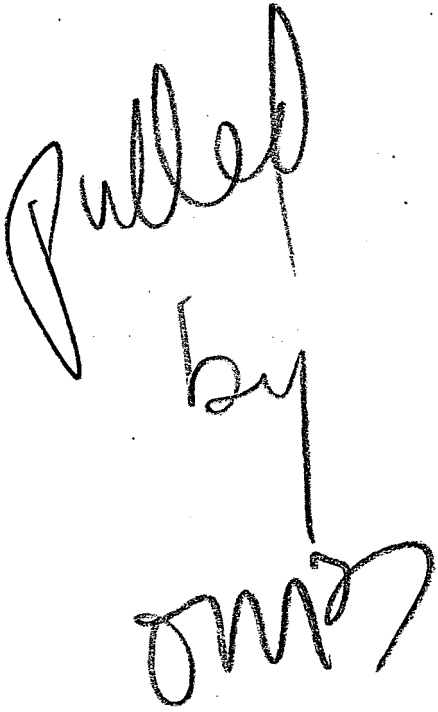
[5/29/79-Not Submitted-DF]

Folder Citation: Collection: Office of Staff Secretary; Series: Presidential Files; Folder: [5/29/79-Not Submitted-DF]; Container 119

To See Complete Finding Aid:
http://www.jimmycarterlibrary.gov/library/findingaids/Staff_Secretary.pdf

THE WHITE HOUSE
WASHINGTON



THE WHITE HOUSE

WASHINGTON @@($ 2294

Date: May 29, 1979 MEMORANDUM

FOR ACTION:

Hamilton Jordan — Best : hold
Stu Eizenstat
Tim Kraft — attached
Frank Moore (Les Francis) N C
Jim McIntyre — attached
Charles Schultze w/se comment
Nelson Cruikshank — attached

FOR INFORMATION:

The Vice President
Jack Watson
Anne Wexler
Alfred Kahn

FROM: Rick Hutcheson, Staff Secretary

SUBJECT: Califano memo re Social Security

YOUR RESPONSE MUST BE DELIVERED TO THE STAFF SECRETARY BY:

TIME: 1200

DAY: Thursday

DATE: May 31, 1979

check w/ SSA on timing how long hold

ACTION REQUESTED:

____ Your comments

Other:

STAFF RESPONSE:

____ I concur. ____ No comment.

Please note other comments below:

PLEASE ATTACH THIS COPY TO MATERIAL SUBMITTED.

If you have any questions or if you anticipate a delay in submitting the required material, please telephone the Staff Secretary immediately. (Telephone, 7052)

THE WHITE HOUSE
WASHINGTON

5/29/79

MEMO FOR TIM KRAFT
HAMILTON JORDAN

FROM: RICK HUTCHESON

SUBJECT: Attached Califano Memo on Social Security Cuts

I strongly agree with Califano on this. This is one 'self-inflicted wound' we should avoid.

The Ohio Democratic Party sent me a whole bunch of unsolicited letters from grass roots Democrats to them expressing shock that Carter would try to cut back social security. This is an issue of intense interest to grass roots Democrats all over the ccuntry.

If our 'reform' proposals are not going to prevail, let's not drag this out until we've milked the last ounce of political damage out of it, the way we usually do.

THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE
WASHINGTON, D.C. 20201

MAY 28 1979

MEMORANDUM FOR THE PRESIDENT

FROM: JOE CALIFANO

I recommend that you now make a decision to fund social security at the current services level in the fiscal 1981 budget and that this decision guide your determination of the 1981 HEW budget mark.

I do not believe it makes either programmatic or political sense to propose any significant reduction in social security benefits.

Programmatic reasons

A variety of studies will be completed by the end of this year. It will take at least a year to digest them, run them through computers and develop intelligent programmatic suggestions.

- The Social Security Advisory Council will report this October, after having taken a comprehensive look over the past eighteen months at most every aspect of the system: benefit levels, financing methods, etc. The report will not be unanimous.

- The Universal Coverage Study will be finished this December.

- The study of the treatment of women under social security was released in February and we will be holding forums and meetings around the country to develop specific comments on it through the rest of the year.

Political reasons

The proposals we made in the fiscal 1980 budget are relatively modest in terms of savings and changes in the social security system. Yet, those proposals have run into serious opposition. Ultimately, virtually all of them are likely to be enacted, but perhaps not in a Presidential election year.

Further proposed reductions in benefits--even when fully justified on the merits--are likely to be effectively attacked and soundly defeated next year.

Why decide now?

It is important to make this decision now, rather than wait until the end of the budget process.

- Social security is the largest part of the HEW budget. Of the $200-plus billion in the FY '81 HEW budget, some $120-plus billion--60 percent--represent social security benefits. To set an overall budget mark for HEW that does not take into account a decision to fund social security at current levels, would result in savage reductions in other domestic programs.

- If you are ultimately not going to make significant cuts in social security, why subject yourself to the substantial, perhaps irreparable, political damage that will result from staffing out severe benefit cuts in that program to meet your tentative budget mark?

I realize (to put it mildly) there is no lack of political courage on your part to make tough decisions and stick by them. But this is an occasion when such a decision would be a futile action. In the political climate of a Congressional/Presidential election year, there is no chance of enacting any significant reductions in social security benefits. Under such circumstances, it makes no sense to propose them.

You have a good record in social security; the financial integrity of the system has been restored and we are likely to reform the disability program. You should not jeopardize that record.

One final note

This memo does not deal with the issue of what to do at hearings this September when I am asked to testify on possible reductions in the 1981 tax increase.

When Congress faces the realities of reducing the 1981 tax bite, it will recognize that either benefit reductions must be made or general revenue financing must be tapped. Neither is likely. Benefit reductions will be politically unachievable; general revenue financing will run into Congressional Committee turf problems and fail. Particularly since the tax bite does not come until after the 1980 election, I think this Congress will eventually leave that issue for its successor in 1981.

CC: Stu Eizenstat
Hamilton Jordan
Jim McIntyre

		FOR STAFFING
	✓	FOR INFORMATION
		FROM PRESIDENT'S OUTBOX
		LOG IN/TO PRESIDENT TODAY
		IMMEDIATE TURNAROUND
		NO DEADLINE
		LAST DAY FOR ACTION

FOR ACTION	FYI	
		VICE PRESIDENT
		JORDAN
	✓	EIZENSTAT
		KRAFT
		LIPSHUTZ
		MOORE
		POWELL
		RAFSHOON
		WATSON
		WEXLER
		BRZEZINSKI
		MCINTYRE
		SCHULTZE
		ADAMS
		ANDRUS
		BELL
		BERGLAND
		BLUMENTHAL
		BROWN
		CALIFANO
		HARRIS
		KREPS
		MARSHALL
		SCHLESINGER
		STRAUSS
		VANCE

Eizenstat has copy

		ARONSON
		BUTLER
		H. CARTER
		CLOUGH
		CRUIKSHANK
		FIRST LADY
		HARDEN
		HERNANDEZ
		HUTCHESON
		KAHN
		LINDER
		MARTIN
		MILLER
		MOE
		PETERSON
		PETTIGREW
		PRESS
		SANDERS
		WARREN
		WEDDINGTON
		WISE
		VOORDE

	ADMIN. CONFIDEN.
	CONFIDENTIAL
	SECRET
	EYES ONLY

THE WHITE HOUSE

WASHINGTON

May 30, 1979

MEMORANDUM FOR: RICK HUTCHESON

FROM: NELSON CRUIKSHANK

SUBJECT: Califano Memo re Social Security

I am in general agreement with the recommendation of Secretary Califano that we fund social security at the current level in the FY 1981 budget. Furthermore, this recommended position, if adopted, would go far toward removing the anti-social security label which has been attached to this Administration by the FY 1980 budget proposals. I also agree with the acknowledgement of the role of the advisory councils and the in-depth policy studies now underway which are reflected in the Secretary's memo.

