

## PETROLEUM AND NATIONAL STRENGTH

Mr. Ira H. Cram

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INDUSTRIAL COLLEGE OF THE ARMED FORCES  
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PETROLEUM AND NATIONAL STRENGTH

19 November 1962

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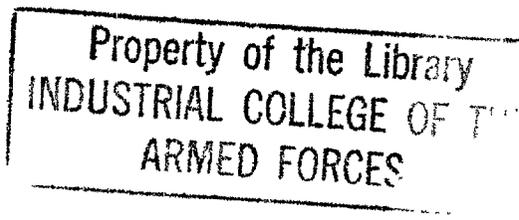
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Reporter--Grace R. O'Toole



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INDUSTRIAL COLLEGE OF THE ARMED FORCES

Washington 25, D. C.

~~PETROLEUM AND NATIONAL STRENGTH~~

19 November 1962

GENERAL STOUGHTON: Gentlemen:

We continue our studies of resources and national strength. We start this new week with a look at one of the most vital of those resources, petroleum.

Our speaker this morning has spent his life in the petroleum industry, in both the national and the international fields. It is of particular note that in 1960 he was a member of the U. S. Petroleum Delegation to the U.S.S.R.

We are fortunate to have him here to take advantage of his wide knowledge and experience.

It is a pleasure to present Mr. Ira H. Cram, the First Vice President of the Continental Oil Company.

MR. CRAM: Thank you, Mr. Chairman. Gentlemen:

The opportunity to address the Industrial College of the Armed Forces comes to very few people. I feel distinctly honored. I am particularly pleased to be invited to speak upon my favorite subject, Petroleum and National Strength.

General Quijl suggested that in the development of the subject I discuss certain items. This I shall do, naturally concentrating on those appearing most pertinent to the American scene.

Not so many years ago my remarks would probably have been directed almost exclusively to liquid petroleum. Today the growing role being played by natural gas and contained liquids necessitates including gaseous petroleum in any

discussion involving petroleum.

The story of petroleum's contribution to our society is an exciting one. The future promises to be no less exciting. Did you hear about the fellow who was hailed into court and said, "Judge, why am I here?" The Judge said, "Well, you are here for drinking." The man said, "Well, let's get started." So now I am going to get started.

The United States has been and still is the great busy laboratory of the petroleum business. Here in our growing, competitive, industrial society hunger for energy, we have learned how to put petroleum to work and have developed a technology which has insured an adequate supply of raw material and a mounting number of useful and improved products. Day by day we have become more dependent upon petroleum.

(Chart) Now oil and gas supply almost three-fourths of the energy consumed in our country. On this slide you will see the history of energy consumption in this country. It is a percentage slide. You will notice that coal had a dramatic rise percentagewise into the early 1900's, and since then oil and gas have taken over, and wood has practically disappeared. As a matter of fact, in the early 1900's, coal supplied three-fourths of the energy. Now coal is down to one-fourth, and perhaps you can't see it but the last two figures here are supposed to be 1970 and 1980. That's a rank guess as to what is going to happen. At the present time coal supplies less than a quarter of the energy. But outside of the country, outside the United States and Canada, coal still supplies about two-thirds of the world's energy.

(Chart) The volume of coal consumed has declined since the close of the war. Today the consumption of either oil or gas exceeds that of coal. This slide is plotted on semi-log paper so that the percentage of growth can be seen. You will notice the red line and the yellow line have crossed the coal line, which is the one next to the top. So that today, volumewise, oil and gas supply most of our energy.

Now, during the coal age, prior to 1920, real gross national product generally rose as fast as the consumption of all forms of energy. That's the green line, the third from the top. But during the hydrocarbon age since the close of World War I, it has generally risen faster than the total consumption of energy. You see the green line converging on the top line. Stated differently, energy consumption per unit of gross national product has declined generally during the hydrocarbon age.

(Chart) A clear picture of the growth of petroleum in our energy picture through the years, and of the relationship of this growth to our well-being, is obtained by a per capita study. Note again the gross national product line, the total energy line, and the hydrocarbon energy line, which are the red and yellow. Per capita consumption of hydrocarbons has climbed faster than either per capita consumption of all energy or per capita gross national product, the climb conforming closely to the growth of industrial production. The dashed line at the top is the index of industrial production. You will notice that in the last few years it and the hydrocarbon energy line practically conform to each other.

It is tempting to attribute the accelerated growth in industrial production

since the depression days to the expanding use of hydrocarbons. However, during the same period per capita consumption of electricity increased even faster. So I guess that the fair conclusion is that hydrocarbons played a big part but not a dominant part in the growth of industrial production.

(Chart) In the last three decades, while consumption of total energy increased in the world at large, the rate of increase of oil and gas usage outstripped that of coal. In other words, the oil and gas lines are rising faster than the coal line, which is the next to the top.

(Chart) Again, the increase in worldwide industrial production in the last 20 years follows closely the increase in per capita consumption of oil and gas, both increasing slightly faster than in the United States. Again notice the dashed industrial production index, which parallels pretty well the oil line.

However, our per capita consumption of energy is still more than three times that of Western Europe and over eight times that of the rest of the world. Our per capita consumption of oil and gas is over seven times that of Western Europe and about twenty times that of the rest of the world.

(Chart) The increase in energy consumption has not been uniform throughout the world. In the last decade consumption increased faster in the Iron Curtain countries. However, the increase in consumption of hydrocarbons in the Iron Curtain countries was exceeded only by the Far East and approached only by Western Europe.

Again we have the tempting correlation of increasing hydrocarbon consumption with mounting industrial production in these areas.

Volumewise the Iron-Curtain countries today consume almost as much total energy as the United States and Canada, and they consume about as much hydrocarbon energy as Western Europe.

(Chart) Worldwide there is a close though inexact correlation of per capita national income and per capita consumption of energy. Both are highest in our country. Of the group of selected countries, the lowest is India. The anomalies, such as Switzerland, are explainable on the basis of the nature of the economies of these particular nations.

I could, but need not, go further documenting the close relationship between the consumption of energy, particularly hydrocarbon energy, and a nation's industrial strength and well-being.

Having taught the world the might and comfort of petroleum, we now see the Soviet Union and other industrialized nations going our way in the matter of consumption of liquid and gaseous petroleum, and we see practically every country, however impoverished, struggling to industrialize in a hurry, and striving to develop within their borders the energy indispensable to industrialization, particularly oil and gas.

These countries all have something else in mind--petrochemicals, knowing, no doubt, that the value of petrochemicals produced in the United States last year was more than half the value of all chemicals.

The No. 1 problem of any extractive industry is capturing the minerals that Mother Nature has cleverly hidden in the earth's crust. It has always been and will continue to be the petroleum industry's primary problem, even though at

certain times, such as the present, the problem of the day seems to be the disposal of excess production. So I am going to spend most of my remaining time discussing the development of supplies, particularly in the United States.

(Chart) First it is necessary to examine briefly the supply position of our country. Crude oil and natural gas are produced in 50-odd countries. In only a very few countries is there no possibility of finding hydrocarbons. However, a mere handful of countries, notably, Venezuela, the Soviet Union, and the Middle East, now have sizable exportable surpluses. In other words, on this slide you will notice that Latin America, the Soviet Union, and the Middle East produce far more than they consume, the production being on the right side and the consumption on the left side.

The United States and Canada are now net importers of crude oil and products. Our annual net imports are now approximately 650 million barrels per year. However, the reserve productive capacity of crude oil in both the United States and Canada is very substantial and is ordinarily calculated to be about 50 percent greater than the net imports of crude and products. Just how long such a rate of production can be maintained without a stepped-up, sustained drilling campaign, is anybody's guess. At any rate, without any question, a very comfortable amount of additional liquid petroleum can be produced and transported quickly, as was demonstrated in the Suez crisis.

It is important to remember that of the large industrial nations only the United States and the Soviet Union have sufficient production within their borders to satisfy their present needs of liquid petroleum and natural gas. By contrast,

Western Europe produces only some 7 percent of its liquid requirements. The bulk of its supplies come from overseas by tanker.

It is a little surprising to find out that the amount of oil arriving at ports on the East and West Coasts of the United States by tanker exceeds the amount carried to free Europe by tanker. True, over half of this oil is our own, shipped from the Gulf Coast to the East Coast. Yet once on the high seas it is subject to the fortunes of war.

The Caribbean supplies about 65 percent of our imports of crude oil and refined products. The Middle East supplies less than 20 percent, Canada about 6 percent, and Indonesia and the other countries the rest.

(Chart) Most interesting is the fact that more crude and refined products are shipped from the Caribbean to the Eastern Hemisphere than from the Eastern Hemisphere to the Western. Our Hemisphere is potentially self-sufficient. So is the Eastern Hemisphere, because that hemisphere also has reserve productive capacity of crude oil which exceeds the net amount imported from the Western Hemisphere.

(Chart) Pursuing further the matter of our position in the world's supply of crude oil this slide shows the growth of crude oil reserves in the world. The bottom lines are the United States, the middle one is the Western Hemisphere, and the top is supposed to be the world. So take my word for it. Our relative position in the world has deteriorated in recent years. Twenty-five years ago we were producing 60 percent of the world's crude and boasted of 44 percent of the reserves. Now we produce 34 percent and claim only 11 or 12 percent of

the reserves. So our relative position has deteriorated.

Now, if these trends tempt you to read gloom into our position, keep in mind that American companies are producing almost 56 percent of the free world's crude oil, and that their reserve position may be even better. In other words, the strength of our industry and of our Nation is not all within our borders. Looking ahead, there is general agreement that the world will continue to have a coming appetite for petroleum. The various prognosticators disagree, of course, and, of course, no estimate takes into account the unexpected.

(Chart) Whatever estimate one is inclined to believe in, the quantities of petroleum that will be consumed down the line stagger the imagination. Here is a little guesswork which suggests that in the 1960-1970 decade we will consume 40 billion barrels of oil and 157 trillion cubic feet of gas. This happens to be the amount we consumed in the last 16 years instead of 10 years. The free world, according to this guess, will consume as much petroleum in the next 10 years as it did in the previous 20.

