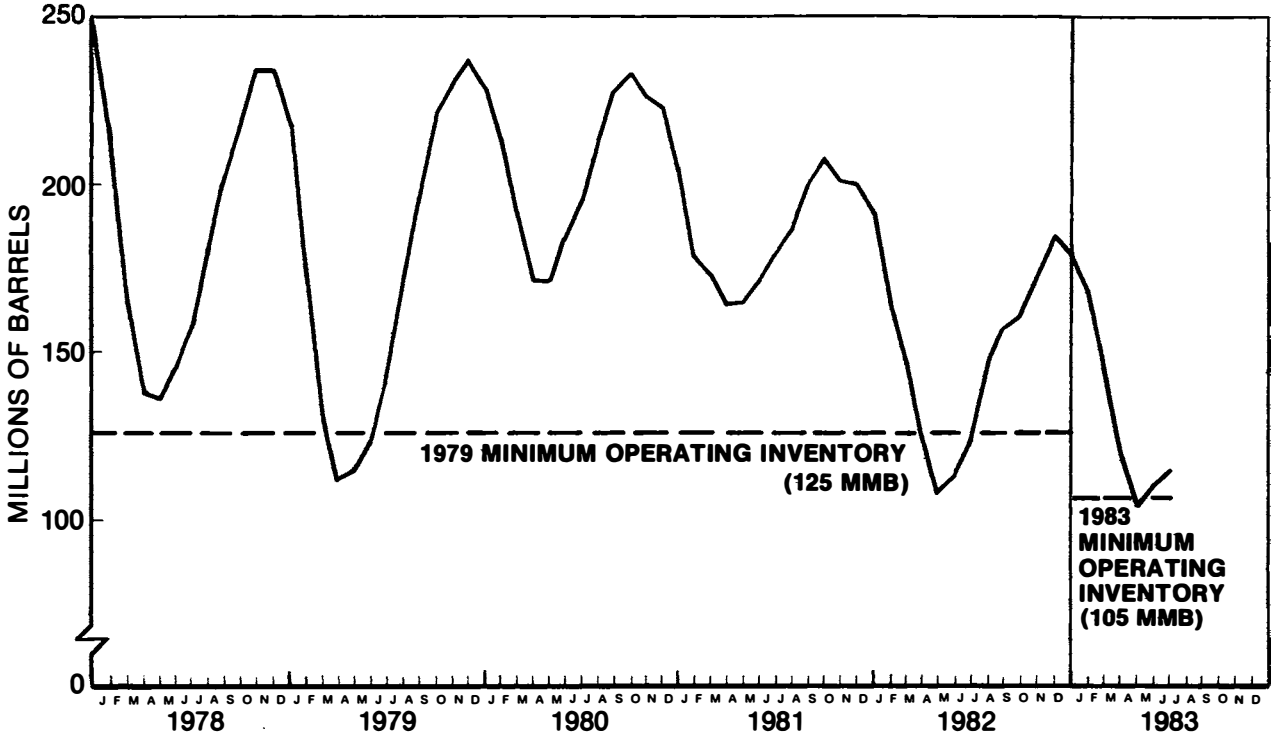


Figure I-8. Stocks of Distillate Fuel Oil—Total U.S. (Millions of Barrels).

