

647
ENERGY IMPORTS AND THE U.S. BALANCE
OF PAYMENTS

HEARINGS
BEFORE THE
SUBCOMMITTEE ON INTERNATIONAL ECONOMICS
OF THE
JOINT ECONOMIC COMMITTEE
CONGRESS OF THE UNITED STATES
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NOVEMBER 6, 7, AND 8, 1973

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ENERGY IMPORTS AND THE U.S. BALANCE OF PAYMENTS

TUESDAY, NOVEMBER 6, 1973

CONGRESS OF THE UNITED STATES,
SUBCOMMITTEE ON INTERNATIONAL ECONOMICS
OF THE JOINT ECONOMIC COMMITTEE,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10:05 a.m., in room S-407, the Capitol, Hon. Henry S. Reuss (chairman of the subcommittee) presiding.

Present: Representative Reuss; and Senators Fulbright and Humphrey.

Also present: William A. Cox, Sarah Jackson, and John R. Karlik, professional staff members; Michael J. Runde, administrative assistant; George D. Krumbhaar, Jr., minority counsel; and Walter B. Laessig, minority counsel.

OPENING STATEMENT OF CHAIRMAN REUSS

Chairman REUSS. Good morning.

The Subcommittee on International Economics will be in order for its hearings on oil imports and the U.S. balance of payments.

The Arab embargo on oil shipments to the United States has focused attention on some of the problems of our growing dependence on oil imports. While the embargo lasts we can expect mandatory allocation of fuel oil, and even rationing of gasoline to individual consumers.

The present crisis dramatizes the need to reassess our import policy not only to avoid undue reliance on insecure foreign sources, but also to minimize overall energy costs. We already import 33 percent of our oil, and nearly one-third of that has been coming directly and indirectly from the Middle East and North Africa. Current administration projections show that in the medium term, through 1980 at least, we shall continue to need increasing quantities of foreign oil.

Last month Persian Gulf producers once again raised prices sharply; Venezuela, Nigeria, and Indonesia are following suit. The increased cost of foreign oil will spur domestic production and help curb energy demand, but the initial impact will be to increase the import burden. Without adequate external receipts from increased export sales, profit remittances, and inflows of foreign capital, the drain on our balance of payments could prove disastrous. If the dollar declines, our oil import bill will only rise further.

At some future date, this subcommittee may investigate the economic consequences of continuation of the embargo. Hopefully it will not be long lived.

This week we are looking at the U.S. balance of payments under an alternative set of assumptions. We are presuming that imported oil will be available, but at sharply higher prices.

We are grateful to the Commerce Department for releasing the preliminary results of their work on the balance-of-payments effects of future energy imports. The analytical model that the Commerce Department has developed is designed to evaluate different basic assumptions with respect to prices and import levels. In the "illustrative case," provided: If the United States were to import 11.6 million barrels a day of oil in 1980 at a cost of \$6.25 per barrel landed in the United States, the total gross import bill for that year would be \$26 billion. Of this, \$11.7 billion would be offset by U.S. exports to oil producers and to countries receiving assistance from oil producing countries and \$6.3 billion would be returned in remitted profits and earnings on transportation. A current account deficit of \$8.8 billion would remain. The study predicts an additional \$5.4 billion might be expected in long-term investments by the oil-producing countries in the United States. The basic balance-of-payments deficit would then total only \$3.1 billion. The study also shows that, although the U.S.-payments position will deteriorate somewhat due to increased energy imports, those of Western Europe and Japan will deteriorate even more. The only net gainers will, of course, be the oil producing countries. In these hearings we will be looking closely at the various assumptions underlying this kind of balance-of-payments model.

This morning, we are fortunate to have with us as witnesses, Mr. Joseph Yager, director of the energy project at the Brookings Institution, and Mr. Edward Fried, senior fellow of the Brookings Institution. We also have Mr. Thomas Stauffer of the Economics Department of Harvard University who will focus on the specific problems related to sizable accumulation of funds by producer states. And, finally, Mr. Donald Wells of the Economics Department at the University of Arizona will comment on how the United States might adjust to higher prices for imported oil.

We are grateful, gentlemen, for your help and your promptness in getting your statements to us.

I will call first on Mr. Yager, then Mr. Fried, then Mr. Stauffer and Mr. Wells.

Mr. Yager, please proceed.

STATEMENT OF JOSEPH A. YAGER, DIRECTOR, ENERGY PROJECT, THE BROOKINGS INSTITUTION

Mr. YAGER. Thank you, Mr. Chairman.

Chairman REUSS. Incidentally, all of your prepared statements will be included in full in the record, and you may deliver them either by reading them, by summarizing, by going beyond them, or any way you choose.

Mr. YAGER. My prepared statement is fairly brief, so perhaps I should just read it.

In a time of crisis, it is important not to lose sight of the forces and problems which will affect U.S. interests over the longer run. The current hearings on energy imports and the U.S. balance of payments are therefore most timely in that they can serve to put some of our difficulties in the Middle East in longer term perspective.

I have been asked to describe briefly the problems that the United States will face in obtaining the oil imports that it will need in future years to supplement its domestic sources of energy and to suggest some possible ways to deal with those problems. In doing so, I must emphasize that I speak only for myself and that my views should not be attributed to the Brookings Institution or its officers and trustees.

No one concerned with energy problems can ignore the current Middle Eastern crisis and the attendant disruption of normal oil suppliers. I believe that it is useful, however, to look beyond the difficulties that we face today and examine the oil-related international problems that existed before the crisis and that may persist after the crisis has passed.

There is no physical shortage of oil in the world, but the United States and the other oil-importing countries share in varying degree two basic problems:

First, a large part of their oil imports are vulnerable to politically motivated embargo; and second, they must, at least for the moment, buy their oil in a sellers' market.

Several additional problems are in large part consequences of these two basic problems:

Fear of an oil shortage—or an actual interruption of oil supplies, such as is being experienced at present—stimulates competition for available supplies and could seriously damage relations among the major oil importing countries.

The high cost of oil could retard the economic growth of some of the poorer nations.

Finally, several oil-exporting countries appear to be capable of accumulating much larger financial resources than they are likely to be able to use at home. As a consequence, they may be less disposed to expand oil production, or if they do so, new requirements will be posed for the international economic system.

I shall leave the financial implications of the changing world oil market, including the impact of rising oil costs on the U.S. balance of payments, to my colleague, Mr. Fried. I will deal briefly with the question of what might be done about the other problems which I have described. My basic thesis is that in every instance solutions are to be found principally through international cooperation, rather than through unilateral U.S. actions.

The only full and satisfactory solution to the oil embargo problem is of course to bring about a lasting settlement of the Arab-Israeli dispute. But even without a settlement, this problem is far from hopeless. The United States, which is the main target of the current Arab measures, received only 15 percent of its oil imports—or about 5 percent of its total oil requirements—from Arab countries in 1972. Western Europe obtained 70 percent of its oil imports from those countries in that year and Japan 38 percent. This circumstance explains why the Arabs have supplemented their embargo of oil shipments to the United States with overall reductions in oil production in an effort both to reduce leakage of oil to the United States and to exert indirect pressure on the United States through its allies.

How effective this tactic will be cannot be predicted with any degree of assurance. Several lessons may, however, tentatively be drawn from the current crisis:

First, oil is a clumsy political weapon; to strike at the United States, the Arabs must damage relations with other countries with whom they have no real quarrel.

Second, oil stockpiles are of great value in permitting an orderly adjustment to reductions in oil supply.

Finally, the major oil-importing countries would be in a better position to meet the current emergency if they had agreed in advance on an emergency allocation and conservation plan and had promptly put it into effect in response to Arab cutbacks in oil exports.

In approaching the other basic problem of the oil-importing countries, their weak bargaining position, one central fact must be kept in mind: Perpetuation of the current sellers' market is by no means automatic. Unless some oil exporters restrict production below levels that would be physically possible, a situation of potential excess supply could develop a few years from now. This means that concerted, cooperative efforts by the major oil importers to diversify sources of energy and expand energy supply capabilities could reduce the current bargaining advantage of the oil-exporting countries. Possible multilateral measures to this end might include cooperation in the development of the Venezuelan tar belt, the Canadian tar sands, and U.S. shale oil deposits, assisting other countries—principally the less developed countries—in surveying prospects for offshore oil and gas, helping develop Soviet—and possibly also Chinese—oil and gas resources, and insuring an adequate supply of enriched uranium. Ongoing national efforts to develop new, higher cost energy resources, such as the oil deposits in Alaska and under the North Sea, also obviously serve to improve the position of the oil-importing countries.

As the bargaining power of oil exporters and oil importers becomes more equal, both might see advantages in an international agreement which would stabilize the production and marketing of oil. Formation of a comprehensive international oil organization, consisting of both exporters and importers, might be a useful first step in the direction of eventual negotiation of such an agreement.

An international oil organization might be particularly attractive to the oil-importing less-developed countries, which have no forum in which to express their views. The industrialized countries of course have OECD and the oil exporters have OPEC.

More concrete measures should also be taken by the international community to cushion the seriously adverse impact of high oil prices upon some of the developing countries. From a global point of view, the accumulation of excess oil revenues in a few oil-exporting countries is an historic opportunity. Some of these revenues should, if possible, be channeled into the development of the poorer oil-importing countries. The World Bank would probably be best equipped to undertake such an effort. The Bank might, for example, issue a new financial instrument carrying a guarantee against exchange devaluation or denominated in special drawing rights, which might be particularly attractive to countries with excess oil revenues. The proceeds of selling this new instrument could then be invested in the development of the poorer oil-importing countries. Or the Bank might organize joint ventures to invest in those countries, bringing together capital from the oil-exporting countries and technical skills from the United States, Western Europe, or Japan.

Merely by engaging in a variety of cooperative activities in the energy field, the danger that the industrialized countries would pursue mutually destructive independent oil policies would be reduced. Success in shifting the bargaining advantage in the direction of the importers could of course eliminate this danger altogether.

In any case, cooperative efforts such as those outlined above are more likely to produce a more stable situation and one more acceptable to all parties involved than would a decision by the oil-importing governments to form a common front in negotiations with the oil-exporting countries over the terms of oil supply. There is no doubt room for more consultation among the major industrialized countries on the problems involved in relations with the oil-exporting countries, but formation of an OPIC to confront OPEC would add little or nothing to the bargaining strength of the importing countries.

In summary, then, the long-term oil import problems facing the United States and the other oil-importing countries can be solved through cooperative international action. The industrialized countries need an agreed emergency plan to meet oil supply interruptions. They also should act with other members of the international community to cushion the impact of high oil prices on some of the poorer nations. Of greatest importance, the industrialized countries should devote major resources to cooperative efforts to diversify sources of energy and to increase energy supply capabilities. Through such efforts, the present bargaining advantage of the oil exporters might be reduced and favorable conditions created for negotiating an international oil agreement that would stabilize both the revenues of exporters and the oil supplies of importers.

Chairman REUSS. Thank you, Mr. Yager.
Mr. Fried, please proceed.

STATEMENT OF EDWARD R. FRIED, SENIOR FELLOW, THE BROOKINGS INSTITUTION¹

Mr. FRIED. With your permission, Mr. Chairman, I would like to start on a provocative note. The large uncertainties surrounding the security of oil imports pose a number of difficult issues for the United States—economic, environmental, and political. Of these, the balance of payments consequences of oil imports are likely to be among the least important. I say this only to stress the need for the United States to avoid making the hard decisions that lie ahead on the basis of the wrong reasons.

Our oil import bill, to be sure, is rising dramatically. The causes are well known: Higher volume and higher prices. In 1970, U.S. net imports were 3.4 million barrels per day; in 1973, they will be almost twice that much. In 1970, the average price of Persian Gulf crude oil, excluding transportation costs, was less than \$1.50 per barrel; in 1973, it may average out at almost \$3 a barrel. Oil imports this year, therefore, may cost \$6.5 billion, more than triple their value in 1970, and will account for approximately 10 percent of total U.S. imports.

¹ The views expressed in this statement are the sole responsibility of the author and do not purport to represent those of the Brookings Institution or its officers, trustees, or other staff members.

How far can this trend go? In the short run, as the present situation has demonstrated, it can obviously go very far. During October, as you pointed out, Mr. Chairman, the producing countries increased prices by 40 percent. While we have a great deal to learn about elasticities in this area, it is evident that a rapid runup of prices alone—that is unaccompanied by mandatory actions to restrain consumption—will neither quickly reduce the demand for oil nor quickly increase the domestic supply. In the medium and longer term, however, higher prices will have substantial effects on the world oil market—in reducing oil demand by encouraging conservation measures and shifts to alternative sources of energy and in increasing supply through encouraging the more intensive exploitation of conventional sources of oil and hastening investments in synthetic oil.

I know you will be going into these matters in detail during subsequent sessions of these hearings. My purpose at this point is to emphasize that if one leaves the short run aside, underlying factors in the world oil market show no compelling evidence of a physical shortage of oil nor of a persistent bargaining advantage on the part of sellers. Major producers, as the present crisis has shown, can certainly curtail output to raise prices—but not without ultimately affecting world oil consumption in ways that would substantially alter the world market balance. For example, a reduction of 1 percent in the projected rate of increase in world oil consumption would reduce world import requirements in 1985 by 11 million barrels per day, or by 17 percent of the total projected market of the producing countries. In sum, while a return to the soft markets and low oil prices of the 1960's can be ruled out, a continuing sharp runup of prices would seem to be equally unsustainable.

While long-term price trends cannot now be predicted with any assurance, it may be useful for present purposes to examine the financial implications of a world market in which oil prices increase steadily but relatively moderately; that is, by enough to assure producing countries of a significant increase in real prices but not by so much as to set in motion sharp countervailing tendencies in both oil supply and demand that eventually would erode the market. Let us assume again by way of illustration, that price increases of 3 to 4 percent a year—in constant dollars—might satisfy these conditions. These figures come out not very different from those of the Department of Commerce that you outlined at the beginning of this hearing, Mr. Chairman.

U.S. foreign exchange outlays for oil might increase to \$16 billion in 1980 and \$23 billion in 1985—all in constant 1973 dollars. Even this large an oil import bill should not prove to be a special burden on the U.S. balance of payments.

For one thing, rising oil import costs will be a phenomenon common to all industrial countries. Western Europe and Japan will be increasing their oil imports almost as rapidly as the United States. For the next decade or so, the United States will account for something less than one-fourth of the world's oil import bill. Consequently, it should be able to defray much or all of the foreign exchange costs of its own oil imports by competing for markets in the oil-producing countries that will be greatly enlarged as a result of these oil revenues, and by increased receipts from the investments of U.S. companies in the world oil industry.

On the basis of the above price assumptions, and taking into account transportation costs and all factors relating to oil relationships between the United States and the producing countries, the United States may have a current account deficit from oil transactions of about \$1 billion a year and a basic deficit of about \$2 billion a year through the period in 1985. Since the U.S. current account can be expected to double between 1973 and 1985, increasing from approximately \$80 billion to \$160 billion, the relative significance of this deficit would decline over the period. And if the producing countries with financial surpluses to invest abroad made only a moderate proportion of their investments in the United States, that deficit could easily disappear.

These results, of course, depend heavily on the future international competitive position of the United States, which will determine its ability to compete in the rapidly enlarging markets of the oil-producing countries. But the need to maintain a strong international competitive position is even more necessary as a determinant of whether the United States will be in equilibrium in its economic relations with other industrial countries which, of course, quantitatively are many times larger than transactions in oil. In other words, oil does not add to the U.S. problem of maintaining equilibrium economic relations with other industrial countries. Indeed, these projections suggest that if the basic accounts of the United States turn out to be in balance or in small surplus for 1973, as now seems to be in prospect, increasing oil imports over the future will affect them very little, one way or the other.

Oil prices higher or lower than those assumed probably would not make very much difference as far as the balance of payments is concerned. Higher prices would mean larger balance of payments deficits from oil in the short or medium term, as you pointed out, Mr. Chairman, but since the United States is in a better position to reduce oil imports than either Western Europe or Japan, they probably would result in smaller U.S. balance of payments oil deficits, or even surpluses, in the longer term. Conversely, lower oil prices would mean a smaller oil deficit in the short run but eventually much of this saving in foreign exchange would be largely offset by smaller exports to the oil producing countries.

On the other hand, a rapid increase in the value of oil imports poses a number of questions for the international economic system that will require consideration. Briefly stated, projected oil transactions could mean the generation of financial surpluses by oil producing countries averaging \$8 to \$10 billion a year over the period 1975-85. These surpluses, I might add, Mr. Chairman, are net, or after allowances for assumed levels of military and economic assistance from Arab oil producing countries to other Arab countries. While these are large amounts, they will emerge during a time when the combined GNP of the United States, Western Europe, and Japan would average almost \$4 trillion a year. A combined economy of that size could readily absorb the savings of oil producing countries.

What then are the problems? The possibility that the Arab countries might use their financial surpluses to destabilize or destroy the international monetary system can be rejected out of hand. In the first place they will be accumulated on a significant scale by only a few countries, principally Saudi Arabia, the United Arab Emirate, and

Kuwait. If these countries seek to achieve radical policy objectives, they would use oil exports, not financial transactions, for the purpose. As far as their financial surpluses are concerned their interests lie in finding the most attractive investment opportunities, and this endeavor would be enhanced by stability rather than instability in the exchange markets.

The unique characteristics of the oil trade, however, pose issues relating to the operation of the international adjustment mechanism, which will require careful consideration in international monetary reform. They derive from the facts that oil exports move almost exclusively from a relatively small number of developing countries to the industrial countries, that a large part of the offsetting transactions will be in the form of services rather than goods, and that oil exports will not be entirely offset in the current account.

This will mean, first, that the industrial countries as a group can have substantial trade deficits in a situation of balance of payments equilibrium. If industrial countries accept such deficits as being normal, no problems are likely to arise. However, if they persist in neomercantilist attitudes toward their trade position, which certainly have characterized their policies for a long time now, these deficits can contribute to protectionist tendencies or give rise to exchange rate policies that by definition could only worsen the situation. Certainly the industrial countries could only worsen, not improve, their trade position toward oil exporting countries by depreciating their exchange rates.

For the same reason, these factors will have to be taken into account in formulating the new rules for exchange rate adjustment. The fact that a few oil producing countries will be accumulating large financial reserves would not be grounds for their revaluing their exchange rates. Nor would the absence of reserve accumulation on the part of selected industrial countries necessarily be grounds for their not revaluing exchange rates. For the first group of countries, revaluation would worsen rather than improve adjustment. For the second group of countries, avoidance of revaluation might lead to the persistence of disequilibrating rates for trade among the industrial countries.

And finally, the existence of financial surpluses in a few oil producing countries should be taken into account in determining needs for the creation of special drawing rights—SDR's. Should these countries choose to use part of their surplus to add to their monetary reserves rather than to invest in the industrial countries, or elsewhere, this action would represent a new and possibly continuing requirement for additional international liquidity. A failure to allow for it could be a source of future disequilibrium in the system.

One means of mitigating each of these problems would be to devise special financial instruments through which the surplus financial revenues of the oil exporting countries could be channeled into development assistance, and thereby spent for goods and services ultimately entering into the current account of the industrial countries. As noted by Mr. Yager, a special World Bank debt instrument, whose exchange value in SDR's was guaranteed by the industrial countries would have its attractions for the oil surplus countries and might thereby serve this purpose, at least in part. Another possibility would be to provide for special activations of SDR's for sale to oil exporting countries

whenever they chose to hold surpluses in this form rather than as short-term financial balances. The IMF could then invest the proceeds of these special issuances of SDR's in the World Bank's International Development Association, thus setting in motion a stream of additional demand for the goods and services of industrial countries that would help to offset the foreign exchange cost of their oil imports. These SDR's would have to carry an appropriate interest rate, the cost of which the industrial countries would have to finance, directly or indirectly. None of the usual arguments against a link between SDR's and development assistance would seem to apply in this case. It would not contribute to inflationary pressures, since the SDR's in effect, would be in payment for the equivalent amount of oil. And by replacing Eurodollars, or reserve currencies with SDR's, this form of link would be a stabilizing element for the international monetary system.

In sum, Mr. Chairman, each of the special problems posed by financial surpluses in selected oil producing countries appears to be readily manageable. The magnitudes are not large when viewed in terms of the present and prospective size of the world economy and the organizational and procedural requirements are reasonably straightforward. But these issues will have to be specifically considered by the industrial countries in the formulation of future international trade and monetary policies, and in some respects special provisions will be necessary to deal with them.

Thank you, Mr. Chairman.

Chairman REUSS. Thank you, Mr. Fried.

Mr. Stauffer, please proceed.

**STATEMENT OF THOMAS R. STAUFFER, LECTURER IN ECONOMICS
AND RESEARCH ASSOCIATE, CENTER FOR MIDDLE EASTERN
STUDIES, HARVARD UNIVERSITY**

Mr. STAUFFER. Thank you, Mr. Reuss. I apologize that my prepared statement has not arrived, but there were some logistic failures in my office yesterday. But, in any case, I had not proposed to read it but rather to summarize the prepared statement informally. Barring some subsequent failure, it should arrive in about an hour.

Chairman REUSS. When it arrives, it will be included in full in the record.

Mr. STAUFFER. Thank you.

I would like to focus on four points which I think are of interest here, and shall not attempt any comprehensive coverage of so complex a question.

The four issues which I feel are worthy of note are the following:

First of all, I would agree in part with Mr. Fried that the future dollar deficits on oil accounts are probably overstated because our underlying calculations have seriously understated the flexibility of our economy to react to higher prices over a period of 10 years.

Second, I think by far the most important question here is not what the oil exporting countries might do with their surplus revenues, but rather the more basic question of whether they would even be willing to accumulate them in the first place. The volumes of oil which

the Western world needs at the present time imply very large surplus revenues for these countries. Hence, there is a need for some outlet for those revenues lest, indeed, the oil may not be produced at all—which I think has far more serious economic repercussions.

The third point is that insofar as one wants to induce these countries to produce oil in excess of their current revenue needs, some form of secure and mutually desirable financial asset will have to be created.

The fourth point is a word of caution—perhaps a voice in the wilderness—with regard to the notion that long-term investment by the oil exporting countries is really an offset to oil imports. Someone stated this morning that the deficits in oil accounts disappear if the oil countries make investments in the United States or the industrialized countries. That is technically true if you take a very narrow, myopic view of the definition of the balance of payments. The disadvantage of this myopic interpretation is that it involves a trading of long-term liabilities against the current consumption of a consumption good, which is an undesirable practice, I would suggest.

Let me turn to these in sequence. With regard to the overstatement of the deficit, Mr. Fried summarized many of those points. The calculations all excluded the effect of the recent price increases. Prices of domestic and foreign oil have gone up anywhere by a factor of two to three over the past couple of years, and this means that future consumption of fuel in new equipment is going to be much lower than otherwise, that there will be a drop in the growth rate for oil. For example, new refineries—refineries that are being designed today for installation a couple of years down the road—use between one-third and one-half as much fuel per barrel as present refineries. It is possible to design processes differently and, therefore, to use less energy. Similarly, as we have seen, the market has recently shifted toward smaller cars which is another area of major demand for hydrocarbons where the “redesign” of new equipment is going to reduce the demand for imports.

Second, with regard to the large inventory of existing equipment, the turnover of which is very slow, the rise in prices makes it possible to install energy-saving devices, and I can give a very humble example from what I have done in my own house, if I may. Over a period of 5 years, I have reduced my fuel consumption by a factor of about one-third. In other words, a 30-percent reduction in fuel use was achieved through the installation of storm windows and insulation. The recent increase in price makes still another fuel-economizing device feasible in the private dwelling. At the more macrolevel, throughout the economy, these kinds of opportunities have been created by these new price differentials, and I think we shall see them exploited on a wide scale.

Chairman REUSS. What is the other device?

Mr. STAUFFER. The other device is what is called an automatic stack damper which reduces fuel losses when the furnace is not operating. A unit like this would not be economical at a fuel price of 15 cents per gallon. At a fuel price of 30 cents per gallon it becomes more economical and pays off in about 3 years in a larger house.

Throughout our economy, based on the work I have been doing in this area, I perceive such opportunities, and we will see people rapidly exploiting them. They represent the expenditure of real costs in terms

of other resources but they also imply significant savings in fuel consumption in existing equipment without any reduction in total services.

Over and above that, as Mr. Fried mentioned, as prices go up, there will be some real conservation in the sense of reduction in the use of equipment. Thus, on the demand side, I think we can expect significant savings in consumption.

Paralleling that on the supply side, one can also expect increased supplies of domestic, conventional hydrocarbons—that is, oil and gas—but with a lag time of 3 to 4 years at the minimum. But, over the period for which you have asked us to examine the situation—10 years or more—I think we can expect a sizable increase in domestic supply over and above that which was built into the Department of Commerce's forecast, for example. As a consequence of the almost doubling of wellhead oil prices, it is possible to drill deeper, it is possible to look for smaller fields, and it is possible to exploit both oil and gas fields which are inherently less prolific—lower flow rates and thus higher costs.

It is also possible to implement tertiary and more advanced recovery techniques, so instead of leaving 70 percent of the oil reserves in the ground, 10 years from now, we may leave only 50 percent in the ground.

Chairman REUSS. What are primary, secondary, and tertiary? Primary is just pumping it out?

Mr. STAUFFER. "Primary recovery" is where you produce the oil, using only the natural energy in the reservoir. Pumping is in between primary and secondary, since one puts energy into the reservoir in the form of a pump. Secondary recovery consists of either the injection of water or natural gas to increase the rate of flow or flush out oil that might have been left behind.

Tertiary recovery involves the injection of chemicals and more complex measures, all of which are expensive and were regarded as uneconomical some years ago. Many of these measures are not merely uneconomical, but handsomely profitable at the present time.

Chairman REUSS. The secondary measures, like water flooding, are used. Are tertiary measures now in use and, if so, where?

Mr. STAUFFER. There are a variety of measures which have been used on a limited scale, largely experimentally because of their cost. But that cost calculation was based on oil with a wellhead price of \$3.10. A wellhead price of \$6 or \$7 may ensue, depending on what the Cost of Living Council does, and then the tertiary measures can become quite attractive. One rather large-scale unit is being operated in Texas involving what is called a miscible flood using carbon dioxide injection; but there is a whole spectrum of these techniques available, all of which, given the new prices, can elicit, over a 3- or 4-year lag time, significant increases in output.

The upshot is that I would suggest that the volumetric estimate for our demand for oil is probably significantly overstated as we push to the late 1970's or early 1980's. This is a consequence both of cutbacks on the demand side and increased availability on the supply side, quite aside from what additional energy might emerge in terms of synthetic fuels from coal. Consequently, the total oil import deficit is going to be rather less. What price figure one throws in, however, to apply to that import deficit is an open question at this juncture. But I suspect that

the net figure for the dollar outflow is going to be less than in the Department of Commerce report. It will be certainly less than the rather dramatic estimates published by the Chase Manhattan Bank.

