RATIONING

ANALYSIS OF GASOLINE RATIONING

Energy Conservation and Environment
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SUMMARY

Description of Rationing System

- Each licensed driver in the country would receive an equal monthly allotment of coupons entitling him to purchase 36 gallons/month at the controlled price. These coupons could be freely traded or sold. The coupon market would permit those drivers with needs greater than those represented by the monthly allotment to purchase additional coupons from those who use less than their monthly amount.

- Commercial users would receive coupon allotments equivalent to 90 percent of their consumption during the 1973 base period.

- For that limited class of users for whose special needs the coupon resale market is not a reasonable solution, 3% of the coupons would be set aside and distributed by the state. This distribution would be based primarily on emergency or hardship.

- Coupons would be picked up in person at Post Offices by each eligible individual. They will be invalidated at the pump at time of purchase, and deposited by retailers with banks in a special coupon account. Gasoline deliveries to suppliers will be made to retailers only for amounts equivalent to coupons collected.

Gasoline Use Data

- Estimated consumption in 1975 is 6.4 million barrels per day or 270 millions of gallons per day (MG/D)

- Number of licensed drivers in 1974 was 125.1 million. There will be an increase of up to 15 million anticipated if coupon rationing is put into effect.

- Without rationing, each driver would use 50 gallons per month.

- With the expected increase in licensed drivers and supply limited by 1 million barrels per day, by rationing, the allowance for each licensed driver would be:
  - per day = 1.2 gallons
  - per month = 36 gallons
  - per year = 432 gallons

roblems with Gasoline Rationing

Gallons per month and price of Gasoline

- To save 1 million barrels per day, while assuring adequate fuel for business will mean limiting each licensed driver to about 36 gallons per month, compared to current average of 50 gallons/month. It is expected that the coupons will sell for about $1.20 per gallon. Hence, for those who must purchase more than their basic ration, the effective price of gasoline (pump plus coupon price) is estimated at $1.75/gallon.

Impact on National Energy Goals

- Gasoline rationing, while it may limit consumption in the short run, makes no contribution to our mid- and long-term goals of energy independence, because it provides no incentives for increasing supply.

- Gasoline consumption is only 40% of total petroleum use. Residual and fuel oil comprise a substantial amount of total petroleum imports. By concentrating exclusively on private vehicles and gasoline, other fruitful areas for energy conservation are not addressed -- such as improved industrial efficiency and better constructed and insulated buildings. In the final analysis, we cannot be independent unless these other petroleum uses are also reduced dramatically.

Potential for Inequities

- Each person receives an equal number of coupons, but use of gasoline varies widely among drivers. Thus, rationing inevitably leads to inequities. Some examples are:

  - A widowed secretary with two children living in the suburbs who commutes 16 miles each way to work in a car that gets 12 mpg will experience a 68% increase in her commuting costs, because she must purchase 17 additional coupons each month at an average cost of $1.20 per gallon. This amounts to about $245/year in additional costs.

  - A blue-collar worker who owns a car that gets only 9 mpg can drive just over 320 miles/month on his basic ration, and could not easily afford to purchase a new, more efficient automobile. On the other hand, an affluent neighbor can readily trade in his equally inefficient old car to purchase one getting better than 22 mpg. This allows him to drive over 790 miles on the same allotment of coupons.

- Substantial regional inequities would exist. The average driver in some rural states such as Montana travels nearly 600 miles per month versus about 300 in less rural states such as New York and New Jersey. Similar disparities exist between city dwellers and suburbanites. Under rationing each would receive the same gallonage.

- Certain very poor persons, such as migrants, drive large distances each year. They can neither afford to buy additional coupons nor are alternative methods of transportation available to them.

- The recreation and tourism industry would be very heavily impacted, as would the auto industry. Automobile sales could decrease 35% from what they would otherwise be.

Increase Bureaucracy and Complexity

o The Government would be involved in many new aspects of our every day life, adding an inescapable portion of bureaucracy, complexity, and inconvenience.

o The Government would decide:

  - if a new business should get fuel;
  - if expanding businesses deserve more fuel;
  - if specific individuals would qualify for more coupons because of hardships.

o Gasoline rationing can be implemented but it is complex, expensive, and at best a short term solution. It takes 4-6 months to implement, about 15 to 25,000 full-time people and $2 billion in Federal costs, uses 40,000 Post Offices for distribution, and requires 3,000 state and local boards to handle exceptions.

o Because coupons are transferable, they must be picked up by each driver in person quarterly at Post Offices. Long lines and delays are inevitable.

o Gas stations, with limited quantities to sell, are unlikely to maintain more than the most limited service hours. Evening and weekend closings are almost a certainty.

Impact on GNP

- Use of allocation and rationing to reduce imports by one million barrels per day could create a drop of nearly 13 billion dollars in the GNP and place several hundred thousand more workers on unemployment rolls. Also, rationing would have an inflationary impact due to the significantly higher clearing price of gasoline coupons sold by those having excess coupons.

Comparison of Gas Rationing and President's Program

- Each option has major regional impacts; rationing hits the mountain states, the southwest and the mid-west hardest. The President's program affects New England and the east coast.
- Rationing will reduce consumption in the short term but is inadequate as long term solution. The President's program is effective in both the short and long run.
- Both rationing and the President's program transfer about $2 billion to poor families in the first year.
- Rationing is costly and complex; the President's program is inexpensive and easy to administer.
- Rationing raises the CPI by over 2.5 percentage points: the President's program by about 2.5 points.
- Rationing could cost the country $13 billion in GNP and a substantial increase in unemployment; the President's program would have negligible effects in each area.

DESCRIPTION OF COUPON RATIONING SYSTEM

At the time of the 1973 embargo an effort was begun to design a rationing plan. After much analysis regarding various possible approaches, that effort culminated in the development of a proposed rationing program and the purchase of 4.8 billion coupons. A description of that proposed plan is outlined below.

I. SYSTEM OPERATION

A. Entitlements

- An estimated 140 million licensed drivers receive an equal monthly coupon allotment (estimated at 36 gallons per month). These coupons could be freely traded and sold.
- Commercial users receive a coupon allotment equivalent to a percentage of base period consumption, estimated at 10% less than 1973 consumption.
- State set-aside for special cases (3% of available supply), i.e., migrants, the handicapped, etc.
- Government and non-profit organizations included in commercial sector.
- Coupons for first quarter are all of the same denomination, and are not serialized. Changes could be made in subsequent quarters.

B. Distribution

- Postal Service would distribute coupons at the 40,000 Post Offices four times a year.
- Estimated that 4.8 billion coupons would be needed in first quarter (amount currently in storage).
- Under special conditions, an agent could pick up coupons for those not able to do so themselves.
- Users would pay a fee of $3.00 per quarter amounting to $1.5 billion. (This would cover most of estimated program cost).
- Local Boards throughout the states would handle special appeals from state residents with emergency or hardship gasoline needs.
- In first quarter, individuals would turn in self-executed application forms at their Post Office. Postal employees would validate application, examine and mark driver's license, and issue ration coupons.

- In subsequent quarters, licensed drivers would receive state-issued authorization cards in the mail, entitling them to pick up ration coupons at their post offices.

- For first quarter, commercial users would submit an FEA form to their bank, which would issue them an allotment in the form of a coupon draft. These drafts would be exchanged for coupons at the Post Office. Forms would be forwarded by banks to FEA so that FEA could issue coupon drafts for the second and following quarters.

- Forms retained for audit purposes.

- U.S. agencies would apply directly to FEA for coupon allotments.

C. <u>Banking System</u>

- Commercial banks would be mainstay of coupon redemption mechanism.

- Initially, gas stations take deposit ration coupons received from motorists to local banks and receive gasoline drafts (in gallons) enabling them to purchase additional gasoline from their supplier.

- In subsequent quarters, a complete ration banking system would be established, in which commercial, government and non-profit users along with gas stations, and suppliers, would participate.

- FEA Processing Centers would handle initial applications and maintain records of all commercial users. These centers would issue drafts for ration coupons in subsequent quarters, through the mail.

D. <u>Coupon Resale Market</u>

- Unused coupons would be freely traded or sold. Those with excess coupons could sell them to those willing to pay the price.

- Federal Government would make no attempt to control or regulate trade in coupons except to identify and prohibit practices which inhibit natural interplay of market forces.

- It is estimated that excess coupons would be sought by more than one half of all users.

E. State Set-Aside

- o State set-aside of coupons (about 3%) would be available to recognize claims of users for whom the resale market is not a vehicle for their special needs.

- o About 3,000 local boards throughout the states would administer the set-asides, replying to applications.

- o The State set-aside will also be used for organizations or governmental units performing essential public health or safety services.

- o Federal Government could provide guidelines to assure uniform application of eligibility criteria.

F. Enforcement System

- o Vigorous enforcement program would be required to prevent widespread abuses.

- o The audit program would focus on commercial and non-profit users to detect overstatement of base period volumes, and on gasoline suppliers to detect illegal shipments of gasoline.

- o There would also be a system to detect multiple applications by individuals.

II. PRELIMINARY ESTIMATE OF RESOURCES REQUIRED (STEADY-STATE ANNUALIZED BASIS)

A. Personnel Resources

(1) Federal

FEA Headquarters - 625 positions

FEA Regions - 3,250 positions (1,200 opl; 2,000 enforcmt)

U.S. Post Office - unknown

Non-FEA Enforcement - 2,500 positions

(2) State and Local

3,000 local boards @10 each (15,000 volunteers; 15,000 support staff)

51 Department of Motor Vehicle @100 each - 5,100 positions

B. Costs

	(million $)
USPS Distribution @ $1.60 per transaction	845
USPS shipping costs	50
Coupon printing serialized	195
Forms printing	30
ADP system	200
Public Education Materials	10
	1,330
Direct Salaries	
o Federal (6375 @ 20K)	127.5
o State and local (20,100 @ 20K)	402
GRAND TOTAL	1.86 billion

GASOLINE USE DATA

Use Data

A. Estimated consumption in 1975

Millions of barrels per day (MB/D)	6.4 MB/D
Millions of gallons per day (MG/D)	270 MG/D

B. End use categories - volume (MG/D) and percent

Private use	205	76%
Business/Commercial	57	21%
Government	8	3%

C. Number of registered vehicles in 1975 — 130.75 million

D. Number of licensed drivers in 1974 (increase of up to 15 million anticipated if coupon rationing is put into effect) — 125.1 million

Programmatic Assumptions for Rationing

A. Will achieve 1 MB/D saving through reduction in gasoline consumption

B. Business will receive 90% of 1973 gasoline consumption

C. Coupons will be provided to licensed drivers as opposed to allocations based on registered vehicles

Key Parameters of Data and Assumptions

A. Savings target (1 million B/D) — 42 MG/D

B. Business and Government Allowance

- o Estimated 1975 consumption — 65 MG/D
- o Less 10% of 1973 Consumption — 6 MG/D
- o Allowance — 59 MG/D

C. Private Use Allowance

- o Estimated 1975 consumption — 205 MG/D
- o Less reduction — 36 MG/D
- o Allowance — 169 MG/D

D. Allowance for Each Licensed Driver

Gallons: Per day = 1.2
per month = 36
per year = 432

E. Private Use of Automobiles by Trip Purpose

Work trip	31%
Recreational trip	31%
Family business	34%

PROBLEMS WITH GASOLINE RATIONING

Gallons per Month and Price of Gasoline

- To save 1 million barrels per day, while assuring adequate fuel for business will mean limiting each licensed driver to about 36 gallons per month, compared to current average of 50 gallons/month and restricting businesses to 10% less than their last year's use. It is expected that the coupon will sell for about $1.20 per gallon during the first year. Hence, for those who must purchase more than their basic ration, the effective price of gasoline (pump, plus coupon price) is estimated at $1.75/gallon.

Impact on Energy Conservation Goals

- Gasoline rationing, while it may limit consumption in the short run, makes no contribution to our mid- and long-term goals of energy independence.

- Rationing limits the consumption of gasoline not through price but through proscription. Thus, an artificial shortage is created, inciting people to attempt to "beat the system" rather than to conserve fuel.

- Moreover, because of the inherent complexities in even the most carefully designed rationing system, and the fluid nature of American society, a rationing scheme is probably limited to a useful life of no more than two years. Thus, even as a conservation tool, it has a limited utility.

- Rationing provides no incentive for increasing domestic petroleum supply or bringing on alternate energy sources.