I do not agree with the Secretary's conclusions that in connection with the September hearings on taxes we will be confronted with a choice only between benefit reduction or general revenue financing. In the first place, any benefit reductions sufficient to offset the .52 percent increase scheduled for 1981 would have to be so horrendously large that they would have absolutely no chance of being passed by Congress. (Note: if all the cuts proposed in the FY 1980 budget, including the disability cuts were enacted it would justify a reduction of only .1 percent.)

Of the total rate increase scheduled for 1981, .25 percent is for health insurance (HI). If we can pass hospital cost containment, that portion of the increase will be unnecessary.

Retaining the remainder of the .27 percent increase will produce an estimated $5 billion surplus in 1981. It may not be desirable to increase the surplus so rapidly -- especially if there is general revenue underwriting of the trust fund.

There is also the possibility of financing a part of Medicare (HI) from general revenues which would make possible a shift of resources from HI to Old-Age and Survivors' Insurance (OASI) without increasing overall taxes.

Finally, the latest figures on disability insurance indicate a surplus in this fund beginning in 1980. Legislation authorizing transfers between trust funds provides another alternative to benefit cuts for easing the tax burden.

In summary, even without putting in general revenues, and without any substantive benefit cuts, we could reduce what is now scheduled to be a 0.52 percent raise down to only a 0.15 percent increase or even less.

All of these options, and possibly others, should be fully explored.

THE WHITE HOUSE

WASHINGTON @@($ 2294

Date: May 29, 1979 MEMORANDUM

FOR ACTION:
Hamilton Jordan
Stu Eizenstat
Tim Kraft
Frank Moore (Les Francis)
Jim McIntyre
Charles Schultze
Nelson Cruikshank

FOR INFORMATION:
The Vice President
Jack Watson
Anne Wexler
Alfred Kahn

FROM: Rick Hutcheson, Staff Secretary

SUBJECT:
Califano memo re Social Security

YOUR RESPONSE MUST BE DELIVERED TO THE STAFF SECRETARY BY:
TIME: 1200
DAY: Thursday
DATE: May 31, 1979

ACTION REQUESTED:
____ Your comments
Other:

STAFF RESPONSE:
____ I concur. ____ No comment.
Please note other comments below:

(see attached memo.)

Nelson Cruikshank

PLEASE ATTACH THIS COPY TO MATERIAL SUBMITTED.

THE WHITE HOUSE

WASHINGTON @@($ 2294

Date: May 29, 1979 MEMORANDUM

FOR ACTION:
Hamilton Jordan
Stu Eizenstat
Tim Kraft
Frank Moore (Les Francis)
Jim McIntyre
Charles Schultze
Nelson Cruikshank

FOR INFORMATION:
The Vice President
Jack Watson
Anne Wexler
Alfred Kahn

FROM: Rick Hutcheson, Staff Secretary

SUBJECT: Califano memo re Social Security

YOUR RESPONSE MUST BE DELIVERED TO THE STAFF SECRETARY BY:
TIME: 1200
DAY: Thursday
DATE: May 31, 1979

ACTION REQUESTED:
___ Your comments
Other:

STAFF RESPONSE:
✓ I concur. ___ No comment.
Please note other comments below:

For once -- I concur with Califano --

T.K.

PLEASE ATTACH THIS COPY TO MATERIAL SUBMITTED.

THE WHITE HOUSE
WASHINGTON

5/29/79

MEMO FOR TIM KRAFT
HAMILTON JORDAN

FROM: RICK HUTCHESON

SUBJECT: Attached Califano Memo on Social Security Cuts

I strongly agree with Califano on this. This is one 'self-inflicted wound' we should avoid.

The Ohio Democratic Party sent me a whole bunch of unsolicited letters from grass roots Democrats to them expressing shock that Carter would try to cut back social security. This is an issue of intense interest to grass roots Democrats all over the country.

If our 'reform' proposals are not going to prevail, let's not drag this out until we've milked the last ounce of political damage out of it, the way we usually do.

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

JUN 4 1979

MEMORANDUM FOR THE PRESIDENT

FROM: James T. McIntyre, Jr

SUBJECT: Treatment of Social Security in the 1981 Budget

Secretary Califano has recommended that you now exempt social security from any budget reductions for fiscal year 1981. Such a decision need not be made at this time for the following reasons:

-- As part of the 1981 Budget planning process, I intend to give HEW a separate social security planning ceiling. This action will prevent budget manipulations along the lines of last fall when the Department proposed $2 billion of 1980 social security reductions so as to provide leeway for discretionary health, education, and social services program increases. Toward the end of the 1980 budget process, some of your advisers argued against many of these cost savings proposals and you finally decided upon social security reductions of about $600 million after Secretary Califano agreed to intensively lobby the Congress for their enactment. A separate ceiling for social security set at a reasonable level and including reductions of $600-$900 million (or about 1/2 of one percent of program outlays) should enable HEW to better design reductions for 1981. In his 1981 budget request to OMB, Secretary Califano will still be able to reject all social security cuts and substitute offsetting reductions in other HEW programs to meet the planning target. But I would not recommend acceptance of unrealistic social security cuts to provide for increases in other HEW programs.

-- Social security constitutes nearly a quarter of the entire Federal Government's 1981 outlays and 59 percent of HEW's 1981 outlay projections. To completely exempt such a significant portion of your 1981 Budget from reductions at this time could set an undesirable precedent. Every time an exclusion is made, your budget options are constrained and this special request may be especially inadvisable if 1981 payroll tax reductions are to be considered this fall.

-- There are sound reasons for proposing social security changes similar to those in the 1980 Budget. Social security legislative changes typically require more than a year's debate before being enacted. Even though Secretary Califano believes the social security proposals will not be enacted this year, it should be noted that: (a) disability reform legislation has met with some success in the Congress; (b) favorable articles on the Administration's social security reforms have been written recently in the New Republic, Washington Post, and Newsweek; and (c) the Congress has provided for some social security cost savings legislation in the 1980 First Concurrent Resolution.

The social security system is still in need of reform and cost savings proposals could be recommended for 1981 without conflicting with the current reviews of various study groups. Rather than excluding social security from fiscal restraint, I recommend that we give social security a separate ceiling with a relatively modest reduction target which will permit Secretary Califano to advance well constructed and argued changes. This approach does not prevent you from deciding later in the year that social security cuts are not needed, but it does provide some assurance that social security proposals will be judged on their own merits during the 1981 budget review and in light of other actions which may be more severe.

original here -

THE WHITE HOUSE
WASHINGTON

5/29/79

TO: KITTY SCHIRMER

FM: RICK HUTCHESON Rich

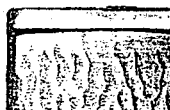
DF

Is this worth passing on to the President?

Anything new or thought-provoking in here?

Thanks.

2929



Office of the Attorney General
Washington, D.C.

May 29, 1979

MEMORANDUM FOR THE PRESIDENT:

I enclose a paper given recently by Ambassador George C. McGhee entitled, "The Decline and Fall of Petroleum." Ambassador McGhee was the third ranking person in the State Department under Dean Rusk and George Ball. I have known him for many years, and he recently suggested that I might be interested in the paper.