So, we come back to the point that Mr. Fried has made; namely, that when all is said and done, the net outflow on oil account, which one can reasonably expect by the early 1980's, is going to be a very small fraction of our GNP and a rather small fraction of our total foreign exchange. Hence, I would conclude that the dollar outflow side of the question is really a secondary issue.

If I may turn now to the second point; that is, whether or not the oil countries will, in fact, export oil. I think this is, over the medium run, a much more important issue. Are they willing to accept excess money in return for the oil which the Western World wants from them—because, from many kinds of calculations and perceived from their point of view, oil in the ground may be worth a lot more to them than dollar accounts in U.S. banks, or shares in Equity Funding or National Student Marketing or in Swiss accounts which are sterilized and which bear no interest. Given that the generation of surplus revenues is inevitable in these countries, a point which we can pursue later if you wish, I think it becomes vitally necessary to find some way to make the production of surplus oil interesting to them, which in turn means creating some kind of assets in which they want to invest and where they believe that they can do so safely. If we look at the Saudi Arabian figures for a moment, it can be estimated that the maximum amount of oil that they must produce to meet their probable future level of cash needs is approximately 4 million barrels a day. Yet, if demand is to be met, once the embargo and other problems are eliminated or circumvented, Saudi Arabia must produce something like five times the amount of oil which suffices for its own needs.

Now, from their point of view, there are a number of significant drawbacks to producing oil which generates surplus revenues. The first, which has also been touched upon by other witnesses this morning, is the risk of devaluation and inflation. The Saudis, the Kuwaitis, and the Libyans, for example, largely sat on their investment portfolios through the two dollar devaluations. They saw something like 20 percent of the equivalent purchasing power of their portfolios disappear over about 18 months. Kuwait, if I remember correctly, lost a half a billion dollars as a consequence of its extraordinary conservatism in managing its investment portfolio.

One of the ministers in question phrased the question to me very, very simply. He stated: "Why should I produce oil and generate revenues if I see the purchasing power of my assets going to hell?"—a literal translation—and, second, ". . . if I run the risk of having them neutralized?" as was the term. This comes to the second drawback from their point of view—that is, confiscation risk of assets held overseas. They know what happened to the Egyptian assets in 1956; they are well aware of the French seizure of Tunisian assets in 1964; and they know that the United States seized German assets during the Second World War.

A third drawback to the creation of large balances is what you might call the greed of one's neighbors. The larger the balances that they maintain, the more pressure they are going to be under to make contributions to their neighboring states. And, indeed, that external prob-

lem extends domestically because the larger are the financial reserves of the country, the greater are the pressures upon the government to increase wages for civil servants or, as is done in Kuwait, to buy up private land and thereby pump money into the private sector.

There are a number of serious drawbacks from their point of view to creating these surpluses. And I think the question which we in the consuming countries must ask ourselves now is: What compensating benefits can we offer to induce them to produce rather than to invest in the oil in the ground? The first is financial security and the second is probably going to be some kind of a political tradeoff. Sheikh Yamani made it quite clear publicly, and he has made it equally clear privately, that he is uninterested in money as such, but he would be willing to produce more oil if he sees some political quid pro quo.

This then brings us to what might constitute a secure asset, and I think that has been adequately treated by my predecessors. But I would like to mention one device which the British established in 1968 as a way of insuring the partial security at least of foreign countries' official balances held in sterling, and this was the Basle Agreement, which was negotiated in the later part of 1968, and it provided through a rather complex set of individual negotiations a guarantee of the dollar value of sterling-denominated reserve assets held by a number of foreign countries—largely Commonwealth or ex-Commonwealth countries in the U.K. It guaranteed those assets against a dollar devaluation. It proved rather inadequate for the task, because the dollar and the pound both fell against other currencies, and so these people who thought they had been secure found themselves incurring sizable devaluation losses on what amounted to, in effect, 60 to 70 percent of their portfolios.

Now, if we do want to go the route of providing an investment outlet, then this is one device which might offer at least a unilateral approach to that solution, provided it were somehow generalized to protect the investor against major dislocations in currency values. One such formula was built into the OPEC price formula at the Geneva settlement of last year whereby the dollar price of oil was pegged to the arithmetical average of nine major trading currencies for tax purposes. That could be made much more sophisticated if one wished, or one might go to some international asset with some clause of that sort. But, I think it is crucial that somehow financial assets be made safe and desirable in order to induce the production of surplus oil—"surplus" from the producer's point of view—so that the West can get what it needs, because the consequences of its not getting it are much more serious.

The final point deals with whether or not foreign investments by these countries really are an offset to our balance of payments. Technically, it is. If a billion dollars in oil is imported and if a billion dollars flows out, but if that billion is returned as a capital inflow, then there is an offset. But, what is left out of that calculation is the service of the debt. We are dealing with the question of whether investment by the oil-exporting countries in the United States really is an offset to the balance of payments, to the outflow on oil import accounts, and I am arguing that it really is not except in a very narrow, technical sense. Because of the fact that those accumulations of assets must be serviced, there will be an outflow of dividends, or an outflow of interest.

To give an illustration of the numbers involved, if we assume a constant level of capital inflows earning 7-percent interest, that means that within 7 years of the beginning of that accumulation, one-half of the offset will already be wiped out. And within 14 years we will be back where we were before.

Now, in more complex situations, the numbers are different but this is the basic drawback to regarding such return flows of long-term investment as an offset to a current account item.

Chairman REUSS. So, let me ask you in coming to your fairly optimistic conclusion, that the effects of oil imports on our deficits are, in your judgment, greatly exaggerated. In reaching that conclusion, you did not factor in any black ink items on Middle East investment in this country?

MR. STAUFFER. I included really on what the Department of Commerce built in. But, since—

Chairman REUSS. Well, they built something in.

MR. STAUFFER. They built something in which probably was a little bit optimistic as to what might really flow back into this country, barring some political settlement. But, it would appear to me that by the early 1980's, or even possibly the late 1970's, the overall balance is not going to be as bad as those figures would suggest, so that even when you allow for the problem of servicing that debt, if it should be accumulated, the problem itself is small. If you accept the more pessimistic forecast of what we will have to import, then I would argue that because of the servicing of that debt, the situation would be even worse than those figures suggest—by a quite sizable amount. So, the apparent inconsistency lies, I think, in the fact that the amounts themselves will be small to begin with, so that this complication is not going to be serious. If one accepts the less optimistic forecast, then this "debt-service" effect does become serious.

And to summarize the last point, I think to rely upon capital inflows to offset our oil import deficit is literally equivalent to borrowing long term to meet a current need. That is bad financial practice; it is bad practice for an individual; and I think it is bad practice on the international monetary scene.

Chairman REUSS. Thank you, Mr. Stauffer.

Your prepared statement will be included in the record at this point.
[The prepared statement of Mr. Stauffer follows:]

PREPARED STATEMENT OF THOMAS R. STAUFFER

It is a privilege to be invited to testify before the Joint Economic Committee upon so complex an issue as the balance of payments implications of U.S. oil imports. It is a subject in which I have a sustained interest, having prepared the studies included in the report of the Cabinet Task Force on Oil Import Control and another set of analyses for the Ford Foundation-Rand Corporation project on Middle Eastern oil. This is also the subject of a monograph which I am presently drafting.

The attached statement focuses on only four specific issues, since I believe that this may be more responsive to your query, in view of the other witnesses who also will testify and who are better qualified on the many other aspects of this intricate problem:

- (1) Forecasting Dollar Deficits on Oil Account.
- (2) Financial Absorptive Capacity of the Oil-Exporting Countries.
- (3) Financial Security of Oil-Exporting Countries' Portfolio Investments.
- (4) Desirability of Oil-Exporters' investments as Counterflows to Oil Imports.

These are four issues which I believe to be important and upon which I can possibly offer useful comment.

With regard to the alarming balance of payments deficits which are forecast due to oil imports, there are good reasons to believe that the presently projected estimates are inflated. The newest price increases for imported oil carry over into our domestic markets and must be expected to curb consumption in a number of significant areas, as well as to elicit significant additional supply by the late 1970's. However, insofar as we do import oil, then a central question is the financial absorptive capacity of the oil-exporting countries. This will determine how much of their oil revenues will flow into the international capital market and, almost more importantly, will directly influence the likely levels of production in "swing" countries such as Saudi Arabia or Iraq. Thirdly, since levels of oil production which are desired by the West and Japan imply oil revenues to these countries which are far in excess of their needs, it becomes vitally important that the consumer nations contrive some attractive and secure outlet for these surplus funds. Otherwise, oil production may be restrained. Fourthly, we must be alert to the future burden of dividend payments and debt service which is the concomitant of any accumulation of financial assets in the United States by the oil-exporting countries. Because of this less-recognized burden, direct investment by them in the United States is not truly an offset to our increased oil imports.

FORECASTING DOLLAR DEFICITS ON OIL ACCOUNT

First of all, I wish to inject a note of caution with regard to the interpretation of the dramatically large dollar outflows which have been forecast on oil account for the 1980's. Although it is often useful to dramatise an issue in order to focus attention upon a possible problem, it is also undesirable to catalyze possible over-reactions. The dimensions of the possible balance of payments problem may be exaggerated. In particular, most of the forecasted dollar deficits appear to err on the high side, quite apart from the more fundamental question of whether even such large deficits might be accommodated through the international adjustment process. The existing estimates of the U.S. needs for imported oil are all predicated upon price and demand patterns which prevailed prior to the rapid changes in the prices of imported oil, which doubled or tripled over the past three years. Even recent forecasts do not reflect any careful assessment of the implications of these new price patterns.

More precisely, there are three sets of considerations which suggest that all such forecasts are likely to be much too high, plus a fourth consideration which contributes in the opposite direction. Additionally, it is necessary to note carefully the time horizon to be discussed: over the next 3-6 years there is only limited scope for additional supply, but some latitude for reducing demand or the growth in demand. Over the longer period, there is very considerable scope for the increases in domestic supply of all forms of energy, as well as similar potential for reduction in demand in response to the very much higher prices. Since imports of oil are the difference between domestic demand and supply, modest adjustments on both sides of that equation can produce sizable reductions in the need for imports, even though those adjustments themselves do not imply fundamental shifts in the average, overall patterns of energy use or production by the mid-1980's.

If we turn to the question of consumption (demand), the first consideration is the improvement in efficiency of new hardware. It is clear that newly-designed equipment will be much more efficient thermodynamically than the state-of-the-art installations of, say, last year. New refineries, for example, are expected to consume about half as much refinery fuel per barrel processed at present "best-design" units, reflecting the designers' ability to trade off fuel consumption against additional outlays for recuperators, heat exchangers, combined-cycle systems, and other forms of energy-economizing hardware configurations. There has already been a marked shift away from the larger U.S. cars to the smaller domestic models, just in the last few months, which implies an appreciable drop in additional demand within the most important category of demand for liquid hydrocarbons. Moreover, as existing automobiles or other equipment are replaced by newer, more efficient units, the base requirements will drop correspondingly, further reducing the estimated need for imports.

Secondly, with regard to the existing equipment which embodies older, less efficient design principles, some economies in fuel may also be anticipated. Again, higher fuel prices mean that retrofitting fuel-economizing modifications on to existing hardware can be justified in many more cases. This is all the more

apparent since prices will have doubled in many instances so that the economic incentives are large. We may expect much more widespread insulation of privately-owned homes or apartments where the landlords are responsible for heating bills, for example. Similarly, it is possible, although less certain, that both industrial and individual consumers may use equipment less, even after effecting whatever economies are possible.

The net impact of these effects upon both new equipment and the existing inventory of equipment is that the growth in energy consumption is probably overstated over the longer period, quite aside from the effect of any possible slowdown in economic growth which would further reduce projected energy needs. As a very homely illustration of what is possible, let me cite my own experience with my home heating system. Over a five-year period since acquiring a house which had been built in the 1930's, I have reduced my heating oil requirements by about one-third, after allowing for degree-day differences, by: (1) installing storm windows; (2) laying six inches of fiberglass insulation in the attic floor; and (3) weatherstripping the leakier windows. With the new increases in the price of No. 2, it is now worthwhile to install electrical flue dampers for an additional saving of 10-15% in fuel. Such opportunities at both my level and grander levels are widespread, and we must expect that they will be exploited increasingly, thereby reducing the prospective need for oil imports.

Thirdly, the quantum jumps in the prices of imported oil have rendered economic a variety of energy production alternatives which previously were marginal or quite uneconomic. If domestic energy prices are unfettered, then we can expect significant increases in the production of domestic conventional fuels. (oil and gas) with a lag of some 3 years or more. Specifically, there is then scope to more than offset the decline in domestic oil and gas production which otherwise has been forecast. Not only is it possible to discover and develop smaller and/or deeper hydrocarbon reserves, it is also possible to realize higher recovery factors on known or future reservoirs (present average is circa 30%), by initiating more costly forms of secondary or tertiary recovery.

The thrust of these effects—assuming that the blighting influence of the Federal Power Commission is eliminated and that no new regulatory impediments are created—is to ensure a higher level of domestic supply than has hitherto been projected. This also cuts deeply into the forecasted import needs, and leads one to conclude that the response both of domestic demand and domestic supply to the unanticipated rises in world price levels will contribute to an important reduction in future import needs.

We have argued that the volume of imports may be much less than is ordinarily forecast; the dollar drain depends not only upon volume but also upon government revenues per barrel, the share of participation crude oil, world trade patterns, and other imponderables. My own research suggests, for example, that the return flows on trade account will be less than estimated by the Department of Commerce, since the marginal propensity of the oil states to import from the United States has been much less than the average propensity since 1967. In some cases it is close to zero and far from Commerce's figure of 25%.

More important, however, is the ominous uncertainty which surrounds the future price level of imported oil, whether from the Middle East, Venezuela, or Canada. Some economists have prominently predicted a decline in the world price to one dollar; their error has become equally prominent, but we still are little able to predict future levels. Some price plateau must exist, based upon alternate fuel technologies, but it may imply an equilibrium at prices still substantially above those today.

Thus, in such measure as prices increase still further, this could partially or fully offset the reduction in projected volumes of imported oil. On the other hand, still higher prices would induce further responses in terms of reduced domestic consumption and increased domestic supply of oil and gas or, over the longer period through the mid 1980's, could elicit sizable increases in domestic production of surrogates such as gas or liquids from coal.

On balance, therefore, the dollar drain resulting from oil imports may be rather less serious than it presently appears. If we take the Department of Commerce's figure of a \$17 billion outflow on basic balance for 1980, that represents about one percent of the likely GNP. Moreover, that calculation omits the short-term assets accumulated by the oil-exporters which, if only partly held in the U.S., would largely finance that deficit. Since the United States, almost uniquely blessed with large and readily accessible coal reserves, is in a position to achieve near autarky in energy over the next two decades, and since the necessary measures are now

commercially viable because of the price of imported oil, I would suggest that the issue of dollar outflows for oil can be subordinated to the more important question of the overall, long-term strength of our economy.

ASSETS VERSUS OIL

It has frequently been observed that the oil-exporting countries of the Middle East will probably accumulate staggeringly large financial surpluses over the next ten or twenty years, and it has been asked whether these accumulations might undermine the stability of the world's financial markets. A far more important question is whether those countries will be willing to produce oil and generate financial reserves well in excess of their foreseeable needs. In other words, the more crucial question, I suggest, is not how those reserve assets will be used or where they might be placed, but rather the more basic question of whether or not the associated volumes of oil will be produced in the first place.

Phrased still differently, oil in the ground may be a more attractive asset than dollar accounts, shares in Equity Funding, or sterilized and non-interest bearing Swiss franc deposits from the standpoint of those oil exporters with the greatest potential for increased production. If this oil is not produced, there ensues a far more serious problem for the world economy than any question of the structure or disposition of their investment portfolios.

Except for Iran and Algeria, among the countries producing a million barrels per day or more, future oil revenues, even at modest growth rates in production levels, will more than suffice for their near-term needs for imported goods and services, so that significant increases in production necessarily entail generating large financial surpluses. While I cannot offer any precise estimates, several rough measures indicate this effect.

First, we can note that Saudi Arabia increased its foreign exchange reserves by \$1.5 billion in 1972, saving about one-half of its revenues. Since then, its revenues per barrel have more than doubled, and, until the embargo of last month, its oil production had risen 50% over the 1972 level. Had it not been for the latest Middle East war, which led both to a curtailment of production and to increased outlays for regional military and economic aid, these levels would have implied a further increase in foreign exchange holdings of well over three billion dollars in calendar 1973. A full year at the new revenue and at, say 9 million B/D of production, would yield a surplus of about \$7 billion.

ILLUSTRATIVE FINANCIAL ABSORPTION LEVELS (KUWAIT)

	1965	1970
Population.....	467,000	739,000
Non-Kuwaitis.....	(247,000)	(391,000)
Total imports (KD) ¹	(²)	(³)
Imports (amount per capita).....	\$862	\$856

¹ KD equaled \$2.80 (1970).

² KD144MM.

³ KD227MM.

The scope for increasing domestic expenditure of oil revenues within the oil-exporting "surplus" countries is rather limited, since their administrative and technical cadres are still inadequate to the task, and an excessive rate of spending, or rate of increase in spending, creates inflation, causes structural dislocations and establishes undesirable precedents for waste and corruption. By way of illustration, we note that Kuwait has been unable to increase its per capita expenditure out of oil income over the most recent five years for which the data is available. As shown in the table below, the level of imports has stagnated at about \$850 per head, and growth in total merchandise imports has only barely tracked overall population growth, which includes a sizable immigration of non-Kuwaitis from overseas. If we use this figure as a rough measure of an upper bound for feasible, domestic expenditure levels over the next few years—excluding foreign loans or assistance—and extrapolate that experience to Saudi Arabia, it is equivalent to a production level of 3.8 million B/D, based upon the level of government revenues per barrel in October 1973 and the population estimate of 5 million souls for Saudi Arabia.

Even that estimate involves a tripling of the present level of per capita imports, as compared with the present in Saudi Arabia. Given the absorption

limits discussed above, that increased rate of expenditure could not be realized except over a period of some years, so that even a production level of under 4 million barrels per day generates sizable surpluses. Yet output must rise to circa twenty million B/D by 1980 if consumers' projected demands for oil are to be satisfied. Under even the most optimistic forecast, the "surplus" countries' capacity to spend on imports cannot keep pace with the revenues from needed production levels, so some outlet for the surplus funds must be found—financial assets, aid to neighboring political allies, or both.

Consequently, generalizing from these two isolated examples, we may ask whether Saudi Arabia, the principal future source of incremental oil production in the Middle East, plus—to a lesser extent—Abu Dhabi, Libya, Iraq, or Kuwait will be willing to accumulate such large portfolio holdings. Several factors militate against an accumulation of conspicuously large financial reserves:

1. Devaluation and inflation risk.
2. Confiscation or sequestration risk.
3. Covetousness:
 - a. Domestic
 - b. Foreign

Devaluation losses have been painfully real. The Governments of Saudi Arabia, Kuwait and Libya all quite steadfastly held their dollar and sterling assets through both devaluations and thus saw an appreciable fraction of their portfolios' values dissipated, while the multinational corporations and banks, as well as some other governments, hedged and switched currencies with varying degrees of success in order to protect their own reserve assets. Portfolio managers there are now fearful of a repeat performance of weakness of the dollar, and their reluctance to acquire more financial assets is reinforced by the inroads which inflation makes upon even the relatively high yields on Eurocurrency bonds or deposits.

Sequestration risk reflects their fear that the weapon of nationalization, which they have wielded often enough in recent times, might be reversed, their overseas financial holdings assuming the role of the European and American oil investments in the host countries. Such portfolio investments could possibly be "laundered" and camouflaged by being passed through trustee accounts in Switzerland or conduit corporations in various of the tax havens or accommodating states in Europe, but this risk, nonetheless, adds to their unwillingness to accumulate financial assets as such. Oil in the ground still appears to be the most secure form of investment and, to boot, may well offer the highest real return.

The other liability which results from accumulated assets is a consequence of the prominence of such financial balances. The larger are those balances, the more susceptible is the country to demands from less well-endowed neighbours. Pressures both domestic and external for increased spending are essentially proportional to the size of the country's financial assets. Neighbours can clamour more insistently and more convincingly for aid when they can point to escalating assets as reported officially by IMF publications. Similarly, when the Government is known to be "fat", local notables or the parliament are more likely to demand new welfare programs, recurrent pay raises for the military and civil service, or more extensive public purchases of private land, the latter, for example, being a popular vehicle for transferring public funds into the private sector in Kuwait.

New determinations of what constitutes the desired level of income, allowing for increased obligations to Egypt and Syria, plus possibly increased defense needs of their own, will logically follow the resolution of this most recent conflict. The newest price increase facilitated increases in gross revenues even though output is actually curtailed. But additional revenue may be needed to maintain larger aid programs, so that surplus revenues may be temporarily reduced.

Nonetheless, the disadvantages of excessive income will weigh heavily in the Councils of State, when oil output increases are again considered. Kuwait, it is to be remembered, decreed a production freeze some time ago for purely fiscal reasons, and also allocated a specific fraction of State revenues for reinvestment in special reserve accounts. Saudi Arabian leaders have several times expressed their qualms about unrestricted increases in oil production, and have suggested that political promises were of more interest to them than mere money as the *quid pro quo* for future increases in production. Such extra-economical considerations will probably loom even more important as future decisions about allowed production levels are reviewed.

Far from competing frenetically for increased production, as prophesied by Professor Adelman, the exporting countries instead are inclined to restrain production. Ingenuity and plausible incentives—financial, or political, or both—may be necessary to elicit the desired levels of oil production. This issue—whether the oil will be forthcoming—is to my mind the most important aspect of holdings of portfolio assets by the oil-exporters, and their use of such assets, as distinct from their existence, is really a secondary issue.

FINANCIAL SECURITY OF OIL-EXPORTING COUNTRIES' PORTFOLIO INVESTMENTS

One device which might make accumulation of financial reserves by the oil-exporters more attractive—or, at least, less unattractive—would be a more general version of the Basel Agreement, which could be extended to official dollar assets held in the United States by oil-exporting countries. The original Basel Agreement was an understanding between the U.K. and those principal sterling-area countries which maintained sizable sterling-denominated balances or asset positions in the United Kingdom. After the devaluation of 1967, in order to discourage those countries from liquidating their sterling holdings too quickly—with obviously disruptive effects—the U.K. Treasury offered to guarantee a specified, large, but individually negotiated fraction of each country's holding against devaluation of the pound with respect to the dollar.

The Basel Agreement, as finally implemented, was not an overwhelming success, because it transpired, contrary to most expectations, that the dollar and sterling both proved to be weak, and joint devaluations occurred for both with respect to the other major trading currencies. Since the oil-exporting nations' transactions are largely with those other nations—Continental Europe or Japan—they perceived an effective devaluation loss on some 60–70% of their sterling portfolios, in spite of the structural guarantees under the Basel Agreement.

Consequently, since shifts in currency values are now multi-dimensional, rather than simply bilateral vis-a-vis the dollar as was the case in happier times long past, any modernized reincarnation of a "Basel Agreement" would necessarily require a more sophisticated definition of the reference point for measuring devaluations or revaluations. The metric for "Valuation" would need to be more complicated than the simple link between the dollar and the pound which was embodied in the original agreement of 1968.

One extremely simple such attempt at a multi-dimensional valuation formula was incorporated into the OPEC crude oil pricing formula after the Geneva Settlement of last year. It provided for an adjustment of the OPEC member tax reference (which were and are still denominated in U.S. dollars) in proportion to any movements in the simple arithmetic averages of the values of some nine currencies with respect to the U.S. dollar.

The simple "OPEC-type" devaluation formula resulted from a negotiated compromise. It has a serious drawback, consequently, because it can either undercompensate or overcompensate, depending upon actual circumstances. A still more refined version would weight the various currencies in terms of the investor countries trade and/or investment patterns, including the possibility of chain-linking periodic revisions of the formula to reflect any secular changes in those patterns.

A device of this sort could be so constructed to offer the oil-exporting countries protection against currency devaluation for their portfolio investments in the United States or other oil-consuming countries. It is more difficult to offer any insurance against depreciation in value because of inflation, or, more relevantly, because of different rates of inflation in different depository countries, because measurement of purchasing power is uncertain. Approximations, however, are possible.

There remains a more serious obstacle to the creation of an attractive financial asset into which surplus oil revenues might be attracted. If an oil exporter does accumulate significant assets in the United States, those assets become a potential hostage for the political conduct of the investor country. Indeed, this is one reason why the Middle Eastern oil exporters have maintained only a small fraction of their investment assets in the United States. All are familiar with the precedents of the U.S. Seizure of German assets during World War Two—including some held via Swiss or neutral nominees—or the French sequestration of Tunisian assets in the mid-1960's, or the British freezing of Egyptian sterling deposits in 1956.

Thus, political apprehensions become a major obstacle, and these would need to be soothed or eliminated before sizable counterflows of investment capital on

official account into the United States could be induced. In one sense, this constraint implies an almost circular argument. If Middle Eastern oil does finally flow to the U.S. once again—the only circumstance under which this discussion of dollar outflows is at all meaningful—that fact itself will presume some sort of fundamental political rapprochement in the Middle East, which itself implies that the political risks of sequestration, etc., as perceived by the oil-exporting countries, are very much reduced, if not eliminated completely. Nonetheless, if a desirable and attractive asset is to be constructed, sequestration risk must be duly considered, and the only solution may in fact be the creation of some form of truly international asset, which is guaranteed to be both convertible and liquid by a credible and maximally depoliticised international organization such as the IMF or the BIS, or possibly even the IBRD. In any case, some sort of guarantee against political loss might well be needed over and above a devaluation protection.

DESIRABILITY OF OIL-EXPORTERS' INVESTMENT AS COUNTERFLOWS TO OIL IMPORTS

The fact that the U.K. needed to guarantee such foreign assets in order to hold the reserve balances of the sterling countries highlights another problem associated with regarding portfolio investment by the oil-exporting countries as a balance of payments offset to our increased imports of oil from them. In the narrowest sense an inflow of long-term investment can offset an expenditure on current account, but only when one interprets the balance of payments definitions in the most myopic sense. Each year, such an offset is possible, but the narrow, formal definition of "balance" excludes from the calculation the annual dividend or interest payments on the steadily accumulating asset balances.

This effect can be illustrated very simply for the case where the inflows are constant each year, which is equivalent here to assuming a constant level of oil imports each year. Then, if the average interest or dividend rate is 7 percent, the debt service charge alone will already offset one-half of the "offsetting" capital inflow by the seventh year. By the 14th year, the interest charge will equal the oil import bill even if the surpluses are continually reinvested.

Britain succeeded in "financing" its balance of payment deficit on current account, including oil, for a number of years by exploiting its role as a reserve currency center and gathering the surpluses of its supplier countries in the form of British Government bonds, local council issues, or bank deposits. This method for financing a chronic deficit failed ultimately as the pound came under pressure, so that suppliers were less willing to hold ever greater balances, and as the service costs built up to the point that the annual increase in balances did not equal the debt service charge.