- Gasoline consumption is only 40% of total petroleum use. Residual and fuel oil compromise a substantial amount of total petroleum imports. By concentrating exclusively on private vehicles, many other fruitful areas for energy conservation are not addressed -- such as improved industrial efficiency, better constructed and insulated buildings, less wasteful use of electricity and natural gas. In the final analysis, we cannot be independent unless those other petroleum uses are also reduced dramatically.

Potential for Inequities

- Each person receives an equal number of coupons, but use of gasoline varies widely among drivers. Governmental decisions will be based on statistical averages and broad, objective criteria; they cannot possibly take into account most of the differences in individual needs and preferences. Thus, rationing inevitably leads to inequities. Some examples are:

- A widowed secretary with two children living in the suburbs who commutes 16 miles each way to work in a car that gets 12 mpg will experience a 68% increase in her commuting costs, because she must purchase 17 additional coupons each month at an average cost of $1.20 per gallon each. This amounts to about $245/year in additional costs.

- A blue-collar worker who owns a car that gets only 9 miles/gallon can drive just over 320 miles/month on his basic ration, and could not easily afford to purchase a new, more efficient automobile. On the other hand, an affluent neighbor can readily trade in his equally inefficient old car to purchase one getting better than 22 mpg. This allows him to drive over 790 miles on the same allotment of coupons.

- A single individual with a mid-size car (14 mpg) could drive up to 17 miles/day. If he wanted to take a 500 mile trip over a long 4-day weekend, he could only use his car for that four-day period during that month. He would have to arrange for other transportation for the remaining 26 days of the month, or purchase additional coupons.

- A Congressman living in Georgetown has enough gas to drive his 10 mpg car to work by himself 5 days a week and still travel 54 miles on the weekend.

- Substantial regional inequities would exist. The average driver in some rural states such as Montana travels nearly 600 miles per month versus about 300 in less rural states such as New York and New Jersey. Similar disparities exist between city dwellers and suburbanites. Under rationing each would receive the same gallonage.

- A family of 4 with two licensed drivers and one car which gets 15 mpg moves from New York to California. This move would take 2-3/4 months of the family's coupons. One out of every five families moves every year.

- Certain very poor persons, such as migrants, drive large distances each year. They can neither afford to buy additional coupons nor are alternative methods of transportation available to them.

- A family in which the husband, wife and two teenage children all drive would receive sufficient coupons to drive approximately 2160 miles per month while the next door neighbor with only one licensed driver could drive only 540 miles per month, assuming both own cars which get 15 mpg.

- The recreation and tourism industry would be very heavily impacted, as would the auto industry. Automobile sales would decrease 35% from what they would otherwise be.

- A small successful Midwestern sales firm which had increased its business and sales area 50% since 1973 would have the market area it can cover reduced 40% under its basic rationing allotment.

Increased Bureaucracy and Complexity

- The Government would be involved in many new aspects of our everyday life, adding an inescapable portion of bureaucracy, complexity, and inconvenience.

- Gasoline rationing can be implemented but it is complex, expensive, and at best a short term solution. It takes 4-6 months to implement, about 15 to 25,000 full-time people and $2 billion in Federal costs, uses 40,000 Post Offices for distribution, and requires 3,000 state and local boards to handle exceptions.

- The Government would decide:

  - if a new business should get fuel;
  - if expanding businesses deserve more fuel;
  - if specific individuals would qualify for more coupons because of hardships.

- Because coupons are transferable, they must be picked up by each driver in person quarterly at Post Offices. Long lines and delays are inevitable.

- Gas stations, with limited quantities to sell, are unlikely to maintain more than the most limited service hours. Evening and weekend closings are almost a certainty.

- The longer a rationing program is in place, the more likely collusive and illegal behavior becomes, such as counterfeiting or pilferage of coupons.

Impact on GNP

- Use of allocation and rationing to reduce imports by one million barrels per day would create a drop of nearly 13 billion dollars in the GNP and place several hundred thousand more workers on unemployment rolls. Also, rationing would have an inflationary impact due to the significantly higher market clearing price of gasoline (pump plus coupon) resulting from reduced supplies.

- Rationing leads to distortions in the marketplace as adjustments in business investments, modes of distribution, and purchases are made based on artificial, rationing-imposed costs.

Impact on Poor

- Low income people are likely to drive less than average and thus, have excess coupons to sell. If speculators buy large quantities of coupons from the poor at low prices in order to resell them at high prices to the more affluent, the potential income benefits of the rationing program will be garnered by these entrepreneurs rather than by the poor.

Effects on Refining Runs

- A reduction of 1 million barrels per day in the use of gasoline through rationing would have the following effects on refining production:

  - 1,500,000 b/d crude oil imports

  + 500,000 b/d product imports (made up of approximately 300,000 b/d residual oil products and 200,000 b/d middle distillates)

- Such a reduction is likely to reduce domestic petroleum related employment, increase the cost/barrel of domestic production, and decrease the production rate and efficiency of U.S. refiners.

COMPARISON OF GAS RATIONING AND PRESIDENT'S PROGRAM

There are two principal options for reducing petroleum imports in the short to mid-term. They include the President's program of a petroleum tariff and decontrol of domestic oil prices; and a cap on imports with gasoline rationing and petroleum allocation. This paper briefly describes these options and discusses the impact of each on reducing imports, regional equity, inflationary impact, impact on the poor, administrative complexity and cost, and impact on the recession and employment.

OPTION A: IMPORT CAP/RATIONING

- A volumetric limit would be placed on imports equivalent to the reductions called for in the President's program. A reduction of 1 million barrels per day cannot feasibly be allocated without rationing.
- The current system of price controls for petroleum would be strengthened, including control of new domestic crude; thus an artificial shortage would be created.
- Since price is not used to determine distribution of petroleum products, the government would maintain its system of allocating to retailers, based essentially on historical use for products other than gasoline. The government would also control refinery yields.
- To prevent long gas lines, coupon rationing would be introduced. Such a program would include as its basic features:

  1) Each licensed driver would receive an equal monthly coupon allotment; these coupons could be freely traded or sold. The coupon market (the "white market") permits those drivers with needs greater than those represented by the monthly allotment to purchase additional coupons from those who use less than their monthly amount. Thus the market, rather than the government, is responsible for assessing "need" for gasoline above the basic minimum ration. Failure to provide a white market would invite a black market and increase the inequities.

2) Commercial users, whether they buy in bulk or at the pump, would receive coupon allotments equivalent to a percentage of their consumption during the 1973 base period.

3) For that limited class of users (migrants, handicapped, etc.) for whose special needs the coupon resale market is not a reasonable solution, a proportion of coupons would be set aside and distributed by the state. This distribution would be based primarily on emergency or hardship needs.

4) Coupons would be picked up in person at Post Offices by each eligible individual. They will be invalidated at the pump at the time of purchase, and deposited by retailers with banks in a special coupon account. Gasoline deliveries to suppliers will be made to retailers only for amounts equivalent to coupons collected.

OPTION B: PRESIDENT'S PROGRAM OF TARIFF, TAX DECONTROL AND REBATE

o After April 1975, this program would consist of an additional tariff on petroleum imports of $2 per barrel and an excise tax of $2 per barrel on all domestic petroleum.

o Domestic oil prices will be decontrolled and a windfall profits tax implemented to ensure that the revenue generated will accrue to the government, not the oil companies. This will raise the overall price of petroleum by $2 a barrel. The tariff, taxes and decontrol, then, will add $4 to the price of a barrel of oil.

o In addition, an excise tax on natural gas equivalent to $2 a barrel would be adopted and new natural gas prices deregulated to equalize the impact on oil and natural gas consumers and decrease natural gas consumption.

o $30 billion will be collected by the government from the tariff and taxes. These revenues will all be rebated to consumers and governments.

Regional Disparities

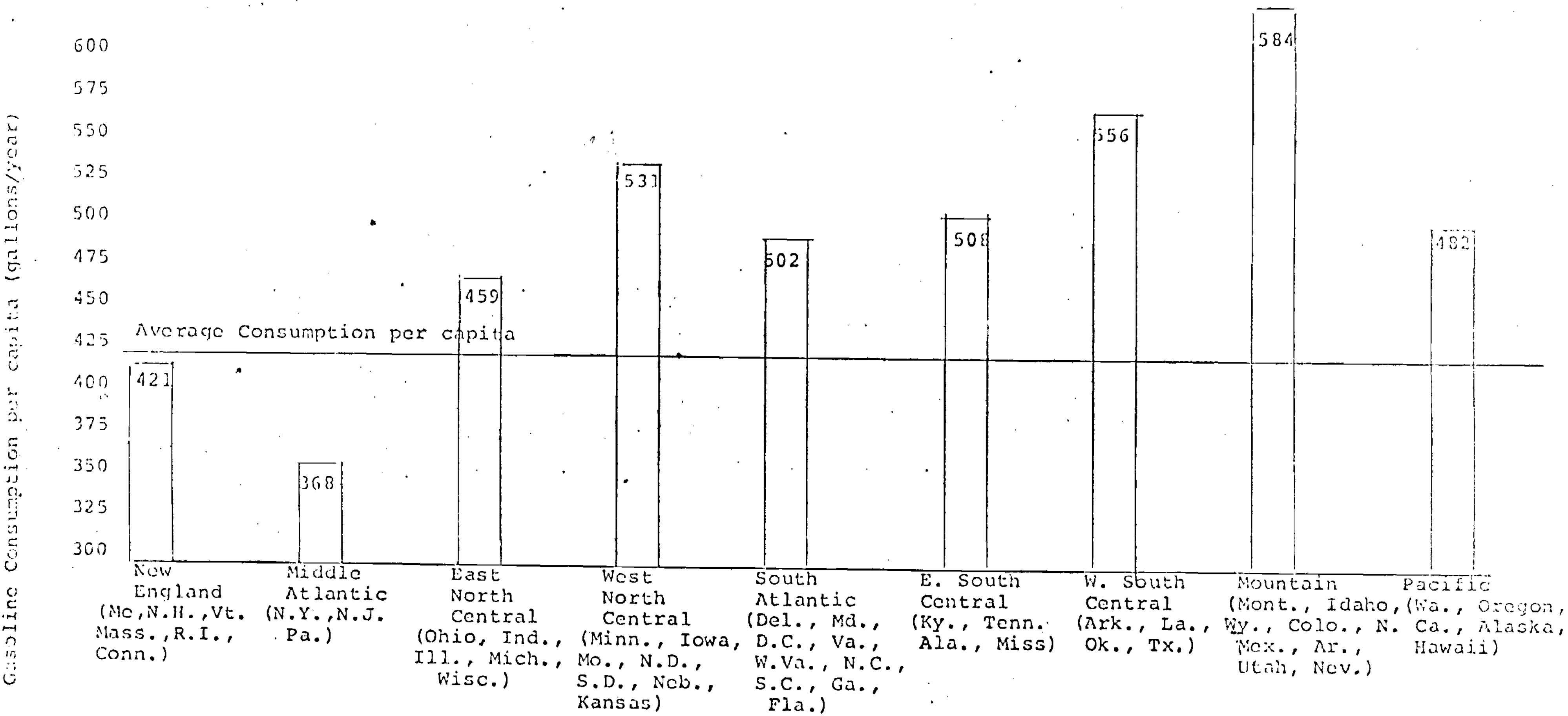
- Both options have major regional impacts. There are substantial regional variations in per capita gasoline use. Those in the Middle Atlantic states use less than two-thirds the gasoline of those in the Mountain states. Gasoline rationing as the attached chart shows, weighs more heavily on residents of the mountain states, southwest, and mid-west than on other citizens.

- Reliance on gasoline to bear the brunt petroleum cutbacks also discriminates against rural dwellers and in favor of those in cities. In the aggregate, rural dwellers use almost twice the gasoline/year of city dwellers.

- The President's program, which includes oil, natural gas and electricity generated from petroleum, impacts most heavily on the New England, West North Central, West South Central, and Mountain states.