(Chart) Here is more guesswork -- 1961 through 1980. According to this we would consume in the next 20 years 21 billion barrels more oil than we have consumed in the past 100 years. According to this guess the free world would consume just about double the previous free world production.

Making available such astronomical quantities will be a monumental task but not the frightening task it was before we learned that there was more oil and gas in the earth's crust than hardly anybody dreamed of, the quantity, though unmeasurable, being in all probability still large beyond comprehension. There

are approximately 20 million square miles in the world in which oil and gas fields may exist. We have ~~approximately one-eighth~~ of these hunting grounds within our borders. The Soviet Union has one-fifth. To be sure, not all of the hunting grounds are of equal quality. As a matter of fact, we Americans were not blessed with lush hunting grounds full of gigantic oil fields from which great quantities of oil can be produced relatively cheaply from a limited number of wells. Our country has been one of relatively small oil fields, and the chances of finding the gigantic one diminish with time.

According to present estimates, we have only four oil fields that will ultimately produce more than one billion barrels, and only one, East Texas, that will produce more than five billion.

By contrast, the ultimate production of crude oil from the 26 fields in the Middle East has been estimated to average 7 billion barrels per field, and one field, Bergan in Kuwait, may produce ultimately as much as 60 billion barrels of crude oil. This happens to be approximately the estimated recovery of our 241 largest fields.

There are other giants in the world, too. Russia has some of them, and Venezuela. Russia has some large gas fields, also. It simply takes more effort, ingenuity, and money to ferret out and develop numerous relatively small and tiny fields than it does a few giants. Hence, from the beginning, and except for certain depressed periods, the domestic industry has had to increase its exploratory and development efforts almost constantly in order to replace mounting production and make some provision for the future. But if we were endowed with

~~hard-to-capture resources, we were endowed~~ with a counterbalancing blessing.

It seems that our forefathers were clairvoyant when they permitted holders of the surface to own the minerals beneath and encouraged individuals to be productive through a system of free, competitive enterprise. Without both the sort of hydrocarbon resources with which we were endowed could only be skimmed. The finding of oil and gas fields is a highly imaginative and risky business in any land. No one oil operator or limited number of operators has a monopoly on imagination and courage, regardless of his pocketbook.

So it is pretty obvious that when a system permits and encourages thousands of individuals to spend their own money on their own ideas, the oil and gas fields that are missed by one are eventually found by another, and collectively they outwit tricky Mother Nature and capture the hidden resources.

Let us take a look at some of these individual problems. Immediately you wonder if the remaining resources of our country are ample. I am one who does not try to make estimates of the magnitude of these resources, because no one can visualize the innumerable geological/<sup>positions</sup>under which commercial oil and gas fields may occur. I attack the question from an economic standpoint.

(Chart) Oil and gas are found only by the drill. The volume of drilling is very sensitive to current well-head revenue or anticipated revenue. The bottom line is revenue. The dashed line in the middle is the footage trend. You will notice that except for the low rate of drilling during the war the jiggles in the footage line closely parallel the jiggles in the revenue line. So that drilling is very sensitive to well-head revenue.

Notice that from about 1944 to about 1957, in the middle of the chart, the drilling trend was generally upward. -Also during that period, in the middle of the chart, there is a line called gross additions, and it was upward. Before, when the drilling was at a low rate, before and after the line was upward, reserves failed to increase materially. So it is my thesis that as long as substantial new reserves are forthcoming during the period of expanding drilling there are no grounds for concern about the size of our remaining resources. In other words, as long as the resource responds to the drill, the hump of discovery has not been reached.

(Chart) Costs as well as revenue are critical. On this chart I have plotted a group of five-year averages. You must do this because of the wide variations in reserves reported each year. Anyway, the top line is the revenue per unit produced. That happens to be a trillion BTU of hydrocarbons, the unit. The yellow line is the cash outlay per unit produced. That is your effort, how much money you are spending. The bottom line, the red line, is the cash outlay per unit of gross additions to reserves. That is what you got for your money. On the left is current dollars--on the right, in the same three lines, constant dollars, plus the footage per unit of gross additions to reserves on the bottom line.

The chart shows this: If you compare the last five years with the five years, say, from 1946 to 1950, cash outlay per unit of gross additions to reserves increased 85 percent on a current-dollar basis, and 41 percent on a constant-dollar basis. Using drilling as effort rather than dollars, the increase was 35 percent.

Without much question, then, real unit costs of the industry have increased through the years and have increased more than unit revenue, which is obvious on the chart. The red line converges with the black one on the top. The result is a cost-price squeeze of serious proportions. The rise in real unit cost implies, and implies strongly, that technology has not kept up with the growing problems of finding and developing oil and gas reserves. Nevertheless, the technological advances made through the years are impressive, and I think the very slight rise in real cost in the last 10 years is evidence of accelerated technological growth. You will notice that the rise seems to have flattened off in the last two five-year periods.

(Chart) The technological advances are largely improvements in old tools rather than the invention of new ones. The reflection seismograph, the electric logging devices, and the rotary drill, to mention a few, were all in use in the 1930's, but they were Model T's, so to speak. Today we can explore with reasonable accuracy areas in depth that were once beyond us. The modern electric log gives a much more accurate picture of the contents of the formation, and the 20,000-foot hole is no longer a dream.

Along with the improvement in tools has come better interpretation, new concepts as to where oil and gas fields may be found, and, most important, recovery methods that result in recovering an ever-increasing percentage of the oil already discovered.

It is a heady story, really, on the advances in technology. I see something new almost daily indicating that technology is moving fast. The overall result

is the widening of the producers' horizon. The domestic hunting grounds have been greatly expanded horizontally and vertically, and they are still being expanded. Concurrently, the hunting grounds of the world in general have been expanded. The technology that is galloping ahead in response to the urge of the many competitors to outdo one another finds applications throughout the world, and greatly hastens discovery. In Libya, for instance, a number of fine oil fields were found in a short time by applying modern exploratory technology to a virgin area in which had been planted oil fields that were difficult to detect.

To summarize the supply problem ahead, this can be said: Outside the United States, and particularly in the Middle East, a tremendous proved reserve has been discovered which has not developed to the extent of ours. So a great deal more production can be developed by drilling development wells in fields already discovered. New important producing areas such as Libya are in the early stages of development. All in all, a given country or a given company will undoubtedly be disappointed down the line, but collectively the old and new producing areas outside the United States can supply at reasonable cost just about any amount of oil the outside world desires.

The job ahead within the United States is more difficult, but how difficult is not as readily predictable. Recalling my statement that until an expanding drilling campaign fails to provide substantial new reserves, there are no grounds for concern, is it likely that the resource will fail to respond to such drilling in the near future? It is my judgment, based upon the appraisal of the geologic evidence, that such a calamity will not occur in this decade and perhaps not in the

next. Furthermore, if new discoveries of oil do turn out to be disappointing, producing technology will surely continue to find ways to recover economically an expanding percentage of the almost 250 billion barrels of crude estimated to be in place in the fields already discovered but not recoverable by methods now in use.

The hunting grounds are still large. The gas hunting grounds are still large. And there is a tendency for the deeper reservoirs to contain more gas and natural gas liquids. Then, too, the oil and gas potential of Canada provides insurance.

We have another form of insurance, conservation. I doubt very much that any oil or gas is being produced in the United States at a rate that would cause physical waste above ground and decrease ultimate recovery, whether or not the wells be located in a State that determines the rate of production. The maximum efficient rate of production is a matter of opinion, but today that opinion is based upon growing knowledge of the fundamentals of oil and gas recovery rather than hunch. By and large engineers and managements are dedicated to recovering that last drop of oil at the least possible cost, rather than making a fast buck.

The major cost item is the drilling of wells. It has been learned that a tremendous number of wells have been drilled that are not required. We are dealing here with a complicated subject involving laws and regulations as well as engineering fact and opinion. Suffice it to point out that in the last 20 years there has been a general widening of spacing patterns and that further widening can be

expected in many instances.

Obviously, the drilling of ~~too many wells is economic waste~~ which reduces the capability of the industry to perform--in the finding of new reserves, for instance. Reduction of economic waste, then, produces the same result as reduction of physical waste, namely, a greater supply of oil and gas.

There is still another form of insurance. I refer to oil shales, mainly in Colorado, and tar sands, mainly in the Athabasca region of Alberta, Canada. Pilot-plant operations carried out in both areas have demonstrated that usable crude oil can be recovered. It has been estimated that one trillion barrels of petroleum-like substances are present in the oil shales of the United States and that the richer portions contain a half-trillion barrels. The latter is more oil than most men believe will eventually be recovered from our underground crude-oil resources.

It can be expected that in time commercial operations will be attempted and that if successful technology will grow to the point that a material proportion of these shale-oil reserves will be recovered.

You have probably discovered by now that I think there is sound reason to believe that we are far from running out of petroleum resources and technological ingenuity either in the United States or elsewhere. Given the proper economic incentive, the desired supply of hydrocarbons will assuredly emerge. So we have to concern ourselves with the economic climate rather than with the remaining resources.

Business men do not expect the economic climate to stay at either the

~~cost-price squeeze level of recent years or the boom level of the early fifties,~~  
and they know that political as well as strictly economic forces determine the climate. However, oil men were hardly prepared for the political ingredient in the economic climate to grow to the present extent at home and abroad. I must mention some of the more onerous government accomplishments and threats that darken the economic climate.

By and large the Federal and State governments have followed the advice of our forefathers to promote enterprise rather than to hinder it. The conservation laws, regulation of imports, the depletion and expensing provisions of the tax laws, the work of the Bureau of Mines, and the Federal and State geological surveys are all potent factors in the growth of the petroleum industry.

Now there are those who, while decrying the relatively slow growth rate of our country, promote ways of stunting it. For instance, the depletion provision which has provided so much incentive to the search for petroleum is again under attack as excessive, though its critics offer no effective substitute. Reduction can only result in a scaled-down exploratory effort when there is every indication that expanded effort is required down the line. The control of well-head prices of natural gas by the Federal Power Commission is impossible to accomplish on an equitable basis, but it is the law of the land. It is also one of the causes of the debilitating cost-price squeeze.