In effect, the device of regarding the accumulation of dollar balances by oil-exporting countries as an offset to our increased imports of oil is very short-sighted. At best it is a way to gain some time until we can achieve either energy autarky or a more fundamental equilibrium in our balance of payments position by some other route. It would be dangerous, however, to regard the financing of oil imports—which represent current consumption needs—through the accumulation of long and short-term liabilities, as anything other than a short-run expedient. In particular, it would be very dangerous to view such balances with complacency—or even solicit them as a solution, as argued by the Department of State—since that myopic focus ignores both the debt servicing obligation and any question of the final liquidation or disposition of those balances.

Chairman REUSS. We will now hear from Mr. Wells.

STATEMENT OF DONALD A. WELLS, PROFESSOR OF ECONOMICS, UNIVERSITY OF ARIZONA

Mr. WELLS. Thank you, Mr. Chairman.

One of the concerns I want to express today is the need that we have for meaningful indicators of balance-of-payments performance. I doubt that our traditional measures give us much insight into international economic performance and the problems that are posed by the rising petroleum imports that we are going to face.

Increases or decreases in the U.S. balance-of-payments deficit, a deficit which has persisted over the past 20 years, today serve only in a limited way as a guide to policy decisions, and estimates of potential deficits in my opinion do not offer much assistance in evaluating the international impact of the U.S. energy shortage. It is attempted here to explain why the current balance-of-payments measurements give us little insight into the costs of a growing reliance on foreign sources of energy, and to identify approaches which provide a suitable basis for making choices. I think the big change that has occurred in this regard is the greater degree of flexibility in the international exchange rate system.

The current measures of the balance-of-payments position of the United States—net liquidity and official reserve transactions balances—identify net changes in liquid assets and liabilities as the measures of the deficit or surplus. But with freely fluctuating exchange rates, net changes in the holdings of liquid dollar assets by nonresidents are based on commercial considerations; that is, they reflect the demand for liquidity. In this perspective, our present concepts of balance-of-payments deficits become measures of net foreign demand for U.S. liquid assets. As such, these deficits should not be viewed as necessarily favorable or unfavorable.

We know that we do not live in a world of freely fluctuating exchange rates determined only by market considerations. The floats are controlled by governments which purchase and sell U.S. dollars and liquid assets. For the past 2 years other governments have attempted to limit the appreciation of their own currencies primarily in order to protect the competitive position of their exports. Increases in U.S. liabilities to other governments assume a somewhat different meaning than those based only on commercial considerations, but with flexible exchange rates their purchases of dollars or dollar assets are essentially discretionary decisions. And regardless of whether these assets are acquired on private or public accounts, the effect is to reduce the real cost to the United States of its imports and investments abroad.

Therefore, in this context, I find it difficult to assess the policy significance of an increase in the balance-of-payments deficit. Under a fixed exchange rate system, deficits tend to depress the values of currencies, and countries are forced to take corrective actions to maintain these values. With efforts to increase international receipts relative to payments, deflationary policies are adopted with their resultant costs of lower rates of growth and higher unemployment. And today, with a fluctuating exchange rate system, for the United States there is no official obligation to maintain the value of the dollar, and the deficit becomes essentially a measure of the "voluntary" accumulation of U.S. liquid assets. If we view these deficits as primarily short-term loans to the United States, during a period when other countries reduce their accumulation of these assets; that is, a period when our deficit is reduced, we would, in many respects, incur a higher cost than a period when the deficit is actually higher.

A posture of maintaining flexibility of the dollar has its costs, and these are costs which balance-of-payments deficits do not measure. We simply do not get at these costs in an adequate way. As the value of the dollar decreases, the prices of imports increase relative to exports, and this means for us as a society that we have to commit more resources

to exports in order to finance a given volume of imports. The past year is quite instructive in that regard. Our rising levels of agricultural exports, made cheaper in international markets by the depreciation of the dollar, have contributed to higher prices and shortages in this country. This means that any depreciation of the dollar which is associated with energy imports will result in increases in real costs of this type.

Another consequence of this balance-of-payments posture will be increased amounts of foreign investment in the United States. There have been increased foreign holdings of corporate bonds and stocks, and a contributing factor has been the depreciation of the dollar, which has helped to induce investors abroad to purchase dollar denominated securities.

I want to suggest today that these two considerations illustrate the weaknesses of our current measures of the balance-of-payments position of this country. They offer us little guidance in contending with development which accompany appreciation or depreciation of the U.S. dollar. There is nothing wrong with the measurements, per se, as long as we recognize developments which are more important and for which these measurements offer little insight. We faced this problem of interpretation and analysis with fixed exchange rates, too, particularly from 1965 onward, but the adoption of more flexibility in exchange rates has heightened the problem. So, to assess the impact of rising imports of energy sources, we should not focus primarily on the potential balance-of-payments deficit; rather, we should take a broader perspective of the potential costs and benefits.

What I would like to do now is bring up a number of considerations that I think do deserve our attention. I think on the basis of the discussion this morning that I need not spend any time on the concept of an international energy balance. I think we all recognize that in economic terms this does not have too much meaning, and that the composition of trade is always changing, given different availability and costs both here and abroad. Therefore, we should not concentrate upon this.

The second point that I would like to emphasize is that any projections of balance-of-payments developments should be regarded as speculative. We made an attempt back in 1963 to project ahead 5 years in the balance of payments and it offered us little insight. The literature has gone from dollar shortage to dollar glut very quickly and perhaps right now is changing back again. To attempt to look ahead 5 or 7 years and anticipate the balance-of-payments position of the United States is not going to be very helpful.

A third point that I think should be emphasized is that if by 1980 oil imports grow to between 15 and 20 percent of our total merchandise imports, as has been projected by many, this signifies that a growing segment of U.S. imports will be relatively price inelastic, and thus a segment of our imports will be less responsive to balance-of-payments policies aimed at a reduction of imports through more stable domestic prices, or through depreciation of the dollar. Whatever policies we adopt we have to accept the price inelasticity of imports.

A related consideration to this, and it is tied in closely with many of the projections that have been made of the U.S. balance of payments, is that most of the modeling done today seems to focus upon oil as the swing fuel. We get the large numbers for petroleum im-

ports that we do today from this basic assumption. I think there is some growing evidence, especially with the developments in the Middle East, that this assumption might not any longer be valid and that we must incorporate into our modeling a growing use of coal. My expertise is not in the area of energy sources, but I have a friend who has been working on this more recently, and he thinks that our modeling should use domestic sources of coal as the swing fuel. This would fit in partially with Mr. Stauffer's remarks on whether or not we can depend upon the Middle East to increase their oil production to levels that are assumed by these studies.

Another issue which may become increasingly important for the remainder of the 1970's concerns rising levels of foreign investment in the United States. Attitudes questioning the desirability of foreign investment which are often expressed by other countries may become more prevalent here as petroleum-producing countries increase their investments in the United States. If Saudi Arabia were to allow its production to increase to levels approximately 16 to 20 million barrels per day by 1980, it alone may have from \$15 to \$30 billion for long-term investments by 1980. I have projected, given the levels of trade and output in Saudi Arabia associated with those production figures, that they might also want to be holding something on the order of \$20 billion in short-term assets.

In this regard, I find myself in disagreement with much of the literature. It is expressed often today that Saudi Arabia does not—and I put in quotes the word “need”—Saudi Arabia does not “need” more revenues. To an economist the word “need” has no significance. We talk about desires, and there seems to be a prevalent opinion that Saudi Arabia does not want to become richer in the sense of rising consumption standards. I think there is nothing in the history of Saudi Arabia over the past 10 years, that there is nothing in the development plans of the last 2 years, and nothing inherent in their society which suggests that they are going to put artificial limits on attempts to raise consumption standards in Saudi Arabia. It is very easy to slip into judgments that Saudi Arabia is going to be a very rich country, but today they are not rich. Only in their last development plan are they talking about getting electricity into the smaller towns, and the kind of revolution that occurs in a society when electricity is brought to such areas for the first time is in Saudi Arabia's future. I believe considerably higher consumption standards will be a goal of Saudi policy as we look ahead for the next 10 or 15 years.

In this respect, too, I think that we underestimate the extent to which Saudi Arabia will be willing to invest abroad. The reason for this is that Saudi Arabia might want to diversify its sources of foreign exchange. If it has any long-run perspective, looking ahead 15, 20, or 30 years, and given the limited production possibilities in that desert kingdom, I believe that Saudi Arabia will want to diversify its international assets.

I do disagree with Mr. Stauffer here. I think that we are going to see a considerable amount of long-term foreign investment by Saudi Arabia, not only here by the diverse types of assets they will hold, but I am sure they will diversify geographically, too.

Finally, I think we have a substantial stake in the preservation of some degree of flexibility in the international exchange rate system. Increases and decreases in the value of the dollar will facilitate the

major types of adjustments that must occur as a result not only of what is happening in the petroleum sector but in all aspects of international trade. If petroleum-producing countries were to manage their international assets in a destabilizing manner, we should recognize that flexible exchange rates as against fixed exchange rates penalize those who try to unload assets very quickly. The speculator is rewarded with fixed exchange rates, but if the speculator has to suffer losses that will occur with the magnitudes we are talking about for the Saudi Arabians, I think that flexibility would contribute to stability. Given this, I think that we have some major choices to make. I offer three of them as indications of where we should focus our attention in contrast with an emphasis upon balance-of-payments deficits.

First, increased U.S. expenditures on petroleum imports are going to tend to lower the foreign exchange price of the dollar, and worsen the unit terms of trade. That is, everything else being equal, prices of imports will tend to rise relative to prices of exports. This means that the real costs of acquiring petroleum and other imports will tend to rise. This is a major cost which we should consider when we look at the desirability of different levels of petroleum imports.

Second, it is elementary economics but I think it is still worthwhile to emphasize that increased reliance upon foreign sources of petroleum will require a commitment of domestic resources as payment, whether we do it in the short term or whether we do it in the long term as investment service.

And, finally, the strength of the dollar is closely tied, it seems to me, in the shorter run to the extent of foreign investment in the United States, both long term and short term. If we adopt policies which discourage this investment, this will tend to depress the value of the dollar, and increase the costs of our purchases of goods and services from abroad.

I think these are prominent examples of the types of choices that are required in our formulation of balance-of-payments policy. Concern about balance-of-payments deficits are related to these choices, but this concern should not obscure the real choices we must make.

Chairman REUSS. Thank you, Mr. Wells.

Senators Fulbright and Humphrey will have, I know, some questions. Let me ask the first one of you, Mr. Wells.

You end up by saying that we should encourage investment in this country from the Middle Eastern surplus countries. What is the policy of the United States today with regard to investment from the Middle Eastern countries within the United States?

Mr. WELLS. Our policy today is one of allowing the market mechanism to work. I do not think that we offer any positive inducements in the sense of special considerations for these countries in and of themselves. What I am asking for is a continuation of this posture. If we look ahead for the next 15 years, we are talking about capital investment in terms of energy sources of somewhere between \$400 and \$500 billion. The Middle East contribution can occur quite naturally if they want to go into downstream operations as well as other types of investments.

Chairman REUSS. Is it your view that the U.S. policy toward Middle East investment here should be one of neither offering any special incentives nor imposing any impediments?

Mr. WELLS. Right.

Chairman REUSS. I wonder if that really is our policy. I was in Nairobi a few weeks ago, and I had a long talk with the leading investment banker of Kuwait, who has billions of dollars at his disposal. And he told me that in September of this year he wanted to take a trip to Germany, the United Kingdom, and the United States to invest some of those billions of dollars, and he went to the German Embassy and they gave him a visa in 5 minutes. He went to the United Kingdom Embassy and they gave him a visa in 5 minutes. And he went to the U.S. Embassy and they said, well, come back in a week, we will let you know what we can do. And this aroused Mr. Ibrahim's ire, so he just cut the United States off the list of places that he was visiting and told me that neither he nor his firm would darken our doorstep again. If true, and I intend to find out whether it is true or not, do you regard that as consistent with your concept of not imposing impediments?

Mr. WELLS. No, it is not.

Chairman REUSS. He was a widely known man.

Mr. WELLS. No, I would certainly hope we would do away with such things. I have to smile as I listen to this because I have talked to American businessmen trying to work in the capital cities of Riyadh and Kuwait, and 1 week would be a very short period of time in comparison. But, you are quite right.

Chairman REUSS. Yes, but we are not exporting oil to Kuwait. That is one difference.

Mr. WELLS. No, I would certainly hope we would do away with impediments like these.

Chairman REUSS. Mr. Fried, let me turn to your provocative initial sentence in which you said that the balance-of-payments consequences of oil imports are really likely to be the least important of the difficult issues which oil imports pose for us, economic, environmental, and political. Let me make sure I understand what you mean by those three words. By political, I suppose you mean whether we are going to succumb to Arab pressures to be less friendly with Israel in return for more oil. That is one political issue.

Mr. FRIED. There are a whole host of complex factors.

Chairman REUSS. What are some other political factors?

Mr. FRIED. To begin with, to what extent should we permit oil and factors relating to oil affect the way we view our foreign policy interests in the Middle East, one way or the other.

Chairman REUSS. By environmental issues, you mean that if we are prepared, for example, to burn high sulfur fuel here, if we are prepared to strip mine and rather vigorously drill offshore and build Alaska pipelines without environmental impact statements and so on, that will, of course, produce more domestic energy and make us more impervious to threats of cutoff and higher prices?

Mr. FRIED. Exactly right.

Chairman REUSS. Now, what about economics, your last group? What is there to economics over and above the balance-of-payments consequences which you said are not very important?

Mr. FRIED. A policy of maximum self-sufficiency not only has balance-of-payments implications and environmental implications, but it can mean that we would choose consciously to pay more for oil than

might otherwise be necessary. Now, obviously, that will not be the case if the external price of oil keeps rising to the point at which it becomes profitable to produce oil from the high-cost sources in the United States. We have, since 1958, adopted a policy on oil which has involved an economic cost for the United States. Rightly or wrongly, we paid more for oil than the Europeans or the Japanese.

Senator HUMPHREY. Excuse me, I just want to elaborate.

Chairman REUSS. Yes. Go ahead.

Senator HUMPHREY. What do you mean we have paid more for foreign imports?

Mr. FRIED. No. We have paid more for the U.S. oil we used. The price of oil in the United States was roughly in the area of \$3 to \$3.25 a barrel, whereas Europe or Japan, who relied entirely on imported oil or virtually entirely on imported oil, paid less than \$2 a barrel in the 1960's.

Chairman REUSS. It was our oil import quotas that pressed this crown of thorns on us?

Mr. FRIED. There may be other reasons for adopting the policy, but there is an economic issue involved: How much do we want to pay for oil?

Chairman REUSS. Let me finally turn to Mr. Yager on the interesting point you made as did Mr. Fried, in answer to the thing that occurs to most people who view this situation. Why, if the Middle Eastern countries are going to make these tremendous surpluses out of their oil sales in years to come, don't they help the poor people of the world with some sort of foreign aid? That would settle everything, and of course, the quick answer is that they, like ourselves, can think of many reasons why they would not want to be all that generous. To meet the problem then, you offer the suggestion of special issues of SDR's, new World Bank devaluation-guaranteed paper, and so forth, all of which I think is an innovative approach, and we are very interested in it. But, I have this question: Why is that much different from the present World Bank bonds? Why doesn't Mr. McNamara just sell big issues of World Bank bonds in those countries? World Bank bonds are frequently denominated in a portfolio of currencies so they are really devaluation proof, and of course, he does sell a few in Kuwait now.

Mr. YAGER. I suppose it is a matter of targeting more on this new accumulation of capital and trying to tap more of it. I do not think the World Bank has tried the joint venture approach in this particular context although they have experience in it and this might actually turn out to be more productive than raising more money through bonds or any other financial instrument. The idea would be that the bank would be the organized, the middleman, the catalyst that would bring together the managerial and technical skills of the industrialized countries and the money of the oil exporting countries to invest in some of the poorer oil importing countries. We feel this is worth a try.

Chairman REUSS. Would you want to add something, Mr. Fried?

Mr. FRIED. Three things. I do not think it is right, Mr. Chairman, that World Bank bonds have an exchange value guarantee. They are denominated—

Chairman REUSS. You can buy it in marks or—

Mr. FRIED. They are denominated and increasingly have become denominated in stronger currencies. But, I should not think there is any necessary assurance that today's strong currencies will be strong currencies 10 or 15 years from now.

Chairman REUSS. I think you are right. While they could hedge a bit by getting a package of strong currency denominated bonds, that is not as good as being 100-percent secure.

Mr. FRIED. Essentially, an SDR denominated bond represents an exchange guaranteed value denominated in a package of currencies.

Chairman REUSS. And you are right in saying that the World Bank is not offering one of those.

Mr. FRIED. It is not empowered to do so, as far as I know, because there may be some question within the mechanics of the World Bank as to how the exchange guarantee would, in fact, be financed. But, there is no reason why it could not explore the use of such a device.

Chairman REUSS. If I may interrupt there. Is there anything wrong with our sending a note to Mr. McNamara through our Executive Director?

Mr. FRIED. I should think not. We will inevitably be moving in this direction. World Bank debt instruments denominated in SDR's for this purpose would be potentially very useful.

In the second area—promoting investment in the oil-importing countries—we already have a vehicle at hand in the International Finance Corporation, the World Bank's investment promotion affiliate. I have always found it rather sad that we have not been willing to encourage far more ambitious use of the IFC. It would require very little. What it needs, in effect, is that the IFC have a much larger capacity to take equity positions. If, for example, the United States and other industrial countries increased the paid-in capital of the IFC, the IFC would be in a position to take on a much more ambitious role in promoting investments in the developing countries. It could then be an important vehicle for mobilizing both capital from the oil-surplus countries and technical experience from the United States and other industrial countries to promote economic development in the poor countries.

The third issue of SDR's is, of course, quite separate. The possibility of special issues of SDR's for this purpose relates to the desire of the surplus countries to hold a significant portion of their surpluses as monetary reserves rather than as investments abroad. If they are to be able to do this, they would need some sort of special arrangements, and the means are at hand.

Chairman REUSS. It would sort of be in advance consolidation of your dollar balances before you get the dollar balances?

Mr. FRIED. I did not want to put it that way, but it is a perfectly proper interpretation.

Chairman REUSS. Senator Fulbright.

Senator FULBRIGHT. Well, Mr. Chairman, I regret that I was not here in the beginning, because I know all of these gentlemen are very fine economists. I wonder if it would be out of order to ask you what policies, Mr. Fried—I can ask any of you but I will start with Mr. Fried—what policies of the Government of the United States and particularly the legislature, that is, the Senate to be specific, and/or the Congress, they work together, would you say has been most ac-

countable for our present condition with regard to our international payments and supplies of oil? You mentioned one, such as the import quotas, or I think one of you mentioned import quotas as having increased the domestic cost. Well, one person calls it in a committee meeting, "drain America first policy" was that policy that we now find ourselves in, or at least that contributes to some of these difficulties.

Can you identify any other policies we have followed in the last few years or are presently following that contribute to our difficulties, political ones, with which we have not solely economic question but the things which the Congress has done? What I am trying to get out is that, as a layman, as far as being an economist is concerned, what is it as a political matter, I suppose, that the Congress has done or is doing that has contributed to our difficulties?

Mr. FRIED. I am sorry, Senator Fulbright. Is it difficulties with respect to oil or difficulties with respect to something else?

Senator FULBRIGHT. Do you see, for example, that our policies in Southeast Asia or some other difficulties have caused problems or is that a compartment that has no effect on the rest of our economy, inflationwise or deficitwise or anything else?

Mr. FRIED. Well, obviously, the extent to which our performance on inflation was not satisfactory, to the extent that prices rose in the United States, our payments position weakened vis-a-vis the rest of the world. Vietnam, to a degree, and it was a significant degree, added to fiscal requirements in the United States.

Senator FULBRIGHT. Was it a significant degree?

Mr. FRIED. Well, I would say that the Vietnam war cost about, at its peak, in today's dollars something on the order of \$25 to \$27 billion.

Senator FULBRIGHT. Per year?

Mr. FRIED. At its peak.

Senator FULBRIGHT. Per year?

Mr. FRIED. Oh, yes.

Senator FULBRIGHT. Overall it is far greater. I think I have seen a figure as high as \$300 billion.

Mr. FRIED. I think, as a total, that figure is high.

Senator FULBRIGHT. I only wanted to make sure that it was a year and not overall.

Mr. FRIED. At its peak in 1968 and 1969, the incremental cost of the Vietnam war was about \$28 to \$29 billion in 1973 dollars, and only gradually wound down. The cumulative costs, of course, are very large.

Senator FULBRIGHT. Well, what I am really trying to make myself clear on is that we tend to regard all of these questions in compartments and we look at one and then another, and we vote upon them in the Congress that way. Today, we have a subcommittee of the Foreign Relations Committee on commitments abroad, and we have been studying this. This is an enormous organization which we have today in existence, and Senator Mansfield summed it up, I thought rather well, and I think after considerable research that we have something in the neighborhood of 1,900 bases outside of the United States, of which 320 are major bases of 500 or more men, and these are enormous costs. He estimated that the NATO overall costs alone, including backup and everything, our commitment cost is \$17 billion. Well, I do not want to argue about the amounts; they are very large

amounts. Now, we have these bases virtually all over the world. We have MAP Missions, at least I think, in 46 or 56 countries. We are continuing to maintain a worldwide network of military bases. Do you think that this has anything to do with our international fiscal situation, our deficits and present condition? I mean, does that have any influence upon our capacity to service our people in oil or anything else? Is there any relationship between these policies and what we are concerned with in our own economy?

I am trying to bring this together. If any of you would wish to either say yes or no—

Mr. FRIED. I would be happy to try.

Senator FULBRIGHT. All right.

Mr. FRIED. I think that the net foreign exchange cost of our military activities abroad probably amounts to on the order of \$2 to \$3 billion a year at the present time. That is a large number in balance of payments terms but it is always dangerous, as I think any of us in this panel would stress, to separate out one particular element of the balance of payments. For these purposes my estimate would be that the gross foreign exchange costs of our military activities abroad—our forces in Europe and bases in the Far East—would be something on the order of \$4 to \$5 billion. The net foreign exchange inflow from those activities abroad—principally increased purchases of military equipment by allies in the United States—would be something under \$2 billion. So the net foreign exchange cost, to use a rather crude concept, would be \$2 to \$3 billion. That is large. It represents—

Senator FULBRIGHT. Do you include foreign military assistance in that?

Mr. FRIED. Yes. I think that the foreign exchange cost or foreign military assistance is not very great. My own feeling, Senator Fulbright, is that it is not too wise to focus solely on foreign exchange costs. I believe we should be far more concerned about the total budget costs of U.S. Defense Forces and the missions they are designed to serve. That is a much larger figure and to my mind raises much more significant questions.

Senator FULBRIGHT. Well, I was only trying to prompt you gentlemen to translate your economic knowledge into the field in which I have a more direct responsibility. For example, there is another illustration: We all are concerned about the immediate shortage of oil. My constituent called me yesterday and we had a bad winter last year. There were floods all in that area. We had, therefore, 1972 which has been taken as the level at which allocations would be made and was very low, and particularly a man called me and he said he is in heavy earth moving. He had a very, very minimum amount of activities in November 1972 because of floods. Now, he cannot get any oil at all. He had enough for 5 days and he ran out and he is out of business. He employs 40 people. To him it is a very serious matter.

Now, is this related or are they conditions affected by our policy in the Middle East? Is there a price for the political policy of our support for Israel continuing and does this have any effect upon the oil or not? Are these related is what I am saying. Do you think they are related?

Mr. STAUFFER. May I offer a comment? At least in the short run it is obvious that they are related and I think we are going to see an in-

creasing crunch this winter, particularly on the east coast, as up to 40 percent of the east coast supply seems to be in jeopardy at this point. Over the long run, though, if you are looking for specific examples of legislative actions which have had repercussions in this area, I think that one may look to the EPA. As a consequence of the decisions to restrict sulfur emissions, a number of plants, utility plants in this country which could have burned coal, have switched to oil or gas. And insofar as anyone switches from coal to oil at this point, that is immediately translated into a demand for extra imports. So, there has been a tradeoff between reduced sulfur emissions in certain cities and a sizable increase in the balance-of-payments outflows. There is one direct consequence such as you asked for.

Senator FULBRIGHT. What I am trying to find out is that I never expect to be an expert economist, but to relate those matters so that when we vote to intervene in a matter like the Middle East, we ought to recognize what the cost is. If we are going to do that, part of the cost is to do without oil or at least to pay twice as much for something, and that is all I am going to say. These things are related and they do have their costs.

Now, you do say that if we are going to have clean air then we have got to pay for it, and you pay for it either through paying for oil, or you have got to have an enormous research project. I mean, for example, we went to the Moon, we enjoyed the television spectacle, but we could have used that money to find out how to make coal usable, either technologically remove the sulfur or to convert it into gas or something. We might have, might we not, if we had spent the \$70 billion on research and on conversion of coal, oil shale, tar sands, we probably would have made some progress if we had spent the equivalent amount of money and effort, would we not? Do you think we would have?

Mr. STAUFFER. Almost with certainty.

Senator FULBRIGHT. But we would have had then plenty of fuel. But now the people should realize that by diverting our energies over into space, which is lovely, and we outdid the Russians and we can brag about it, and it gave us entertainment but there is some fall out, I suppose, in a tangible way. But they should just simply realize that these things have their costs and it comes down to where we direct our energies and this is what the Congress has to do. The Congress voted these bills and this is what I am trying to get you to focus on. What should the Congress do or not do that it has been doing with regard to this problem, oil and our balance of payments; if you have any suggestions?

People, I think, often are reluctant to give advice or criticism to us to our face, but I think that it is time that we ought to have it if we need it.

Mr. STAUFFER. Well, if I may take up the gauntlet on that?

Senator FULBRIGHT. Well, I am offering it to you.

Mr. STAUFFER. And venture into an extremely unfashionable area—

Senator FULBRIGHT. Well, that is all right.

Mr. STAUFFER. It has become clear, at least in some circles, if not to the general public over the last couple of weeks that, first of all, if we want to be clean we are going to be cold.

Senator FULBRIGHT. This is what ought to be made clear.

Mr. STAUFFER. And that was never discussed in the press when the various environmental pressures were being presented before the legislature. It was always presumed that this was a costless venture, in terms of risk and in terms of the economic burden which were implied. Yet we now see ourselves in a position where the crunch which is about to come would have been lessened had we not decommissioned a number of coal-burning electric utilities. The number that sticks in my mind is something like the equivalent of 400,000 barrels a day. But I may be off by a factor of two on that.

Senator FULBRIGHT. The equivalent in oil?

Mr. STAUFFER. The equivalent in oil. If we had those plants in operation today, we would be facing that much less of a shortfall as a consequence of the present Middle Eastern crisis. Some of those plants could be put back into service if the orders were given. In many cases, the equipment has long since rusted away. Here is one area where we have paid a balance-of-payments cost, and we have incurred a security risk, but, indeed, the contingency against which we might have insured ourselves is now come to pass. The wolf is at the door.

Senator FULBRIGHT. Yes.