The paper is the best summation that I have seen on the energy problem, and it occurred to me that you would find it informative.

Ambassador McGhee is now retired and living in the Washington area and would be glad to help in any way that he can, including a chat with you if you thought it worthwhile. I must add that I believe he is a director of Mobil. He made a fortune, I am told, in bringing in new oil fields by the time he was thirty, and thereafter devoted his energy to the government service.

Respectfully,

Griffin B. Bell

Griffin B. Bell

Enclosure

THE DECLINE AND FALL OF PETROLEUM

George C. McGhee
Tuscon, Arizona
March 6, 1979

Although I will be happy to discuss with you this evening any aspect of the general world energy picture, I will focus my remarks principally on what is called crude oil. The world is now engaged in a belated effort to avert an energy crisis that could come anytime. Indeed, it may already be here. Since hydrocarbons are in most cases the most desirable fuel, they will be used to productive capacity first, almost irregardless of price, except for gas that cannot be moved to consuming areas. Crude oil is, however, easily movable and can, therefore, be dealt with in its global aspects.

Looking at it broadly the few billion inhabitants on planet earth will use up within the 150 years from 1900 - 2050, the 2 trillion barrels of recoverable crude oil that it took the vegetable and animal life of our seas 3 billion years to form. Production of oil which peaked in the U. S. in 1970 was, assuming normal supply-demand, expected to peak worldwide between 1985 and 90. Without Iran it has already peaked.

Many questions are being raised today which I will try to answer for you. Where do we stand on oil and gas domestically and world wide? Will supply meet demand? How long will reserves hold out? What is the impact of recent events in Iran? How do we know there isn't more oil and gas to be discovered - as in Mexico? Why can't we recover more oil now being left in the ground? What will take the place of oil? What will happen to prices?

The best expert we have on oil and gas supply and demand is Walter Levy, a consultant in New York. His article in the Winter Foreign Affairs was excerpted for the New York Times on January 4th. I talked with him last week and got his most recent views taking Iran into account.

Levy predicted that Non-Communist World demand will rise from 51 million barrels a day in 1977 to 62 million in 1985. In 1985 Opec must produce 37 million barrels a day (against 32 in 1977, including that for internal Opec needs) to meet free world demand. This assumes non-Opec countries produce 25 million, including production from 8 developing countries. This also assumes no appreciable demand on Opec by the Communist Bloc (contrary to a recent CIA report). Opec productive capacity, including Iran at normal production, is 39 million barrels a day - adequate both now and in 1985. This assumes that Saudi Arabia, which is down for 11 million a day, will exceed its self-imposed limit of 8.5 million (which in the face of losses in Iran has been stretched to 9.5 billion, presumably for the duration of the crisis.) When Iran virtually shut down production some three months ago in defiance against the Shah, the world lost about 5 million barrels a day (5.6 million barrels production less the Iranian requirement of 600,000). With Saudi production up 1.5 million (from 8) and the rest of the world

production about a million more, there has been a deficit of about 2.5 million a day which is coming from in-transit oil and reserve stocks. There has also been some reduction in demand due to increased price and local breakdown in supply. A tight situation has been created which, by June, will be acute - unless Iran comes back.

No one, however, expects Iran to come back to previous production levels since the Consortium of 12 foreign companies led by BP, the Consortium's Oils Service Supply Company of Iran, and their foreign personnel, are out of the picture. The new head of the Iranian National Oil Company, Hassen Nazih, is trying to find what he considers the necessary technicians, roughly 120 in number to replace the 600 discharged. He promised within two months to be producing 3.6 million barrels a day, about 3 million for export.

Apart from the technical difficulties, however, there is the political problem of the Marxist-Oriented Oil Industry Labor Party which has not yet been faced up to by the new Ayatollah Khomeini Regime. No matter how well things work out, moreover, there will be a net loss to the world of 2 million barrels a day, which will put world oil production on the razor edge of demand. Normal decline in production will bring supplies inexorably down. Discoveries cannot be expected to fill the gap. World oil will be peaked.

Saudia Arabia alone will have excess capacity. Whether this capacity can equal or exceed the 14 million barrels a day ARAMCO has thought could be made available by 1980 has been brought into question by the report just issued by the Senate Foreign Relations Committee. No one speaks anymore of the 20 million per day once expected. The issue is more whether Saudia Arabia will hold at 9.5 than go up to 11. (They have since gone to 8.5).

But what about projected demand? Can it decrease by further conservation? Levy's estimate of a 37 million a day demand of Opec by 1985 assumes an annual increase between 1977 and 1985 of 2.5%, vs. a 7.5% increase between 1965 and 1975. This also assumes on OECD growth rate on only 3.6% (vs. 4.7% from 1965-75) and an energy coefficient (i.e. ration between energy growth and overall growth) of .81 rather than 1.13.

The Pre-Iran Projection by the International Energy Agency, a more realistic figure at that time, would boost oil demand on Opec by 1985 to 42-48 million barrels (compared with Levy's 37), against Levy's estimated Opec production of 36-38 (which with Iran at only 3.0 million would be reduced to about 33 to 35). Such a demand just couldn't be met. Indeed, Levy's estimated demand couldn't be met.

In the meeting of the International Energy Agency in Paris reported March 5, the 20 industrial nations involved set a goal of 2 million barrels a day reduction in demand, with the U.S. accepting the largest cut of 5%, or 1 million barrels a day. The Carter Administration is expected to attempt to meet this goal by voluntary cuts of 3% by business, local governments and consumers, plus saving from regulatory changes and government cutbacks. This would eliminate the present shortage in U.S. supply of 500,000 barrels a day, which would otherwise be expected to increase to 800,000 within a few months.

Productive capacity to meet demand is one thing, but how long will it last? What are world oil reserves today and what are they likely to be in the future? The most authoritative estimates of world oil reserves are those by the Oil and Gas Journal, who published in their December 1978 issue estimated proved reserves as of January 1, 1979. These are accepted by the American Petroleum Institute. Except for the USSR, they represent drilled reserves recoverable at present technology and prices. The USSR uses what they call "Explored Reserves", which includes proved, probable and some possible. They are, therefore, not strictly comparable to the reserves given for the rest of the world.

Contrary to a popular view, the estimation of oil reserves is a highly developed and in most cases a precise science. The structure and thickness of producing sands, their porosity, permeability, and connate water content, and the characteristics of included oil and gas are all considered. Conditions of production, whether by gas expansion or water drive are also taken into account. The final estimates are in most cases reliable and provide the oil industry with a stable basis for financial transaction affecting oil properties.

The Oil and Gas Journal sets the free world's reserves at 547 billion barrels of oil and the Communist World's at 94 billion, making a total of 641 billion. The largest concentration, approximately, 370 billion barrels, occurs, of course, in the Middle East.

Reserves attributed to particular regions are:

- Asia Pacific Area-- 20 Billion - ½ in Indonesia
- Western Europe-- 24 billion - mostly North Sea
- Africa-- 57 Billion - mostly in Libya and Nigeria, and
- Western Hemisphere-- 75 Billion - 28½ Billion in the U. S. of which 10 are in Alaska.

The figure attributed to Mexico, 16 billion, is obviously too low. Official proved reserves announced last year by the Mexican Government are 40.2 Billion which are expected to be increased any day to 60 billion. Mexican figures, however, have always been viewed with some skepticism by American engineers.