Petroleum and Natural Gas Use by Regions of the United States

* Per Household per Year	Petroleum Consumption (bbl) *	Natural Gas Consumption (MMCF) *	Petroleum & Natural Gas (BTU) *
United States Total	744.02	3.307	7384.8
New England	120.57	.071	731.74
Mid-Atlantic	85.81	.156	625.86
East North Central	66.19	.326	688.85
West North Central	74.12	.386	792:61
South Atlantic	88.62	.164	649.80
East South Central	62.34	.299	640.76
West South Central	97.89	1.158	1694.87
Mountain	80.51	.467	907.81
Pacific	67.97	.280	652.37


Gasoline Consumption per capita (gallons/year)
600
575
550
525
500
475
450
425
400
375
350
325
300
Average Consumption per capita
421
368
459
531
502
508
556
584
482
New England (Me, N.H., Vt. Mass., R.I., Conn.)
Middle Atlantic (N.Y., N.J. Pa.)
East North Central (Ohio, Ind., Ill., Mich., Wisc.)
West North Central (Minn., Iowa, Mo., N.D., S.D., Neb., Kansas)
South Atlantic (Del., Md., D.C., Va., W.Va., N.C., S.C., Ga., Fla.)
E. South Central (Ky., Tenn. Ala., Miss)
W. South Central (Ark., La., Ok., Tx.)
Mountain (Mont., Idaho, Wy., Colo., N. Mex., Ar., Utah, Nev.)
Pacific (Wa., Oregon, Ca., Alaska, Hawaii)

Effectiveness in Reducing Imports in Short and Long Term

- In the mid to long term the elasticity for gasoline is lower than that for other petroleum products. This is because there are fewer substitutes for gasoline than there are for other fuels. This means that an increase in the price of all petroleum products (President's program) will reduce imports more than an equal increase in the price (gasoline tax) of gasoline. In the short term this is not the case.

- The reduction in imports from the President's program option is 900,000 barrels per day in 1975, 1.6 million in 1977, and 2.1 in 1985. This estimate is not a guaranteed saving, but is based on econometric studies.

- The rationing/allocation option could obviously be adjusted to any level desired. The level considered in this paper is 1 million barrels per day in 1975 moving to 1.5 million in 1977. Because of the complexity of the administration and the limited ability of a rationing program to adjust to changes in the economy (e.g., people moving, new businesses started) it is probably not a viable option for more than one or two years. Hence, it is not really a feasible part of a mid or long term program. Moreover, the longer the system lasts, the more exceptions are made, the more people learn how to evade the rules, and the greater are the opportunities for counterfeiting and abuse.

- If we are to reduce significantly our vulnerability to imports in the mid and long term we must adopt an option to reduce consumption of petroleum that can be effective in 1980 and 1985.

Income Effect

- Gasoline rationing would have some beneficial impact as lower income people sell their excess coupons to those with higher income who in general use more gasoline. This effect would be somewhat limited by the plan to distribute coupons only to licensed drivers. The actual income transfer effects depend on the size of the shortage and the marginal price of the coupons.

- Private sector demand for gasoline in 1975 is estimated to be approximately 206 MG/D. Reducing daily petroleum consumption by 1 MMB/D solely through reductions in gasoline would result in a 17 percent reduction in supplies. The equilibrium price of gasoline would be about $1.75 per gallon ($.56/gal pump price plus $1.19/coupon).

- The average "poor" household consumes 404.7 gallons of gasoline per year per vehicle while the "lower," "middle" and "well-off" households average 632.2, 823.1, and 800.8 gallons per year per vehicle, respectively. The average number of gallons of gasoline consumed per vehicle is 727.8. The surplus/shortage of gasoline per household group and the potential income transfer can be calculated by comparing the individual household consumption rates with the average consumption rate. The table shows the average gasoline use, by household income, the surplus/shortage of gasoline, and the net income transfer likely to occur through the sale of coupons.

GASOLINE CONSUMPTION
AND INCOME TRANSFER

Income	(0-5,000)	(5,000-12,000)	(12,000-16,000)	(16,000+)
Gal/Veh	404.7	632.2	823.1	800.8
Net Surplus/ Shortage (Gal/Veh)	+199.4	-28.1	-219.0	-196.7
Net Income Transfer ($Billions)	+2.20	-.20	-.92	-1.08

- The poor household would have surplus coupons for 1,852 billion gallons of gasoline. The coupons for purchase of gasoline would trade at $1.19/gallon which would result in a net transfer of 2.20 billion dollars to the poor category of households in the first year.

- o Similarly, the President's program would transfer roughly $2 billion from those with incomes above $12,000 to those with lower incomes, preliminary calculations indicate.

	Income ($1,000)			
	0-5	5-12	12-16	16+
Additional Cost of Energy ($Mil)	725	8,200	2,900	7,500
Rebated Revenues ($Mil)	3,520	7,350	3,610	4,520
Net Transfer ($Billions)	+1.36	+0.44	-1.06	-.74

Administrative Complexity and Cost

- o The cost and number of people required to implement the President's system of tariffs, taxes and rebates is estimated at about $50 million and 400-500 additional people on the government payroll.

- o The complexity of administering gasoline rationing and allocation is considerably greater than the other option, both because of the printing, distribution, collection, and control of coupons and because of the exceptions process for the poor necessary in every state and local community. Rationing will require an additional 17,000 government employees and approximately $2 billion per year to administer.

Inflationary Impact

- o A $2/barrel import tariff plus excise taxes on domestic petroleum and natural gas would increase the Consumer Price Index by about 2.5 percentage points in 1975. Again, these fees would be returned to consumers so that the overall level of disposable income would not be changed.

o Under rationing, the cost of buying an additional coupon should stabilize at the market clearing level of $1.19. Thus, there would be an "inflationary" impact of over 2.5 percentage points on the Consumer Price Index in 1975.

ADDENDUM

To save 1MMB/D of petroleum imports in 1975 could be accomplished by reducing market supplies of gasoline, distillates, residual etc., in varing amounts. The amount of gasoline that would be available for private use and the costs of gasoline would depend on the amount of petroleum saving that is "loaded" onto gasoline. The table shows the amount of gasoline per registered driver, the percent reduction of gasoline supply, and the estimated cost of coupons under 100, 70 and 50 percent application of petroleum saving to gasoline.

% of 1MMB/D Applied to gasoline	Gasoline per driver/wk (gals)	Gasoline per driver per month (gals)	Cost of coupon ($ per gal)
100	8.4	36	1.19
70	9.1	39	.64
50	9.5	41	.38

A similar computation for a rationing program lasting through 1977 and equaling the impact of the President's tax package (1.6 MMBD savings of petroleum imports) can be made:

% of 1MMB/D Applied to gasoline	Gasoline per driver/wk (gals)	Gasoline per driver per month (gals)	Cost of coupon ($ per gal)
100	7.5	32	.70
70	8.2	35	.41
50	8.8	38	.26

ALLOCATION AND
PRICE CONTROLS

February 4, 1975
Conservation and
Environment

ALLOCATION AND PRICE CONTROLS AS A SOLUTION TO THE ENERGY PROBLEM

Introduction

Allocation is one method of distributing petroleum products throughout the U.S. economy. It does not of itself reduce demand; it merely provides a set of rules and mechanisms to pass out whatever quantity of petroleum supplies are available. Allocation has been linked with price controls, and will no doubt continue to be. This paper discusses the possible use of a mechanism consisting of an import cap, price controls and allocation as an alternative to the President's program to reduce imports. It assumes that the import cap will be used to reduce petroleum imports by one million barrels a day; that prices will not then be allowed to rise to market clearing levels and thus a shortage will be created; and that this shortage will be managed by an allocation program similar in most respects to that which has been in effect since January, 1974.

This should not be confused with the President's program to limit imports. The President's proposal would not create a shortage in fuel and, hence, does not depend on an allocation mechanism to distribute the shortage around the country. Instead, the President's program, by increasing the price for petroleum relative to other goods and services, would cause individuals and industry to reduce their demand for petroleum products thereby reducing the need for imported oil.

Present Allocation Program

The Emergency Petroleum Allocation Act of 1973 provides for the mandatory allocation of crude oil, residual fuel oil and certain refined petroleum products, and for price controls for the producer, refiner, reseller, and retailer levels of the petroleum marketing chain. Major features of the present program are:

- First sales of domestic crude oil are subject to a "two-tier" pricing system. "Old" oil (crude oil produced in amounts up to 1972 levels from a particular property) is priced at an average of $5.25 per barrel. Oil produced from a property in excess of 1972 levels and oil from a property which produced less than 10 barrels per well per day may be sold at free market prices. The price of imported crude oil is also uncontrolled.

- In general, refiners may pass along their increased crude oil costs and some limited non-product cost increases, but may not generally increase profit margins. These same rules apply down the marketing chain: a dollar-for-dollar pass-through of increased product costs, and some additional limited increases in selling prices to reflect non-product cost increases.

- The regulations provide for a crude oil supply program for small and independent refiners, utilizing a freeze as of December 1, 1973 of supplier-purchaser relationships for crude oil and a buy/sell list, under which the 15 major oil corporations are required to sell specified volumes of crude oil to these small and independent refiners. There is also a program which provides for substantial equalization of average crude oil prices among refiners by the purchase and sale of "entitlements" to run cheap, price-controlled "old" oil in the same nationwide proportion at all refineries.

- Refined products are distributed to ultimate users in accordance with the allocation regulations, except for gasoline, where the mandatory allocation chain ends at the retail station and bulk purchaser. Three general classes of users are established:

  - Those users who are authorized to receive their "current requirements" - essentially whatever they request -- and are not subject to any allocation fraction. This includes Department of Defense, agriculture, and space heating for hospitals.

  - Those who receive their current requirements but are subject to an allocation fraction -- emergency services, energy production, etc.

  - Those who receive some percentage of their historical consumption, or "base period volume" (usually based on 1972) and are subject to an allocation fraction.

  - These class definitions, and further percentage delineations within the third class are decided by the government and are spelled out in detail in regulations. Their effect is to limit each user to a specific monthly, or for some fuels quarterly, authorized amount; the user/category scheme varies from one petroleum product to another.

- A supplier must continue to supply the same customers he serviced during the base period. If he has sufficient product to meet the sum of all his customers' authorized amounts, he delivers this amount to each. If not, he reduces each purchaser's share on a pro rata basis by applying his "allocation fraction", equal to his total supply over the sum of his customers' authorizations, and delivers this percentage of authorization to each customer.

- A portion of the product is reserved for each state to use flexibly to eliminate hardships. This "state set-aside" is administered by state energy offices.

- A detailed case handling and appeals process has been established to handle adjustments of base period use to account for changed circumstances or unusual growth, and other applications for exceptions and assignment of supplier.

Positive Aspects of an Import Cap and Allocation Program

There are at least four positive accomplishments that can be expected from a cap on imports and allocation.

- The level of reduction in petroleum imports can be established with certainty. There is no dependence on price elasticities of energy for achieving conservation results.

- Prices can be kept from rising, thus minimizing any increase in the consumer price index.

- Although the allocation program does not save energy, it can spread around the nation the shortages caused by the import cap, thus tempering the regional impacts of such a program.

- The Government can make gross choices as to which sectors of the economy should be allocated the greatest portion of the shortage. For example, fuel can be made available to the industrial sector at the expense of home heating fuel or gasoline for automobiles.

Basic Difficulties with An Import Cap and Allocation

- Under an allocation program the government replaces the market in distributing energy supplies. Several significant problems arise with such a substitution.

  -- An allocation system depends on a government determination of a person's "need" for fuel, and yet need is almost impossible to define. The standards currently employed for making this determination rely on historical use and a government judgment on priorities (e.g., agriculture should get all the fuel it needs). Unfortunately, in thousands of cases, the amount of fuel an individual or firm used two years ago may have little or no relation to how much fuel he currently needs. Thus, an exceptions process must be created and administrative judgment and procedures used to supplement the historical use standard. There simply are not enough Solomons around to make such a system work well.

  In addition, any system that classifies users according to government-determined priorities shifts the struggle for market advantage from the marketplace to the offices of those who write definitions and regulations. The political pressures to give groups special preference become very great. Should tobacco growing be made part of agriculture, and thus tobacco growers be made eligible for the same priority as wheat farmers? What about green houses growing flowers? Are portable toilets part of "sanitation services?" Those who are most effective in these political battles are not necessarily those who would be the most effective in a competitive market situation but for each the decision regarding their allocation priority can make the difference as to whether the business thrives or suffers.

-- Because the allocation of petroleum products under an allocation system is performed by the Federal and State governments rather than by the market, public costs are incurred. Allocation during the recent embargo required the full-time efforts of about 4,000 people and cost approximately $100 million; in addition, substantial record keeping, reports and audits were required of the private sector.

-- An allocation system assumes that retailers will distribute supplies according to rules set by the government. In practice, however, it is impossible to enforce these rules equitably among thousands of gas station operators and fuel oil dealers. Thus practices such as preferential treatment for special customers, car wash/gasoline fill-up schemes, pre-paid gasoline contracts, and even direct black market operations quickly spring up.

