Final Report

Findings and Views Concerning the Exemption of Motor Gasoline From the Mandatory Petroleum Allocation and Price Regulations

September 1977

ns

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

EXECUTIVE SUMMARY

-- "Gasoline allocation and price controls are another major area of unsettled oil policy. Gasoline prices have never reached their allowable controlled ceilings, and marketers have contended for some time that deregulation of gasoline would increase competition by allowing them to shop among suppliers. There is little question that gasoline allocation and price controls have distorted what at times has been a competitive market.

In order to assure the maintenance of such competition in the gasoline marketplace, the Administration will support legislation similar in concept to the pending 'dealer day in court' bill that would protect service station dealers from arbitrary cancellation of their leases by major oil suppliers. In addition, the Administration currently hopes to eliminate gasoline price controls and allocation regulations at the end of the peak driving season this coming fall. Gasoline prices and market competition will be closely monitored between now and then to assure this policy is appropriate. If gasoline were to be decontrolled, controls could be reimposed if prices rose above a predetermined level. This standby authority would permit the elimination of controls while protecting consumers."*

* The National Energy Plan, page 59.

-- To exempt motor gasoline from the Mandatory Petroleum Allocation Regulations, the Federal Energy Administration (FEA) must find "...that such oil or refined product category is no longer in short supply and that exempting such oil or refined product category would not have an adverse impact on the supply of any other oil or refined product..." [Section 12(d)(1)(A) of the Emergency Petroleum Allocation Act of 1973 (EPAA), as amended]. FEA's finding is that the supply of motor gasoline is now adequate and will be adequate through the year 1978. The national allocation fraction (defined as total supply divided by supply obligation to all levels of distribution) is now approximately 1.0, and surplus product is currently available in the marketplace. Because historically domestic refinery capacity has been inadequate and is still inadequate to fully satisfy demand for all refined products, a small supply of motor gasoline continues to be imported.

A demand and supply balance for the year 1979 is less certain. Depending on factors not related to the exemption, supply could fall short of demand in that year. During peak demand periods refinery capacity may be inadequate to meet increased motor gasoline demand in 1979. However, FEA's finding is that in 1979 additional

imports of motor gasoline coupled with market forces can offset any supply shortfall. If it becomes apparent that supplies in 1979 will be inadequate, controls could be reimposed to forestall the price increase that would be the normal consequence of a supply/demand imbalance.

-- To exempt motor gasoline from the Mandatory Petroleum Price Regulations, the FEA must also find "...that competition and market forces are adequate to protect consumers and that exempting such oil or refined product category will not result in inequitable prices for any class of users of such oil or product..." [Section 12(d)(1)(B) of the EPAA]. With current adequate supplies of motor gasoline and the industry operating at an adequate level of profitability, motor gasoline prices are not experiencing any strong upward pressures. Competition and market forces are therefore adequate to protect consumers as long as supplies remain adequate. It is not anticipated that exempting motor gasoline from regulation will result in inequitable prices for any class of consumer.

-- The FEA further finds that the exemption of motor gasoline is consistent with the attainment of the objectives set forth in the EPAA.

-- The FEA also finds that exemption of motor gasoline from regulation will not significantly affect the rate of unemployment, Consumer Price Index, or the Gross National Product (GNP). However, in the event of a supply shortfall in 1979, either reimposition of controls or the resulting price increase would influence these economic indicators.

-- Continuation of motor gasoline regulations designed for a shortage situation is not now necessary to achieve the objectives of the EPAA. Exemption may, in fact, stimulate production and should not adversely affect supply. Consequently, concurrent with the issuance of this report, FEA is proposing to the Congress, in accordance with the requirements of Section 12 of the EPAA, Section 551 of the Energy Policy and Conservation Act (EPCA), and Section 102 of the Energy Conservation and Production Act (ECPA), the exemption of motor gasoline from the Mandatory Petroleum Allocation and Price Regulations.

-- FEA will shortly propose for public comment a post-exemption gasoline price monitoring system, in keeping with that facet of the National Energy Plan, to ensure that unwarranted price increases do not occur after gasoline is exempt from regulations.

FINDINGS AND VIEWS CONCERNING THE EXEMPTION OF MOTOR GASOLINE FROM THE MANDATORY PETROLEUM ALLOCATION AND PRICE REGULATIONS

CHAPTER I

INTRODUCTION

This report presents the Federal Energy Administration's (FEA) findings and views with respect to its proposal to exempt motor gasoline from the Mandatory Petroleum Allocation and Price Regulations (10 CFR Parts 210, 211, and 212), issued pursuant to the Emergency Petroleum Allocation Act of 1973 (EPAA), as amended. The Energy Policy and Conservation Act (EPCA), Public Law 94-163, (December 22, 1975), in Section 455 added Section 12 to the EPAA, requiring that any amendment submitted to the Congress to exempt a product or product category from regulation be supported with certain findings and the FEA's views as to a variety of matters related to the exemptions. Motor gasoline is defined therein as a separate "refined product category." Section 102 of the Energy Conservation and Production Act requires separate submissions to the Congress of energy actions exempting a refined product category from price and allocation provisions of the FEA regulations, but it does permit the FEA to submit concurrently, separate energy actions proposing price and allocation exemptions.

Based on an analysis of historic and projected supply, demand, and price trends, the FEA has concluded that mandatory allocation and price controls are no longer necessary for motor gasoline and that exemption of motor gasoline, in addition to satisfying the other requisite criteria of Section 12 of the EPCA, will be consistent with the attainment, to the maximum extent practicable, of the objectives specified in Section 4(b)(1) of the EPAA. Accordingly, final rules are being issued concurrently with this report and the FEA is submitting to the Congress two concurrent energy actions in accordance with the provisions of Section 12 of the EPAA, Section 551 of the EPCA, and Section 102 of the ECPA, to exempt motor gasoline from allocation and price controls. If neither House of Congress disapproves these amendments during the 15-day period allowed for legislative review, the exemption would become effective upon the date specified in the amendments and the regulations would be converted to standby status. Inasmuch as the FEA is submitting concurrent energy actions exempting motor gasoline from both price and allocation regulations, this report considers the impact of both proposed exemptions.

The FEA's findings and views regarding the exemption of motor gasoline from allocation and price controls are summarized as follows:

- o Motor gasoline is currently not in short supply and is expected to remain adequate through 1979.
- o Exemption of motor gasoline from the allocation and price regulations will not have an adverse impact on the supply of any other oil or refined petroleum product subject to the EPAA.
- o Following exemption of motor gasoline from regulations, competition and market forces should be adequate to protect consumers as long as motor gasoline supplies remain adequate.
- o Exemption of motor gasoline from regulation will not result in inequitable prices for any class of user of motor gasoline or other products.
- o Exemption will not have adverse state or regional impacts.
- o As long as supplies remain adequate, exemption of motor gasoline will not have an adverse effect on:
  - availability of consumer goods and services;
  - the Gross National Product (GNP);
  - competition;
  - small business;

- supply and availability of energy resources as fuel or feedstock for industry;
- consumer prices, Consumer Price Index, or the implicit price deflator for the GNP; or,
- the rate of unemployment.

The FEA also believes that the exemption of motor gasoline from allocation and price regulations is consistent with the objectives set forth in Section 4(b)(1) of the EPAA.

Since adequate supply is currently available and is projected to meet future demand, continued mandatory allocation and pricing of motor gasoline are not necessary to:

- o protect public health, safety, welfare, and the national defense [section 4(b)(1)(A)];
- o maintain public services [section 4(b)(1)(B)] and agricultural operations [section 4(b)(1)(C)];
- o maintain exploration for and production or extraction of fuels [section 4(b)(1)(G); or
- o ensure equitable distribution of crude oil, residual fuel oil, and refined petroleum products at equitable prices [section 4(b)(1)(F)].

Because the regulations issued pursuant to the EPAA are designed to deal with shortage conditions, the

exemption should facilitate the attainment of the following EPAA objectives in the current period of ample supplies:

- o preservation of an economically sound and competitive petroleum industry [section 4(b)(1)(D)];
- o economic efficiency [section 4(b)(1)(H); and,
- o minimization of economic distortions, inflexibility, and interference with market mechanisms [section 4(b)(1)(I)].

Further, the exemption should not have an adverse effect on allocating suitable crude oil to U.S. refineries [section 4(b)(1)(E)], maintaining energy production, or providing for maximum use of refinery capacities.

Chapter II provides background information on use, production, and distribution of motor gasoline. Chapter III analyzes the historical interaction of supply, demand and price, and explores the market structure for motor gasoline during 1968-1977, prior to and during imposition of allocation and price controls. Chapter IV examines supply, demand, price, and market structure impacts of exempting motor gasoline from controls. In Chapter V, the potential economic impacts of exemption are evaluated, and Chapter VI provides a final summary of the FEA's findings and views in support of its judgment that motor gasoline should be exempted from the Mandatory Petroleum Allocation and Price Regulations.

CHAPTER II

BACKGROUND

An understanding of the supply, demand, price and market relationships for motor gasoline as analyzed in this report requires a review of the nature and use of motor gasoline, its production and distribution, and of the supply and demand patterns for the product. This chapter provides background information on use, production, and distribution of motor gasoline.

DEFINITIONS

Motor gasoline is the commonly known and technically accepted name of the product purchased at neighborhood gas stations. As defined by 10 CFR 211.51 "motor gasoline means a mixture of volatile hydrocarbons, suitable for operation of an internal combustion engine, whose major components are hydrocarbons with boiling points ranging from 140° to 390° F and whose source is distillation of petroleum and cracking, polymerization, and other chemical reactions by which the naturally occuring petroleum hydrocarbons are converted to those that have superior fuel properties." Aviation gasoline is excluded from the above definition. For purposes of the pricing regulations, "gasoline" has been defined in 10 CFR 212.31 as "all of the various grades, other than aviation gasoline, of refined petroleum naphtha which, by its composition,

is suitable for use as a carburant in internal combustion engines."

Grade of gasoline, as defined by the American Society of Testing Materials (ASTM), refers to differences in octane number between types of gasoline. The octane number is a measure of the ability of a fuel to withstand high temperatures and pressures in an engine combustion chamber without exploding prematurely (i.e., knocking). An octane number may be raised by increasing the concentration of high, clear-octane components in the fuel or by adding certain metallic compounds.

Motor gasoline, as marketed in the U.S. consists basically of two types: leaded and unleaded, both of which are marketed at various octane ratings. Unleaded gasoline was introduced into the motor gasoline market in substantial amounts in 1974 as the fuel required under the Clean Air Act for most new automobiles marketed in the U.S. This requirement was placed in effect to reduce pollution from auto emissions and to permit efficient functioning of catalytic emission control equipment installed in automobiles for that purpose. By January 1975, unleaded gasoline based on actual deliveries was 7.9 percent of the total U.S. gasoline consumption. Unleaded gasoline demand as a percentage of total demand in 1976 was approximately 19 percent and for the first three months of 1977 increased by 3 percent to approximately 22 percent.

249-464 O - 77 - 2

Since the 1974-1976 period, demand for unleaded gasoline has been increasing at a substantial rate.

Legislation calling for a significant reduction in allowable lead concentrations in motor gasoline resulted in the promulgation of Environmental Protection Agency (EPA) regulations which require that all major U.S. refiners meet a 0.8 gram per gallon maximum by January 1, 1978, and a 0.5 gram per gallon maximum by October 1, 1979. These lead levels contrast with previous industry levels in the 3-4 gram per gallon range. Standards for existing capacity of small refiners are set forth in Section 223 of the 1977 Clean Air Act Amendments (PL 95-95, enacted August 7, 1977) and are somewhat relaxed until 1982.

As lead was the principal octane rating enhancer, this loss of octane enhancement capability, and the concurrent market demand shift to unleaded fuel required by the post-1974 automobiles, has resulted in difficulties for refiners in meeting octane requirements. As the demand for high quality unleaded gasoline grows and each progressive step toward the 0.5 gram per gallon standard takes place, it will become increasingly difficult for such requirements to be met.

Another less effective octane enhancer is a manganese-based compound, methylpentadienyl manganese tricarbonyl (MMT). It has been used in unleaded gasoline in minor amounts. While this material does not poison the catalytic converters employed by auto makers to achieve the Clean Air

Act emission standards, it now appears the additive may tend to increase hydrocarbon emissions. Extensive industry and government testing is presently underway to quantify and confirm the nature of the problem.

Section 222 of the 1977 Amendments to the Clean Air Act prohibits the use of gasoline additives, including MMT, subsequent to September 15, 1978. Further, the maximum concentration of manganese in a gallon of motor gasoline shall be no greater than .0625 grams per gallon after November 30, 1977. The EPA Administrator may grant a waiver of such restrictions if an applicant can demonstrate that a fuel additive or a given concentration of it will not cause or contribute to the failure over its useful life of an emission control device or system.

Presently, MMT availability is limited by production capability. The sole MMT manufacturer's plans for expansion have been suspended because of uncertainty of MMT's future use. Chapter IV discusses the significance of MMT usage and quantifies the impact of the use or non-use of MMT.

THE REFINING PROCESS

Gasoline is produced by refining crude oil. The first stage in the refining process is the distillation of crude oil into various fractions. The crude oil is first vaporized and fractions are recovered at different levels of a fractionating tower, where they condense according to their different boiling points. The lightest weight fractions, the gases (including methane,

ethane, propane, and butane), emerge directly from the top of the tower. At the next level are naphthas, whose boiling range extends from about 85°F to about 430°F. Next are liquids called gas oils whose boiling points are above 430°F. Finally, at the bottom of the tower, a heavy residue is obtained. So-called "straight run" gasoline, produced directly from the distillation process, is contained in the naphtha fraction. This fraction constitutes about 25 percent of total yield from the distillation process

Additional gasoline is produced through chemically combining light end fractions such as propanes and butanes in an alkylation process. To increase the yield of gasoline beyond this point, the gas oils, which constitute about 45 percent of the yield from the distillation process, are "cracked." This involves breaking down some of the large molecules in the heavier gas oil and residue stocks. In a catalytic cracker, or "catcracker," heavier stocks are broken down in the presence of a catalyst which aids completion of the chemical reaction involved. Thermal cracking is also used to break down heavier gas oil and residue stocks. Such a cracking process is designated "coking." In addition to increasing the naphtha stocks from which gasoline is made, the cracking processes also produce additional light gases, and lighter gas oils and a heavy aromatic gas oil residue.

The resulting increased naphtha stocks may then be further processed to yield gasoline and other finished products. As a major part of this additional processing, reforming units, used to restructure naphtha molecules to give the gasoline produced a higher octane rating, are becoming increasingly necessary to produce unleaded gasoline. Figure II-1 is a diagram of a refinery processing system by which gasoline as well as other refined products are produced from crude oil. Marketable motor gasoline is created by blending the gasoline components produced from the refining process with additives as necessary to produce the fuel specifications required for use in spark-ignited internal combustion engines.

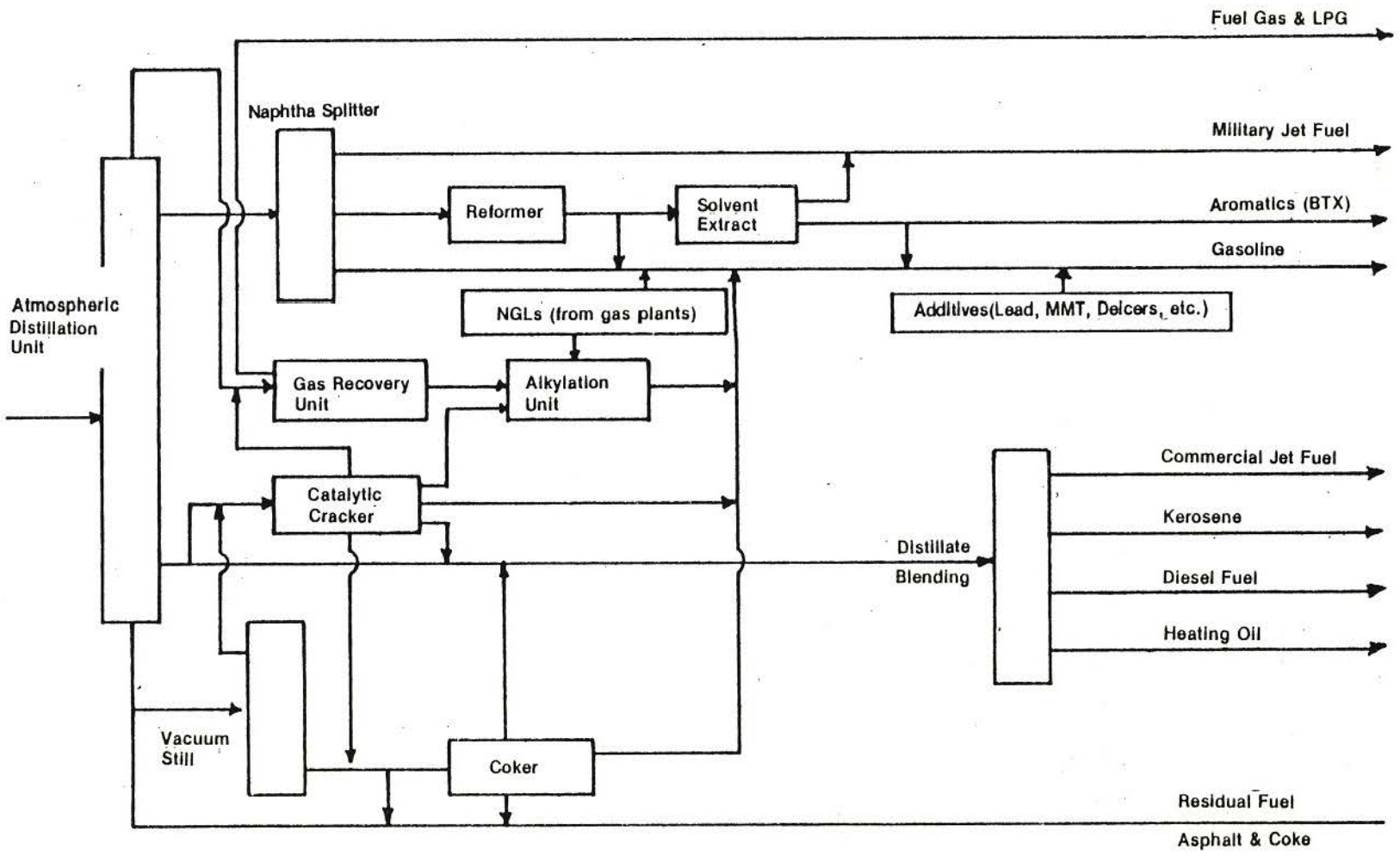
USE

Motor gasoline is the primary petroleum product produced in the U.S., comprising about 45 percent of the total refined product produced from crude oil. Of the more than 110 billion gallons of gasoline sold annually in the U.S., approximately 97 percent is domestically produced. It is the fuel used by most automobiles, some trucks and buses, and certain non-highway vehicles. Motor vehicle use accounts for over 90 percent of U.S. gasoline consumption, with passenger automobiles accounting for 75 percent.

DISTRIBUTION

Motor gasoline is marketed through the most complex and comprehensive distribution system of all the petroleum

Figure II-I
Refinery Processes



products in the U.S. Approximately 15 large integrated refiners and 125 small and/or independent refiners together supply about 10,000 wholesale distributors and approximately 179,000 retail outlets with approximately 97 percent (excluding imports) of total U.S. gasoline supplies. Gasoline generally moves from refiners by pipeline or vessel to primary terminals, then by truck to distributors, large consumers and retail outlets.

Retail outlets may be classified as full service stations, limited or self-service stations, and stations selling gasoline as a sideline to another business (e.g., convenience or discount stores). Before 1973, the trend in retail operations began to shift from traditional full-service stations to lower priced, higher volume, limited-service stations. This trend was interrupted by the oil embargo of 1973-1974, but resumed with the return of surplus product during late 1974. As a result, there has been an increase in average sales volume per station even though the number of retail stations has decreased. The impact of those changes in gasoline retailing on the participants in the motor gasoline distribution system, within the framework of FEA regulations, is discussed in Chapter III.

CHAPTER III

HISTORIC CONDITIONS (1968-1977)

This chapter examines the historical interaction of supply, demand and price of motor gasoline, and market structure of the petroleum industry in order to address the following principal questions required to be satisfied by the EPCA to support exemption from regulation:

- Will prices be equitable for all classes of users?
- Will motor gasoline be in adequate supply?
- Will the competitive market structure of the petroleum industry be maintained?

To provide a perspective for estimating the effects of exempting motor gasoline from the Mandatory Petroleum Allocation and Price Regulations, these questions are addressed from an historical and current viewpoint for the period 1968 through 1977. Beginning in 1971, various price rules were implemented which had both a direct and indirect impact on free market relationships. A chronological review of price and allocation controls is therefore presented in this chapter, followed by a discussion of the effects which these controls have had on the supply, demand and price of motor gasoline and on the market structure of the petroleum industry.

CHRONOLOGY OF ALLOCATION AND PRICE CONTROLS

Allocation and price controls on motor gasoline have been imposed at various times over the past several years as part of major U.S. economic regulatory programs beginning with the series of price controls established under the Economic Stabilization Program. The principal allocation and price controls involved, for purposes of this report, are as follows:

Program	Effective Date	Description and/or Responsible Office
Phase I	Aug. 15, 1971	Original Price Freeze Office of Emergency Preparedness
Phase II	Nov. 13, 1971	Mandatory Price Controls Price Commission
Phase III	Jan. 11, 1973	Voluntary Price Standards Cost of Living Council
Special Rule No. 1	Mar. 6, 1973	Mandatory Price Controls on Petroleum Industry Cost of Living Council
Voluntary Petroleum Allocation Program	May 10, 1973	Original Product Allocation Program on a Voluntary Basis Dept. of the Interior
Price Freeze II	June 13, 1973	Sixty Day Price Freeze Cost of Living Council
Phase IV	Aug. 19, 1973	Mandatory Price Controls Cost of Living Council
Emergency Petroleum Allocation Act of 1973 (EPAA)	Nov. 27, 1973	Mandatory Allocation and Price Regulations issued January 14, 1974 Federal Energy Office and Federal Energy Administration

The PHASE I CONTROLS consisted of a general price freeze imposed on all sectors of the U.S. economy for a period of 90 days under which prices were frozen at their August 14, 1971 level. This had the effect of freezing motor gasoline prices at their seasonal high levels, and conversely, of freezing home heating oil and other middle distillates prices at their seasonal low price levels.

The PHASE II MANDATORY PRICE CONTROLS established ceiling prices for all industries based on Phase I prices, with limited adjustments allowed to reflect increased costs. The Phase II rules therefore had the effect of continuing the seasonal high price levels allowed for motor gasoline while middle distillates were held close to their seasonal low price levels.

The PHASE III VOLUNTARY PRICE STANDARDS also applied to all industries generally. Under Phase III, increases above those lawfully in effect on January 10, 1973, were permitted to reflect increased costs without regard to profit margin limitations. Phase III voluntary controls had the effect of permitting the petroleum industry to correct the price imbalance between motor gasoline and middle distillates that had prevailed under Phases I and II. However, Phase III also had the effect of permitting large increases in petroleum prices. As a result,

Phase III was amended by SPECIAL RULE NO. 1 on March 6, 1973, the first time price controls were established expressly for the petroleum industry. Under Special Rule No. 1, mandatory price controls were imposed on the sale of crude oil and refined petroleum products by firms with annual sales of $250 million or more, which generally limited automatic price increases to a weighted average price of one percent above the January 11, 1973, base price levels. Because Special Rule No. 1 applied only to the 23 largest oil companies, petroleum prices continued to rise because of price increases by the uncontrolled portion of the petroleum industry.

The VOLUNTARY PETROLEUM ALLOCATION PROGRAM (VPAP) was developed to deal with increasingly frequent spot shortages of petroleum products, which had first appeared in late 1972. Through an April 30, 1973, amendment to the Economic Stabilization Act of 1970 (P.L. 93-28), Congress empowered the President to allocate petroleum products and crude oil to meet essential needs and to prevent anti-competitive effects caused by shortages. The VPAP was initiated on May 10, 1973, and set out guidelines for the petroleum industry for the allocation of products at all levels of distribution. The program relied on voluntary compliance.

PRICE FREEZE II was placed in effect on June 13, 1973, for a 60-day period, partly because of continuing increases

in petroleum prices, including increases in gasoline prices. This 60-day price freeze was imposed on virtually all consumer prices. At the same time, the Cost of Living Council was directed to develop Phase IV regulations which were to include measures to stabilize the price of petoleum products.

THE PHASE IV CONTROLS, developed during the 60-day price freeze, went into effect on August 19, 1973, with the exception of those for retail dealers which went into effect September 7, 1973, and provided for a comprehensive system for controlling petroleum prices at all levels of the petroleum industry. The Phase IV price controls are the basis for the Mandatory Petroleum Price Regulations now in effect under the EPAA.

THE EPAA, enacted November 27, 1973, under which the Mandatory Petroleum Allocation and Price Regulations were issued January 14, 1974, provided for comprehensive controls for both allocation and prices of petroleum products at virtually all levels of the petroleum industry. These regulatory programs were established to deal with the problems created by the reduction in supplies of petroleum products resulting from the October, 1973, Arab oil embargo. Controls established under these programs were designed to preserve in a shortage situation, to the extent possible, an economically

sound and competitive petroleum industry, including the competitive viability of the independent segments of the industry. Other controls implemented as part of these programs contained provisions to assure equitable distribution of refined petroleum products at equitable prices. Included among these controls is the Domestic Crude Oil Allocation (Entitlements) Program which was created to eliminate the competitive marketing advantages of those refiners with disproportionate access to price controlled domestic crude oil. By eliminating these advantages, costs are brought into approximate parity assuming that market competition will result in equitable prices for consumers of petroleum products. Under this program, refiners with greater than average access to low-cost "old" oil are required to make payments to refiners who use greater than average amounts of more costly domestic and imported crude oil, so that all domestic refiners, in effect, have equitable shares of the limited quantities of low-priced domestic crude oil.[1/]

In times of short supply of foreign sources, what then?

Under the allocation portion of these regulatory controls, all regions and economic sectors are to receive, to the extent possible, equitable shares of

---

1/ Under the EPCA, price controls on both new and old domestic crude oil are to be phased out over a 40-month period which commenced February 1, 1976. The FEA has expanded its Entitlements Program to cover all domestic crude oil.

available crude oil and petroleum product. Accordingly, a priority allocation system was established for the distribution of petroleum products. In addition, a state set-aside for certain petroleum products was created for the purpose of meeting local hardship and emergency requirements.

SUPPLY/DEMAND

During the shortage that occurred as a result of the embargo imposed in October 1973, the allocation and price regulations achieved a substantial measure of success in easing the impact of the shortage. However, there are clear indications at this time--and have been for over two years--that adequate supplies of all refined petroleum products are available and controls are no longer needed. During 1976, the Federal Energy Administration was able to make the necessary findings to support the exemption from regulation for several other categories of petroleum products including residual fuel oil (effective June 1, 1976), middle distillates (effective July 1, 1976), naphthas, gas oils, and other specialty products (effective September 1, 1976), and naphtha base jet fuel (effective October 1, 1976). Also in 1976, the Energy Conservation and Production Act, P. L. 94-385 (enacted on August 14, 1976) exempted stripper well crude oil production from FEA's price regulations.

This section traces the historical growth in demand for motor gasoline and examines the adequacy of supply in meeting that demand before and during the four phases of controls. Data used throughout this section represents the most recent Bureau of Mines (BOM) data available; however, the 1977 data also includes other data consistent with BOM. For the early months of 1977, where official BOM data are not yet available, industry figures have been cited to provide the most current available information.

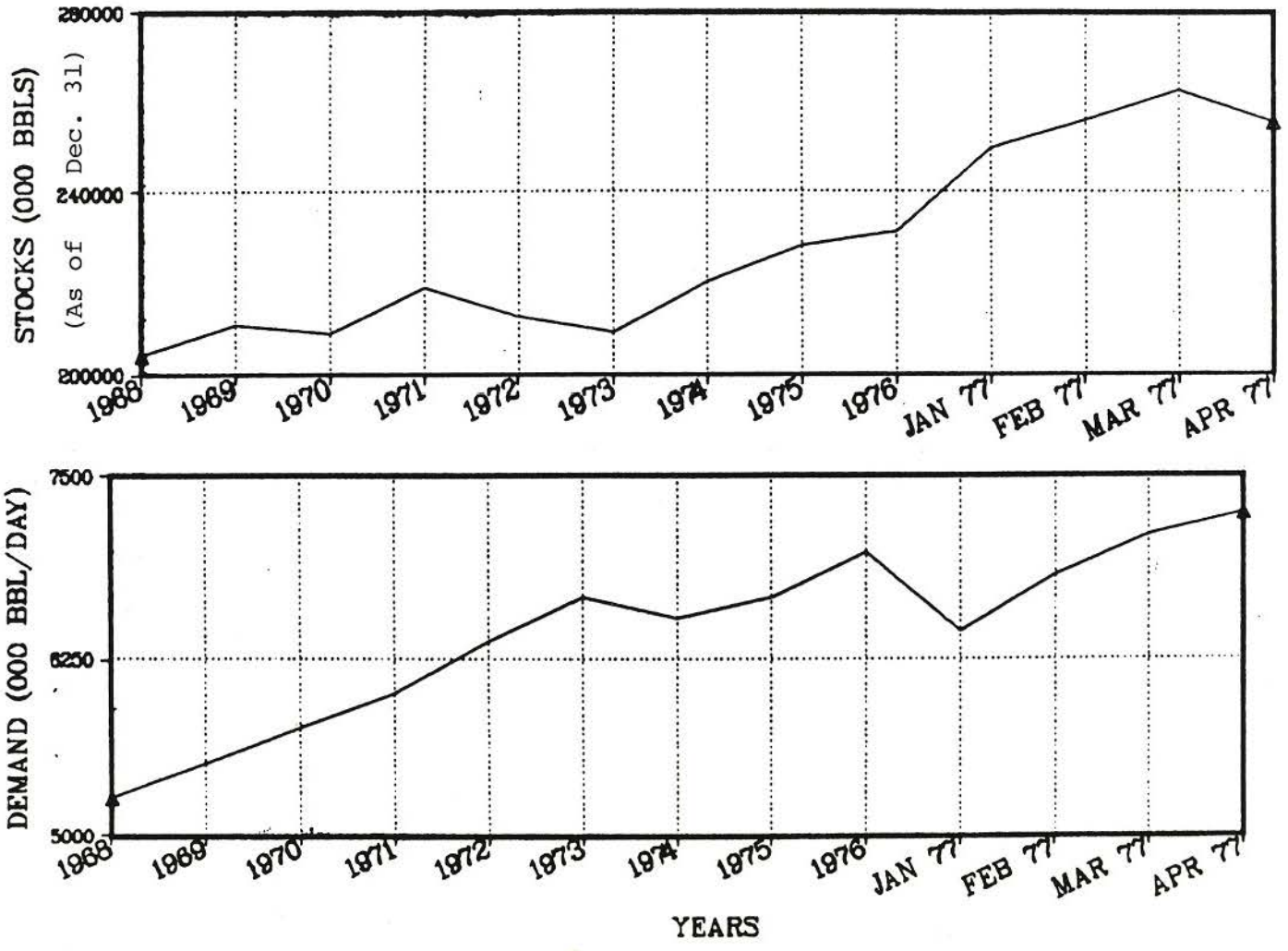
A. Growth in Demand

The demand for motor gasoline (see lower scale in Figure III-1) showed a steady increase at an average annual rate of slightly over 3 percent over the nine-year period from 1968 through 1977. As shown in Table III-1, the 1973-74 oil embargo interrupted this trend, reducing total 1974 demand by 2 percent from 1973. However, 1974 demand remained above 1972 demand.

For the peak-season period, June through August, demand in 1975 was nearly 1 percent above its level during the corresponding period in 1974. For the entire year, demand in 1975 recovered to a level roughly comparable to that of 1973 and steadily increased during 1976 to record high levels (see Table III-1). For the first four months of 1977, average demand was only slightly above the average for 1976.

FIGURE III-1

DEMAND FOR MOTOR GASOLINE IN RELATION TO STOCKS OF MOTOR GASOLINE 1968–1977



SOURCE: Bureau of Mines - 1968 through Februarr 1977.
American Petroleum Institute March - April 1977.

TABLE III-1

MOTOR GASOLINE DEMAND AND STOCKS

	Demand (000 BBL/Day)	Stocks (000 BBLS) Dec. 31	Number of Days of Supply
1968	5,344	211,526	39.6
1969	5,596	217,392	38.8
1970	5,839	214,348	36.7
1971	6,063	223,771	36.9
1972	6,376	212,770	33.4
1973	6,674	209,395	31.4
1974	6,537	218,346	33.4
1975	6,675	234,925	35.2
1976	6,978	231,387	33.2
1977			
Jan.	6,466	252,608	39.1
Feb.	6,823	255,991	37.5
Mar.	7,094	262,536	37.0
Apr.	7,242	255,577	35.3
AVERAGE (4 months)	6,905	256,678	37.2

SOURCE: Bureau of Mines - 1968 through February 1977

American Petroleum Institute - Mar. and Apr. 1977

249-464 O - 77 - 3

The upper scale on Figure III-1 compares the year-end stock level to the average demand for the same year. In 1973, motor gasoline stocks were at their lowest point since 1970 despite a steady increase in demand over that period. However, 1973 average stocks were still considerably above 190 million barrels, the level then generally considered by the FEA and the industry to be the minimum acceptable level. Gasoline stocks are normally drawn down during the summer when residual fuel oil and distillate stocks are being accumulated, and are then rebuilt during the winter and spring in anticipation of heavy summertime demand.

Between 1968 and 1976, the annual ratio of average stocks to daily demand decreased slightly, as shown in Table III-1. Although stocks were not as high in relation to demand in 1976 as they had been from 1968 to 1971, the 1976 relationship was an improvement over the low stocks seen in 1973, a trend which continued through April 1977. Even though demand in 1976 rose to a level higher than that of 1973, 1976 stocks were about 22.0 million barrels higher, and the number of days supply in stocks continued to rise during the first quarter of 1977 and remained higher than 1976 annual average levels until April when drawdowns reflected the onset of the seasonal rise in demand in April, two months earlier than usual.

The motor gasoline stock levels for the first three months of 1977 have been maintained at a level significantly above the corresponding months of 1976. Increased refinery capacity has provided a larger refining capability margin than existed in 1970 and 1971. This larger margin has been more than adequate to accommodate the demand surge experienced during the second and third quarters of 1976, with stocks meeting the initial part of the surge while refinery runs were being increased.

B. Adequacy of Supply

Growth in domestic production of motor gasoline has kept pace with the growth in consumption during the period of 1968 to 1976. The surge in demand during 1976, which included an historic high first quarter, was ultimately met from increased domestic production. A higher degree of utilization of increased refinery capacity allowed new demand levels to be met. Table III-2 demonstrates that domestic production of motor gasoline has historically followed the domestic production trends of the total of all refined products.