If one projects the Oil and Gas Journal's 1978 free world oil production of 46 billion, the indicated life of their free world reserves would be only 12 years. Obviously we have more oil than this since oil is still being discovered. How much remains to be discovered?

This brings the appraisal engineer into a much more uncertain area, indeed almost to the crystal ball. Yet reliable estimates have been made. The accepted authority in this field is Mr. N. King Hubbert, formerly with the U. S. Geological Survey. Hubbert's method for estimating future discoverable reserves is an extrapolation based on past experience, rather than on an attempt to measure future reserves directly. He assumes that reserves added by each additional unit of drilling is a function of cumulative explorative drilling. He graphs trends in production and projects them into the future by empirical curves that best fit the data. In this way he is

able to predict ultimate production, as well as production and discovery rates for the future until the terminal point.

A contrary method of estimating ultimate reserves, once used by the U.S. Geological Survey, is based on the assumption that just as much oil will be found in the future as was found in the past, when geologically similar sedimentary basins are subject to equivalent exploratory effort. In other words they assumed that, with sufficient exploration, a cubic mile of sediment anywhere will produce the same amount of oil produced in known areas. The results at one time led to unduly optimistic expectations of oil that could be produced in this country and in our outer continential shelf, going as high as 405 billion barrels as contrasted with Hubbert's figure of 215 billion.

I have talked with Hubbert recently and brought up to date his estimates of total world oil, which aggregates 2 trillion barrels, or a range of 1.8 to 2.2 trillion. According to Hubbert, the average of published figures by reputable authorities is 1.9 trillion, including a recent estimate by John Moody, formerly Chief Geologist of Mobil, of 2 trillion and one by H. R. Warnerman of BP of 1.8 trillion. Rand Corporation made a review for the CIA in 1978 and came up with a figure of 1.7 to 2.3 trillion for ultimate world oil. As you can see, all of these estimates coincide closely.

Hubbert breaks his figures down as follows:

	BILLION BARRELS	
United States	215	(including Alaska with 43 billion which Hubbert now considers high)
Canada	32	
South America	160	
Mexico	45	(as high as he will go even in light of recent discoveries)
Western Europe	68	(including 45 for the North Slope)
Africa	162	
Middle East	598	
Asia Pacific	96	
Communist World	472	

This, with a contingency of 173 billion barrels, aggregates 1.973 or just at the seemingly magic 2 trillion.

Of this amount, approximately 400 billion has already been produced leaving 1.6 billion for the future. At the productive rate given by the Oil and Gas Journal for 1978, this will last an additional 35 years. This would mean that world oil would be exhausted by the year 2014. This is, of course, not what will in fact take place since production will increase

before it decreases, new reserves may not always be found in time to maintain productive capacity, and in the end oil will be conserved below productive capacity. The point of exhaustion will, therefore, come later. If production could be leveled out at present rates, Hubbert feels that the exhaustion date for world oil would be extended to 2040 or 2050.

If we accept the Oil an Gas Journal figure of 646 billion barrels proven reserve, and add to it world production to date of 400 billion, we find that we have produced almost precisely 1/2 of the estimated 2 trillion recoverable oil leaving 1 trillion yet to be discovered. This seems like a large amount, however, it has been dwarfed by the tremendous growth in world demand. At 1978 production rates this trillion barrels of oil yet to be discovered would last only 20 years. At present rates the world consumes a billion barrels of oil every 20 days. And future demand will be greater as long as productive capacity can meet it.

Hubbert's method also makes it possible to predict when world oil production will peak and go down. This is a very important consideration, since world demand will not necessarily peak at that time. Continued increase in demand and natural decline in production will leave a widening gap between supply and demand which must be allocated by some device among consumers. At that point, extreme pressure will be put on price, strong efforts will be made by the more powerful consuming countries to obtain a greater share through political and economical pressure, even possibly through the use of force. The present, hopefully temporary, shortage provides us a useful preview.

Hubbert's orignial estimate of the peak, assuming normal supply and demand continued to operate without political interference or deliberate withholding of supplies to delay income or to get a higher price, was approximately 1990. Since then the consensus has moved the peaking point up to at least 1985. However, as we have seen, the loss of 2 million barrels a day from Iran would move it up even closer. Without Iran, world oil has already peaked and we are on the way down.

While we are discussing ultimate reserves, we might take a little closer look at U. S. reserves which are, of course, a matter of particular interest since this is the only oil we control politically. The Oil and Gas Journal gives us 28½ billion barrels proved reserves, including 10 for Alaska. We have already produced 120 billion, which gets us up to 148.5 billion. Remaining reserves to be discovered are estimated by Hubbert at 72 billion barrels. Following are some other estimates:

MOBIL	88 Billion
U.S. GEOLOGICAL SURVEY	98 Billion
SHELL	110 Billion
NATIONAL ACADEMY OF SCIENCE	113 Billion
EXXON	118 Billion

The average, which is 100 billion, might be considered a good figure to work with.

At the average daily U. S. oil production rate for December, 1978, of 8.8 million barrels, our 28.5 billion proved reserve would last 9 years an extra 100 billion yet to be found would provide an extra 31.5 years for a total of 40 years - to 2118. This will of course last longer because of normal production decline and possible lag in discoveries. It should be noted, also, that U. S. production accounted for only 46% of total estimated average supply of 19,399,985 barrels per day for December, 1978, the remainder of which was met by imports. (Figures from World Oil of February 1, 1979.)

Exploration of oil and gas in the U. S. is of course in a very advance stage. We have altogether 508,000 producing wells as of July 1, 1978, and have drilled, in most cases, to the deepest possible producing horizon in our favorable sedimentary basins. The only important discovery we have made in recent years in our lower 48 states is in the Wyoming Over-Thrust area which may ultimately produce 37 billion barrels. The remaining areas yet to be tested: East Coast Continential Shelf, Gulf of Mexico below 1,000 ft. depth, Gulf of Alaska and Northern Slope outside Prudhoe Bay, do not look favorable.

You will remember the disappointment over failure to find oil in the Destin Anticline off Florida, the biggest structure ever mapped in the Gulf of Mexico. The net result of all exploratory wells drilled in the Baltimore Canyon is perhaps 2 small gas fields which may not be big enough to pass ashore. The 4 billion barrels expected by the U. S. Geological Survey does not appear to be there. There is no real basis for expecting more favorable results in the other leases on the Atlantic Shelf, which the government has just made available and which got very luke warm response. Eight dry holes have been drilled in the Gulf of Alaska with no discoveries. The original North Slope reserves estimates have never been raised. Tests in the nearby Naval Reserve have been discouraging.

In addition to productive capacity and reserves there is one more important factor in the total oil picture which must be considered - the future in rate of discovery. This is important to assure that production will not be limited by a lag in the discovery rate even though the oil is there waiting to be found. Exxon, in its world energy outlook published in April, 1978, shows that discovery rates on a 5-year average basis ranged until 1970 from 20-25 billion barrels a year, mostly in the Middle East. Production outside of the Middle East, however, climbed by 1970 to a rate of 10 billion barrels a year, with Middle East discoveries down to 5. Exxon projects discoveries for the 1977 to 1990 time frame at somewhere between 12 and 18 billion barrels a year, expecting individual years to fluctuate between 10 and 25 billion barrels.