Mr. WELLS. Since you have offered us this opportunity, I cannot resist it. It seems to me the contribution this discussion makes in terms of the formulation of our foreign policy is that the costs of the absence of peace in the Middle East have gone up; whatever our posture was in the Middle East prior to the present situation, as far as petroleum is concerned, those costs were less 5 years ago than they are today. If I may give just one application of this. Suppose part of a peace package in the Middle East were to be the establishment of a Palestinian state on the west bank. In terms of the costs and the type of assistance that such a state would require, if the costs of having oil cut off to us has gone up, as it has, then is it not worthwhile for us to commit resources to a settlement of this type? In other words, you simply have to consider the alternatives.

Senator FULBRIGHT. That is right.

Mr. WELLS. And since we have a larger stake, perhaps we should be more ready to commit some resources to a settlement of the situation.

Senator FULBRIGHT. That is a good example of what I mean. And to try to bring together the overall costs to a country, or to put it in a simple way. What is the national interest in this case if you consider all of the elements? I think there is a great tendency to look at just one aspect of it and not relate it to the other aspects. As you said about the EPA, I mean, well, it is nice to have clean air and everybody is for clean air but they never consider—they are not all for being cold, or they are not all for having their plants closed down and having no job, as this man that spoke to me yesterday said, and I do not know that I can do anything about it. He needs diesel oil to run his tractors. He has got contracts to work on levees and roads but he has got to lay them off if he cannot get diesel oil because these are caterpillar tractors, primarily, and trucks, so we have to take our choice. So, I think the Congress does not weigh—I should say the Senate, I will leave the House out of it. The House I am sure does. The Senate does not weigh the overall costs in a lot of these programs. And on this space business, it is just fine, per se. It is a great thing to do. Nobody considered, well, if you do that you are not going to do something else

because this is an awfully big piece of the pie. It was running at \$5 billion a year at one point, and it still is over three and so on down the line, this is the old ancient phrase of priorities and we are unable to do it; do it well, I think. And I think a panel like this is very healthy for you to point out these things and it is very useful for us to have another authority that says, well, we have got to do something about the EPA, at least on the short term, and I think we do because I think the people do not like to be cold rather than clean at this particular point. At least in the wintertime. In the summer, it is better.

Chairman REUSS. A majority.

Senator FULBRIGHT. I will yield to the chairman. He is much better equipped to ask intelligent questions.

Chairman REUSS. Well, I hold out a ray of hope, Senator Fulbright, that with the passage of the budget reform proposal that we will be able to reorder those priorities in a way that will please us all.

Senator FULBRIGHT. Well, you see, our motives get so mixed up. I mean, I have been accused of not being in sympathy with Israel. That is not so. It is a difference of judgment as to what is in the long-term interest of the Israelis and the United States. I do not think that pursuit of a war and a nonsettlement is in either interest and yet this has a great relation to what we are talking about here this morning on oil and its costs. So, I think that we let our emotions too often completely override our judgment in many cases.

Chairman REUSS. That is one of the reasons we have the panel here.

Senator FULBRIGHT. I agree, so I yield to the chairman.

Chairman REUSS. Mr. Yager, what could you have to say about this? Is it realistic to expect the multinational oil firms which have found that they can maintain good profits even though the world price of middle eastern oil goes up, by passing it on to the consumer. Is it realistic to expect them to have a very large incentive to develop new high cost energy supplies elsewhere and particularly in this country when they are able to maintain profits, by simply riding with the price movement in the Middle East?

Mr. YAGER. Well, of course, their prices are rising also so that there will be a profit margin for development of high cost resources. They are developing Alaska. They are interested in more offshore drilling. So, I would not rule this out. If prices were fixed, then I believe what you say would be true. But, with these higher prices there should be a profit margin. Even the shale oil may be profitable fairly soon, if we decide that it is needed and are willing to pay the environmental costs.

Mr. STAUFFER. May I offer a comment on that, sir?

Chairman REUSS. Yes, Mr. Stauffer.

Mr. STAUFFER. I think there is a rather good and perhaps even dramatic illustration of Mr. Yager's point. Look at the Gulf Oil Corp., which has perhaps the largest crude position of any of the major oil companies in the world, yet it is the company which on its own has developed the most promising form of gas-cooled reactor, a reactor which is now going into commercial production. There is a good example of Mr. Yager's point—a company with a formal surplus crude but which is actively pursuing competitive methods for energy resources.

Chairman REUSS. Suppose this development of domestic sources of oil and other forms of energy is as successful as we hope it will be, would we some day have to reimpose import quotas on middle eastern

oil in order to protect the high cost investment in these new alternative sources here at home?

Mr. STAUFFER. I can only hazard an answer to that. Insofar as our domestic production of oil and gas responds to these higher prices, then that should not, as such, be a problem. If, however, we go to subsidizing unconventional forms at costs which are higher even than the present high prices of international oil, then, of course, we might have to worry. If you believe Professor Adelman's prediction that dollar oil would come to pass, then we desperately do have to worry about protecting all of our domestic sources of energy. But the United States is particularly lucky in that we have an extraordinarily large resource base of quite low-cost coal, once we decide to accept the dirt and the ravages of the landscape in producing it. And, over a time horizon of 10 or 15 years, existing coal technology would permit us, in effect, to stabilize a selling price for imported oil which would relate to the alternatives based on coal. Other parts of the world do not have that option, so we might well see a two-tier price system emerge at a higher price for the rest of the world and a lower price to us (insofar as the producers might want to sell any to us and we might want to buy it). But that is about 15 years off.

Chairman REUSS. To take you up on one thing you just said, is it necessary that we accept the ravaging of the landscape in order to utilize our coal? Why not add somewhat to the price and admittedly a less expensive form of energy and clean up the landscape?

Mr. STAUFFER. I think that question is appropriate, and it is eminently possible, as far as I understand, with available techniques to reclaim strip mined land in the West, at a price, or an additional cost, which is really nominal compared with the cost of the coal. Reclamation techniques in Appalachia are more expensive and may add 25 percent to the cost of coal. But that extra cost, which would have been large 2 years ago, all but disappears now and becomes irrelevant in view of the overall increase in world price levels.

Chairman REUSS. Let me now ask Mr. Wells and Mr. Stauffer to confront each other on what I think is a difference in their testimony. Mr. Wells said Middle Eastern investment is good, it helps on our balance of payments when it is made and while remittances later are red-ink items on the balance of payments, they come later on and may not swallow the former black ink. Mr. Stauffer, I think, indicates that it is a bad deal from the standpoint of balance of payments and, therefore, we certainly should not encourage it.

This is like the old controversy, the other way around between the multinationals sending American investment abroad which said it is wonderful because we repatriate all of this income, and the enemies of multinationals like the AFL-CIO, which said, nonsense, it causes us more harm balance-of-payments wise by the initial investment than by the subsequent partial repatriation. I never have been able to make up my mind on that one and I am not sure that I am going to be able to make up my mind on the reverse that you are arguing about, but I would like to hear you. And if either Mr. Yager or Mr. Fried has anything to say, we will let them be heard, too.

Mr. STAUFFER. Well, I think the parallel with investment by or in a multinational corporation is not the best here. Let me try an analogy. In this case if we were borrowing money in the form of investments by

Middle Eastern countries to build a boiler we are borrowing to create an investment. So we are borrowing—we are incurring a liability—to create a durable, productive asset. However, to continue that parallel, we are not in this instance borrowing to build a boiler, but instead we are borrowing each year to put the fuel into that boiler. Thus, we are borrowing to finance current consumption, which is something that one is willing to do to meet a liquidity (cash “crunch”), as in a family, for example, but it is not something which one is willing to do chronically.

Chairman REUSS. I would have thought that we were fracturing a financial asset built up by the supplier of the oil in the previous period. And I am not sure I can see your distinction.

Mr. YAGER. I do not see it either. After all, using his family example, by borrowing you release money you otherwise would have spent for something else and put it into oil. You know that money is fungible.

Mr. WELLS. Many families finance a car. A car is a consumption item. You just spend out the payments for that car. To the extent that we have a short-run problem, extending up through 1985, it seems to me this makes sense. Beyond the economic argument, we have an interest, politically, in making these countries part of the vested interest of the entire international financial world. The richer they become the more they become one of the “have” countries, and in terms of per capita income, they are going to be right at the top. The more interest they have in stable international financial relations, the more reliance they are going to have on stable international trade, and, I think this carries over, the more interest they are going to have in stable political relationships. International investment of this type, mutually agreeable to both parties, and working through the market process, can create conditions which are mutually beneficial.

Senator FULBRIGHT. Mr. Chairman, could I say “Amen” to that? This is the type of thing I am talking about, the interrelationship between just the economics of it. I think you can make a case, but I think it does have a very important effect, or it could have, and something has to be done to curb the extreme nationalism that has merged upon us for so long, and this could do that.

Chairman REUSS. I think one plus item for encouraging foreign investment, including Middle Eastern investment here, and leaving aside the question of whether in the long run it helps or hurts our balance of payments, is that it does make jobs. And we, in a major democracy, seem to have the hardest time making jobs. Do you agree with my question or proposition? Is not new capital investment here a new direct investment, that is likely to be job producing? In my State of Wisconsin, Kikkoman Soy Sauce Co. of Japan has started to make chili sauce and employed 100 people who would otherwise have been on the relief rolls. I have been applauding that.

Before allowing Mr. Fried to respond, I would like to place in the record, without objection, an article entitled “Foreign Investment in the United States—A Danger to Our Welfare and Sovereignty?” from the October 1973 issue of the Federal Reserve Bank of St. Louis.

[The article follows:]

[Article from the Federal Reserve Bank of St. Louis, issue of October 1973]

FOREIGN INVESTMENT IN THE UNITED STATES—A DANGER TO OUR WELFARE AND SOVEREIGNTY?

(By Anatol Balbach)

For many years we have heard bitter debate about U.S. investments abroad. From Canada, South America, Europe, and Asia came serious complaints that U.S. capital was talking over their industries and draining their economies of resources. Now, with an apparently significant increase in foreign investment in the United States, sounds of alarm are beginning to be heard from our own businessmen and politicians. We have read that Japanese purchases of hotels, lumber stands, and land are contributing to shortages and inflation. We hear that our "need" for Middle Eastern oil is such that the oil-rich countries will eventually accumulate enough dollars to purchase and, in turn, control our industry.

The purpose of this note is to examine the impact of foreign investment on inflation and welfare, and to assess the probability of a foreign takeover of American industry. The analysis is addressed only to the investment aspect of foreign trade and not to the impact of transactions in current goods and services. Furthermore, it is assumed that all transactions are undertaken by individual decision makers who are interested in maximizing their profits or wealth rather than by governments for strategic or tactical purposes.

DOES FOREIGN INVESTMENT INCREASE OUR COST OF LIVING?

First, let us discuss the question of whether increased foreign investment causes inflationary pressures and whether it has been a factor in the recent dramatic increase in consumer prices. To be consistent with the events of the past several years, this issue should be analyzed under two conditions: one in which foreigners have no accumulated dollar assets and, as is the case now, one in which they do.

If foreigners did not have accumulated dollar balances and wished to buy a capital asset in the United States, they would first have to acquire dollars. In order to do this they would have to sell an equivalent amount of goods to U.S. residents. As a result of this process, the dollar holdings of U.S. residents who bought the imports would decline, and those of foreigners would increase. In turn, as these foreign dollar balances were drawn down, those of U.S. residents who sold capital assets would increase. The U.S. money stock would remain the same; thus there would be no reason to expect additional spending and additional inflationary pressure. To be sure, the prices of the capital assets demanded would have a tendency to increase. On the other hand, Americans would have been induced to import more only if the prices of these imported goods were lower than prices of similar goods produced domestically.

Furthermore, consider the welfare implications of these events. We would have traded some claims on capital assets for some goods or services and, in the process, some prices would have changed. Presumably, trade was entered into willingly by those involved because they found it profitable or because it increased their satisfaction. Thus, even if there was a relative increase in some prices, society would still be better off than it was prior to the trade.

Now consider the situation in which foreigners have accumulated dollar assets from trades in the past. What is the *current* impact of foreign investment? If, as has been common practice, this dollar accumulation by foreigners is held in the form of U.S. Treasury securities, then these securities would have to be sold. The dollar balance of the securities buyers would decline and those of the sellers of claims on capital assets would increase. Again, this action alone would not increase our money stock and, hence, would not be a source of inflationary pressures. The prices of claims on capital assets demanded by foreigners would have a tendency to rise while the prices of the Treasury securities they are selling would tend to decline.

If, however, these accumulated balances were held in the form of foreign central bank balances at the Federal Reserve Banks, then the spending of these balances would increase the money stock and add fuel to inflationary pressures

in the United States. In fact, this is not likely to occur; these central bank balances are relatively small and are usually maintained at a relatively stable level for use in day-to-day transactions. A significant reduction of these balances, in view of their small size as compared to foreign holdings of Treasury bills, is highly unlikely. Therefore, even if foreign investment were to continue to increase at the rapid pace exhibited in the past several months, its impact on inflation would be negligible. And since this investment is undertaken voluntarily by all the trading partners, we must presume that it will benefit society as a whole.

CAN FOREIGNERS GAIN "CONTROL" OF U.S. INDUSTRY?

Another frequently heard argument is that because of our insatiable desire for oil, foreign oil producers will accumulate vast dollar reserves with which they will buy up U.S. industry and eventually control our productive facilities. We can interpret this statement in the following way: (1) *irrespective of price* we will keep buying the same or increasing amounts of oil from Middle Eastern producers; (2) these producer countries will buy goods and services from the United States at a rate which will be a relatively stable proportion of their oil revenues; (3) the remaining "surplus" will be spent on U.S. productive assets *irrespective of their price*; and (4) foreign "control" of these assets would somehow be "bad."

Suppose for a moment, as improbable as it may be, that we were to buy foreign oil at a rate like that postulated above, and that all of the surplus revenue earned by foreign oil producing countries was spent on investments in the United States. If this continued into infinity, and the U.S. economy grew at a slower rate than our purchases of oil, it would be theoretically possible for Middle Eastern oil producers to gain "control" of our industry. Whether this "control" would be good or bad is not at all clear. As we have discussed previously, such transactions ultimately amount to a voluntary exchange of our productive asset ownership for foreign oil. This exchange, if undertaken by individuals and in the absence of coercion, must be economically beneficial to them.

But what about the future? So long as our industry produces all the goods and services that we are willing to purchase, why should we be so concerned about ownership? If foreign ownership is undesirable from the political point of view, or from a strategic point of view during a war, foreign owners could be controlled by legal sanctions. But there are no economic grounds for the evaluation of foreign versus domestic ownership. Besides, if the sellers of these domestic assets still wished to own income-producing goods, and if these goods were too expensive at home because of foreign demand, they could buy foreign assets, perhaps even exploratory rights of oil fields abroad. But such speculation about what could happen and about the welfare implications of foreign ownership is not very realistic; we should rely take a look at the possibility of such foreign capital invasion occurring even under the very pessimistic assumptions made above.

Let us speculate on how large this foreign investment in the United States could be and whether it could give foreigners "control" over our industry. We can proceed with the previously made interpretations of the argument which will yield the strongest case for it.

Estimates have been made that U.S. oil reserves will be depleted in 10 years and Middle Eastern and North African reserves in 60 years.¹ Let us assume that our oil consumption would rise at a constant rate associated with the growth of our real GNP and that after 10 years our domestic oil output would have to be fully supplanted by greater imports from the Middle East and North Africa. Let us further assume that their imports from the United States would rise at, say, 5 percent per year, and that the remaining dollar surplus would be spent buying capital assets in the United States. Trade between Middle Eastern countries and the world outside of the United States is excluded from consideration because such trade, in relation to the investment in the United States, would set off repercussions on the exchange rate which would violate our assumption of price constancy.

¹ See Walter J. Levy, "Oil Power," *Foreign Affairs* (July 1971), p. 653.

Chart 1
Bilateral Trade Balance Projections
 United States — Oil Producers in the Eastern Hemisphere

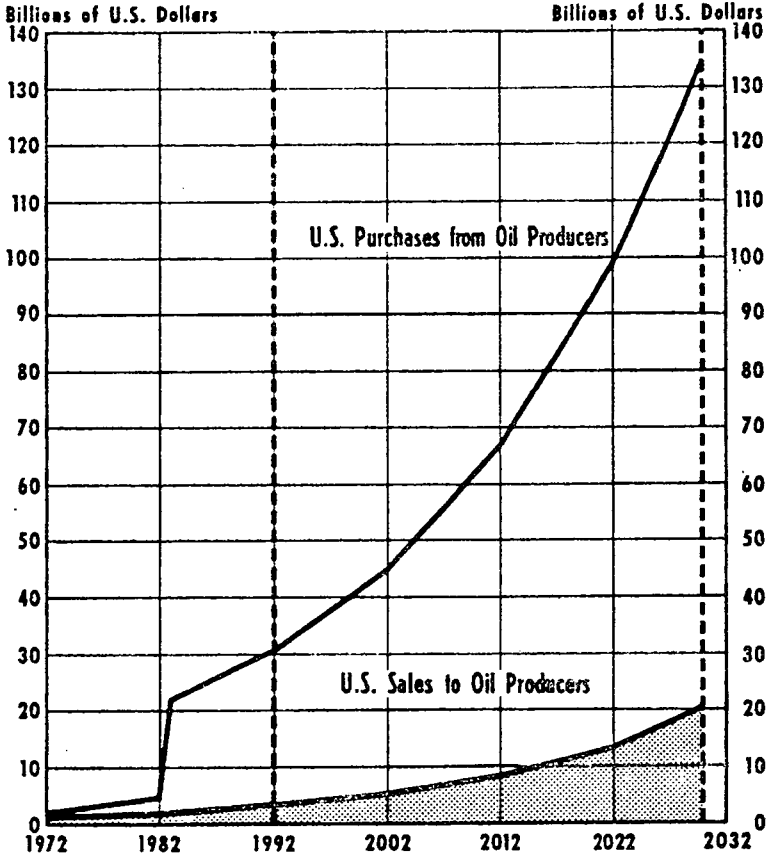


Chart II
**Projections of U.S. Non-Human Wealth
 and Asset Accumulation by Oil Producers**

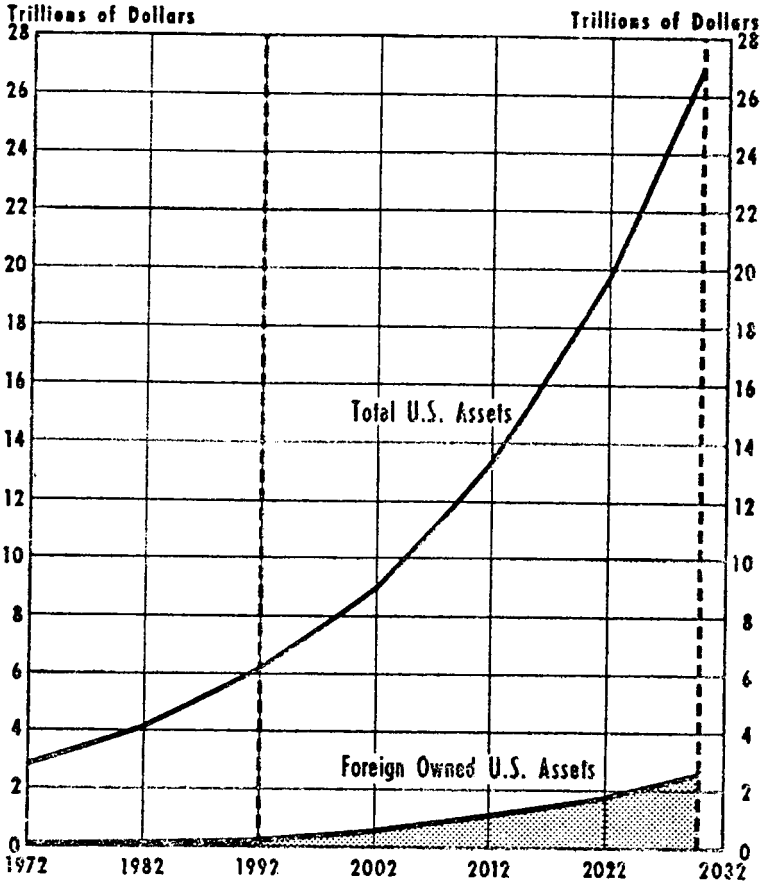


Chart I shows the projected U.S. imports of oil from the Eastern Hemisphere and the projected U.S. exports to these countries. The projections are based on the assumption that U.S. oil consumption will remain at 0.7 percent² of our real GNP which will rise at a 4 percent annual rate. Further, it assumed that the exports of U.S. goods and services to oil producing countries will rise at 5 percent per annum, and that the Western Hemisphere's oil reserves will be depleted in 10 years. The cumulative difference between U.S. oil imports and U.S. exports to oil-producing countries is assumed to be the amount of foreign dollar accumulation which is then invested in the ownership of U.S. industry.³

Chart II shows projections of the growth of non-human assets in the United States and projected accumulation of U.S. assets by foreigners resulting from import-export activities depicted in Chart I. The U.S. asset growth is simply

² This percentage has prevailed for the past 10 years.

³ It is assumed that: U.S. oil production will remain constant (4.1 billion barrels per year), due to limits on the refining capacity, until U.S. reserves are depleted; oil reserves in the Western Hemisphere will be depleted at the same time as U.S. reserves; and the price will remain at \$2.50 per barrel.

the projected GNP multiplied by a factor of 3.5, which assumes that approximately 28 percent of our total factors of production will consist of non-human assets. All of the assumptions are admittedly simplistic yet not unreasonable.

There are two points in time that we should be concerned with—1992 and 2030. One estimate of the Eastern Hemisphere's oil supply is 250 billion barrels.⁴ Another one states that this supply will run out in 60 years.⁵ If we take the first estimate and assume that our projected U.S. oil consumption is one-half of total world oil consumption, then the reserves will be used up in 1992. The other estimate puts us in the year 2030.

As can be seen in Chart II, in 1992 the value of our non-human productive assets would be \$6,100 billion and the maximum accumulation of foreign-owned assets would reach \$232 billion or 3.8 percent. If we consider the year 2030, the value of assets would reach \$26,900 billion and foreign ownership \$2,600 billion or 9.6 percent. In either case it would not produce foreign "control" of our industry.

This simple exercise is not intended to make accurate predictions into the future. Some reasonable assumptions of growth have been made and constant prices and exchange rates have been presumed. Increases in prices of traded assets may tend to narrow the accumulation of dollar reserves. Thus, the case presented here tends to overstate the possible acquisition of U.S. assets by foreigners. Even under these pessimistic circumstances the assertion of foreign control of U.S. industry becomes ridiculous.

Chairman REUSS. Mr. Fried, please go ahead.

Mr. FRIED. Mr. Chairman, in this respect I do not think that the benefits from the movement of capital for direct investment are different from the benefits arising from the movement of goods. Direct investments from the Middle East or anywhere else in the United States are a source of capital and of building up productive capacity and set in motion a whole chain of consequences, which make it almost impossible to predict the balance-of-payments consequences. This movement of capital around the world, I would argue, is to the mutual benefit of all countries.

Second, we should be careful not exaggerate this problem, even in the narrow sense in which we are looking at it. All of us have taken the position that the balance-of-payments consequences of our future oil imports are likely to be very small and if that is so, then the extent to which they will involve or will require offsetting transactions in the form of direct investment is also going to be very small, and particularly in comparison to the large movements of capital out of the United States and into the United States that are in prospect.

Senator FULBRIGHT. Could I ask you if you mean only the United States when you say very small, or would you include Western Europe and Japan?

Mr. FRIED. No. I think the balance of payments consequences of oil imports, as I said earlier would be smaller for the United States and much larger for Western Europe and Japan.

Senator FULBRIGHT. The consequences of its adding to inflation, to the cost of producing could be very great, could they not?

Mr. FRIED. Yes, they could be large. But, again, I think one has to look at this in terms of a tremendously growing world economy. Assuming the price of oil rises moderately in real terms for the next 10 or 15 years, moderately meaning 3 or 4 percent a year, then on the average, the real costs to the importing countries would be about \$13 billion a year, of which the United States, Western Europe and Japan would bear perhaps 75 percent. Now, that is a large number and rep-

⁴ "Tankers that Move the Oil that Moves the World," *Fortune* (September 1, 1967).

⁵ Levy, "Oil Power," p. 653.

resents a significant shift in the terms of trade in favor of the oil exporting countries and against the oil importing countries. On the other hand, in the context of a \$3½ to \$4 trillion economy that Western Europe, the United States and Japan, combined will represent, it is relatively a small amount.

I would like to take this opportunity to stress the point that when we talk about these huge incomes of a few countries, it is important to remember that the large part of the income going to oil exporting countries will be going to countries that are relatively poor, and which will continue to be relatively poor in 1980 and 1985 as well. They will be generating increased income from oil exports and will be spending it for imports of goods and services for development. Mr. Wells made the point that it is easy to exaggerate the wealth of Saudi Arabia, when one gets into the argument of saying whether it will be in their interest to sell oil. I am convinced, leaving political questions aside, it will be in their interest to sell oil. I believe that they would be ill-advised not to do so right on through the period. And again on the assumption that oil export prices increase steadily but moderately, oil revenues for Saudi Arabia in 1985 would be about \$1,500 per capita in today's dollars, which is less than one-third the income of the United States today.

Senator FULBRIGHT. \$1,500 per capita?

Mr. FRIED. Per capita.

Senator FULBRIGHT. Are you sure about that?

Mr. FRIED. I am fairly confident.

Mr. WELLS. That sounds considerably lower than what I had thought.

Senator FULBRIGHT. I thought it was in the neighborhood of \$300,- to \$400,000?

Mr. FRIED. No, sir. But my figures are based on the assumption of moderate increase in oil prices—an assumption that I believe would maximize revenues for the oil exporting countries over the medium and long term.

Senator FULBRIGHT. You are talking about Saudia Arabia. I think—

Mr. STAUFFER. I get a number closer to \$10,000.

Senator FULBRIGHT. I am sure it is up around \$2,000 or \$4,000.

Mr. STAUFFER. I would agree with you, Senator Fulbright.

Senator FULBRIGHT. I would be very surprised if Saudia Arabia is so low as \$13,000.

Mr. FRIED. By the way, this is in today's dollars, the only meaningful measure, I think. Frequently some of these estimates get involved with inflation and we do not know what kind of prices people are talking about. My calculations assume an export price by 1985 of something on the order of \$4 in today's dollars; \$4 or \$4.25.

Senator FULBRIGHT. I thought it was already higher than that.

Mr. FRIED. It is \$3.60 at the present time, after the most recent big jump. That kind of price increase cannot be sustained.

Senator FULBRIGHT. What is the significance of Canada, the other day, increasing by 400 percent its export tax? What does that mean?

Mr. STAUFFER. That means we pay it.

Senator FULBRIGHT. Well, that is right and it all comes directly on the price that our consumers may pay, does it not, if they get away with it? I understand that the Provinces are questioning our challenging that move.