In addition to production and change in stocks, the third component of motor gasoline supply is imports. The difference between the two curves on Figure III-2 represents the amount of gasoline imported. Imports

TABLE III-2

AVERAGE ANNUAL DOMESTIC PRODUCTION OF REFINER PRODUCTS AT REFINERIES FOR 1968-1976
(Thousands of Barrels/day)

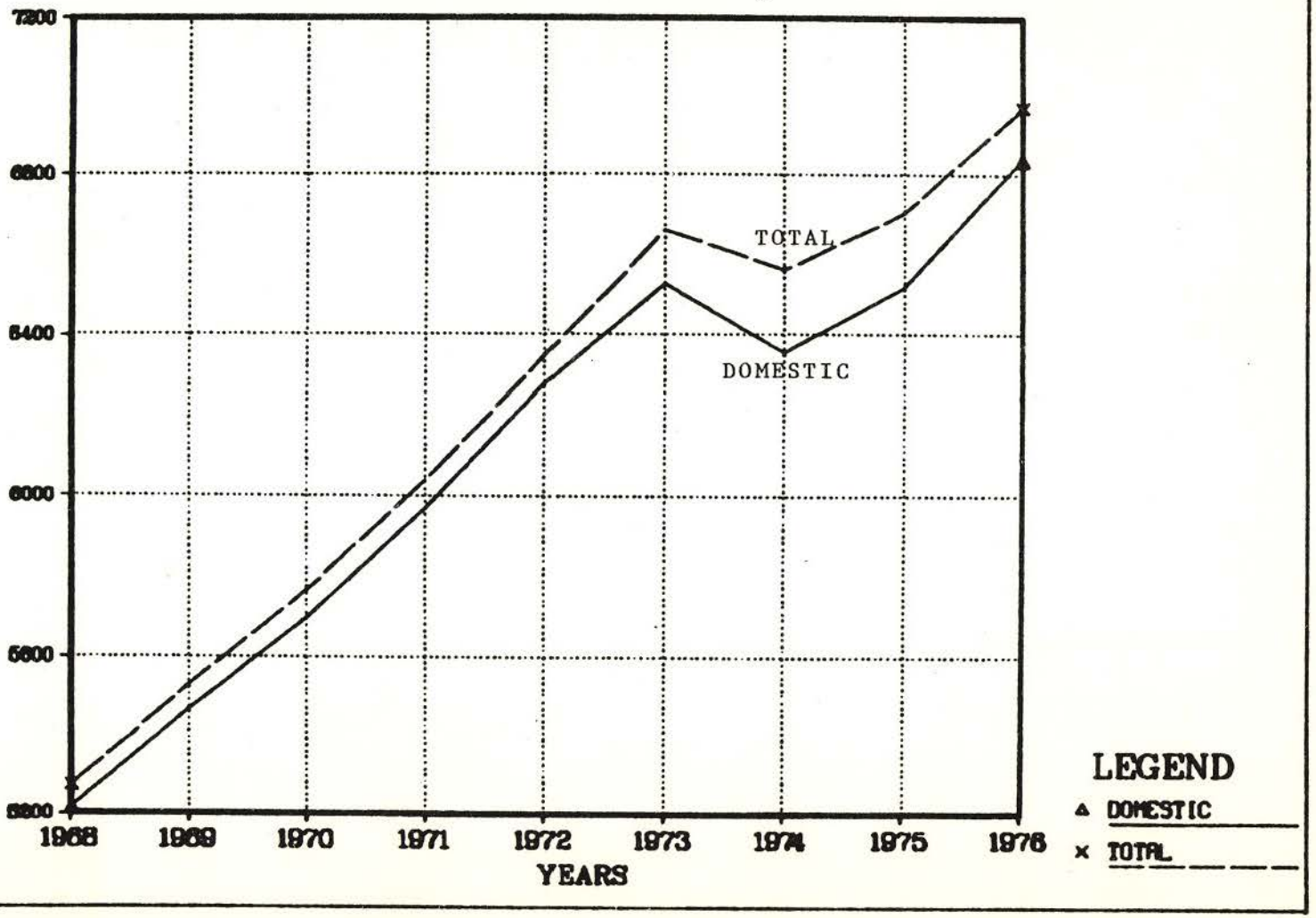
		Motor Gasoline	*Distillate Fuel Oil	Residual Fuel Oil	Jet Fuel	**Other Products	Total All Products
1968		5,212	2,300	756	863	2,001	11,132
1969		5,468	2,340	729	881	2,062	11,480
1970		5,699	2,454	705	827	2,222	11,907
1971		5,971	2,495	752	834	2,245	12,297
1972		6,281	2,630	799	847	2,149	12,706
1973	I Qtr.	6,213	2,875	1,035	893	2,299	13,315
	II Qtr.	6,695	2,626	914	854	2,520	13,609
	III Qtr.	6,830	2,790	870	839	2,628	13,957
	IV Qtr.	6,366	2,992	1,068	852	2,404	13,682
	AVERAGE	6,527	2,820	971	859	2,463	13,641
1974	I Qtr.	5,950	2,505	1,003	805	2,151	12,414
	II Qtr.	6,433	2,670	1,002	849	2,415	13,369
	III Qtr.	6,689	2,694	1,052	824	2,580	13,839
	IV Qtr.	6,358	2,808	1,220	865	2,301	13,552
	AVERAGE	6,358	2,668	1,070	836	2,362	13,294
1975	I Qtr.	6,285	2,688	1,356	855	1,964	13,148
	II Qtr.	6,290	2,496	1,182	856	2,110	12,934
	III Qtr.	6,900	2,663	1,161	917	2,422	14,063
	IV Qtr.	6,599	2,764	1,245	859	2,200	13,667
	AVERAGE	6,518	2,653	1,235	871	2,174	13,452
1976	I Qtr.	6,470	2,826	1,373	911	2,176	13,756
	II Qtr.	6,880	2,759	1,260	902	2,403	14,204
	III Qtr.	7,067	2,963	1,306	955	2,136	14,427
	IV Qtr.	6,931	3,144	1,568	903	2,357	14,903
	AVERAGE	6,837	2,924	1,377	918	2,268	14,323

* Excludes kerosene
** Includes kerosene

SOURCE: BOM

FIGURE III-2

MOTOR GASOLINE SUPPLY 1968–1976
THOUSANDS OF BARRELS/DAY



SOURCE: BOM

remained relatively constant from 1968 through 1972, increased to over 3 percent of total supply in 1974, and began to decline slightly in the fourth quarter of 1975. This trend continued during 1976 when imports were substantially reduced below the 1974 high; imports represented 1.9 percent of total supply in 1976. This reduction occurred during a period of record demand indicating the enhanced ability of domestic refinery production to meet that demand. However, concurrent with the 1976 decline in gasoline imports, there has been a substantial increase in imports of crude oil. The relationship of gasoline imports to the total imported supply of crude oil and refined products is shown in Table III-3 and Figure III-3.

The total national supply of motor gasoline (domestic production plus imports) increased from 1968 to 1976 (see Figure III-2), although supply deviated markedly from the historical trend by declining in 1974.

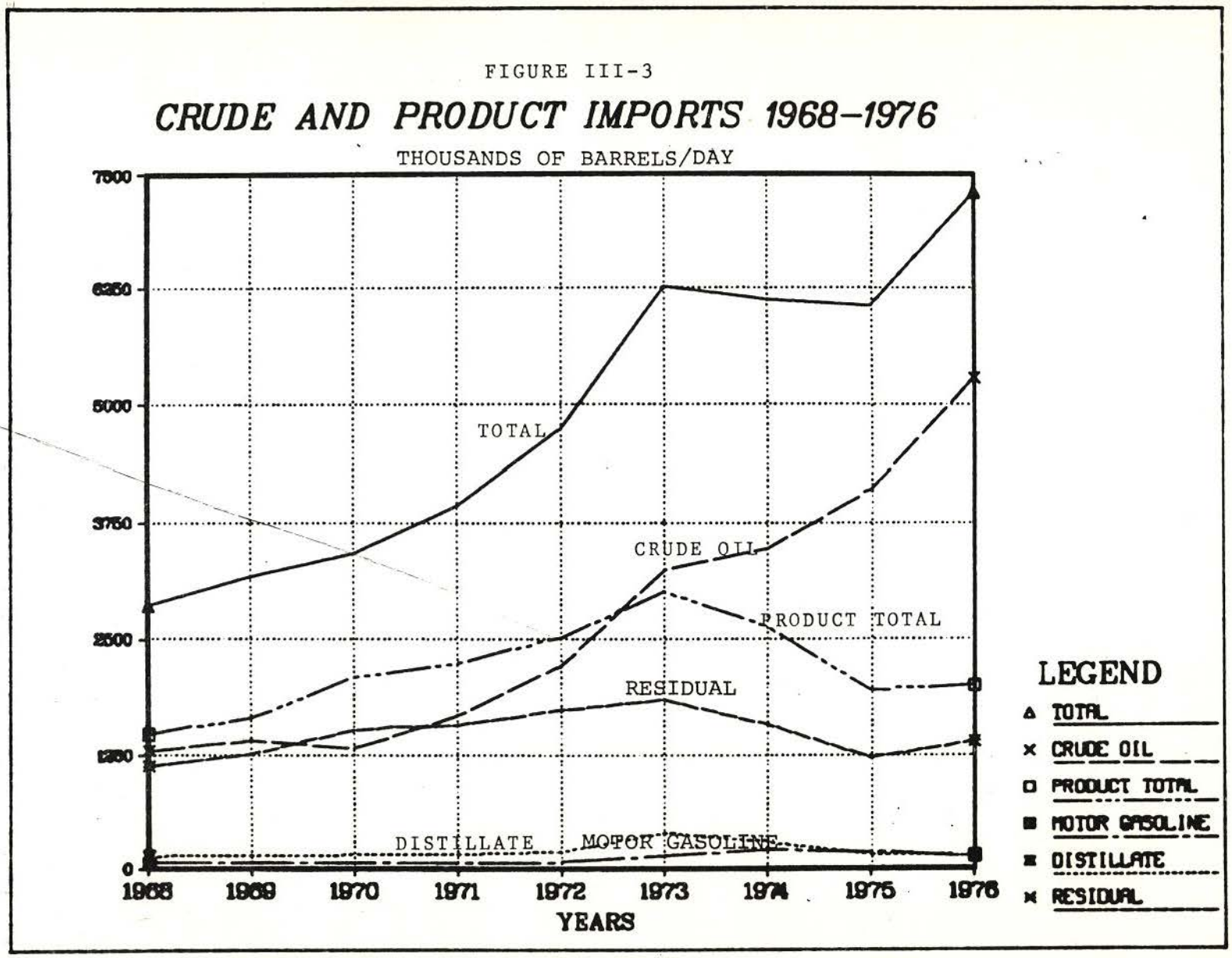
TABLE III-3

CRUDE AND PRODUCT IMPORTS FOR 1968-1976
(Thousands of barrels/day)

Year	Motor Gasoline Imports	Distillate Fuel Oil Imports	Residual Fuel Oil Imports	Crude Oil Imports	Total Product Imports	Total Petroleum Imports
1968	59	132	1123	1294	1473	2767
1969	67	139	1264	1408	1651	3059
1970	67	147	1528	1324	2095	3419
1971	59	153	1582	1681	2245	3926
1972	68	182	1742	2216	2525	4741
1973	134	392	1853	3244	3012	6256
1974	204	289	1587	3477	2635	6112
1975	184	155	1223	4105	1951	6056
1976	131	144	1402	5287	2007	7294

Source: Bureau of Mines

FIGURE III-3



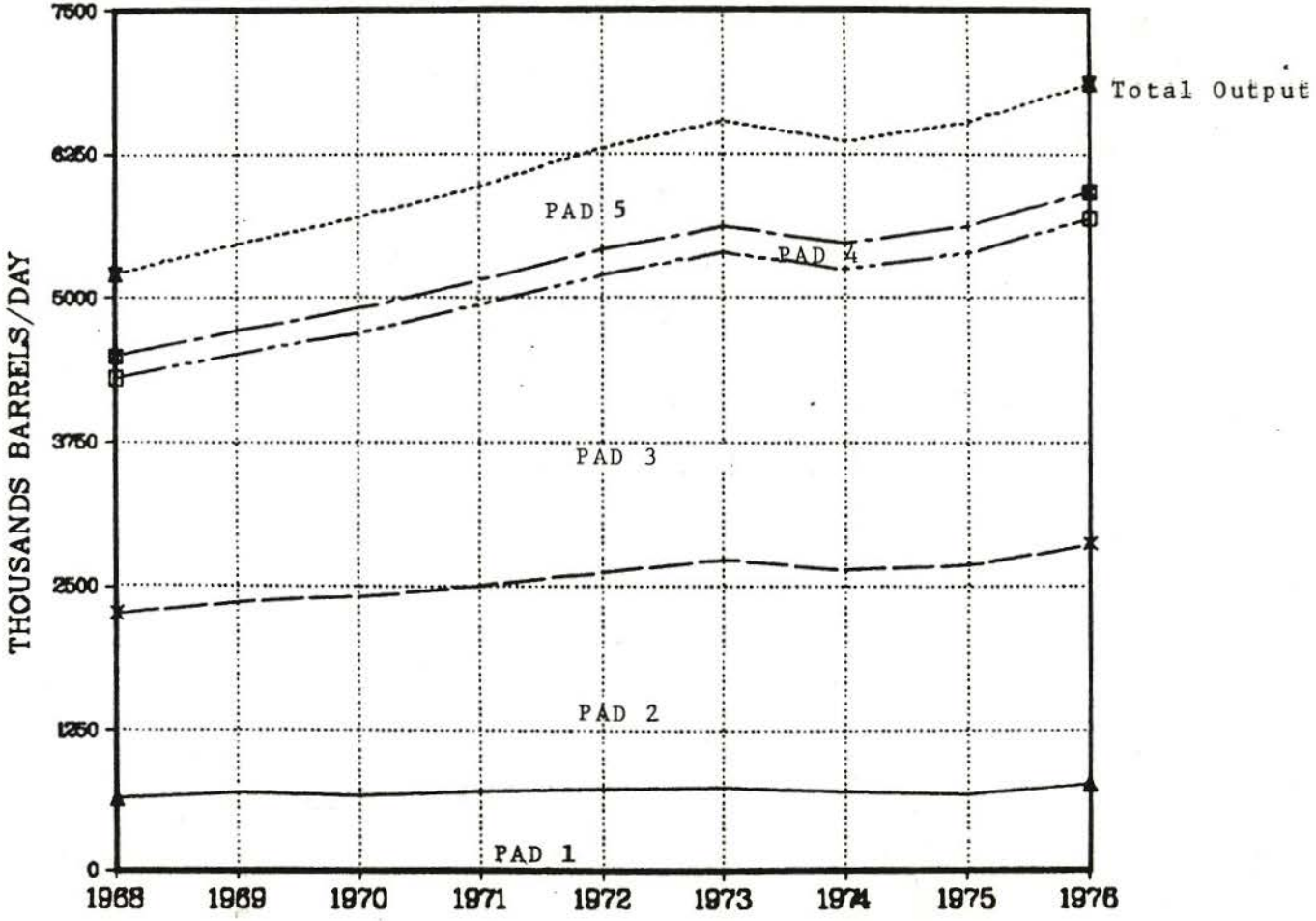
SOURCE: Bureau of Mines 1968-1976.

The major portion of U.S. motor gasoline consumption is in the Northeastern and North Central parts of the U.S., PAD[1/] I and PAD II, while PADs II and III, in the North Central as well as the South and Southwest U.S., account for the major share of production (see Figure III-4). Historically, inter-PAD transfers of gasoline have accommodated most of the demand in those districts where production falls short of consumption levels. In PADs I and V, imports have supplemented domestic production. Domestically produced gasoline, whether from domestic or imported crude oil, is less expensive than foreign gasoline due to the effects of price controls on domestic crude oil. In addition, the FEA Entitlements Program has provided refiners with an incentive to reduce product imports at the expense of increased crude oil imports. Gasoline imports for the period January - July 1976, show a decline to the lowest level since 1973 even during the peak demand period, May through July 1976. In general, there was no discernible variation from the historical regional supply/demand patterns during the first half of 1976 when demand reached record levels.

1/ Petroleum Administration for Defense District

FIGURE III-4

REFINER OUTPUT OF MOTOR GASOLINE SUPPLY BY PAD DISTRICT 1968–1976



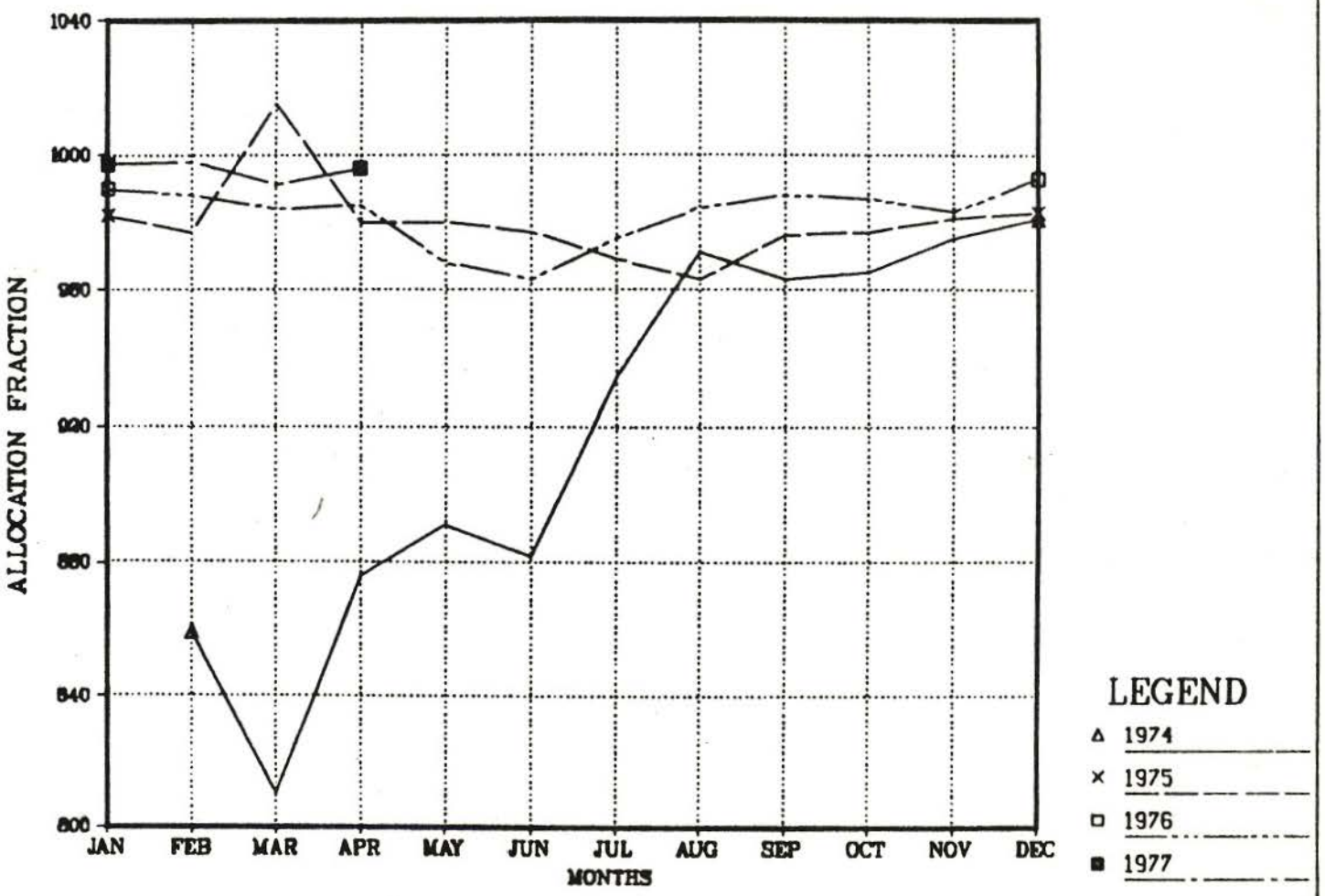
SOURCE: BOM, FEA This information is presented primarily to show the relative historical distribution of supply among PAD districts.

Analysis of allocation and surplus product reports submitted by refiners offers strong evidence that supplies are currently adequate to meet demand. First, the national allocation fraction (i.e., the adequacy of major motor gasoline suppliers' available product to meet their customers' allocation entitlements) indicates a normal (i.e., approximately 1.0) supply situation. The fraction reached a low of 0.81 in March 1974 (the most severe point of the embargo), recovered to 0.97 by September 1974, and generally remained close to 1.0 through the end of 1976 (see Figure III-5). This is particularly significant because the sum of all allocations exceeds current demand as a result of numerous upward adjustments of allocation entitlements under the regulations and the absence of any downward adjustments. This supply adequacy is verified by the surplus product[1/] declared in supplier reports for the past two years. Declared surplus motor gasoline during 1976 was over 50 percent greater than the comparable period of 1975.

1/ By FEA definition, surplus product is product in excess of the amount of the supplier's obligations to his base period purchasers, or product not actually lifted by those purchasers.

FIGURE III-5

ALLOCATION FRACTIONS FOR MOTOR GASOLINE 1974–1977



SOURCE: Federal Energy Administration

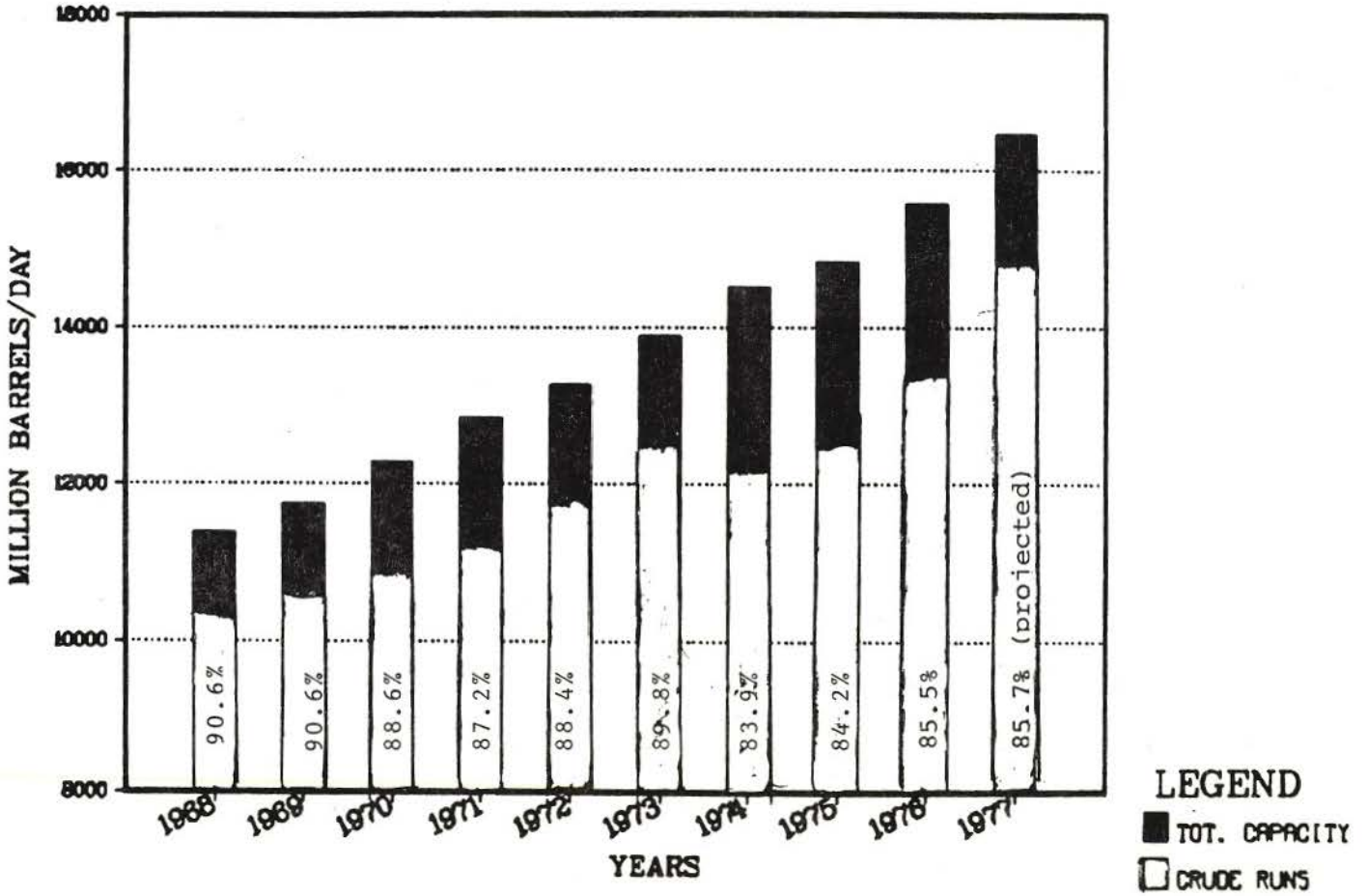
Refinery capacity utilization, including projections for 1977, also indicate adequate supply availability. In 1975 and 1976, annual average refinery capacity utilization (based on crude inputs only) declined to 84.2 percent and 85.5 percent, respectively, from 89.8 percent in 1973 (Figure III-6). Domestic refinery capacity has generally kept pace with the demand for gasoline and is currently more than adequate as demonstrated by the production levels attained to meet the record demand in 1976 and 1977. The existence of sufficient refinery capacity, surplus product, high allocation fractions and the maintenance of high primary stock levels in the current peak demand season document that present supplies of motor gasoline are ample.

PRICE AND MARGIN TRENDS

This section traces motor gasoline price trends for the period 1968-1977 and examines gross margins for the refining/distribution and retailing segments of the petroleum industry. While price controls on domestic crude oil are recognized as the major factor influencing the price of motor gasoline, other factors are also important. At various times during the period 1968 to 1976, the U.S. economy underwent a recession, experienced high levels of inflation and operated under four phases of price controls. Each of these three

FIGURE III-6

REFINERY CAPACITY AND CRUDE RUNS PERCENT OF UTILIZATION



SOURCE: FEA Trends in Refinery Capacity & Utilization, June 1976. Shows crude inputs only and therefore is not consistent with BOM and industry data which reflect other inputs.

factors has an important impact on prices, gross margins, and operating profits.

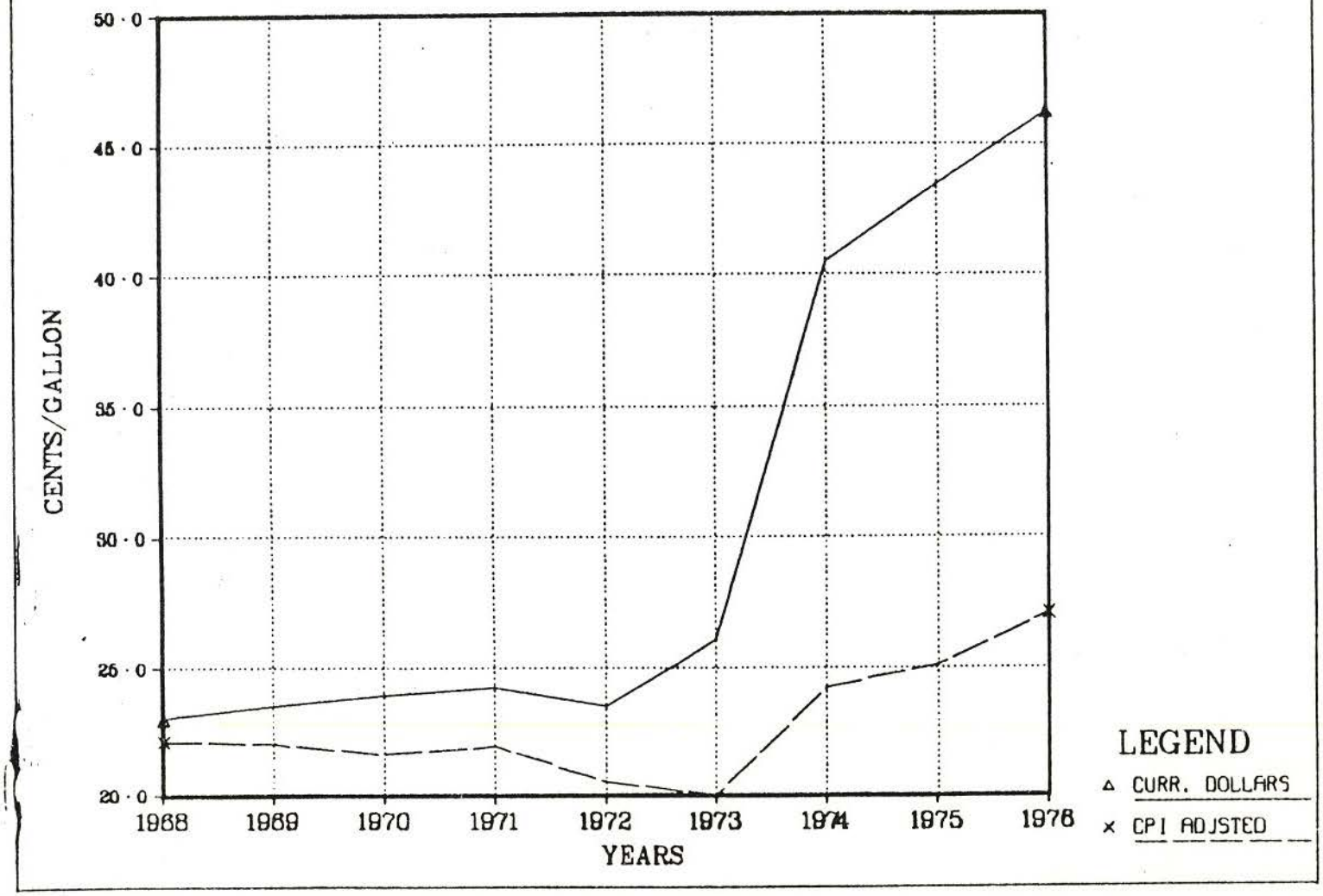
A. Price Trends

The movement of retail motor gasoline prices over the nine year period is plotted in Figure III-7. As indicated in Figure III-7, prices increased at an annual rate ranging from 1 to 3 percent from 1968 through 1973, and then escalated rapidly in 1974 and 1975 (50.4 percent in 1974 and 8.4 percent in 1975). While current prices have more than doubled over the nine-year period, Consumer Price Index (CPI) adjustments indicate that the increase was only 27 percent in real (1967) dollars and most of this increase actually occurred in 1974. Trends in motor gasoline prices can be traced in terms of the four phases of controls:

Phase I: During the first five months of 1971, retail gasoline prices declined more than 2 cents per gallon from their January 1971 level. However, through the summer demand season, gasoline prices rose from 23.4 cents per gallon in May to a year-high of 26.8 cents per gallon in August, when Phase I controls were instituted. While gasoline prices declined following the end of controls, this decline can be attributed to the end of the heavy summer demand period. Thus, it is unclear whether 1971 price movements were affected by Phase I controls.

FIGURE III-7

AVERAGE PRICE OF MOTOR GAS. AT RETAIL STATIONS (EXCL. TAX) 68-76



SOURCES: Gasoline Prices - Platt's Oilgram 1968 through 1976.

Phase II: Phase II controls were in effect throughout 1972. Gasoline prices did not exceed their 1971 levels during this period; in fact, in in both current and real terms, prices declined 3 and 7 percent, respectively. This decline in the face of growing demand is evidence that Phase II controls depressed gasoline prices below market clearing levels.

Phase III: Phase III controls contributed to a leveling of prices in the early months of 1973. However, prices increased rapidly in the spring, and at the same time complaints of inequitable distribution of petroleum products were being reported.

Phase IV: Phase IV controls, introduced in August 1973, were in effect at the time of the embargo. The cost of crude oil to U.S. refiners more than doubled, rising from an average of 9.6 cents per gallon in August 1973. Due to cost pass-through provision most of this cost increase was passed on to consumers, causing motor gasoline prices to rise by the end of 1974 from an average of 26 cents to 40 cents per gallon.

Phase IV controls had to allow gasoline and other product prices to rise to the extent of increased crude oil or product purchaser costs in order to assure continued adequacy of supply. The U.S. could not produce enough crude oil to meet demand and did not have enough residual fuel oil manufacturing capacity to meet demand.

249-464 O - 77 - 4

The 50.4 percent increase in gasoline prices was accompanied by a 2 percent decline in demand from 1973 to 1974. If the 2 percent demand decline is attributed to the difficulty consumers had in purchasing gasoline during this period, e.g., the long lines at the pumps, it can be assumed that motor gasoline demand is relatively inelastic in the ranges of prices experienced. In 1975, demand returned to 1973 levels while prices continued to rise. In 1977 this trend has been sustained with both prices and demand exceeding previous levels.

B. Margin Trends

A margin represents the difference between the industry sector's purchase price and its subsequent selling price of petroleum. This difference is a measure of the amount of revenue available to cover profits and all costs other than purchase costs of goods sold.

Margins are discussed in this chapter in the context of their historical movement and the pressures that movement has placed on prices from 1968 to 1977. The effect of current margins on future prices will be discussed in Chapter IV.