Competition among fuels as well as individuals has been one of the sources of great strength in that it has assured an endless supply of energy at the lowest possible cost to the consumer, and in a time that gave us a head start on the rest

of the world. Yet there are those who would impose and use controls on all forms of energy. It can be hoped that it will dawn upon them that competition among fuels is the only control mechanism that will work.

Our arch rival, the Soviet Union, has ample petroleum and other fuel supplies within its borders. This is no time to threaten our indigenous supplies. Nor is it timely to tamper with the effectiveness of our petroleum operations outside the United States. I can only construe our companies' control of 56 percent of the free world's crude oil production as a most important element of our overall strength. But again there are those who would increase taxes on the foreign operations of these companies.

Foreign governments are as active as beavers in injecting themselves into every phase of the oil business. The governments of the producing and would-be producing countries are particularly active. There are various forms of troublesome action all designed to increase government revenue and all stemming from growing nationalism. Do you know that 30-odd nations have organized government-controlled national oil companies to operate some portion of the oil business? Certainly you know that when a government organizes a national company to engage in competitive business it has taken a long stride toward a planned economy, Soviet style.

The Soviets, recognizing this, and also recognizing that the performance of the privately controlled oil companies is one of the finer symbols of the potency of Westernism, are active in supporting these national companies with long-term, low-interest loans and technological assistance. Some of the countries,

India, for example, have accepted such aid. Of course, the largest government-controlled oil company is in the Soviet Union and, as has been well advertised, they are raising a little havoc in the market place through their price cutting and barter activities. Significantly, about 62 percent of the Soviet exports of crude oil goes to government-controlled companies.

I shall not enter into the subject further except to point out that the competition of nationalism is very real. Even though these national companies have proven to be generally inefficient, they are not subject to the rigorous economic discipline privately owned companies are, and they do have a monopoly on some portion of the business. Thus the opportunities of the privately owned companies for expansion as the market expands are curtailed while paying additional tribute on current operations.

Truly, nationalism is working relentlessly in the direction of reducing the strength of international companies. To the extent that our Government may directly or indirectly finance these national companies, it is working against itself.

Well, gentlemen, I am about through. You have noted that I have avoided the temptation of assuming the role of armchair general. Only you, the military experts, can weigh intelligently the military implications of what I have had to say. However, I have not and should not have resisted expressing some views on governmental actions inimical to the functioning of an indispensable cog in the world society. Oil and gas have become particularly indispensable to us, for we have learned to depend upon them for three-fourths of our energy requirements.

Because of the nature of our domestic resources the development of new supplies in tune with expanding demands requires the effort of thousands of competing individual operators. Our Government's problem then becomes one of maintaining incentive at a level that will encourage these individuals to perform. Government cannot eliminate the business cycle but it can eliminate hamstringing laws and regulations and refrain from substituting others just as restrictive.

When groping for solutions to the inevitable problems of the future, our Government can and must reach solutions that provide optimum incentive. Outside the United States our Government's problem is the same one--providing incentive to its nationals. This it can do by refraining from excessive taxation and regulation and by exerting its not inconsiderable prestige in international affairs.

Not so many years ago only a handful of American operators had ventured into foreign lands. Now there are about 150. The principle of multiplicity of effort, so effective at home, cannot fail to work elsewhere. As I have pointed out, growing nationalism is working in the direction of curtailing the opportunities of private companies, but the aggregate activity of our many companies all over the world works in the direction of counteracting the adverse actions of nationalism. The activities of these operators provide us with a good chance of maintaining and increasing our position in world oil affairs. They will, for instance, find supplies of petroleum in other lands, thereby achieving diversification of supplies, so important in an emergency. When they find these supplies, they

contribute far more to that country's economy than the more affluent countries can accomplish through governmental aid programs.

Lastly, the money that may be made in foreign lands has a way of finding its way home to be used in strengthening the domestic economy.

Now, gentlemen, I am through. We have one main problem, don't we? the preservation of our way of life.

Thank you very much.

MR. MUNCY: Gentlemen, Mr. Cram is ready for your questions.

QUESTION: Mr. Cram, in the eternal quest for new wells, how is the proportion of the efforts of this Nation's companies divided as to domestic exploration and overseas exploration? If you can't answer it, I'd be interested in the effort of your own company.

MR. CRAM: I can give a rough answer to that. The great effort of the oil business is still in the United States, any way you look at it—the wells drilled, the seismographs running around, or anything. The companies spend most of their money here and work hardest here. Oh, there could be an exception, but I don't know who it might be.

QUESTION: Mr. Cram, if I understood your philosophy, it was that we could continue punching holes underground and there would be more oil, and that you are not worried about it until we start taking the stuff off. You mention that there is no end in sight in this 10-year period. That seems to me to be a very short view from a national viewpoint. It seems to me that we should import all the oil we can and conserve our own. Will you comment on that, please?

**MR. CRAM:** Of course, we are importing a considerable amount of oil.

It amounts to 20 percent or something of our production. This is a very tempting argument, to import more and more and conserve what we've got. I think, if you analyze a lot of the figures that I batted around too fast, we are going to have to import more and more. Now, I admit that 10 years is a short view. I happen to think it won't happen in 20 years. But I can't prove it. I can't even prove the 10.

The trouble with shutting it down in the United States is that you can't turn it on again. If you shut down the exploratory effort, the drilling effort, the talent disappears and reassembling the football team is going to be a little rough. So in practical operations you have to keep it going. You can't turn it around at the drop of a hat.

I suppose in my company, for instance, from the time you buy a lease until the time that you've got an oil well, five years have elapsed. That's somewhat of an average. So, if we try to get cute and say we'll turn it on some day when we need it, we can't turn it on. We can start, but it will take 5 or 6 years to get the team playing again.

So a big domestic effort is necessary from a practical standpoint. I don't know how to argue that it should be bigger than it is or smaller than it is but I know that if it isn't big we are going to get into more trouble in the future. I have great faith not only in what is left to be found here but in the comment I made on the ability of the smart fellows to get more oil out of the ground. There are supposed to be 250 billion barrels of oil in the field we've already found, and

we don't know how to get it out, yet. I'll bet somebody gets smart-enough to get a big piece of it out.

That takes constant effort, also. We have to whittle away at it every day in order for such advancements to take place.

So I didn't duck your question completely, I hope, and I hope you see what I am talking about.

QUESTION: Mr. Cram, I have a two-base question about the extrapolation of your energy curves that you had in the early part of your talk. No. 1, did those curves take into account the further development of new energy sources, such as the nuclear, hydroelectric, solar, and so on, and, if not, what is your viewpoint on that? Secondly, around the 1980 period, we noticed an increase in coal again, which had been decreasing. My question deals with the significance of that increase.

MR. CRAM: You are very observing. I was saving words. You have two points. There is a recent volume which I recommend to you. It is a national fuel study. In that volume they guess that in 1980 nuclear energy will have come into the fold and may contribute as much as electrical energy. So in one of those charts you saw the curve go up this way to 1980 or something, and that was some more energy from nuclear energy.

Now the coal angle is this. There are those who think--and they are probably in the ball park--that electricity is going to become more and more important used instead of flattening out or anything like that, and coal is the material/mostly for the generation of electricity. So the coal curve going upward is based on that

thought, that with time coal becomes more and more important because of electricity.

Here's an interesting comment on that. If in 1980 that percentage of coal is being used, it happens to be the same percentage that was used in 1870-- in other words, 26 percent. But the volume of coal is 20 times what it was in 1870, and, if you are interested in screwy statistics, the volume of hydrocarbons in 1980 would be 5,000 times what it was in 1870.

**QUESTION:** Mr. Cram, I wonder if you would comment on the efficiency of the Soviet petroleum industry as based upon your own work in that survey.

**MR. CRAM:** You saw that I ducked most of this Soviet business because I didn't want to make a speech on it. But I can give a broad comment on that. Those fellows are 15 years behind the times, or 10, or 20, or something like that, without any question. You can see it in the refineries. You can see in in the oil fields. Undoubtedly they are smart people and they've got a few tricks that we don't know anything about it. To give them credit, they must know something that we don't. But on balance they are a bit behind the times. So what? They've got an easy job right now, finding oil fields. Without getting technical, they found some big ones over there that any half-witted geologist could find if he had the opportunity.

We just don't have those things left in this country. So they have had an easy job. They can brag about their great technology, but it just ain't so. They haven't needed it. So from a practical standpoint they are doing a swell job, and being behind the times 10 or 15 years doesn't make any difference.

QUESTION: Sir, it seems that you'd like the best of all worlds. You want special depletion rates and taxes and things. You want the Government to restrict imports, and you want the Government to get out of the price business. What would happen in the oil industry if the Government removed the special depletion rates, removed any restriction on imports, allowed unlimited imports, and got out of prices?

MR. CRAM: That's a good one. I don't know the answer to all that. I know that if the depletion were thrown out the exploratory effort would fall on its face. Everybody knows that. If all the conservation laws were thrown out, we would have some trouble on that score. If imports were unrestricted, we'd have price trouble. So I can build a picture where, if the Government stepped out completely--which is apparently the picture you are building--then the supply of oil in the United States would just go to hell fast, because most of us couldn't make it.

As I pointed out, and I think I am right, it takes a lot of us to make the grade. So, sure, I'm like other business men. I want the best of everything. But I happen to know what works and what we are doing is what works. Don't forget that, even though I want the best of everything, the price of gasoline today is about the same as it was 30 years ago, that stuff you put in your car, and it's an infinitely better product.

So this thing that I say works for me also works for you.

QUESTION: The Government has set aside about 23 million acres of oil reserves for the military in Alaska. To what extent have these lands been

explored and drilled, and what are the prospects up there?

