

ESO 186

U. S. Energy--Sources, Uses,
Potential, Emphasis on Petroleum

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U. S. ENERGY: SOURCES, USES, POTENTIAL AND
EMPHASIS ON PETROLEUM*

The Energy Crunch--1974

In 1973 the energy problem came into focus following periods of brownouts at times in meeting electrical needs in various areas of the country. In the summer of 1973 petroleum supplies became critically limited. The supply crunch became a major problem when the Mideast petroleum producing area imposed an embargo on October 17, 1973.

Conservation measures were recommended and many actions were taken at the national and state levels to enforce a reduction in petroleum demand. These measures carried the country through the embargo period, the emergency period. The country still has long term problems in meeting projected energy needs.

Oil and its products provide the source of about 50 percent of our energy needs at the present time. Oil production in this country reached a peak in 1970. Authorities suggest that world production will peak in the late 1990's. Worldwide, then, we are approaching the peak of the Petroleum Age.

In this situation, there are short run and long run supply problems. Short run issues are a combination of conservation and the development

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of alternatives and supplies--primarily more oil exploration and development as well as development of synthetic oil and gas. The long run problem is the development of alternative sources of basic fuel.

The following information is a compilation of broadly based basic data relating mostly to the petroleum industry. The information may be useful in delineating the scope of the energy situation and can be useful in evaluating policy suggestions and alternatives that will continue to be debated.

Growing Requirements

Total U.S. Energy	*Quadrillion BTU
1965	56
1970	69
1975	85
1980	105
1985	129

Note that the projected increase in total energy demands from 1975-1985 is almost 80 percent of our total use in 1965. This will require investments totalling in the hundreds of billions of dollars and must come, in this time span, from existing technology.

*We've gotten used to billion dollar figures; trillions are upon us; and now come quadrillions--105,000,000,000,000,000.

In the not too distant past, coal provided 50 percent of our energy requirements. U. S. coal resources are substantial and may provide our future fuel needs while new sources are developed.

ENERGY SOURCES

Petroleum	46 %
Natural Gas	32 %
Coal	17 %
Hydro-Power	4 %
Nuclear	1 %

Energy Requirement Growth Rate Per Year--4-5 percent

U. S. ENERGY USES

Industrial	28.8 %
Electrical Generation	25.6 %
Transportation	25.0 %
Household-Commercial	20.6 %

When electricity as an energy user is factored into final use classifications, the percentages are as follows: (Note that industrial and transportation sectors use two-thirds of our energy supply.)

ELECTRICAL ENERGY FACTORED INTO OTHER USES

Industrial	43 %
Commercial	14 %
Residential	19 %
Transportation	24 %

Now to petroleum.

CRUDE OIL PRICE

<u>Price Increase</u>	<u>1948 - 1972</u>
All prices	+ 74 %
Oil	+ 30 %

The "real" price (inflation removed) probably declined during this period.

RECENT PRICES

U. S. - 1972	\$3.40
U. S. - 1974	
Old oil	\$5.25
New Oil	9.00+
Imports	9.00 - 11.00

Petroleum priced at \$5.25 for old oil and \$9.00 for new oil and imports to meet present consumption levels brings retail gasoline prices to about 60 cents per gallon. If all oil prices settle at the \$9.00 level, gasoline prices would be about 75 cents per gallon.

Who did it to us? Why didn't someone warn us?

1946---A report from the U. S. Department of the Interior stated we couldn't meet the needs of another war.

1952---A federally sponsored study, the results of which are known as the Paley Report, reported: We must develop alternative sources for liquid and gaseous fuel. (Oil shale and coal)