The refining and distribution margin, expressed on a per unit (gallon or barrel) basis is defined as follows:

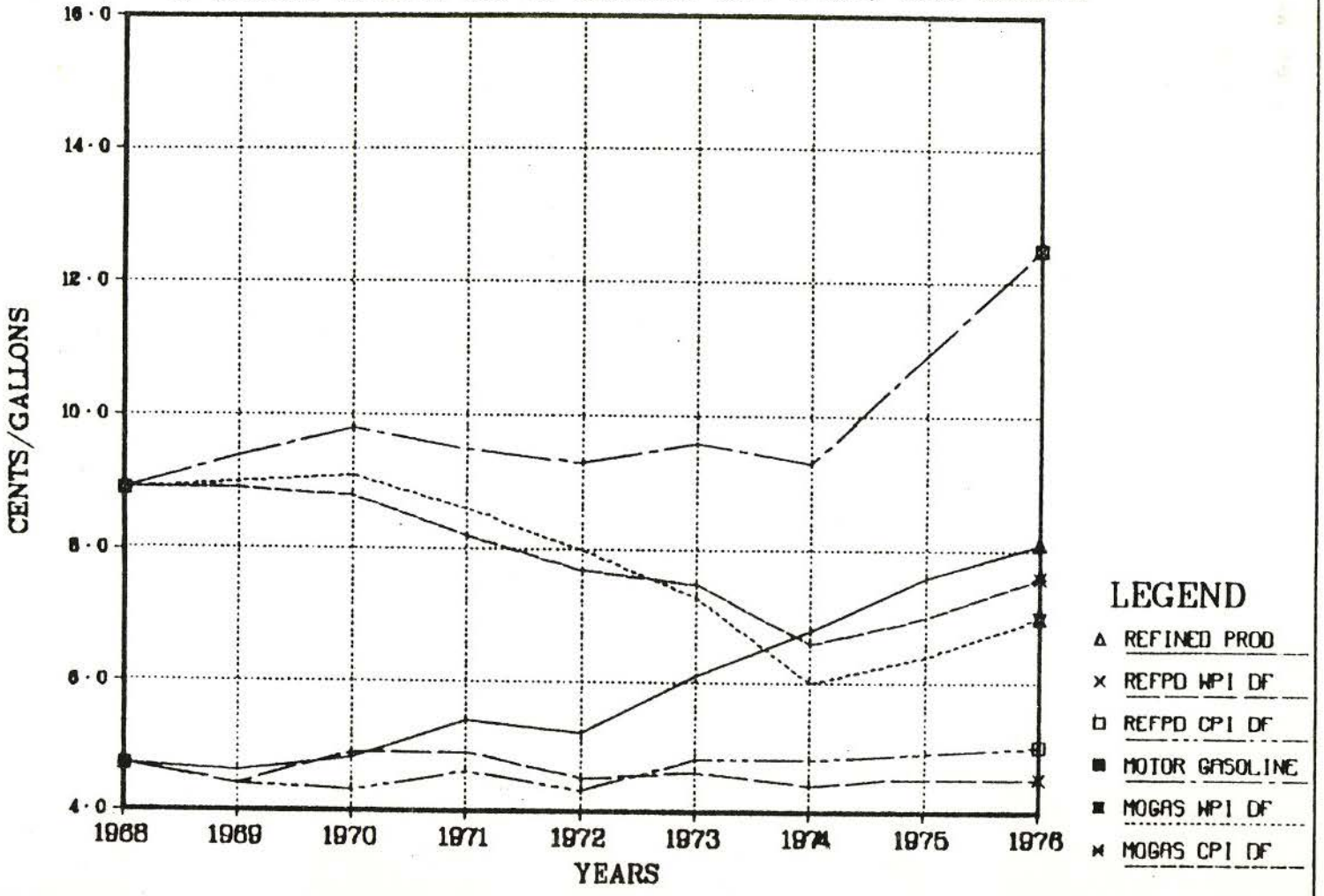
Refiner/distributor margin = refiner/distributor selling price minus crude oil price

The margin trend for all refined products (depicted in Figure III-8) was determined using a mixed barrel

FIGURE III-8

REFINER DISTRIBUTION MARGINS 1968-1976

In Current Dollars and in Constant (CPI & WPI) 1968 dollars



SOURCE: Mandatory Reports (FEO-96), BOM, Platts Oil Gram

of motor gasoline, No. 2 distillate, jet fuel, and residual fuel. These four products represent more than 80 percent of all petroleum products. The actual mixed barrel prices and margins are presented in Table III-4. As indicated in Figure III-8, margins for all refined products were relatively stable during the period 1968 to 1972, including the period of price controls. During the period 1972 to 1976, however, margins for all refined products increased by 56 percent, while the margins on motor gasoline increased, at a slower rate of 34 percent for 1972-1976. Following removal of the special products rule in March 1975 which had limited the amounts of costs allocable to motor gasoline, and the subsequent increase in gasoline prices, the refiner distributor motor gasoline margin remained at a relatively high level through 1976, averaging 12.5 cents for the year. (See Table III-5.)

The decline in average dealer margins from 9.7 cents per gallon in 1974 to 8.4 cents per gallon in 1975 resulted from competition at the retail level and the continuing trend toward high volume, low margin outlets (see Table III-6). In 1976 competition increased, resulting in a lowering of dealer margins to 7.8 cents.

The changes in margins for the refiner/distributor and retailer segment of the industry in the last few years do not necessarily represent a direct measure of the profitability of the industry during these periods. The additional factors of operating costs, volume, and

TABLE III-4

MIXED BARREL PRICES AND MARGINS

(dollars per barrel)

	Average Mixed Barrel Price	Average Crude Cost	Refiner/Distributor Margin
1968	$ 5.13	$ 3.17	$ 1.96
1969	5.24	3.29	1.95
1970	5.41	3.40	2.01
1971	5.85	3.60	2.25
1972	5.75	3.58	2.17
1973	6.73	4.15	2.58
1974	11.92	9.07	2.85
1975	13.57	10.38	3.19
1976	14.14	10.74	3.40
1977* Jan.	14.95	11.64	3.31
Feb.	15.29	11.80	3.49
Mar.	15.75	11.88	3.87
Apr.	15.83	11.82	4.01

* Based on FEA form P-302-M-1, first four months of 1977.

SOURCE: Mandatory Reports (FEA-96) submitted to FEA, Bureau of Mines, Platt's Oilgram and Lundberg Survey, Inc.

TABLE III-5

REFINER/DISTRIBUTOR MARGIN FOR MOTOR GASOLINE

(cents per gallon)

Year	Margin	CPI** Deflated	WPI** Deflated
1968	8.9	8.9	8.9
1969	9.4	8.9	9.0
1970	9.8	8.8	9.1
1971	9.5	8.2	8.6
1972	9.3	7.7	8.0
1973	9.6	7.5	7.3
1974	9.3	6.6	6.0
1975	10.9	7.0	6.4
1976	12.5	7.6	7.0
1977			
Jan.	11.8		
Feb.*	12.2		

SOURCE: Platt's Oilgram, FEA, Lundberg Survey, Inc. Bureau of Labor Statistics

* Preliminary

** Expressed in real 1968 dollars.

TABLE III-6

RETAIL DEALER MARGIN FOR MOTOR GASOLINE

(cents per gallon)

Year	Margin	Margin*
1968	6.5	6.5
1969	6.7	6.4
1970	6.7	6.0
1971	7.1	6.1
1972	6.7	5.6
1973	7.4	5.8
1974	9.7	6.8
1975	8.4	5.4
1976	7.8	4.8

Source: Platts Oilgram, FEA, Lundberg Survey, Inc.
Bureau of Labor Statistics.

* Margin expressed in real 1968 dollars. (CPI deflated).

investment levels for the refiners, distributors and retailers are addressed in the discussion of profitability in Chapter IV.

MARKET STRUCTURE

This section addresses the question of whether market forces in motor gasoline refining and marketing are adequate to preserve the competitive viability of independent refiners and marketers, and thereby ensure consumers an adequate supply of motor gasoline at equitable prices following exemption of motor gasoline from regulations.

Recent trends indicate that non-major refiners and nonbranded independent marketers have stabilized their market shares of retail gasoline sales. Non-major refiners increased their share of total gasoline sales slightly in 1976 over both 1975 and 1972. These trends are discussed in detail by:

- Describing the refining and distribution system for motor gasoline;
- Tracing the market structure of the refining and marketing segments before the period of allocation and price controls; and,
- Examining the changes in market share experienced by different classes of refiners and marketers during the period of controls.

A. The Distribution System

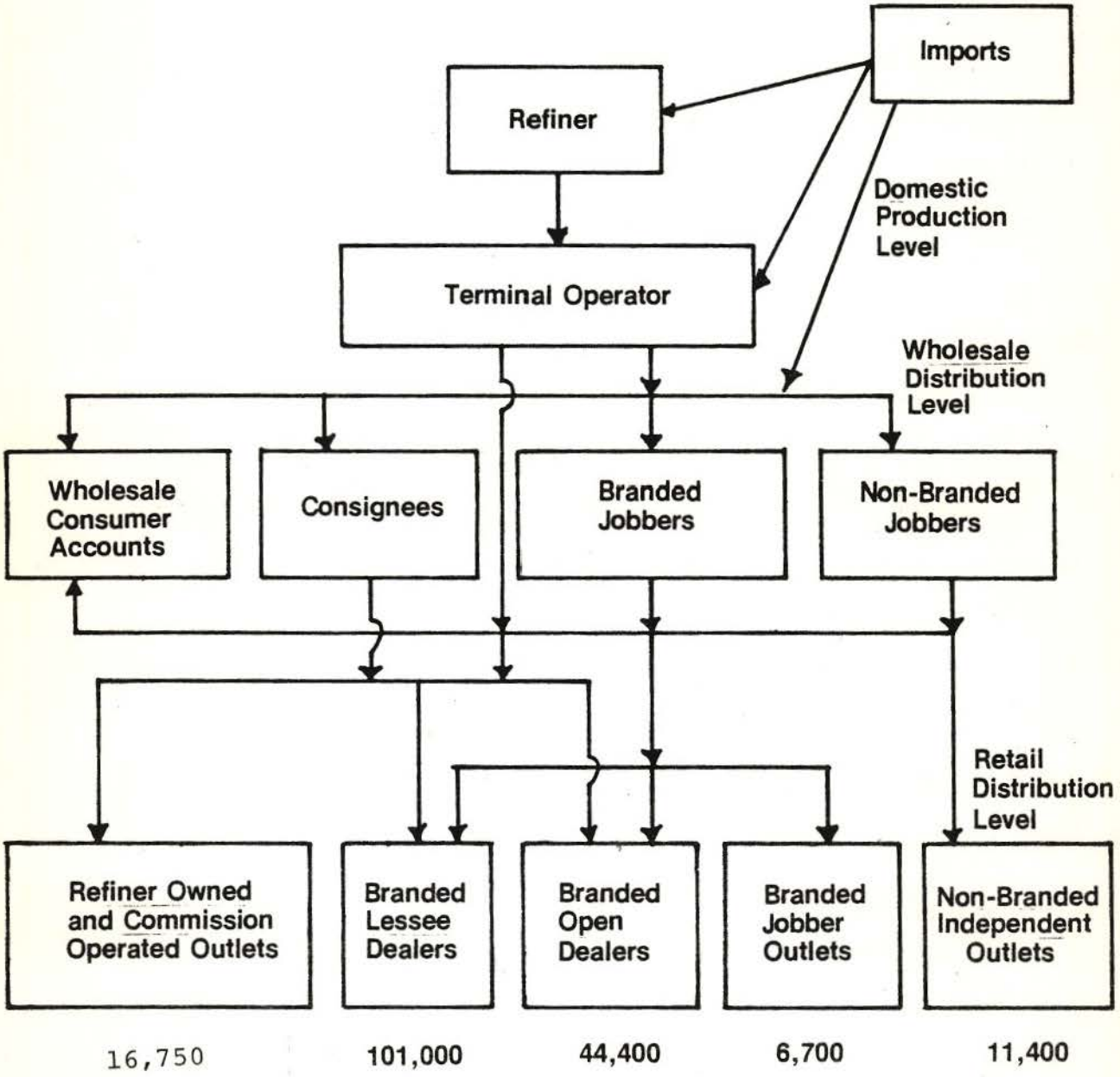
Almost all the motor gasoline consumed in the U.S. is produced in domestic refineries; currently, less than 3 percent is imported. Gasoline is distributed through a complex network of refiners, wholesalers, and retailers depicted in Figure III-9. Refiners distribute gasoline to six separate groups:

- o Large-volume consumers (e.g., truck fleets and other industry accounts) serviced by the refiner;
- o Refiner-owned and operated retail outlets;
- o Consignees;
- o Branded dealers, both open (i.e., dealer owns or leases station from a party other than the refiner) and lessee (i.e., dealer leases station from the refiner);
- o Branded independent jobbers; and,
- o Nonbranded independent jobbers.

Both branded and nonbranded jobbers may perform both wholesale and retail functions. Jobbers store and distribute gasoline to retail service stations. These may be either branded lessee dealers, open dealers, or dealers who lease a station from the jobber. A jobber also makes direct sales to consumer, farm, commercial or industrial accounts.

Figure III-9

Motor Gasoline Distribution



Some jobbers also own stations that are operated by salaried employees. A consignee sells and delivers petroleum products at the wholesale level but this method of operation differs from that of a jobber in that (a) for the most part remuneration is on a commission basis and, (b) title to the product remains with the refiner and the refiner's invoice is used in billing of the product.

The types of businesses operated at the retail level of the gasoline marketing system include: full-service stations; the so-called "gas and go," high volume, limited-service stations; full self-service stations; and those that sell gasoline only as a sideline to some other business, such as a convenience or discount store.

Based on a survey* taken by the Bureau of Census and a census of refiners by the FEA, about 179,100 gasoline service stations were operating in the U.S. in January 1977. 152,100 of these were branded independent gasoline stations, the majority (101,000) of which were run by independent dealers who leased their stations from a refiner or jobber and sold gasoline under a refiner's brand name. The balance of branded independent gasoline stations was composed of open dealer-operated stations (44,400) and those operated by branded jobbers (6,700). The remaining stations were operated by refiners with salaried personnel (15,600) and non-branded independent marketers (11,400).

* Monthly Report on Gasoline Service Station Market Shares, FEA, April 1977.

Total sales by gasoline service stations in 1976 amounted to about 70 billion gallons, or about 65 percent of all gasoline sales; the remainder was primarily direct sales by refiners and jobbers to commerical and industrial consumers. The current amount of gasoline sold by convenience food stores, car washes, department stores, and other retail outlets not classified as gasoline service stations is not known, but is estimated at less than 5 percent of the total.

B. The Market Structure Before Controls

Prior to the late 1960's, crude oil production provided a substantial portion of the total corporate profits of the large integrated oil companies. This was due in part to the Federal income tax structure which contained a crude oil depletion allowance. Crude oil production profitability created an extremely strong incentive for crude oil producers to develop reserves and increase their volume of crude production as rapidly as and to the maximum extent possible, subject to state conservation restrictions. As a result, integrated oil companies rapidly expanded their refining, distribution, and marketing systems in the 1950's and 1960's to provide for the disposition of the larger volumes of products resulting from their expanded crude oil production.

During the 1960's, growth in U.S. demand for all petroleum products outstripped growth in domestic supply. U.S. imports of crude oil increased by 38 percent in the 1960 period. Several of the large, integrated oil companies had, by this time, invested substantially in foreign oil exploration and production.

However, since the rest of the domestic integrated oil companies had to purchase most of their imported crude from the international integrated companies, they obtained limited or no crude oil profits from their incremental refining and marketing volume. In response, these companies shifted their primary refining and marketing objectives from maximization of product sales to optimizing per unit profitability within the the refining and marketing segments. This increased emphasis on profitability within the marketing segments by the exclusively domestic integrated companies exerted important pressures on the market structure of the industry prior to allocation and price controls. Although historical market structure data are limited in availability prior to 1972, the major trends in the marketing segments are evident.

The basic production-oriented economics of the petroleum industry induced many independent refiners to enter the refining segment during the 1930's through

the 1960's to process crude from producers eager to increase their volume. In addition, as foreign crude oil became available (at prices lower than domestic oil) in the 1950's, mandatory import quotas were enacted. These quotas were intended to protect the domestic crude oil production industry from low-cost foreign crude. Under the foreign crude oil allocation system, fee free import licenses were issued to each refiner based on his historical runs of foreign crude oil. While these licenses could not be sold, the imported oil could be exchanged for domestic crude oil. The price disparity between foreign crude oil and domestic crude oil set a value of $1.00-$1.25 per barrel on each license. Through exchanges, inland refiners without historical access to foreign crude oil were able to obtain a value for their import licenses to offset their higher feedstock costs. All classes of refiners were thus able to compete equally in the marketplace and license allocations were biased in favor of small refiners.

In 1971, as OPEC began to raise the price of its crude oil, the value of import licenses decreased proportionately. In May 1973, when foreign and domestic crude price differentials had narrowed substantially, the oil import program was revised to reflect the changing conditions. Although licenses were still issued at no cost to those refiners who had historically run volumes of foreign crude oil, the program

was opened to all purchasers and a "fee paid" license could be purchased by anyone. A value of 21 cents per barrel was established for fee paid licenses and import quotas were abolished. Thus the advantages which had accrued to many small and independent refiners under the previous program significantly diminished as the value of licenses decreased to the 21 cent level. Anyone could obtain a license to import for the established fee.

The development of an extensive gasoline marketing system in the 1950's and 1960's aimed at moving as much product as possible permitted the entry of small independent jobbers who were either more efficient within their geographic markets than large refiner marketers, or who offered integrated producer-refiners additional (unbranded) channels for finished product marketing, and correspondingly increased crude oil sales. By the late 1960's, more than 10,000 independent wholesalers and distributors of gasoline were in operation.

As described earlier, starting in the mid to late 1960's, imports became the marginal source of crude oil. Domestic integrated companies (excluding those having substantial overseas reserves and production operations) suffered a decrease in production profitability and began to emphasize their marketing profitability by

attempting to raise their product margins. This emphasis caused fundamental changes in industry operations as pressure on margins grew. For example, some integrated refiner-marketers selectively withdrew from marginally profitable geographic markets. Generally, these were markets: (1) where their market share was less than 5 percent; (2) that were far from the refinery or distribution systems and thus costly to supply; and, (3) that had low volume high-cost-per-gallon retail outlets. A large number of market withdrawals were carried out by some major suppliers in a number of areas in the U.S., including the Mid-continent and the East Coast. However, since profitability of market areas varies from one supplier to another, there is no evidence that market withdrawals have been concentrated in any one particular marketing area.

In each case, other marketers in those areas who had more efficient distribution systems expanded their sales. No product shortages were caused by such withdrawals, and, in fact, consumers tended to benefit from increased competition among the more efficient, lower cost marketers who continued to serve the areas concerned. Clearly, the individual jobbers and dealers served by the withdrawing marketer were disadvantaged,

but consumers' interests were in all probability served well by these market-dictated shifts.

Another related trend was the growth of the chain retailer, who purchased directly from refiners, thereby bypassing the jobbers. This was an attempt to reduce the total distribution and marketing costs from the refinery gate to the pump.

Stimulated by the rapid growth in gasoline demand in the post-World War II period, and attracted by the relatively high margins, many independent retail dealers began operations during the 1940's, 1950's and 1960's. Over 226,000 outlets were in operation during the peak year of 1972 (See Figure III-10). The general rise in the costs of operating a business (wages, taxes, materials, rent, etc.) other than cost of the gasoline has exceeded the rate of growth in retail level. Accordingly, the minimum number of gallons sold required to "break even" or attain a reasonable net income has increased over the last few years. Over this same period the number of outlets has been declining as part of a movement toward fewer stations with higher sales volume.

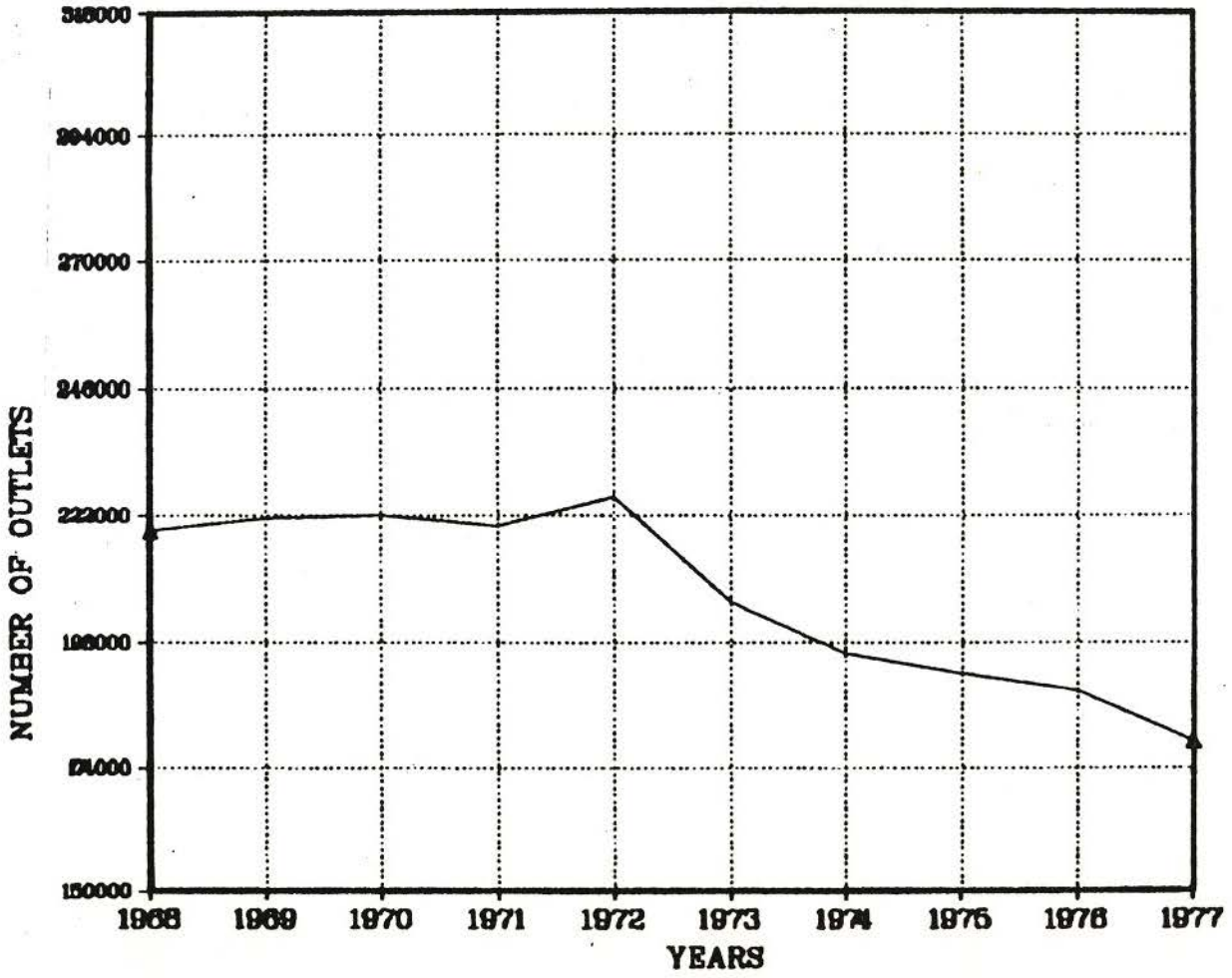
C. The Market Structure During Controls

During the 1971-1973 period of price controls, market shares in the refining and gasoline marketing segments

249-464 O - 77 - 5

FIGURE III-10

TRENDS IN GASOLINE RETAIL OUTLETS



SOURCE: National Petroleum News, Factbook

were generally stable, except that in the spring and summer of 1973, market shares of independents began to decline in the face of a tight product supply situation. Excess refining capacity declined and refiners were less willing to sell to independents, preferring instead to sell their products through their own distribution system. The 1973 embargo and its attendant price rises created significant additional pressures affecting the gasoline market structure.

Two new pressures were of central importance. The first was the initiation of actions by the Organization of Petroleum Exporting Countries (OPEC) to nationalize or otherwise gain effective ownership of the foreign production operations of international oil companies. These actions substantially reduced the future crude oil profitability for the international oil companies.

A second event of major impact was the elimination of the crude oil depletion allowance in May 1975 for all but small producers. This change led the integrated oil companies to shift their emphasis with respect to refining and marketing operations from maximizing sales to attaining higher levels of profitability per sale.

Another significant factor was the shift in purchasing patterns by motorists. After the 1973

price rises, motorists became more price conscious, causing the distribution channels and retail outlets that were the least price-competitive to suffer a decline in market share.

The embargo placed some integrated refiners and many independent (as defined below) and small refiners at a price disadvantage relative to the international U.S. oil companies, who produced the majority of price-controlled domestic crude oil. Accordingly, as discussed earlier, the FEA Entitlements Program was established effective November 1974, in part to ensure equitable prices of product, regardless of crude source. The FEA Buy-Sell Program was also established to assure sources of crude oil for those refiners without sufficient access to crude oil.

The Emergency Petroleum Allocation Act (EPAA) defined three types of refiners based on their refining capacity and crude oil self sufficiency. Specifically, an independent refiner is a refiner which controls less than 30% of its supply of crude oil and which markets a large volume of the gasoline it refines through independent marketers. A small refiner is a refiner whose total refinery capacity does not exceed 175,000 barrels per day. Thus a major refiner must, by definition, control more than 30% of its crude oil supply and have a refinery capacity greater than 175,000 barrels per day.

At the time EPAA was enacted, there were fifteen large integrated (or major) refiners, four large independent refiners, and more than 100 small independent refiners. Since 1973, there have been a few changes, however, for consistency of analysis, refiner shares data is based on December 1973 classifications.

The large integrated refiners' market share of motor gasoline sales increased slightly in 1973, and then declined approximately 3 percent by 1976. Conversely, the shares of large independent and small refiners gradually increased from less than 26 percent in early 1972 to over 29 percent of sales at the refiner level in 1976 (see Table III-7). Although the allocation and price regulations helped to preserve the shares of the independent and small refiners during the embargo-caused national crude oil shortage in 1974, the overall trend since 1971 and since the adoption of the FEA's Entitlements Program indicates that these refiners are able to maintain their market share when they have equal access to a competitively priced crude oil supply.

Table III-8 shows the market shares of unleaded motor gasoline sales by refiners since 1974. Large independent and small refiners have a smaller share of the unleaded sales than of the total motor gasoline sales

TABLE III-7

REFINER SHARES (PERCENT) OF TOTAL MOTOR GASOLINE SALES

Quarter	Large Integrated Refiners	Large Independent Refiners	Small Refiners	Total Motor Gasoline Sale (Millions of Gallons)
1972				
Jan-Mar	74.1	8.4	17.5	23,139
Apr-June	74.0	8.1	18.0	25,626
July-Sept	73.6	8.2	18.2	26,493
Oct-Dec	72.8	8.4	18.8	25,324
ANNUAL	73.6	8.3	18.2	100,581
1973				
Jan-Mar	72.8	8.5	18.7	24,547
Apr-June	75.0	7.6	17.4	26,698
July-Sept	75.0	7.5	17.5	27,606
Oct-Dec	73.3	7.8	19.0	25,973
ANNUAL	74.1	7.8	18.1	104,824
1974				
Jan-Mar	72.8	8.0	19.2	22,935
Apr-June	73.6	7.7	18.7	26,277
July-Sept	74.4	6.9	18.7	27,291
Oct-Dec	72.6	7.6	19.1	26,370
ANNUAL	73.3	7.6	19.1	102,873
1975				
Jan-Mar	71.5	8.4	20.1	24,214
Apr-June	72.0	7.8	20.2	27,298
July-Sept	73.4	7.4	19.2	27,709
Oct-Dec	71.5	8.1	20.4	26,565
ANNUAL	72.1	7.9	20.0	105,788
1976				
Jan-Mar	70.5	8.5	21.0	25,683
Apr-June	71.3	7.9	21.2	28,737
July-Sept	71.4	7.6	20.9	29,024
Oct-Dec	70.7	8.2	21.1	28,034
ANNUAL	71.0	8.0	21.0	111,478

Source: FEA Refiner Survey (FEA P-305-S-O and P-306-M-O)

NOTE: Includes data for U.S. Territories (e.g., Puerto Rico and Virgin Islands) as well as from the 50 United States.

TABLE III-8

REFINER SHARES (PERCENT) OF UNLEADED MOTOR GASOLINE SALES

Quarter	Large Integrated Refiner	Large Independent Refiners	Small Refiners	Total Unleaded Gasoline Sale (Millions of Gallons)
1974				
Jan-Mar	94.7	4.9	0.4	358
Apr-June	87.4	5.1	7.5	720
July-Sept	80.4	4.7	14.9	2,040
Oct-Dec	80.3	5.2	14.6	2,328
ANNUAL	82.2	5.0	12.8	5,446
1975				
Jan-Mar	80.8	5.7	13.4	2,443
Apr-June	80.8	6.2	13.0	3,091
July-Sept	81.2	6.0	12.7	3,747
Oct-Dec	80.3	7.0	12.6	3,914
ANNUAL	80.8	6.3	12.9	13,196
1976				
Jan-Mar	78.4	7.4	14.2	4,275
Apr-June	78.9	7.0	14.0	5,361
July-Sept	79.1	6.8	14.1	6,034
Oct-Dec	78.6	7.3	14.1	6,105
ANNUAL	78.8	7.3	14.1	21,775

Source: FEA Refiner Survey (FEA P-305-S-O and P-306-M-O), May 4, 1977.

NOTE: Includes data for U.S. Territories (e.g., Puerto Rico and Virgin Islands) as well as from the 50 United States.

volume, but they have been gaining shares relative to the large integrated refiners since 1972. There is no evidence of a shortage of unleaded motor gasoline supplies at the refiner supply level for marketers normally served by large independent and small refiners.

To protect independent gasoline jobbers as well as retailers during the embargo, supplier-purchaser relationships were frozen as of 1972, the last year in which a reasonably normal market situation existed. Despite this freeze, however, a strong consumer focus on low-price outlets caused significant changes in the market shares of various distribution channels, reflecting a trend that had started before allocation controls.

During 1974-1976, refiner and jobber volumes shifted toward lower-cost, higher-volume, and self-service retail outlets. Since branded lessee and open dealers generally operated the highest-cost, lowest-volume outlets, they were the most severely affected.

Reflecting the above trends (see Table III-9), the sales of nonbranded product by independent marketers increased 3.5 percentage points from 1974

TABLE III-9

MOTOR GASOLINE DISTRIBUTED THROUGH JOBBERS AND DISTRIBUTED DIRECTLY BY REFINERS, 1972-1976
(IN PERCENT)

	Sold through Jobbers		Direct Refiner Distribution				
Year	Branded	Nonbranded	Refiner Operated	Branded Lessee Dealers	Branded Open Dealers	Bulk Purchaser Consumer	Total
1972	20.4	15.2	7.9	36.6	11.1	8.8	100.0
1973	21.1	13.3	8.7	36.8	11.7	8.4	100.0
1974	21.3	16.0	9.1	33.8	11.6	8.2	100.0
1975	22.8	18.3	10.7	29.8	10.8	7.6	100.0
1976	24.1	19.5	11.9	27.6	10.4	6.5	100.0

Source: FEA Refiner Survey (FEA P-305-S-O and P-306-M-O), May 4, 1977

to 1976. This reflects the recovery of the nonbranded sector from the depressed sales level of 1973. From 1972 to 1976, direct refiner sales to lessee and open dealers have dropped by nearly 10 percentage points, from 47.7 to 38.0 percent of refiner sales. This drop occurred in nearly all regions among dealers of both large integrated and other refiners (see (Table III-10). Conversely, direct sales through refiner-operated outlets, which have higher average sales volumes, have steadily increased since 1972. As indicated in Table III-11, this trend has occurred in nearly all regions and among both large integrated and other refiners, but the largest growth has been realized on the part of small and independent refiners rather than large integrated refiners.

In terms of the absolute number of dealers affected, the trend away from lessee dealers is by far the most significant. The number of lessee dealers supplied directly by refiners has been declining since 1972, the earliest period for which complete market structure data are available. Refiners supplied 112,000 lessee dealers in the first quarter of 1972, but less than 73,000 by the fourth quarter 1976, a drop of 34.8 percent. This trend away from lessee dealers was evident among all refiners.

TABLE III-10

REFINER DIRECT SUPPLIES OF GASOLINE TO OPEN AND LESSEE DEALERS BY CENSUS REGION (VOLUMES IN MILLIONS OF GALLONS)

Refiner Group and Year	Total*	CENSUS REGION Northeast	North Central	South	West
Large Integrated Refiners					
1972	41,159	10,099	9,177	12,063	9,426
1973	43,489	10,649	9,312	13,266	9,825
1974	40,282	9,973	8,458	12,428	9,022
1975	37,773	9,654	7,624	11,498	8,622
1976	37,706	9,742	7,302	11,380	8,845
1975					
Jan-Mar	8,852	2,208	1,805	2,752	1,986
Apr-June	9,765	2,470	1,969	2,993	2,228
July-Sept	9,975	2,551	2,027	2,991	2,302
Oct-Dec	9,183	2,389	1,821	2,759	2,106
1976					
Jan-Mar	8,714	2,225	1,679	2,674	2,028
Apr-June	9,697	2,483	1,888	2,941	2,275
July-Sept	9,916	2,555	1,923	2,955	2,371
Oct-Dec	9,377	2,475	1,810	2,806	2,168
Other Refiners					
1972	6,780	918	3,471	1,913	468
1973	7,445	913	2,975	1,987	555
1974	6,197	763	3,238	1,665	517
1975	5,152	739	2,629	1,303	478
1976	4,718	688	2,361	1,120	548
1975					
Jan-Mar	1,195	187	575	335	96
Apr-June	1,353	185	707	342	121
July-Sept	1,348	180	714	313	140
Oct-Dec	1,251	191	632	312	117
1976					
Jan-Mar	1,104	166	536	291	110
Apr-June	1,245	165	631	292	156
July-Sept	1,221	172	617	274	157
Oct-Dec	1,148	184	577	263	125

SOURCE: FEA Refiner Survey, May 4, 1977 (FEA P-305-S-O and P-306-M-O).
* Regions will not sum since total includes data for U.S. Territories (e.g., Puerto Rico and Virgin Islands) as well as from the 50 States.
NOTE: Figures may not add due to rounding.

TABLE III-11

GASOLINE SALES THROUGH REFINER OPERATED OUTLETS
BY CENSUS REGION
(volumes in millions of gallons)

Refiner Group and Year	CENSUS REGION				
	Total*	Northeast	North Central	South	West
Large Integrated Refiners					
1972	3,328	455	583	1,386	893
1973	3,798	558	791	1,434	1,004
1974	3,698	575	812	1,409	890
1975	4,501	622	1,166	1,730	973
1976	5,417	785	1,541	2,078	1,004
1975					
Jan-Mar	945	130	233	365	213
Apr-June	1,087	149	278	417	239
July-Sept	1,231	175	325	471	256
Oct-Dec	1,236	166	329	475	263
1976					
Jan-Mar	1,230	163	331	466	267
Apr-June	1,335	195	371	515	251
July-Sept	1,428	221	408	549	246
Oct-Dec	1,423	204	429	547	238
Other Refiners					
1972	3,761	874	1,404	917	363
1973	4,460	962	1,712	1,371	413
1974	4,931	1,058	1,854	1,531	488
1975	6,293	1,272	2,386	1,978	657
1976	7,379	1,412	2,863	2,277	826
1975					
Jan-Mar	1,466	298	532	483	153
Apr-June	1,559	318	592	488	161
July-Sept	1,545	313	599	462	171
Oct-Dec	1,724	344	662	545	172
1976					
Jan-Mar	1,739	334	665	568	171
Apr-June	1,800	358	689	554	199
July-Sept	1,881	361	731	564	224
Oct-Dec	1,959	359	777	591	232

SOURCE: FEA Refiner Survey (FEA P-305-S-O and P-306-M-O), May 4, 1977.
* Includes data for U.S. Territories (e.g., Puerto Rico and Virgin Islands) as well as from the 50 United States.
NOTE: Figures may not add due to rounding.

The most noticeable shifts, however, were among the large integrated refiners who in 1972 depended more heavily than other refiners on the marketing of branded gasoline through independent dealers. These refiners accounted for 85.8 percent of the reduction in lessee dealers supplied by refiners. Table III-12 and Figure III-11 show the number of lessee dealers supplied by each of the three classes of refiners from 1972 through 1976.

Following the price rises of late 1973, the trend toward lower-price, higher-volume retail outlets accelerated as a result of sharply increased consumer price sensitivity. Nonbranded independents and refiner-operators operated most of these newer higher volume outlets and maintained higher average sales per station (Table III-13). Both have increased their market shares since late 1974 (Tables III-14 and III-15). During this same period, the market share of branded independent retailers, who have lower average sales, decreased from approximately 79 percent to approximately 70 percent.