MR. CRAM: I can give you an antiquated review of that. I was in Alaska when the Navy was doing the work up there. They found a little gas field, and maybe it's a big one by now, and a little oil field. I am sure that if this land were not on the north slope of Alaska and happened to be in Nebraska, for instance, with the same kind of geology and everything else, it would probably be full of oil and gas fields by now.

So the problem up there is exploring it sufficiently by drilling a lot of wells, and they just didn't drill very much. It has been about the worst place in the world to operate, and then after you find the field you have to build a thousand-mile pipeline or something through an equally forbidding country. So that is why it hasn't been explored to any extent--not because there aren't any oil or gas fields under it.

QUESTION: Sir, the 1953 Foreign Assistance Appropriation Act provided about \$440 million for specific guarantees or insurance against confiscation, war risk, and revolution, or any conflict. Does the oil industries avail themselves of this insurance on foreign investments?

MR. CRAM: You'd better not take this answer as the lowdown, but, as I understand it, a refinery, for instance, could be insured through that route, or a new petrochemical plant, providing it was in a country where you had that arrangement. But an oil field can't be insured that way. In other words, if I found a couple billion barrels of oil in one of these countries and they took it away from me, they just took it away from me. That insurance does not apply.

I hope that's the right answer. It is my understanding of it.

QUESTION: Concerning the amount of shale and the Canada sand, can you tell us anything about the problems involved in the recovery of the oil, and what the capital investment is that might be required?

MR. CRAM: I don't know enough about it. The Bureau of Mines, you know, had a pilot plant at Rifle, Colorado, for a long time. Then the Union Oil Company tried it. Now I understand that the Bureau is going to try to try it again. There have been several tries in Canada.

I am sorry I don't remember figures, but I remember this: The various economics that these fellows bat around seem to indicate that either the sand or the shale is on the verge of being economic, because they compute a figure of something like \$3.00 a barrel as the overall cost. Don't ask me how they compute it, but they've got \$3.00 a barrel in both countries. Well, the price of crude in this country is less than \$3.00 a barrel these days, but that's getting closer than it used to be. And the Canadian government just approved a project up in the Athabasca sands country, and maybe those fellows will really figure out how to do it.

So far you get this \$3.00 affair and that's with a whale of a capital investment. I don't remember what it is.

QUESTION: You spoke of government hindrance in the petroleum industry. Do you, in your opinion, have any specific programs or changes in the present government programs to improve the atmosphere in plans of the petroleum industry?

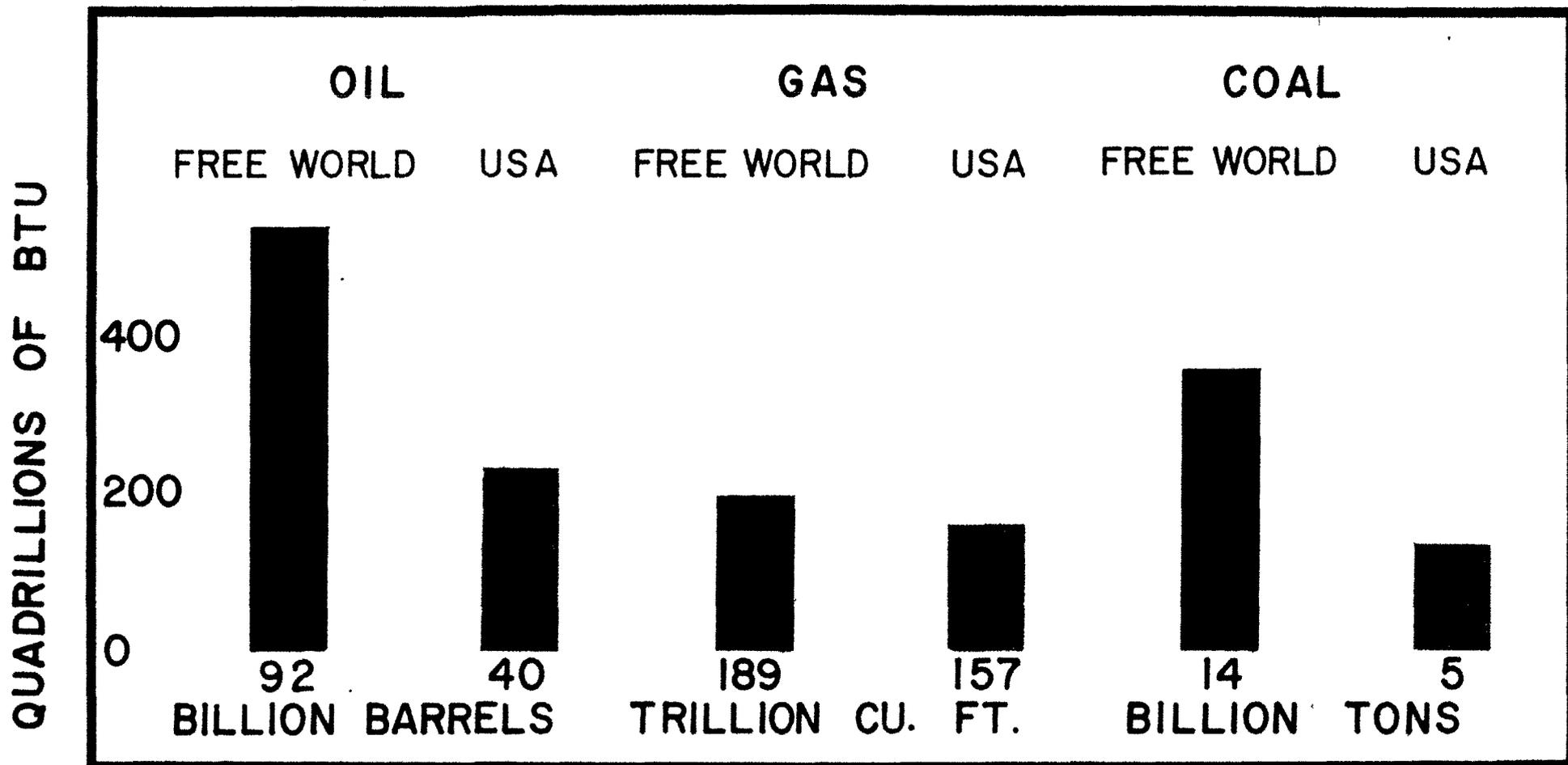
MR. CRAM: You remember, now, I said the Government has been a lot of help through history. There is one specific that every oil man is mad about. I'll just dwell on that. That's the price of natural gas. This is controlled by the Federal Power Commission. <sup>In</sup> /the Federal Power Commission, at least the last one, every fellow on the Commission knew that he couldn't do it, but that was his job, and so he tried, but was never satisfied with the result. So every oil man and every gas man, except the distributors in Brooklyn, or some such place, resents that price control. Everybody would like to get rid of it, naturally. We got rid of it twice, almost. In fact, both Eisenhower and Truman vetoed a bill, I think for the same reason -- they were afraid of politics. That's the No. 1 fly in the ointment.

The sniping at the depletion provision has always been an annoyance, but yet you have to admit that one of the jobs of government is to question, to take a strong look at any tax system at any time. Is it out of date or isn't it? So a lot of those fellows have to question this. And we've had a periodic battle on keeping the depletion provision.

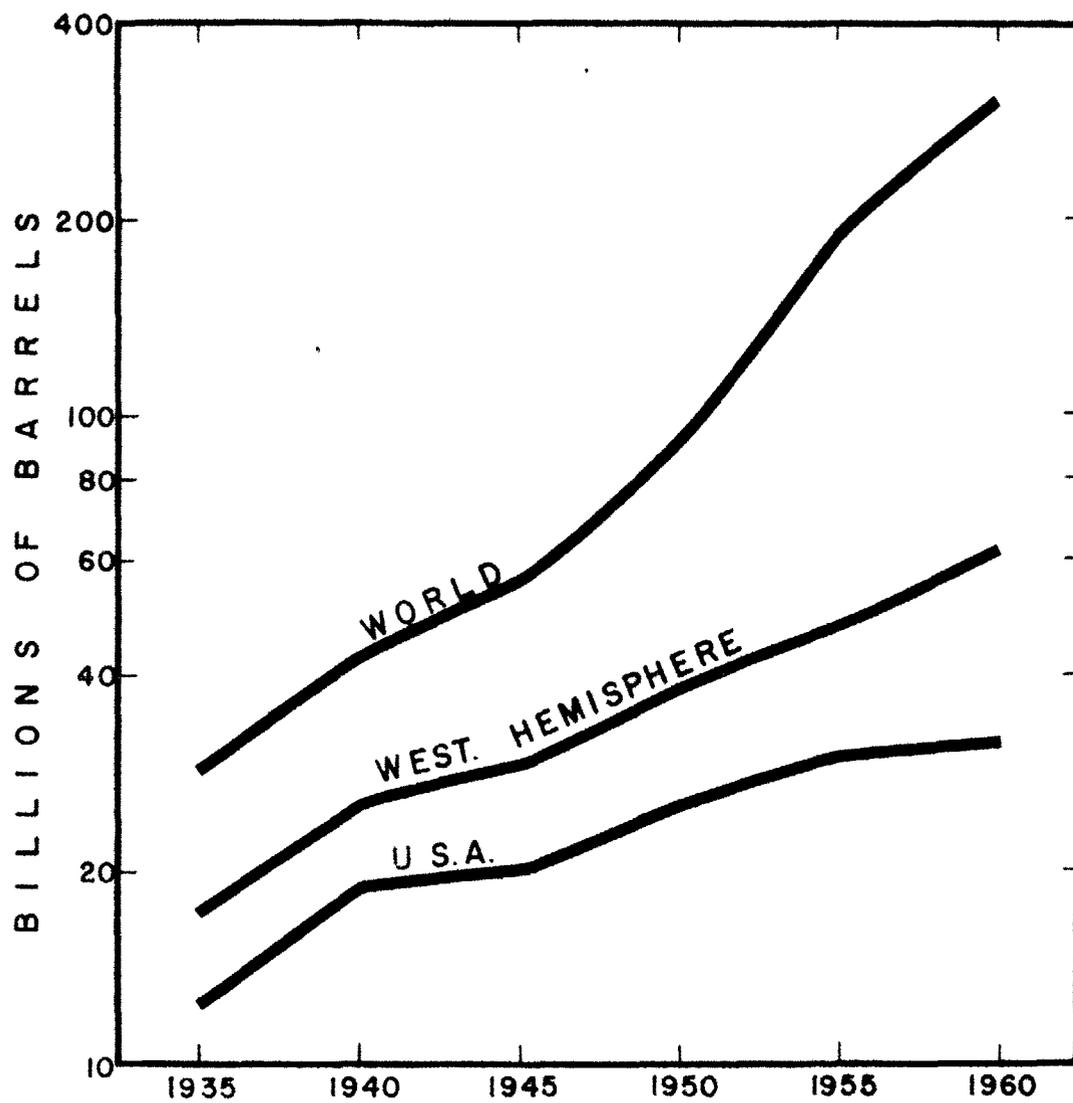
Well, we haven't had a battle for 3 or 4 years, but I guess next year we'll have the battle again.