The location of much of the oil yet to be discovered is fairly well known. Saudi Arabia, for example, has many large structures yet undrilled which may take its ultimate reserves as high as 500 billion barrels. Fairly good estimates exist as to ultimate reserves in China, roughly 40 billion on shore and 40 billion off shore. There have been significant discoveries,

such as off shore Vietnam, which had to be abandoned for political reasons before ultimate reserves could be determined. Finding and developing the remaining oil of the world is becoming progressively more difficult and costly. Lead times are, according to Exxon, becoming increasingly longer - 6 to 12 years to commercial production and 10-12 years for full production.

As would be expected, discovery rates in the United States, which would anticipate the production peak of 1970, peaked in the late 1950's. Except for Prudhoe Bay, which came into production in 1977, discoveries have failed to keep up with production. Reserves fell in 1976 and 1977 at the rate of 1.72 billion barrels a year, about the same 5% rate at which production is now failing.

A new and disturbing factor in the future development of oil reserves worldwide is a breakdown in the traditional role of the international oil companies. They cannot continue to spend the enormous sums they have in the past for exploration and development in the face of almost certain nationalization once production has been developed. This happened in Mexico in 1934, more recently in the Middle East and elsewhere. The risks in oil explorations are so great that the companies cannot continue to pay for their failures and have their successes taken over at book value. Although many companies have been making small exploration investments, say in the order of tens of millions of dollars, larger development investments, in the 100's of millions, are being limited to politically stable areas such as the U. S., Canada and North Sea.

Some countries, i.e., Saudi Arabia through ARAMCO, are capable of developing undiscovered oil. Other areas, however, must await some new approach, perhaps through world bank funds or guarantees for private exploration. This is a grave problem which must be solved, otherwise world production will be held below levels which could otherwise be attained.

What about secondary and tertiary recovery? One often hears that the average oil field produces only 25% to 30% of the oil in place. Undue expectations have been built up that this can be added to available oil. The mechanics of oil production are well known. Through gas expansion alone one can get only about 25% of the oil in place, however, an active water drive that can keep up with the rate of production can flush out 75% of the oil. Secondary recovery, i.e., the use of pressure maintenance through water and gas injection as an aid to production, has been known and practiced almost from the beginning of oil production. There has indeed been a strong economic motive to do so. Mobil estimates that 70% of its fields are under secondary recovery.

In many cases there is comparatively little more that can be done even at increased prices, and the results would come slowly over a long period. The "Dribble" of oil that would result would not have a marked effect on total production. A recent study by the U. S. Office of Technicological Assessments concluded that at present world oil prices of $14.30 a barrel, enhanced recovery techniques could add 1/2 million to 1 million barrels to U. S. production in 1985; at $22 a barrel .9 to 1.3 million barrels a day; and an increase to $30 a barrel would only increase production by about 17% tertiary recovery, which means washing of the sand by some detergent-like

chemical, is included in the above. However, this is a very costly and hazardous process and will add little to rates of production.

I will not go deeply into alternative forms of energy. The principle point is that we and the rest of the world have been deficient in creating substitute sources in light of the imminent shortage of world oil. In view of the lateness of the hour, and particularly in light of the long lead times involved, we cannot afford to pick and choose. We do not have the luxury of taking the alternatives up in seriatom--most promising first. We must proceed to develop all forms of energy which could make a contribution. We must develop solar, whether it can provide 5% or 20% of our needs, as soon as any feasible technology is available.

Oil must be obtained from shale and tar sands and synthetized from coal, as a direct contribution to oil supplies. A start should be made in all of these, irregardless of cost, with government subsidy or price guarantees where necessary. Since gas is in the short term more plentiful than oil, we should switch to gas wherever possible, both to relieve oil supplies and to save foreign exchange. Although coal, which is also in long supply, is limited largely to utilities and is handicapped by environment consideration, we should increase its use as rapidly as possible.

The big slack in available oil supplies must, however, be taken up by increased nuclear energy production. Nuclear power is the most economical, the cleanest and from all evidence available the safest form of energy. Adequate uranium supplies are available in this country and safe methods for dealing with nuclear waste have been developed. Although the present administration publicly supports more conventional high pressure water reactors, no real progress is being made in getting the necessary legislation to reduce the 12 year time required for getting the necessary approvals for new plants. This is perhaps our most immediate energy roadblock.

In the meantime, America must press conservation, not as a solution to our problem but in order to prepare for impending shortages and to alleviate our balance of payment problem. The most immediate way to induce conservation is to raise the price of consumers, which has up to now been blocked by Congress. World oil prices, which have since the 1974 quadrupling been held steady by Opec, have been sent skyrocketing by the Iranian shutdown.

The Opec price of $13.34 was scheduled for an increase of 14.5% by the end of 1979. Following the Iranian stoppage, Saudi Arabia took the lead in adding a $1.20 a barrel excise tax to the cost of the "extra" oil it produced. Other countries, Iraq, Duwait, Venezuela and Libya have followed suit to all of their oil. Venezuela has announced the intention of increasing all prices 14%, Algeria 25%, and Iran, who started the trouble, is selling oil to the highest bidder at $18.00 to $20.00 a barrel, an increase of 50%. Ashland, the largest independent American refiner, has bought 2,000,000 barrels of Iranian oil in this range. Spot prices for smaller quantities have been reported as high as $28.00.

Until the Iranian shutdown there was no shortage in U. S. supply; however, our national bill for oil imports, roughly $48 billion a year, has been a major cause of our large balance of payments deficit and the decline of the dollar. If prices go up a total of 25%, which appears conservative, our oil bill would go up another $12 billion a year. Even if we reduce our demand by 1 million a day as we have promised the IEA, which is unlikely--the increase would still be $6 billion a year.

Within 2 years there is every likelihood that oil prices will be at least $25.00 a barrel--with disasterous balance of payment consequences for the U. S. A quick calculation shows that even if imports increased no more after our 1 million barrels a day decrease , our oil bill would be $75 billion. Walter Levy believes that the inflationary balance of payments and overall financial problems due to increased price constitute a greater threat to our country than a possible 5% supply deficit. This is one half the deficit, during the 1973-74 Arab Blackade, that cost us 600,000 jobs and $20 billion balance of payments. It would be a cruel choice, but we may, if we are unable to hold down the price of imported oil, be forced to deny ourselves the oil we need even below the limited amounts likely to be available, as the lesser of the two evils.

In the case of oil, it is not a question of bad news and good news--only bad news and worse!