D. Summary

At the refinery level, the small and independent refiners have increased their share of motor gasoline sales from 1972 through 1976, indicating that these

TABLE III-12

NUMBER OF LESSEE DEALER RETAIL OUTLETS SUPPLIED DIRECTLY BY REFINERS

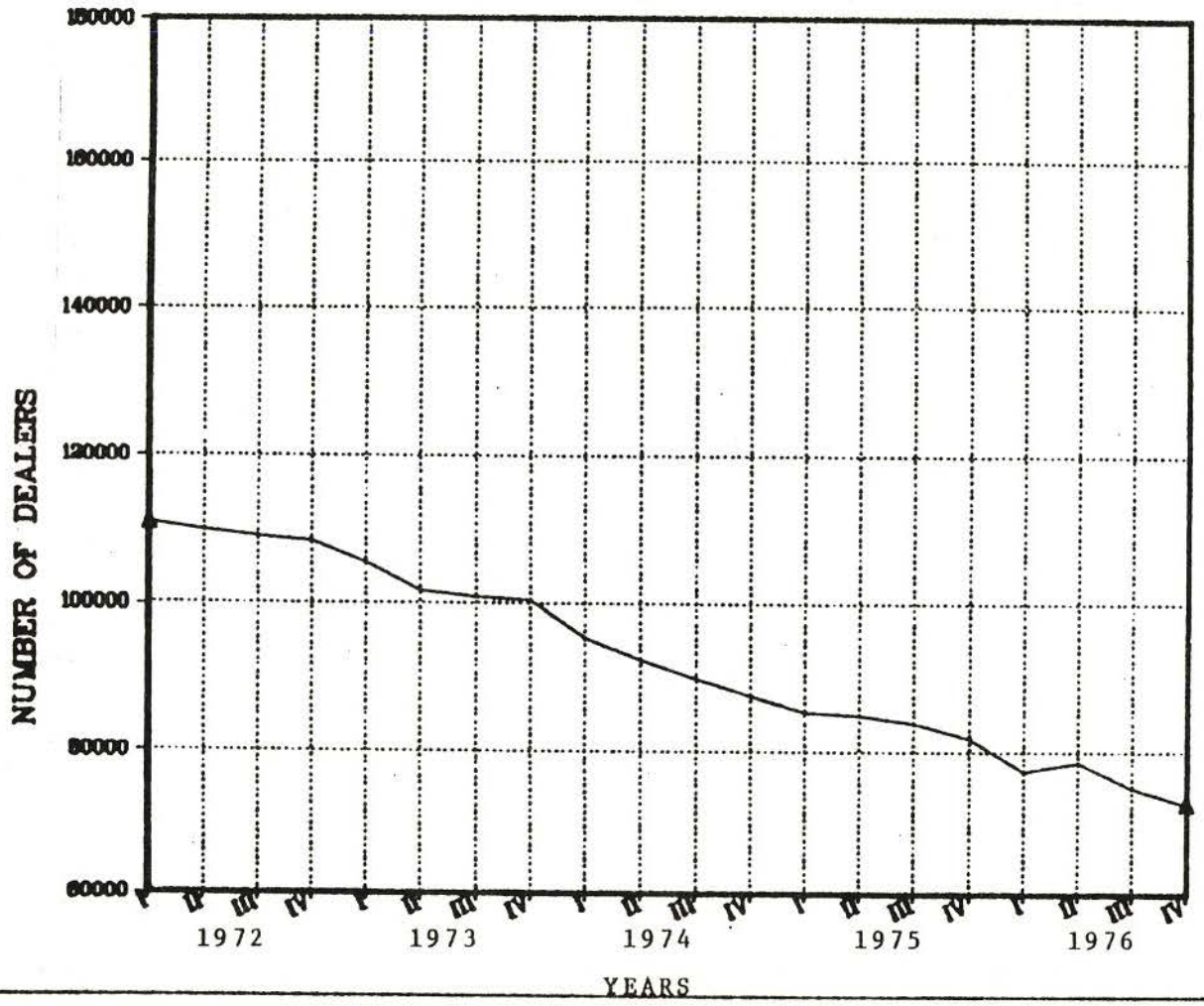
Quarter	Average Monthly Number of Outlets Supplied by: Large Integrated Refiners	Large Independent Refiners	Small Refiners	All Refiners
1972				
Jan-Mar	100,308	5,374	6,365	112,047
Apr-June	99,785	5,147	6,415	111,348
July-Sept	99,344	4,814	6,408	110,565
Oct-Dec	98,426	4,618	6,326	109,370
1973				
Jan-Mar	96,565	4,358	6,372	107,795
Apr-June	94,525	4,292	6,706	105,523
July-Sept	91,726	3,359	6,429	101,517
Oct-Dec	89,581	3,229	6,168	98,979
1974				
Jan-Mar	86,884	2,952	5,809	95,645
Apr-June	84,971	2,806	5,664	93,442
July-Sept	83,549	2,600	5,664	91,793
Oct-Dec	81,331	2,457	5,489	89,278
1975				
Jan-Mar	79,148	2,710	4,949	86,806
Apr-June	78,425	2,561	4,855	85,841
July-Sept	77,566	2,493	4,761	84,821
Oct-Dec	75,941	2,428	4,579	82,948
1976				
Jan-Mar	74,028	2,574	4,364	80,967
Apr-June	71,449	2,498	4,422	78,370
July-Sept	68,178	2,449	4,126	74,754
Oct-Dec	66,174	2,418	3,674	72,266

Source: FEA Refiner Survey, May 4, 1977 (FEA P-305-S-O and FEA P-306-M-O).

NOTE: Includes data for U.S. Territories (e.g., Puerto Rico and Virgin Islands) as well as from the 50 United States.

FIGURE III-11

NUMBER OF LESSEE DEALERS SUPPLIED DIRECTLY BY REFINERS



SOURCE: Federal Energy Administration

TABLE III-13

NUMBER OF GASOLINE SERVICE STATIONS AND AVERAGE SALES BY MARKETER TYPE*

	U.S. Total	Ref./ Mrktrs.	Non-branded Indepen.	Branded Indepen.
		November 1974**		
No. of Stations	201,258	13,958	8,400	178,900
Average Sales (gallons per station)	28,123	56,813	55,500	24,600
		January 1976		
No. of Stations	192,350	16,050	11,300	165,000
Average Sales (gallons per station)	28,916	63,863	56,814	23,606
		July 1976**		
No. of Stations	187,500	17,300	10,400	159,800
Average Sales (gallons per station)	32,938	66,358	58,077	27,685
		Janaury 1977		
No. of Stations	180,250	16,750	11,400	152,100
Average Sales (gallons per station)	30,974	65,013	52,281	25,628

SOURCE: Bureau of Census Retail Survey and FEA Refiner Survey (FEA Form P306-M-O), September 19, 1977.

* These numbers have been revised since the preliminary report to reflect updates to data base.

** Due to seasonality, it is best to compare January 1976 to January 1977. Other months have been included for completeness.

TABLE III-14

GALLONAGE SALES THROUGH SERVICE STATIONS BY MARKETER TYPE*

		Millions of Gallons Sold by Service Stations			
		U.S. Total	Ref./ Mrktrs	Non-branded Indepen.	Branded Indepen.
1974	October	5,716	812	417	4,487
	November	5,660	793	466	4,401
	December	5,803	848	520	4,435
1975	January	5,506	827	505	4,174
	February	5,149	799	486	3,864
	March	5,618	940	533	4,181
	April	5,573	884	558	4,131
	May	5,916	952	564	4,400
	June	5,959	938	575	4,446
	July	6,153	958	581	4,614
	August	6,050	988	606	4,456
	September	5,650	949	572	4,129
	October	5,793	1,010	605	4,178
	November	5,536	982	596	3,958
	December	5,853	1,085	639	4.129
1976	January	5,562	1,025	642	3,895
	February	5,247	965	585	3,697
	March	5,794	1,092	614	4,088
	April	5,909	1,068	643	4,198
	May	5,914	1,082	661	4,171
	June	5,970	1,100	618	4,252
	July	6,176	1,148	604	4,424
	August	6,110	1,152	610	4,348
	September	5,779	1,107	606	4,066
	October	5,934	1,152	614	4,168
	November	5,819	1,115	602	4,056
	December	6,134	1,204	692	4,238
1977	January	5,583	1,089	596	3,898
	February	5,298	1,033	572	3,693
	March	5,885	1,163	615	4,107
	April	6,112	1,168	674	4,270
	May	6,163	1,207	682	4,274
	June (P)	6,142	1,154	672	4,316

(P) Preliminary

* Refiner-marketer volumes have been revised since the preliminary report to reflect more accurate data collected by FEA. Previously, data collected by the Bureau of Census had been used.

TABLE III-15

U.S. MARKET SHARES OF GASOLINE SERVICE STATIONS*

		PERCENT OF SALES BY TYPE OF SERVICE STATION			
		U.S. Total	Ref./ Mrktrs.	Non-branded Indepen.	Branded Indepen.
		(in percent)			
1974	October	100.0	14.2	7.3	78.5
	November	100.0	14.0	8.2	77.8
	December	100.0	14.6	9.0	76.4
1975	January	100.0	15.0	9.2	75.8
	February	100.0	15.6	9.4	75.0
	March	100.0	16.1	9.5	74.4
	April	100.0	15.9	10.0	74.1
	May	100.0	16.1	9.5	74.4
	June	100.0	15.7	9.7	74.6
	July	100.0	15.6	9.4	75.0
	August	100.0	16.3	10.0	73.7
	September	100.0	16.8	10.1	73.1
	October	100.0	17.5	10.4	72.1
	November	100.0	17.8	10.7	71.5
	December	100.0	18.5	10.9	70.6
1976	January	100.0	18.5	11.5	70.0
	February	100.0	18.4	11.1	70.5
	March	100.0	18.8	10.6	70.6
	April	100.0	18.1	10.9	71.0
	May	100.0	18.3	11.2	70.5
	June	100.0	18.4	10.4	71.2
	July	100.0	18.6	9.8	71.6
	August	100.0	18.8	10.0	71.2
	September	100.0	19.1	10.5	70.4
	October	100.0	19.4	10.4	70.2
	November	100.0	19.2	10.3	70.5
	December	100.0	19.6	11.3	69.1
1977	January	100.0	19.5	10.7	69.8
	February	100.0	19.5	10.8	69.7
	March	100.0	19.8	10.4	69.8
	April	100.0	19.1	11.0	69.9
	May	100.0	19.6	11.1	69.3
	June (P)	100.0	18.8	10.9	70.3

(P) Preliminary

* These market share numbers have been revised since the preliminary report to reflect more accurate data collected by FEA for refiner-marketers. Previously, data collected by the Bureau of Census had been used.

refiners are able to compete effectively when they have equal access to competively priced crude oil. The non-branded independent marketers increased their share of the gasoline service station market from 9.2 percent in January 1975 to 10.7 percent in Janaury 1977. These marketing trends point up that nonbranded outlets can compete successfully in gasoline retailing when they are able to obtain supplies at competitive prices. Further, many of these nonbranded stations provide distribution sales outlets for independent refiners. The motorist, in turn, seems increasingly willing to purchaser unbranded gasoline with less service, most likely for price reasons.

These trends indicate the continuing viability of independent refiners and nonbranded independent marketers. The reduction of lessee dealer outlets is part of a general marketing trend away from low-volume sales outlets which tend to have higher average prices and is a consequence primarily of the combined forces of (1) a shift in consumer preferences to less service in return for lower price and, (2) the need for a full service station, in order to maintain a viable business, to increase gallonage because of increased costs while sustaining other profit centers, such as repairs, tire and battery sales, etc.

CHAPTER IV

IMPACT OF THE EXEMPTION OF MOTOR GASOLINE ON SUPPLY/ DEMAND PRICE AND MARKET STRUCTURE

This chapter considers future demand, supply, price and market structure conditions, and assesses the impact of exempting motor gasoline from Mandatory Petroleum Allocation and Price Regulations. The principal questions raised by the EPCA relating to price, supply/demand, and market structure are:

- Will exemption of motor gasoline from regulation result in shortages of motor gasoline or any other refined product?
- Will exemption result in inequitable prices for any motor gasoline class of user?
- Will competition and market forces be adequate to protect consumers following an exemption of motor gasoline from regulation?

To answer these questions, the following analytical approach has been taken:

- Demand forecast -- A demand forecast for motor gasoline and all refined products was developed for the period 1977-1979.
- Supply forecast -- The availability of refining capacity and crude oil supply on both a domestic and worldwide basis to meet forecast demand has been evaluated. The analysis of gasoline assumes

that refiners comply with the Environmental Protection Agency's lead phasedown schedule and assumes that no MMT is used. The effects of actions regarding lead phasedown and MMT would be the same with or without controls. An alternative assessment, based on a survey of refiners' planned supplies, is given for comparative purposes. Additionally, FEA isolates impacts that would be a result of decontrol from impacts that would occur with or without decontrol.

- o Pricing factors -- The price movement pressures arising from the cost and margins associated with the major industry segments, banked costs, foreign market prices, and the competitive structure of the industry were assessed.
- o Market structure and competition -- Trends that may affect the future competition of the major industry segments were examined.

Many trends in the industry will continue under either controlled or uncontrolled conditions. For example, rising crude oil prices, increased refiner non-product costs, rising proportion of higher cost unleaded gasoline as a part of total gasoline value, and the increased costs of producing lower lead-content leaded gasoline to comply with EPA's lead phasedown schedule will all tend to increase motor gasoline prices, with or without controls. Accordingly, the discussion

in this chapter focuses on the price effects resulting from exemption of motor gasoline from controls.

SUMMARY OF ANALYSIS

Although the impact that decontrol will have on the demand, supply and prices of gasoline and other petroleum products cannot be determined with precision, the FEA can make certain judgments, based on the best data available, about the ranges of possibilities for these factors.

Since the Findings and Views of January 14, 1977, the FEA has extended its gasoline supply and demand projections beyond 1978 through 1979. There has not been a change in the basic FEA findings regarding the adequacy of gasoline supply in 1978. Both gasoline and other refined products supplies are projected to be more than adequate in 1978 to meet projected demand without increasing imports of any refined products.

FEA's assessment of the industry's refining capability indicates that the supply of gasoline will be just adequate in 1979 to meet projected gasoline demand for the year. No general shortage is expected to develop which would cause a price increase as a result of decontrol. To meet peak-period demand in 1979 stock drawdowns will be considerable but attainable. This assessment assumes no waiver to the lead phasedown schedule and no use of MMT. If the EPA does not prohibit the use of MMT, or if it permits waivers to the current lead phasedown schedule, FEA finds that supplies of gasoline should be comfortably adequate to meed demand in 1979.

FEA has conducted a separate analysis for unleaded gasoline and finds that refiners will have adequate reforming capacity to be able to shift some of their production capability from leaded gasoline into the production of unleaded gasoline. This ability will help avoid any shortage developing specifically for unleaded gasoline.

The projections of gasoline supplies for 1979 are based upon FEA's refinery analysis model. The margin of error for the supply projection in this computer analysis model could easily be plus or minus 100 MB/D, so that domestic supplies could fall short of projected demand by 100 MB/D on an annual basis. As long as the domestic shortfall remains less than 100 MB/D on an annual average, it can be met by additional imports.

However, the gasoline demand forecast could also be overstated by 100 MB/D. The 7.4 million barrel per day demand projection is based on economic forecasts consistent with the President's overall economic and energy objectives. An alternative simulation, based on more conservative economic assumptions would yield a demand of about 100 MB/D less.

Projections for supply and demand for petroleum products during 1979 indicate that the total demand for petroleum products will substantially exceed the supply of all petroleum products from domestic refineries. Total U.S. demand is projected to increase by 1.1 MMB/D between 1978 and 1979

which would be met in part by increased domestic refining capacity and in part by increasing petroleum product imports by 500 MB/D over their current levels.

Based on projected supply and demand, it will be necessary to increase imports of residual fuel from 1.4 MMB/D in 1976 to 1.7 MMB/D in 1979, middle distillates from 100 MB/D in 1976 to 200 MB/D in 1979, and "other products" from 200 MB/D in 1976 to 300 MB/D in 1979 in order to meet the rising demands for these products and maintain reasonable production yields in domestic refineries. The 100 MB/D increase in the "other" category is primarily due to increased imports of LPG's and petrochemical feedstocks. Price increases will occur for these products as a result of the additional higher-priced imports, but these price increases will not be a direct result of motor gasoline decontrol, as they would have occurred as well under continued controls.

An analysis of banked costs indicates another factor which may cause a price increase for gasoline if gasoline is decontrolled. Usually large volumes of unrecovered costs for gasoline and all petroleum products by all refiners can be taken as evidence that the market is in equilibrium. However, a situation has developed in which the prices of a small number of large refiners are currently being constrained by FEA's pricing regulations below levels of other large refiners. Three of the top 30 gasoline refiners had inadequate banks (based on April data) to sustain June retail

price levels. June survey data indicate that the retail prices of these refiners averaged about one-half of a cent below other major refiners. If motor gasoline is decontrolled, these refiners can be expected to raise prices to market levels, which would probably raise the average level of prices by less than one-half of a cent per gallon.

During the hearings held September 6, 7, and 8, 1977, on the "Preliminary Findings" some refiners and retailers indicated that cost pressures exist which could cause them to raise the price of motor gasoline more than the one cent per gallon increase projected by the FEA. There was some testimony that refiners might vary existing credit card practices to transfer to retailers some of the costs of handling credit transactions. A number of refiners indicated that a price increase in excess of one cent would be needed to recover increased investment costs. Other testimony by retailers pointed out that while retail gasoline prices were below ceiling levels, this is due in large part to competition at the self-serve, leaded grade pumps. Full serve pump prices, it was contended, are in certain areas close to maximum levels and could rise further upon decontrol. However, even should these increases be realized, and FEA believes they would not, the combined increases would still be within the range of impacts projected in Chapter V.

In response to comments by the Administrator of the EPA, FEA has examined the impact of decontrol on the relative price

249-464 O - 77 - 6

of leaded and unleaded gasoline and does not expect decontrol to have any major effect on the price differential. Under present regulations increased costs on a volumetric basis are allocated to gasoline as a product and refiners are permitted to spread these costs among established types and grades of gasoline as they wish. It is very difficult to allocate refining costs accurately among products and much more so between type or grades of a product. This flexibility was provided to refiners so that they could make their own determination as to which type or grade of gasoline was most expensive to refine. As it is, however, generally conceded that unleaded gasoline is more expensive to refine than regular leaded gasoline, refiners have generally increased the wholesale price of unleaded gasoline from the one cent a gallon above leaded regular previously permitted, to around two cents a gallon under current regulations. As this increase could have been much greater under current regulations, there is no reason to believe that refiners would behave differently under decontrol. Indications are that retailers have generally competed most vigorously in the leaded regular, or "house brand" grade which is more heavily in demand by consumers who tend to own pre-1975 model cars which can use that grade. Consequently, the retail price unleaded gasoline has tended to increase more rapidly than the price of leaded regular. Persons testifying at FEA hearings were unable to offer estimates as to whether this trend will continue.

It is important to recognize that even if gasoline prices are not decontrolled, certain rises in motor gasoline prices and other products as well, will be caused by crude oil and refinery operating costs increases. Domestic crude oil costs will rise as allowed by provisions of the EPCA and ECPA and in accordance with the President's proposed taxes on domestic crude oil (crude oil equalization tax). Motor gasoline tax increases, if implemented, would also increase prices. Refiners' operating costs will rise with general inflation and with increases in refinery fuel costs. If a shortage were to occur under continued controls, there would be an additional price increase of about three cents per gallon. Retailers could raise prices by two cents per gallon to ceiling levels authorized by FEA regulations. Refiners with banked gasoline costs would be able to draw down these banks, a practice which would increase gasoline prices by an additional one cent.

It is difficult to project the rate of increase in foreign crude oil costs, but it is expected that these costs will not decline, and may rise to keep pace with the costs of U.S. goods purchased by OPIC countries. For this analysis, the cost to the U.S. of imported crude oil is assumed to rise in annual increments at the projected rate of inflation for U.S. goods and services. Moreover, because the volume of imported crude oil and uncontrolled domestic oil will increase relative to the volume of controlled

domestic crude oil, the average costs of crude oil to U.S. refiners will rise at a higher rate than the rate of inflation.

Assuming that rising product and nonproduct costs are allocated among all refined products according to percentages of production, controlled motor gasoline price increases will closely follow those cost increases except for normal seasonal adjustments, since the amount of motor gasoline imported is small compared to domestic production. Projected price increases for motor gasoline with continued controls are shown in Table IV-16.

Investment costs, and consequently depreciation costs will increase if refiners are to undertake the expansion of refining capacity needed to meet projected demand for all petroleum products. Under current FEA regulations refiners can pass through depreciation costs, but not the full amount of investment costs. If the FEA were to provide additional incentives for investment in needed refining capability, under continued controls, it would probably change its regulations to provide for the recovery of return on investment. Although no decision has been made as to whether to allow such additional cost passthrough, FEA's best estimate is that a price increase for motor gasoline on the order of one-half to one cent per gallon would occur as a result of such a change.

In this chapter other factors taken into consideration in examining price effects are long-term world oil prices, the trend in gasoline margins, the general level of industry

profitability and the additional investment for refining capacity that will be needed.

General industry profitability is one indication that prices may not rise more than the amount needed to cover a possible motor gasoline shortage and investment in refining. Separate data on refining and marketing activities which would enable the FEA to evaluate whether or not integrated refiners are subsidizing their refining and marketing operations with profits from crude oil production are not available. Recent changes in the law, and loss or potential loss of foreign production may require integrated firms to reexamine their refining and marketing operations as profit centers. However, an examination of aggregate data for the major oil companies indicates that recent overall oil industry rates of return are close to the average for all industries and higher than the historical rates for the petroleum industry. Provided that refiners can cover the costs of investing in additional refining capability, overall industry profitability should be adequate.

Inadequate refining, distributing and retailing margins for motor gasoline have been cited as factors in justifying potential price increases. During April 1977, the average total motor gasoline margins were 5.0 cents per gallon below the general level of price increases (i.e., the Consumer Price Index), indicating that the margins did not rise as fast as annual inflation rates both before and after the imposition of price controls. On the other hand, higher

sales volumes tend to compensate for reduced unit margins. More importantly, the retail margins for leaded gasoline currently are about 2.4 cents below the maximum allowed by the regulations, a fact which tends to demonstrate that competition is restraining potential price increases.

FEA regulations have granted a total increase of three cents per gallon for nonproduct costs incurred since May 15, 1973, at the retail level. A one-cent per gallon nonproduct cost increase was permitted effective January 1974, and an additional two cents per gallon increase was permitted effective March 1974. Most retailers have not maintained their margins at the legal maximum. The current retail gasoline margin average is only 0.6 cents per gallon above the May 1973 level (7.3 cent per gallon in May 1973 vs. 7.9 cents per gallon in May 1977). Thus, FEA regulations have not, in general, been constraining motor gasoline prices at the retail level, which is strong evidence that market forces have been holding motor gasoline prices below those levels permitted by price controls.

An analysis of recent world and domestic leaded motor gasoline prices indicates that domestic motor gasoline prices currently average two to six cents below world prices. World prices reflect the higher cost of foreign crude oil, the costs of refining gasoline in foreign refineries, and transportation costs. An analysis of spot market prices bears out this level of difference between world and domestic prices. If a domestic shortage develops,

it may be possible to increase leaded gasoline imports by more than the additional 100 MB/D believed to be readily available on the world market. However, any additional reliance on imports beyond historic levels would most likely drive world prices upward.

To sum up, the available supply and demand data indicate that motor gasoline prices will not rise in 1979 as a result of an imbalance between supply and demand for motor gasoline. A price increase of about one cent per gallon could occur under decontrol to cover the additional cost of investment in refineries. A larger price increase of up to 7 cents per gallon could occur as a result of decontrol under a shortage of the magnitude derived from the survey of refiners' estimates of production capabilities under pessimistic assumptions as to environmental controls. Under continued controls a small increase in price may occur in 1978 and 1979 as a result of price adjustments by refiners that do not have any banks.

DEMAND FOR MOTOR GASOLINE

Motor gasoline demand is expected to increase by 3.0 percent in 1977, 0.6 percent in 1978, and 1.9 percent in 1979. Altogether, the expected rise in total gasoline demand from 1976 to 1979 averages about 1.8 percent annually, reaching an average total gasoline demand level of 7.4 million barrels per day for 1979 (Table IV-1 and Table IV-6). The simulation from which the 7.4 million barrels per day demand forecast for 1979 is derived is

consistent with the President's overall economic and energy objectives. If an alternative simulation based on more conservative economic assumptions were used, such as those in the Data Resources Inc., Cyclelong 6/77 simulation, the demand for motor gasoline and total refined product would be reduced. If DRI's latest Cyclelong 6/77 simulation were used, as it was in the January 1977 decontrol analysis, the 1979 demand for motor gasoline would decrease by nearly 100 thousand barrels per day.

The projected decline in the rate of growth of gasoline demand is attributed to two factors: (1) greater fuel efficiency for new automobiles, and (2) a shift from the use of gasoline engines in smaller trucks and some cars to the use of diesel engines. In 1979 the savings in gasoline consumption that will occur from increased fuel efficiency and dieselization is projected to be about 340 and 35 MB/D, respectively. In 1978 the savings are projected to be 200 and 16 MB/D, respectively.

DEMAND FOR UNLEADED GASOLINE

With the use of catalytic converters on new cars, the demand for unleaded gasoline is expected to rise much faster than the demand for all gasoline. In 1975, unleaded gasoline demand was less than a million barrels per day (Table IV-1) and less than 15 percent of total demand. By 1979 unleaded motor gasoline demand could be as high as 3.2 MMB/D (see Appendix I and Table IV-1) and nearly 43 percent of total demand.

TABLE IV-1

PROJECTED DOMESTIC PETROLEUM PRODUCT
DEMAND ASSUMING NO PRICE INCREASE DUE TO EXEMPTION
(Thousands of barrels per day)

	1975	1976 [1/]	1977 [1/3/]	1978 [1/3/]	1979 [1/3/]
Motor Gasoline	6,674	6,978	7,200	7,200 [4/]	7,400 [5/]
Leaded	5,699	5,633	5,200	4,600	4,200
Unleaded	975	1,345	2,000	2,600	3,200
Middle Distillates [2/]	2,849	3,130	3,300	3,500	3,700
Residual Fuel	2,433	2,786	3,000	3,200	3,600
Kero Jet Fuel	791	789	800	800	800
Naphtha Jet Fuel	210	198	200	200	200
Other Products	3,334	3,562	3,900	4,200	4,500
Total Domestic Demand	16,291	17,443	18,500 [6/]	19,100	20,200
Exports & Crude Oil Losses	223	224	200	200	200
Total Demand	16,514	17,667	18,700	19,300	20,400

SOURCE: FEA Demand Model (7-15-77) Forecasts are derived from FEA's short-term model which uses macroeconomic forecasts by Data Resources Incorporated. The 7-15-77 demand estimates are based on a control solution consistent with the Counsel of Economic Advisors FEA economic targets of the DRI CEA Spirit 0377 Simulation. (See Appendix I). The gasoline demand estimates for 1978 and 1979 include 16,500 and 35,000 barrel per day downward adjustments, respectively, for dieselization. Distillate demand includes a corresponding upward adjustment. The gasoline demand includes a 200,000 and 344,000 barrel per day downward adjustment for increased fuel efficiency in 1978 and 1979 respectively. Residual fuel oil demand for 1977 is increased 200,000 barrels per day for natural gas curtailments. The demand estimates are based on price trajectories that include the effect of the President's crude oil equalization tax.

1/ Assumes real income growth rate will 6.6% in 1978 and 5.4% in 1979.
2/ Kerosene is included in other products.
3/ Rounded to the nearest 100,000.
Numbers may not equal total due to rounding.
4/ Actual unrounded figures for forecasted motor gasoline demand in 1978 are about 40 MB/d higher than those for 1977.
5/ Forecasts of gasoline demand for 1979 from DRI's CycleLong 6/77 simulation are 7,300 MB/d. This CycleLong simulation does not include the objectives of the President's National Energy Plan.
6/ The 1977 demand estimate has been adjusted based on actual figures.

TOTAL REFINED PRODUCT SUPPLY FORECASTS

To assess the adequacy of petroleum product supplies relative to forecast demand, the key supply determinants of refinery capacity and catalytic reformer capacity, the effect of continued use and prohibited use of MMT, and crude oil supply were analyzed. The overall supply forecast which was developed is given in Table IV-2.

Refinery Capacity

An analysis of projected supplies in Table IV-2 shows that total average annual petroleum product demand for 1979 cannot be met from increased domestic refining capacity and will cause increases in imports of several product categories. Domestic refinery capacity is projected to increase by 1.7 MMB/D from 1976 to 1979, while the increase in total petroleum demand is projected to be 2.7 MMB/D. The projected utilization of this capacity (based on crude oil inputs only) will have to increase to an annual rate of 88.3 percent by 1978 and to 91.0 by 1979. To meet the total demand for refined products in 1979, imports will increase by 500 MB/D above the 1976 level. These incremental imports include 100 MB/D of distillate fuel oils, 300 MB/D of residual fuel oil, and 100 MB/D of other products and petrochemical feedstocks. The projected 1979 capacity utilization rate is comparable to the rate achieved in 1968, 1969, and to date in 1977, (Table IV-3).

TABLE IV-2

PROJECTED U.S. PETROLEUM SUPPLY

(Thousands of barrels per day)

	1975	1976	1977 1/	1978 1/	1979 1/
Refinery Capacity*	14,832	15,692	16,800	17,200	17,400
Percent Utilization**	84%	85.5%	86.9% 2/	88.3%	91.0%
Anticipated Utilization	12,442	13,416	14,600	15,200	15,800
Domestic Crude ***	8,363	8,119	8,300	9,300	9,200
Foreign Crude ****	4,105	5,297	6,300	5,900	6,600
Product Imports	1,888	2,007	2,000	2,000	2,500
Residual Fuel		1,402	1,400	1,400	1,700
Other Imports		605	600	600	800
Natural Gas Liquids	1,633	1,604	1,500	1,500	1,500
Other*****	497	640	600	600	600
Total Supply	16,460	17,667	18,700	19,300	20,400

* FEA estimates; do not include Puerto Rico and Virgin Islands, which contribute approximately 1 million barrels per day additional capacity but whose product shipments to the U.S. are considered as imports. Numbers are obtained by adding announced new capacity projects to existing capacity. These estimates were revised upward in July 1977 from those provided in the January 14, 1977 "Findings."

** Based on crude inputs only.

*** Revised September 16, 1977, to take into account latest available data.

**** Does not include incremental imports for Strategic Petroleum Reserve purchases and does not include imports for any stock buildups.

***** Includes processing gain and other hydrocarbon inputs.

1/ Rounded to the nearest 100,000
Numbers may not equal due to rounding.

2/ Preliminary 1977 monthly reports indicate that the projected utilization is being exceeded.

TABLE IV-3

DOMESTIC REFINERY CAPACITY UTILIZATION

Year	Percent Crude Input to Capacity	Year	Percent Crude Input to Capacity
1968	90.6	1974	83.9
1969	90.6	1975	84.2
1970	88.6	1976	85.5
1971	87.2	1977	86.9 projected
1972	88.4	1978	88.3 projected
1973	89.8	1979	91.0 projected

SOURCE: U.S. Bureau of Mines, 1968-1973.
REA Estimates, 1974-1979.

NOTE: Revised to incorporate more recent data since publication of FEA's Findings of January 14, 1977.

GASOLINE SUPPLY

FEA's analysis indicates that the total supply of motor gasoline will be barely adequate to meet the total projected gasoline demand for 1978 and 1979 on an annual basis (Table IV-5) assuming that the EPA does not permit waivers to the lead phasedown schedule or to the MMT ban.

These supply estimates allow for a slight reduction in motor gasoline yields and assume rates of about 91 percent for refinery capacity utilization. From 1976 to 1979 the annual average percentage yield for motor gasoline shows a slight decline.

This decline in motor gasoline yield does not indicate that there will be unused motor gasoline production capability. An FEA analysis of reformer capacity (Table IV-9) indicates that reformer capacity will be just adequate in 1979 to meet projected demand given that the use of MMT is prohibited and there is no change to the EPA's lead phasedown schedule. Catalytic reformers produce reformate which is used to build up clear octane levels in lieu of TEL or MMT. With the continued use of MMT up to .0625 grams per gallon until September 1978, motor gasoline supplies will be likely to meet annual demands during 1978 and 1979. With waivers to the lead phasedown schedule or the ban on MMT after September 1978, motor gasoline supplies would more likely be adequate to meet annual demands in 1979.

The analysis is derived from an FEA model of the refining industry which takes into account various refinery configurations on a national average basis. To the extent that the model does not take into account all of the variables which may affect reformer output, the model will have some margin of error

associated with its forcasts. The motor gasoline supply estimate derived from the model could be overstated or understated by 100 thousand barrels per day.

FEA solicited motor gasdoline production estimates and demand forecasts from seventeen large refiners on July 15, 1977, to determine the degree of correlation between industry expectations and FEA's own supply and demand forecasts. These refiners represent 84.1% and 78.7%, respectively, of domestic unleaded and leaded gasoline production.* The seventeen refiners were asked to base their production estimates on the assumption that use of MMT would be banned. Aggregation of their estimates, extrapolated to include all refiners, indicates that supply will meet demand comfortably in 1978, and marginally in 1979 if the EPA approves such requests it has received for waivers from its lead phasedown schedule (Table IV-4). If, on the other hand, requested waivers are not granted, supply would be marginally adequate in 1978 and a shortfall of about two hundred thousand barrels per day in 1979 would develop.

Assuming the use of MMT is prohibited and no waivers to the lead phasedown schedule are granted, the survey indicated that gasoline supplies will fall short of demand by about 200 MB/D even if imports are increased from 200 MB/D to 300 MB/D. The additional imports could be refined gasoline or raw feedstocks, such as reformate which could be used to produce both leaded and unleaded gasoline.

* Following a meeting with the FEA Administrator, the seventeen companies then separately provided the FEA with the specific estimates and forecasts that had been requested.

TABLE IV-4

EXTRAPOLATION OF REFINERS' PROJECTIONS OF MOTOR GASOLINE SUPPLY VS. FEA DEMAND FORECAST (MB/D)*

A. Assuming prohibition of MMT and current EPA lead phasedown without waiver of 0.8 gpg lead standard.

	1978			1979		
	Unleaded	Leaded	Total	Unleaded	Leaded	Total
Production	2,600	4,300	6,900	3,200	3,600	6,800
Imports	--	300	300	--	300	300
Total Supply	2,600	4,600	7,200	3,200	3,900	7,200
FEA Demand Forecast	2,600	4,600	7,200	3,200	4,200	7,400
Excess/(shortfall)	--	--	--	--	(300)	(200)

Note: Sum of grades may not equal total due to rounding

B. Assuming prohibition of MMT and current EPA lead phasedown with waiver of 0.8 gpg lead phasedown.

	1978			1979		
	Unleaded	Leaded	Total	Unleaded	Leaded	Total
Production	2,700	4,500	7,200	3,300	3,800	7,100
Imports	--	300	300	--	300	300
Total Supply	2,700	4,800	7,500	3,300	4.100	7,400
FEA Demand Forecast	2,600	4,600	7,200	3,200	4,200	7,400
Excess/(shortfall)	100	200	300	100	(100)	--

Note: Sum of grades may not equal total due to rounding.

* Does not include any effect of MMT.