MR. MUNCY: Mr. Cram, on behalf of the Commandant and all of us here, thank you for a very knowledgeable lecture.

# CONSUMPTION OF ENERGY 1961 THRU 1970

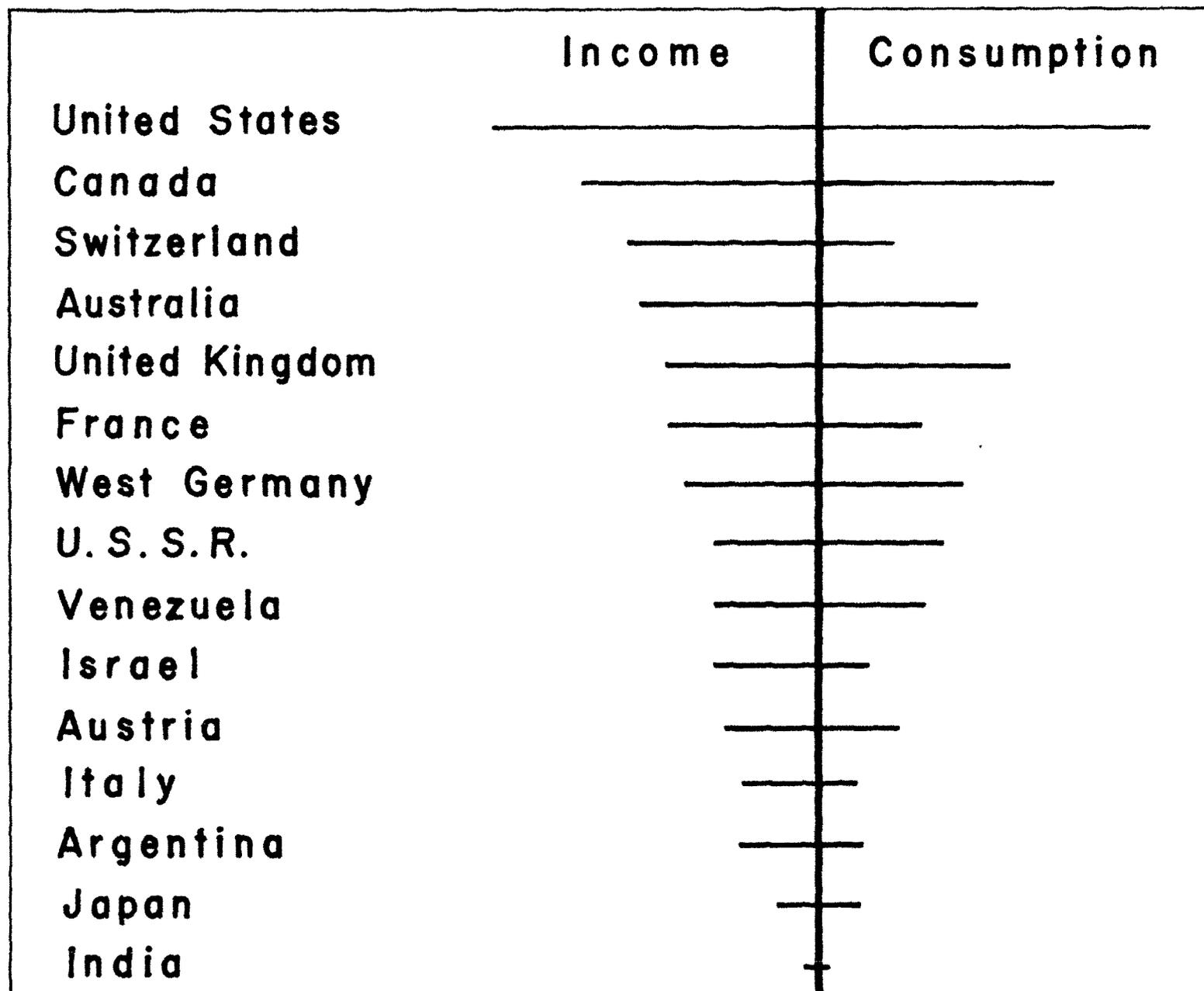


# CRUDE OIL PROVED RESERVES

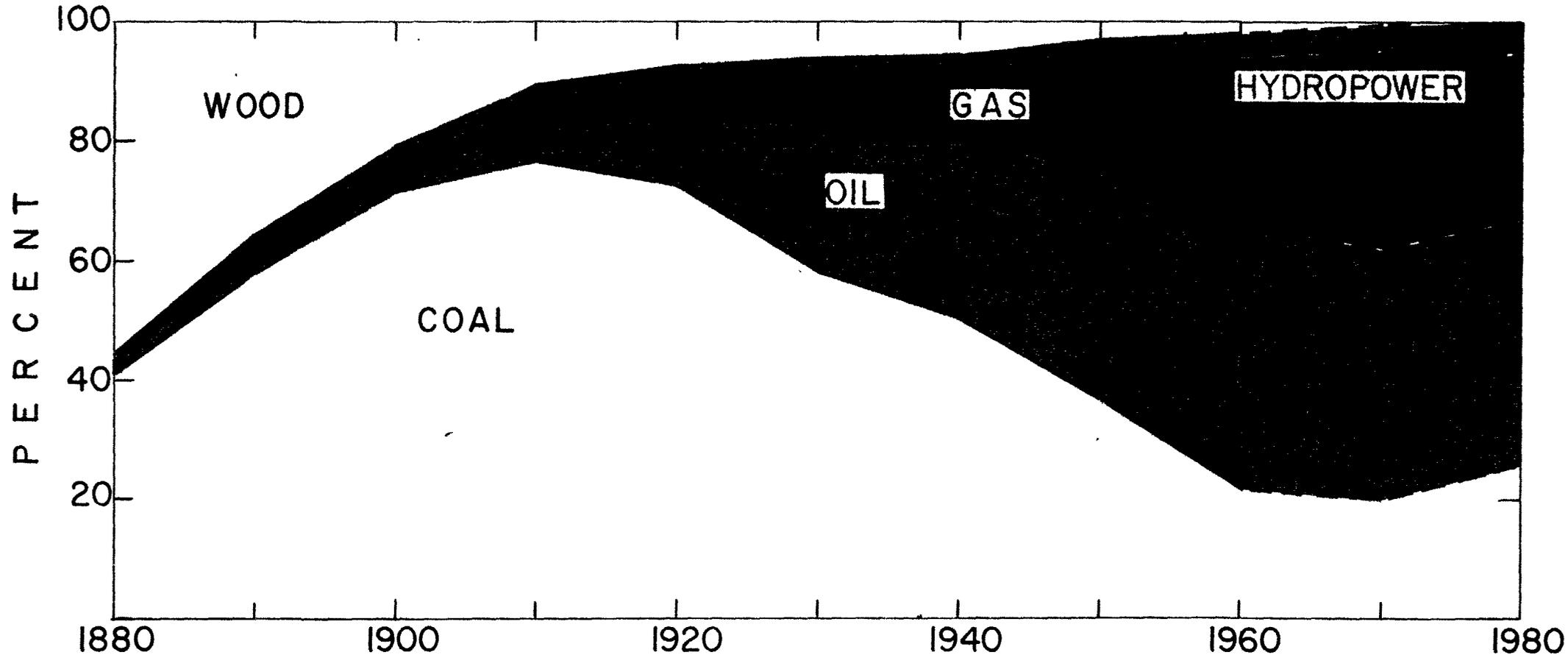




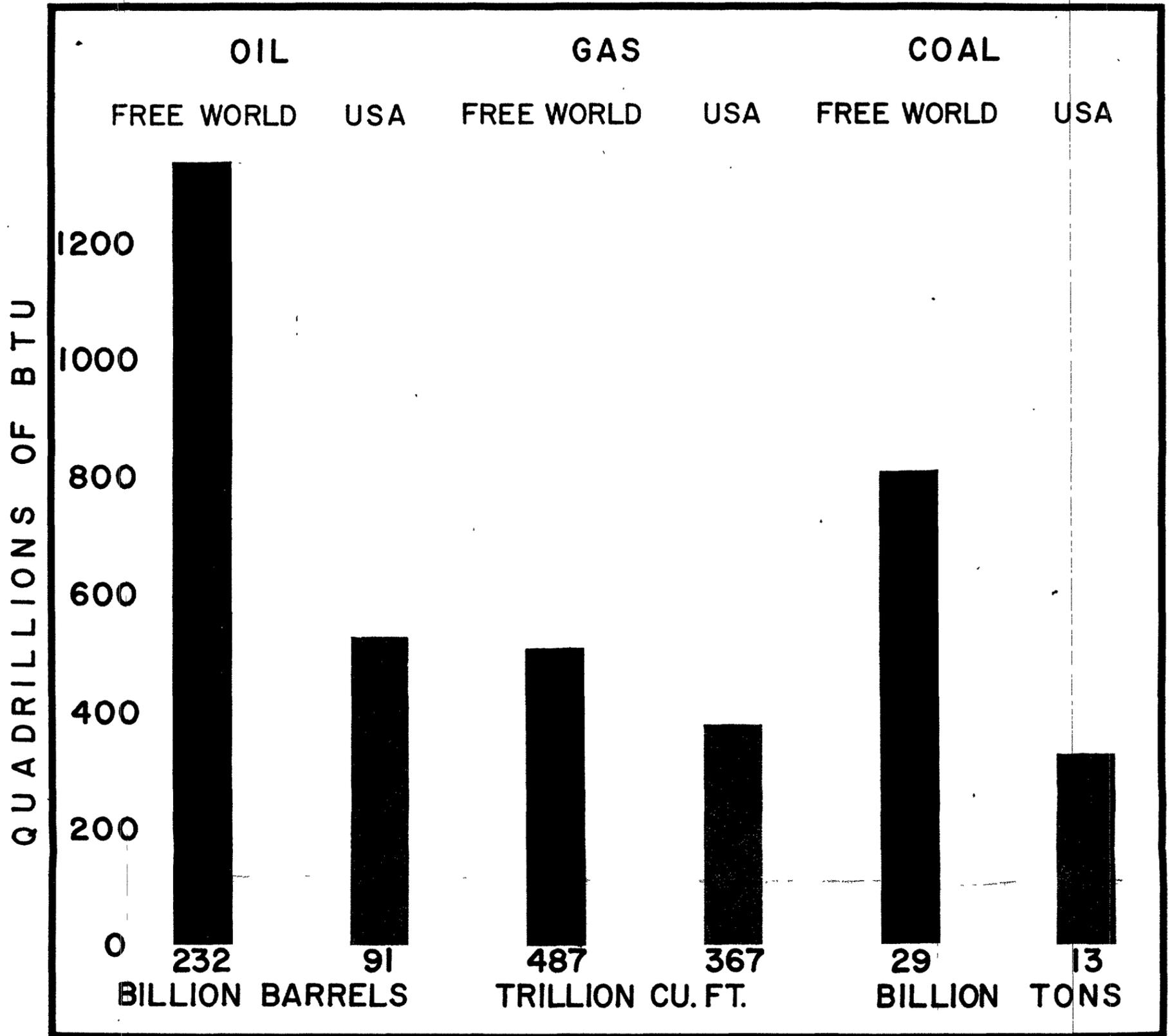