- Allocation does not aid in solving mid- or long-term energy problems. An allocation program, while it is useful in managing a shortage created by embargo or a cap on imports, makes no contribution to our mid- and long-term goals of energy independence, because it provides no incentive for increasing domestic energy supply.

- Choosing the base period in an allocation system is an especially difficult problem. On the one hand, choosing an early base period such as 1972, for which complete data are available, means making numerous individual changes in the system to mirror current consumption, since thousands of new businesses have begun, old ones failed, and many people moved in the intervening years. Using a more recent base period, however, penalizes those who conserved during this period while rewarding those in the same allocation category who did not curtail wasteful fuel use during the base period.

- Allocation has a retarding effect on GNP growth and employment. A reduction of 1 million barrels a day through an import cap and allocation will reduce GNP by an estimated 6 billion dollars and place 250,000 more people on unemployment rolls.

This occurs because an allocation program must spread fuel across the various sectors of the economy according to a set of relatively inflexible and complicated national rules. Energy thus is made available for both more efficient and less efficient uses. On the other hand, reliance on higher prices and the market to deal with a shortage means on the whole a distribution of fuel to those who value it most. It is then more likely to be used efficiently for productive purposes resulting in a higher GNP and greater employment.

- While an allocation and price control program would limit direct increases in fuel costs, it does carry with it other costs. Examples abound: reduced airline schedules and thus reduced mobility; sales of petroleum products linked to contracts or sales of other goods and services; drastically limited service hours; and above all, continuing uncertainty as to supply availability which makes planning impossible for businesses and individual citizens. In this regard, the major cost to the consumer will likely be the inconvenience of gasoline lines. To minimize the negative impact of the shortage on the economy and jobs, most of the reduction in consumption would probably have to come from private auto use of gasoline. Thus, a substantial reduction in imports is likely to result in a recurrence of last year's long gasoline lines.

- Even the best designed allocation program generates unforeseeable effects. During the recent embargo, for example, people took few long trips. Thus rural gasoline consumption was down relative to urban consumption; since allocations to gasoline stations were based on historical consumption, urban stations were unable to supply the unexpected increased demand resulting from this changed consumption.

- An allocation program is not an effective conservation tool and has limited utility as a means of distributing products in short supply due to a cap on imports. Because of the inherent complexities in even a carefully designed allocation system, and the fluid nature of American society, the larger the shortage, the shorter the useful life of such a system.

ACHIEVEMENT OF ONE
MILLION BARREL/DAY
IMPORT SAVINGS

Revised Base Case Forecast and The President's Program Forecast

National Petroleum Product Supply and Demand

Technical Report 75-2

Office of Quantitative Methods

February 5, 1975

Federal Energy Administration

Washington
D.C. 20461

NATIONAL PETROLEUM PRODUCT SUPPLY AND DEMAND

REVISED BASE CASE FORECAST AND

THE PRESIDENT'S PROGRAM FORECAST

Technical Report 75-2

F.E.A. - E.A.T.R. - 75-2

February 5, 1975

Short Range Modeling and Forecasting Division

Office of Quantitative Methods

Federal Energy Administration

This Technical Report replaces Technical Report 75-1, <u>Comparison of Forecasts of Petroleum Product Demand Illustrating the Effects of Prices and Other Factors</u>, FEA, January 16, 1975.

SUMMARY

For 1975 as a whole it is estimated that the President's program will:

- -- reduce aggregate petroleum demand by 548 MBD;
- -- increase domestic production by 101 MBD;
- -- reduce petroleum imports by 649 MBD.

The effects of each component of the President's program grow over time. As a result, for the fourth quarter 1975 the impact will be greater than when averaged over the entire year. For fourth quarter 1975:

- -- aggregate petroleum demand will be reduced by 880 MBD;
- -- domestic production will be increased by 160 MBD;
- -- petroleum imports will be reduced by 1040 MBD.

By December 1975 the President's goal of reducing petroleum imports by one million barrels per day will be surpassed under the President's program. For December under the program

- -- aggregate petroleum demand will be reduced by 934 MBD;
- -- domestic production will be increased by 160 MBD;
- -- petroleum imports will be reduced by 1094 MBD.

The import savings in December 1975 are accounted for as follows (MBD):

160	Elk Hills development
98	conversion to coal
147	suspension of gas curtailments
689	effects of higher prices
1094	

The reductions in petroleum demand by product in December 1975 will be (in MBD):

motor gasoline	-278
distillate	-238
residual	-310
all other products	-108
Total	-934

INTRODUCTION

This Technical Report presents the results of implementing FEA's short term petroleum product supply/demand balance simulation under two sets of assumptions: a Base Case scenario which documents petroleum product supply and demand using a current macroeconomic simulation and updated price and weather data; and a Policy Option Scenario which incorporates the particulars of the President's energy program into the Base Case scenario. The supply and demand forecasts presented here are slightly different from those prepared in December 1974 and early January 1975 in that:

- -- the particulars of the President's program (rather than its general structure) are accounted for explicitly;
- -- more recent macroeconomic forecasts are available; and
- -- price and weather data have been updated.

The impact of the President's program on aggregate petroleum demand and petroleum imports for 1975 as a whole, fourth quarter 1975, and December 1975 are presented in a summary section. Other sections of the report present the scenarios and associated supply and demand forecasts, the derivation of the effect of the President's program on petroleum prices, and the derivation of forecast inventory policies. The forecasting procedure utilized for this report is documented in National Petroleum Product Supply and Demand, October 1974 Through 1975, Technical Report 74-5, FEA, November 8, 1974.

Appendices present a comparison of alternative forecasts documenting the effects of prices and other important factors, alternative elasticity estimates, and factors influencing a determination of the price of imported crude oil.

SUPPLY/DEMAND BALANCE SCENARIOS AND FORECASTING RESULTS

Two supply/demand balance scenarios are presented: a Base Case and a Policy Option Scenario. The two scenarios are specified as follows.

> Base Case: The petroleum product demand simulation documented in Technical Report 74-5 was utilized. Based upon recent economic indicators, a DRI macroeconomic simulation prepared in December was incorporated in the demand forecast; this simulation projected relatively weak consumer demand over 1975 with a decline in real GNP of 3.5 percent over the year. The relative prices of the products were held constant at their last observed level.
>
> Policy Option Case: This case differs from the Base Case through the incorporation of the President's energy policy as given in the State of the Union Message.
>
> The price assumptions occasioned by the imposition of import fees and deregulation are given below in the section on prices. In addition it was assumed that:

-- domestic production increases by 160 MBD by the end of 1975 due to the development of Elk Hills;

-- petroleum demand is reduced by 98 MBD due to switching from oil to coal;

-- petroleum demand due to natural gas curtailments ceases after May 1, 1975 due to the deregulation of new natural gas at the wellhead;

-- price changes due to the President's policies are held constant in real terms at their May 1975 levels.

The Base Case supply/demand balance scenario is presented in Table I and the Policy Option scenario in Table II. Tables III through VII itemize the impact of the various components of the President's program by product for each quarter of 1975 and for 1975 as a whole.

Table I

Base Case (1/25)
Supply and Demand Forecast
(MBD)

Forecast without Implementation of the President's Program		1975				
		1Q	2Q	3Q	4Q	Year
D	MOGAS	6178	6715	6880	6614	6597
E	Distillate	3916	2546	2215	3457	3034
M	Residual	2654	2010	1935	2401	2250
A	Kerojet	769	812	815	838	809
N	Naphthajet	211	248	244	276	245
D	Petrochemicals	333	338	337	350	339
	LPG	1560	1076	1025	1470	1283
	Other products	2029	2127	2383	2178	2179
al all products		17650	15872	15834	17583	16735
S	Domestic: Crude	8663	8622	8575	8540	8600
U P	NGL	1676	1657	1650	1656	1660
P L	Gain	413	399	357	407	393
Y						
Total Domestic Supply		10752	10678	10582	10603	10653
Change in inventories		-229	+165	+323	-260	0
Imports		6669	5359	5575	6720	6082
Total all products		17650	15872	15834	17583	16735

Table II

Supply and Demand Forecast
with the President's Program
(MBD)

	Forecast with full Implementation of the President's Program		1975 1Q	1975 2Q	1975 3Q	1975 4Q	Year
D	MOGAS		6139	6489	6603	6336	6392
E	Distillate		3915	2462	2055	3243	2919
M	Residual		2625	1879	1718	2118	2085
A	Kerojet		767	803	797	816	796
N	Naphthajet		211	245	238	269	241
D	Petrochemicals		332	330	322	333	329
	LPG		1559	1068	1009	1445	1270
	Other products		2027	2108	2344	2143	2155
Total all products			17575	15383	15085	16703	16187
S U	Domestic:	Crude	8703	8702	8695	8700	8701
P P		NGL	1676	1657	1650	1656	1660
L Y		Gain	413	399	357	407	393
Total Domestic Supply			10792	10758	10702	10763	10754
Change in inventories			-229	+165	+323	-260	0
Imports			6554	4790	4706	5680	5433
Total all products			17575	15383	15085	16703	16187

Table III

Impact of the President's Program
First Quarter 1975
(MBD)

Product	Demand Changes: Price Effects	Demand Changes: Coal Conversion	Demand Changes: Suspension of gas Curtailments	Total
MOGAS	-39	0	0	-39
Distillate	- 1	0	0	- 1
Residual	- 4	-25	0	-29
Kerojet	- 1	0	0	- 1
Naphtajet	- 1	0	0	- 1
Petrochemicals	- 1	0	0	- 1
LPG	- 1	0	0	0
Other	- 2	0	0	- 2
otal all Products	-49	-25	0	-75

Elk Hills Development - 40

Current change in consumption
Demand for petroleum imports = -115

Table IV

Impact of the President's Program
Second Quarter 1975
(MBD)

	Demand Changes			
Product	Price Effects	Coal Conversion	Suspension of gas Curtailments	Total
MOGAS	-227	0	0	-227
Distillate	- 20	0	-62	- 82
Residual	- 48	-49	-34	-131
Kerojet	- 9	0	0	- 9
Naphtajet	- 3	0	0	- 3
Petrochemicals	- 8	0	0	- 8
LPG	- 9	0	0	- 9
Other	- 20	0	0	- 20
Total all Products	-344	-49	-96	-489
Elk Hills Development			-	80
Current change in consumption Demand for petroleum imports			=	- 569

Table V

Impact of the President's Program
Third Quarter 1975
(MBD)

	Demand Changes			
Product	Price Effects	Coal Conversion	Suspension of gas Curtailments	Total
MOGAS	-278	0	0	-278
Distillate	- 64	0	-96	-160
Residual	- 89	-74	-54	-217
Kerojet	- 19	0	0	- 19
Naphtajet	- 6	0	0	- 6
Petrochemicals	- 15	0	0	- 15
LPG	- 16	0	0	- 16
Other	- 38	0	0	- 38
Total all Products	-525	-74	-150	-749

Elk Hills Development - 120

Current change in consumption
Demand for petroleum imports = -869

Table VI

Impact of the President's Program
Fourth Quarter 1975
(MBD)

	Demand Changes			
Product	Price Effects	Coal Conversion	Suspension of gas Curtailments	Total
MOGAS	-278	0	0	-278
Distillate	-120	0	-94	-214
Residual	-131	-98	-53	-282
Kerojet	- 22	0	0	- 22
Naphtajet	- 7	0	0	- 7
Petrochemicals	- 17	0	0	- 17
LPG	25	0	0	- 25
Other	- 35	0	0	- 35
Total all Products	-635	-98	-147	-880

Elk Hills Development	-	160
Current change in consumption Demand for petroleum imports	=	-1040

Table VII

Impact of the President's Program
Annual 1975
(MBD)

	Demand Changes			
Product	Price Effects	Coal Conversion	Suspension of gas Curtailments	Total
MOGAS	-205	0	0	-205
Distillate	- 52	0	-63	-115
Residual	- 69	-61	-35	-165
Kerojet	- 13	0	0	- 13
Naphtajet	- 4	0	0	- 4
Petrochemicals	- 10	0	0	- 10
LPG	- 12	0	0	- 12
Other	- 24	0	0	- 24
Total all Products	-389	-61	-98	-548

Elk Hills Development -	101
Current change in consumption Demand for petroleum imports =	-649

PRICE ASSUMPTIONS

The petroleum product demand simulation applies price elasticity assumptions to deflated wholesale price indices for all products except motor gasoline. For motor gasoline price effects are measured in terms of the deflated, ex-tax retail price per gallon. For all products except motor gasoline, the price effects are lagged with respect to how long a price change is assumed to be sustained. This lag structure (assuming constant elasticities) is given for a one, two, and three quarter duration. The assumed elasticities are:

Product	1Q	2Q	3Q
Distillate	-.09	-.12	-.12
Residual	-.15	-.18	-.21
Kerojet	-.06	-.07	-.08
Naphthajet	-.06	-.07	-.08
LPG	-.04	-.04	-.05
Petrochemicals	-.12	-.14	-.16
Other products	-.05	-.05	-.05

For motor gasoline the relationship between market price and demand was included as part of the regression estimating the demand forecasting equation. The specification of the forecasting equation is such that the price elasticity of motor gasoline demand varies somewhat depending upon the values of price and quantity demanded at which it is measured. Generally, for the year 1975, the price elasticity of motor gasoline is -.15.