TABLE IV-5

FEA ANALYSIS OF PROJECTED GASOLINE SUPPLY [5/]
(Thousands of barrels per day)

	1975	1976	1977 [3/]	1978	1979
Refinery Capacity [1/]	14,832	15,692	16,800	17,200	17,400
Percent Utilization [4/]	84.0%	85.5%	86.9%	88.3%	91.0
Crude Oil Demand	12,468	13,416	14,600	15,200	15,800
Domestic	8,363	8,119	8,300	9,300	9,200
Import [6/]	4,105	5,297	6,300 [7/]	5,900	6,600
Gasoline Yield [2/] from Crude Oil	5,810	6,121	6,300	6,300	6,500
Percent Gasoline Yield	46.5%	45.6%	43.4%	41.4%	41.1
NGL's Blending/Processing	711	725	700	700	700
Imports	185	131	200	200	200
Total Gasoline Supply	6,705	6,977	7,200	7,200	7,400

1/ Based on July 1977 FEA Survey data.

2/ Actual gasoline yields for 1975 and 1976 were from the Bureau of Mines.

3/ Rounded to nearest 100,000.

4/ Based on crude oil inputs only.

5/ Without lead phasedown waivers. No MMT

6/ Excludes Strategic Petroleum Reserve imports and imports for stock buildups.

7/ Projected imports of crude oil have been adjusted to be consistent with demand estimates in Table IV-1 and changes in Alaskan supply.

TABLE IV-6

PERCENTAGE INCREASES IN REFINING CAPACITY
AND REFINED PRODUCT DEMANDS

	1976 to 1977	1977 to 1978	1978 to 1979
Refinery Capacity	7.7	2.4	1.6
Total Product Demand:	5.8	2.8	5.9
Gasoline	3.1	0.5	1.9
Distillates	6.8	3.9	6.4
Residual Fuel	8.0	5.3	13.8
Jet Fuel	1.5	-1.4*	0.6
Other Product	10.6	5.4	7.6

SOURCE: FEA

NOTE: Percentage based on numbers presented in Table IV-1 and IV-2 before rounding.

* The decline in projected demand for jet fuel from 1977 to 1978 results from a decline in projected purchases of naphtha jet fuel by the Department of Defense.

A potential shortfall of as much as 200 MB/D as indicated by the refiner survey, which probably could not be met by imports, would result in price increases in the absence of FEA price controls. Historically, gasoline demand has been relatively unresponsive in the short-term to changes in gasoline prices. Based on results of FEA's Short-Term Demand Model, a ten percent increase in price will probably decrease demand by no more than two percent in the short run. A one cent rise in the price of gasoline, therefore, would reduce demand by about 20 MB/D. Thus, if 1979 demand is 200 MB/D above the projected supply, a price increase in the range of ten cents per gallon could occur to reduce demand to the level of supply. However, this assumes a constant elasticity of 0.2. If elasticity of 0.1 were assumed, the price increases would be 20 cents. On the other hand, to the extent that gasoline prices might rise, refiners would have an economic incentive to increase gasoline yields at a higher cost and with losses in overall refinery production. Such losses could be offset by importing additional quantities of middle distillates and residual fuel oil or by unusual stock drawdowns of the latter products if primary stocks were at high levels at that time. If such a shortage were to develop under continued controls, prices would increase about three cents per gallon, as indicated on page 80. Thus, if a shortage of 200 MB/D occurred, the net increase, as a result of decontrol, would be ten minus three or seven cents per gallon.

The U.S. refining industry has available to it a variety of alternatives to deal with a prospective or emerging shortage. Each of these alternatives has a cost associated with it, but in no case could the cost exceed a fraction of the amount of money generated by a ten-cent per gallon price increase. At a demand level of 7.4 MMB/D, each one cent per gallon would generate over $3 million per day and over $90 million per month. Although the alternatives available to each refiner would vary, and thus no quantification can be provided, this amount of additional revenue would cause the refining industry collectively to undertake one or more of the following operational changes to increase gasoline production:

- o Emergency debottlenecking;
- o Crude intake changes;
- o Yield changes;
- o Increases in processing severity;
- o Deferral of planned maintenance or renovation;
- o Increased blending stock purchases, domestic and foreign;
- o Emergency additions to storage capacity;
- o Increased imports from unaccustomed sources.

This is not an exhaustive list and is given merely to document the fact that a penny a gallon is a good deal of money in the refining industry and would prompt refining

action to increase product to meet the shortfall. The notion that the shortage would be tolerated in the face of the potential for extraordinary production increases supported by revenues is basically without practical foundation. Refiners testified to this in FEA hearings.

Satisfying Seasonal Gasoline Peaks

To determine if motor gasoline supplies will be adequate during the peak gasoline demand seasons in 1978 and 1979, the FEA has analyzed catalytic reforming capacity requirements during the peak demand season to determine the ability of the industry to meet part of the peak period demand from inventory drawdown (See Table IV-7 and IV-9).

If the EPA were to prohibit the use of MMT before September 15, 1978, and were to enforce the lead phasedown schedule as currently proposed, shortfalls of reforming capacity would exist for peak demand periods in both 1978 and 1979. Reforming capacity shortfalls during peak demand periods would be 210 MB/D in 1978 and 250 MB/D in 1979. These shortfalls of catalytic reforming capacities are equivalent to approximately 400 to 475 MB/D of motor gasoline production in 1978 and 1979, respectively. The capability to meet the peak period demand would be determined primarily by the level of motor gasoline stocks and the extent to which they could be drawn down. By drawing

TABLE IV-7

PROJECTED PEAK PERIOD DEMAND
FOR MOTOR GASOLINE

	Total Peak Demand	Unleaded Demand	Leaded Demand
June-Aug. 77	7,600	2,100	5,500
June-Aug. 78	7,700	2,800	4,900
June-Aug. 79	7,800	3,400	4,400

SOURCE: FEA

down motor gasoline stocks from 240 MMB, which represents an average level of motor gasoline stocks for the beginning of the peak driving season, to 210 MMB, which is believed to be slightly above the minimum acceptable level, approximately 330 MB/D would be available for a period of 90 days. It would then be necessary to import an additional 70 MB/D of motor gasoline during the peak demand period of 1978 and an additional 145 MB/D to meet the projected demand in 1979 under the reforming capacity shortfalls that would develop without the use of MMT and without a lead phasedown waiver. Offshore gasoline is available to satisfy these 3 month demand peak requirements.

If the EPA does not grant lead phasedown waivers and does permit the use of .06 (1/16) grams per gallon of MMT in the unleaded motor gasoline pool, production plus drawdowns will be adequate to meet the peak periods in 1978 and 1979. The use of MMT reduces the amount of catalytic reforming capacity needed to maintain required octane levels. Using .06 grams per gallon of MMT, catalytic reforming capacity shortfalls are still projected for the peak demand periods for both 1978 and 1979. However, these reforming capacity shortfalls are much smaller than those which would be experienced without using MMT. The reforming capacity shortfalls are projected to be 30 to 150 MB/D during the peak periods of 1978 and 1979, respectively. These catalytic reforming capacity shortfalls are equivalent to approximately 60 MB/D of motor gasoline during the peak period of 1978, and 285 MB/D of motor gasoline during the peak period of 1979. For both 1978 and 1979, these shortages could be offset by motor gasoline stock drawdowns.

Projected Refining Capacity by PAD

Projected refinery capacity by PAD is shown in Table IV-8. Refinery capacity growth in PAD's II and IV is expected to be slower than growth in other regions. This expectation is a function both of crude oil supply sources and expected consumption growth characteristics. The change is not expected to affect domestic distribution or regional gasoline availability to any important extent.

Refinery Yields

Refinery yields are an important factor in the supply forecast, particularly in assessing the effects of motor gasoline exemption on the supplies of other products. Since the rate of demand growth varies among refined products, shifts in refinery yield will be necessary to respond to a changing demand mix. To identify any potential problems associated with refinery yield, historic yields are contrasted with future demand mix. Table IV-10 shows the historic yields and the yields needed to meet projected demand.

Refined Product Imports

FEA analyses indicate that world refinery capacity compared to world product demand is now adequate to meet imports of leaded motor gasoline, at current price levels, into the United States of about 100 MB/D of imports over 1976 levels if it should become necessary.

These imports would be priced higher than domestic gasoline. Under current price regulations the cost of

TABLE IV-8

PROJECTED U.S. PETROLEUM REFINING CAPACITY, 1976-79
(Thousands of barrels per day)

Year	PAD DISTRIBUTION					TOTAL
	I	II	III	IV	V	
1976	1,790	4,180	6,550	550	2,620	15,700
1977	1,910	4,220	7,140	570	2,910	16,800
1978	1,910	4,240	7,440	590	2,980	17,200
1979	1,930	4,330	7,570	590	3,010	17,400
Percent Growth 1979 over 1976	7.8	3.6	15.6	7.3	14.9	11.2

SOURCE: FEA Trends in Refinery Capacity and Utilization, June, 1977, and FEA updates to projections.

TABLE IV-9

Catalytic Reforming Capacity Needed to Meet Projected Peak Period and Annual Average Demands for Gasoline [1] (MMB/CD)

	Projected Reforming Capacity	Necessary Reforming Capacity for Motor Gasoline		Estimated Reforming Capacity Necessary for Petrochemical Industry	Total Reforming Capacity Requirement		Excess Capacity or (Shortfall)	
		Without Manganese	0.06/G/Gal. of Manganese		Zero Mn	0.06g Mn	Zero Mn	0.06 Mn
Peak Period [2] 1978	3.52	3.43	3.24	.31	3.74	3.55	(0.21)	(0.03)
Annual Average 1978	3.52	3.14	3.07	.31	3.45	3.38	0.07	0.15
Peak Period [2] 1979	3.56	3.46	3.37	.34	3.80	3.71	(0.25)	(0.15)
Annual Average 1979	3.56	3.23	3.06	.34	3.57	3.40	(0.01)	0.15

1. Assumes maximum gasoline pool lead level is 0.8 g/gal. in 1978 and 1979.

2. Peak period defined as months of June, July, and August.

NOTE: Rounded to the nearest 10,000. Numbers may not equal due to rounding.

Source: FEA study conducted by Office of Energy Information and Analysis using comprehensive refinery model.

249-464 O - 77 - 7

TABLE IV-10

REFINERY YIELDS FOR THE UNITED STATES 1/
(Annual Percent)

	1968	1969	1970	1971	1972	1973	1974	1975	1976*	1977*	1978*	1979*
Gasoline	43.9	44.8	45.3	46.2	46.4	45.8	46.2	46.5	45.6	43.4	41.4	41.1
Jet Fuel	8.3	8.2	7.5	7.3	7.1	6.8	6.8	7.0	6.8	6.2	5.9	5.7
Middle Distillates 2/	24.8	24.3	24.7	24.0	24.0	24.1	23.0	22.5	22.3	22.1	22.4	22.2
Residual Fuel Oil	7.2	6.8	6.4	6.6	6.7	7.7	8.7	9.9	10.3	11.0	11.8	12.0
Other	18.8	19.0	19.3	19.2	19.0	19.2	19.2	17.8	18.7	21.4	22.4	22.8
Shortages	-3.0	-3.1	-3.2	-3.3	-3.2	-3.6	-3.9	-3.7	-3.7	-4.1	-3.9	-3.8
3/	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

1/ Other unfinished oils added to crude oil in computing yields

2/ Includes kerosene.

3/ Numbers may not equal total due to rounding

* Projected

Source: U.S. Bureau of Mines and FEA

imported motor gasoline may be fully passed through by refiners and resellers. To the extent, then, that these refiners and nonrefiner marketers should have to meet peak motor gasoline demand by increasing imports of motor gasoline, exemption of motor gasoline from price controls would have no price impact additional to that which would occur if controls remained in effect.

Foreign Excess Refining Capacity

Since the FEA estimates that domestic refining capacity will be insufficient to meet increased residual fuel oil, distillate, and LPG demand in 1979, consideration has been given to the availability of foreign refining capacity.

World refining capacities and consumption for the 1973-1977 period are shown in Table IV-11. The worldwide refining capacity (excluding the United States) has grown from 36.5 MMB/D in 1973 to 45.8 MMB/D in 1977. The demand for crude oil, exluding U.S. demand was about 28.5 MMB/D in 1976 (estimated using a 3 percent growth rate over 1975 demand), which was slightly less than the consumption level in 1973. Free-world refinery capacity utilization, excluding the U.S., decreased from 74 percent in 1973 to 63 percent in 1976.

Including the refinery construction projects that were underway, foreign refining capacity in the free-world is projected at about 46 MMB/D for mid-1977. This level is 64 percent higher than the estimated 1975 consumption of

TABLE IV- 11

FOREIGN REFINING CAPACITY

	1973*		1974*		1975*		1976*		1977*	1977-1980
	Refining Capacity	Consumption	Refining Capacity	Consumption	Refining Capacity	Consumption	Refining Capacity	Consumption	Refining Capacity	Refining Additions Planned
										**
North America (Ex. U.S.A.)	2350	2327	2413	2420	2638	2440	2748	N.A.	3035	623
Central America & Caribbean	1170	627	1765	601	1781	580	1917	N.A.	1894	288
South America	4670	2117	4875	2216	5120	2220	5014	N.A.	5088	1186
Eastern Europe	16827	14492	18110	13681	13718	12603	19972	N.A.	20859	3490
Middle East	2758	1539	2882	1606	3281	1607	3285	N.A.	3348	1342
Africa	825	947	1092	948	1083	1027	1328	N.A.	1479	1536
Asiatic Area	7916	7911	8933	7803	9397	7300	9868	N.A.	10076	2055
Grand Total (Ex. Sino-Soviet Area)	36516	29960	40070	29275	42018	27777	44132	N.A.	45779	10520

* As of January 1
** Estimated from the Oil and Gas Journal, April 25, 1977; "Worldwide Construction," Pages 124-142.

cc: Oil and Gas Journal for 1973 and 1974.
Bureau of Mines, International Petroleum Annuals for 1975-1977 data.

64 percent higher than the estimated 1975 consumption of 28 MMB/D in the free-world excluding the United States. Assuming reasonable rates of refinery utilization (77 percent excluding the U.S.), there would be enough refining capacity, at 46 MMB/D, to accommodate a free-world petroleum demand growth rate of about 16 percent per year in the 1975-1979 period. FEA believes that worldwide consumption will not grow at this rate but will continue to grow at a rate closer to the historic three percent rate, so that there would be an excess foreign refining capacity available to meet any anticipated increase in U.S. refined product import demand.

However, world refinery capacity that would be used for the production of motor gasoline could be limited. Foreign refineries are designed to produce more fuel oils and less gasoline compared to U.S. refineries. Foreign refineries could produce substantially more motor gasoline than current production levels. However, they would have to produce roughly six times as much fuel oil as motor gasoline, and there may not be adequate demand and storage facilities for the fuel oil. The amount of additional motor gasoline that foreign refineries would produce to supply the U.S. market would, therefore, depend on the fuel oil supply/demand situation in Europe, and the relationship between European and U.S. motor gasoline prices. At current motor gasoline price levels, European refineries would probably not produce substantial amounts of

fuel oil for storage in order to have motor gasoline for the U.S. market; therefore, the U.S. could probably expect to import no more than another 100 MB/D.

Availability of Crude Oil

Supply projections indicate that increasing amounts of imported crude oil will be refined domestically, even though imports of residual fuel will rise. Crude oil imports are projected at the following levels:

Year	MB/D
1975	4,100
1976	5,300
1977*	6,300
1978*	5,900
1979*	6,600

As indicated, the requirement for imports will increase to a peak of 6.6 MMB/D in 1979. Crude oil production from Alaskan sources is expected to bring an additional 1,200,000 barrels per day during 1978.

The FEA has determined that sufficient shut-in production is available in foreign countries to meet an increased demand for crude oil imports. The March 1977 crude oil shut-in production in the major exporting countries amounted to 14.9 percent of total production capacity (Table IV-12). While 13 OPEC countries, Canada, and Mexico together had a

*Figures revised September 16, 1977, from the Findings of January 14, 1977, due to the updated projections for demand (See Table IV-2).

TABLE IV-12

CRUDE OIL PRODUCTION

Crude Oil Production for Major Petroleum Exporting Countries-January 1977

Country	Production						Production Capacity	Production Shut in
	1972 Year	1973 Year	1974 Year	1975 Year	1976 Year	1977 March**	March	March Percent
	Thousands of barrels per day							
Algeria	1,040	1,070	960	960	990	1,000	1,000	0
Irag	1,465	2,020	1,970	2,260	2,280	2,305	2,000	21.7
Kuwait*	3,283	2,020	2,545	2,085	2,150	1,900	2,500	45.7
Libya	2,239	2,175	1,520	1,480	1,903	2,210	2,500	11.6
Qatar	482	570	520	440	490	409	700	30.0
Saudi Arabia*	6,016	7,595	8,480	4,075	8,580	9,860	11,500	14.3
United Arab Emirates	1,202	1,535	1,680	1,665	1,940	2,002	2,380	15.1
Subtotal: Arab OPEC	15,727	17,985	17,675	15,965	18,360	19,830	24,580	19.3
Ecuador	78	210	175	160	190	160	225	28.9
Gabon	125	150	200	225	220	220	250	12.0
Indonesia	1,080	1,340	1,375	1,305	1,500	1,720	1,008	4.4
Iran	5,023	5,860	6,020	5,350	5,830	6,580	6,700	6.3
Nigeria	1,815	2,055	2,255	1,785	2,070	2,206	2,300	1.7
Venezuela	3,219	3,365	2,975	2,345	2,290	2,306	2,600	9.2
Subtotal: Non-Arab OPEC	11,340	12,980	13,000	11,170	12,150	13,000	13,875	6.3
Total: OPEC	27,067	30,965	30,675	27,135	30,510	32,830	38,455	14.6
Canada	1,540	1,800	1,695	1,460	1,300	1,338	1,800	25.7
Mexico	440	465	580	720	850	920	1,000	8.0
Total: OPEC, Canada Mexico	29,047	33,230	32,950	29,315	32,660	35,088	41,255	14.9
Total world	50,550	55,745	55,865	52,990	57,170	60,700		

* Includes about one-half of the former Kuwait-Saudi Arabia Neutral Zone. Production in March 1977 amounted to approximately 370,000 barrels per day.
** Estimated

Source: Central Intelligence Agency and National Energy Board of Canada.

total production capacity in excess of 41 MMB/D in March 1977, they produced only 35.1 MMB/D. These countries are thus capable of producing an additional 6.2 MMB/D provided that such a level of demand exists and that incentives exist for expanding production. Even when considering a total phase-out of Canadian imports, the countries are capable of producing an additional 5.7 MMB/D.

Thus, without controls, and augmented by additional imports of residual fuel, distillate, and "other" refined product, the national supply of all refined product is expected to be adequate to meet demand through 1979. Furthermore, no localized supply problems are anticipated as a result of exemption. An FEA pilot study of the Northern Tier refineries recently addressed the potential impact on the Northern Tier states (Wisconsin, Minnesota, Michigan, North Dakota, and Montana) expected to result from the phase-out of Canadian crude imports by 1982. The continued existence of crude oil allocation authority would provide the FEA flexibility to reduce any impacts resulting from product disruptions in the Northern Tier.

PRICING FACTORS

The price effects from the supply demand balance were analyzed in a previous section. In this section the implications for prices from other factors are assessed, with a focus on how controls exert influence on these factors.

Banked Costs - Gasoline

Under current FEA price regulations, the maximum allowable price which a refiner may charge for refined products is generally equal to his May 1973 prices plus increases in his crude and purchased product costs and certain allowable nonproduct price increases. If a refiner charges a price lower than the allowable maximum, he can put the amount of unrecovered costs into a "bank." These banked costs may be used in subsequent months to maintain or raise his selling price up to his legal maximum if the market place allows. Certain limits have been placed on the use of the motor gasoline banks. Under regulations adopted in February 1976, to implement certain provisions of the EPCA, an individual refiner generally may not raise prices by more than enough to reduce the total motor gasoline bank in any one month by more than 10 percent of the total amount of unrecouped increased costs calculated for all covered products as of January 31, 1976, or any month thereafter. The refiner may reallocate his banked costs accumulated for the other covered products into the bank for motor gasoline. During July 1976, additional rule changes provided refiners greater motor gasoline pricing flexibility by permitting the equal application rule to be applied on a regional basis.

The existence of banked costs for refiners would indicate generally that they are not charging as high a

price as the regulations would permit. Thus, actual prices would be market-clearing prices where supply equals demand. When ceiling prices are higher than the market prices, then the elimination of the pricing regulations which establishes the price ceilings should have no effect on market prices, since competitive forces are sufficient to keep them below maximum lawful levels. Of course, this does not mean that no individual sellers' price would ever rise as a consequence of decontrol, but only that weighted average prices should not rise as a result of decontrol.

Preliminary data indicate that in June 1977, the total gasoline bank for the top 30 refiners who account for 85 percent of domestic gasoline sales, was $958 million (Table IV-13). This figure tends to understate the extent to which market prices for motor gasoline are below maximum allowable prices for individual refiners because refiners can reallocate product costs increases and banked costs from other products still subject to price control to motor gasoline when computing maximum allowable gasoline prices. The total top 30 refiners' bank for all products was over $1.5 billion in June 1977. To the extent that these banks have not subsequently been used up, these costs represent another source for allowable motor gasoline price increases which have not been fully utilized by all refiners. (Table IV-14).

TABLE IV - 13

Banked Cost For Top 30 Refiners

	No. 2 Distillate	Motor Gasoline	Aviation Jet Fuel*	Other Products	Total
	(Millions of dollars)				
1974					
Jan.	116	91		43	250
Feb.	184	87		175	446
Mar.	198	85		237	520
Apr.	223	215		346	783
May	261	255		446	963
June	326	394		630	1,350
July	355	325		648	1,327
Aug.	392	349		665	1,405
Sept.	409	431		650	1,490
Oct.	295	424		531	1,250
Nov.	245	475		595	1,315
Dec.	209	413		492	1,114
1975					
Jan.	254	431		672	1,357
Feb.	300	418		790	1,508
Mar.	282	452		966	1,700
Apr.	302	485		807	1,594
May	292	370		771	1,433
June	284	266		785	1,334
July	233	219		624	1,075
Aug.	280	344		583	1,208
Sept.	347	335		661	1,342
Oct.	338	245		673	1,255
Nov.	426	275		796	1,497
Dec.	446	211		826	1,483

TABLE IV - 13 (continued)

Banked Cost For Top 30 Refiners

	No. 2 Distillate	Motor Gasoline	Aviation Jet Fuel*	Other Products	Total
		(Millions of dollars)			
1976					
Jan.	336	242	131	515	1,224
Feb.	279	336	145	456	1,216
Mar.	263	316	163	456	1,198
Apr.	237	398	180	424	1,239
June	N/A	628	135	349	1,112
July	N/A	587	129	384	1,100
Aug.	N/A	679	125	352	1,156
Sept.	N/A	619	134	340	1,093
Oct.	N/A	733	151	372	1,256
Nov.	N/A	796	168	368	1,332
Dec.	N/A	723	139	317	1,179
1977					
Jan.	N/A	901	166	325	1,392
Feb.	N/A	1,038	187	303	1,528
Mar.	N/A	956	180	287	1,423
Apr.	N/A	1,029	194	343	1,566
May	N/A	968	199	328	1,495
June**	N/A	958	232	342	1,532

N/A = not available since middle distillates were decontrolled on July 1, 1976.

* Prior to January 1976, refiners were not required to maintain separate banks for aviation jet fuel.

** Preliminary Figures

SOURCE: FEA

TABLE IV-14

PROJECTED UNRECOUPED COSTS FOR GASOLINE:
30 LARGEST REFINERS, MAY TO DECEMBER 1977

Gasoline Bank

(Million $)

May	950
June	800
July	800
August	750
September	850
October	800
November	800
December	800

SOURCE: FEA Short-Term Price Forecasting Model

A potential or immediate problem, however may exist for some of these refiners. A small number of large refiners are currently being constrained by FEA's pricing regulations below levels of other large refiners. Based on April data, three of the top 30 gasoline refiners were out of banks. June survey data indicates that retail prices of the three constrained refiners had increased from January levels by 0.3 to 0.5 cent per gallon less than the increases in the prices of the unconstrained refiners. If motor gasoline is decontrolled, the three refiners can be expected to raise prices to the level of prices for the unconstrained refiners. The impact on the average market price from these three refiners is estimated to be quite small (less than one half cent per gallon) since these three refiners account for less than one-fifth of the gasoline market.

Crude Oil and Refiner Nonproduct Costs

Motor gasoline prices will rise as crude oil costs and refiner nonproduct costs rise whether or not motor gasoline is exempted from controls.

Domestic crude costs will rise in accordance with the provisions of EPCA, ECPA, the President's proposed crude oil equalization tax and the influx of higher priced crude oil from Alaska and the Naval Petroleum Reserve. The President's tax on crude oil is designed to bring domestic crude oil prices to world levels by 1980. The first

stage of the tax would raise the cost of old oil on January 1, 1978 by $3.50 per barrel. The second stage would raise the cost of old oil to the cost of upper tier oil, estimated to be about an additional $3.70 per barrel. Each of these incremental increases would raise motor gasoline prices by about two cents per gallon. On January 1, 1980, the cost of all controlled oil will be increased to the level of imported crude oil. These increases will have a net impact on motor gasoline prices of about two and one-half cents per gallon.

It is difficult to project the rate of increase in foreign crude oil costs over a number of years, but it is expected that these costs will not decline and will probably continue to rise in the future. For the period subsequent to July 1, 1977, the cost of U.S. imported crude oil is assumed to rise each year in January at the same rate as the cost of U.S. goods and services as measured by the GNP deflator.

As the volume of imported crude oil increases relative to the volume of domestic controlled crude oil, the average costs of crude oil to U.S. refiners will rise at a higher rate than the rate of inflation. Projected increases in crude oil costs are shown in Table IV-15. Because the EPAA permits dollar-for-dollar passthrough of increased crude oil costs, continued controls would have no influence on price increases generated by crude oil cost increases.

TABLE IV-15

PROJECTED COMPOSITE CRUDE COSTS AND
NON-PRODUCT COST INCREASES WITH CONTROLS

Year and Qtr.	Cumulative Crude Oil Increase Over 3rd Qtr. 1977 Cost* (Cents/gal.)	Cumulative Increase In Refiner Nonproduct Costs** (Cents/gal.)	Total Cumulative Increase (Cents/gal.)
1977 4th	.4	.2	.6
1978			
1st	4.0	.4	4.4
2nd	4.3	.6	4.9
3rd	4.8	.8	5.6
4th	4.9	1.0	5.9
1979			
1st	8.3	1.2	9.5
2nd	8.6	1.4	10.0
3rd	8.9	1.6	10.5
4th	9.1	1.8	10.9

---

* Based on FEA Short-term Petroleum Price Forecasting Model (7-19-77). See Appendix II.) These forecasts of crude oil cost increases include increases that could result from the President's National Energy Plan. Preliminary projections indicate that average crude costs would be about one and one-half to two cents higher in 1978 and three and one-half to four cents higher in 1979 as a result of the crude oil equalization tax. Costs of increased refining capacity is not included.

** Annual 0.8 cents per gallon nonproduct cost increase estimated on the basis of nonproduct costs reported to FEA by refiners.

NOTE: Does not include any investment cost necessary to increase refining capacity.

Under current FEA regulations, refiners can pass through certain nonproduct costs. These costs are projected to increase about 0.8 cents per gallon per year.

Assuming that these rising crude oil and nonproduct costs are allocated to all refined products on a percentage of production basis, except for normal seasonal motor gasoline price variations, controlled motor gasoline price increases will closely follow those of crude and refiner nonproduct costs increases since the amount of motor gasoline imported is relatively small. Projected cumulative price increases for motor gasoline with controls are shown in Table IV-16. From the third quarter 1977 to the fourth quarter 1979, gasoline prices are projected to rise about ten cents per gallon even if controls for motor gasoline are maintained. Included in these increases is a normal seasonal variation on the order of three percent of the total price. These seasonal variations result in higher prices during the peak demand summer driving months.

Cost of Increase Refining Capacity

Increasing demand for petroleum products will require expansions of refining capacity. These new expansions will be at higher costs than the costs were for existing refineries. An increase in the price of motor gasoline will probably be necessary to cover these

TABLE IV-16

PROJECTED CUMULATIVE GASOLINE
PRICE INCREASE WITH CONTROLS

Year	Quarter	Cumulative Increase (over 3rd Qtr. 1977)
1977	4	-.5
1978	1	2.5
	2	4.4
	3	5.7
	4	4.7
1979	1	7.5
	2	9.3
	3	10.5
	4	9.6

Note: The assumption is made that imports of gasoline remain at their 1976 level, and the price of imported gasoline rises by the same amount as foreign crude oil. There would be normal seasonal variations on the order of three percent of the total price. These seasonal variations result in higher prices during the peak demand summer driving months. The decline in the projected increase in the fourth quarter of 1979 from the third quarter of 1979 is due to a normal seasonal decline in the fourth quarter.

Source: FEA Short-term Petroleum Price Forecasting Model (7-19-77)

marginal costs, whether or not motor gasoline prices are decontrolled. Assuming refiners can recoup their total investment on motor gasoline sales over a seven-year period, a price increase for motor gasoline of about a one-half to one cent per gallon will probably be adequate, depending upon refiners' expectations about acceptable rates of return on investment.

MARGINS FOR REFINING, DISTRIBUTING, AND RETAILING

Another consideration in determining the impact of decontrol on motor gasoline price is whether or not profit margins for refining, distributing and retailing of motor gasoline will expand.

Whether or not these margins are currently at normal profit levels is difficult to determine using available data. Margin information, (that is, the difference between the price of the product and its cost per unit) does not necessarily reflect the level of profits or the adequacy of profits. However, the margins which the FEA has been able to estimate do provide general guidelines upon which judgments can be based.

The FEA has estimated a range of motor gasoline price increases that would be necessary to increase margins for refining, distributing, and retailing of motor gasoline at the same rate as inflation. The additional amounts range from no increase at the lower end of the range to 5.0 cents per gallon at the highest end of the range.

The exact amount depends on the assumptions one makes about the behavior of costs. Most petroleum indices indicate costs in this industry exceeded the national inflationary rate increase. It should be noted that the FEA has expanded the permitted categories of costs covered.

This does not necessarily mean that integrated firms will remain content to continue, or will be able to continue, to regard refinery and marketing operations as only an adjunct to their profitable production operations. With withdrawal of most tax advantages for domestic production and the diminished control over foreign sources of crude oil, these firms are becoming increasingly concerned with the profitability of refining and marketing divisions. There have been reorganizations of firms to establish more clearly the profitability of each division and indications are that each will be expected to "carry its own weight" or face possible disposal. The impact of this relatively new approach cannot yet be clearly evaluated.

Total Motor Gasoline Margins

The total margin, for purposes of this analysis, is the sum of gross margins for refining, distributing and retailing motor gasoline. Thus, it is the difference between the retail price, excluding taxes, for motor

gasoline and the cost of crude oil into refineries.* The effects of price controls on the total margin are discussed in Chapter III. The total margin represents a measure of the per unit revenue for refining, distributing, and retailing. In order to make a judgment regarding whether or not this margin is adequate to yield a normal rate of return, its rate of increase was compared with the general rate of inflation as measured by the Consumer Price Index. The year 1968 was taken as a reference year because it represents a reasonable time period prior to implementation of the first price controls in 1971.

As indicated by the analysis of Table IV-17, the total margin for refining, distributing and retailing gasoline did not keep pace with inflation during the period from 1968 to February 1977 (the latest month for which crude costs data are available). The Consumer Price Index rose during this period by 72.4 percent, whereas the total margin increased by only 40.3 percent. In order for the total margin to keep up with inflation,

---

* For the period beginning after May 15, 1973, the refiner's acquisition cost of crude oil, including transportation costs, was reported by refiners to FEA. To estimate the costs for periods prior to May 1973, the costs of crude oil to refiners were determined by using the Bureau of Mines average value at the wellhead plus FEA's estimate of transportation costs (based on survey of refiners). Bureau of Census import costs plus FEA's estimate of transportation costs prior to May 1973.

TABLE IV-17

COMPARISON OF THE MARKUP OF THE PRICE OF RETAIL GASOLINE OVER CRUDE COST TO THE CONSUMER PRICE INDEX

Year	Markup of Retail Gasoline Price Over Crude Costs 1/	CPI 2/	Percent Increase since 1968 Markup	CPI
1968	15.4	104.2	0.0	0.0
1969	16.1	109.8	4.5	5.4
1970	16.5	116.3	7.1	11.6
1971	16.6	121.3	7.8	16.4
1972	16.0	125.3	3.9	20.2
1973	17.0	133.1	10.4	27.7
1974	19.0	147.7	23.4	41.7
1975	19.3	161.2	25.3	54.7
1976	20.3	170.5	31.8	63.6
1977				
Jan.	19.7	175.3	27.9	68.2
Feb.	20.1	177.1	30.5	70.0
Mar.	20.5	178.2	33.1	71.0
*Apr.	21.6	179.6	40.3	72.4

NOTE: Gasoline prices represent regular gasoline, excluding taxes in cents per gallon.

SOURCE: 1/ Platt's Oilgram and FEA-1968 to 1974; Lundberg Survey, Inc., 1975

2/ Bureau of Labor Statistics

* Preliminary

a price rise of 5.0 cents per gallon would be needed, based on market conditions during April 1977.

There are three reasons why the 5.0 cents figure is an inaccurate assessment of any possible price rise. First, it does not take into account the fact that volumes of sales for motor gasoline have also increased approximately 35 percent. As volumes increase, so do total revenues provided prices do not decrease significantly. Profitability could increase even if margins did not. When comparison to the CPI is made for estimated total revenues based on increased sales volume, the result is quite different. Total margins for the industry have risen by about 90 percent whereas the CPI has increased by 70 percent. Second, as motor gasoline marketing has recently shifted dramatically from high cost full service stations to low-cost self-service and limited service stations, operating costs per gallon have been significantly reduced. Third, by using yearly averages, the effects of seasonal changes are not taken into consideration.

The FEA recognizes that an analysis of the total margin may overlook component factors. Inasmuch as FEA has accumulated accurate data on retail margins, it is possible to break the total margin into two segments, the one representing refiner and distributor margins, and the other retailer margins.

Table IV-18 depicts the historic behavior of the gasoline refiner/distributor margin. Following the

TABLE IV-18

COMPARISON OF MOTOR GASOLINE REFINING AND DISTRIBUTION MARGINS OVER CRUDE COST TO THE CONSUMER PRICE INDEX

Year	Difference Between DTW Price of Gasoline and Crude Costs (Cents per Gal/M)	CPI 1/	Percent Increase	
			Markup	CPI
1968	8.9	104.2	0.0	0.0
1969	9.4	109.8	5.6	5.4
1970	9.8	116.3	10.1	11.6
1971	9.5	121.3	6.7	16.4
1972	9.3	125.3	4.5	20.2
1973	9.6	133.1	7.9	27.7
1974	9.3	147.7	4.5	41.7
1975	10.9	161.2	22.5	54.7
1976	12.5	170.5	40.5	63.6
1977				
Jan.	11.8	175.3	32.6	68.3
Feb.	12.2	177.1	37.1	70.0
Mar.	12.7	178.2	42.7	71.0
*Apr.	13.5	179.6	51.7	72.4

SOURCE: Platt's Oilgram and FEA - 1968 to 1974; Lundberg Survey, Inc., 1975

1/ Bureau of Labor Statistics

* Preliminary

removal of the special products rule in March 1975, and the substantial increase in motor gasoline prices thereafter, the refiner/distributor margin rose to an annual average of 12.5 cents per gallon in 1976. Since total refinery margins, with the exception of authorized increases, have been frozen under FEA rules the high level of refiner/distributor margins for motor gasoline is an indication that more than a volumetric proportion of increased costs has been allocated to this product. The refiner/distributor margin remained at a relatively high level during the first four months of 1977. It should also be noted that refiner and distributor margins were at their peak during those months in which motor gasoline sales were at their highest level of volume, yielding more revenues from refining and distribution. Without adjusting for an increase in the volume of sales, the increase in the refiner/distributor margin is less than the rate of inflation.