Mr. WELLS. Back to Saudi Arabia. If we accept that the population of Saudi Arabia is at 5 million persons, and if we accept \$5 as the price of oil in 1980, I had a per capita income range of between \$6,600 and \$8,000.

Mr. YAGER. What are you assuming for oil exports?

Mr. STAUFFER. What level of oil exports?

Mr. WELLS. Something around 18 million barrels a day.

Senator FULBRIGHT. I thought there were more people; I thought there were 6 or 7 million people. You give 5 and nobody knows.

Mr. WELLS. The range of estimates have gone from 3½ to 14 million in published sources.

Mr. YAGER. The level of oil exports may be the difference.

Mr. FRIED. Mr. Chairman, may I comment on this?

I think this shows us one of the difficulties in the projections that currently are floating around. I am not saying that one is right or one is wrong. There are a number of key variables. I have been assuming a population of 8 million now and higher by 1985. But that is one of the variables.

But, I think a far more fundamental question is what estimates you assume about future exports. Now, I suggest that if the market is to be maintained, that is if the exporting countries are able to manage the market so as to constantly increase prices, to keep it tight, that that would require Saudi Arabia, in effect, as well as some of the smaller surplus countries to act as residual suppliers. And if they do, they would have to restrain their exports, as Mr. Yager suggested, far below what they physically can export—exporting perhaps 10 million barrels a day in 1980, and 15 million as a maximum in 1985. So these are variables as well. That is the difficulty with these figures.

Mr. STAUFFER. May I offer a comment, sir?

There is an utter worldliness about these projections of Saudi Arabian production because at least in September when I last discussed this with them, the issue before them—this is prior to the war—it was really whether or not they should cut production, let alone expand it. And there was a cleft within the Oil Policy Committee—they have one, too—on the issue of whether or not oil production should be cut or maintained, with really isolated voice arguing for any significant increase. And if you look at the last year's performance with the old price and the old production level, they saved 50 percent of their revenues. If at the present price, and at present production they were to continue, prior to the embargo, next year they would save something like 7 billion. And if you look at their ability to spend money domestically, it can increase only at a relatively moderate rate. If one naively reads the budget statements, one sees large increases allocated for development, for example, but if you track those down to find out how much was spent, you find that the expenditure ratio typically runs about 56 percent of allocation. So that if you believe the budget, they appear to be able to spend considerably more money than they, in fact can, and their ability to increase that rate of expenditure is seriously constrained by their administrative and technical cadres. So, within the planning organization itself, the optimists feel they can increase expenditures over the old levels of about 20 percent a year. That still would leave for next year somewhere a surplus of between \$5 and \$8 billion, with that surplus rising each year. The key question is whether

or not they are going to be willing to produce at that level to supply the West.

Senator FULBRIGHT. With inflation that is further incentive, and they see now that it is worth a lot more today than it was a year ago and next year it may be the same.

Mr. STAUFFER. They also can do their sums, and they may come to the conclusion that, allowing for devaluation, for inflation, and for security risks, that oil in the ground is probably the most secure asset they have and, secondly, it probably has the highest yield. So why should they produce?

Mr. WELLS. I know that these discussions are going on in the Saudi Government, but I think one should not ignore the pressures that arise in a population for rising living standards, and those pressures arise in Saudi Arabia as well as any other country. Between 1971 and 1972, at a time when their large increase in revenues were unanticipated, they increased actual cash expenditures something on the order of 26 percent. The limits to expenditures in Saudi Arabia are more apparent than real, I think, because those expenditures spill over into imports. They have the rest of the world to supply that output, and the only limit to expenditures is their ability to process imports, and I do not think that those limits are very real. They have undertaken programs to subsidize housing and they are going to rebuild towns and cities throughout the kingdom.

I do not know why we should think that the Saudis have any less propensity to spend public moneys than any other government around the world. In fact, they have shown a remarkable ability to do it, even without much administrative skill, and certainly they are going to be better prepared for that in the next 7 years than they have been over the past decade. As late as 1963, they did not even have a national budget. Well, those days are passed. They have very skilled people over there.

Senator FULBRIGHT. Their problems of development, they are not numerous, but the one I saw is extremely modern and they hired German and Swedish, I believe, engineers for construction and I do not know what other opportunities they have. They spent about \$100 million on that one irrigation project and it was a very good one. I have never seen a better one in this country. It was just finished. So I think there is something to that, but they are limited by manpower, I think, by the number of people that are capable of planning and organizing that kind of project.

Mr. WELLS. That is true if you put the focus on expenditures on development. What I am trying to suggest is that in a society where 60 percent of the gross national product accrues to the government, there is a substantial role for subsidization of consumption.

Senator FULBRIGHT. I think the present government discourages that because they think it corrupts the quality of life of their people. Not everybody subscribes to the unlimited consumerism that we may. I believe that the governing class does not believe that it is good for them to engage in that kind of consumption at the present time, in the same way that they do not believe that women ought to be out in the public and they do not appear in public. And they do not appear much of anywhere and the schools are segregated. I am not sure why we should say that is not right. Our women's libs have overpowered us.

We do not know whether we are right or wrong on that. I think it is good to see how the Saudis come out. Because we have been henpecked does not mean everybody has to be.

Mr. FRIED. I do not think we have anything to say about that, Mr. Chairman.

Senator FULBRIGHT. No, we cannot do anything about it now. But, I am all for the Saudis to give us an opportunity to see how it works.

Mr. WELLS. I appreciate their traditions as well as anyone, but I think that they have already taken the steps and have become rich enough over the past 5 years that they are caught in the process of change.

Senator FULBRIGHT. They have admitted women in the universities and I guess that is the opening edge. But, of course, that is a source we all said where they do have a great reservoir of talent. If they do release the women to participate in their economy with equality, that would give them a tremendous boost I am quite sure in manpower; do you not think it would?

Mr. WELLS. Yes, except that they do not need this labor as I see Saudi Arabia developing; they may let the rest of the world work for them.

Mr. STAUFFER. How long has it been since you have been there and involved in the development process?

Mr. WELLS. It has been 6 years, but I have been talking to people in the planning agencies and as I see the picture the progress has accelerated from the time I was there; the modernization process is certainly taking place more quickly than it was 6 years ago.

Chairman REUSS. Mr. Fried, did you have something?

Mr. FRIED. Just one brief point.

Again, I share Mr. Wells' view on this. I think that it is a matter of development. If Saudi Arabia comes anywhere close to the kind of development programs that Kuwait has undertaken, you get some pretty large numbers as to what they will spend on education, health, and health services, and these expenditures would have a tremendously high import content because they would have to import services as well as goods. Their restraint may well be, as I think you were suggesting, Senator Fulbright, political rather than anything else, if the regime believes that these programs in some sense might be dangerous.

One other point on this key issue of how Saudi Arabia views its alternatives—that is, oil in the ground versus oil exports. Let us not forget that if they are anywhere near rational, they are not going to hold their reserves in non-interest-bearing Swiss assets. Presumably, the choice is between investing in earning assets, direct investments or otherwise, whose earnings will accumulate over time, and reserves held underground whose price may not appreciate as rapidly as the rate of return on investments.

Senator FULBRIGHT. Well, fundamentally, I do not want to prolong this but it seems to me our problem is not just economic, but it is political, and that we have to come to terms with the political situation, at least. And what the economist can do is to highlight and point out the costs of these political policies. I mean, we have to take it into consideration and this is what I do not think the country or the Congress does. They seem to simply regard them as if they were separate departments, much as they did about the EPA. Everybody

was for it because it was going to be clean, and they never thought about what the other costs were. And I think it is the same in the Middle East, that the economist should go to great pains to point out in the most objective way what the cost of this political policy or political policies are, because I cannot believe that this country has become so irrational that it can defeat its own interests in the way that it has been in the last 10 years. And not only there but in South-east Asia. At some point we have to begin to consider what the interest of the United States is and not always be considering what somebody else's interest is. And, well, the economists though can do a lot of this. I think you are too reticent and too modest in pointing this out because you think, well, that would be treading on somebody else's field. The field the chairman and I are in is everybody's field and we have to deal with it all. And he is the only expert we have in your field. I am not an expert at all. But, I think I can see what is happening to this country and it does not please me very much at the moment.

Chairman REUSS. If you do it in sufficiently obscure terms, you can escape detection for years.

Senator FULBRIGHT. Well, I have said enough, Mr. Chairman. I think these are very important hearings.

Chairman REUSS. I just have one more question.

In the U.S. News and World Report this week, occurs an interview with Director John Love of the Energy Policy Office in which he says, and I am quoting, and he is asked :

Is the day coming when gasoline will cost \$1 a gallon?

He says :

I don't know how good a prophet I am in that regard, but it does not sound impossible to me.

Then he says :

Gasoline that now costs 40 cents a gallon, probably will cost 44 to 48 cents within the coming year. In the long-term, a higher price, as painful as it may be, is certainly going to be necessary to force the kind of conservation that Americans must face up to.

Then a few questions later he is asked :

Would a tax of 10 cents or 25 cents a gallon force some conservation?

Answer :

Probably if you make it that high, the tax becomes quite regressive for the man that has to drive back and forth to work and has a relatively low income.

Well, my question is: Is it not just as rough on the man with the low income to be taxed by the oil companies as it is to be taxed by the U.S. Government? This higher price is going to hurt the man who has to drive to and from work quite as much as reaching the same results by a tax, would it not?

Mr. WELLS. It is true in that regard. The difference, it seems to me, is to determine how the price increase would affect the economy in terms of the supply response. If the price increase goes to the producer, presumably there will be more of a supply response to a higher price than if the increased price is a result of a tax.

Chairman REUSS. Yes, but is there not a descending curve there? If you are going to let the producer charge a price necessary to secure a human conservation objective, to reduce consumption by 25 percent,

that may have little or no relationship to what is necessary by way of a higher price to secure additional production.

Mr. WELLS. Right. These, unfortunately, are two sides of the same coin.

Mr. FRIED. Except, of course, you could try in different circumstances to limit price increases to additional output, as we already do in some areas.

Senator FULBRIGHT. Could I suggest that if the Government did it, we might use this money for decent mass transit which would be very useful.

Chairman REUSS. The suggestion is gratefully accepted.

Gentlemen, thank you very much. You have been most helpful. I have several rather detailed questions for Mr. Fried and one for Mr. Yager, which do not particularly lend themselves to off-the-cuff answering because they involve statistics. May I present those to you and when you correct your testimony, if you would be kind enough to answer them then?

Mr. FRIED. I would be happy to try.

Mr. YAGER. Certainly.

Chairman REUSS. Thank you very much, gentlemen.

We will stand in recess until tomorrow morning when we meet in room 2128 of the Rayburn House Office Building.

[Whereupon, at 12:15 p.m., the subcommittee recessed, to reconvene at 10 a.m., Wednesday, November 7, 1973.]

[The following information was subsequently supplied for the record:]

RESPONSE OF EDWARD R. FRIED TO ADDITIONAL WRITTEN QUESTIONS POSED BY
CHAIRMAN REUSS

Question 1. For a possible oil import bill of \$16 billion (\$23 billion in 1985) in constant dollars, you estimate the United States would have only a \$1 billion current account deficit and a \$2 billion basic balance deficit. As these figures differ significantly from those proposed in the Commerce Department's study, particularly with regard to the current account deficit, can you provide the figures and the underlying assumptions you used to reach these conclusions?

Answer. As against the projected oil import bill of \$16 billion in 1980, my assumptions suggest the following offsets:

[In billions of dollars]

U.S. exports of goods and services to the oil exporting countries.....	9.8
U.S. earnings from oil transportation.....	1.2
Earnings of U.S. companies from production and sale of oil.....	3.8
Downstream investments of oil exporting countries in United States....	.4
	15.2

Additional underlying figures are that the oil exporting countries will earn \$47 billion in 1980, of which they will spend \$38 billion on goods and services for domestic consumption and for foreign military and economic assistance. Thus, the US share of this market would be approximately 25 percent, or roughly the share experienced in 1970. Market shares based on the 1970 experience may be a minimum expectation. In that year the US trade surplus was in large measure the result of a recession in the United States and a boom in Western Europe and Japan. Consequently, equilibrium exchange rates in the future may put the United States in a somewhat stronger competitive position. In addition, increasing purchases of military equipment by oil producing countries, which now seem to be in prospect, would suggest a higher market share for the United States.

Other prices and revenue forecasts are plausible so that no special significance should be attached to these particular calculations. The main points are (1) Western Europe and Japan as well as the United States will have to pay more for oil imports; (2) as prices rise, the United States is in a more favorable position than other industrial countries to increase production of domestic sources of energy; (3) the oil-exporting countries will use the major proportion of their oil revenues to buy goods and services from the industrial countries; and (4) the United States should be expected to be a competitive supplier to that market.

Question 2. You note that in the medium and longer term, higher prices will have a "substantial effect" in reducing oil demand and in increasing alternative sources of supply. However, on the demand side at least oil has been considered relatively price inelastic. Could you comment specifically on (a) over what time period and at what price would higher prices limit oil consumption; (b) at what price will alternative sources be recognized as feasible and what lag time will be required to develop them in commercial quantities; and (c) what U.S. Government policies would be necessary to support this effect?

Answer. While there is obviously a great deal of uncertainty about responses to higher oil prices, I believe they generally tend to be underestimated.

On the demand side, most projections of world oil requirements assume a continuing increase in the rate of growth of oil consumption. These projections are heavily influenced by trends in the past when oil was extraordinarily cheap. Higher oil prices in the future will have a dampening effect on total energy consumption and influence the mix of primary energy sources away from the use of oil. Even in the next year or two, the effect of higher prices on demand will not be insignificant, as evidenced by the rush toward small cars, the greater interest in home insulation, and the positive reaction to the campaign to reduce auto speeds. Increased use of coal, both in the United States and in Western Europe, may be the most significant medium term factor reducing the demand for oil. More generally, it is important to note that even small reductions in the rate of growth in world oil demand could decisively alter the world oil equation and significantly weaken the world oil market.

On the supply side, high prices should:

Encourage increased drilling and higher recovery rates for both oil and gas in the United States;

Hasten the development of North Sea reserves;

Intensify exploration and drilling elsewhere in the world;

Possibly make feasible the construction of a pipeline from the Siberian gas fields to Western Europe, and thus make Soviet natural gas a significant factor in the world oil market.

Hasten the commercial development of U.S. shale, Canadian tar sands, and the Venezuelan tar belt. Production lead times, however, are long, so that output probably would not reach sizable proportions until well into the 1980s.

Current price trends are already stimulating exploration and drilling for conventional sources of oil and gas in the United States and elsewhere. In the case of non-conventional sources of oil (shale and tar sands particularly) a considerable amount of expert opinion suggests that assured prices of \$5 to \$6 (1973 prices) a barrel would underwrite the large-scale investments that are required.

It probably would take at least two or three years for developments on the supply side to begin to affect oil import requirements; after that their significance could be expected to grow. By 1980, the combined effect of higher prices on world oil demand and supply might be to reduce import requirements by perhaps 10 million barrels per day, or by 25 percent of currently projected import requirements for the oil importing countries.

As to government policies, permitting higher prices for additional oil production, deregulating additional natural gas production, and opening up new areas for leasing are necessary for a higher sustained effort in exploration, development, and production. In the case of shale oil production, the large investment requirement and long amortization period probably will require government subsidies for prototype plants and long term price guarantees.

Question 3. In light of the recent changes in price (you note the 40 percent increase in October 1973), how would you reassess your estimates of likely price rises on the order of 3 to 4 percent per year in constant dollars?

Answer. While recent actions have demonstrated only too dramatically that oil demand and supply are price inelastic in the short run, they have also set countervailing forces in motion that will substantially change the future world oil market. The drive toward self-sufficiency in the United States and new

measures to arrest the decline of coal production in Western Europe are two major examples. Greater world wide emphasis on energy conservation is another. They suggest that the oil exporting countries as a group will have to prevent production from rising substantially to maintain reasonably tight markets and sustain even moderate price increases in the medium and longer term. The growing diversification of oil production is likely to make this kind of market control increasingly difficult to organize.

RESPONSE OF JOSEPH A. YAGER TO ADDITIONAL WRITTEN QUESTIONS POSED BY
CHAIRMAN REUSS

Question 1. In commenting on the potential for recreating a market situation of excess oil supply in the next few years, if there were no cutback, you note the need for major cooperative efforts amongst the importing countries. Can you elaborate on this proposal? What would you assign to official governments and private companies in this arrangement? What multi-national forum would you consider the most effective? How would you evaluate this proposal in light of present production cutbacks and the oil embargo?

Answer. The proposal that major oil importing countries cooperate in efforts to diversify and expand sources of energy is designed to make it progressively more difficult for the oil exporting countries to maintain high oil prices by restricting production. Many of those countries need their oil revenues and are not likely to restrict production in any case, except possibly for limited periods for political reasons. Those countries (Saudi Arabia and a few others) that may be prepared to try to play the role of residual suppliers will be less disposed to do so, if the required sacrifice of potential oil sales is too great, or if they realize that any reduction in their oil exports will be promptly made up by production elsewhere.

The best forum for getting the major oil importing countries to unite behind the proposal is OECD. Cooperation on specific projects, however, would probably be best organized through smaller *ad hoc* groupings. In general, the execution of projects would be in private hands, and most of the capital required would be from private sources. Governments would provide diplomatic support, advice on priorities, and any needed investment guarantees and supplementary financing. In the case of high-cost energy sources (Canadian tar sands, Venezuelan tar belt, US shale oil), governmental action would probably be needed to assure investors of the continued availability of a market at adequate prices.

The proposal would of course not produce additional sources of supply quickly enough to help meet the current embargo and production cutbacks. Serious consideration of this long-term strategy by the major oil importing countries might, however, exert a restraining influence on the Arab oil exporting countries. They might with some reason fear that prolonging or tightening current pressures on the United States, Western Europe and Japan would provoke countermeasures that would in time both undermine their current commercial bargaining advantage and weaken the value of oil as a political weapon.

Question 2. Can you comment on the likely attitudes of Japan and Western Europe to proposed multilateral cooperation in developing other energy sources and in negotiating with the producer countries? Is this proposal consistent with their own national energy policies? Can you shed any light on why efforts to date have been so unsuccessful in creating a consumer cartel?

Answer. A consumer cartel is neither feasible nor desirable. The governments of the major oil importing countries differ in their political relations with the oil exporting countries, in their relations with the oil industry at home and in producing areas and in their degrees of dependence on imported energy. Even if all of these differences could somehow be overcome and a joint negotiating group formed, no significant bargaining advantage would be achieved. Under current market conditions, the importers would still have no short-term alternative to buying the oil they need on pretty much the exporters' terms.

The oil importing countries should not waste their time considering how to confront OPEC directly, but should instead cooperate in efforts to diversify sources of energy and expand energy supply capabilities. This indirect strategy is much more likely to bring about the desired improvement in the bargaining strength of the oil importing countries.

This strategy is not inconsistent with the national energy policies of the Western European countries and Japan. All of these countries are reaching out for new sources of energy, and a few multilateral efforts to this end already exist (e.g., the British-German-Dutch centrifuge project) or are under serious discussion (e.g., a Japanese-US gaseous diffusion plant).

One may properly ask, however, whether the lack of cooperation among the industrialized nations in the current oil supply emergency may not have discouraging implications for longer run. No confident answer to this question can be made at this time, but it is possible to hope that the present unhappy experience will not create lasting distrust, but teach the need for cooperative action.

Question 3. You mentioned the added burden of oil costs on the developing countries. How great will it be relative to the burden on industrial countries?

Answer. The increased cost of oil (or of any other import) is more burdensome to the developing than to the industrialized countries in the same way that an increase in the price of any necessity bears more heavily on the poor than on the rich. But in addition to this general difference in the circumstances of the two groups of nations, the developing countries can less afford the adverse impact of a rising oil import bill on economic development.

In some of these countries, growth is already constrained by a shortage of foreign exchange with which to pay for materials and equipment not available domestically. In such countries, spending more for imported oil is clearly at the expense of growth. Even if foreign exchange is not the immediate problem, the resources devoted to paying for imported oil might have been invested, so even in these circumstances rising expenditures for oil are a drain on development.

ENERGY IMPORTS AND THE U.S. BALANCE OF PAYMENTS

WEDNESDAY, NOVEMBER 7, 1973

CONGRESS OF THE UNITED STATES,
SUBCOMMITTEE ON INTERNATIONAL ECONOMICS
OF THE JOINT ECONOMIC COMMITTEE,
Washington, D.C.

The subcommittee met, pursuant to recess, at 10:10 a.m., in room 2128, Rayburn House Office Building, Hon. Henry S. Reuss (chairman of the subcommittee) presiding.

Present: Representatives Reuss, Widnall, and Brown.

Also present: Sarah Jackson and John R. Karlik, professional staff members; Michael J. Runde, administrative assistant; George D. Krumbhaar, Jr., minority counsel; and Walter B. Laessig, minority counsel.

OPENING STATEMENT OF CHAIRMAN REUSS

Chairman REUSS. Good morning.

The International Economics Subcommittee is in session for a continuation of its hearings on oil imports and the U.S. balance of payments.

Although we are all concerned with the Arab embargo on oil shipments to the United States, at some future date our subcommittee may take a specific look at the economic consequences of that. This week, however, we are looking at the U.S. balance of payments under an alternative set of assumptions; namely, that imported oil will be available but at much higher prices.

Yesterday we heard that the balance-of-payments impact of growing U.S. imports will not be as great as sometimes has been suggested. The current deficit, it was said, would be largely offset by U.S. exports, remitted profits, and would be relatively insignificant compared with total trade flows.

What I personally am concerned with is the rationale by which it was determined that the United States would automatically get those extra exports as opposed to the Europeans, the Japanese, or somebody else, and also the rationale by which it was determined that profits under our present tax system would, in fact, be repatriated in the amounts projected.

However, this is a matter which will undoubtedly be gone into at future hearings. Several witnesses yesterday suggested potential deficits would be curtailed because the higher prices which we will have to pay for imports, would in themselves have a tendency to cut wasteful energy use and spur a domestic supply response. One other question which was raised yesterday, and will be relevant today, is whether it

will be in the interest of the oil producers to maintain oil production sufficiently to meet the needs of the major industrial countries.

In today's discussion we will focus on the prospects for world oil supplies and likely prices through 1980. Last month the Persian Gulf producers once again raised oil prices by some 40 percent. Venezuela, Nigeria, and Indonesia have already agreed to do likewise. We are here to investigate the underlying situation in the world market and what is likely to be the situation through the rest of the decade.

We have with us today three eminently distinguished witnesses with vast knowledge of the international oil situation. We have Mr. William G. Croly, an independent consultant from New York, who was formerly directly involved in marketing oil internationally for an American company. We will also hear from Mr. James Hanson, chief economist of the Exxon Corp.; and Mr. John Lichtblau, executive director of the Petroleum Industry Research Foundation, Inc.

Gentlemen, we are most grateful for your very informative prepared statements, which under the rules will be received in full into the record, and we would now like to ask you to proceed to summarize at least your remarks and findings.

First, Mr. Croly.

**STATEMENT OF WILLIAM G. CROLY, INDEPENDENT CONSULTANT,
NEW YORK, N.Y.**

Mr. CROLY. Mr. Chairman, it is a privilege to be able to testify on this most important subject, and my background, as you have suggested just now, is much more in line with the operating areas of oil and the shipping business. And I will probably direct most of my remarks toward those sectors of this subject.

You do have my prepared statement. I can summarize it very rapidly, and then I would like to make a couple of extra remarks because upon receiving my copy of the press release yesterday it seems that the remarks that I have written for the record would have been directed better perhaps toward yesterday's schedule rather than today's. But in any event I shall proceed.

I have studied the notes put out by the Department of Commerce, and I think that there are a couple of assumptions that I would alter. Namely, I do not think we can assume that there will be future credits to our balance of payments labeled company profits or repatriated earnings, because I strongly suspect that within a year or perhaps 2 years most of the U.S. holdings overseas will have been so effectively nationalized, or so effectively acquired by the host governments that oil company profits, repatriated profits, will be most limited. And even if these companies do maintain their present participation schedule, I believe that the latest round of price increases in the Middle East will effectively hold company profits to about 35 or 50 cents per barrel. All of this, of course, means that the offsets to the balance of payments outflow, that is the balance of payments flow into the United States will not be as large as we may have assumed in the past. In short, there will be no growth of producing profits per se.

A couple of other cases. I do not think that the tanker rates can be realistically assumed to be maintained on a flat schedule from now through 1985. Bunker prices have already increased as much as 150 or

200 percent, particularly for diesel fuel. However, I think the work done by the department is excellent and should be expanded and enlarged.

The next subject I touched upon in my prepared statement were the six factors which will affect our energy balance of payments. They are the physical supply of oil and gas, U.S. foreign policy, the cost of ocean transportation, environmental considerations within the United States, U.S. demand and the availability of energy alternatives.

The physical supply is probably better commented upon by authorities on the subject than by myself. But, certainly our physical supply within the United States is not large enough. I strongly suspect further that by well before 1985 the physical production of oil in the world will be declining.

I think U.S. foreign policy, particularly in the Middle East, has been very harmful to our balance of payments, not merely because we are exporting large quantities of military weapons there, and certainly I do not want to get into the pros and cons of any of the current Middle East disputes, but this has undoubtedly aggravated and accelerated the increase in prices, not only in the Middle East, but as the Chairman suggested, or mentioned, Venezuela, Nigeria, and other countries have followed. Therefore, a more evenhanded policy in the Middle East, or more strenuous efforts in the past—and, of course, very strenuous efforts are being made right now to settle these problems—would, I think, enhance or would have enhanced our balance of payments situation.

I think another thing that we have to consider is that these very large price increases are very destructive to the economies of less developed countries, countries like India which can ill afford price increases or two or three times former prices per barrel in the Arab, Persian Gulf. Perhaps we will have to increase our aid program in order to assist these countries because of the larger outflows of foreign currency for essential oil.

The cost of ocean transportation is a very important element, of course, in any foreign exchange program. The freight rates in the bulk trades have moved as much as 1,000 percent over those of 2 or 3 years ago. The phenomena, of course, of cyclical freight rates in the oil business and the grain business is very well known. Normally most companies do keep enough tankers or enough tonnage under long-term charter or ownership that they can dampen the effect of these freight rate changes.

One consequence of the current embargo on crude oil shipments to the United States could be that certain Arab nations might initiate so-called black lists against the tankers trading to the United States such as is currently maintained against tankers that trade with Israel. The obvious consequence of this would be that foreign tankers would be most reluctant to trade with U.S. ports, even though these tankers were from Nigeria, Venezuela, or Iran, because they would then be unable to trade from Arab ports. So this could be an extra reason for supporting the 50 percent bill, the so-called 50 percent bill of having 50 percent of our oil imported on U.S. flag tankers. It would also help our foreign exchange situation.