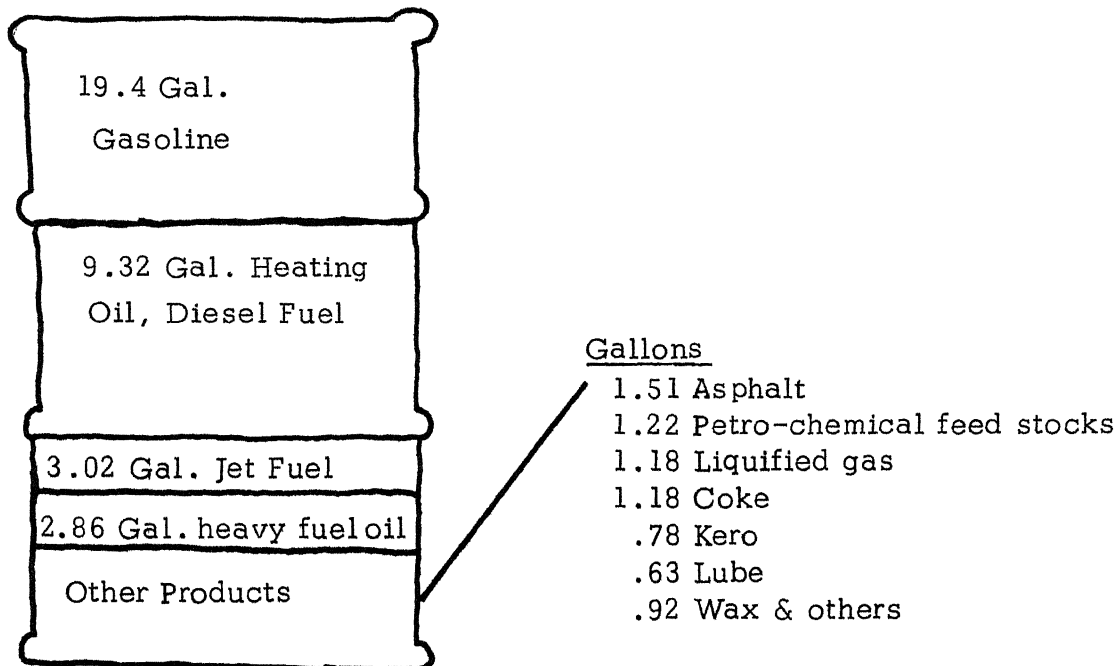
1967---Fortune Magazine reported that in ten years development of alternative sources could reduce reliance on Mideast oil (then 350,000 barrels a day).

COMPARATIVE ENERGY SELF-SUFFICIENCY, 1971

<u>Country</u>	<u>Oil</u>	<u>Total</u>
U. S.	74 %	89 %
Canada	98 %	110 %
Japan	0 %	11 %
United Kingdom	2 %	53 %
Germany	7 %	51 %
France	5 %	22 %
Italy	6 %	15 %

The U. S. is relatively well off, but oil imports will continue to expand rapidly to meet the needs of the 1970's. There are arguments for moving toward self-sufficiency; there are equally good arguments for developing trade as a prime objective.

OIL'S BOUNTIFUL BARREL



1973-74 PETROLEUM "CRUNCH"

	<u>Million Barrels Per Day</u>
Needs	± 18
Sources	
Domestic	+ 10
Imported	+ 7

October 17, 1973
MIDEAST EMBARGO!

Potential Shortages

Direct Imports	1.3	Million Barrels Per Day			
Through Canada & Caribbean	.6	"	"	"	"
Through Europe	.5	"	"	"	"
Direct Caribbean*	<u>.6</u>	"	"	"	"
Total	3.0	"	"	"	"

*These direct Caribbean shipments were quantities that could be directed to other nations that were also embargoed.

SOURCES OF PETROLEUM IMPORTS

	<u>000 Barrels/Day</u>
Venezuela	926
Other Caribbean	809
Canada	1366
Other Western Hemisphere	599
Western Europe	183
* N. Africa	336
W. Africa	480
* Iran	210
* Other Mideast	550
Indonesia	209

This is an incomplete list identifying major sources only. The information is based on the second quarter, 1973.

OIL REDUCTION POLICY ACTIONS--WINTER, 1973-74

	<u>Barrels/Day</u>
Reduce Airline Flights	170,000
Lower Thermostats	640,000
Reconvert from Oil to Coal	430,000
Reduce Highway Speeds	600,000
Increase Oil Production--Private	350,000
Increase Oil Production--Elk Hills Naval Reserve	160,000
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Potential Savings	2,350,000

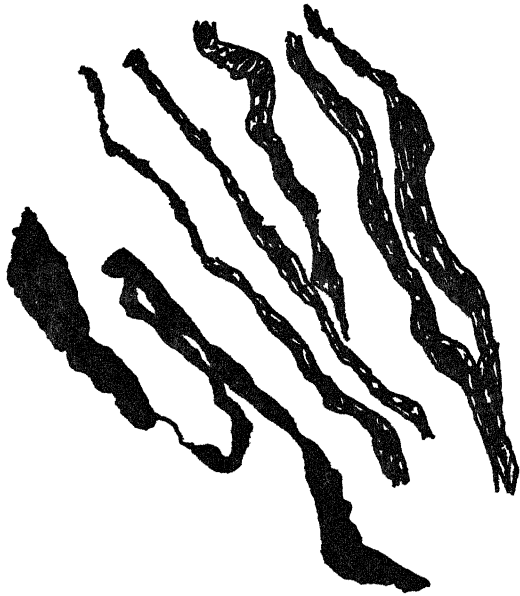
These policy actions left a possible shortfall of 650,000 barrels per day between potential demand and supply restrictions imposed by the embargo. The embargo was "leaky" however as some oil was transshipped from other areas.