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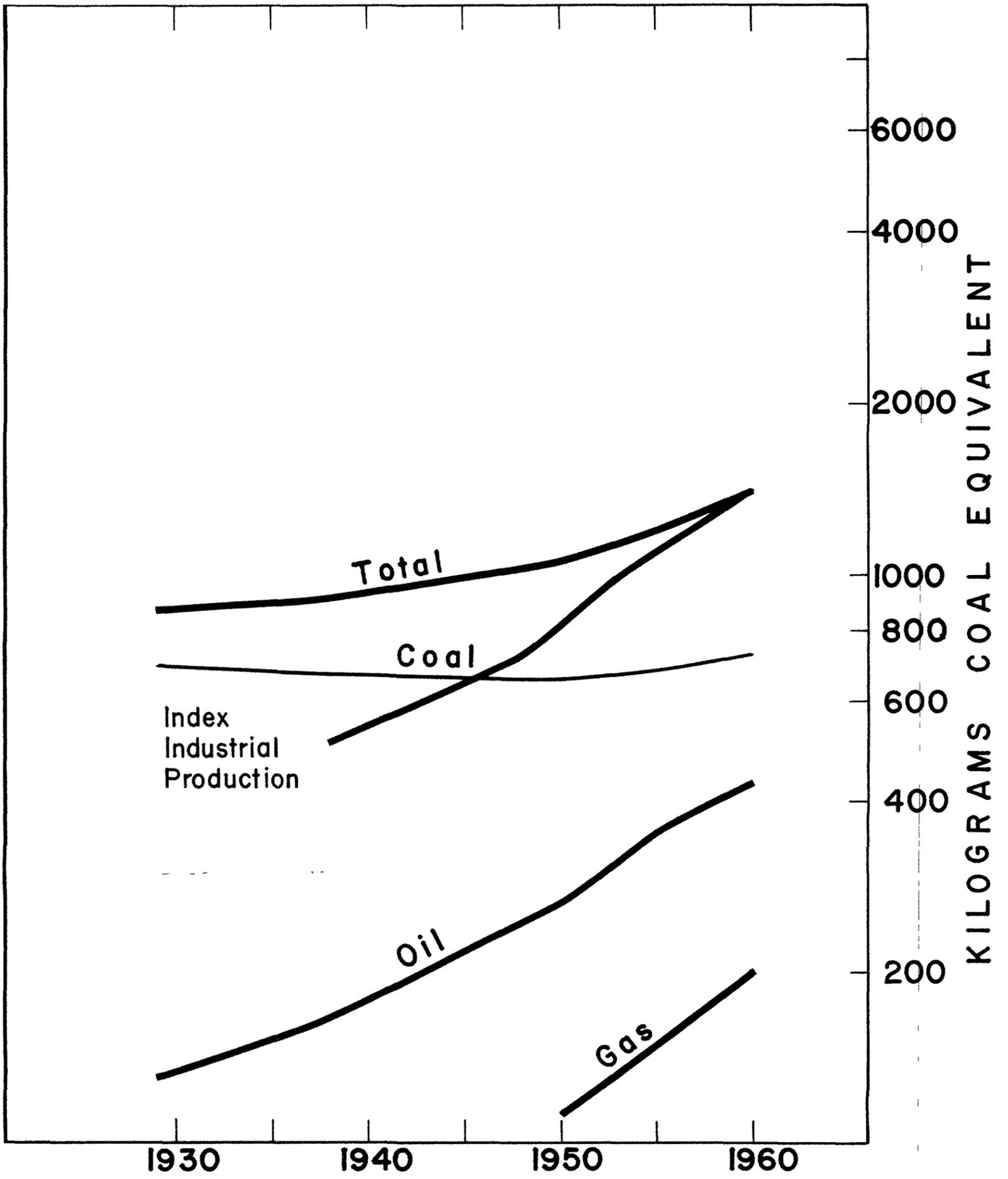
# U.S.A. CONSUMPTION OF ENERGY



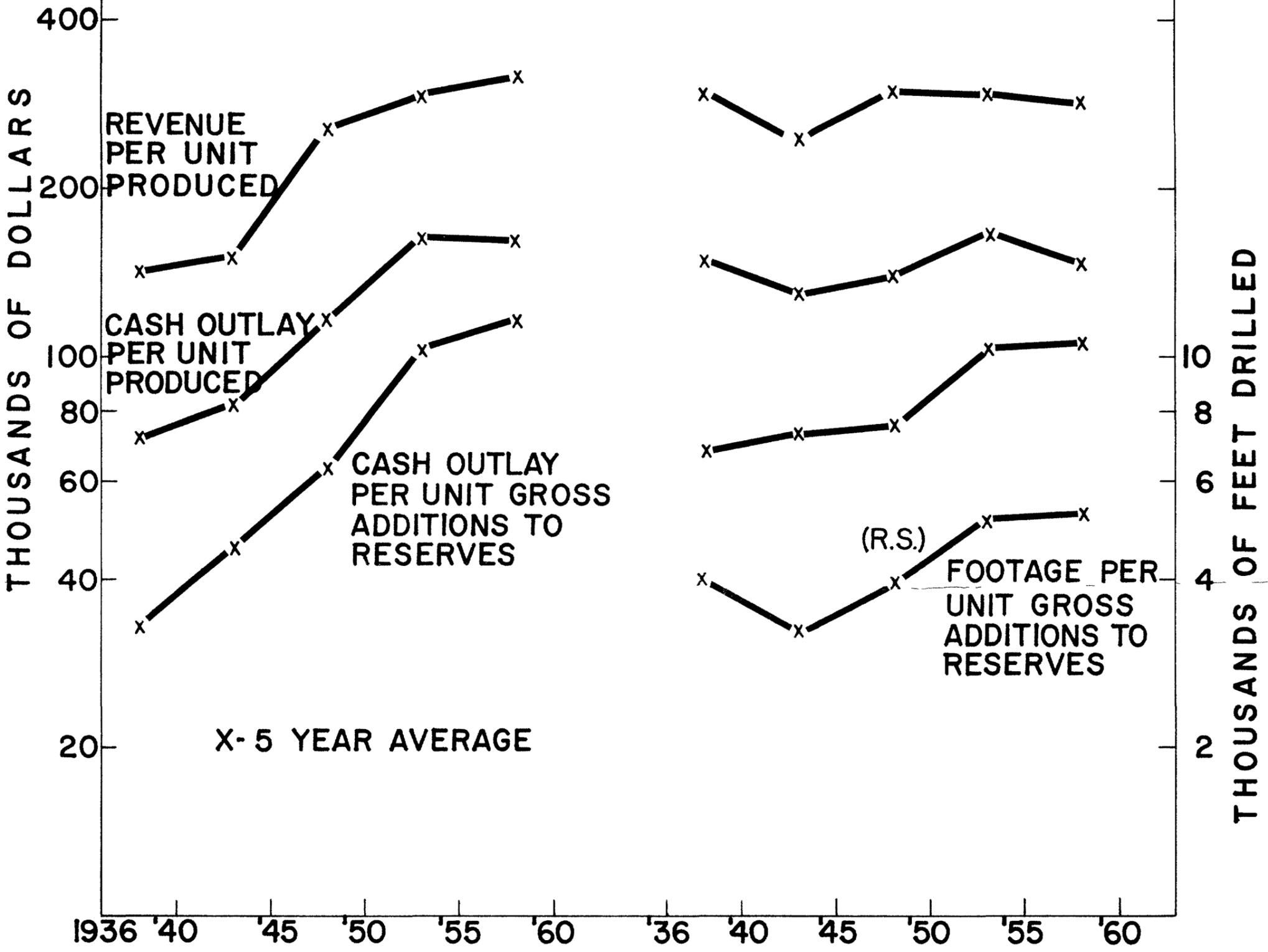
# CONSUMPTION OF ENERGY 1961 THRU 1980



# PER CAPITA WORLD ENERGY CONSUMPTION



- U. S. A.  
**CASH OUTLAY FINDING-DEVELOPING**  
**PER TRILLION BTU HYDROCARBONS**  
**CURRENT DOLLARS                      CONSTANT (1954) DOLLARS**