Using the results of analyses conducted with the Office of Economic Impact, FEA, the implication of the President's policy of import fees, and deregulation was traced for nominal prices measured by month for January through May 1975. These nominal prices were then converted into the appropriate indexed and deflated format for incorporation into the petroleum product demand simulation. The derivation of the nominal price time series is given below.

Construction of May 1, 1975 Petroleum Prices

The end of year 1974 crude oil price was derived as follows

$8.4425 = .75 [.6 x Old Oil Price + .4 x New Oil Price]
+ .25 x Imported Oil Price

where .75 = proportion of crude & NGL domestically produced
.25 = proportion of crude & NGL imported
.6 = current proportion of domestic supply that is Old Oil
.4 = current proportion of domestic supply that is New Oil

Old Oil Price = $5.25 per barrel
New Oil Price = $11.00 per barrel
Imported Oil Price = $11.00 per barrel*

The May 1, 1975 crude price was obtained by equating the Old Price to the New Oil Price, and the Imported Oil Price to $13 to account for decontrol, the domestic excise tax, and the import fee. It was assumed that the price of NGL would be equivalent to the price of crude oil, even if a smaller BTU equivalent tax were to be placed on it. After May 1, 1975, all petroleum prices were assumed to rise nominally by the rate of inflation; that is, not to change in real terms.

The refined product average was constructed using the crude oil series plus estimates of refining costs and other cost factors. The distillate and residual price series were constructed from the crude series with the rule that increases in the domestically produced distillate and residual would equal increases in average crude prices. Imported residual and distillate were assumed to increase in price by an amount equal to the import fee. The average price indices constructed for the products are the weighted by their domestic to imported ratios. Since nearly all gasoline is domestically produced, its price increases only reflect crude increases.

These rules produce straight pass through of costs to products without shifting costs from one product to another. As an alternative to this simple, pro-rata "cost pass through" price construction, historical price relationships were also examined. Historical ratios of the various product prices to the refined products average were used to forecast prices. The results of forecasting prices on the basis of historical ratios was little different from that given by the simple pass through assumptions. Since it is expected that regulations will be enforced to equalize product price increases, the equalized cost pass through with immediate adjustment was used to forecast prices. The nominal price forecast assumed is given in Table VIII.

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* Although higher imported oil prices are quoted, $11 is the estimate of the average economic cost of imports to refiners. See Appendix B.

First Four Months of 1975

For the transition period February 1 to April 30, 1975, the following prices were used.

The per barrel increases in crude prices in February, March, and April reflect the \$1, \$2, \$3 import fee on imported crude. Domestically produced crude is still averaged under the Old-New Oil Scheme. The product average, residual, distillate, and gasoline prices during this period reflect the change in crude prices due to the \$1, \$2, \$3 crude import fee and the \$0, 60¢, \$1.20 fee on imported products,* as well as the ratio of domestically produced to imported products.

These ratios are assumed to be:

Petroleum Product Average	
Domestically Produced	.82
Imported as Product	.18
Residual	
Domestically Produced	.35
Imported as Product	.65
Distillate	
Domestically Produced	.85
Imported as Product	.15

Gasoline - All Domestically Produced.

Product prices are calculated as follows:

Petroleum Product Average Wholesale Price = \$10.15** + .82 (Average Change in Crude Oil Price) + .18 (Change in Product Import Fee)

Residual Wholesale Price = \$ 7.75** + .35 (Average Change In Crude Oil Price) + .65 (Change in Product Import Fee)

Distillate Wholesale Price= \$11.98** + .85 (Average Change in Crude Oil Price) + .15 (Change in Product Import Fee)

Gasoline Retail Price = \$0.41** + Average Change in Crude Oil Price per gallon

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* See The White House, Fact Sheet (January 15, 1975) The President's State of the Union Message, p. 33, items (A) 1(a) and (A) 1(c). The system of rebates on products nullifies the February fee on products.

** Latest observed price per barrel - except gasoline (per gallon).

Table VIII

Price Assumptions

	Jan.	Feb.	March	April	March
Crude*	8.44	8.99	9.54	10.09	13.00
All Products*	10.15	10.60	11.16	11.72	14.25
Distillate*	11.98	12.44	13.00	13.56	16.15
Residual*	7.75	7.94	8.52	9.10	10.64
Gasoline**	.41	.423	.436	.449	.519

---

* Wholesale prices per barrel

** Retail price per gallon excluding taxes. The natural average for gasoline taxes is 12-14¢.

INVENTORY ADJUSTMENTS FOR 1975

A comparison of forecast and observed inventory policies for the months of October, November and December 1974 has revealed higher than forecast stock levels. In fact the stock levels observed at the beginning of December 1974 are believed to be near the industry's sustainable capacity as that capacity was measured in September 1973. As a result, the inventory profiles assumed for the supply/demand simulations presented here were changed in the aggregate to be consistent with recent observations. A more careful analysis of expected product by product inventory behavior will be incorporated in the implementation of the regionalized, shortfall minimizing supply/demand simulation to be prepared in February 1975.

Stated simply: the inventory changes projected for 1975 in Technical Report 74-5 and subsequent applications of that report showed a net drawdown in 1975 of over 200 MBD for 1975 as a whole. The estimate of this reduction in inventories arises from the imposition of "minimum operable" as compared to "historically normal" bounds on major product inventories.* The inclusion of more traditional inventory profiles will be reflected in the results of the next application of the full regional model.

For the forecasts given above the following assumptions were imposed upon the aggregate inventory profile assumed:

-- a zero net change in aggregate stock levels over 1975;

-- inventory build-up in the second and third quarter 1975 was constrained such that the largest assumed aggregate stock level was that observed on December 1, 1974;**

-- the relative rate of first quarter to fourth quarter drawdown and second quarter to third quarter build-up was set at that given by the Base Case simulation in Technical Report 74-5.

The assumed inventory profile for 1975 is as follows (in MBD):

Quarter	Stock Change
1975:1Q	-229
1975:2Q	+165
1975:3Q	+323
1975:4Q	-260

* Such an inventory policy is appropriate to a period of embargo related shortages; but not appropriate to the current supply situation.

** Aggregate inventories are estimated to have changed by-770 MBD during December 1974.

APPENDICES

Appendix A: Comparisons of Forecasts of Petroleum Product Demand Illustrating the Effects of Prices and Other Factors

Appendix B: Domestic New Oil and Imported Crude Prices

APPENDIX A

Comparisons of Forecasts of Petroleum Product Demand Illustrating the Effects of Prices and Other Factors

The time series describing the consumption demand associated with four different sets of assumptions were determined using the petroleum product forecasting procedure (documented in Technical Report 74-5). The assumptions separate income and weather effects from price effects from the end of 1973 through 1975. Actual data is used for all the time series for all periods prior to the fourth quarter of 1973. The particular assumptions follow.

Series I: Pre-Embargo Forecast

This series projects consumption demand for the fourth quarter 1973, and for the years 1974 and 1975 under the assumption that the severe economic downturn did not occur, that the relative price of petroleum products did not increase, and that normal weather prevailed. The macroeconomic forecast assumed was prepared in December 1973.

Series II: Income and Weather Effects

This series simulates consumption demand from fourth quarter 1973 through 1974 using observed values for the macroeconomic variables and the weather. Normal weather was assumed for 1975. The macroeconomic forecast for 1975 was prepared in December 1974. The differences between Series I and II are attributable entirely to income and weather effects. The relative price of petroleum products was held at its third quarter 1973 level.

Series III: Price Effects

Series III differs from Series II in that the effects of the increase in petroleum prices are incorporated in the simulation. For 1975 the relative price of petroleum products was assumed to remain at its present level. For 1974 Series III represents "expected consumption" as determined by the forecasting procedure. For 1975 Series III is the current "base case" forecast without accounting for the President's program.

Series IV: Actual Consumption for 1974, the President's Program in 1975

Series IV portrays actual demand during 1974 and presents the demand forecast associated with the President's program as documented above.

THE COMPARISONS

The following figures present recent consumption experience and forecast consumption for each of the assumptions given above, for each of motor gasoline, distillate and residual fuel oil, and all petroleum products taken together

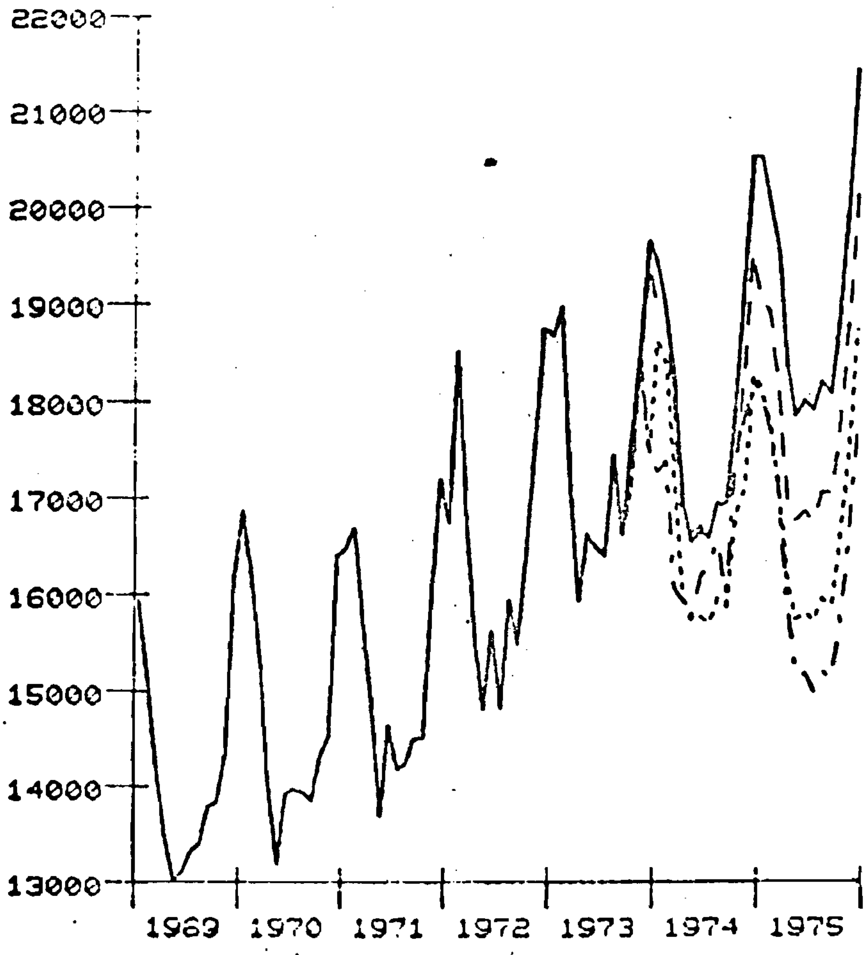
- o the four time series are illustrated for the period 1969-1975 and separately for 1974 and 1975 on a larger scale

- o the four time series are expressed in percentage terms with Series I = 100%. The three remaining series are plotted in percentage terms with respect to Series I.

For 1974 actual consumption fell below those levels which were anticipated before the economic downturn and higher prices (as given in Series I). Even when higher prices and lower income are taken into account, first quarter demand is still lower than "expected" due to the embargo. In the summer of 1974 a surge of post-embargo "pent up" demand may be noted. However, in the last quarter of 1974 demand returns to "expected" levels determined by the forecasting procedure.

A brief discussion of alternative elasticity estimates is provided as the last section of the Appendix.