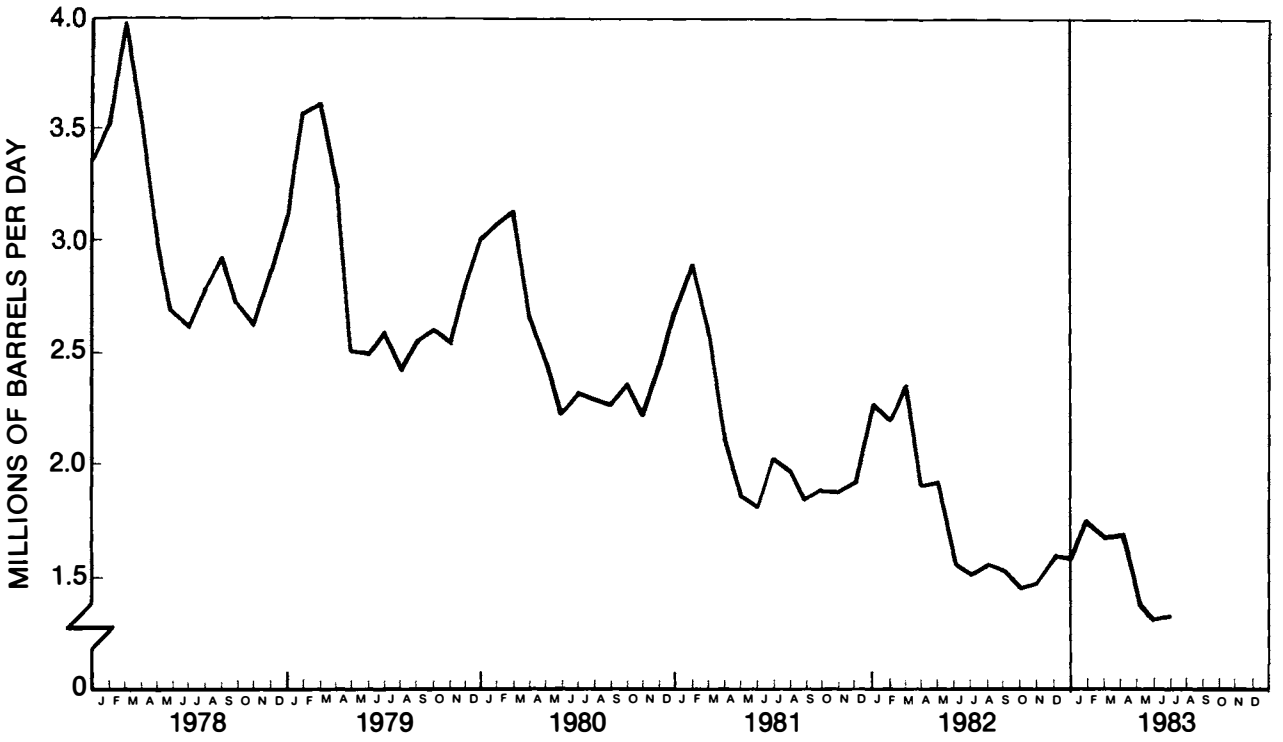


Figure I-9. Demand on Primary System for Residual Fuel Oil—Total U.S. (Millions of Barrels per Day).