Possible upward pressure could be applied to prices at the retail level. Table IV-19 shows that retail margins were relatively low during the first four months of 1977 as compared to 1974 and as compared to the CPI. An additional three cents per gallon would be needed to make this statistic match the rate of inflation. However, as indicated earlier, a price increase of this magnitude should not occur because the increase in the total revenue for retailers was adequate to keep pace with inflation

TABLE IV-19

COMPARISON OF RETAIL DEALER MARGIN FOR REGULAR GASOLINE TO THE CONSUMER PRICE INDEX

Year		Retail Dealer Margin 1/ (cents per gallon)	CPI 2/	Percent Increase from 1968	
				Retail Dealer Margin	CPI
1968		6.5	104.2	0	0
1969		6.7	109.8	3.1	5.4
1970		6.7	116.3	3.1	11.6
1971		7.1	121.3	9.2	16.4
1972		6.7	125.3	3.1	20.3
1973		7.4	133.1	13.8	27.7
1974		9.7	147.7	49.2	41.7
1975		8.4	161.2	29.2	54.7
1976		7.8	170.3	20.0	63.6
1977	Jan	7.9	175.3	21.5	68.2
	Feb.	7.9	177.1	21.5	70.0
	Mar.	7.8	178.2	20.0	71.0
	Apr.	8.1	179.6	24.6	72.4
	May	7.9	180.6	21.5	73.3

SOURCE: 1/ Platt's Oilgram and FEA-1968 to 1974; Lundberg Survey, Inc. 1975

2/ Bureau of Labor Statistics

(Table IV-20). Moreover, many of the retail outlets have been setting up self-service and mini-service lanes and using other labor and cost saving measures, such as staying open fewer hours. Thus, they have been able to pump the increased motor gasoline volume without increasing the number of personnel and raising their operating costs proportionate to the increase in their volume. For this reason, the FEA believes that there is little pressure for a price increase as long as a shortage does not develop. Even if such pressure did exist, the fact that current retail margins are below ceiling levels would indicate that the market would not bear the additional price rise. FEA regulations have granted a total increase of three cents per gallon for non-product costs incurred since May 15, 1973. Retailers, particularly full service stations, have not maintained their margins at the maximum levels under controls because the current retail motor gasoline margin average is only slightly above the May 1973 level. Therefore, FEA regulations have not, in general, constrained motor gasoline prices at the retail level. This indicates that market forces have successfully held motor gasoline prices below those permitted by price controls.

A study was performed to determine refiner and distributor margins for the total barrel of crude oil during the period 1968 through April 1977 (Table IV-21). The mixed barrel which was used comprises motor gasoline, No. 2 distillate, jet fuel, and residual fuel. These

TABLE IV-20

COMPARISON OF RETAILER DEALER MARGINS, ADJUSTED FOR INCREASED SALES VOLUME, TO THE CONSUMER PRICE INDEX*

Year		Adjusted Retail Dealer Margin (cents per gallon)	CPI	Percent Increase from 1968 Retail Dealer Margin	CPI
1968		6.5	104.2	0	0
1969		7.0	109.8	7.7	5.4
1970		7.4	116.3	13.9	11.6
1971		8.3	121.3	27.7	16.4
1972		8.1	125.3	24.6	20.3
1973		10.0	133.1	53.9	27.7
1974		13.6	147.7	109.2	41.8
1975		12.1	161.2	86.2	54.7
1976		12.6	170.5	93.9	63.6
1977	Jan. 7.9	14.1	175.3	116.9	68.2
	Feb. 7.9	15.0	177.1	130.8	70.0
	Mar. 7.8	15.5	178.2	138.5	71.0
	Apr. 8.1	15.9	179.6	144.6	72.4
	**May 7.9	15.6	180.6	140.0	73.3

* 1968 = 100 Adjusted for average volume of sales per station.

** Based on preliminary sales volumes

SOURCE: Platt's Oilgram, FEA, Lundberg Survey, Inc., Bureau of Labor Statistics, Federal Highway Administration

TABLE IV-21

AVERAGE VALUE OF PRODUCT SOLD
COMPARED TO CRUDE COST

		Average Mixed Barrel Price*	Average Crude Cost	Refiner/Distributor Margin
		(all figures are in dollars per barrel)		
1968		$ 5.13	$ 3.17	$ 1.96
1969		5.24	3.29	1.95
1970		5.41	3.40	2.01
1971		5.85	3.60	2.25
1972		5.75	3.58	2.17
1973		6.73	4.15	2.58
1974		11.92	9.07	2.85
1975		13.57	10.38	3.19
1976		14.29	10.89	3.40
1977	Jan.	14.95	11.64	3.31
	Feb.	15.29	11.80	3.49
	Mar.	15.75	11.88	3.87
	Apr.	15.83	11.82	4.01

SOURCE: Mandatory Reports (FEO-96) submitted to FEA, Bureau of Mines and Platt's Oilgram.

* Based on FEA Form P-302-M-1

four products were selected because they repres. than 80 percent of all refined products.

Table IV-21 shows that during the period prior to controls, 1968 to 1970, the total margin for the mixed barrel remained relatively constant and would tend to indicate that the increase in the total margin has been adequate to compensate for inflation. Between 1970 to 1972, the total margin increased by about 8 percent. From 1972 to 1975 (Phases III and IV), the margin increased by $1.02 per barrel, which is equivalent to a 47 percent rate of increase. In 1976, the margin rose by 21 cents per barrel over its 1975 level. By April 1977, the total margin was $2.05 higher than it was in 1968. The percentage increase from 1968 to April 1977, was about 105 percent, which is higher than the rate of increase of the CPI for the same period.

Profit

To gain more insight into the potential pressures on prices, data on oil industry aggregate profits were studied. While these data are not directly pertinent to motor gasoline prices, they do illustrate the relative health of the industry's profits.

The rate of return on equity of multi-national oil companies declined 30 percent in 1975 from the record year of 1974. Nonetheless, on a worldwide basis, the return on equity for these companies in

1975 was above its historic average (see Table IV-22). Domestic return on equity has averaged 11.0 percent for the last 8 years. During 1975 the rate of return on equity for domestic production averaged 12.7 percent. which was slightly above the 11.8 percent average for all industries. The eight year average, which includes the two years of price controls, equalled the all-industry average (12.1 percent).

DOMESTIC GASOLINE PRICES LIMITED BY FOREIGN GASOLINE PRICES

Imports of motor gasoline account for a very small portion of U.S. demand. Less than 3 percent of domestic demand is projected to be satisfied by imports for 1977, 1978, and 1979. For this reason, the price of imported motor gasoline is not expected to have a significant impact on the price of domestic motor gasoline.

If a shortage were to occur, the U.S. could increase imports of motor gasoline by a small amount at a price which is approximately three cents per gallon above expected domestic wholesale prices prior to implementation of the crude oil equalization tax.

Approximately the same price differential is obtained when foreign spot prices are compared to expected domestic wholesale prices (See Table IV-23).

A small increase in imports would not be likely to raise U.S. gasoline prices to the world market price. Importers would average the higher cost of imports with

TABLE IV-22

RATES OF RETURN
ON EQUITY
(percentage)

	Domestic Petroleum	Foreign Petroleum	Worldwide Petroleum	All Industries
1968	11.9	10.0	11.1	12.4
1969	10.6	10.9	10.7	11.8
1970	10.0	10.7	10.3	10.1
1971	9.3	11.9	10.5	10.9
1972	9.6	9.6	9.6	11.8
1973	10.3	19.6	14.8	14.2
1974	13.6	22.2	17.7	14.0
1975	12.7	12.1	12.4	11.8
1976	N/A	N/A	N/A	N/A
8-year average	11.0	13.4	12.1	12.1

Calculated from Chase Manhattan Bank Data

249-464 O - 77 - 9

TABLE IV-23

DOMESTIC AND LANDED IMPORTED* GASOLINE PRICES
(cents per gallon)

	1976								1977				
	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
Gasoline (Regular)													
ITALY	41.1	41.0	40.5	39.6	39.0	39.3	38.9	38.2	37.9	39.7	38.7	39.2	38.4
ROTTERDAM	42.3	43.0	42.3	42.0	41.5	41.6	41.0	40.2	38.5	40.3	39.8	40.6	40.4
DOMESTIC	34.4	35.7	36.1	36.5	35.8	35.7	34.9	34.9	35.6	36.2	37.0	37.6	38.3
Italy	+6.7	+5.3	+4.4	+3.1	+3.2	+3.6	+4.0	+3.3	+2.3	+3.5	+1.7	+1.6	+ .1
Rotterdam	+7.9	+7.3	+6.2	+5.5	+5.7	+5.9	+6.1	+5.3	+2.9	+4.1	+2.8	+3.0	+2.1

SOURCE: Domestic Gasoline: FEA Jobber Survey of Major Brand Regular Gasoline for the Northeast Region. (Prices reflect jobber purchase prices.)

ITALY: Platt's Oilgram European Bulk Cargoes for regular gasoline FOB ITALY, plus duty and transportation charges. (Mediterranean: USNH World scale rate)

ROTTERDAM: Platt's Oil gram European Bulk Cargoes for regular gasoline CIF ROTTERDAM plus duty and transporation charges. (ROTTERDAM: USNH World scale rate.)

Imported product prices from Rotterdam and Italy represent fee-free prices. If a license fee is required, an additional 1.5 cents/gal. should be added.

* Estimate based on Platt's New York Harbor Spot Cargoes Price.

their domestic supplies in order to remain competitive with other marketers who do not have to import. This practice explains why domestic heating oil prices have not risen to world market levels even though heating oil imports account for about eight percent of total demand in the Northeast. However, if a domestic shortage drove domestic motor gasoline prices above world levels, more motor gasoline could become available on the world market.

Conclusion

FEA forecasts an adequate supply situation in 1979 despite a refiners' survey indicating possible shortfall in 1979 and FEA concludes that the maintenance of allocation and price controls is not warranted.

The supply problem in 1979 is a function primarily of domestic refiners' difficulty in producing sufficient quantities of high, clear-octane blending stocks to meet total octane needs in 1979 without the use of TEL, possibly with reduced use of MMT or with no MMT. Refinery improvements to install significant additions of catalytic reforming capacity to make the required amounts of high, clear-octane reformates normally take about three years, which is approximately the period of the EPA lead phase-down schedule. However, regulatory disincentives existed until February 1977 which discouraged refiners from making the capital expenditures necessary for refinery upgrading. More specifically, price regulations did not until recently

allow recovery of certain costs of depreciation associated with such investments. Current regulations still constrain investment by not permitting the direct passthrough of capital expenditures, by fixing the method that refiners must use in allocating costs to motor gasoline, and by limiting the passthrough of certain nonproduct costs.

If a supply shortage does materialize in 1979, the Federal Government will be faced with two choices: to allow price increases to restrain demand, thus eliminating the shortfall, or to suffer the shortfall, restraining prices by price controls and distributing the shortfall by allocation controls. Because of the tentative nature of the forecasts and the flexible status of other factors affecting the supply-demand equation (e.g., lead phasedown waivers), FEA believes that the proper course is to remove controls now during the current period of supply adequacy and, if necessary, reimpose a limited form of controls in 1979 if a shortage materializes and if it then appears that such reimposition would be appropriate.

Certain other possibilities exist for 1979 that might ameliorate the potential shortage indicated by the survey of refiners. It is possible for refiners to reduce the octane rating of all grades of motor gasoline slightly ("shaving octane"), thus increasing their motor gasoline production capabilities. Shaving octane reduces the "car satisfaction level" (the percentage of all cars that will not incur driver-audible knock under acceleration) at that octane

rating. It is possible to reduce octane rating slightly and incur a decrease of only a few percentage points in the car satisfaction level. Another possibility involves the use of methanol as a motor gasoline additive to boost the octane current support; they are presented merely as examples of a range of potential actions that could improve the refining industry's tentatively pessimistic supply-demand equation in 1979.

FEA finds that the probable price increase attributable to decontrol would be one cent per gallon, as a result of the primarily, recovery of return on investment by the refining industry in additional refining capabilities. Although it is possible that FEA would amend its regulations to permit such a passthrough, no final decision on the topic has been made as of the development of these findings and views. While other possible increases have been alluded to in the hearing, the one cent increase is presented as a result of decontrol.

In summary, the conclusions of this chapter are that supply will be adequate to meet demand through 1979 and that the price increase associated with decontrol will be small in comparison with increases which will occur under continued controls.

CHAPTER V

IMPACT OF EXEMPTION OF MOTOR GASOLINE ON THE ECONOMY

The EPAA, as amended by the EPCA, requires that FEA express its views about the potential impacts, if any, of exempting motor gasoline from control. These include, where practicable:

- State and regional impacts (including effects on governmental units).
- Economic effects on the availability of consumer goods and services and the Gross National Product (GNP).
- Effects on employment and consumer prices: the rate of unemployment, the Consumer Price Index (CPI), and the implicit price deflator for the Gross National Product.

In Chapter IV, FEA expressed its views about a number of factors that could influence the supply, demand, and price of motor gasoline. Among the factors which would be operating to increase prices even in the event controls were maintained are the rise in costs associated with increases in foreign and domestic crude oil prices, the rise in refinery operating costs, and the rise in non-product costs at all levels.

In this chapter, an analysis of alternative scenarios is undertaken. The first section discusses the economic impacts associated with FEA's forecasts and analysis in Chapter IV, which yield a continuing supply-demand balance. The second section contains a treatment of a possible increase in the price of gasoline of up to ten cents per gallon in

1979 if gasoline is decontrolled, or three cents per gallon if controls are maintained, resulting from the supply/demand imbalance for 1979 suggested by FEA's survey of production capabilities projected by refiners for 1979 under pessimistic assumptions. The second section also contains a qualitative analysis of the impact of this possible shortage if present controls on gasoline are not lifted.

I. PROBABLE ECONOMIC EFFECTS OF DECONTROL UNDER FEA FORECAST

As has been pointed out in Chapter IV, a price increase of one cent per gallon could occur after decontrol if removal of controls encourages refiners to undertake certain investments in refining capacity improvements which they might not have undertaken under controls because of regulatory limitations on the recovery of return on investment. Since FEA's supply-demand analysis in Chapter IV predicts no supply shortage in 1978 or 1979, the maximum economic impact derived from FEA's forecasts and analysis in Chapter IV would be associated with a price increase of one cent per gallon not currently allowed under controls. In the hearings industry indicated that other factors in conjunction with investment in refiner capacity improvements could possibly result in price increases in excess of one cent per gallon. The impact of a two or three cent per gallon increase would be approximately two or three times respectively, the one cent per gallon case presented here.

MACROECONOMIC IMPACTS

Methodology

The impact on the national economy that could result from a hypothetical $.01 per gallon increase in the price of motor gasoline was evaluated by using FEA energy models and the Data Resources Inc. (DRI) Quarterly Econometric Model of the U.S. economy. A base case solution for the economy was constructed without the price increase. A second "test" solution for the economy was then constructed in which it was assumed that the motor gasoline price increased by $.01 per gallon above the base case solution starting from the last quarter of 1977 through 1979. The difference between the base case solution and the "test" solution constitutes the possible economic effects of an increase in the price of motor gasoline above the level maintained under control.

The base case was constructed by first solving FEA energy models to determine values of selected energy variables under base case assumptions. Values for corresponding variables in the DRI-generated solution for the economy were then modified to agree with those generated by the FEA models. These variables are: the wholesale price index for fuels, related products and power; the 1967 dollar value of imported fuels and lubricants; the average unit value index for imported fuels and lubricants; and the implicit price deflator for consumption of gasoline and oil. The DRI model was then solved using these values,

to give the base case for the national economy.

The case representing a hypothetical increase over the base case in motor gasoline price of $.01 per gallon was constructed by modifying wholesale price indices for refined petroleum products as used in the FEA models so as to agree with the assumed increase. The FEA models were then re-solved. Values generated for the relevant energy variables were then incorporated as revised assumptions to the DRI model base case. A new solution for the economy was generated and compared to that for the base case to determine the effects of the assumed price increase.

Results

The effects on selected macroeconomic variables of a hypothetical $.01 per gallon increase in the price of gasoline are summarized in Table V-1. As can be readily seen, the magnitude of these effects relative to the base case is quite small.

With a $.01 per gallon increase in the price of gasoline, unemployment levels are affected by up to 100,000 individuals during any given quarter, but there is no change on average for any of the years 1977 through 1979. There is not more than a one-tenth of one percent increase in the Consumer Price Index or in the GNP price deflator in any quarter from the last quarter of 1977 through the end of 1979. The increase in the average wholesale price of energy does not exceed eight-tenths of one percent during any quarter, and real GNP is lower by no more than one-tenth of one percent during these quarters. In dollar terms, real GNP is

TABLE V-1

EFFECTS OF $.01 PER GALLON INCREASE
IN PRICE OF GASOLINE

		QUARTERLY									ANNUAL		
		1977:IV	1978:I	1978:II	1978:III	1978:IV	1979:I	1979:II	1979:III	1979:IV	1977	1978	1979
Real GNP (1972 Dollars)	Change in Annual Rate--billions	-1.3	-0.2	-0.6	-0.7	-0.8	-0.8	-0.7	-0.7	-0.6	-0.3	-0.6	-0.7
	Percent Change	-0.1	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0
Nominal GNP	Change in Annual Rate--billions	-0.8	1.1	0.7	0.7	0.6	0.6	0.7	0.9	1.0	-0.2	0.8	0.8
	Percent Change	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unemployment	Change in Level (millions)	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0
	Percentage Point Difference in Rate	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GNP Implicit Price Deflator	Percent Change	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1
Consumer Price Index	Percent Change	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1
Wholesale Price Index for Energy (Fuels, Related Products, and Power)	Percent Change	0.8	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.2	0.7	0.8

$0.3 billion lower for the full year 1977, $0.6 billion lower for 1978, and $0.7 billion lower for 1979 than it is in the base case for those years.

REGIONAL INCOME EFFECTS

This section considers disparities in regional impacts resulting from hypothetical increases in the price of motor gasoline. Impacts are measured in terms of real personal income and by Census region. They were determined by comparing projected income levels for the base case with the "test" case.

Methodology

Real personal income for each state is derived by using the Data Resources Inc. State and Area Forecasting System (SAFS). In this model, personal income for each State is a function of 1972 levels of state wage and non-wage income and industrial employment, and projected levels of national wage and non-wage income and industrial employment. Variables are added to the income and employment equations to adjust for any bias resulting from the fixed-share approach. Income for the Census regions is derived by summing appropriate state incomes. Output from the Data Resources Inc. macroeconomic model acts as input into the SAFS model.

Results

As mentioned in Chapter IV, amendments to the FEA regulations have already afforded refiners regional pricing flexibility for gasoline of up to three cents per gallon. Therefore, removing controls should not result in disparate price increases for any region. Differences in regional income levels which might result from a $.01 per gallon

TABLE V-2

IMPACT OF DECONTROL ON REAL PERSONAL INCOME BY CENSUS REGION
($.01/gallon Case Minus Base Case)
(Billions of 1972 Dollars)

REGION	1978	1979
New England	0.00	0.01
Middle Atlantic	0.01	0.02
South Atlantic	0.02	0.02
East North Central	0.04	0.04
East South Central	0.01	0.02
West North Central	0.03	0.04
West South Central	0.03	0.04
Mountain	0.01	0.01
Pacific	0.02	0.02
U.S. Total	0.17	0.22

Note: Totals may not add because of rounding.

increase in the price of gasoline are shown in Table V-2. Impacts across regions and throughout the time period involved are very small.

The relatively greater impact on income in the East North Central region is attributable in large part to lower earnings for Michigan. A slightly lower national income inherently results in lower demand for automobiles nationwide, which in turn affects the economy in a very select way, because automobile manufacturing is highly concentrated in this region.

In brief, the results show that real personal income levels in any of the nine Census regions would be lowered by, at most, forty million dollars. There is little interregional variation of impacts in terms of real personal income.

Other Regional Effects

Recent regulatory changes also have allowed for certain regional price differentials in recognition of varying regional and sub-regional costs. However, releasing supplies from allocation controls would provide refiners with the opportunity to withdraw from marginal marketing areas or to alter current marketing practices, thus creating the possibility of temporary sub-regional spot shortates. However, these spot shortages and dislocations would exist only as long as required for the market in these areas to stabilize. Thus, the overall impact of the proposed regulatory changes is negligible. However, sub-regional deviations are speculative and no data exist to predict that they would occur.

Normally, if there is a demand, some entity will satisfy that demand as long as there is no overall supply shortage.

INDUSTRY EMPLOYMENT EFFECTS

To determine industry impacts attributable to gasoline decontrol, it was first necessary to estimate impacts on components of final demand for nineteen categories of Personal Consumption Expenditures, Gross Private Domestic Fixed Investment, Business Inventories, Imports, Exports, Federal Defense Expenditures, Federal Non-Defense Expenditures, and State and Local Government Expenditures. These were then applied to the input-output bridge program to generate total final demand by input-output classification industry. Employment requirements were estimated for 1979 for the base case and the $.01 per gallon decontrol case. The ten industries having the largest measurable percentage changes in employment requirement are presented in Table V-3.

For 1979, the impact of a $.01 per gallon increase in the price of gasoline is expected to reduce industry employment in these industries in a range from .16 percent in the special machinery industry to .34 percent in the petroleum products industry. The impact on total private employment as measured by jobs lost is less than .06 percent.

SOCIOECONOMIC EFFECTS

Methodology

There are direct and indirect effects of any increase in the price of motor gasoline. Direct effects on the

TABLE V-3

MAXIMUM NEGATIVE IMPACT ON EMPLOYMENT
FOR SELECTED INDUSTRIES OF A $.01 PER GALLON
INCREASE IN THE PRICE OF GASOLINE

Rank	Industry	Percent Loss
1.	Petroleum Products	-.34
2.	Copper Rolling and Drawing	-.30
3.	Agricultural Chemical	-.21
4.	Material Handling Equipment	-.20
5.	Other Transportation	-.20
6.	Tobacco Manufacturing	-.19
7.	Other Non-Ferrous Rolling and Drawing	-.18
8.	Crude Petroleum	-.18
9.	Forestry Fishery Products	-.17
10.	Special Industry Machinery	-.16

consumer would result from an increased price for motor gasoline at retail outlets. Indirect effects would consist principally of increased prices for consumer products which use motor gasoline in the distribution of such products. These indirect effects are very difficult to estimate, but some idea of their magnitude may be obtained by examining the previous section on industrial impact.

Direct effects are more easily estimated by means of the FEA Household Energy Expenditure Model. This model was used to estimate consumer expenditures for motor gasoline in 1979 with and without decontrol, assuming a $.01 per gallon rise in the price of motor gasoline. Comparisons of the expenditure levels under the "test" case with the expenditure level under a no-price-increase case were then made to estimate the impact that decontrol would have on various income and socioeconomic groups.

Results

As can be seen from Table V-4, household expenditures for motor gasoline in 1979 would increase quite insignificantly in the case of a $.01 increase. As would be expected, these increased expenditures, as a percentage of income, are greater for lower income groups than for higher income groups since consumption of motor gasoline does not increase proportionately with income. Thus, while the absolute dollar amount rises from about $2 per year for the lowest income group to $5 per year for the highest, the impact measured as a percentage of income declines.

TABLE V-4

INCREASE IN DIRECT HOUSEHOLD GASOLINE EXPENDITURES BY INCOME CLASSES, 1979

Household Disposable Income	$.01/gallon Differential Increase in Gasoline Price	
	Annual Cost Increase	Percent of Income
Under $1000	$2	(na)
$1000-$4999	2	.08
$5000-$9999	3	.04
$10,000-$14,999	4	.03
$15,000-$19,999	5	.03
$20,000-$24,999	5	.02
Over $25,000	5	(na)
National Average	3	(na)

SOURCE: FEA Household Energy Expenditure Model

Even though household energy expenditures may be expected to increase, as percentages of income they are so small as to be negligible.

SUMMARY AND CONCLUSION

The effects of a hypothetical $.01 per gallon increase in the price of gasoline on selected macroeconomic variables are so small as to be hardly significant and the removal of allocation and price controls will cause virtually no adverse effects at the sub-national level or on the economy as a whole.

II. COMPARATIVE ANALYSIS OF THE PRICE EFFECTS OF A SHORTAGE

Although FEA's analysis in Chapter IV projects a continuing supply-demand equilibrium, estimates of production capabilities by refiners were also solicited. Under pessimistic industry assumptions, extrapolation of these forecasts to the whole industry yields a supply shortage in 1979. This shortage would either occasion an increase in price of up to ten cents per gallon in order for demand to be depressed sufficiently to come into balance with supply, or controls would be reimposed and the shortage would be administered by allocation. This section discusses the economic impacts of such alternatives.

As was brought out in Chapter IV, there is room under continued controls for price to rise by as much as three cents per gallon because of the present status of banked costs and the level of dealer margins. However, if refiners' forecasts

249-464 O - 77 - 10

that further environmental constraints will affect gasoline supply do materialize, and a shortage develops in 1979, the price of gasoline could rise by 10 cents if controls are removed, whereas if controls continued, it would rise by the three cents by which current market price is below the ceiling price. Therefore, in order to provide some quantification of the potential impact of decontrol under this scenario, FEA analyzed the impact of a $.10 per gallon increase on the economy as a whole and compared it to the $.03 per gallon increase which would occur under continued controls. The following sections present the results of a number of simulations showing the differential impacts on the economy of these price increases.

MACROECONOMIC IMPACTS

Methodology

The impact on the national economy that could result from the two possible increases in the price of motor gasoline was evaluated by using FEA energy models and the Data Resources Inc. (DRI) Quarterly Econometric Model of the U.S. economy. A base case solution for the economy was constructed with a price increase of $.03 per gallon. A second "test" solution for the economy was then constructed in which it was assumed that the motor gasoline price increased by $.10 per gallon or $.07 per gallon above the base case solution, starting

in the first quarter of 1979. The difference between the base case solution and the "test" solution constitutes the possible economic effects of a $.07 increase in the price of motor gasoline above the level under control.

The base case was constructed by first solving FEA energy models to determine values of selected energy variables under base case assumptions. Values for corresponding variables in the DRI-generated solution for the economy were then modified to agree with those generated by the FEA models. These variables are: the wholesale price index for fuels, related products and power; the 1967 dollar value of imported fuels and lubricants; the average unit value index for imported fuels and lubricants; and the implicit price deflator for consumption of gasoline and oil. The DRI model was then solved using these values, to give the base case for the national economy.

The decontrol case was constructed by modifying wholesale price indices for refined petroleum products as used in the FEA models so as to agree with the assumed increase of ten cents per gallon. The FEA models were then re-solved. Values generated for the relevant energy variables were then incorporated as revised assumptions to the DRI model base case. A new solution for the economy was generated and compared to that for the base

case to determine the effects of the assumed price increase.

Results

The effects on selected macroeconomic variables of a $.07 per gallon differential increase in the price of gasoline are summarized in Table V-5. As would be expected, the magnitude of these effects relative to the base case is significant.

Real GNP, measured in 1972 dollars, is $5.2 billion lower in 1979 than it is for the base case. This is approximately one-half of a percent decline as a result of decontrol from the level under continued controls.

Unemployment levels are also increased differentially by up to 100,000 individuals in 1979, which means a one-tenth of a percentage point rise in the unemployment rate. The locus of this unemployment is discussed in the following two sections on regional impact and industry employment impact.

The relative impact on the price indices is fairly large, with the GNP Implicit Price Deflator rising by four-tenths of a percent and the Consumer Price Index rising by six-tenths of a percent in 1979. And as would be expected, the Wholesale Price Index for Energy increases by 4.6% in 1979. It must be kept in mind that the macroeconomic impacts of the shortage in the base case are not measured and included in the comparison measured. If these could be measured, the differences in real GNP and in employment between continued controls and decontrol would be less.

TABLE V-5

EFFECTS OF $.07 PER GALLON DIFFERENTIAL INCREASE IN PRICE OF GASOLINE

		QUARTERLY				ANNUAL
		1979:I	1979:II	1979:III	1979:IV	1979
Real GNP (1972 Dollars)	Change in Annual Rate--billions	-9.2	-1.7	-4.9	-5.1	-5.2
	Percent Change	-0.6	-0.1	-0.3	-0.3	-0.4
Nominal GNP	Change in Annual Rate--billions	-7.6	6.6	2.6	3.0	1.2
	Percent Change	-0.3	0.3	0.1	0.1	0.0
Unemployment	Change in Level (millions)	0.1	0.1	0.1	0.1	0.1
	Percentage Point Difference in Rate	0.1	0.1	0.1	0.1	0.1
GNP Implicit Price Deflator	Percent Change	0.3	0.4	0.4	0.5	0.4
Consumer Price Index	Percent Change	0.5	0.5	0.6	0.6	0.6
Wholesale Price Index for Energy (Fuels, Related Products, and Power)	Percent Change	4.8	4.5	4.6	4.5	4.6

REGIONAL INCOME EFFECTS

This section considers disparities in regional impacts resulting from the projected increases in the price of motor gasoline. Impacts are measured in terms of real personal income and by Census region. They were determined by comparing projected income levels for the base case with the "test" case.

Methodology

Real personal income for each state is derived by using the Data Resources Inc. State and Area Forecasting System (SAFS). In this model, personal income for each State is a function of 1973 levels of state wage and non-wage income and industrial employment, and projected levels of national wage and nonwage income and industrial employment. Variables are added to the income and employment equations to adjust for any bias resulting from the fixed-share approach. Income for the Census regions is derived by summing appropriate state incomes. Output from the Data Resources Inc. macroeconomic model acts as input into the SAFS model.

Results

As brought out in Chapter IV, the July 1976 amendments to the FEA regulations have already afforded refiners regional pricing flexibility for gasoline of up to three cents per gallon. Therefore, removing controls should

not result in differential price changes for any region. Differences in regional income levels which might result from a $.07 per gallon differential increase in the price of gasoline are shown in Table V-6.

The relatively greater impact on income in the East North Central region is attributable in large part to lower earnings for Michigan. A lower national income inherently results in lower demand for automobiles nationwide, which in turn affects the economy in a very selective way because automobile manufacturing is highly concentrated in this region.

In brief, the results show that real personal income levels in any one of the Census regions would be lowered by, at most, three hundred and fifty million dollars. There is some interregional variation of impacts in terms of real personal income with the New England states and the Pacific states being the least affected by such a price increase.

Other Regional Effects

Recent regulatory changes also have allowed for certain regional price differentials in recognition of varying regional and sub-regional costs. However, releasing supplies from allocation controls would provide them with the opportunity to withdraw from marginal marketing areas or to alter current marketing practices, thus creating the possibility of temporary sub-regional spot shortages. However, these spot shortages and dislocations would exist only as long as required for the

TABLE V-6

IMPACT OF DECONTROL ON REAL PERSONAL INCOME BY CENSUS REGION
($.10/gallon Case Minus Base Case)
(Billions of 1972 Dollars)

REGION	1979
New England	$0.06
Middle Atlantic	0.21
South Atlantic	0.26
East North Central	0.35
East South Central	0.14
West North Central	0.31
West South Central	0.26
Mountain	0.10
Pacific	0.22
U.S. Total	1.90

Note: Totals may not add because of rounding.

market in these areas to stabilize. However, sub-regional deviations are speculative and no data exist to predict that they would occur. Normally, if there is a demand, some entity will satisfy that demand as long as there is no overall supply shortage.

INDUSTRY EMPLOYMENT EFFECTS

To determine industry impacts attributable to this scenario, it was first necessary to estimate impacts on components of final demand for nineteen categories of Personal Consumption Expenditures, Gross Private Domestic Fixed Investment, Business Inventories, Imports, Exports, Federal Defense Expenditures, Federal Non-Defense Expenditures, and State and Local Government Expenditures. These were then applied to the input-output bridge program to generate total final demand by input-output classification industry. Employment requirements were estimated for 1979 for the base case and the $.10 per gallon decontrol case. The ten industries having the largest measurable percentage changes in employment requirements are presented in Table V-7.

For 1979, the impact of a $.07 per gallon differential increase in the price of gasoline is expected to reduce employment in these industries in a range from 2.4 percent in the petroleum products industry to .50 percent in the miscellaneous stone, clay and glass products industries. The impact on total private employment as measured by jobs lost is less than .25 percent.

TABLE V-7

MAXIMUM NEGATIVE IMPACT ON EMPLOYMENT
FOR SELECTED INDUSTRIES OF A $.07 PER GALLON
DIFFERENTIAL INCREASE IN THE PRICE OF GASOLINE

Rank	Industry	Percent Loss
1.	Petroleum Products	-2.40
2.	Crude Petroleum	-2.00
3.	Other Transportation	-1.56
4.	Misc. Transportation Equipment	- .85
5.	Motor Vehicles	- .80
6.	Water Transportation	- .75
7.	Wholesale Trade	- .68
8.	Rubber Products	- .54
9.	Misc. Nonferrous Metal Products	- .50
10.	Misc. Stone, Clay, and Glass Product	- .50

SOCIOECONOMIC EFFECTS

Methodology

There are direct and indirect effects of any increase in the price of motor gasoline. Direct effects on the consumer would result from an increased price for motor gasoline at retail outlets. Indirect effects would consist principally of increased prices for consumer products which use motor gasoline in the distribution of such products. These indirect effects are very difficult to estimate, but some idea of their magnitude may be obtained by examining the previous section on industrial impact.

Direct effects are more easily estimated by means of the FEA Household Energy Expenditure Model. This model was used to estimate consumer expenditures for motor gasoline in 1979 with a $.03 per gallon increase under continued controls and with a $.10 per gallon increase in the case of decontrol. Comparisons of the expenditure levels under the two cases were then made to estimate the impact that decontrol would have on various income and socioeconomic groups.

Results

As can be seen from Table V-8, household expenditures for motor gasoline in 1979 would increase by a fairly large amount as a result of a $.07 per gallon differential increase. As would be expected, these increased expenditures, as a percentage of income, are greater for lower

TABLE V-8

INCREASE IN DIRECT HOUSEHOLD GASOLINE EXPENDITURES BY INCOME CLASSES, 1979

Household Disposable Income	$.07/gallon Differential Increase in Gasoline Price	
	Annual Cost Increase	Percent of Income
Under $1000	$2	(na)
$1000-$4999	2	.08
$5000-$9999	3	.04
$10,000-$14,999	4	.03
$15,000-$19,999	5	.03
$20,000-$24,999	5	.02
Over $25,000	5	(na)
National Average	3	(na)

SOURCE: FEA Household Energy Expenditure Model

income groups than for higher income groups since consumption of motor gasoline does not increase proportionately with income. Thus, while the absolute dollar amount rises from about $18 per year for the second lowest income group to $52 per year for the highest, the impact, measured as a percentage of income, declines.*

It must be kept in mind, however, that the shortages that would exist under controls also impose costs on the consumer which could affect the various income classes disproportionately. The next section examines these costs.