On the environmental considerations I mention three of them, a refinery in Maine, and had it been built when proposed it would now

be producing oil, and also current activities in drilling offshore and the Alaska pipeline. I estimate that the Alaska pipeline alone, that is the delay in it, will have a cost of \$15 billion in foreign exchange on current accounts before 1978. And, of course, we can do many of the programs suggested by numerous government agencies such as conservation, that sort of thing, or development of alternative energies, sources of energy. I suppose the President will touch on these things in his message to the country.

There were a couple of specific questions in the Chairman's letter to me of October 25, which I would like to make some reply to.

Will production limitations by the oil producing countries, both for political and conservation reasons, also affect overall prices?

Yes; of course they will. I secured permission from the Oil and Gas Journal to reproduce for your record their table¹ showing how crude oil prices have increased from October 1 through October 31, and they do not even have some of the latest increases, particularly those of Venezuela. So, of course, it will increase. However, even with cost, insurance, and freight, crude oil prices of \$21 per barrel delivered to the United States, the following product prices would probably result:

Gasoline, \$1 per gallon. That includes 11 cents in taxes. Distillate, 60 cents a gallon, and the current price to the homeowner is about 25 cents; and fuel oil of \$10 per barrel, 0.5 percent sulfur. It has already reached that level for at least 0.3 sulfur which, of course, means an enormous increase in payments to the oil producing countries.

What are the possibilities of developing other oil resources outside of the Middle East?

There is an article which paraphrases or extracts from Mr. Warman's remarks. Mr. Warman is in charge of production for British Petroleum Corporation. In the current issue of Petroleum Press, which I think is excellent on this subject there is an article which should perhaps be referred to the committee. But we will never find oil again that costs 3 to 25 cents per barrel.

What will the effect of increased demand for energy by the rest of the world be, particularly Western Europe and Japan?

Very high prices. Already in Japan the price of gasoline, based on the latest yen-dollar exchange, is about \$1.25 per gallon.

Are major consumers likely to become more competitive or cooperative in their efforts to secure adequate supplies of oil at stated prices?

On the short term they are going to become more competitive, but on the long term more cooperative. We will have to be more cooperative. But you notice everytime there is a shortage of tankers, the freight rates are bid very high, so there is a very limited amount of cooperation. Of course, United States companies could not cooperate very well in this area because of Department of Justice implications.

One last thing on tanker rates. Tanker rates are the major and perhaps only untaxed area of profit in the flow of oil from the reservoir to the consumers' tanks. Many foreign owners, particularly those who are in so-called flag of refuge countries, have no taxes whatsoever, so that this area of production of income, shall we say, for the international political groups might be one worthy of investigation by all nations.

And to summarize, I have summarized in a way what I hope the Government will try to implement their programs. I think that since

¹ See table, p. 57.

we had a very successful NASA program, and the Manhattan project 25 or 30 years ago, and the interstate highway program, there is no reason why, as a French engineer friend of mine said, that a country with the resources of the United States, and one which its President said in 1961 should have or would have a man on the moon by 1970, and did it—and the technology that had to be developed—there is no reason why with government guidance we cannot do the same thing right now. However, under the aegis of private investment.

I imagine I am running out of time, but I think you do have to secure the parameters of this problem. They are very difficult to forecast, but I think in general most studies appear to be based on production and consumption soaring within the lights or within the limit or under today's or yesterday's economic situation. Certainly if gasoline is obtainable at a refinery cost of 15 cents a gallon or less, there is no reason why the average consumer will curtail his consumption, and why the manufacturer of cars will stop manufacturing a car that gets 7 miles per gallon.

Minister Yamani was quoted in today's press as having said Americans will ease their political view toward the Middle East situation because they won't give up oil. "Americans don't like to be uncomfortable."

I don't think that is true. I believe that we do not like to be uncomfortable, but I do not believe that we will give in to anyone forcing us to change policies, although I must say I think we should change our policies.

I think another thing that should be looked into in this whole economic study is are there enough resources on the face of the earth to support an 80 or 90 million or 100 million barrel a day production program. Is there enough steel to build enough tankers? There may be enough steel, but concomitantly with the construction of these tankers would be the construction of powerplants and so forth to consume this oil. Very little has been done on this that I can find. That is, can the rest of the world's resources support this sort of increase, can the earth's atmosphere support it?

Well, so I do think, in closing, that the embargo by certain of the Arab States, or I guess all of the Arab States against the United States is really a great favor to us. I think it has awakened us or will awaken us in time so that we can implement these very important programs that I hope that the Government will implement, not tomorrow but today. I think that the energy industry, and I am a man who has worked against, fought, competed very hard with very large oil companies. I have always been in the independent sector of the oil business, and I know and understand something about competing with major companies. But, nevertheless, I believe they have done an outstanding job in supplying the United States and the world with energy, the United States, and then a couple of British, and Dutch companies, and lately some European and Japanese companies. I think it is a job that can only be characterized as splendid.

I think the Government, for example—these are some isolated remarks—but, if we condemn land for airports, I think that the Government long ago, and I say the Government, Government whether it is the Federal Government, or State government, or some supernational agency, could have condemned land for the construction of re-

fineries. The head of the New York State Public Service Commission, Mr. Swidler, was quoted also in today's press as saying that he thought that we should cut back on gasoline production to increase fuel oil consumption. Yes, that is probably true, we will have to, and ration gasoline because it is more important to keep yourself warm, I guess, than drive around. But, we who live in the Northeast, I live in New York, have to realize that we prefer to import all of this energy, and we do not want drilling offshore, we do not want refineries in our areas, we do not want offshore oil terminals, and perhaps as the Governors of Texas, Louisiana, and Oklahoma at the Southern Governors Conference said, when they were quoted as having said that perhaps they would embargo oil to the Northeast themselves, I recognize under our Federal system that that is highly unlikely, but nevertheless they do have a point. Therefore, I think every section of the country has to cooperate.

And last, but not least, if the producer countries get most of the dollar, yen, sterling credit that exists in the world, I suppose there will be such a tremendous revaluation of these credits that in the end they would end up with nothing more nor less than 10 cents on the dollar. Perhaps they will resort to barter and exchange so they have something worth something more than credits in the international monetary system.

Thank you.

[The prepared statement of Mr. Croly follows:]

PREPARED STATEMENT OF WILLIAM G. CROLY

It is a privilege to be able to testify on this most important subject. As a person whose experience has been more in the practical and operating areas of the oil and shipping business, I will speak more to those sectors of the subject.

By way of background, I have read the Technical Notes prepared by the Domestic and International Business Administration, U.S. Department of Commerce, October 18, 1973 and October 29, 1973 furnished by your staff. I will not comment in detail, but I have several observations.

1. It is likely, particularly if U.S. Foreign Policy continues substantially unchanged in the Middle East, that most of the assumed future credits to our balance of payments labelled as producing company profits or as repatriated earnings in the Notes, will not be earned because all U.S. holdings will have been nationalized, at least in Arab nations, within the near future.

2. Even if U.S. companies remain on the current schedule for host country participation, profits cannot be assumed to rise as crude oil prices and tax paid costs rise. The most recent round of posted price increases in the Middle East will hold company profits to around 35/50 cents per barrel.

3. In one case shown, tanker rates are held at a flat rate from 1974 to 1985, while the f.o.b. crude price rises from \$3.65 to \$12.08. Bunker price increases and additional insurance premiums on higher valued cargoes will cause tanker cost increases even if steel and machinery costs and wages did not rise.

4. The overall approach taken by the Department is interesting, however uncertain are price data assumptions by anyone. The study can and should be expanded and constantly updated.

There are six major factors that are affecting or have affected our energy balance of payments. They are:

1. The physical supply of oil and gas domestically and overseas.
2. U.S. Foreign Policy, particularly in the Middle East.
3. Cost of ocean transportation.
4. Environmental considerations within the United States.
5. Demand for oil within the United States.
6. Availability of domestic fuel alternatives.

I will comment on each of these briefly.

PHYSICAL SUPPLY

There is a very large body of expert writing on current and potential U.S. and foreign oil and gas supply. Our domestic production of oil and gas condensate liquids, now about 10,900,000 barrels per day in 1973, will decline steadily until Alaskan production comes on stream. Most of the United States has been surveyed by oil hunters—no doubt more oil can be found off New England or the Gulf and Pacific Coasts—but not enough to help our balance of payments substantially if oil consumption increases at its present pace.

More oil will be found elsewhere in the world—(there are about 570,000,000,000 barrels of known recoverable reserves left)—I believe there is the possibility of finding another trillion or trillion and a half barrels of oil. There appears to be little doubt that within 12 to 15 years we will be on the down slope of oil production worldwide—so the oil balance of payment problem will be self curing eventually—there won't be much left to import. The real balance of payments problem exists relatively short term.

FOREIGN POLICY

The end results of United States Foreign Policy is curing part of the balance of payments problem right now. Without getting into any pro's or con's of current Middle East disputes, the Arab oil exporting nations believe U.S. policy to have been biased against them. If much of the U.S. is cold this winter, it will be because the Arab oil exporting nations have been resentful of continued U.S. military aid to occupy parts of their countries. Their embargo is as understandable as would be our embargoing say wheat exports to some nation assisting a foreign military occupation of say Florida or Maine. There is no doubt in my mind that oil cost increases have been accelerated by the unsettled Middle East events. Naturally, price increases there are quickly adopted by other oil exporters. Consider, too, the great economic consequences to less developed countries of large oil price increases. The U.S. aid programs will have to be enlarged to help these LDC's offset the increased outgo of foreign exchange for energy—a new factor perhaps for the Department of Commerce to consider in its work.

COST OF OCEAN TRANSPORTATION

Ocean freight rates in the bulk trades (wheat, coal, petroleum) are virtually unregulated by any national or international agency. In times of expanded trades, oil freight rates may increase by a factor of 800 to 1000%. For example, it was possible a couple of years ago to charter (hire) a tanker to lift or carry crude oil from Saudi Arabia to Europe for about \$5.00 per ton. In September 1973, freight rates as high as \$45.00 per ton were paid. Normally, about 60–80% of the tankers required to lift crude oil are operated under long term agreements negotiated at moderate costs or owned by oil companies so that the swing of freight rates is dampened somewhat by this amount of relatively steady freight costs.

Certainly, however, a large part of the balance of payments has been paid in freight monies. Until recently, Arabian Light Crude Oil cost about \$2.75 per barrel—thus a freight rate of World Scale 150 is equal to \$15.000 per long ton, or about \$2.00 per barrel—Saudi Arabia to Europe or the United States.

One consequence of the current embargo on crude oil shipments to the United States is that certain Arab nations may refuse to load foreign flag tankers that operate from Iran, Nigeria or Venezuela to the United States—similar to the present so-called "black list" of tankers operating to Israel over the last 20 years. Such tankers may not be loaded at Arab ports which will make foreign tanker owners chary of trading to the United States. The obvious consequence, of course, is even higher freight rates on the remaining tankers that will trade to the U.S.

In my opinion, this latter possibility of a "black list" of tankers trading with the U.S. is an excellent reason for supporting a law requiring the transport of at least 50% of our imported oil in U.S. flag tankers. This would stimulate a larger U.S. flag tanker fleet which not only would save foreign exchange but would ensure a reasonable cost of transportation with the absolute dependability of U.S. flag vessels.

ENVIRONMENTAL CONSIDERATIONS

The delay of the Alaskan pipeline is too well known to discuss here. Assuming, however, 2,000,000 barrels per day of crude oil has been delayed two years,

the foreign exchange cost at \$10.00 per barrel will be \$20,000,000 per day, or about \$14.6 billion in dollar outflow. A refinery in Maine, if built as planned five years ago, would be producing 200,000 barrels per day of heating oil which not only would have assisted the balance of payments, but would have been delivering oil this winter otherwise unobtainable. Current opposition to drilling activities in the Santa Barbara Channel and off Long Island, understandable as such opposition is, will be paid for in billions of dollars in foreign exchange in later years.

DEMAND FOR OIL WITHIN THE UNITED STATES AND ALTERNATIVE FUEL SOURCES

We will control our increase in demand by using smaller cars, better insulation, more efficient uses of machinery and automotive transport. The use of stack desulfurization should permit greater use of high sulfur coal. Other forms of fossil energy will be developed. Japanese interests have already discussed with me methods of securing U.S. Government approval to invest in oil shale and tar sand development. Naturally, they would expect to receive some of the oil for use in Japan.

Obviously, as prices of overseas oil become significantly higher than the cost of exacting oil from oil shale and coal, we may expect to see a lot of interest in foreign as well as domestic investment in these areas. This sort of foreign capital investment could be an offset or credit in the Department of Commerce study of this subject.

There were some specific questions in Chairman Reuss' letter to me of October 25, 1973 which I would like to answer.

Question 1. Will production limitations by the oil producing countries, both for political and conversation reasons, also affect overall prices?

Answer. Yes, drastically. Prices are rising dramatically. The appended table from page 50 of the October 29 issue of the Oil & Gas Journal shows the extraordinary increase in posted prices in one month. Of course, actual prices have not risen quite this much but the net effect will hold producers' profits at or near 35/50 cents per barrel in most cases, until nationalization is complete.

I compute, for example, c.i.f. crude oil costs of \$21.00 per barrel would result in the following product prices: Gasoline, \$1.00 per gallon (incl. \$0.11 taxes); Distillate, \$0.60 per gallon; Fuel oil, \$10.00 per barrel (0.5% sulfur); which would mean enormous increases in payments to oil producing nations. After the recent escalation in crude oil prices, prices close to this level may be closer than we may believe.

Question 2. What are the possibilities of developing other oil resources outside of the Middle East?

Answer. Limited, though one expert, Mr. H. R. Warman of B.P., thinks that by 1985 the Middle East's share of oil production may have declined percentage-wise. However, we shall never find oil again that costs 3 to 25 cents per barrel to produce, as in the Middle East. A determined effort must be made to enhance exploration in the United States.

Question 3. What will be the effect of increased demand for energy by the rest of the world—particularly Western Europe and Japan?

Answer. Higher prices and shortages. Some foreign automobile drivers now pay \$1.00 and more per gallon for gasoline, though some of this is excise tax. The foreign exchange implications, however, of say \$20.00 per crude oil are almost beyond belief.

Question 4. Are major consumers likely to become more competitive or cooperative in their efforts to secure adequate supplies of oil at stated prices?

Answer. I believe much more competitive. One example can be provided by competition for tankers. In a time of shortage, private companies will bid tanker rates to very high levels, though they all know that no matter what price is offered, it is physically impossible to produce another tanker on short notice. The United States appears to be isolated right now from some of its NATO allies because of the oil crisis—so competitive factors appear to rule.

We must adopt a more even-handed Middle East policy if there is to be any hope for a well balanced and thoughtful program for sharing energy resources with the rest of the world and to ensure producing nations' cooperation. I sincerely believe we shall all be cooperating within one or two years—the alternative is chaos.

SUMMARY

To reduce the net expenditure of foreign exchange for crude oil as a nation, we must:

1. Develop a program of domestic energy alternatives with real meaning to it—similar to NASA, the Manhattan Project or the Interstate Highway Program—largely by private investment but with Government guidance to get the program going in a timely and effective manner.
2. Develop a program of genuine energy conservation. This program must have real teeth in it. The development and conservation programs will assist other consuming countries and relieve pressures on the producing countries to deplete their reserves too rapidly.
3. Develop an even-handed foreign policy towards all producing nations' governments and in particular to encourage peace in the Middle East by a more understanding policy towards Arab aspirations. The antagonisms caused in recent years by some of our policies have cost not only us but our friends billions of extra dollars in oil cost—a particularly sad plight for the developing countries.
4. Encourage the development of a U.S. flag tanker fleet.
5. Encourage foreign investment by developed countries in certain energy development programs within the United States.
6. Make a determined effort to export more goods and services to producing nations and to encourage their investment within the U.S.

HOW CRUDE-OIL PRICES HAVE SOARED

Type	Gravity	Posted or tax-reference price f.o.b. loading port—	
		Oct. 1	Oct. 31
Persian Gulf:			
Abu Dhabi:			
Murban.....	39	3.144	6.045
Umm Shaif.....	37	3.110	5.5379
Zakum.....	40	3.185	5.964
Iran:			
Basrah.....	35	2.977	5.061
Light.....	34	2.995	5.091
Heavy.....	31	2.936	4.991
Iraq:			
Kuwait Qatar.....	35	2.884	4.903
Dukhan.....	40	3.143	5.343
Marine.....	36	3.037	5.163
Saudi Arabia:			
Light.....	34	3.011	5.119
Medium.....	31	2.884	4.903
Heavy.....	27	2.725	4.632
Mediterranean:			
Libya.....	40	4.604	8.925
Algeria.....	43	5.000	1 5.000
Arabian light (Sidon).....	34	4.205	2 7.148
Kirkuk.....	36	4.243	2 7.213
South America:			
Ecuador.....	28	3.600	5.250
Venezuela.....	11-39	4.610	4 4.610
Nigeria:			
Light.....	34	4.287	4.291
Blend.....	27	4.148	4.148
Indonesia:			
Kasim.....	43.5	5.000	5.000
Minas.....	34	4.750	4.750

¹ Spot \$7 per barrel.

² Estimated.

³ Average.

⁴ Adjustment due Nov. 1 to take account of OPEC increases.

Source: The Oil and Gas Journal, Oct. 29, 1973.

Chairman REUSS. Thank you, Mr. Croly.
We will now hear from Mr. Hanson.

STATEMENT OF JAMES W. HANSON, CHIEF ECONOMIST, EXXON CORP.

Mr. HANSON. Thank you, Mr. Chairman.

As you indicated in your opening statement, the world is clearly witnessing a major change in the energy environment, and we face undoubtedly a period when energy will be the subject of continuing international concern.

Until only a short while ago energy supplies were plentiful and cheap. New resource development—particularly petroleum—outstripped demand growth. Both oil companies and, very importantly, the governments of oil exporting countries competed aggressively for outlet, with the result that energy prices declined steadily.

Now, in a dramatic reversal of roles, consumers are aggressively competing for limited supplies of environmentally acceptable fuels. Spare oil producing capacity has effectively disappeared and evaporated around the world and it appears unlikely that future increments will be able to keep up with historic growth trends in demand. Dependence on the Middle East is mounting rapidly, and producing-country governments are assuming a more direct role in controlling the rate and terms under which their reserves are being produced. Faced with the threat of shortages, consuming-country governments are increasingly concerned with security of supply, and a competitive scramble for supplies is underway. Impeding the response of supply to higher demand—and indeed contributing to higher energy demand per se—has been the outburst of regulations and public pressures to preserve the physical environment. The net result of all of this is that readily accessible and environmentally acceptable energy supplies are becoming increasingly scarce, and prices are rising sharply. By definition, future demand will equal supply—that is, consumption cannot exceed the amount of energy actually available. But the question is whether the necessary adaptations will occur in a timely and orderly fashion, or whether sharp or abrupt shifts in economic patterns and life styles will be required.

In my remarks today, I will first review the factors which have led to this assessment. Then I will turn, as suggested in your opening statement, Mr. Chairman, to the future and attempt to hazard some judgments as to the role that we see for oil and for other energy supplies in an environment of protracted supply scarcity. I shall concentrate on basic longer range aspects rather than the immediate situation—though I should point out that today's production cutbacks and embargoes serve to underscore the urgency of resolving the long-standing frictions and conflicts of the Middle East. And last, I will consider what needs to be done to meet the complex challenges posed by the new energy environment. I shall stress worldwide rather than U.S. perspectives, as resolution of international policy issues is key to surmounting the energy challenge.

WHAT HAPPENED?

To the man in the street, the change from energy abundance to constraint must have come as a shock. To most industry observers, the underlying factors had been perceived for some time; but even the

experts did not expect the transition to be as rapid or dramatic as it turned out to be. The basic problem has not been a sudden surge in energy demand—although energy utilization per unit of economic activity or GNP has continued to exceed historic levels. The surprise was rather the failure of energy forms other than oil to shoulder their expected share of energy supply. In the case of the United States, for example, we had thought 5 years ago that coal consumption would grow at an annual rate of 4 percent, but it has turned out to be only 1 percent because of the impact of mounting environmental pressures on the production and use of coal. Nuclear power plants, as we know, have been delayed for technological and operational as well as environmental reasons. Of the 70 plants scheduled to be in operation in the United States by now, only about 35 are onstream. And I understand out of some 58 that were to have been coming onstream between 1972 and 1975, some 50 are behind schedule.

Clean-burning gas has not proved equal to the task, reflecting the effects of two decades of ill-advised FPC price controls; quite to the contrary, the U.S. natural gas shortage has grown to crisis proportions. The long and short of it is that the demand for oil has expanded at an unexpectedly brisk pace all around the world. And this has taken place at a time when oil availability has fallen short of expectations because of various factors—ranging from Alaskan pipeline delays and restraints on U.S. offshore exploration, to production cutbacks ordered by the governments of Libya and Kuwait, well before the latest outbreak of hostilities. U.S. crude oil production is already on the decline, and spare producing capacity abroad has essentially evaporated. I might say, reflecting in no small measure the sharply expanding U.S. import requirements.

The tightening U.S. energy balance has been further aggravated by constraints on the development of new refining capacity. Uncertainties over future oil import policy, coupled with the unpredictable and arbitrary manner in which the prevailing program was being administered, tended to inhibit new investment. Furthermore, uncertain environmental regulations made it difficult to anticipate future product quality and refinery emission standards, while refinery sites have become increasingly hard to obtain. Finally, investment costs were mounting in the face of Government restraints on petroleum product prices which could only dampen economic incentives. Fortunately, at least some of these problems were cleared up by the administration's energy message this spring—and the response has been a series of announced refinery expansions equivalent to some 20 percent of current capacity. Until this new capacity is operating, however, which could take upward of 4 years or more, the U.S. oil product balance is likely to tighten further. And in the interim, rising U.S. import demands will center on refined products rather than crude oil.

LONGER RANGE CHALLENGE

Although the refining problem behind today's product shortages in the United States may be on the way to being solved, there remains a far more serious problem that is at the same time both a paradox and a challenge. The paradox is that we are entering what appears to be a sustained period of world energy scarcity, even though there is an

abundance of energy resources in the earth's crust. The challenge is to prevent this scarcity from becoming severe or even crippling.

The world's energy needs have traditionally grown at about the same rate as economic activity, which in turn has responded to growing population and the drive for improved living standards. Until recently at least, economists saw little reason to anticipate any significant slackening in these underlying growth factors; hence a "trends-continue" projection would signal a doubling of world energy consumption between now and 1985.

Any long-range energy projection is, of course, subject to a wide range of error, both because of possible chances in the economic outlook, and very importantly in the relationship between economic activity and energy demand. This is particularly the case in a supply-constrained environment where we would expect some diminution in energy utilization per unit of economic activity. As I indicated and as witnesses yesterday indicated, there will almost certainly be some demand reduction in response to higher prices. In addition, governments will likely change tax and regulatory structures, or otherwise mold public attitudes and practices, in an effort to conserve energy. On the other hand, should these more or less normal and logical steps be insufficient to balance constrained supply capability, economic activity and general welfare would be more severely impaired.

The crux of the energy problem is that, unlike the recent past, oil can no longer be relied upon as the primary means of meeting the world's ever-expanding energy needs—not only to meet "trends-continue" demand but even one that reflects the dampening effects of higher prices and moderate conservation measures. This basic supply constraint results from two factors, we believe. The first is the long lead times and high costs required to exploit energy sources other than oil, and, second, the fact that oil that might otherwise be used to achieve a viable balance is inordinately concentrated in the Middle East.

Our forecasts indicate that, even after making generous allowances for expansion of nuclear power and coal, world oil production would nearly have to double by 1985 to balance energy supply with demand. But based on existing intelligence, opportunities for significant production growth outside the Middle East are quite limited. In the United States, production is already declining, and a major effort will be required just to hold production at present levels, even with Alaskan oil available. Canadian discoveries have not been as prolific as expected several years ago. Venezuelan production has peaked out, and prospects for expanding production in other areas of Latin America are limited. Even among the brighter spots, North Sea production is expected to supply only 15 percent of Europe's rising oil demands by 1985. And discoveries in Africa and Indonesia have not been up to earlier expectations. Finally, the Communist areas will certainly develop additional production, but not sufficient to generate large exportable surpluses—and even this will require infusions of capital and technology from the Western World.

As a result, the only major source of discovered but as yet undeveloped oil reserves is in the Middle East, which now contains over half of the world's discovered resources. Thus, based on a "trends-continue" demand projection, this area would have to cover no less than two-thirds of the growth in free world oil consumption and almost one-

half of the growth in total energy needs. This means that Middle East oil production would have to reach the 50-million-barrel-per-day league by 1985, or nearly three times last year's level.

But there are major reasons why this is an unrealistic expectation. First, even the Middle East's immense reserves are not unlimited, and these reserves could not sustain such high rates of production indefinitely. Thus, under the best of circumstances, production might well plateau and even begin to decline from the mid to late 1980's. It would not be reasonable to plan facilities, or demand growth, on the basis of a temporary peaking in production.

But the second reason is likely to be the more immediately pressing one. It is simply unrealistic to expect the Middle Eastern governments to expand their output as rapidly as the needs of the free world would dictate. The disposition to use oil as a political weapon is all too evident in today's production cuts and embargoes. But even if the political issues were to be fully resolved, and it is becoming increasingly urgent that this be accomplished, producing country governments will continue to have an economic incentive to consider limiting oil production growth. Some, at least, will be inclined to stretch out the life of their resources, seeking to maximize the flow of income over time taking into account rate of depletion as well as unit revenues. This will most certainly be the case for countries such as Saudi Arabia which have vast oil reserves but limited internal needs, and are understandably concerned about being able to utilize their mounting monetary inflows wisely. They will be particularly mindful of the need to develop new sources of income for the time when their oil resources are depleted. As mentioned earlier, the governments of Kuwait and Libya had already ordered production cutbacks for conservation reasons well before the October hostilities broke out.

Thus, it would seem imprudent to assume that the producing governments will be disposed to supply whatever volume demands are put upon them. On the contrary, production seems very likely to be limited to a level substantially below the tripling from last year's level maintained earlier. The ability to achieve even modest increases in the near term is now in question. This near-term situation poses an extremely serious problem because of a doubling in the Middle East production to the 40 million barrel per day league is virtually essential between now and the early 1980's, the earliest time by which new alternative sources of energy can become significant—unless, of course, conservation measures take hold much sooner and more effectively than now seems likely.

If the Middle East cannot be counted on to fill this gap, what are the odds we can find this oil elsewhere?

The scale of current and projected oil consumption is truly staggering. To replace the oil that the world is already consuming would require discoveries on the order of 20 billion barrels every year—equivalent to two fields the size of Alaska's Prudhoe Bay. And by 1980, annual consumption will be in the 30 billion barrel league.

And I might mention here, Mr. Chairman, that this is shown in chart 4¹ in my prepared statement. Consumption is shown on the smooth line—solid through the early 1970's, and broken thereafter.

¹ See chart 4, p. 69.