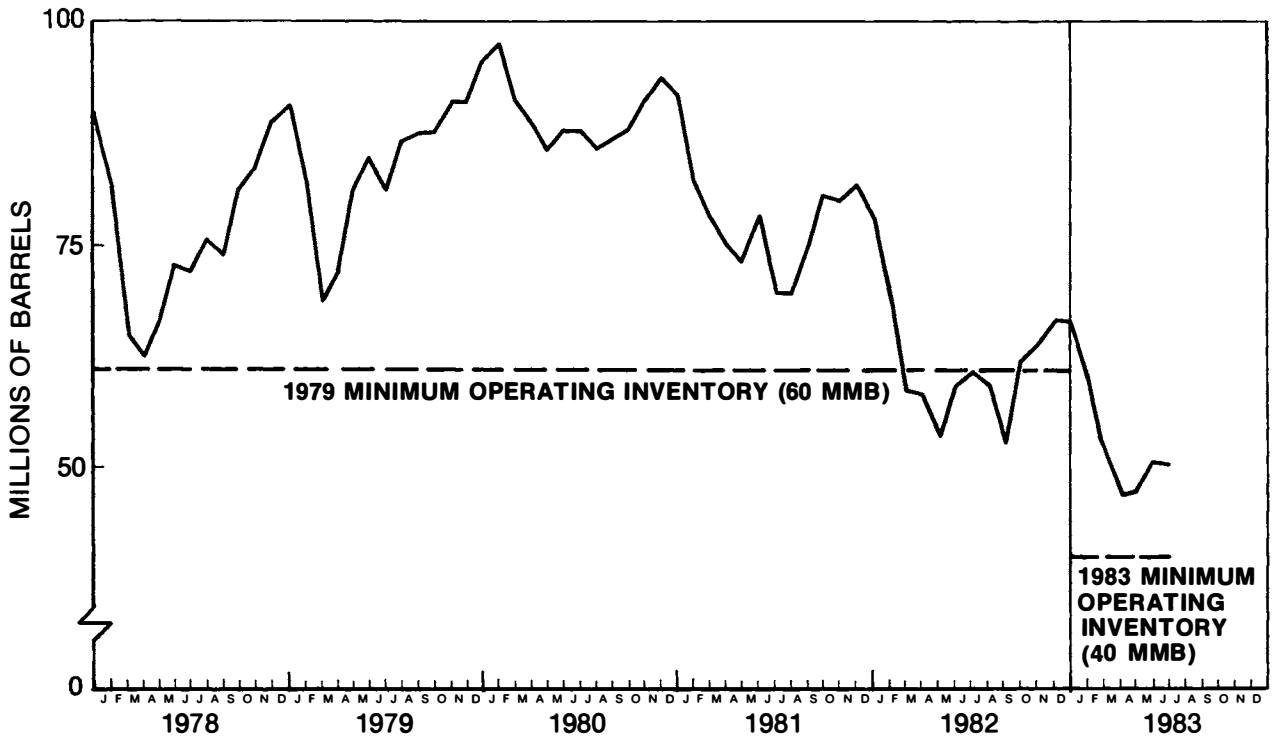


Figure I-10. Stocks of Residual Fuel Oil—Total U.S. (Millions of Barrels).

GLOSSARY

aviation gasoline -- all special grades of gasoline for use in aviation reciprocating engines, as given in ASTM Specification D910 and Military Specification MIL-G-5572. Includes all refinery products within the gasoline range that are to be marketed straight or in blends as aviation gasoline without further processing; i.e., any refinery operation except mechanical blending. Also includes finished components in the gasoline range which will be used for blending or compounding into aviation gasoline.

Alaskan crude oil in transit by water -- crude oil cargoes in transit by tanker from Alaskan loading ports to other states, Puerto Rico, the Virgin Islands, Guam, and the Hawaiian Foreign Trade Zone. Includes crude oil shipped from all sources in Alaska, including Cook Inlet and Valdez.

barrel -- the standard unit of measurement of liquids in the petroleum industry, containing 42 U.S. standard gallons at 60°F.

basic sediment and water (BS&W) -- bottoms, sediments, and water that collect at the bottom of storage tanks.

bulk plant -- a nonconsumer facility used for storage and/or marketing of petroleum products that has total storage capacity of less than 50,000 barrels and does not receive petroleum products by barge, tanker, or pipeline.

bulk terminal -- a nonconsumer facility used for storage and/or marketing of petroleum products that has total storage capacity of 50,000 barrels or more or receives petroleum products by barge, tanker, or pipeline.

clean products -- motor gasoline, kerosine, jet fuel, and distillate fuel oil.

contingency space -- space in excess of the maximum operating inventory, exclusive of the unavailable space, that is required to maintain a workable operating system. This space is only used in times of abnormal operations, such as equipment failure (see Figure 3).

crude oil -- technically defined as a mixture of hydrocarbons that exists in natural underground reservoirs and remains liquid at atmospheric pressure after passing through surface separating facilities. Statistically defined to also include lease condensate (see definition) and small amounts of nonhydrocarbons produced with the oil. Unfinished oils (see definition) and natural gas liquids produced at natural gas processing plants and mixed with crude oil are excluded.

distillate fuel oil (general) -- a general classification for one of the petroleum fractions that is used primarily for space heating, on- and off-highway diesel engine fuel (including railroad engine fuel and fuel for agriculture machinery) and electric power generation. Included are products known as No. 1 and No. 2 heating oil conforming to ASTM Specification D396 and diesel fuel conforming to ASTM Specification D975 for No. 1-D and No. 2-D.