# WORLD ENERGY CONSUMPTION

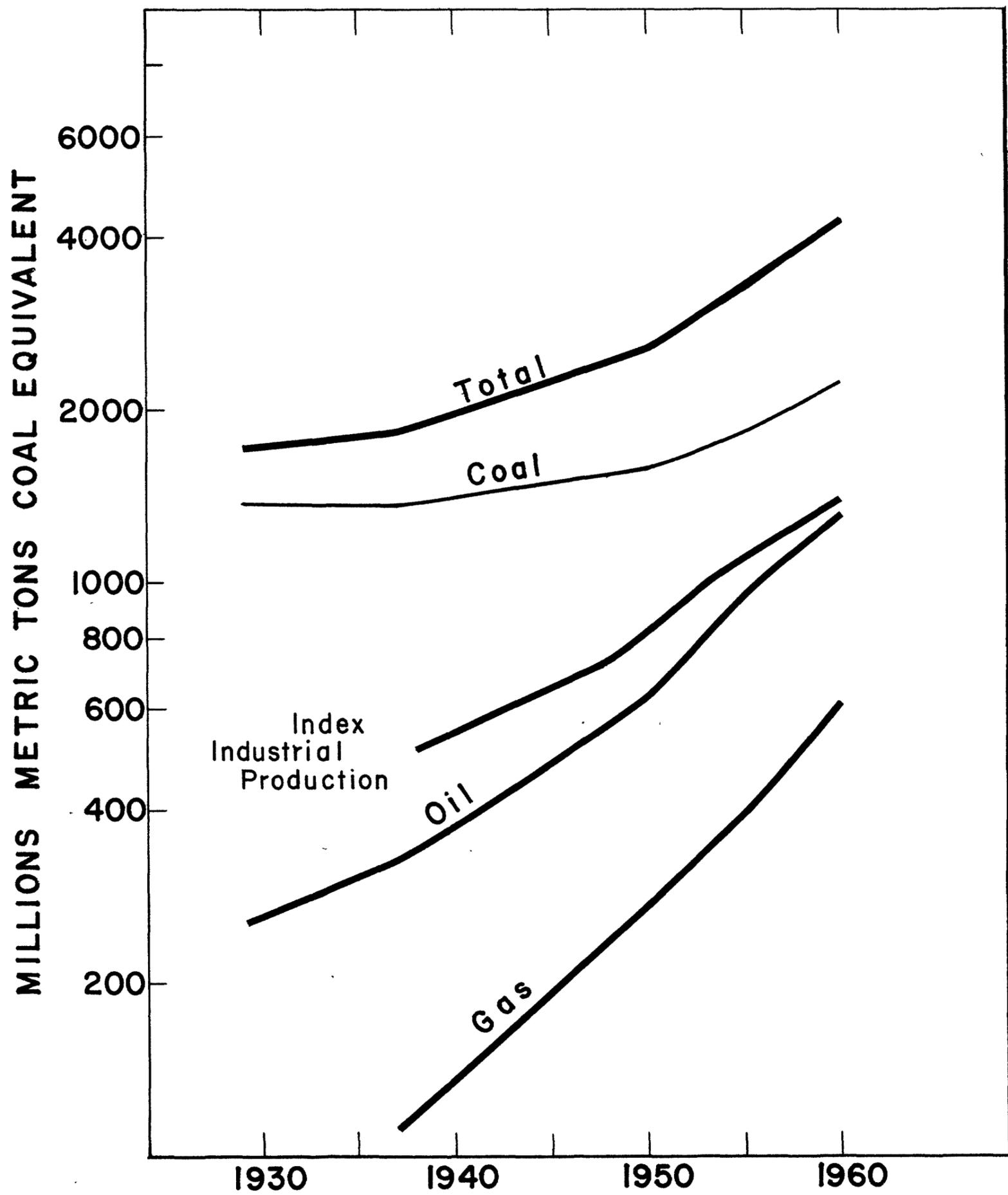
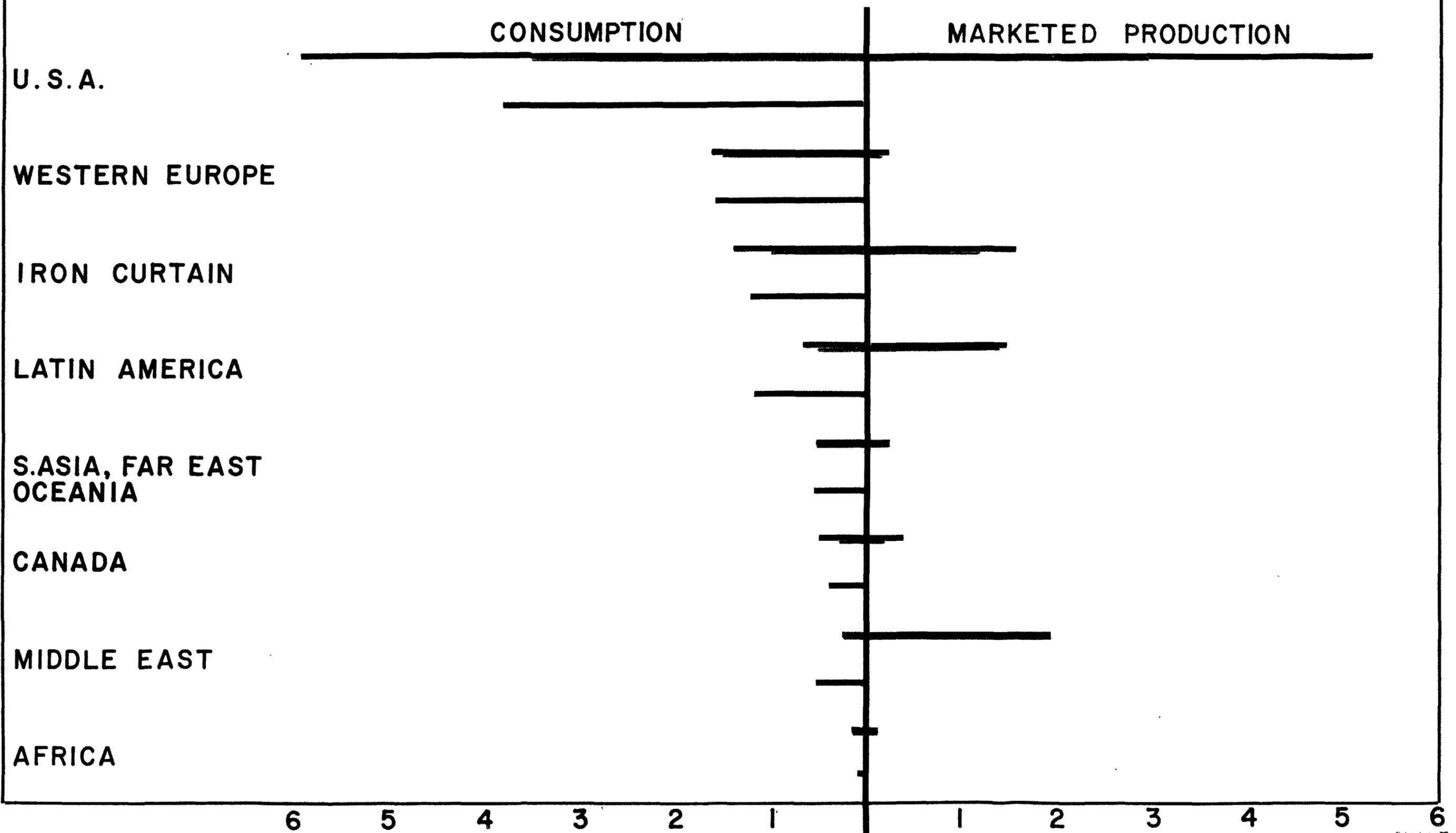
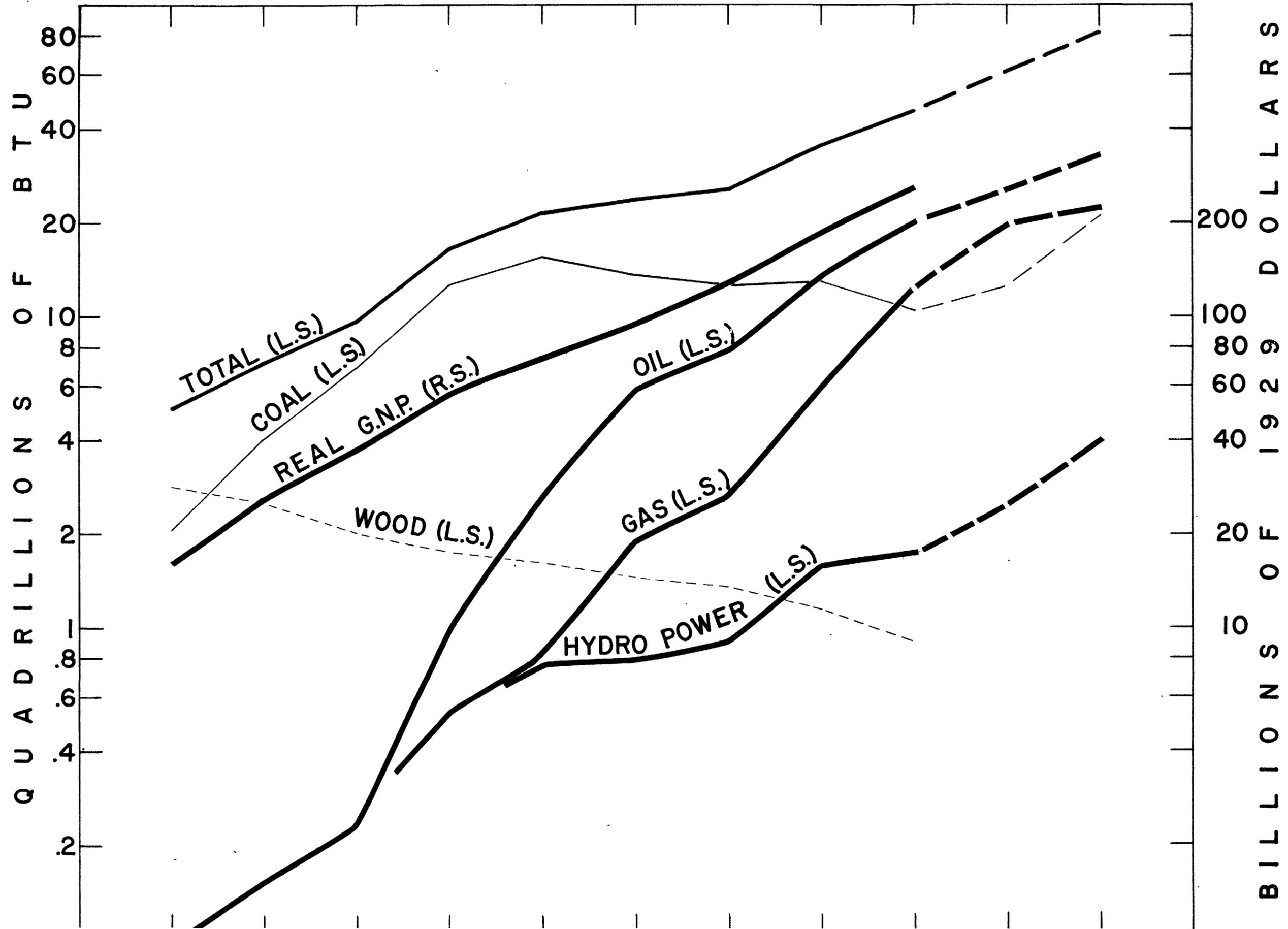