FURTHER IMPACTS OF A SHORTAGE UNDER CONTINUED CONTROLS

Under refiners' estimates of supply capabilities under pessimistic conditions in 1979, if prices are at FEA ceiling levels, demand could possibly exceed supply by as much as 200,000 barrels per day even after imports are increased. If price and allocation controls have been removed, market forces could eliminate the shortage through a price increase of as much as ten cents per gallon. However, if controls are not removed or are reimposed, the bulk of the shortage will persist and the economy will experience further effects of this shortage in addition to the effect of the three cents increase in price. Having presented the differential price impact above, we now turn to the other impacts of the shortage that would persist.

When the existing supply is insufficient to meet

* Household impacts were also estimated using another FEA computer model, namely, the Comprehensive Human Resources Data System (CHRDS). The results are contained in Appendix IV.

the demand for gasoline of all those who are willing to pay the controlled price, and price is not permitted to rise to balance supply and demand, shortages will develop. It will be necessary then to devise a scheme for allocating the existing supply (or distributing the shortage). Given existing legislation and the experience during the 1973/74 energy crisis, FEA's principal means to minimize the adverse impacts of the shortage would be to utilize the allocation and price regulations currently in force.

Unless revised, the FEA allocation priorities currently in existence will govern the allocation of gasoline in 1979. Those regulations, as found in 10 CFR 211, establish allocation rules for various levels of gasoline sale.

At the end-user level, end-users who are bulk purchasers or wholesale purchaser-consumers are provided with specific allocation levels. Specifically, the following end-users are allocated 100 percent of current requirements, not subject to an allocation fraction:

1) Agricultural production;

2) Department of Defense.

The following end-users are allocated 100 percent of current requirements subject to an allocation fraction (which basically reflects the availability of gasoline supplies held by the purchaser's supplier relative to the supplier's total obligations to his purchasers):

1) Emergency services:

2) Energy production;

...n services;

...mmunication services;

3) ...senger trasnportation services;

Cargo, freight and mail handling by truck;

...) Aviation ground support vehicles and equipment.

The following purchasers are allocated 100 percent of base period (i.e., the corresponding month of 1972) use, as reduced by the allocation fraction:

1) Industrial use;

2) Commercial use;

3) Governmental use;

4) Social service agency use.

Other end-users, such as most automobile motorists, are not provided any specific allocation of gasoline.

Wholesale purchaser-resellers, including retail sales outlets, are allocated gasoline based on the volume of gasoline which their historical purchasers, not subject to an allocation fraction, are entitled to receive, and 100 percent of their own base period purchases, subject to the allocation fraction. Those purchasers who are provided a specific allocation level are to obtain these allocated supplies from the suppliers who supplied them in the base period (i.e., 1972). All others must seek supplies on their own from whomever has available gasoline.

Distributional Impacts

The system of allocation described above implies that the brunt of the gasoline shortage would be borne by retail

purchasers, who would curtail their consumption vo. and also undergo the inconvenience of waiting in long at retail gasoline outlets. Though not a system of ration. by-price or by coupon, this is in effect a system of rationing-by-waiting, administered by gas station operators rather than by the government.

As memories of the 1973/74 energy crisis are still fresh, it is not difficult to recall some of the hardships and inequities resulting from such an allocation scheme which are not reflected in common economic variables.

A system of rationing-by-waiting discriminates against the single-driver household and households whose drivers are working, and favors, relatively speaking, households with more than one driver, and those which have non-working drivers, such as housewives and retired persons. These latter tend to place lower economic value on their time and therefore can find waiting less costly. An FEA study* shows that single-driver households are mostly concentrated in the below $10,000 income classes, and that lower income classes have the most numerous single-driver households (Table V-9).

The same FEA study mentioned above shows that consumption of gasoline per driver is greater at lower than at higher income

* Final Report On An Economic Impact Analysis of Gasoline and Diesel Fuel Rationing, FEA, July 16, 1976.

249-464 O - 77 - 11

TABLE V-9

PERCENT OF HOUSEHOLDS BY LICENSED DRIVERS AND ANNUAL INCOME

Number of licensed driver(s) per household	Income classes: Under $3,000	$3,000-3,999	$4,000-4,999	$5,000-5,999	$6,000-6,499	$7,500-9,999	$10,000-14,999	$15,000 & over	Income Unknown	All households
	Percent by income class									
One	34.5	42.6	48.4	41.2	34.7	26.0	16.4	11.3	19.2	29.4
Two	10.4	26.8	33.0	40.4	48.2	57.1	64.2	51.9	59.0	42.8
Three	1.4	3.4	3.9	5.4	7.3	11.5	14.3	25.9	21.8	9.4
Four-or-more	0.1	1.1	2/	2.3	2.7	3.1	3.7	10.9	0.0	3.0
Subtotal	46.4	73.9	85.3	89.3	92.9	97.7	98.6	100.0	100.0	84.6
None	53.6	26.1	14.7	10.7	7.1	2.3	1.4	2/	0.0	15.4
All households	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0 1/
	Percent by number of licensed drivers									
One	20.0	10.8	10.1	11.6	13.6	13.6	10.1	3.0	7.2	100.0
Two	4.2	4.7	4.7	7.8	13.0	20.6	27.1	9.4	8.5	100.0
Three	2.6	2.7	2.5	4.8	9.0	18.9	27.5	21.4	10.6	100.0
Four-or-more	0.6	2.7	2/	6.3	10.2	15.8	22.4	27.8	14.2	100.0
Subtotal	9.4	6.5	6.2	8.8	12.7	17.8	21.1	9.1	8.4	100.0
None	59.6	12.3	5.7	5.9	5.3	2.3	1.6	0.3	7.0	100.0
All households	17.1	7.5	6.1	8.3	11.5	15.4	18.1	7.8	8.2	100.0 1/

1/ 62.5 million households.

2/ Data insufficient for analysis.

Source: U.S. DOT/FHWA, Nationwide Personel Transportation Survey, Report 11 - Automobile Ownership, 1974, p. 22.

levels (Table V-10). Thus, because of their consumption patterns, lower income classes are likely to be more inconvenienced in obtaining their gasoline than higher income classes.

It is clear that the distributional impact of this type of allocation is highly discriminatory among consumers and is likely to be keenly resented by those adversely affected, especially in the absence of an externally caused crisis that would justify in their view the burdens they are so arbitrarily made to bear. As experience in the 1973/74 energy crisis reveals, any allocation system among wholesale suppliers and retailers based on historical records would inevitably produce regional, state, and dealer distortions due to recent changes in factors affecting demand and supply which have not been reflected in base period records. These distributional distortions contribute further to the general sense of frustration and inequity, necessitating continually increasing government involvement in ad hoc adjustments to the allocation system.

Efficiency Impacts

The basic intent of the system of allocation and price regulations that was devised during the 1973/74 energy crisis, in addition to ensuring an equitable distribution of the shortage, was to cause as little disruption of the economy, and essential services and to interfere as little as possible in the market mechanism. An attempt was therefore made to

TABLE V-10

ANNUAL GASOLINE CONSUMPTION PER DRIVER BY INCOME - 1973

Approximate Household income	Gallons/Driver
1. $ Under 4,000	729
2. 4,000-5,999	636
3. 6,000-8,499	592
4. 8,500-11,250	598
5. 11,251-15,999	589
6. 16,000-24,999	579
7. 25,000-49,999	610
8. 50,000 and over	493

SOURCE: FEA, Final Report on an Economic Impact of Gasoline and Diesel Fuel Rationing July 16, 1976, p. 269

place the principal burden of conservation on the final consumer, but to allow other sectors to experience as little reduction in their allocation as possible. While this policy may not have been entirely successful, in the short-run and in a temporary crisis situation, it was a feasible policy. In the long-run, however, had crude oil and products remained in short supply, the impact on the economy would have been quite significant. In this section, the efficiency impacts of the 200,000 B/D projected possible shortage will be sketched, assuming an allocation scheme such as that which is in place today.

The economic impact of this type of allocation of gasoline is very difficult, if not impossible, to quantify. Most macro models in common use are not sophisticated enough to fully distinguish between the impact of a shortage and the impact of a corresponding price increase. Indeed, a frequently used procedure in evaluating the impact of a shortage of gasoline on real macro variables is to translate the shortage into a price increase and then analyze the impact of this. Such a procedure implies that the supply is not allocated according to a particular manner, and even if it is allocated according to a particular scheme, there is freedom to resell either the gasoline itself or the coupons, if rationed. In this situation, the shortage and the price increase would indeed produce equivalent results on real macro variables, such as employment and output, except for

for the income-distributional effects. In the case under study, however, the limited supply is assumed to be allocated according to the FEA allocation regulations which allow no resale by consumers or final end-users. Hence, the economic impacts of the shortage will be difficult to estimate. The essentially qualitative analysis that follows attempts to capture the principal adverse economic impacts of a 200,000 barrel per day shortage.

As Table III-1 shows, gasoline demand fell in 1974 by about 140 MB/D from its level in 1973. Beside the effect of the embargo, this decline reflects the impacts of the higher price of petroleum and other factors. However, this magnitude is not a true measure of the shortage inasmuch as demand for gasoline would have been expected to be higher in 1974 than in 1973. A reasonable estimate of the shortage in 1974 would be twice as large as the actual decline noted. Nonetheless, a review of some of the economic impacts of the 1973/74 shortage of gasoline is instructive in assessing the likely impacts of a 200,000 barrel per day shortage in 1979.

During the embargo, the demand for all petroleum products exceeded supply by about 1.9 million barrels per day according to FEA estimates.[1/] The shortage of gasoline caused an estimated 10,000 gasoline service stations to be

---

1) FEA, Project Independence Report, 1974, Appendix p. 284.

closed and 64,000 unemployed.[1/] Since motorists were unable to obtain sufficient gasoline for long trips, long distance travel by vacationers and others was significantly curtailed. As a result, occupancy in hotels and motels was substantially reduced. This industry suffered an estimated revenue loss of $179 million and 27,000 jobs due to the embargo-induced gasoline shortage.[2/] It is well known that American automobile manufacturers experienced a drastic reduction in the demand for their intermediate and large sized automobiles during the embargo, causing an estimated 236,000 workers in automobile and auto related industries to become unemployed. For the economy as a whole, an estimated 500,000 people became unemployed and GNP fell by $10-$20 billion as a result of the embargo.[3/]

To the extent that rising prices might eventually induce increased gasoline supplies, price decontrol would mitigate some of the economic problems associated with the gasoline shortage projected for 1979. With greater gasoline supplies, more gasoline stations would remain in business, the demand for goods and services in the economy would be greater, unemployment would be lower, and real GNP would be greater than otherwise.

---

1) Estimate by the American Petroleum Institute in FEA, Short Term Microeconomic Impact of the Oil Embargo, p. 108, and Table V-11.
2) FEA, Ibid, p. 122 and Table V-11.
3) Ibid, Appendix, p. 288.

TABLE V-11

Total Reduction of Employment
November 1973 - March 1974
in Selected Industries
Sensitive to Energy Shortages
(seasonally adjusted)

Industry	Approx. Employment Reduction Due to All Causes	Percent Reduction in Employment
Automobile and Auto Related	237,000	9.2
Retail Gasoline Service Stations	64,000	10.3
Basic Steel Products	27,000	4.3
Hotels, Motels and other Lodgings	27,000	3.0
Misc. Transportation Equipment - Motorcycles, Bicycles, Trailers Recreational Vehicles, etc.	22,000	14.5
Transportation by Air 1/	15,000	5.4
Aircraft and Parts	11,000	2.1
Special Trade Contractors	9,000	.5
Laundry and Dry Cleaning Establishments	9,000	2.2
Real Estate	7,000	.9
Misc. Plastics Products	4,000	1.1
Boat Building	No significant change -	
Trucking		

Source: FEA, Project Independence Report, 1974, p. 297

1) This estimate excludes returning strikers.

III. SUMMARY AND CONCLUSION

The analysis in Section II attempted to show the impact of decontrol in a scenario in which a shortage occurs in 1979 because of the refining industry's inability to produce adequate supplies while in compliance with certain assumed environmental controls. The impact of decontrol was isolated by comparing that case with what would happen under continued controls. A comparative analysis of the price increases under both cases was undertaken using standard macro models to trace through the impacts of these price increases on the rest of the economy and then employing various micro models to answer some more detailed questions about the impacts.

It was shown that there was a negative impact on real GNP of $5.2 billion along with a rise in unemployment of about 100,000. At the same time, the GNP Implicit Price Deflator rose by 0.4 percent while the Consumer Price Index increased by 0.6 percent. Various regions and sectors of the economy experienced larger impacts than did others. The East North Central region showed the largest decline in real personal income which was probably due to the impact on the automobile sector located there. In addition, the petroleum products and crude petroleum industries showed the largest employment impacts in the private sector. Finally, the socioeconomic analysis showed that expenditures on gasoline rose for all groups with the largest absolute

rise being felt by the highest income group, those households earning $25,000 or more.

In order to complete the analysis, it was necessary to estimate the other impacts of the shortage experienced under continued controls and to set these against the differential impacts of the price increases. However, because of the difficulty of quantitatively analyzing the impacts of the shortage, the comparative analysis undertaken is likely to be unbalanced. Thus, it is important to emphasize some of the unmeasurable, but real, impacts of the shortage.

First, the efficiency impacts of continued controls have been noted in Section II above. They relate principally to unemployment and output in the automotive, leisure, and gasoline retail sectors. By referring to the experience during the embargo period, it would appear that these impacts could be significant. Furthermore, whereas many consumer products, which can hardly be described as necessities at least at the margin (as any visit to a supermarket or store would reveal), would use up gasoline valued at a low price, other consumer needs that depend on driving would go begging even at a higher price for gasoline. From an economic welfare point of view, a reduction in economic well-being would result in such a case.

Second, there are distributional and equity impacts peculiar to continued controls which have been noted in

Section II. Most important among these are the psycho-logical and political consequences of a "rationing-by-waiting" allocation scheme at a time when a national crisis situation may not be apparent. In addition, there will be many legitimate complaints about the unequal sharing of the burden among classes of consumers, regions, and dealers.

Finally, the macro impacts of the price increase under decontrol are necessarily incomplete, since additional expenditures by producers of gasoline and by stockholders, both of whom benefit from higher prices of gasoline, on both investment and consumption goods are not reflected in the macro simulations. The multiplier effects of these expenditures should be included in the comparative analysis. Most importantly, the longer run impact on supplies of gasoline which are favorable under decontrol should be taken into account in comparing the two alternatives.

The economic impact analysis of a shortage condition is presented, however, only to quantify certain assessments to which FEA does not subscribe. FEA's analysis and forecast in Chapter IV indicate that supply will be adequate to meet demand in 1979 under any assumptions as to environmental controls, even though asssumptions as to the most vigorous environmental controls which are currently contemplated will require large peak period stock drawdowns in order to

satisfy summer demand. The economic analysis in Section I of conditions under FEA forecasts, which anticipate a maximum price increase of one cent per gallon following decontrol, (a price increase which may or may not have been allowed under continuing controls) indicates that there will be no significant economic impact resulting from decontrol. FEA's findings and views are, therefore, that decontrol will not significantly influence the GNP, CPI, implicit price deflator for the GNP, the rate of unemployment or the availability of goods and services, and will thus have no impacts on states, regions or governmental units.

CHAPTER VI

FINDINGS AND CONCLUSIONS

This chapter sets out FEA's findings and views concerning the possible exemption of motor gasoline from the Mandatory Petroleum Allocation and Price Regulations. Section 12 of the Emergency Petroleum Allocation Act of 1973 (EPAA), which was added by the Energy Policy and Conservation Act (EPCA), requires that FEA make certain findings and express its views on a variety of matters in proposing to Congress that a product be exempted from regulation. As indicated in Chapter I, since FEA is submitting to Congress concurrent Energy Actions exempting motor gasoline from both pricing and allocation regulations, the findings and views contained herein address both of the exemptions.

FEA's findings and views expressed in this chapter are drawn from the combined analyses presented in Chapters III, IV and V. These findings and views are grouped under five general headings: (1) findings related to supply and demand, required for exemption from allocation regulations; (2) findings related to price, required for exemption from price regulations; (3) FEA's findings that exempting motor gasoline from regulation will be consistent with the objectives of the EPAA; (4) FEA's views on a variety of potential impacts that must accompany any proposed exemption submitted

to Congress, including state and regional impacts; and (5) FEA views related to the effects of employment, the Consumer Price Index, the availability of consumer goods and services and the Gross National Product.

(1) Findings Related to Supply and Demand

In proposing exemption of any oil or refined product from the allocation regulations, the Federal Energy Administration (FEA) must determine "...that such oil or refined product category is no longer in short supply..." [Section 12(d)(1)(A) of the EPAA]. Chapters III and IV present FEA's examination of the supply/demand situation of motor gasoline. In this report, FEA finds that motor gasoline is not now in short supply and that anticipated supplies of motor gasoline will be sufficient to meet the demand through 1979. Stocks of motor gasoline have recovered from the low levels of 1972 and 1973 and appear to be sufficient to meet demand surges.

The total supply of motor gasoline will be adequate over the 1977-1979 period, and exemption will not result in shortages of motor gasoline and other products. Expanded domestic refinery capacity, along with available imports, is expected to be adequate to meet demand. Sufficient supplies of foreign crude oil should be available, and the Entitlements Program will ensure the

availability of equitably priced crude to all domestic refiners. An analysis of the refinery yields required to meet motor gasoline demand through 1979 demonstrates that domestic refineries can satisfy expected demand for gasoline without increasing the percentage yield.

For 1979 FEA has presented an alternative case based on a survey of large refiners' estimates of supply in that year. These estimates suggest that if EPA does not grant waivers to the lead phasedown schedule or to the ban on the use of MMT , supply could fall short of demand by 200 MB/D in that year. In that case, some shortfall would result unless contingency actions are taken by refiners, or unless an increase in price of a magnitude sufficient to dampen demand occurred. Absent other measures, the increase in price sufficient to produce a supply-demand equilibrium could be 10 cents per gallon or more under a 200 MB/D shortage. FEA finds, however, that continued regulation could not ameliorate potential problems in 1979 and is of a view that exemption from controls may afford an opportunity of forestalling potential future shortages. The demand/ supply situation will be closely monitored and the FEA retains the authority to reimpose controls to the extent necessary under changing conditions.

Any proposed exemption must also be accompanied by a finding "...that exempting such oil or refined product category will not have an adverse impact on the supply of any other oil or refined petroleum product subject to the Act..." [Section 12(d)(1)(A) of the EPAA]. Having examined existing and projected domestic refining capacity utilization on both annual and peak bases, the FEA finds that adequate capacity exists to increase yields of other products while still meeting the demand for motor gasoline. Consequently, FEA finds that exempting motor gasoline will not have any adverse impact on the supply of other products.

The analysis of historical supply and demand in Chapter III, and the supply and demand analyses in Chapter IV, fully support FEA's findings that motor gasoline supply is now and will continue to be adequate to meet demand. The uncertainty in future years is a result of estimates other than those of the FEA.

(2) Findings Related to Price

In proposing exemption from price regulations, the FEA must determine "...that competition and market forces are adequate to protect consumers..." [Section 12(d)(1)(B) of the EPAA]. Motor gasoline prices will increase as

crude oil costs and other costs increase. The removal of controls (which permit cost increases to be passed through) will have only a slight incremental effect on price movements through 1979. Needs for investment in additional refining capabilities could cause price increases of up to one cent per gallon more than is allowed under current regulations for gasoline.

If demand exceeds supply by 200 MB/D in 1979, as in the estimate derived under one set of industry assumptions, a price increase of at least seven cents per gallon more than allowed under controls could be expected to result. Since this supply-demand estimate is at variance with FEA's analysis in Chapter IV, FEA does not anticipate such an increase as a result of the exemption.

The industry is expected to achieve adequate levels of profitability, and competition is expected to continue to constrain price increases. It is FEA's finding, therefore, that competition and market forces are adequate to protect consumers if motor gasoline is exempted from regulation.

The FEA must also accompany any proposed exemption from price regulations by a finding "...that exempting such oil or refined product category will not result in inequitable prices for any class of users of such oil

or product..." [Section 12(d)(1)(B) of the EPAA]. Because only minor price increases are projected to occur as a result of exemption, and since the market structure analysis in Chapter IV indicates little change in market structure from historical patterns as a result of exemption, FEA finds that exemption would not result in inequitable prices for any class of end-user. The competitive market for this product has traditionally been a workable one. With supply presently adequate, and the petroleum industry operating at an adequate level of profitability, price increases for motor gasoline after the exemption, are not expected to impact unduly on any one class. Competition in the refining and distribution segments appears to be sufficient to protect both the independent sector of the petroleum industry and consumers. The large number of independent and small refiners and independent marketers now competing successfully in the motor gasoline market indicates that sufficient competition exists to protect consumers.

(3) Consistency with the Objectives of the EPAA

The FEA, in presenting any proposed exemption for Congressional review, is required to support such a proposal with a finding that it is "consistent with the attainment of the objectives specified in Section 4(b)(1) of the EPAA."

249-464 O - 77 - 12

It is FEA's finding that the exemption of motor gasoline from the price and allocation regulations is consistent with the attainment of the objectives set forth in Section 4(b)(1) of the EPAA. Since an adequate supply exists, allocation and price controls on motor gasoline are not now necessary to protect the public health, safety and welfare and the national defense [Section 4(b)(1)(A)]; the maintenance of all public services [Section 4(b)(1)(B)]; the maintenance of agricultural operations [Section 4(b)(1)(C)]; or the maintenance of exploration for the production or extraction of fuels and minerals [Section 4(b)(1)(G)]. The positive effects of increased competition should insure that the exemption is consistent with the preservation of an economically sound and competitive petroleum industry [Section 4(b)(1)(D)]; the equitable distribution of crude oil, residual oil and refined petroleum products at equitable prices [Section 4(b)(1)(F)]; avoidance of economic distortions, inflexibility, and interference with market mechanisms [Section 4(b)(1)(I)]. The exemption should have no adverse effect on the allocation of suitable crude oil to U.S. refineries [Section 4(b)(1)(E)].

(4) FEA's Views Related to Potential Economic Impacts.

Any proposed exemption from either price or allocation regulations must be accompanied by "...a statement of the

President's views as to the potential impacts (if any) of such (exemption) amendment..." [Section 12(d)(2)(A) of the EPAA]. This section of the EPAA further specifies a number of particular views which should be included, if practicable. In this section of the report, the FEA presents views of such potential impacts, presented in the order in which they are cited in the Act.

Views on the state and regional impacts (including impacts on governmental units). Because no supply or demand impact or significant price impacts are anticipated as a result of the proposed exemption in the short term, no significant state or regional impacts are anticipated. In particular, no impact is expected on any governmental units. If future shortages materialize, controls would be reimposed in a form designed to provide for equitable distribution and pricing.

Views on the effects on the availability of consumer goods and services. Assessing the potential impacts on the availability of consumer goods and services as a result of exempting motor gasoline involves consideration of the major uses of this product. Motor vehicles are dependent on this product and account for over 90 percent of all gasoline consumed. In the short term there are no substitutes for this essential commodity. Since supplies of motor gasoline have been determined in Chapters III and IV to be adequate to meet both present and projected demand

over the 1977-1979 period under FEA's forecast, it is FEA's view that exemption will have no adverse short-term impact on the availability of consumer goods and services.

Views on the effects on the Gross National Product. The price increase for motor gasoline which may occur as a result of decontrol has been found in Chapter IV to be small. Therefore, the effect on the Gross National Product (GNP), as determined in Chapter V, has also been found to be small and can be termed insignificant.

Views on the effects on competition. In Chapters III and IV, FEA examined that market structure for motor gasoline and concluded that exemption of motor gasoline from regulation will not adversely affect the competitive viability of independent refiners and marketers.

Views on the effects on the supply and availability of energy resources for use as fuel or as feedstock for industry. Chapters III and IV examined the supply availability of motor gasoline and demonstrated that supplies are adequate to meet present demand and, under FEA's forecast, are adequate to meet anticipated demand through 1979. The supply situation is not likely to change as a result of exemption, and, therefore, the fuel and feedstock needs of industry will continue to be met following exemption.

(5) Views on Unemployment, Consumer Price Index, and Gross National Product

In the case of a proposed exemption from price regulations, the FEA must analyze the effects of such exemption on "...the rate of unemployment for the United States, the Consumer Price Index (CPI) for the United States, and the implicit price deflator for the Gross National Product..." [Section 12(d)(2)(B) of the EPAA].

As long as supplies remain adequate the only price increase as a result of decontrol is a one cent increase which might also have been allowed under continued controls. The impact of this increase on the rate of unemployment, the CPI and the implicit GNP price deflator has been found to be so small as to be insignificant.

(6) Alternative Assessment. If the shortage resulting from an assessment of the refining industry's production capabilities under "worst case" assumptions were to occur, it would either be offset by a price increase of at least seven cents per gallon more than would be experienced under controls, or would be accompanied by a reimposition of controls. The effects of a price increase of this magnitude would be significant and have been quantified in a separate section of Chapter V; the effects of tolerating the shortage

and administering it by regulation do not lend themselves to similar quantification but have been discussed qualitatively. Since FEA finds that continued controls would not mitigate such a shortage, FEA is of a view that the proper course is to remove controls now and to make the difficult choice between alternative responses if a shortage begins to materialize.

APPENDIX I

OVERVIEW OF THE SHORT-TERM PETROLEUM FORECASTING PROCEDURE

The procedure by which FEA's Short-Term Petroleum Forecasts are generated may be summarized as follows:

(1) First, a number of macroeconomic variables (such as real national income) which are strongly related to the demand for petroleum products are estimated using an econometric model of the U.S. economy. The FEA uses a modification, called CEASPIRIT, to the Data Resources, Inc. (DRI) Trendlong March 1977 Model, which is consistent with the Council of Economic Advisors economic targets through 1982.

The macroeconomic model is used to forecast the following variables, which are subsequently treated as inputs to the FEA petroleum model:

A. implicit price deflator for the gross national product;

B. Federal Reserve Board index of production of chemicals and products;

C. national income; and

D. population.

(2) Second, price trajectories are estimated for the pertinent petroleum products. Petroleum prices are estimated by assuming the complete passthrough of costs by refiners and marketers (see Appendix II).

(3) Next, historical values of these macroeconomic and price variables are utilized (along with other variables) in FEA's Short-Term Demand Model to estimate the demands for petroleum products. Each petroleum product has a forecasting equation constructed from historical data. Each equation attempts to capture the relationship between final demand for the product and the relevant factors influencing that demand. The explanatory factors used in predicting product demand in addition to the macroeconomic variables includes:

A. real product prices;

B. variable representing the effects of weather and monthly (seasonal) variations in demand; and

C. other factors relevant to a particular product.

(4) The model forecasts are adjusted for anticipated natural gas curtailments or other factors wherever appropriate.

As of July 15, 1977, new equations for forecasting product demand for the eight products were incorporated into the model. Documentation of these equations will be forthcoming.

Unleaded gasoline

Unleaded gasoline demand at the national level was projected using EPA estimates of the proportion to total

gasoline demand which will be for unleaded gasoline. The proportions used on an annual basis were as follows:

PROPORTION UNLEADED TO TOTAL GASOLINE DEMAND

1977	28.0%
1978	36.0%
1979	43.0%

Real Income Forecasts in Short-Term

Real income is an important factor in the short-term model. Real national income forecasts used in the model increase as follows:

REAL NATIONAL INCOME

COMPOUND ANNUAL RATE OF GROWTH (%)

To	Real Income Level 1/	Rates of Growth (%)
76	$1007	
77	1058	5.1
78	1128	6.6
79	1194	5.9

1/ Billions of $

Auto Efficiency and Dieselization Improvements

The motor gasoline demand equations do not take into account the impact of improved auto efficiencies or the increased dieselization of truck and auto fleets. In order to account for these structural shifts, the following reductions to the gasoline demand estimates from the short-term model forecast were made:

	REDUCTION IN MOTOR GASOLINE DEMAND DUE TO:	
	Improved Auto Efficiency (MB/D)	Dieselization to Truck and Auto Fleet (MB/D)
1978	200	16.5
1979	344	35.0

Natural Gas Curtailments

The 1977 residual demand forecast was adjusted upward by 200 MB/D to account for incremental natural gas curtailments.

APPENDIX II

OVERVIEW OF THE SHORT-TERM PRODUCT PRICE FORECASTING PRECEDURE

FEA's short-term product price model forecasts prices by addding cumulative increases in refiners' product and nonproduct costs to the most recently reported refined product prices and adjusting these prices for normal seasonal variations. Assumptions made in the model are as follows:

1. Prices for old and new oil are set each month so that the imputed composite crude oil price equals the legal composite price. The legal composite increases at a 10% annual rate.

2. Stripper and Naval Petroleum Reserve crude oil prices and Alaskan costs (prices + transportation) increase at the same rate and at the same time as import costs.

3. Imported crude costs increase each January by the full amount of the change in the GNP implicit deflator over the preceeding year. (GNP deflator forecasts are from the CEASPIRIT update of DRI's Trendlong 0377 model.) An addition 5% increase by Saudi Arabia and the United Arab Emirates is included in July 1977.

4. Estimates of rates of change in old and new crude oil production are based on the rates of change for the different types of producing properties during 1975 and 1976.

5. Stripper oil production remains constant at the April 1977 level.

6. Alaskan North Slope oil will begin flowing in August 1977 at 490M bbl/day and will increase to 760M bbl/day by October, after which it will remain constant.

7. Production from the Naval Petroleum Reserve at Elk Hills starts at 100M bbl/day in January 1977, and reached a maximum level of 150M bbl/day by April 1977.

8. Imports of crude oil are projected each month by substracting projected total deomstic crude oil production from total refinery crude runs-to-stills. Refinery crude runs-to-stills are forecasted on the basis 1974-1976 seasonal variations in refinery utilization rates.

APPENDIX III

INVESTMENT RECOUPMENT

In order to provide for recoupment of investment expenditures required to increase net refinery capacity by 1.6 million barrels per day over 1979 projected refining capacities, gasoline prices would increase about one-half to one cent per gallon. This estimate is based on the following assumption:

A. Projected 1979 refinery capacity of 17.4 million barrels per day (from Trends in Refinery Capacity and Utilization, FEA June 1977).

B. Estimated 19.0 million barrels per day of refining capacity will be necessary to maintain the 1976 level of imported products without increasing imported products in 1979.

C. Estimated capital cost per unit of capacity (barrels per day) is $3,600 (estimated cost of building 15,000 barrels per day light Arabian crude hydroskimming refinery) in January 1977, from Impact of Mandatory Petroleum Allocation, Competitive Viability, and Ease of Entry of Independent Refiners and Small Refiners, FEA Report to Congress, March 1977.

D. Refiners recover their capital investment in seven years.

E. The rate of capacity utilization is 86 percent.

F. All costs are recovered by increasing prices of gasoline only.

G. The average annual motor gasoline domestic production for the next seven years is 7.2 million barrels per day.

Calculation:

1.6 MMB/D X $3,600 = $5.8 billion

$\frac{5.8 \text{ billion}}{7 \text{ years}}$ = $.83 billion/yr.

$$\frac{\$.83 \text{ billion/yr.}}{\substack{110.4 \text{ billion gallon average annual} \\ \text{mogas domestic production for} \\ \text{next 7 years (7.2 million b/d).}}} = 0.75 \text{ cents/gal.}$$

APPENDIX IV

HOUSEHOLD IMPACTS OF GASOLINE DECONTROL

I. INTRODUCTION

Another FEA computer model, the Phase I CHRD System, was also used to estimate the direct impact on household gasoline expenditures of the gasoline price decontrol proposal. Decontrol was evaluated by comparing results under two assumptions, a uniform 3 cents per gallon price increase at the pump in 1979 and a higher, 10 cents per gallon increase in 1979. Decontrol is estimated to increase average gasoline expenditures for households owning one or more cars from $745 under the current regulation (3 cents) scenario for 1979 and $789 under the 10 cents decontrol scenario. This increase amounts to a change of 0.3 in the percent of disposable income spent on gasoline. These impacts are examined for a variety of population subgroups in the body of this report and the estimated impact varies substantially. In absolute dollar terms, the impact is obviously greatest on those who drive a lot, with workers commuting more than 15,000 miles annually estimated to spend $78 more on gasoline under the 10 cents decontrol scenario. Higher income families drive more on average than low income families, and, hence, have larger dollar increases from decontrol, but the impact as

measured by the percent of disposable income spent on gasoline is higher for lower income families where an additional 0.5 of a percent of their disposable income is devoted to gasoline, compared to an additional 0.2 of a percent for families with incomes over $20,000.

II. METHODOLOGY

The socioeconomic impacts of gasoline decontrol were analyzed on the basis of two scenarios simulated for 1979. These included a 3-cent increase in the retail price of gasoline in which the existing controls on retail gasoline were assumed to continue, and a 10-cent increase designed to simulate the 1979 impacts of decontrol.

The scenarios were simulated with the Phase I CHRD System. Since time constraints prevented the development of a complete 1979 CHRDS file, only the AUTOS module was used to project 1979 gasoline expenditures with the 1974 CHRDS file previously developed. Thus, the demographic distribution of the population and the income distribution in 1979 were assumed to be the same as the 1974 distributions. No income effect was included because real disposable incomes were assumed to be unchanged over the projection period.[1/] Also, no adjustment was made for auto ownership

---

1/ This assumption is supported by the absence of a significant change in real per capita disposable income during the past four years with a 1973 value of $4,062, 1974 value of $3,973, 1975 value of $4,014 and a 1976 value of $4,137.
Source: Survey of Current Business, July 1977, Table 8.8.

or the age/size of autos owned since FEA could provide no basis for making such adjustments. However, historical data do support the implicit assumption of an unchanged composition of the auto stock from 1974 to 1979. The demand for large autos is very price-inelastic, and, furthermore, auto manufacturers are improving the fuel efficiency of large autos proportionately more than other size classes. The specific assumptions used to simulate the two scenarios are detailed below.

Price Changes

The retail price of gasoline was 52.6 cents per gallon in 1974 and rose to 76.6 cents in the 1979 3-cent price increase case, and 83.6 cents in the 1979 10-cent price increase case. The absolute gasoline price increases from 1974 to 1979 thus ranged from 45.5 percent to 58.8 percent, as shown in Table A-1. Table A-1 also reports the increase in the real price of gasoline from 1974 to 1979, i.e., the absolute increase deflated by the general inflation that occurred over the period. These increases were much lower, ranging from 4.3 percent to 13.9 percent. Thus, in the business-as-usual reference case, gasoline prices are assumed to rise at a rate slightly higher than the general inflation rate in the economy, while under decontrol they are rising at a faster rate.