COMPARISONS OF TOTAL PRODUCT DEMAND
(MBD)



Series

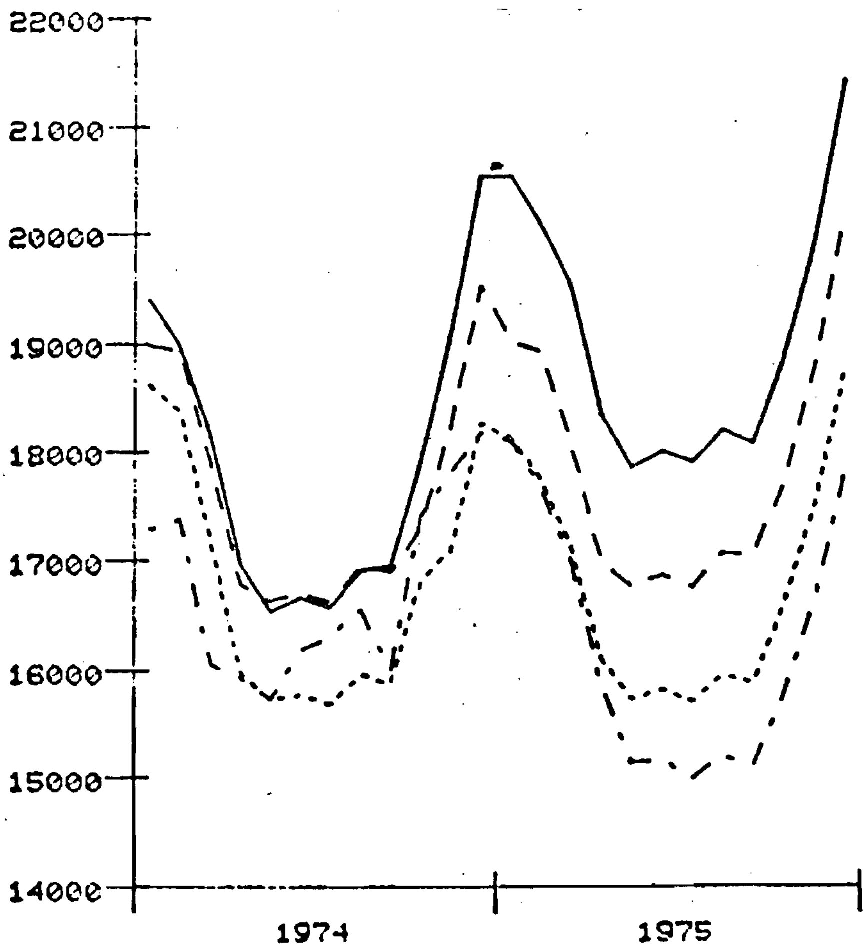
I: Pre-Embargo Forecast ____________

II: Income and Weather Effects - - - - - - - -

Price Effects added to Income and Weather Effects . . . .

Actual 1974, President's Program 1975 -. -. -. -.

COMPARISONS OF TOTAL PRODUCT DEMAND
(MBD)



Series

I: Pre-Embargo Forecast ________________
II: Income and Weather Effects - - - - - - - -
I Price Effects added to Income and Weather Effects . . . .
Actual 1974, President's Program 1975 -. -. -. -.

COMPARISONS OF TOTAL PRODUCT DEMAND
(in percentage terms)

Series

I: Pre-Embargo Forecast ________________

II: Income and Weather Effects - - - - - - - -

Price Effects added to Income and Weather Effects . . . . . .

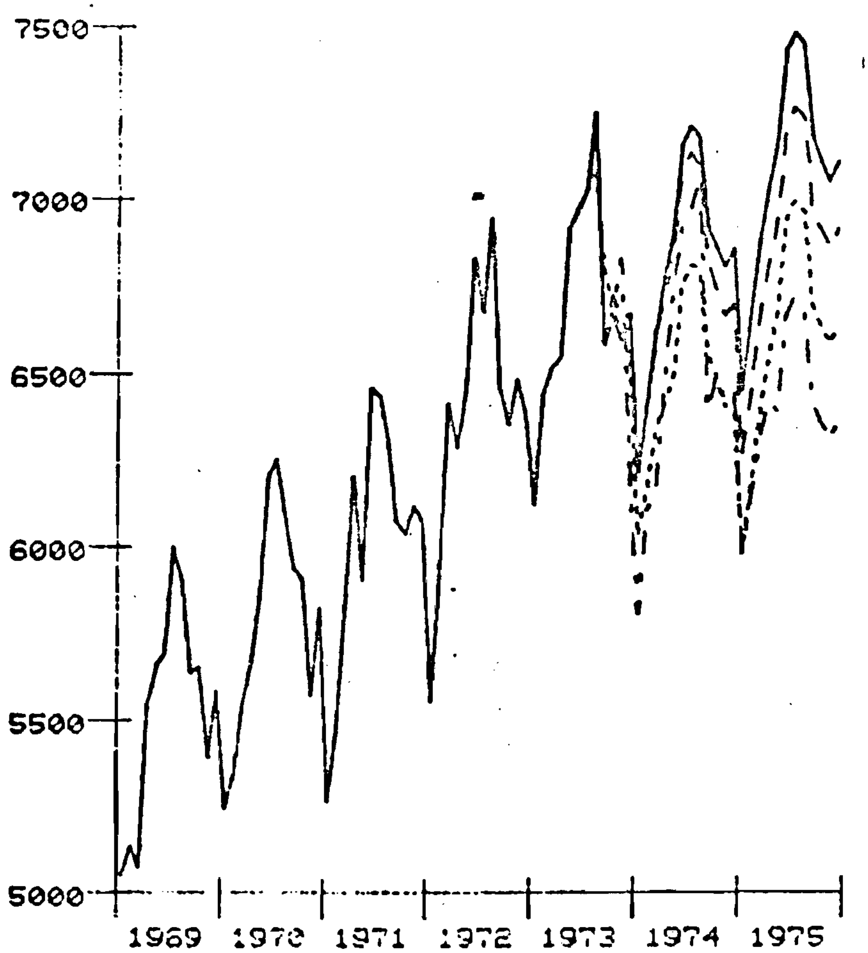
Actual 1974, President's Program 1975 -. -. -. -.

COMPARISONS OF TOTAL PRODUCT DEMAND
(MBD)

	1969	1970	1971	1972	1973
Series I	14139.578	14702.325	15221.[illegible]	16434.[illegible]	17488.376
Series II	14139.578	14702.325	15221.945	16434.795	17450.494
Series III	14139.578	14702.325	15221.945	16434.795	17281.301
Series IV	14139.578	14702.325	15221.995	16434.795	17264.536

	1974	1975
Series I	17879.671	19046.637
Series II	17613.712	17826.402
Series III	16771.089	16734.724
Series IV	16726.897	16186.571

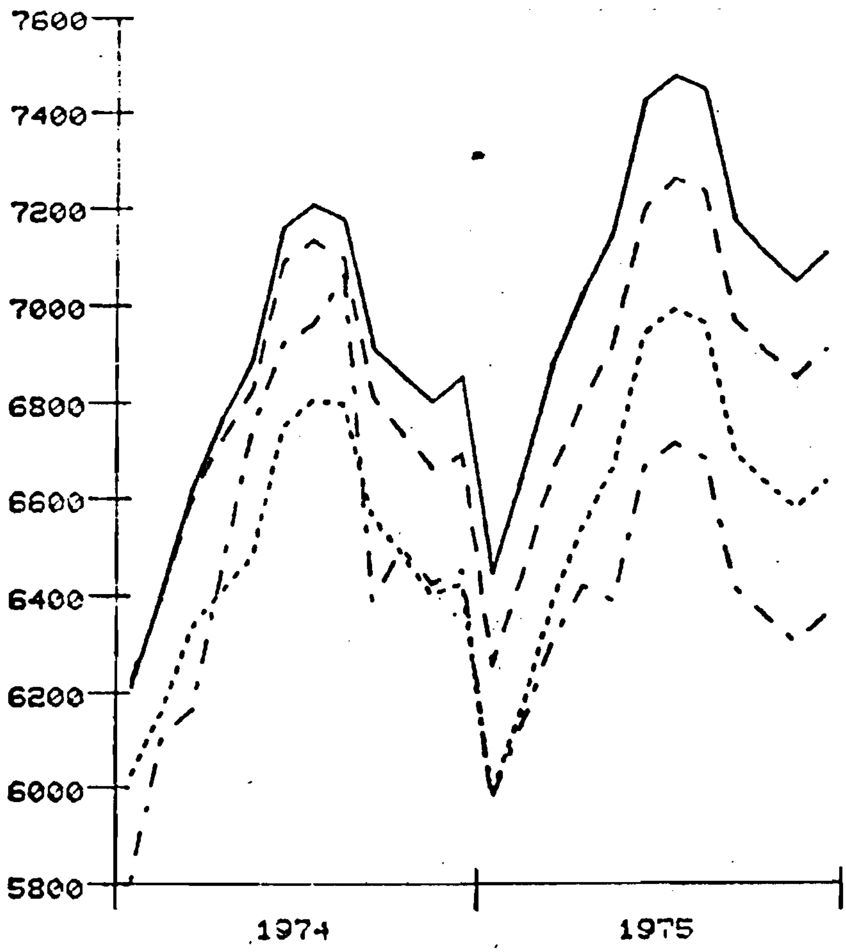
COMPARISONS OF MOTOR GASOLINE DEMAND
(MBD)



Series

I: Pre-Embargo Forecast ____________________
II: Income and Weather Effects - - - - - - - -
III: Price Effects added to Income and Weather Effects . . . . . .
IV: Actual 1974, President's Program 1975 -. -. -. -.

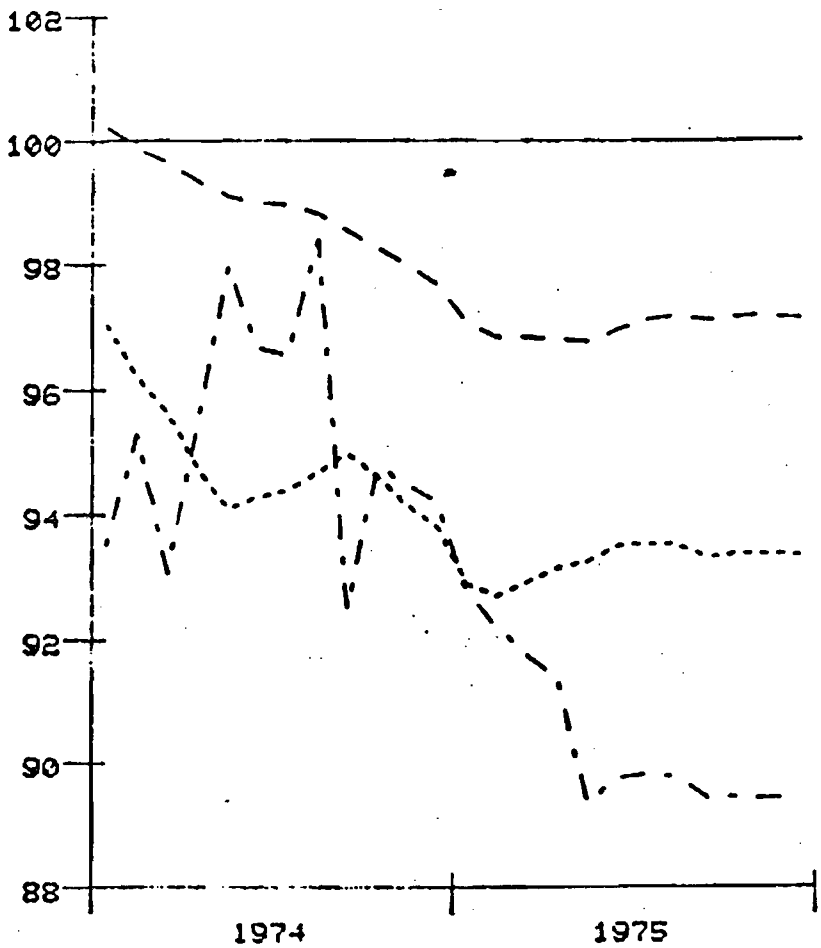
COMPARISONS OF MOTOR GASOLINE DEMAND
(MBD)



Series

I: Pre-Embargo Forecast ____________________
II: Income and Weather Effects - - - - - - - -
: Price Effects added to Income and Weather Effects . . . . . .
: Actual 1974, President's Program 1975 -. -. -. -.