distillate fuel oil (No. 4 fuel oil) -- a fuel oil for commercial burner installations not equipped with preheating facilities; extensively used in industrial plants. This grade is a blend of distillate fuel oil and residual fuel oil stocks that conforms to ASTM Specification D396 or Federal Specification VV-F-815C for this grade. Also included is No. 4-D, a fuel oil for low- and medium-speed diesel engines that conforms to ASTM Specification D975.

futures -- for the purpose of this report, refers to futures trading of No. 2 fuel oil/gas oil, motor gasoline, and crude oil on the New York Mercantile Exchange, the Chicago Board of Trade, and the London International Petroleum Exchange.

idle tankage -- tankage that was idle on March 31, 1983, for reasons other than programmed maintenance, but that could be available for service within 90 days following little or no maintenance work.

idle tankage (environmentally restricted) -- tankage that was idle on March 31, 1983, but that would require environmental waiver or modification to be available for service within 90 days.

in-transit inventory -- inventory that is being transported between domestic storage locations at a given point in time.

inventories -- liquid barrels of crude oil and certain refined petroleum products located within the customs territory of the United States (excluding Puerto Rico) that are stored in the primary and secondary distribution systems and the tertiary storage segment. Does not include inventories in U.S. territories and possessions.

kerosine (non-aviation use) -- a petroleum product used in space heaters, cook stoves, and water heaters, also suitable for use as an illuminant when burned in wick lamps. Included are the two classifications recognized by ASTM D-3699: No. 1-K and No. 2-K, and all grades of kerosine called range or stove oil that have properties similar to No. 1 fuel oil.

kerosine-type jet fuel -- a relatively low-freezing-point petroleum product of the kerosine type used primarily for commercial turbojet and turboprop aircraft engines. Covered by ASTM Specification D1655 and Military Specification MIL-T-5624L (Grades JP-5 and JP-8).

lease condensate -- a natural gas liquid recovered from gas well gas (associated and non-associated) in lease separators or field facilities. Consists primarily of pentanes and heavier hydrocarbons and is included with crude oil in this report.

lease stocks -- crude oil stocks held in storage on producing properties.

maximum operating inventory -- the maximum quantity that could be stored in a defined distribution system while still maintaining a workable operating system (see Figure 3).

minimum operating inventory -- the inventory level below which operating problems and shortages would begin to appear in a defined distribution system. Includes "unavailable" inventory as well as "required working" inventory necessary to maintain normal operations; does not include seasonal inventory (see Figure 3).

motor gasoline -- a complex mixture of relatively volatile hydrocarbons, with or without small quantities of additives, that have been blended to form a fuel suitable for use in spark-ignition engines. Consists of finished leaded gasoline (including leaded gasohol), finished unleaded gasoline (including unleaded gasohol), and motor gasoline blending components. Specifications for motor gasoline are given in ASTM Specification D439 and Federal Specification VV-G-1690B.

naphtha-type jet fuel -- a fuel in the heavy naphtha boiling range meeting Military Specification MIL-T-5624L (Grade JP-4). Used for turbojet and turboprop aircraft engines, primarily by the military; excludes ram-jet and petroleum rocket fuels.

net available shell capacity -- the total shell capacity of tankage less the unavailable space for tank tops and safety allowance (see Figure 3).

operable capacity (refineries) -- the maximum amount of input that can be processed by a crude oil distillation unit in a 24-hour period, making allowances for processing limitations due to types and grades of inputs, limitations of downstream facilities, scheduled and unscheduled downtimes, and environmental constraints. Includes any shutdown capacity that could be placed in operation within 90 days.

operating capacity (refineries) -- the amount of operable refinery capacity that was actively in operation as of the reporting date to DOE. Statistically, as reported to DOE, it is the total operable capacity minus the idle capacity that is shutdown but could be placed in operation within 90 days.

operating cycle -- the cyclic process of delivering oil from a supply tank(s) at one location in the distribution system to another tank(s) in the system to meet demand for that oil at the receiving location. The volume and frequency of the cycle are a function of many factors including the location of both supply and demand, the level of demand, the availability of transportation and refinery facilities, the mode of transportation, and the availability and size of tankage.

operating space -- space in the primary storage system in excess of the minimum operating inventory, available for holding additional inventories while still maintaining a workable system. Includes seasonal inventories and inventory build-up for planned maintenance (see Figure 3).