General inflation over the period from 1974 to 1979, measured by the increase in the Consumer Price Index, was

249-464 O - 77 - 13

TABLE A-1

GASOLINE PRICE INCREASE, 1974 to 1979,
FOR GASOLINE DECONTROL SCENARIOS

Scenario	Money Price Increase	Real Price Increase
3-cent Price Increase	45.527	4.343
10-cent Price Increase	58.833	13.883

Source: Money price increases based on 1974 and 1979 gasoline prices as found in the main text of this report. The real price increases were computed by deflating the money price increases by the 39.5 percent increase in the Consumer Price Index from 1974 to 1979.

projected to be 39.5 percent. This projection was made by assuming that 6 percent annual inflation, the stated goal of the Administration, would occur in 1977-78 and 1978-79. The May 1979 CPI is thus projected from the May 1977 CPI to be 202.9, indicating an increase of 39.47 percent over the May 1974 CPI of 145.5.

Auto Fuel Efficiency

The computation of gasoline usage in 1979 from total miles driven was made on the basis of projected fuel efficiencies by age and size class of auto in 1979. Age of auto was distinguished by individual years from 0 to 10 or more years, and four size classes were distinguished--small, midsize, and large American, and foreign. FEA estimated the fuel efficiencies corresponding to the reference case with a wellhead tax for small, midsize, and large American autos in 1976, 1977, 1978, and 1979. These miles per gallon (mpg) values, reported in Table A-2, correspond to the EPA estimates of fuel efficiencies in city driving and are not comparable to the series of fuel efficiencies developed for 1964-75 from the automobile tests conducted by Consumers Union and published in Consumer Reports. A distinct discontinuity was apparent at the juncture of the two series, necessitating some adjustments to effect a splicing of the two sources of mpg.

TABLE A-2

AUTO FUEL EFFICIENCY IN CITY DRIVING
BY YEAR AND SIZE OF AUTO,
REFERENCE CASE WITH WELLHEAD TAX

Year	Size of Auto			Sales-Weighted Fleet Average
	Small	Midsize	Large	
	(miles per gallon)			
1976	24.3	18.7	15.6	17.9
1977	24.3	19.2	16.3	18.4
1978	24.7	20.8	17.6	19.6
1979	25.5	22.0	18.6	20.6

SOURCE: Federal Energy Administration

NOTE: These fuel efficiencies are the same as those under the Ways and Means tax proposal through 1979.

Each Consumer Reports mpg estimate was therefore compared with the EPA estimate for the same make and model of auto for available overlapping years--1975, 1976, and 1977.[2/] As shown in Table A-3, these results indicate that EPA has consistently overestimated the fuel efficiency of autos relative to Consumers Union by roughly 50 percent. Since the Consumers Union mpg figures are a more realistic estimate of what a motorist is likely to achieve on the road, the Consumers Union fuel efficiency estimates were used for 1976 and 1977 autos, and the 1978 and 1979 fuel efficiencies originally estimated by FEA were deflated by 2/3 to adjust for the 50 percent overstatement by EPA. The fuel efficiency of foreign autos in 1978 and 1979 was approximated as 10 percent larger than the corresponding mpg for small American autos, the observed differential in 1977. The final fuel efficiencies used for computing 1979 gasoline usage, by age and size class of auto, are reported in table A-4. Table A-5 indicates the resulting percentage change in the mpg for each age/size of auto from 1974 to 1979.

2/ An attempt was made to include 1974 autos in addition, but the EPA tables did not provide sufficient information to identify autos comparable to those tested by Consumers Union.

TABLE A-3

RATIO OF FUEL EFFICIENCY ESTIMATED BY CONSUMERS UNION TO FUEL EFFICIENCY ESTIMATED BY EPA, BY YEAR AND SIZE CLASS OF AUTO

	American Autos			
Year	Small	Midsize	Large	Foreign Autos
1975	1.34	1.46	1.43	1.29
1976	1.51	1.41	1.43	1.41
1977	1.49	1.52	1.55	1.42

SOURCE: Computed by Mathematica Policy Research, Inc.

III. ESTIMATED HOUSEHOLD IMPACTS

Using the methodology described above, the Phase I CHRD System was used to estimate the direct impact on households of gasoline decontrol in 1979. Two measures were used to quantify these impacts, the average gasoline expenditures for households with autos in 1979 dollars and the gasoline expenditures as a percent of household disposable income. The predicted expenditure in dollars for each classification of households is provided for the 3 cent price increase assumption and a higher, 10 cent price increase assumption. Average annual gasoline expenditures for car-owning households in 1979 are estimated to be $745 under a 3 cent increase, and $789 under decontrol assuming a 10 cent increase, as shown in table A-6. These gasoline expenditures were 5.2 percent under a 3 cent increase and 5.6 percent under a 10 cent increase. The impacts for particular socioeconomic groups varied considerably from these averages depending primarily on how many miles were driven on average and the fuel efficiency of their cars. The impacts are classified by income class, region, race, sex of household head, age of household head, occupation of household head, number of autos owned and commuting miles in the following sections.

Table A-4

FUEL EFFICIENCY IN CITY DRIVING BY AGE AND SIZE OF AUTO, 1979

		Size Class			
Year	Age	Small	Midsize	Large	Foreign
		(Miles per gallon)			
1979	0	17.0	14.7	12.4	18.7
1978	1	16.5	13.9	11.7	18.1
1977	2	16.1	12.9	9.3	17.7
1976	3	16.2	12.9	9.2	16.4
1975	4	13.2	10.7	8.1	16.2
1974	5	14.1	10.4	8.0	19.5
1973	6	13.0	10.1	7.7	15.4
1972	7	15.3	10.0	8.5	14.8
1971	8	13.7	9.7	7.5	19.4
1970	9	13.5	9.5	8.1	17.7
1969+	10+	13.7	11.8	10.0	19.4

SOURCE: Computed from various issues of Consumer Reports for 1964-1977 as the average mpg for autos grouped by weight and country of origin. Fuel efficiencies for 1978 and 1979 computed by deflating the fuel efficiencies provided by FEA (see Table 2) by 2/3.

NOTE: Autos with unknown age and size were assigned a fuel efficiency of 11.8, the simple average of the fuel efficiencies of all American autos.

Table A-5

PERCENTAGE CHANGE IN FUEL EFFICIENCY FROM 1974 TO 1979, BY AGE AND SIZE CLASS OF AUTO

	Size Class			
Age	Small	Midsize	Large	Foreign
0	20.6%	41.3%	55.0%	-4.1%
1	26.9	37.6	51.9	17.5
2	5.2	29.0	9.4	19.6
3	18.2	33.0	22.7	-15.5
4	-2.2	12.6	0	-8.5
5	24.8	7.2	-5.9	19.6
6	8.3	2.0	-8.3	-6.1
7	23.4	-6.5	-7.6	-16.9
8	-15.4	-29.2	-31.2	-6.7
9	-8.2	-30.1	-30.8	-20.3
10+	-11.0	-10.6	-11.5	-16.0

SOURCE: Computed from table 4 of this report and table D-20 of Jill A. King, The Distributional Impact of Energy Policies: Development and Application of the Phase I Comprehensive Human Resources Data System, final report to the Federal Energy Administration (Washington, D.C.: Mathematica Policy Research, Inc. , June 1977).

TABLE A-6

AVERAGE HOUSEHOLD GASOLINE EXPENDITURES IN DOLLARS AND AS PERCENT OF HOUSEHOLD DISPOSABLE INCOME BY INCOME CLASS

Real Disposable Income Class[b]	Average Gasoline Expenditures[a]		Expenditure as Percent of Disposable Income	
	3¢ Increase (No Decontrol)	10¢Increase (Decontrol)	3¢ Increase (No Decontrol)	10¢ Increase (Decontrol)
Less than 5,000	$ 435	$ 461	9.6%	10.1%
5,000- 9,999	610	646	5.8	6.2
10,000-14,999	778	825	4.6	4.8
15,000-19,999	950	1007	4.0	4.2
20,000 and up	1078	1142	3.0	3.2
Total	745	789	5.2	5.6

SOURCE: CHRDS simulations prepared by Mathematica Policy Research and The Hendrickson Corporation

[a] Amounts are in 1979 dollars. Averages are for households owning at least one auto.

[b] Income classes are in 1974 dollars.

Income Class

The additional estimated expenditure on gasoline under decontrol in 1979 ranged from $26 for households with real disposable income under $5,000 to $64 for households with disposable income over $20,000, with an average increase for all households of $44, as shown in table A-6. Thus, the absolute dollar impact rose with income. However, using the relative measure in which expenditure is measured as a percent of disposable income, the impact falls as income rises. The estimated percent of household disposable income spent on gasoline rose from 9.6 to 10.1 under decontrol for the lowest income group, a change of .5 of one percent, while rising from 3.0 to 3.2 for the highest income group, a change of .2 of one percent.

Region

The average expenditure on gasoline in the nine Census divisions varies from a low of $667 in the West South Central Division to a high of $789 in the East North Central Division under the 3 cent increase scenario, as shown in table A-7. As would be expected, since a national price increase was used in the simulation, the estimated increase in expenditures under decontrol follows the same pattern, with a $40 increase in the West South Central Division and a $47 increase in the East North Central Division. When expenditure changes are measured as a percent of disposable income, there is less dispersion

and the largest impact is on the East South Central Division where expenditures on gasoline are relatively low but where average incomes are even lower, resulting in the highest proportion of disposable income spent on gasoline of any of the regions, 6.7 percent under the 10 cent decontrol scenario.

Race

Whites are estimated to spend considerably more on gasoline than other races in 1979, $753 compared to $639 under the 3 cent increase assumption, as shown in table A-8. Thus, whites have the larger dollar increase in expenditure under decontrol, $45 compared with $38. When expenditures are expressed as a percent of disposable income, however, there are no significant differences between two racial groups.

Sex of Head of Household

Male-headed households with autos consume dramatically more gasoline than do female-headed households with autos, as shown in table A-9, $779 compared to $441 under the 3 cent increase assumption. Consequently, the increase in gasoline expenditures estimated for male-headed households under the 10 cent increase is much higher, $48 compared to $26 for female-headed households. While female-headed households have less income on the average than male-headed households, the difference is not as large as for gasoline consumption, so that female-headed households also spend a smaller proportion

Table A-7

AVERAGE HOUSEHOLD GASOLINE EXPENDITURES IN DOLLARS AND AS PERCENT OF HOUSEHOLD DISPOSABLE INCOME BY REGION

Region[b]	Average Gasoline Expenditure[a]		Expenditure as Percent of Disposable Income	
	3¢ Increase (No Decontrol)	10¢ Increase (Decontrol)	3¢ Increase (No Decontrol)	10¢ Increase (Decontrol)
New England	$747	$792	4.7%	5.0%
Middle Atlantic	784	831	4.8	5.1
East North Central	789	836	5.1	5.4
West North Central	729	772	5.6	6.0
South Atlantic	730	773	5.6	5.9
East South Central	718	761	6.3	6.7
West South Central	667	707	5.6	5.9
Mountain	721	764	5.7	6.0
Pacific[b]	732	776	5.0	5.3
Total	745	789	5.3	5.6

SOURCE: CHRDS simulations prepared by Mathematica Policy Research and The Hendrickson Corporation

[a] Amounts are in 1979 dollars. Averages are for households owning at least one auto.

[b] Does not include Alaska or Hawaii.

Table A-8

AVERAGE HOUSEHOLD GASOLINE EXPENDITURES IN DOLLARS AND AS PERCENT OF HOUSEHOLD DISPOSABLE INCOME BY REGION

	Average Gasoline Expenditure[a]		Expenditure as Percent of Disposable Income	
Race	3¢ Increase (No Decontrol)	10¢ Increase (Decontrol)	3¢ Increase (No Decontrol)	10¢ Increase (Decontrol)
White	$753	$798	5.3%	5.6%
Other Races	639	677	5.3	5.7
Total	745	789	5.3	5.6

SOURCE: CHRDS simulations prepared by Mathematica Policy Research and The Hendrickson Corporation

[a] Amounts are in 1979 dollars. Averages are for households owning at least one auto.

Table A-9

AVERAGE HOUSEHOLD GASOLINE EXPENDITURES IN DOLLARS AND AS PERCENT OF HOUSEHOLD DISPOSABLE INCOME BY SEX OF HEAD OF HOUSEHOLD

	Average Gasoline Expenditure[a]		Expenditure as Percent of Disposable Income	
Sex of Head	3 Increase (No Decontrol)	10 Increase (Decontrol)	3 Increase (No Decontrol)	10 Increase (Decontrol)
Male	$797	$845	5.3%	5.7%
Female	441	467	4.9	5.2
Total	745	789	5.3	5.6

SOURCE: CHRDS simulations prepared by Mathematica Policy Research and The Hendrickson Corporation.

[a] Amounts are in 1979 dollars. Averages are for households owning at least one auto.

of their disposable income on gasoline, 4.9 percent under the 3 cent increase compared to 5.3 percent for male-headed households. The percent of their disposable income spent on gasoline increased by .4 percentage points for male-headed households and .3 percentage points for female headed households.

Age of Head of Household

The consumption of gasoline and, hence, the impact of decontrol varies substantially according to the age of the household head as shown in table A-10. The aged spend much less on gasoline than other age groups and have a smaller estimated impact of decontrol both in terms of the absolute increase of $27 and in terms of the relative increase in the percent of disposable income spent on gasoline of .2 percent. The relative impact of decontrol is largest for the under 25 age group because they spend a large share of their disposable income on gasoline, 7.0 percent under the 3 cent increase assumption and 7.4 percent under the 10 cent decontrol assumption.

Occupation of Head of Household

There are interesting differences between the absolute and the relative measures by the occupation categories. White collar workers are only slightly behind the blue collar workers in terms of average gasoline expenditure, $812 and $823, respectively, under the 3 cent increase scenario as shown in

table A-11. However, white collar workers spend a much smaller percent of their disposable income on gasoline, 4.8 percent, than do farm workers who are estimated to spend 7.7 percent under the 3 cent increase. The not-in-the-labor-force group, many of whom are the over 65 group in table A-10, have average expenditures only half as large as the white collar group, $402 compared to $812 under the 3 cent scenario, spend exactly the same percent of their disposable income on gasoline and face the same relative impact of decontrol.

Number of Autos Owned

As would be expected, both gasoline expenditures and income rise with the number of autos owned. As shown in table A-12 for the 3 cent increase scenario, the estimated expenditure for one-car households is $504 compared to $1,353 for households with three or more cars; the increases under 10 cent decontrol in 1979 are $31 and $81, respectively. The percentage of disposable income spent on gasoline ranges from 4.7 percent for one-car households to 6.8 percent for households with three or more cars under the 3 cent scenario, increasing to 5.0 and 7.2 percent, respectively under 10 cent decontrol in 1979.

Number of Commuting Miles

An obvious area of concern is the impact of any increase in gasoline prices on the person who must drive his car long distances to work. The data do not allow distinquishing those who have other commuting opportunities, but classifying

249-464 O- 77 - 14

TABLE A-10

AVERAGE HOUSEHOLD GASOLINE EXPENDITURES IN DOLLARS AND AS PERCENT OF HOUSEHOLD DISPOSABLE INCOME BY AGE OF HEAD OF HOUSEHOLD

Age of Head of Household	Average Gasoline Expenditure[a]		Expenditure as Percent of Disposable Income	
	3 increase (No Decontrol)	10 increase (Decontrol)	3 increase (No Decontrol)	10 increase (Decontrol)
Under 25	$ 683	$ 724	7.0%	7.4%
25-64	812	860	5.3	5.6
65 and over	449	476	4.5	4.7
Total	745	789	5.3	5.6

SOURCE: CHRDS simulations prepared by Mathematica Policy Research and The Hendrickson Corporation.

[a] Amounts are in 1979 dollars. Averages are for households owning at least one auto.

TABLE A-11

AVERAGE HOUSEHOLD GASOLINE EXPENDITURES IN DOLLARS AND AS PERCENT OF HOUSEHOLD DISPOSABLE INCOME BY OCCUPATION OF HEAD OF HOUSEHOLD

Occupation of Head of Household	Average Gasoline Expenditure[a]		Expenditure as Percent of Disposable Income	
	3 increase (No Decontrol)	10 increase (Decontrol)	3 increase (No Decontrol)	10 increase (Decontrol)
Not in labor force	$ 402	$ 426	4.8%	5.1%
White collar	812	860	4.8	5.1
Blue collar	823	872	5.5	5.9
Service	650	689	5.5	5.9
Farm	806	854	7.7	8.1
Total	745	789	5.3	5.6

SOURCE: CHRDS simulations prepared by Mathematica Policy Research and The Hendrickson Corporation.

[a] Amounts are in 1979 dollars. Averages are for households owning at least one auto.

TABLE A-12

AVERAGE HOUSEHOLD GASOLINE EXPENDITURES IN DOLLARS AND AS PERCENT OF HOUSEHOLD DISPOSABLE INCOME BY NUMBER OF AUTOS OWNED

Number of Autos Owned	Average Gasoline Expenditure[a]		Expenditure as Percent of Disposable Income	
	3¢ Increase (No Decontrol)	10¢ Increase (Decontrol)	3¢ Increase (No Decontrol)	10¢ Increase (Decontrol)
One	$504	$535	4.7%	5.0%
Two	839	890	5.5	5.8
Three or more	1353	1434	6.8	7.2
Total	745	789	5.3	5.6

SORUCE: CHRDS simulations prepared by Mathematica Policy Research and the Hendrickson Corporation

[a] Amounts are in 1979 dollars. Averages are for households owning at least one auto.

TABLE A-13

AVERAGE HOUSEHOLD GASOLINE EXPENDITURES IN DOLLARS AND AS PERCENT OF HOUSEHOLD DISPOSABLE INCOME BY NUMBER OF COMMUTING MILES

Number of Commuting Miles by Auto.	Average Gasoline Expenditure[a]		Expenditure as Percent of Disposable Income		
	3¢ Increase (No Decontrol)	10¢ Increase (Decontrol)	3¢ Increase (No Decontrol)	10¢ Increase (Decontrol)	Percent Household
None	$ 522	$ 554	5.0%	5.3%	27.5%
Under 3,000	701	743	4.9	5.2	21.9
3,000- 5,999	767	813	5.0	5.3	23.3
6,000- 8,999	858	909	5.6	5.9	11.7
9,000-11,999	964	1022	5.7	6.0	6.8
12,000-14,999	1034	1096	6.0	6.4	4.6
15,000 and up	1308	1386	8.3	8.8	4.3
Total	745	789	5.3	5.6	100.0

SOURCE: CHRDS simulations prepared by Mathematica Policy Research and The Hendrickson Corporation.

[a] Amounts are in 1979 dollars. Average are for households owning at least on auto.

households by the total number of miles commuted by auto by the head and spouse offers considerable insight into the impact on automobile commuters. Predictably, the gasoline expenditures, the absolute impact of decontrol, the percent of disposable income spent on gasoline, and the relative impact of decontrol all rise steadily with the number of miles commuted by automobile. The estimated impact of decontrol in 1979 varies from $42 for those commuting less than 3,000 miles per year to $78 for those commuting more than 15,000 miles per year. In terms of the percent of disposable income the 1979 impact of decontrol varies from .3 percentage points for the under 3,000 mile group to .5 percentage points for the over 15,000 mile group. The group commuting more than 15,000 miles per year faces the largest impact of any group identified, although they make up 4.3 percent of all households.

More detailed cross tabulations by state are provided in tables A-14 through A-18, although the potential user should be aware that the basic data came from small samples, the Nationwide Personal Transportation Survey with a sample size of 4,500 households and the Michigan Panel on Income Dynamics with a sample size of 5,000 households. Hence, the estimates will have large standard errors at the state level even though the household sample is reliable at the state level.

TABLE A-14

UNWEIGHTED NUMBER OF HOUSEHOLDS OWNING AT LEAST ONE AUTO, BY STATE AND DISPOSABLE INCOME

State	Disposable Income (1974 Dollars)					
	LT 5000	5-9.9K	10-14.9K	15-19.9K	20000+	TOTAL
MASS	433.	907.	591.	235.	153.	2319.
RI	261.	667.	495.	155.	102.	1640.
CONN	377.	640.	484.	186.	130.	1817.
MAINE	389.	838.	486.	148.	55.	1916.
NH	183.	467.	343.	155.	83.	1231.
VERMONT	115.	362.	305.	119.	104.	1005.
NY	811.	1908.	1054.	435.	365.	4573.
NJ	875.	1098.	707.	310.	220.	2810.
PENN	824.	1709.	981.	303.	198.	4015.
OHID	1062.	1588.	947.	337.	178.	4112.
IND	873.	1337.	685.	232.	111.	3238.
ILL	1018.	1475.	834.	360.	248.	3935.
MICH	1021.	1661.	1007.	409.	311.	4409.
WISC	759.	1230.	641.	231.	115.	2976.
MINN	832.	1226.	595.	228.	110.	2991.
IOWA	1015.	1182.	460.	169.	85.	2911.
MO	1030.	1251.	609.	154.	116.	3160.
ND	306.	485.	339.	125.	88.	1343.
SD	408.	581.	347.	116.	87.	1539.
NEB	824.	1037.	468.	137.	117.	2583.
KAN	884.	1154.	504.	142.	94.	2778.
DEL	161.	338.	320.	154.	90.	1063.
MD	759.	1084.	559.	273.	160.	2835.
DC	169.	337.	258.	120.	116.	1000.
VA	920.	1251.	534.	191.	103.	2999.
WVA	881.	1196.	494.	133.	55.	2759.
NC	1127.	1468.	515.	148.	80.	3338.
SC	704.	1070.	447.	156.	62.	2439.
GA	950.	1296.	527.	173.	106.	3052.
FLA	1306.	1606.	613.	180.	127.	3832.
KY	1103.	1249.	513.	131.	83.	3079.
TENN	1054.	1266.	515.	164.	85.	3084.
ALA	964.	1224.	501.	146.	79.	2914.
MISS	936.	1118.	424.	148.	74.	2692.
ARK	956.	1135.	452.	113.	64.	2720.
LA	928.	1130.	507.	164.	86.	2815.
OK	1006.	1197.	425.	143.	70.	2835.
TEXAS	1820.	2200.	859.	233.	169.	5281.
MONT	398.	698.	398.	131.	75.	1700.
IDAHO	374.	599.	372.	125.	79.	1549.
WY	170.	335.	270.	118.	84.	977.
COLO	899.	1157.	520.	200.	99.	2875.
NM	501.	699.	411.	159.	94.	1864.
ARIZ	851.	1109.	486.	164.	91.	2701.
UTAH	332.	628.	431.	170.	92.	1653.
NEV	190.	284.	289.	146.	116.	1025.
WASH	837.	1007.	501.	192.	101.	2638.
ORE	703.	904.	487.	151.	88.	2333.
CAL	1810.	2421.	1073.	466.	309.	6079.
TOTAL	36703.	52801.	26543.	9478.	5907.	131432.

TABLE A-15

1979 GASOLINE EXPENDITURES BY STATE AND DISPOSABLE INCOME, 3-CENT INCREASE

State	Disposable Income (1974 Dollars)					
	LT 5000	5-9.9K	10-14.9K	15-19.9K	20000+	TOTAL
MASS	440.	620.	678.	986.	960.	752.
RI	432.	574.	757.	894.	1146.	745.
CONN	487.	551.	713.	958.	979.	771.
MAINE	431.	566.	750.	1014.	1051.	679.
NH	443.	617.	715.	890.	1046.	717.
VERMONT	418.	601.	766.	932.	1148.	732.
NY	524.	672.	765.	1086.	1090.	847.
NJ	432.	604.	680.	943.	958.	756.
PENN	404.	559.	680.	1002.	1051.	707.
OHIO	360.	592.	852.	1013.	1134.	791.
IND	372.	629.	800.	963.	1121.	758.
ILL	401.	608.	828.	920.	1031.	777.
MICH	358.	593.	900.	983.	1144.	829.
WISC	370.	639.	829.	964.	1090.	771.
MINN	412.	647.	855.	908.	1032.	766.
IOWA	397.	623.	843.	988.	883.	719.
MO	395.	623.	851.	925.	1049.	725.
ND	496.	699.	795.	909.	1013.	734.
SD	434.	685.	833.	889.	998.	706.
NEB	455.	686.	869.	953.	956.	749.
KAN	402.	601.	751.	955.	976.	679.
DEL	453.	573.	737.	924.	1045.	727.
MD	491.	589.	725.	972.	1204.	794.
DC	457.	519.	717.	904.	1055.	722.
VA	492.	639.	781.	988.	1119.	768.
WVA	432.	688.	742.	950.	1014.	657.
NC	499.	694.	826.	979.	1311.	768.
SC	440.	674.	863.	995.	1071.	743.
GA	472.	620.	807.	975.	1080.	737.
FLA	414.	570.	734.	933.	982.	664.
KY	486.	677.	829.	946.	1224.	730.
TENN	471.	635.	787.	1093.	1228.	734.
ALA	467.	624.	780.	988.	1071.	698.
MISS	465.	658.	819.	964.	1240.	699.
ARK	444.	674.	807.	1026.	1155.	690.
LA	414.	584.	752.	727.	970.	636.
OK	418.	637.	787.	976.	1146.	698.
TEXAS	436.	565.	768.	803.	974.	665.
MONT	494.	642.	854.	994.	949.	737.
IDAHO	490.	668.	844.	959.	1215.	752.
WY	479.	598.	799.	897.	1032.	705.
COLO	477.	605.	776.	811.	1101.	717.
NM	489.	630.	817.	869.	1050.	718.
ARIZ	439.	586.	781.	820.	1153.	707.
UTAH	391.	598.	769.	815.	1078.	698.
NEV	513.	624.	810.	926.	1160.	786.
WASH	425.	577.	776.	843.	1226.	740.
ORE	478.	577.	789.	909.	977.	714.
CAL	434.	571.	740.	873.	1134.	753.
TOTAL	435.	610.	778.	950.	1078.	745.

NOTE: Averages are for households owning at least one auto.

TABLE A-16

1979 GASOLINE EXPENDITURES BY STATE AND DISPOSABLE INCOME, 10-CENT INCREASE

State	Disposable Income (1974 Dollars)					
	LT 5000:	5-9.9K:	10-14.9K:	15-19.9K:	20000+:	TOTAL:
MASS	467.	657.	718.	1045.	1017.	797.
RI	458.	608.	602.	947.	1214.	790.
CONN	516.	585.	756.	1016.	1037.	817.
MAINE	457.	600.	745.	1075.	1114.	720.
NH	469.	654.	758.	943.	1009.	760.
VERMONT	443.	637.	812.	987.	1216.	775.
NY	556.	712.	811.	1151.	1155.	898.
NJ	458.	640.	721.	1000.	1015.	801.
PENN	428.	593.	720.	1062.	1114.	750.
OHIO	382.	627.	903.	1073.	1202.	839.
IND	394.	666.	846.	1020.	1188.	804.
ILL	425.	644.	878.	974.	1093.	823.
MICH	379.	629.	954.	1041.	1213.	879.
WISC	392.	677.	878.	1022.	1156.	818.
MINN	436.	685.	907.	962.	1094.	811.
IOWA	421.	660.	893.	1047.	936.	762.
MO	419.	660.	902.	980.	1111.	769.
ND	525.	741.	842.	963.	1073.	778.
SD	459.	726.	883.	943.	1058.	748.
NEB	482.	727.	921.	1010.	1033.	794.
KAN	426.	637.	796.	1012.	1034.	720.
DEL	480.	608.	781.	979.	1108.	771.
MD	520.	624.	769.	1030.	1276.	842.
DC	485.	550.	760.	958.	1118.	765.
VA	522.	677.	828.	1047.	1186.	814.
WVA	458.	644.	787.	1007.	1075.	696.
NC	529.	736.	875.	1037.	1389.	814.
SC	466.	714.	914.	1055.	1135.	787.
GA	500.	657.	855.	1031.	1145.	781.
FLA	439.	604.	778.	989.	1041.	704.
KY	515.	717.	879.	1002.	1298.	774.
TENN	499.	673.	834.	1159.	1302.	778.
ALA	495.	661.	826.	1047.	1135.	740.
MISS	493.	697.	868.	1022.	1314.	741.
ARK	470.	714.	855.	1087.	1224.	731.
LA	439.	619.	797.	771.	1028.	674.
OK	443.	675.	834.	1035.	1214.	739.
TEXAS	462.	599.	814.	851.	1032.	704.
MONT	523.	680.	905.	1054.	1005.	782.
IDAHO	519.	708.	894.	1016.	1288.	797.
WY	506.	634.	847.	950.	1094.	748.
COLO	506.	641.	823.	860.	1166.	760.
NM	518.	668.	865.	921.	1113.	761.
ARIZ	466.	621.	827.	869.	1222.	749.
UTAH	414.	634.	815.	863.	1142.	740.
NEV	544.	662.	858.	981.	1229.	833.
WASH	451.	611.	822.	894.	1300.	785.
ORE	506.	612.	837.	963.	1035.	751.
CAL	460.	605.	784.	925.	1201.	777.
TOTAL	461.	646.	825.	1007.	1142.	789.

NOTE: Averages are for households owning at least one auto.

TABLE A-17

PERCENT OF DISPOSABLE INCOME SPENT ON GASOLINE, BY STATE AND DISPOSABLE INCOME, 1979 BAU ASSUMPTION
(percent scaled by 10)

State	Disposable Income (1974 Dollars)					
	LT 5000:	5-9.9K:	10-14.9K:	15-19.9K:	20000+:	TOTAL:
MASS	99.	58.	38.	40.	26.	45.
RI	68.	55.	43.	36.	31.	47.
CONN	104.	50.	41.	39.	25.	42.
MAINE	89.	52.	43.	42.	29.	52.
NH	97.	57.	41.	36.	30.	50.
VERMONT	86.	57.	44.	39.	32.	51.
NY	106.	62.	43.	44.	30.	49.
NJ	91.	53.	38.	38.	26.	42.
PENN	86.	51.	38.	41.	29.	46.
OHIO	85.	53.	48.	41.	30.	50.
IND	84.	57.	45.	34.	30.	51.
ILL	93.	55.	47.	37.	28.	49.
MICH	78.	54.	52.	40.	31.	49.
WISC	81.	58.	47.	39.	30.	51.
MINN	87.	61.	49.	37.	28.	53.
IOWA	88.	57.	48.	41.	24.	54.
MO	87.	57.	49.	38.	29.	55.
ND	104.	66.	46.	37.	26.	61.
SD	91.	66.	48.	36.	27.	61.
NEB	93.	63.	50.	39.	27.	58.
KAN	87.	56.	43.	39.	26.	53.
DEL	95.	53.	42.	37.	28.	48.
MD	98.	54.	41.	39.	33.	48.
DC	87.	47.	41.	37.	25.	43.
VA	108.	60.	45.	41.	31.	55.
WVA	94.	57.	42.	39.	27.	58.
NC	99.	65.	47.	40.	35.	61.
SC	94.	64.	50.	41.	30.	60.
GA	102.	59.	46.	40.	30.	57.
FLA	83.	54.	42.	38.	26.	51.
KY	101.	54.	47.	39.	33.	63.
TENN	100.	61.	46.	44.	33.	61.
ALA	96.	58.	45.	41.	31.	59.
MISS	96.	62.	47.	40.	35.	64.
ARK	92.	63.	47.	42.	30.	64.
LA	86.	56.	43.	30.	26.	53.
OK	93.	59.	45.	39.	31.	59.
TEXAS	93.	53.	44.	33.	27.	52.
MONT	107.	59.	49.	40.	26.	59.
IDAHO	111.	52.	49.	39.	32.	62.
WY	98.	56.	46.	37.	29.	56.
COLO	103.	57.	45.	33.	31.	53.
NM	115.	59.	47.	36.	27.	60.
ARIZ	100.	55.	44.	33.	30.	53.
UTAH	99.	56.	44.	34.	26.	51.
NEV	111.	57.	44.	38.	31.	54.
WASH	92.	53.	44.	34.	35.	50.
ORE	107.	54.	45.	37.	26.	53.
CAL	93.	52.	42.	35.	31.	48.
TOTAL	93.	56.	44.	39.	29.	51.

NOTE: Averages are for households with disposable income greater than zero who own at least one auto.

TABLE A-18

PERCENT OF DISPOSABLE INCOME SPENT ON GASOLINE, BY STATE AND DISPOSABLE INCOME, 1979 3-CENT PRICE INCREASE ASSUMPTION
(percent scaled by 10)

State	Disposable Income (1974 Dollars)					
	LT 5000:	5-9.9K:	10-14.9K:	15-19.9K:	20000+:	TOTAL:
MASS	93.	59.	48.	41.	27.	46.
RI	91.	56.	44.	37.	32.	49.
CONN	107.	51.	42.	40.	25.	44.
MAINE	91.	54.	44.	43.	30.	53.
NH	100.	58.	42.	37.	30.	51.
VERMONT	88.	58.	45.	40.	33.	52.
NY	109.	63.	44.	45.	30.	51.
NJ	94.	55.	40.	39.	26.	44.
PENN	89.	52.	40.	42.	30.	47.
OHIO	88.	55.	50.	42.	31.	51.
IND	86.	59.	47.	40.	31.	52.
ILL	96.	57.	48.	38.	29.	50.
MICH	81.	55.	53.	41.	32.	50.
WISC	83.	59.	48.	40.	31.	52.
MINN	89.	63.	51.	38.	29.	54.
IOWA	90.	59.	49.	42.	25.	56.
MO	89.	59.	50.	39.	30.	56.
ND	107.	68.	47.	38.	27.	63.
SD	94.	68.	49.	37.	27.	63.
NEB	96.	65.	51.	40.	28.	60.
KAN	90.	57.	49.	40.	27.	55.
DEL	98.	54.	43.	38.	29.	49.
MD	100.	56.	43.	41.	34.	49.
DC	90.	48.	42.	38.	26.	44.
VA	111.	62.	46.	42.	32.	57.
WVA	97.	59.	44.	40.	28.	59.
NC	102.	67.	49.	41.	36.	63.
SC	96.	66.	51.	42.	31.	62.
GA	105.	61.	47.	41.	31.	58.
FLA	85.	56.	43.	40.	26.	53.
KY	104.	66.	48.	40.	34.	65.
TENN	103.	63.	47.	46.	34.	62.
ALA	98.	60.	46.	42.	32.	60.
MISS	98.	64.	48.	41.	36.	65.
ARK	95.	66.	48.	44.	31.	66.
LA	89.	57.	45.	31.	27.	55.
OK	96.	61.	47.	41.	32.	60.
TEXAS	96.	55.	45.	34.	28.	54.
MONT	110.	61.	50.	41.	27.	61.
IDAHO	114.	63.	50.	40.	33.	64.
WY	100.	58.	47.	38.	30.	57.
COLO	108.	58.	46.	34.	31.	55.
NM	119.	61.	48.	37.	28.	62.
ARIZ	103.	57.	46.	34.	31.	54.
UTAH	93.	58.	45.	35.	29.	52.
NEV	114.	59.	47.	39.	32.	55.
WASH	95.	54.	45.	35.	36.	51.
ORE	110.	55.	46.	38.	27.	54.
CAL	96.	54.	43.	36.	31.	50.
TOTAL	96.	58.	46.	40.	30.	53.

NOTE: Averages are for households with disposable income greater than zero who own at least one auto.

U. S. GOVERNMENT PRINTING OFFICE ; 1977 O - 249-464