COMPARISONS OF MOTOR GASOLINE DEMAND
(in percentage terms)



<u>Series</u>

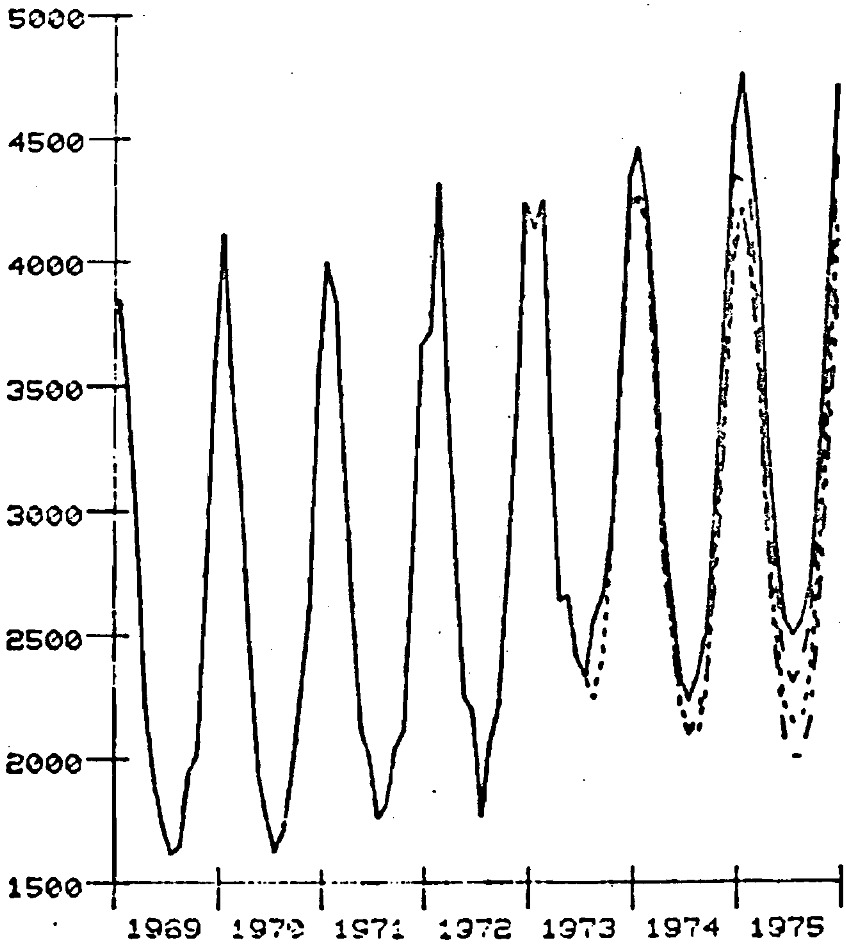
I: Pre-Embargo Forecast ________________
II: Income and Weather Effects - - - - - - - -
III: Price Effects added to Income and Weather Effects . . . .
Actual 1974, President's Program 1975 -. -. -. -.

COMPARISONS OF MOTOR GASOLINE DEMAND
(MBD)

	1969	1970	1971	1972	1973
Series I	5523.206	5781.476	6012.151	6391.249	6684.050
Series II	5523.206	5781.476	6012.151	6391.249	6696.739
Series III	5523.206	5781.476	6012.151	6391.249	6683.399
Series IV	5523.206	5781.476	6012.151	6391.249	6671.254

	1974	1975
Series I	6819.155	7076.738
Series II	6746.946	6865.342
Series III	6467.523	6596.793
Series IV	6496.869	6391.458

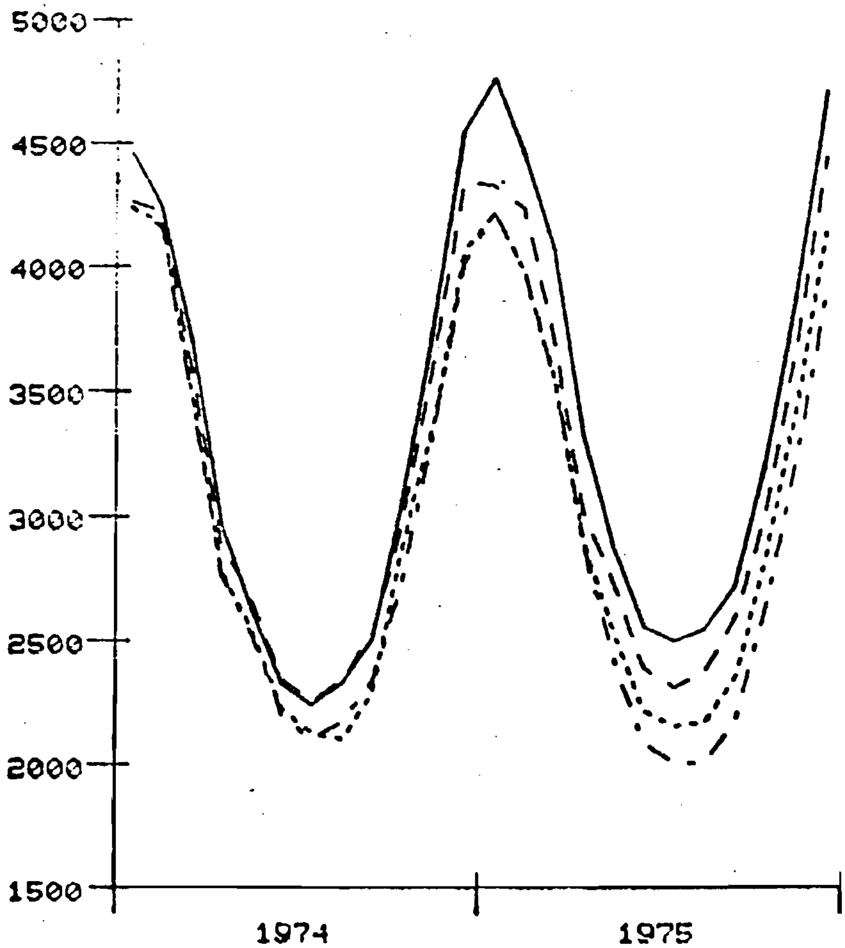
COMPARISONS OF DISTILLATE DEMAND
(MBD)



Series

I: Pre-Embargo Forecast ________________
II: Income and Weather Effects - - - - - - - -
III: Price Effects added to Income and Weather Effects . . . . . .
IV: Actual 1974, President's Program 1975 -. -. -. -.

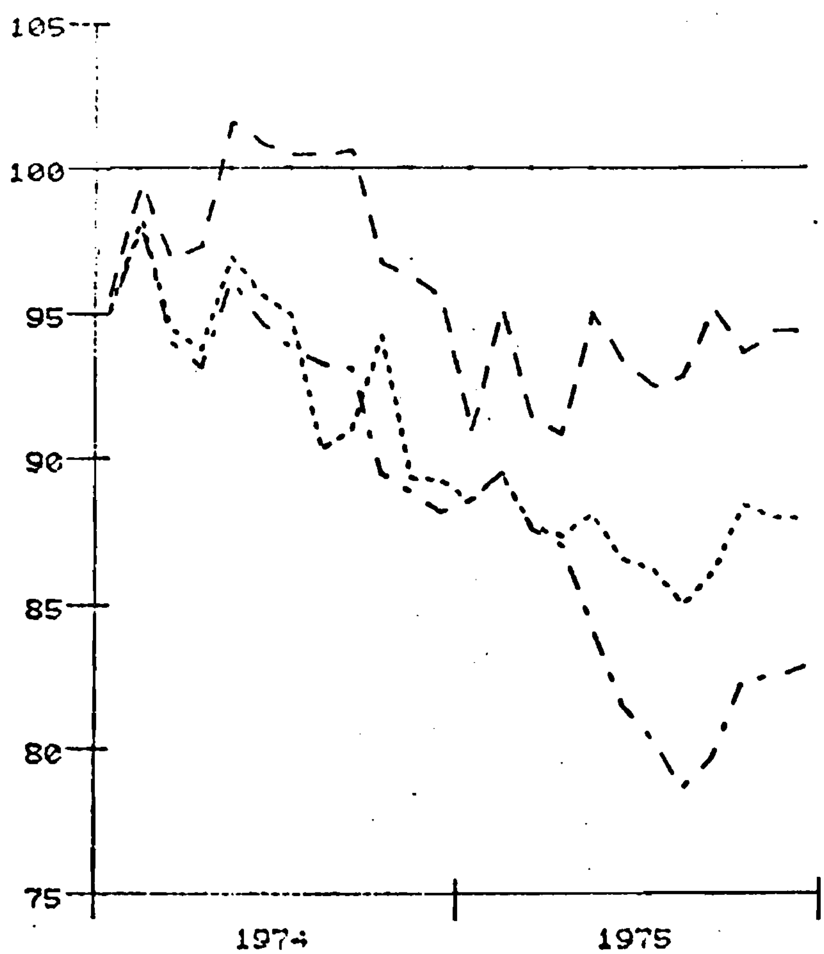
COMPARISONS OF DISTILLATE DEMAND
(MBD)



Series

I: Pre-Embargo Forecast ________________
II: Income and Weather Effects - - - - - - - -
: Price Effects added to Income and Weather Effects . . . . . .
: Actual 1974, President's Program 1975 -. -. -. -.

COMPARISONS OF DISTILLATE DEMAND
(in percentage terms)



Series

I: Pre-Embargo Forecast ________

II: Income and Weather Effects - - - - - - - -

Price Effects added to Income and Weather Effects . . . . . .

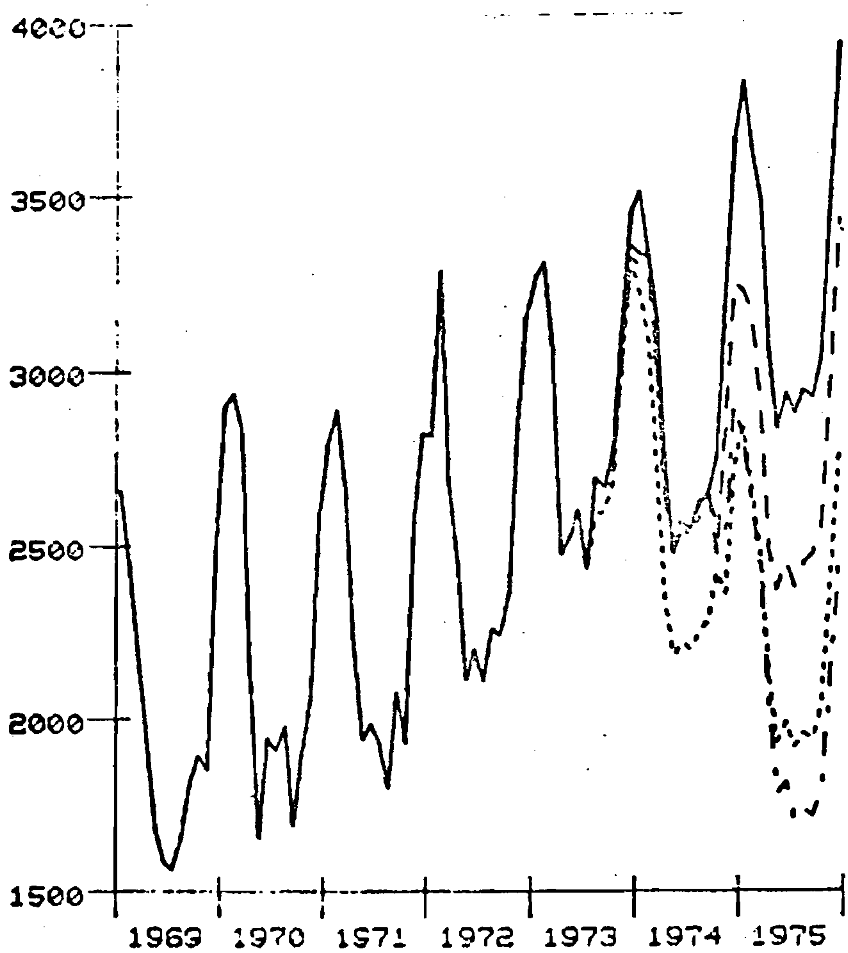
Actual 1974, President's Program 1975 -. -. -. -.