PADDs (Petroleum Administration for Defense Districts) -- a geographic aggregation of the 50 states and the District of Columbia into five districts originally designed by the Petroleum Administration for Defense in 1950 for purposes of administration (see Figure J-1). PADD I has been divided into three sub-PADDs: IA, IB, and IC.

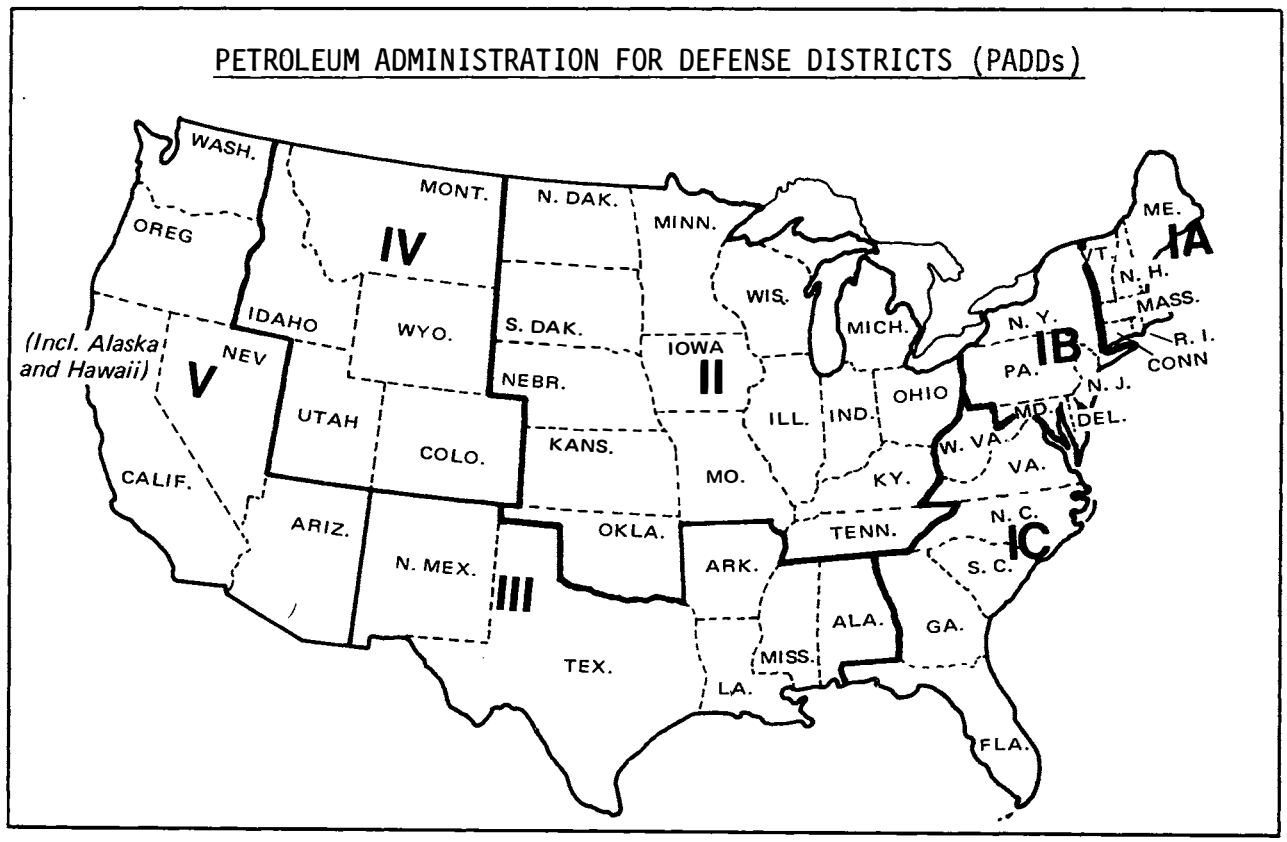


Figure J-1. Petroleum Administration for Defense Districts (PADDs).