Worldwide oil and gas at a glance

COUNTRY	ESTIMATED PROVED RESERVES 1-1-1979		OIL PRODUCTION			REFINING Capacity (b/cd) January 1, 1979				
	Oil (1,000 bbl)	Gas (10⁹ cu ft)	Producing wells July 1, '78	Estimated 1978 (1,000 b/d)	% change from 1977	No. of ref.	Crude	Catalytic Cracking	Thermal Cracking	Reformin
ASIA-PACIFIC										
Australia	2,100,000	31,000	375	430.0	.....	12	708,100	121,225		156,500
Bangladesh	.....	8,000	.....	.....	.....	1	31,200	.....	.....	1,720
Brunei	1,480,000	8,000	558	210.0	+5.0	.....	.....	.....	.....	.....
Burma	45,000	150	429	25.0	.....	2	26,000	.....	1,700	.....
Rep. of China (Taiwan)	*12,000	700	66	*4.3	−15.0	2	425,400	9,040	.....	49,760
Guam	.....	.....	.....	.....	.....	1	29,500	.....	.....	.....
India	2,900,000	3,500	1,600	230.0	+9.5	10	625,750	51,800	62,984	26,318
Indonesia	10,200,000	24,000	3,644	1,650.0	−2.1	9	527,700	19,500	30,000	34,400
Japan	60,000	500	542	10.0	.....	45	5,479,602	325,885	.....	557,009
Korea, South	.....	.....	.....	.....	.....	4	542,000	.....	.....	25,640
Malaysia	2,800,000	17,000	154	210.0	+5.0	3	140,000	.....	.....	8,000
New Zealand	*110,000	6,000	10	*13.0	−13.4	1	74,000	.....	.....	24,000
Okinawa (R.I.)	.....	.....	.....	.....	.....	3	195,967	.....	.....	11,305
Pakistan	200,000	16,000	17	9.3	−7.0	3	110,140	.....	.....	5,210
Philippines	100,000	.....	.....	.....	.....	2	253,300	24,500	.....	36,300
Singapore	.....	.....	.....	.....	.....	4	917,650	.....	48,000	20,000
Sri Lanka	.....	.....	.....	.....	.....	1	38,000	.....	12,500	3,750
Thailand	200	5,000	12	.2	.....	4	160,657	7,000	12,700	23,178
Total Asia-Pacific	20,007,200	119,850	7,407	2,791.8	+1.0	108	10,284,966	559,350	167,884	985,650
WEST EUROPE										
Austria	150,000	420	1,250	35.0	.....	1	280,000	16,500	.....	22,600
Belgium	.....	.....	.....	.....	.....	7	971,900	77,400	.....	109,250
Cyprus	.....	.....	.....	.....	.....	1	15,000	.....	.....	2,400
Denmark	300,000	2,500	18	10.0	.....	3	215,000	.....	45,400	37,700
Finland	.....	.....	.....	.....	.....	2	336,000	9,500	12,000	54,800
France	56,000	6,500	293	21.0	+5.0	23	3,468,625	190,500	43,700	441,050
Germany, West	310,000	6,300	2,933	102.0	−4.8	32	3,102,982	178,800	208,935	439,778
Greece	150,000	4,000	.....	.....	.....	4	411,000	.....	.....	30,200
Ireland	.....	1,000	.....	.....	.....	1	56,000	.....	.....	14,500
Italy-Sicily	650,000	8,000	120	28.0	−6.8	32	4,196,850	251,250	36,300	422,110
Netherlands	70,000	62,000	416	36.0	+20.0	9	1,857,250	75,000	157,100	199,600
Norway	5,900,000	24,000	50	350.0	+25.0	4	284,000	.....	46,000	30,000
Portugal	.....	.....	.....	.....	.....	3	360,780	.....	12,600	52,932
Spain	80,000	200	25	20.0	+25.0	10	1,424,944	.....	13,000	179,382
Sweden	.....	.....	.....	.....	.....	6	410,900	.....	33,000	74,500
Switzerland	.....	.....	.....	.....	.....	2	137,300	.....	24,000	24,500
United Kingdom	16,000,000	27,000	109	1,100.0	+43.2	19	2,526,305	168,575	78,000	452,235
Yugoslavia	300,000	1,340	NA	80.0	.....	6	293,278	1,960	6,100	46,296
Total W. Europe	23,966,000	143,260	5,208	1,782	+30.6	165	20,328,614	969,485	716,135	2,632,933
MIDDLE EAST										
Abu Dhabi	30,000,000	20,000	240	1,450.0	−12.9	1	15,000	.....	.....	2,800
Bahrain	250,000	7,000	233	56.0	.....	1	250,000	34,200	19,000	15,200
Dubai	1,300,000	1,600	71	360.0	+12.9	.....	.....	.....	.....	.....
Iran	59,000,000	500,000	551	5,250.0	−7.3	5	920,500	36,000	42,800	60,845
Iraq	32,100,000	27,800	250	2,500.0	+12.9	7	168,500	.....	.....	5,000
Israelt	10,000	60	25	10.0	+900.0	2	195,000	.....	39,000	24,500
Jordan	.....	.....	.....	.....	.....	1	30,300	4,410	.....	928
Kuwait	66,200,000	31,300	586	1,900.0	+6.7	5	712,000	.....	.....	21,600
Lebanon	.....	.....	.....	.....	.....	2	53,000	7,250	.....	7,300
Divided (Neutral) Zone	6,480,000	5,000	455	420.0	+15.1	.....	.....	.....	.....	.....
Oman	2,500,000	2,000	100	320.0	−6.2	.....	.....	.....	.....	.....
Qatar	4,000,000	40,000	95	480.0	+10.3	1	10,500	.....	.....	1,420
Saudi Arabia	165,700,000	93,900	875	7,800.0	−13.6	3	487,332	.....	2,530	45,386
Sharjah	16,000	.....	4	24.0	−14.3	.....	.....	.....	.....	.....
South Yemen (Aden)	.....	.....	.....	.....	.....	1	142,857	.....	.....	9,524
Syria	2,080,000	1,500	442	170.0	−16.3	2	223,040	.....	20,679	16,975
Turkey	360,000	500	380	50.0	−7.4	4	338,000	38,260	.....	29,875
Total Middle East	369,996,000	730,660	4,307	20,790.0	−6.2	35	3,546,029	120,120	124,009	241,353

EDITOR'S NOTE: All reserve figures except those for the U.S.S.R. are proved reserves recoverable with present technology and prices. U.S.S.R figures are "explored reserves," which includes proved, probable, and some possible.

*Condensate. †Includes Israeli-occupied portion of Gulf of Suez. ‡Estimates based on capacity 1/1/78 plus known 1978 expansions. Catalytic cracking, thermal cracking, and reforming figures converted to b/cd from b/sd (b/sd x 90% = b/cd). §Includes Bulgaria, Rumania, Czechoslovakia, East Germany, Poland, Hungary, Cuba, North Korea, Mongolia, Viet Nam, and Albania.