WHO HAS THE KNOWN WORLD OIL RESERVES?

Middle East	53 %
Africa	16 %
Russia	15 %
United States	5 %
Central-South America	3 %
Canada	2 %
Venezuela	2 %
Europe	2 %
Indonesia	2 %

Note that 83 percent of the known reserves are in areas which in the past have not been politically aligned with the U. S. "Known" reserves are based on old oil prices. New price levels will increase reserves if higher prices hold.

There is more oil!



U. S.



U. S. Geological Survey shows oil reserves in the continental shelf.

	<u>Billion Barrels</u>	
	<u>Proven</u>	<u>Estimated</u>
	<u>Reserves</u>	<u>Additional</u>
U. S.	36	80

This estimated additional supply exists mostly on the continental shelf.

We use about 7 billion barrels per year. "Known" reserves are low, but if environmental, esthetic, legal and fuel needs and goals can be rationally compromised, offshore fields offer additional future supply. Only three percent of these offshore fields are now leased.

At \$8.00 - 9.00 per barrel, alternative sources become economical:

- (1) Shale Oil
- (2) Coal gasification
- (3) Coal liquification

Oil Reserves could triple in eight years! Present oil reserves are based on \$3.50 oil. At eight dollars a barrel, harder to reach and develop petroleum fields become economical. Shale oil, coal gasification, coal liquification become economically feasible at about eight dollars a barrel price level.

<u>Natural Gas</u>	<u>Trillion Feet</u>
Proved Reserves	247
Consumption/Year	22.5
<u>Use</u>	
Residential	23 %
Commercial	10 %
Industrial	47 %
Utility	20 %

Proven reserves of natural gas represent only slightly more than a decade's supply. Liquified imported natural gas is supplementing the supply at a higher price level. Eight years of lead time is needed for exploration and start of large scale production of both new oil and gas fields.

NEAR TERM ADJUSTMENTS

- (1) New Oil Discoveries
- (2) Development
 - Tar Sands
 - Shale Oil
 - Coal Gasification
 - Coal Liquification

Coal reserves if developed would meet our needs for 300 years (1.5 to 2 trillion tons--one-half of the world's supply). These resources and techniques are the principal sources of achieving possible self-sufficiency within the next decade.

LONG TERM DEVELOPMENT

- (1) Nuclear Fission
 - Fast Breeder
- (2) Geo-thermal
 - Perhaps 10-15 percent of our future electrical needs
- (3) Nuclear Fusion
 - A generation before we know whether it's practical
- (4) Solar
 - Costs about two times standard electrical generation

All of these alternatives have the disadvantage of poor thermal efficiency as yet. Safety issues of nuclear reactors are still being contested. Both the nuclear fission reactors for electrical generation have unsolved problems as disposal of radioactive wastes. Some of the wastes have a half life of 24,000

years . They would present a possible hazard for a future period longer than recorded history .

IMPLICATIONS

- (1) Oil price will need to stay above \$8.00 per barrel to provide alternatives .
- (2) Total energy bill could well double (from 4 percent of GNP to 7 percent) .
- (3) Average family expenditure for energy will likely increase from 7 percent of income to 10 percent .
- (4) Businesses will weigh trade-offs more carefully .

These trade-offs will involve considerations of efficiency, productivity, energy costs, assurance of fuel supply, and reliability of energy delivery system .

- (5) Government will need to support basic research for new technology-- estimate \$2-3 billion per year for a decade .
- (6) Industry, government and individuals will need to continue to emphasize energy conservation for several years .

POLICY QUESTIONS

If the petroleum corporations in this situation generate excessive profits , what action should be taken? Should both state and federal regulations about production and price on oil and gas be relaxed to meet short term needs? What incentives should be offered to encourage development of additional exploration for petroleum and of alternative sources of energy? Should environment restrictions on refineries , new oil fields , coal mines and power plants be relaxed while we "catch up " on energy needs ?