CHART 4

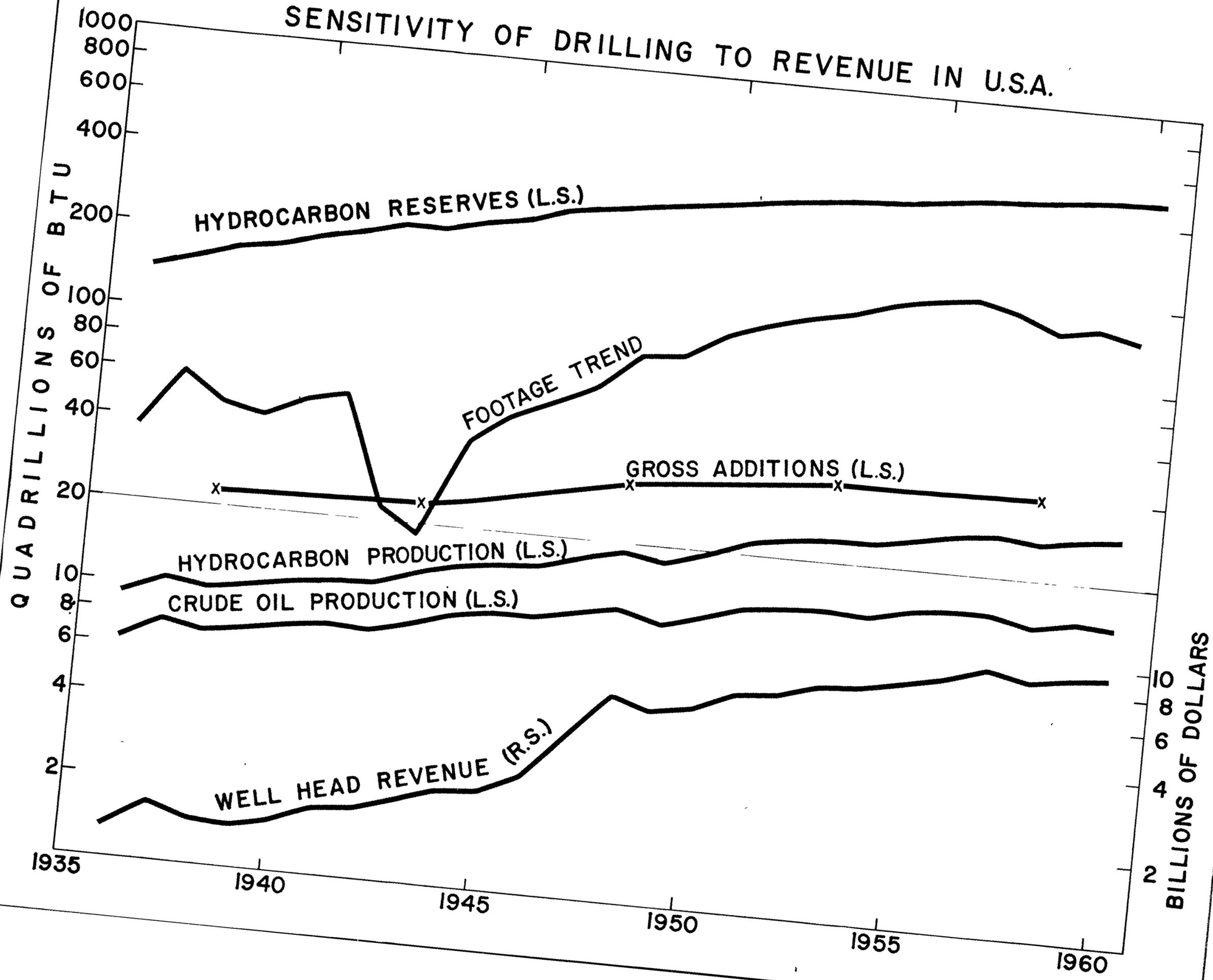
1960  
 BILLIONS OF BARRELS OIL EQUIVALENT  
 — GAS — OIL — REFINING CAPACITY



# U.S.A. CONSUMPTION OF ENERGY

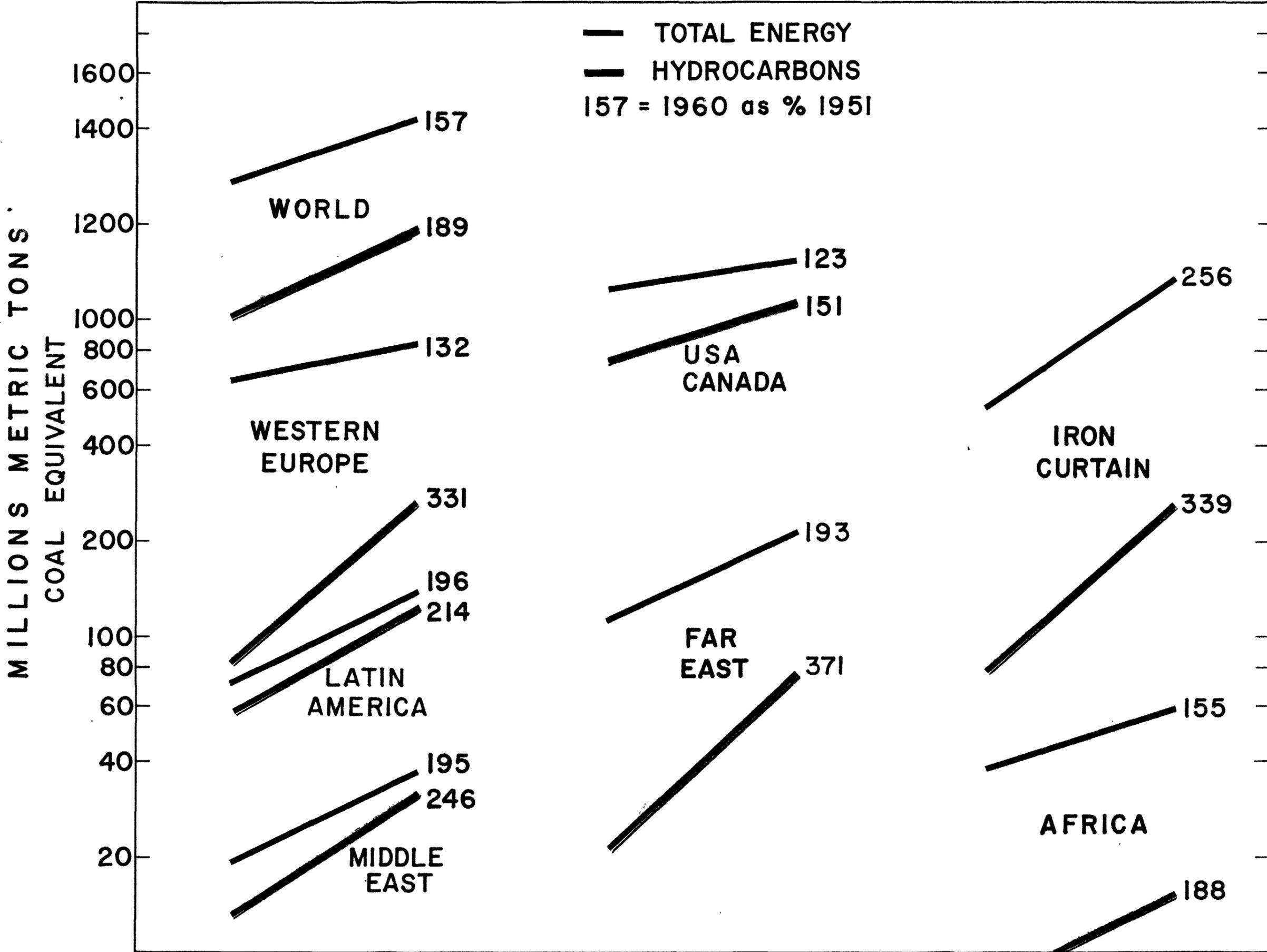


# SENSITIVITY OF DRILLING TO REVENUE IN U.S.A.



# G R O W T H   O F   E N E R G Y   C O N S U M P T I O N

## 1951 to 1960



# USA PER CAPITA CONSUMPTION OF ENERGY