COUNTRY	ESTIMATED PROVED RESERVES 1-1-1979		OIL PRODUCTION			No. of ref.	REFINING Capacity (b/cd) January 1, 1979			
	Oil (1,000 bbl)	Gas (10⁹ cu ft)	Producing wells July 1, '78	Estimated 1978 (1,000 b/d)	% change from 1977		Crude	Catalytic Cracking	Thermal Cracking	Reforming
AFRICA										
Algeria	6,300,000	105,000	989	1 260.0	+15.5	3	122,400			23,600
Angola-Cabinda	1,115,000	1,200	182	130.0	−33.0	1	32,100			1,900
Cameroon	50,000	.....	13	10.0	.....	.....	.....	.....	.....	.....
Congo Republic	315,000	2,260	107	28.0	−15.2	.....	.....	.....	.....	.....
Egypt	3,200,000	3,000	430	490.0	+20.1	4	251,000			7,000
Ethiopia	.....	.....	.....	.....	.....	1	14,430			1,890
Gabon	1,970,000	2,400	211	170.0	−24.4	1	20,000		7,200	1,400
Ghana	.....	.....	.....	.....	.....	1	26,000			4,750
Ivory Coast	.....	.....	.....	.....	.....	1	39,000			5,900
Kenya	.....	.....	.....	.....	.....	1	95,000			9,000
Liberia	.....	.....	.....	.....	.....	1	15,000			2,300
Libya	24,300,000	24,200	817	2,050.0	−0.7	5	137,100			14,500
Madagascar	.....	.....	.....	.....	.....	1	11,440			1,610
Morocco	125	30	1	.1	.....	2	72,000	5,600		9,200
Mozambique	.....	.....	.....	.....	.....	.....	15,000			
Nigeria	18,200,000	42,000	1,322	1,800.0	+9.3	2	159,000	26,000		6,000
Senegal	.....	.....	.....	.....	.....	1	20,138			2,114
Sierra Leone	.....	.....	.....	.....	.....	1	10,000			
Somalia	.....	.....	.....	.....	.....	1	10,000			
South Africa	.....	.....	.....	.....	.....	4	478,000	81,400	58,500	65,500
Sudan	.....	100	.....	.....	.....	1	26,000			1,800
Tanzania	.....	50	.....	.....	.....	1	17,000			4,200
Togo	.....	.....	.....	.....	.....	1	20,000			3,020
Tunisia	2,300,000	6,000	76	100.0	+11.0	1	34,000			3,300
Zaire	142,000	50	12	20.0	.....	1	17,000			3,000
Zambia	.....	.....	.....	.....	.....	1	25,000			5,600
Total Africa	57,892,125	185,290	4,160	6,058.1	−3.1	37	1,667,608	113,000	65,700	177,584
WESTERN HEMISPHERE										
Argentina	2,400,000	12,000	6,020	450.0	+4.7	12	655,039	95,082	39,930	36,846
Bahamas	.....	.....	.....	.....	.....	1	500,000			
Barbados	500	.....	19	.7	+130.0	1	3,000			
Bolivia	250.000	6,000	286	30.0	−14.3	4	74,300			13,800
Brazil	1,200,000	1,500	1,522	160.0	.....	12	1,209,200	216,400		21,600
Chile	400,000	2,500	425	20.0	.....	2	144,000	34,500	8,800	9,000
Colombia	750,000	4,800	1,980	130.0	−6.5	6	173,500	52,000	18,000	
Costa Rica	.....	.....	.....	.....	.....	1	12,000			1,500
Dominican Republic	.....	.....	.....	.....	.....	2	46,461			9,550
Ecuador	1,170,000	4,000	979	200.0	+11.0	4	92,815	12,600	12,600	2,780
El Salvador	.....	.....	.....	.....	.....	1	17,000			3,000
Guatemala	16,000	.....	1	.7	.....	1	14,000			3,000
Honduras	.....	.....	.....	.....	.....	1	14,000			1,800
Jamaica	.....	.....	.....	.....	.....	1	32,600			3,000
Martinique	.....	.....	.....	.....	.....	1	14,000			3,100
Mexico	16,000,000	32,000	4,145	1,270.0	+24.2	9	1,243,500	217,000	82,000	96,000
Netherlands Antilles	.....	.....	.....	.....	.....	2	842,000	42,000	298,000	15,000
Nicaragua	.....	.....	.....	.....	.....	1	14,900			2,800
Panama	.....	.....	.....	.....	.....	1	100,000			7,500
Paraguay	.....	.....	.....	.....	.....	1	5,000			
Peru	560,000	1,150	2,567	150.0	+74.4	5	170,100	23,390		1,760
Puerto Rico	.....	.....	.....	.....	.....	3	284,000	47,00	20,000	76,000
Trinidad & Tobago	500,000	8,000	3,284	240.0	+4.4	2	461,000	26,500		27,000
Uruguay	.....	.....	.....	.....	.....	1	43,000	4,000		3,000
Venezuela	18,000,000	41,000	11,909	2,150.0	−3.8	12	1,445,500	53,400	73,700	21,900
Virgin Islands	.....	.....	.....	.....	.....	1	728,000	.....	.....	80,000
United States	28,500,000	205,000	508,340	8,660.0	+5.9	285	‡17,150,000	‡5,050,000	‡436,000	‡3,840,000
Canada	6,000,000	59,000	25,800	1,300.0	−1.3	37	‡2,225,000	‡550,000	‡42,900	‡450,00
Total W. Hemisphere	75,746,500	376,950	567,283	14,761.4	+4.5	410	27,713,915	6,423,872	1,031,930	4,729,936
Total Non-Communist	547,607,825	1,557,010	588,365	46,183.3	−0.8	755	63,541,132	8,185,827	2,105,658	8,767,396
COMMUNIST AREAS										
U.S.S.R.	71,000,000	910,000	(N.A.)	11,400.0	4.5	31	10,478,000	NA	NA	NA
China	20,000,000	25,000	(N.A.)	2,000.0	11.1	20	1,578,000	NA	NA	NA
Others§	3,000,000	10,000	(N.A.)	410.0	.....	37	2,692,000	NA	NA	NA
Total Communist	94,000,000	945,000	(N.A.)	13,810.0	5.3	88	14,748,000	NA	NA	NA
TOTAL WORLD	641,607,825	2,502,010		59,993.3	0.6	843	78,289,132			

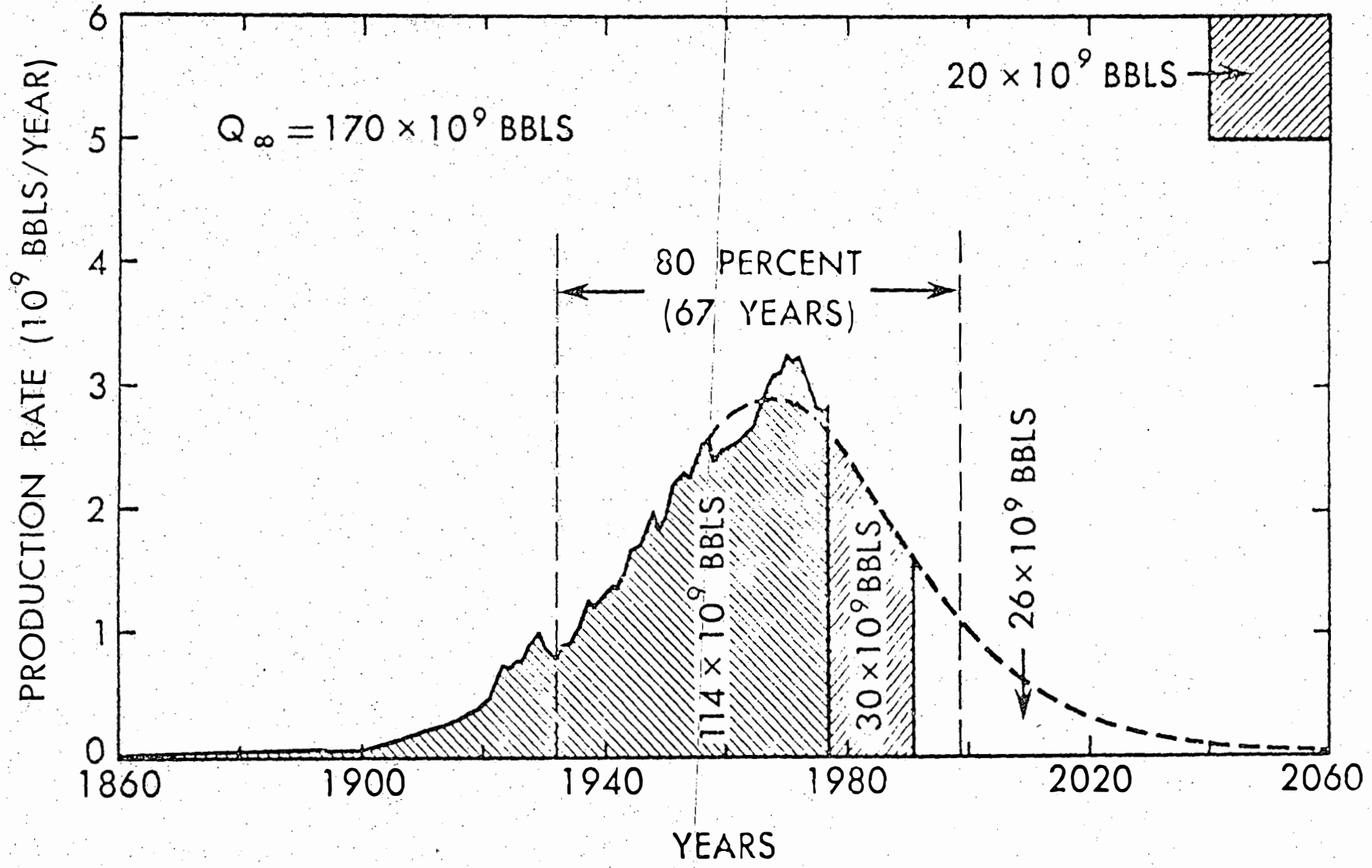


Fig. 16. Complete cycle of crude-oil production in U.S. Lower-48 states.