It is true that oil finding rates have traditionally exceeded consumption around the world and a comfortable reserves-to-production ratio has been maintained. But this impressive record reflects discovery of the massive fields of the Middle East whose size is unprecedented in the history of the industry—and which are unlikely to be duplicated elsewhere. Even in the Middle East, discoveries have fallen off in recent years, which in our view indicates that most of the major fields there have already been found. And as the industry has accelerated its efforts to find oil elsewhere, discoveries have increased—but at a somewhat disappointing rate, and barely enough to hold total discoveries throughout the free world at the average level of the past 20 years or so. Moreover, such discoveries have tended to be located in remote, difficult areas such as the tundra or deep, rough seas—and long leadtimes are involved.

All of this suggests that, while new oil discoveries outside the Middle East can in time moderate excessive dependence Middle East supplies, they offer at best no more than a partial solution.

STEPS TO MEET THE CHALLENGE

What I have said so far adds up to this: Neither new oil discoveries outside the Middle East nor the development of alternative energy sources can save us from the prospect of a supply-constrained environment over the next 5 to 10 years stemming from a reluctance by Middle Eastern governments to produce as much oil as the world's consumers would like to import. Still, I think the adverse effects of such a prospect can be minimized if we act wisely and promptly. And certainly key here would be wise and timely public policies.

Let me briefly sketch some of the elements that should be included in such a policy framework. First, I believe that normal market mechanisms, if allowed to function, could play an important role with respect to both supply and demand. Past failures to rely sufficiently on market forces have been a major contributor to the challenge we face today. I need only cite FPC gas price control wherein we have held artificially low U.S. gas prices which have served only to stimulate consumption while choking off incentives for new investments. It is to be hoped that lessons have been learned from such experiences, and that price can serve as the principal market-clearing mechanism—rather than end-use controls or arbitrary allocation formulas—in the supply-constrained environment foreseen. This may be particularly relevant for the United States whose prodigious consumption of energy makes it a prime candidate for demand moderation in response to higher price, while production from its generous resources base could be expanded in a timely fashion given adequate economic incentive.

Second, in the area of supply, consuming country governments should establish specific objectives and programs for stimulating energy supply development, particularly involving indigenous resources. Once again, North America offers the broadest range of opportunities because of its generous endowment of energy raw materials. There is no question but that development of new energy supplies will entail costs significantly above current levels. On the other hand, costs of synthetic oil and gas from coal or shale are not likely

to be out of line with what imported energy is likely to cost—or in fact has been costing in today's environment of high freight rates and rapidly escalating producing government demands. Eventually, we would hope that the prospect of, and later the availability of, synthetic fuels in volume might serve to temper the economic demands of oil-producing governments.

I might mention in passing that my prepared statement does contain some further reference to the economic as opposed to the physical dimensions of the energy challenge, particularly including some of the balance-of-payments implications.

However, we have to face the fact that the development of alternative energy sources will be a very slow process. As a result, we will be forced to absorb most of the uncertainties and shortfalls of supply by adjusting the demand side of the energy equation. The impact on economic growth of a protracted energy shortage could be severe. Hence, a number of steps should be taken now to encourage the orderly development of energy conservation. Hopefully, the President's message this evening will communicate some important measures in this area.

First, energy consumption that occurs primarily through inadvertence or ignorance should be minimized—so-called wasteful consumption such as overlighting or overheating. Such opportunities are perhaps most widespread in the United States. Second, improvements in the efficiency of energy utilization should be expedited. For example, the typical electric power station uses less than 40 percent of the energy in the fuel supplied to it—the balance goes up the stack. If we could use the wasted heat in an adjoining plant, the combination facility would mean a doubling in overall energy efficiency. Third, specific opportunities for conserving energy should be exploited where the adverse impact on the economy and lifestyles is considered acceptable. In the United States, for example, energy consumption for transportation could be tempered through the promotion of lighter, more efficient automobiles, greater use of car pools, driving at lower speeds, and improved public transportation systems.

Finally, and in parallel with national measures designed to moderate demand and expand supply, the new energy environment calls for new initiatives in international cooperation, in effect a "cooperative partnership" among producing nations, consuming nations, and energy companies.

An important objective of such cooperation should be to find means to encourage producing governments to permit oil production at levels deemed necessary to achieve a viable worldwide energy balance. Moreover, consuming country governments and companies should be supportive of producing government efforts to utilize their rapidly rising monetary inflows in a fashion consistent with their national objectives and aspirations.

As another step, there is a need for a strong, high-level consultative mechanism among consuming nations on energy matters. Consultations should cover not only exchanges of information on national energy policies and programs, but also the development of cooperative procedures for accommodating to supply scarcity. To this end, individual nations should be encouraged to devise appropriate storage and standby supply allocation programs. Also, nations should

reach agreement on a system for sharing available supplies in times of supply scarcity such as that occurring today. Unless meaningful intergovernmental understandings are reached in the very near future, we face either of two potentially destructive scenarios: One, the formation of opposing hostile blocs of consuming versus producing countries; or the other, the continuation of the "every man for himself" scramble which has already begun wherein individual or small groups of importing countries seek privileges access to available supplies. Obviously, the stakes are high to head off either scenario.

In conclusion, let me summarize by saying that we face perhaps a decade of potentially serious supply constraints reflecting the economic and political considerations motivating Middle Eastern governments to restrict the growth of output from their still-vast reserves; the difficulty the world will experience in discovering large new oil supplies elsewhere; the long leadtimes for developing alternative energy forms; and the glacial pace with which, so far, public policies have advanced toward even those solutions that have already been identified. Thank you.

[The prepared statement of Mr. Hanson follows:]

PREPARED STATEMENT OF JAMES W. HANSON

INTRODUCTION

The world is witnessing a major change in the energy environment, and we face a period when energy will be the subject of continuing international concern. Until only a short while ago energy supplies were plentiful and cheap. New resource development—particularly petroleum—outstripped demand growth. Both companies and the governments of oil exporting countries competed aggressively for outlet, with the result that energy prices declined steadily.

Now, in a dramatic reversal of roles, consumers are aggressively competing for limited supplies of environmentally-acceptable fuels. Spare oil producing capacity has effectively disappeared around the world, and it appears unlikely that future increments will be able to keep up with historic growth trends in demand. Dependence on the Middle East is mounting rapidly, and producing country governments are assuming a more direct role in controlling the rate and terms under which their reserves are being produced. Faced with the threat of shortages, consuming country governments are increasingly concerned with security of supply, and a competitive scramble for supplies is underway. Impeding the response of supply to higher demand—and indeed contributing to higher energy demand *per se*—has been the outburst of regulations and public pressures to preserve the physical environment. The net result of all of this is that readily accessible and environmentally-acceptable energy supplies are becoming increasingly scarce, and prices are rising sharply. And the odds are that supply constraint will characterize the energy environment for many years to come. By definition, future demand will equal supply—that is, consumption cannot exceed the amount of energy actually available. But the question is whether the necessary adaptations will occur in a timely and orderly fashion, or whether sharp or abrupt shifts in economic patterns and life styles will be required.

In my remarks today, I will first review the factors which have led to this assessment. Then I will turn to the future, and the role that we see for oil and for other energy supplies in an environment of protracted supply scarcity. I shall

concentrate on basic longer-range aspects rather than the immediate situation—though I should point out that today's production cutbacks and embargoes serve to underscore the urgency of resolving the longstanding frictions and conflicts of the Middle East. And last, I will consider what needs to be done to meet the complex challenges posed by the new energy environment. I shall stress world-wide rather than U.S. perspectives, as resolution of international policy issues is key to surmounting the energy challenge.

WHAT HAPPENED?

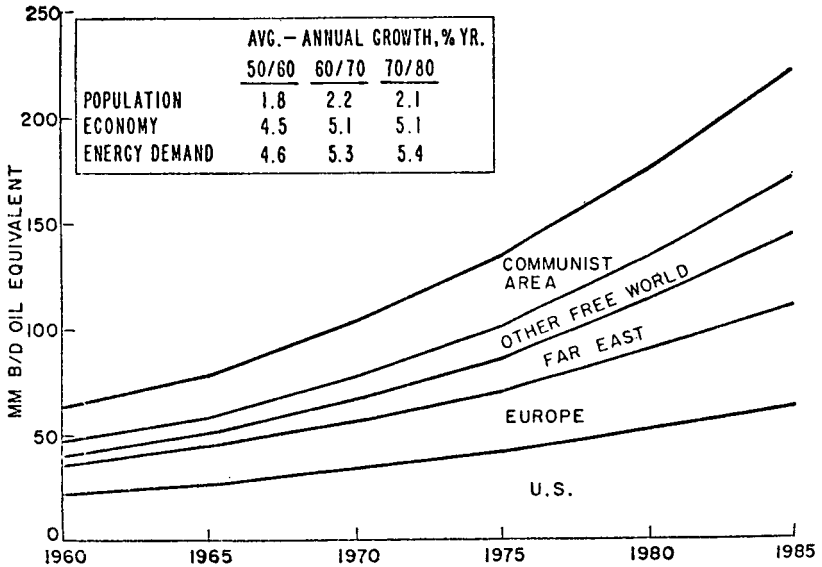
To the man in the street, the change from energy abundance to constraint must have come as a shock. To most industry observers, the underlying factors had been perceived for some time; but even the experts did not expect the transition to be as rapid or dramatic as it turned out to be. The basic problem has not been a sudden surge in energy demand—although energy utilization per unit of economic activity has continued to exceed historic levels. The surprise was rather the failure of energy forms other than oil to shoulder their expected share of energy supply. In the case of the U.S., for example, we had thought five years ago that coal consumption would grow at an annual rate of 4%, but it has turned out to be only 1% because of the impact of mounting environmental pressures on the production and use of coal. Nuclear power plants have been delayed for technological and operational as well as environmental reasons. Of the 70 plants scheduled to be in operation in the U.S. by now, only about 35 are on stream. Clean-burning gas has not proved equal to the task, reflecting the effects of two decades of ill-advised FPC price controls; quite to the contrary, the U.S. natural gas shortage has grown to crisis proportions. The long and short of it is that the demand for oil has expanded at an unexpectedly brisk pace all around the world. And this has taken place at a time when oil availability has fallen short of expectations because of various factors—ranging from Alaskan pipeline delays and restraints on U.S. offshore exploration, to production cutbacks ordered by the governments of Libya and Kuwait, well before the latest outbreak of hostilities. U.S. crude oil production is already on the decline, and spare producing capacity abroad has essentially evaporated—reflecting in no small measure the sharply expanding U.S. import requirements.

The tightening U.S. energy balance has been further aggravated by constraints on the development of new refining capacity. Uncertainties over future oil import policy, coupled with the unpredictable and arbitrary manner in which the prevailing program was being administered, tended to inhibit new investment. Furthermore, uncertain environmental regulations made it difficult to anticipate future product quality and refinery emission standards, while refinery sites have become increasingly hard to obtain. Finally, investment costs were mounting in the face of government restraints on petroleum product prices which could only dampen economic incentives. Fortunately, at least some of these problems were cleared up by the Administration's energy message this spring—and the response has been a series of announced refinery expansions equivalent to some 20% of current capacity. Until this new capacity is operating, however, which could take upwards of four years or more, the U.S. oil product balance is likely to tighten further. And in the interim, rising U.S. import demands will center on refined products rather than crude oil.

LONGER-RANGE CHALLENGE

Although the refining problem behind today's product shortages in the U.S. may be on the way to being solved, there remains a far more serious problem that is at the same time both a paradox and a challenge. The paradox is that we are entering what appears to be a sustained period of world energy scarcity, even though there is an abundance of energy resources in the earth's crust. The challenge is to prevent this scarcity from becoming severe or even crippling.

**TOTAL WORLD ENERGY DEMAND
MM B/D OIL EQUIVALENT**

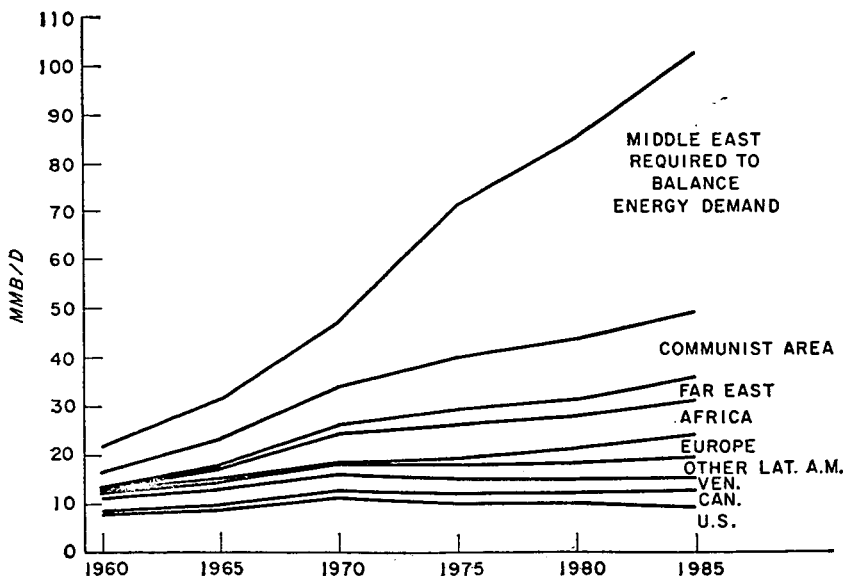


The world's energy needs have traditionally grown at about the same rate as economic activity, which in turn has responded to growing population and the drive for improved living standards. Until recently at least, economists saw little reason to anticipate any significant slackening in these underlying growth factors; hence a "trends-continue" projection would signal a doubling in world energy consumption between now and 1985.

Any long range energy projection is, of course, subject to a wide range of error, both because of possible changes in the economic outlook, and in the relationship between economic activity and energy demand. This is particularly the case in a supply-constrained environment where we would expect some diminution in energy utilization per unit of economic activity. There will almost certainly be some demand reduction in response to higher prices. In addition, governments will likely change tax and regulatory structures, or otherwise mold public attitudes and practices, in an effort to conserve energy. On the other hand, should these more-or-less normal and logical steps be insufficient to balance constrained supply capability, economic activity and general welfare would be more severely impaired.

The crux of the energy problem is that, unlike the recent past, oil can no longer be relied upon as the primary means of meeting the world's ever-expanding energy needs—not only to meet "trends-continue" demand but even one that reflects the dampening effects of higher prices and moderate conservation measures. This basic supply constraint results from the long lead times and high costs required to exploit energy sources other than oil, and the fact that oil that might otherwise be used to achieve a viable balance is inordinately concentrated in the Middle East.

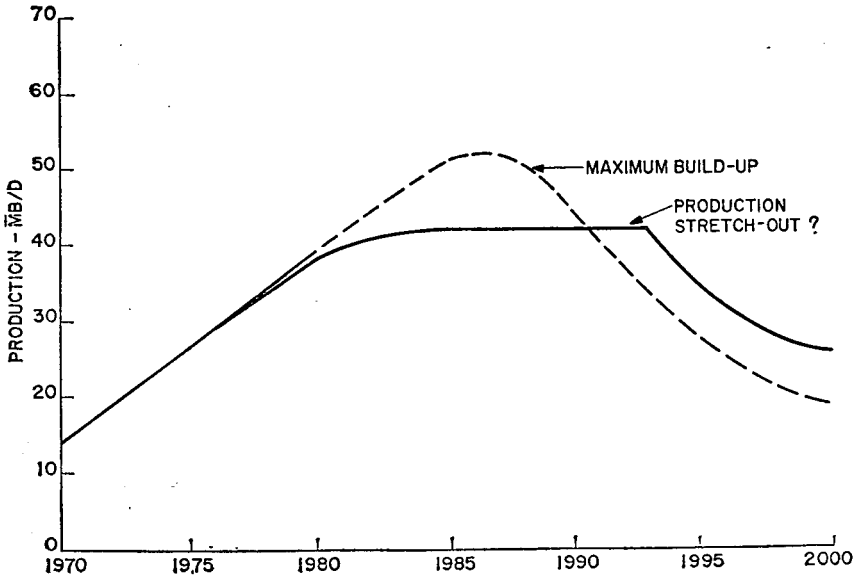
TOTAL WORLD OIL PRODUCTION (INCL. NGL)



Our forecasts indicate that, even after making generous allowances for expansion of nuclear power and coal, world oil production would nearly have to double by 1985 to balance energy supply with demand. But based on existing intelligence opportunities for significant production growth outside the Middle East are quite limited. In the U.S. production is already declining, and a major effort will be required just to hold production at present levels, even with Alaskan oil available. Canadian discoveries have not been as prolific as expected several years ago. Venezuelan production has peaked out, and prospects for expanding production in other areas of Latin America are limited. Even among the brighter spots, North Sea production is expected to supply only 15% of Europe's oil demand by 1985. And discoveries in Africa and Indonesia have not been up to earlier expectations. Finally, the Communist areas will develop additional production, but not sufficient to generate large exportable surpluses—and even this will require infusions of capital and technology from the Western World.

As a result, the only major source of discovery but as-yet-undeveloped oil reserves is the Middle East which now contains over half of the world's discovered reserves. Thus, based on a "trends-continue" demand projection, this area would have to cover no less than two-thirds of the growth in Free World oil consumption and almost one-half of the growth in total energy needs. This means that Middle East oil production would have to reach the 50 million barrel per day league by 1985, or nearly three times last year's level.

MID-EAST MUST GROW—BUT THERE IS A LIMIT



But there are major reasons why this is an unrealistic expectation. First, even the Middle East's immense reserves are not unlimited, and these reserves could not sustain such high rates of production indefinitely. Thus, under the best of circumstances, production might well plateau and even begin to decline from the mid-to-late 1980's. It would not be reasonable to plan facilities, or demand growth, on the basis of a temporary peaking in production.

But the second reason is likely to be the more immediately pressing one. It is simply unrealistic to expect the Middle Eastern governments to expand their output as rapidly as the needs of the Free World would dictate. The disposition to use oil as a political weapon is all too evident in today's production cuts and embargoes. But even if the political issues were to be fully resolved, and it is becoming increasingly urgent that this be accomplished, producing country governments will continue to have an economic incentive to consider limiting oil production growth. Some, at least, will be inclined to stretch out the life of their resources, seeking to maximize the flow of income overtime taking into account rate of depletion as well as unit revenues. This will most certainly be the case for countries such as Saudi Arabia which have vast oil reserves but limited internal needs, and are understandably concerned about being able to utilize their mounting monetary inflows wisely. They will be particularly mindful of the need to develop new sources of income for the time when their oil resources are depleted. As mentioned earlier, the governments of Kuwait and Libya had already ordered production cutbacks for conservation reasons well before the October hostilities broke out.

Thus, it would seem imprudent to assume that the producing governments will be disposed to supply whatever volume demands are put upon them. On the contrary production seems very likely to be limited to a level substantially below the tripling from last year's level mentioned earlier. The ability to achieve even modest increases in the near term is now in question. This near-term situation poses an extremely serious problem because a doubling in Middle East production to the 40 million barrel per day league is virtually essential between now and the early 1980's, the earliest time by which new alternative sources can become significant—unless, of course, conservation measures take hold much sooner and more effectively than now seems likely.

Since the case for reversing the trend toward increased dependence on the Middle East is so clear cut, why can't something be done to accelerate the availability of alternative resources? The problem is in the long lead times for alter-

natives. In some cases, long lead times stem from the fact that reserves are unevenly distributed in relation to demand centers. Vast undeveloped gas reserves, for example, exist in such remote areas as Western Siberia and the Persian Gulf. Where pipeline construction is feasible, engineering, environmental, and political issues must be resolved. Where marine transportation is involved, the massive scale of physical equipment for liquefaction and transport, and the associated capital requirements, are major constraints to rapid development. In either event, many years will pass before significant volumes can be expected.

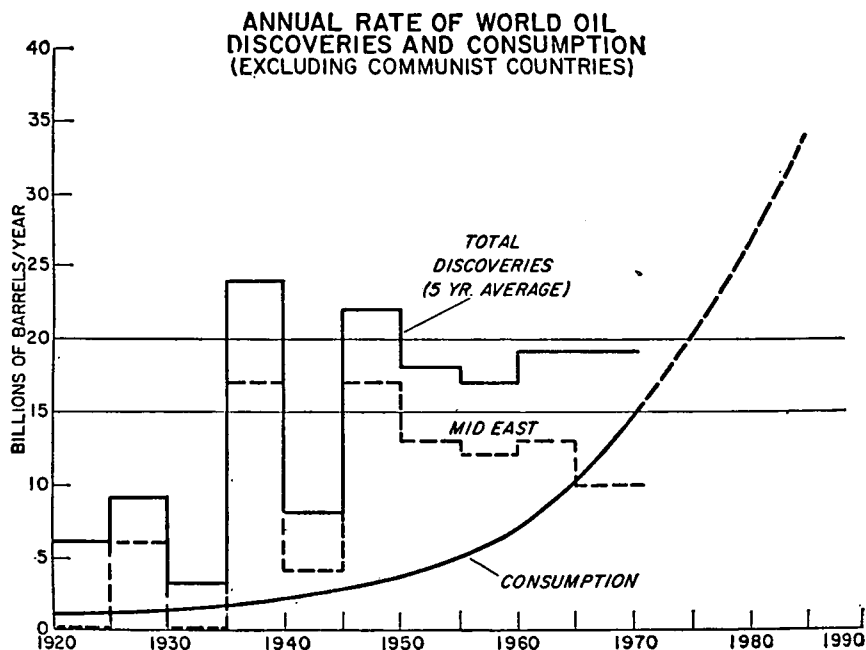
In other cases, delays and/or long lead-times derive from a combination of economic, environmental, and technological constraints. Coal, the most prolific of fossil fuels, is quite broadly distributed—and abundantly so in the U.S.—but world production has grown at only one-third the rate of total energy for the past decade. In recent years, this has reflected the various environmental constraints on its production and/or use. Our own projections assume a dramatic comeback for U.S. coal over the next decade, but this presumes resolution of mine safety problems, adoption of workable surface-mining regulations, and some near-term relaxation of permissible air quality levels. Longer-term, the key will be the development of an economical method to use coal in an environmentally acceptable fashion, either burned directly or converted into clean-burning oil and gas. But at least a decade will be required to demonstrate new technology and build new facilities on a significant scale.

In addition to abundant coal reserves, North America is endowed with rich oil shale and tar sands deposits, all of which offer considerable potential for synthetic oil and gas. But again, at least a decade will be necessary, even when technology is well-advanced, before large-scale commercialization can be realized.

Nuclear power is, of course, not resource-limited at present and may never be if—but only if—breeder reactor development efforts bear fruit in time. But the rapid growth projected for nuclear power over the next decade—about 20 percent per year—is contingent on expedited licensing procedures for U.S. plants and success in meeting ambitious schedules elsewhere. For example, it now takes about eight to nine years to get a new nuclear plant on stream in the U.S.

This run-down of inevitable delays and/or lead times in exploiting new energy forms suggests that oil which can be developed readily with known technology will have to be relied upon as the balancing energy source for many years to come. In other words, alternatives to oil cannot be expected to play a large part in changing the outlook, at least not for the rest of the decade. But if Middle East oil cannot realistically be counted on to fill the gap, what are the odds that we will be able to find a solution through new oil discoveries elsewhere in the world?

CHART 4.



The scale of current and projected oil consumption is truly staggering. To replace the oil that the world is already consuming would require discoveries on the order of 20 billion barrels every year—equivalent to two fields the size of Alaska's Prudhoe Bay. And by 1980, annual consumption will be in the 30 billion barrel league.

It is true that oil finding rates have traditionally exceeded consumption around the world and a comfortable reserves-to-production ratio has been maintained. But this impressive record reflects discovery of the massive fields of the Middle East whose size is unprecedented in the history of the industry—and which are unlikely to be duplicated elsewhere. Even in the Middle East, discoveries have fallen off in recent years, which in our view indicates that most of the major fields there have already been found. And as the industry has accelerated its efforts to find oil elsewhere discoveries have increased—but at a somewhat disappointing rate, and barely enough to hold total discoveries throughout the Free World at the average level of the past 20 years or so.

Moreover, such discoveries have tended to be located in remote, difficult areas such as the tundra or deep, rough seas—and long lead times are involved.

All of this suggests that, while new oil discoveries outside the Middle East can in time moderate excessive dependence on Middle East supplies, they offer at best no more than a partial solution.

Before turning to possible action steps, I would like to touch briefly on some of the economic, as opposed to physical, dimensions of the energy challenge. Clearly, this takes on added importance in view of the growing awareness that future energy costs and prices will be significantly higher all around the world. The prospect of rapidly rising oil import bills facing the consuming countries, coupled with mounting financial prowess on the part of the oil exporting nations, has led to a series of concerns, ranging from the enormity of the wealth transfer involved, to the future posture of the dollar and the U.S. balance of payments, and to the stability of world currency and capital markets.

With respect to the balance of payments impact, there is no question but that the cost of oil imports could be staggering—somewhere in the league of \$30 billion for the U.S. alone before the end of the decade. But we must consider prospects for the various offsets before reaching even tentative conclusions. Items such as profit remittances and shipping earnings, where applicable, tend to go hand-in-hand with rising oil imports. But these are likely to be relatively minor. The biggest potentials lie in exporting goods and services to the oil producing countries, and in attracting investments of their surplus capital back into the U.S. and other consuming countries. Each consuming nation will understandably strive to obtain a sufficient flow of such offsets, though it should be recognized that political as well as economic considerations will determine the outcome. The balance of payments impact can be kept within manageable bounds if each oil importing country is able more-or-less to offset its oil import bill with export sales to the oil producing countries or with investment inflows from them. Any remaining imbalances, if they are not excessive, could be resolvable within the context of greater exchange rate flexibility and a greatly expanded volume of world trade over which currency changes can work out their effects. Even if balance of payments stresses can be contained, however, difficult economic problems would remain. For example, the prospect of significant investments by governments of oil exporting nations in consuming country industries would probably raise issues of economic sovereignty. And for the developing countries, particularly those without exportable commodities which are increasing in value, the problem of increasing oil import costs poses a serious threat to economic growth and political stability.

As for international monetary stability, there can be no doubt that attempts by oil-wealthy countries to shift even a fraction of their funds across currency boundaries would be extremely unsettling. On the other hand, as their financial might grows, their own economic self-interest will become increasingly identified with monetary stability, and any incentive to tamper with the monetary mechanism should accordingly wane. In this regard, diversification of producing country investments should be encouraged, particularly including investment in non-liquid assets.

STEPS TO MEET THE CHALLENGE

What I have said so far adds up to this: neither new oil discoveries outside the Middle East nor the development of alternative energy sources can save us from the prospect of a supply-constrained environment over the next 5-10 years stemming from a reluctance by Middle Eastern governments to produce

as much oil as the world's consumers would like to import. Still, the adverse effects of such a prospect can be minimized if we act wisely and promptly. The key to the solution lies in sound public policies.