COMPARISONS OF DISTILLATE DEMAND
(MBD)

	1969	1970	1971	1972	1973
Series I	2471.056	2544.016	2667.570	2929.040	3149.934
Series II	2471.056	2544.016	2667.570	2929.040	3125.237
Series III	2471.056	2544.016	2667.570	2924.040	3075.981
Series IV	2471.056	2544.016	2667.570	2929.040	3129.982

	1974	1975
Series I	3224.843	3461.554
Series II	3161.426	3227.345
Series III	3016.302	3033.582
Series IV	2999.126	2918.757

COMPARISONS OF RESIDUAL DEMAND
(MBD)



Series

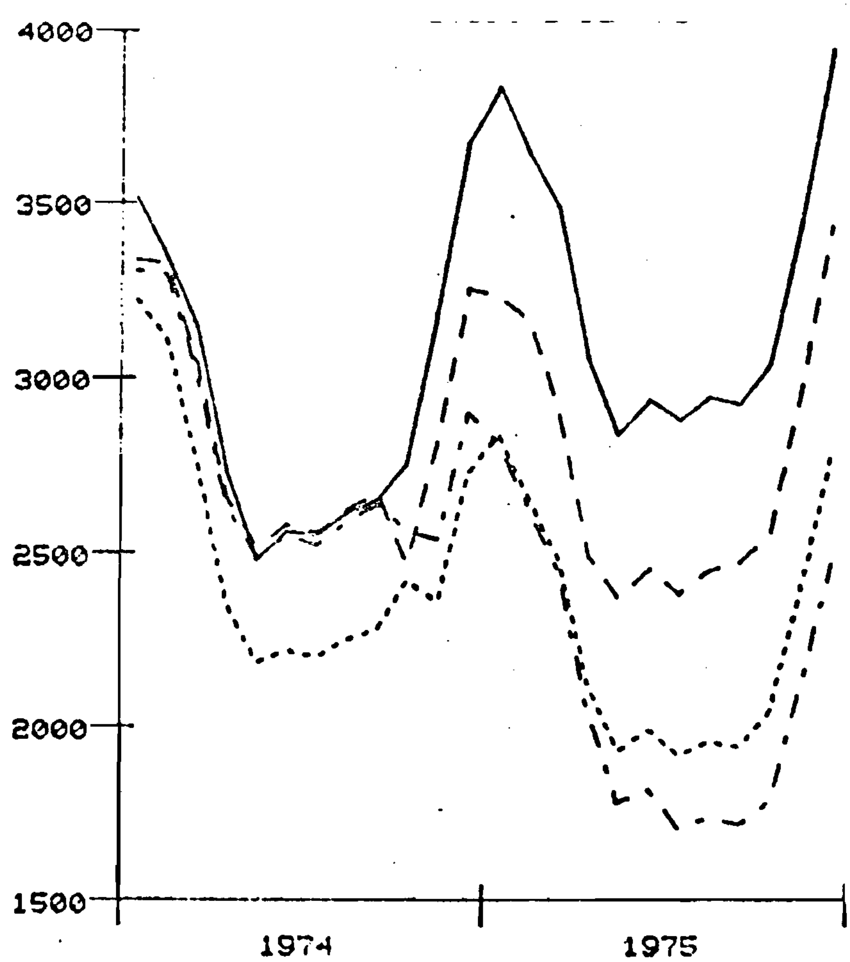
I: Pre-Embargo Forecast ______________

II: Income and Weather Effects - - - - - - - -

III: Price Effects added to Income and Weather Effects . . . . . .

Actual 1974, President's Program 1975 -. -. -. -.

COMPARISONS OF RESIDUAL DEMAND
(MBD)



Series

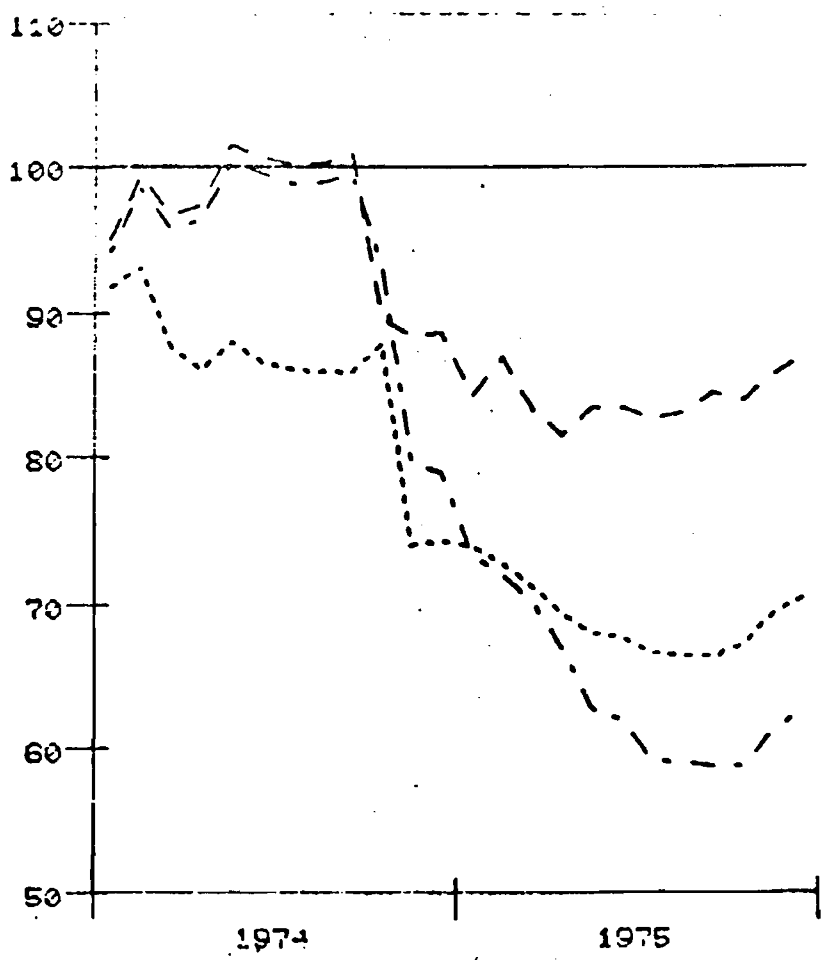
I: Pre-Embargo Forecast ________________

II: Income and Weather Effects - - - - - - - -

III: Price Effects added to Income and Weather Effects . . . . . .

IV: Actual 1974, President's Program 1975 -. -. -. -.

VARIATIONS OF RESIDUAL DEMAND
(in percentage terms)



Series

I: Pre-Embargo Forecast ________________
II: Income and Weather Effects - - - - - - - -
III: Price Effects added to Income and Weather Effects . . . .
IV: Actual 1974, President's Program 1975 -. -. -. -.

COMPARISONS OF RESIDUAL DEMAND
(MBD)

	1969	1970	1971	1972	1973
Series I	1979.634	2206.707	2299.857	2540.901	2861.546
Series II	1979.634	2206.707	2299.857	2540.901	2849.528
Series III	1979.634	2206.707	2299.857	2540.901	2881.617
Series IV	1979.634	2206.707	2299.857	2540.901	2836.278

	1974	1975
Series I	2930.882	3244.806
Series II	2817.434	2735.381
Series III	2503.294	2249.949
Series IV	2749.009	2084.824

COMPARISON OF SELECTED ELASTICITIES

The short run elasticity estimates incorporated in the FEA short-term forecasting procedure are difficult to estimate, particularly in the case of disaggregated product categories. Representative elasticity estimates from alternate sources are presented in Table AI for purposes of comparison to indicate the general plausibility of the figures used in the forecasts. However, the precise interpretation or application of these estimates should not be attempted out of context of the models in which they are developed, the time frames to which they are applied, or the definitions used in their computation. The elasticities presented are calculated on a consistent basis but are intended to be only summary indicators of the price sensitivity of the alternate models. An accurate statement of the price response of other models would require direct application of the full model to price and other changes.

TABLE AI

ESTIMATES OF PRICE ELASTICITY OF DEMAND
PETROLEUM AND PRODUCTS[1/]
SHORT RUN
(Up to 1 Year)

	FEA[2/]	Houthakker, Verlager & Sheehan[3/]	Phlips[4/]	DRI[5/]	Chase[6/]	Hudson-Jorgenson[7/]
All Petroleum[8/]	-.10			-.10	-.10	-.11
Gasoline[1/]	-.10 (-.15)	-.09 (-.14)	-.07 (-.11)		-.13 (-.20)	
Distillate	-.12					
Residual	-.21					
Kerojet	-.08					
Naphthajet	-.08					
LPG	-.05					
Petrochemicals	-.16					
Other Products	-.05					

1/ Estimates of gasoline elasticity relate to retail prices, extax shown in parentheses. All other estimates relate to wholesale prices or have been converted to wholesale prices under the assumption that cost pass-throughs occur without proportional markups.

2/ Consensus estimate by Troika, CEA, Treasury, OMB, and FEA - 1974.

3/ Prepared by EPA and CEQ - December 1973.

4/ Phlips, L., "A Dynamic Version of the Linear Expenditure Model," The Review of Economics and Statistics, Vol. LIV, No. 4 (Nov. 1972), pp. 450-465.

5/ DRI Energy Forecast, January 1975.

6/ Chase Econometric Analysis, January 24, 1975.

7/ For Ford Foundation - 1974.

8/ All elasticities relate to wholesale prices except that in the case of gasoline the second figure in () relates to the retail price before excise taxes. In judging the relative degree to which different products respond to price, the wholesale figures provide the best indication. They indicate that gasoline is less responsive than some other product.

The elasticity figure is higher for the retail price than for the wholesale price. That is because the elasticity is the ratio between the percentage change in consumption and the percentage change in price. A 10¢ change, for example, would be 40% change in a 25¢ wholesale price, but only a 25% change in a 40¢ retail price. Thus, the denominator of the elasticity figure would be greater in the case of the wholesale price than in the case of the retail price. However, if the change in actual consumption -- the numerator -- remains the same, the elasticity figure changes.

APPENDIX B

Domestic New Oil and Imported Crude Prices

The current average price of imported crude reported to the FEA for the cost passthrough is $12.53 per barrel (November). New oil prices currently average about $10.83 per barrel. This appendix discusses differences between the declared and economic price of crude.

One important reason for the difference is the method of valuating imported oil for the cost passthrough. Currently, there are three basic types of purchases of foreign crude: equity, participation, and third party. Equity oil is that oil produced and owned by the concessionaire (e.g., Aramco) under agreement with the host country. Since the concessionaire owns the oil there is no purchase price per se. However, the host country charges the concessionaire taxes and royalties on this oil. The sum of these taxes and royalties, plus the cost of producing the oil, is the tax paid cost and represents the real cost of the oil to the concessionaire. Although there have been increases in tax and royalty rates in recent months, during 1974 tax paid costs were lower than the price of crude sold to non-concessionaires.

The second type of purchase, participation oil, is that oil produced by the concessionaire which the host country owns as a result of a participation agreement and which the host government sells to the concessionaire at a negotiated price. For example, sixty percent of the oil produced by Aramco is owned by Saudi Arabia and Saudi Arabia sells the major portion of this oil back to companies of Aramco at the "buyback" price, which currently is $10.46 per barrel.

The third type of purchase, third party purchases, is oil purchased by any company either from the host government or the concessionaire. This price may be viewed as a free market price although this price will vary depending upon purchase terms (i.e., quantity and date of delivery). During 1974 at times third party purchase prices were higher than both government tax paid costs and buyback prices. During the first quarter some third party purchases ran in excess of $20.00 per barrel.

For purposes of the cost-passthrough refiners value buyback oil and third party purchase oil at purchase price plus transportation cost and fees.

However, for equity crude refiners are permitted to set a value on their equity crude which would prevail if they had dealt with their affiliated entities at arms'-length. In effect, this means that the refiner may charge himself a price on his equity crude which equals the third party purchase price. The $12.53 figure for imported crude includes equity crude which is valued above its actual cost to the refiner. Also, there is the added factor of the U.S. treatment of taxes paid on equity crude. Taxes paid to host governments are the basis for foreign tax credits, and this may reduce the real costs of equity crude. In this sense the $12.53 figure overstates the real costs of imported crude to the refiner. Thus, the difference between the prices of new oil and imported oil reported for the cost passthrough does not necessarily reflect the difference in "real costs" to the refiner.

The real difference in cost is difficult to determine. New Oil prices are still rising and have not stabilized, but it is safe to assume that they will stabilize at some price below $12.53, which would represent an equilibrium between the real costs of imported oil and the price of new oil.

Although institutional complexities complicate the determination of imported crude prices, the equilibrium price of new domestic crude and the opportunity cost of acquiring imported crude will be the same. Therefore, the analysis in this study assumes an imported oil price of $11 per barrel, the approximate price of New Oil.