* World Resources of Fossil Organic Raw Materials, M.King Hubbert, July 10, 1978

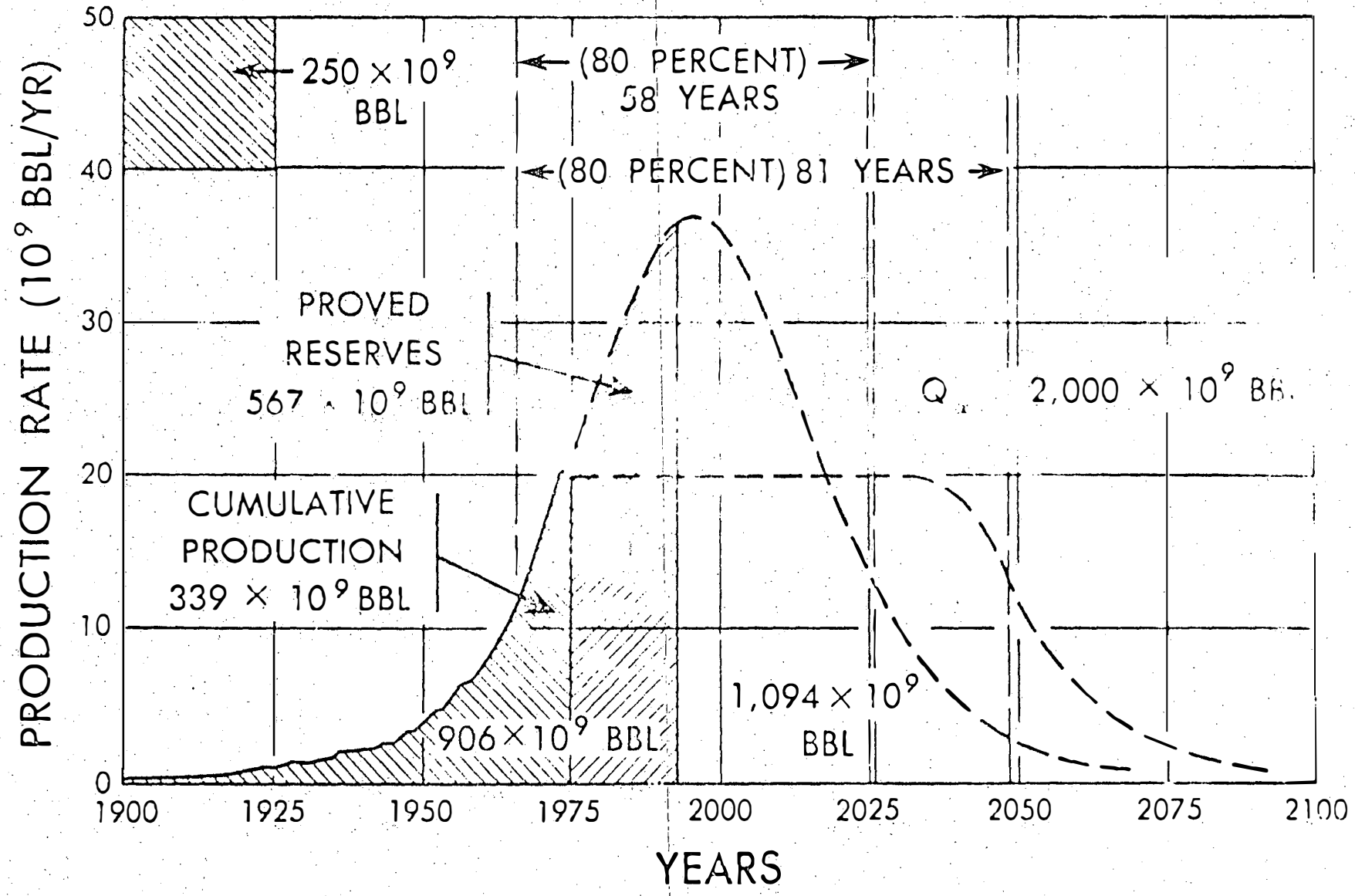


Fig. 18. Complete cycles, world crude-oil production (Hubbert, 1977, Fig. XIX-3).

* WORLD RESOURCES OF FOSSIL ORGANIC RAW MATERIALS, M. King Hubbert, July 10, 1978

Table 2.---Estimates since 1957 of world ultimate production of crude oil

Author	Organization	Quantity (10^9 bbl)	Reference
L. G. Weeks	Standard Oil Co. (N.J.)	1,500	Weeks, 1958
L. G. Weeks	Standard Oil Co. (N.J.)	2,000	Weeks, 1959
M. King Hubbert	National Academy of Sciences	1,250	Hubbert, 1962
T. A. Hendricks	U.S. Geological Survey	2,480	Hendricks, 1965
W. P. Ryman	Standard Oil Co. (N.J.)	2,090	Cited in Hubbert, 1969, table 8.2
- - - - - -	Shell	1,800	Warman, 1971
L. G. Weeks	Consultant	1,870*	Weeks, 1968a,b
M. King Hubbert	National Academy of Sciences	1,350-2,000	Hubbert, 1969
J. D. Moody	Mobil Oil Corporation	1,800	Moody, 1970
H. R. Warman	British Petroleum Co. Ltd.	1,200-2,000	Warman, 1971
L. G. Weeks	Lewis G. Weeks Associates Ltd.	1,950**	Weeks, 1971
J. D. Moody and H. H. Emmerick	Mobil Oil Corporation	1,800-1,900	Moody and Emmerick, 197[illegible]
Richard L. Jodry	Sun Oil Co.	1,952	Cited in Hubbert, 19[illegible]
H. R. Warman	British Petroleum Co. Ltd.	1,800	Warman, 1972
Wim Vermeer	Shell	1,930	Vermeer, 197[illegible]
H. R. Warman	British Petroleum Co. Ltd.	1,915	Warman, 197[illegible]
J. D. Moody and R. W. Esser	Mobil Oil Corporation	2,000	Moody and Esser, 1974
M. King Hubbert	U.S. Geological Survey	2,000	Hubbert, 1974, p. 185; fig. 68

* 85 percent of estimate of 2,200 × 10^9 bbl for petroleum liquids.

** 85 percent of estimate of 2,290 × 10^9 bbl for petroleum liquids.

***World Resources of Fossil Organic Raw Materials, M. King Hubbert, July 10, 1978