petroleum products -- a generic term used to describe products obtained from distilling and processing crude oil, unfinished oils, natural gas liquids, blend stocks, and other miscellaneous hydrocarbon compounds. Includes all gasoline, jet fuels, kerosine, distillate fuel oil, residual fuel oil, liquified petroleum gases, petrochemical feedstocks, lubricants, paraffin wax, petroleum coke, asphalt, and many other miscellaneous products. Under some statistical classifications, petroleum products may refer to all petroleum, excluding only crude oil and lease condensate.

pipeline fill -- inventory in a pipeline between the shipping and receiving tanks in the pipeline system.

primary distribution system -- the system of tanks, caverns, terminals, pipelines, tankers, barges, tank cars, tank trucks, and refineries that receive, transport, and refine crude oil into products for delivery to bulk distribution terminals, the secondary distribution system, or certain end-users. Does not include the Strategic Petroleum Reserve (see Figures 1 and 2).

residual fuel oil -- the topped crude of refinery operation which includes No. 5 and No. 6 fuel oils as defined in ASTM Specification D396 and Federal Specification VV-F-815C, Navy Special fuel oil as defined in Military Specification MIL-F-859E including Amendment 2 (NATO Symbol F-77); and Bunker C fuel oil. Residual fuel oil is used for the production of electric power, space heating, vessel bunkering, and various industrial purposes. Includes imported crude oil to be burned as a fuel.

seasonal inventory -- inventory that is not immediately needed to support current demand levels, but is maintained in anticipation of higher (seasonal) demand levels that cannot be met with then-current manufacturing or transportation capabilities.

secondary distribution system -- includes nonconsumer bulk plants and facilities of resellers of petroleum products, such as gasoline service stations, jobbers, and fuel oil dealers (see Figures 1 and 2).

Strategic Petroleum Reserve (SPR) -- a federal program created by the Energy Policy and Conservation Act of 1975 to establish a reserve of up to one billion barrels of crude oil and/or petroleum products to reduce the impact of disruptions in petroleum supplies and to carry out the obligations of the United States under the International Energy Program (see Appendix F).

shell capacity of tankage -- the design capacity of the tank (see Figure 3).

stocks -- see definition of inventories.

swing tankage -- tankage that is used to store different products at different times of the year.

tank bottoms -- inventory that falls below the normal suction line of the tank. For floating roof tanks, the amount required to keep the legs of the roof from touching the tank bottom. The inventory in tank bottoms (including BS&W) is unavailable (see Figure 3).

tankage under construction -- shell capacity under construction (ground has been broken, the construction contract signed, and major equipment ordered).

tertiary storage segment -- inventory and storage capacity of products at the consumer level (see Figures 1 and 2).

total system capacity -- the sum of net available shell capacity, storage caverns, and unavailable inventory outside of tankage (defined as pipeline fill, inventory in refinery lines, operating equipment, and in-transit from domestic sources excluding Alaskan crude oil in transit by water). In the case of crude oil inventories, producers' lease tankage is also included in total system capacity if stocks are routinely reported to DOE.

unavailable inventory -- includes inventory in tank bottoms, pipelines, refinery pipelines, and operating equipment, quantities set aside as plant fuel or pipeline prime mover fuel, and oil in transit by truck, tank car, barge, and tanker from domestic sources.

unavailable space -- top portion of a tank that is not available to store inventory but is required for design or safety considerations; e.g., to allow for thermal expansion (see Figure 3).

unfinished oils -- mixture or combination of partially processed petroleum oils or any components thereof which are to be further processed; i.e., any refinery operation except mechanical blending.

wet barrel delivery -- futures market delivery mechanism involving the physical transfer of the commodity during the delivery month.

working inventory -- that portion of the minimum operating inventory required over and above the unavailable inventory required to keep the distribution system functioning normally without operating problems and run-outs. Includes the volumes needed to support the normal operating cycle of shipments and receipts as levels rise and fall in each tank when oil is delivered or removed. Also includes the volume needed to handle unavoidable but recurring operating interruptions and schedule changes, and volumes needed to facilitate blending of final product to required specification. Does not include seasonal inventory or stocks held for planned maintenance (see Figure 3).