Let me briefly sketch some of the elements that should be included in such a policy framework. First, I believe that *normal market mechanisms*, if allowed to function, could play an important role with respect to both supply and demand. Post failures to rely sufficiently on market forces have been a major contributor to the challenge we face today—for example, holding artificially low U.S. gas prices has served only to stimulate consumption while choking off incentives for new investment. It is to be hoped that lessons have been learned from such experiences, and that price can serve as the principal market-clearing mechanism—rather than end-use controls or arbitrary allocation formulae—in the supply-constrained environment foreseen. This may be particularly relevant for the U.S. whose prodigious consumption of energy makes it a prime candidate for demand moderation in response to higher price, while production from its generous resource base could be expanded in a timely fashion given adequate economic incentive.

In the area of supply, consuming country governments should establish specific objectives and programs for *stimulating energy supply development*, particularly involving indigenous resources. North America offers the broadest range of opportunities because of its generous endowment of energy raw materials. For the U.S., this means not only accelerated leasing of offshore acreage for conventional oil and gas, but also a major commitment to develop synthetic fuels from coal and shale and to perfect ways of using coal directly in an environmentally-acceptable fashion. Among other energy forms, nuclear development should be expedited, as should research on more exotic sources such as solar, geothermal and fusion energy. Stimulating these other energy forms is particularly important for Europe and Japan, in view of their limited fossil fuel endowment. There is no question but that development of new energy supplies will entail costs significantly above current levels. On the other hand, costs of synthetic oil and gas from coal or shale are not likely to be out of line with what imported energy is likely to cost—or in fact has been costing in today's environment of high freight rates and rapidly escalating producing government demands. Eventually, we would hope that the prospect of, and later the availability of, synthetic fuels in volume might serve to temper the economic demands of oil producing governments.

However, we have to face the fact that the development of alternative energy sources will be a very slow process. As a result, we will be forced to absorb most of the uncertainties and shortfalls of supply by adjusting the demand side of the energy equation. The impact on economic growth of a protracted energy shortage could be severe. Hence, a number of steps should be taken now to encourage the orderly development of *energy conservation*.

Three types of actions should be undertaken. First, energy consumption that occurs primarily through inadvertence or ignorance should be minimized—so-called wasteful consumption such as overlighting or overheating. Such opportunities are perhaps most widespread in the U.S. Second, improvements in the efficiency of energy utilization should be expedited. For example, the typical electric power station uses less than 40% of the energy in the fuel supplied to it—the balance goes up the stack. If we could use the wasted heat in an adjoining plant, the combination facility would mean a doubling in overall energy efficiency. Third, specific opportunities for conserving energy should be exploited where the adverse impact on the economy and life styles is considered acceptable. In the U.S., for example, energy consumption for transportation could be tempered through the promotion of lighter, more efficient automobiles, greater use of car pools, driving at lower speeds, and improved public transportation systems.

One further point needs to be made in regard to both energy conservation and supply stimulation: every effort should be made to ensure that energy impacts are considered when establishing environmental conservation goals. While projected energy shortfalls do not justify abandonment of longer-term or high priority environmental goals, some temporary delays in the timetable for their attainment seem warranted.

Finally, and in parallel with national measures designed to moderate demand and expand supply, the new energy environment calls for new initiatives in *international cooperation*, in effect a "cooperative partnership" among producing nations, consuming nations, and energy companies.

An important objective of such cooperation should be to find means to encourage producing governments to permit oil production at levels deemed necessary to achieve a viable worldwide energy balance. Moreover, consuming country governments and companies should be supportive of producing government efforts to utilize their rapidly rising monetary inflows in a fashion consistent with their national objectives and aspirations.

As another step, there is a need for a strong, high-level consultative mechanism among consuming nations on energy matters. Consultations should cover not only exchanges of information on national energy policies and programs, but also the development of cooperative procedures for accommodating to supply scarcity. To this end, individual nations should be encouraged to devise appropriate storage and standby supply allocation programs. Also, nations should reach agreement on a system for sharing available supplies in times of supply scarcity such as that occurring today. Unless meaningful intergovernmental understandings are reached in the very near future, we face either of two potentially destructive scenarios: one, the formation of opposing hostile blocs of consuming vs. producing countries; or the other, the continuation of the "every man for himself" scramble which has already begun wherein individual or small groups of importing countries seek privileged access to available supplies. Obviously, the stakes are high to head off either scenario.

In conclusion, let me summarize by saying that we face perhaps a decade of potentially serious supply constraints reflecting the economic and political considerations motivating Middle Eastern governments to restrict the growth of output from their still-vast reserves; the difficulty the world will experience in discovering large new oil supplies elsewhere; the long-lead times for developing alternative energy forms; and the glacial pace with which, so far, public policies have advanced toward even those solutions that have already been identified.

Timely actions are essential to minimize the impact of these constraints. Consumers, governments and companies all must play an important role in meeting the challenge of adjusting patterns of energy consumption and supply to mitigate any adverse impact on economic growth. The private sector with its manifest and unique capabilities can play a vital part, as can normal market mechanisms. But the complexity of the energy system also requires resolution of national and multinational public policy issues interacting both with one another and with the private sector. It is perhaps in this latter area that the toughest challenges lie.

Chairman REUSS. Thank you very much, Mr. Hanson.
Mr. Lichtblau, please proceed.

**STATEMENT OF JOHN H. LICHTBLAU, EXECUTIVE DIRECTOR,
PETROLEUM INDUSTRY RESEARCH FOUNDATION, INC., NEW
YORK, N.Y.**

Mr. LICHTBLAU. Thank you, Mr. Chairman.

Given the limited time we have had to prepare this prepared statement, we have not attempted a full analysis of the impact of oil on the U.S. balance of payments, but have limited ourselves to mostly one aspect of the question; namely, whether the United States will be able to pay for the oil import requirements in the foreseeable future through increased exports.

The sharp increase in U.S. oil import demand since the beginning of the current decade has brought about an understandable concern over our ability to pay for these seemingly ever growing imports. Projections have been made to demonstrate that as we reach 1980 and go beyond it the cost of our oil imports may be so high as to strain our balance of payments beyond endurance. In other words, our ability to pay for our projected oil import requirements beyond 1980 has been seriously questioned by experts.

I believe that the maximum impact of oil imports on the U.S. balance of payments is likely to come much earlier; namely, in the period 1975-77, and that from 1980 on, the impact could be more bearable rather than less as a result of several actions taken by us and other importing nations. I would therefore like to focus in this brief statement primarily on the year 1975 and then offer some projections to 1980. The analysis ignores the current Arab oil boycott, because we hope this is a temporary affair which we hope will not have an impact beyond the early part of next year which, admittedly, is optimistic. It assumes that in both 1975 and 1980 there will be no physical restraint on the oil imports shown in our projection. This is an entirely reasonable assumption both from the point of view of resource availability and the technical ability to deliver the resource. Inability to obtain the import volumes projected in this prepared statement would have to be politically motivated and falls therefore outside the scope of our inquiry.

There are a number of ways to measure the effect of a given volume of imports on a country's balance of payments. One somewhat oversimplified indication which limits the inquiry to the balance-of-trade section of the balance of payments is to calculate the change in the amount of exports necessary to pay for a given change in the level of imports. We have used this approach to determine the impact of oil imports on the U.S. balance of trade, as is shown in the first table of my prepared statement.

The figures show that while the volume of imports has risen by slightly more than 50 percent between 1971 and 1973, the value has increased by more than 100 percent. As a ratio of total U.S. exports, oil imports have shown the smallest increase of the three columns—from 7.5 percent of our total U.S. exports to 10.3 percent in 1973.

Now, let us look at 1975. The numbers clearly spell out the problem. The cost of our oil imports will rise by 184 percent and it will take nearly 24 percent of our total export trade to pay for them. The change is truly radical in scope. We have assumed that total U.S. exports will rise by about \$15 billion between 1973 and 1975, or from \$68 billion to \$83 billion. On that basis 86 percent of the increase in exports will be required to offset the additional oil imports. Since non-oil imports will, of course, also grow during this period, it is quite possible that our precarious trade surplus of this year, following 2 years of deficits, will again turn into a deficit by 1975, primarily because of the soaring cost of our oil import requirements. This, in turn, could once again weaken the international value of the dollar.

The figures show that only \$3.5 billion of the \$12.9 billion increase in the cost of oil imports is due to volumetric growth. The rest must be ascribed to higher unit costs. This last factor makes it difficult to take any action to reduce the projected increase since we have no control—directly or indirectly—over world crude oil prices.

To understand the magnitude of the problem we face it may be worth while to examine the premises on which we base our 1975 forecast.

First, the increase in the volume of imports. This is based on the assumption that U.S. demand in 1975 will be supply-limited, that is the amount of oil actually available for consumption from all sources, foreign and domestic, will be less, than the potential demand. The

reason for this constraint—and this has nothing to do with the Arab oil boycott—on demand will be insufficient domestic refining capacity to meet the normal growth in consumption and insufficient foreign export refining capacity to make up the entire deficit. The result will be a growth of only about 3.5 percent in demand in 1975, compared with 6.7 percent in 1973 and the recently projected 6.1 percent in 1974. Our import volume is therefore a minimum figure. If more imports were available more would come in, and the impact on our balance of payments would be the stronger.

A summary of our supply demand projection for 1975 is shown in the last table in my prepared statement. It indicates that by that year, 1975, 44 percent of our oil requirements will come from imported sources compared to 35 percent approximately in 1973.

Next, let us look at import prices. The basic price for foreign oil is generally assumed to be the Persian Gulf f.o.b. price of Arabian light crude oil. Since the signing of the Teheran Agreement in February 1971 which brought about a 30-percent increase in the per barrel revenue of Middle East producing countries, the cost of this oil has developed as shown in the third table of my prepared statement, which shows that the government revenue has increased by \$1.78 per barrel between February 1971 and October 1973, while the market price has risen slightly more, about \$1.95 per barrel. By far the largest of these several increases in these 2½ years occurred on October 16 of this year when government revenue in one single step was raised by 70 percent.

The increase is truly gigantic. At the time of the Teheran Agreement it was calculated that it provided the six Middle East countries with additional revenues of about \$14 billion over the 5-year lifetime of the agreement—1971 through 1975. In other words, they would have received \$14 billion more than under the previous arrangements for tax payments. As a result of the subsequent price increases—mainly the one of October 16—and likely further adjustments in the next 2 years the additional revenue will now amount to \$50 billion over the same period. In 1975 alone these Persian Gulf countries can expect an income of \$30 billion as against \$12 billion for the same volume under the original Teheran Agreement.

Under the new pricing system announced in October, the governments of the Persian Gulf producing countries have not only set a new posted price for the purpose of calculating revenues but have also for the first time established an official market price and tied it by a mathematical formula to the posted price. Thus, any increase in the market price will from now on bring about an automatic increase in the posted price and thus in government revenue. However, this does not mean that prices have now been stabilized, any more than price stability was achieved after the Teheran Agreement even though this was the officially avowed purpose of the agreement.

In order to compute a likely U.S. market import price for 1975 we have assumed—based on unofficial reports and other sources—that the current official f.o.b. market price of \$3.65 per barrel will be raised by 7 percent plus 5 cents a barrel annually. This is not based on official reports, but it is our assumption. There is no official figure out on that yet. That assumption would put the market price in 1975 at \$4.26. Adding an estimated freight cost of \$1.40 gives a landed crude oil

price of \$5.66 per barrel. For imported products prices we have added \$1.75 to the landed cost of crude oil. We have further assumed that all imported oil prices will equate with Persian Gulf crude oil at U.S. ports. This understates the full value of imports, since it makes no allowance for the premiums charged by the producers of low-sulfur crude oil which we require in increasing quantities.

In the light of events over the past 3 years, our price assumptions for 1975 are more likely to be on the low side than on the high side. This applies particularly to products prices. In view of the expected products shortage during the next several years the differential between crude oil and products prices is likely to be higher than we have assumed. Thus, our estimated import cost of 19.9 billion could well be exceeded in 1975.

The analysis shows there is very little we can do to reduce this import cost by 1975. The same applies to the years 1976 and 1977 when oil import costs will continue to rise more rapidly than our merchandise exports, and we will still not have enough domestic refining capacity to reduce the importation of finished products. However, beyond that period, beyond 1977, we may well see a slowing down in the growth of our oil import cost. By 1980 the impact of oil imports on our balance of payments is likely to be smaller than in 1975 even though the actual monetary cost will, of course, be considerably larger.

There are several reasons for this projected improvement by 1980. One is the construction of sufficient domestic refining capacity over the next 7 years to make us again nearly self-sufficient in most products other than residual fuel oil. This would reduce the unit cost of our oil imports significantly.

More important, our demand growth can be significantly curbed by 1980 through conservation measures without causing major economic dislocations. Various studies have shown that over a period of time these measures could easily reduce consumption by at least 10 percent. Assuming that physical supply restrictions will ease after 1977, normal demand by 1980 is likely to be on the order of 24 million barrels daily. Conservation practices could well reduce this figure to 21.5 million barrels a day. The continuing high price of oil can be expected to condition the public to cooperate in putting these measures into effect, provided a start is made now. What is needed is both a technology and philosophy of energy conservation. This will not come about automatically or through appeals to the public. We need specific economic and legal incentives to conserve energy by optimizing its efficiency and specific official disincentives to the wasteful use of energy. This will require overall government energy planning on a broad basis, something which does not exist at present. Over a 7-year period we can expect to make considerable progress in this area if we start now.

Another factor likely to reduce our growth in oil imports is the effect of the very high foreign crude oil prices on domestic crude oil production. At a landed cost of \$5.60 and more we can expect a sharp increase in domestic drilling activity. One of the projections in the 1972 NPC study, "The U.S. Outlook for Energy"—case Ia—assumes a high drilling rate combined with a low finding rate for domestic oil. Under this assumption domestic production in 1980 will be 12.3 million barrels a day or 600,000 barrels a day more than under the NPC's case III assumption which is often cited as the most likely of

the various projections in the study. Given the existing and expected price levels, case Ia could well be more realistic than case III.

Altogether, we foresee the supply-demand balance for 1980, as is shown in the last table of my prepared statement, under the conditions discussed above.

Volumetrically, the 1980 import figure would be only slightly above the 8.36 million barrels per day projected for 1975. As a share of total oil requirements the import ratio would be 41.4 percent or less than the 44 percent projected for 1975. This would be the first structural reversal of this ratio since the mid-1950's. Of course, a stabilization of the volume of imports—which, I would like to reemphasize, is an optimistic but not unachievable assumption—does not mean that its cost will be stabilized. In fact, there is no doubt whatever that oil prices will continue to rise through 1980 and beyond. The question is, By how much? Here one could almost say one guess is as good as another. However, we have arbitrarily assumed an annual increase of 7 percent in the U.S. landed price of imports between 1975 and 1980. This would give the oil exporting countries a revenue increase of several percent more each year than the likely rise in the cost of their imports. Under this assumption the landed crude oil price in 1980 would be about 7.71 per barrel, the product price would be 1.25 higher, since this is likely to be long-term differential between crude oil and products price, and two-thirds of our imports will consist of crude oil. Under these conditions the total cost of oil imports will be 25.5 billion in 1980. Projecting a 10 percent annual increase in U.S. merchandise exports at current prices would give us an export total of 133.6 billion in 1980. In part this increase in our exports would be financed by our dollar outflow from oil imports, since most oil exporting countries will be much more able to turn their massively rising revenues into imports of goods and services over a 7-year period than over a 2- to 3-year period.

Altogether, then, the ratio of oil imports to total exports would be 18.9 percent which would be a substantial drop from the 24 percent of 1975. There is, of course, no assurance that things will turn out that way. The oil exporting countries may insist on an increase far in excess of our assumed 7 percent per year. If they do, the problem of paying for our oil imports may become more severe by 1980 rather than less. But the exporting countries are not oblivious of the economic facts of life. A perceptive slowdown in the growth rate of their exports is less likely to encourage future excessive price increases than a continuation or acceleration of the current growth rate. Of course, this would require not only the United States but also Western Europe and Japan to take measures designed to reduce the growth in oil consumption. It would also require the speediest possible development of alternate commercial energy resources both here and abroad so as to cut further into the growth in oil demand in the mid- and late-1980's, when these new sources of energy will be commercially available. If most of these things are done, we may be able to pay for our oil import needs in the 1980's without weakening our international economic position. To get through the mid-1970's may prove a bit more difficult.

Thank you.

[The prepared statement of Mr. Lichtblau follows:]

PREPARED STATEMENT OF JOHN H. LICHTBLAU

Mr. Chairman, my name is John H. Lichtblau. I am Executive Director of the Petroleum Industry Research Foundation, Inc. in New York. I would like to thank you for inviting me to participate in this hearing on the subject of oil imports and the U.S. Balance of Payments.

The sharp increase in U.S. oil import demand since the beginning of the current decade has brought about an understandable concern over our ability to pay for these seemingly ever growing imports. Projections have been made to demonstrate that as we reach 1980 and go beyond it the cost of our oil imports may be so high as to strain our balance of payments beyond endurance. In other words, our ability to pay for our projected oil import requirements beyond 1980 has been seriously questioned by experts.

I believe that the maximum impact of oil imports on the U.S. balance of payments is likely to come much earlier, namely in the period 1975-1977, and that from 1980 on the impact could be more bearable rather than less as a result of several actions taken by us and other importing nations. I would therefore like to focus in this brief paper primarily on the year 1975 and then offer some projections to 1980. The analysis ignores the current Arab oil boycott and assumes that in both 1975 and 1980 there will be no physical restraint on the oil imports shown in our projection. This is an entirely reasonable assumption both from the point of view of resource availability and the technical ability to deliver the resource. Inability to obtain the import volumes projected in this paper would have to be politically motivated and falls therefore outside the scope of our inquiry.

There are a number of ways to measure the effect of a given volume of imports on a country's balance of payments. One somewhat over-simplified indication which limits the inquiry to the balance of trade section of the balance of payments is to calculate the change in the amount of exports necessary to pay for a given change in the level of imports. We have used this approach to determine the impact of oil imports on the U.S. balance of trade, as shown in the table below.

Year:	Volume of oil imports million barrels per day	Value of oil imports (billions)	Oil imports as percent of total exports
1971.....	3.93	\$3.3	7.5
1972.....	4.74	4.3	8.6
1973 (estimated).....	6.25	7.0	10.3
1975 (forecast).....	8.35	19.9	24.0

The figures show that while the volume of imports has risen by slightly more than 50% between 1971 and 1973 the value has increased by more than 100%. As a ratio of total U.S. exports, oil imports have shown the smallest increase of the three columns—from 7.5% of our total U.S. exports to 10.3% in 1973.

Now let us look at 1975. The numbers clearly spell out the problem. The cost of our oil imports will rise by 184% and it will take nearly 24% of our total export trade to pay for them. The change is truly radical in scope. We have assumed that total U.S. exports will rise by about \$15 billion between 1973 and 1975, or from \$68 billion to \$83 billion. On that basis 86% of the increase in exports will be required to offset the additional oil imports. Since non-oil imports will of course also grow during this period, it is quite possible that our precarious trade surplus of this year, following two years of deficits, will again turn into a deficit by 1975, primarily because of the soaring cost of our oil import requirements. This, in turn, could once again weaken the international value of the dollar.

The figures show that only \$3.5 billion of the \$12.9 billion increase in the cost of oil imports is due to volumetric growth. The rest must be ascribed to higher unit costs. This last factor makes it difficult to take any action to reduce the projected increase since we have no control—directly or indirectly—over world crude oil prices.

To understand the magnitude of the problem we face it may be worth while to examine the premises on which we base our 1975 forecast.

First, the increase in the volume of imports. This is based on the assumption that U.S. demand in 1975 will be supply-limited, that is the amount of oil actually available for consumption from all sources foreign, domestic will be less than the potential demand. The reason for this constraint on demand will be insufficient domestic refining capacity to meet the normal growth in consumption and insufficient foreign export refining capacity to make up the entire deficit. The result will be a growth of only about 3.5% in demand in 1975, compared with 6.7% in 1973 and the recently projected 6.1% in 1974.¹ Our import volume is therefore a minimum figure. If more imports were available more would come in.

A summary of our supply demand projection for 1975 is shown in the following table.

U.S. OIL DEMAND¹ AND SUPPLY BALANCE, 1975

	Percent		
Demand.....	19,400		
Processing gains.....	500		
Required oil supplies.....	18,900		
Domestic crude oil production.....	8,850		
Domestic NGL production.....	1,700	10,550	56
Imported crude.....	4,250		
Imported products.....	4,100	8,350	44
Total foreign domestic supplies.....	18,900		100

¹ IPAA forecast of October 1973.

Next, let us look at import prices. The basic price for foreign oil is generally assumed to be the Persian Gulf fob price of Arabian light crude oil. Since the signing of the Teheran Agreement in February 1971 which brought about a 30% increase in the per barrel revenue of Middle East producing countries, the cost of this oil has developed as follows:

SAUDI ARABIAN POSTED PRICES, GOVERNMENT REVENUES, AND MARKET PRICES FOR SELECTED PERIODS

[In dollars per barrel]

	February 1971	Oct. 1, 1973	Oct. 16, 1973
Arabian light 34°:			
Posting.....	2.18	3.01	5.119
Government take.....	1.27	1.77	3.05
Market price (f.o.b.).....	1.70	2.80	3.65

¹ Reported spot prices.

The figures show that the government revenue has increased by \$1.78/bbl during this period while the spot market price has risen by slightly more—\$1.95. By far the largest of the several increases since February 1971 occurred on October 16 of this year when government revenue in one single step was raised by 70%. The increase is truly gigantic. At the time of the Teheran Agreement it was calculated that it provided the six Middle East countries with additional revenues of about \$14 billion over the five year lifetime of the Agreement (1971 through 1975). As a result of the subsequent price increases—mainly the one of October 16—and likely further adjustments in the next two years the additional revenue will now amount to \$50 billion over the same period. In 1975 alone these Persian Gulf countries can expect an income of \$30 billion² as against \$12 billion for the same volume under the original Teheran Agreement.

Under the new pricing system announced in October the governments of the Persian Gulf producing countries have not only set a new posted price for the purpose of calculating revenues but have also for the first time established an official market price and tied it by a mathematical formula to the posted price. Thus, any increase in the market price will from now on bring about an auto-

¹ Including 200,000 barrels per day of exports.

² Exclusive of income from the sale of "Participation" oil.

matic increase in the posted price and thus in government revenue. However, this does not mean that prices have now been stabilized, any more than price stability was achieved after the Teheran Agreement even though this was the officially avowed purpose of the Agreement.

In order to compute a likely U.S. import price for 1975 we have assumed—based on unofficial reports and other sources—that the current official fob market price of \$3.65/bbl will be raised by 7% plus 5¢ a barrel annually. This would put it at \$4.26 in 1975. Adding an estimated freight cost of \$1.40 gives a landed crude oil price of \$5.66/bbl. For imported products prices we have added \$1.75 to the landed cost of crude oil. We have further assumed that all imported oil prices will equate with Persian Gulf crude oil at U.S. ports. This understates the full value of imports, since it makes no allowance for the premiums charged by the producers of low-sulfur crude oil which we require in increasing quantities.

In the light of events over the past three years, our price assumptions for 1975 are more likely to be on the low side than on the high side. This applies particularly to products prices. In view of the expected products shortage during the next several years the differential between crude oil and products prices is likely to be higher than we have assumed. Thus, our estimated import cost of \$19.9 billion could well be exceeded in 1975.

The analysis shows there is very little we can do to reduce this import cost by 1975. The same applies to the years 1976 and 1977 when oil import costs will continue to rise more rapidly than our merchandise exports. However, beyond that period, beyond 1977, we may well see a slowing down in the growth of our oil import cost. By 1980 the impact of oil imports on our balance of payments is likely to be smaller than in 1975 even though the actual monetary cost will of course be considerably larger.

There are several reasons for this projected improvement by 1980. One is the construction of sufficient domestic refining capacity over the next 7 years to make us again nearly self sufficient in most products other than residual fuel oil. This would reduce the unit cost of our oil imports significantly.

More important, our demand growth can be significantly curbed by 1980 through conservation measures without causing major economic dislocations. Various studies have shown that over a period of time these measures could easily reduce consumption by at least 10%. Assuming that physical supply restrictions will ease after 1977, normal demand by 1980 is likely to be on the order of 24 million barrels daily. Conservation practices could well reduce this figure to 21.5 million b/d. The continuing high price of oil can be expected to condition the public to cooperate in putting these measures into effect, provided a start is made now. What is needed is both a technology and philosophy of energy conservation. This will not come about automatically or through appeals to the public. We need specific economic and legal incentives to conserve energy by optimizing its efficiency and specific official disincentives to the wasteful use of energy. This will require overall government energy planning on a broad basis, something which does not exist at present. Over a seven year period we can expect to make considerable progress in this area if we start now.

Another factor likely to reduce our growth in oil imports is the effect of the very high foreign crude oil prices on domestic crude oil production. At a landed cost of \$5.60 and more we can expect a sharp increase in domestic drilling activity. One of the projections in the 1972 NPC study, "The U.S. Outlook for Energy,"—Case Ia—assumes a high drilling rate combined with a low finding rate for domestic oil. Under this assumption domestic production in 1980 will be 12.3 million b/d or 600,000 b/d more than under the NPC's Case III assumption which is often cited as the most likely of the various projections in the study. Given the existing and expected price levels, Case Ia could well be more realistic than Case III.

Altogether, we foresee the following supply/demand balance for 1980 under the conditions discussed above:

U.S. OIL SUPPLY AND DEMAND, 1980

(In millions of barrels per day)

Demand.....	21.5
Processing gains.....	.5
Total.....	21.0
Domestic production.....	12.3
Imports.....	8.7
Total.....	21.0

Volumetrically, the 1980 import figure would be only slightly above the 8.36 million b/d projected for 1975. As a share of total oil requirements the import ratio would be 41.4% or less than the 41% projected for 1975. This would be the first structural reversal of this ratio since the mid 1950's. Of course, a stabilization of the volume of imports—which, I would like to reemphasize, is an optimistic but not unachievable assumption—does not mean that its cost will be stabilized. In fact, there is no doubt whatever that oil prices will continue to rise through 1980 and beyond. The question is by how much. Here one could almost say one guess is as good as another. However, we have *arbitrarily* assumed an annual increase of 7% in the U.S. landed price of imports between 1975 and 1980. This would give the oil exporting countries a revenue increase of several percent more each year than the likely rise in the cost of their imports. Under this assumption the landed crude oil price in 1980 would be about \$7.71/bbl, the product price would be \$1.25 higher, since this is likely to be long-term differential between crude oil and products prices, and 2/3 of our imports will consist of crude oil. Under these conditions the total cost of oil imports will be \$25.5 billion in 1980. Projecting a 10% annual increase in U.S. merchandise exports at current prices would give us an export total of 133.6 billion in 1980. In part this increase in our exports would be financed by our dollar outflow from oil imports, since most oil exporting countries will be much more able to turn their massively rising revenues into imports of goods and services over a seven year period than over a two to three year period.

Altogether, then, the ratio of oil imports to total exports would be 18.9% which would be a substantial drop from the 24% of 1975. There is of course no assurance that things will turn out that way. The oil exporting countries may insist on an increase far in excess of our assumed 7% per year. If they do the problem of paying for our oil imports may become more severe by 1980 rather than less. But the exporting countries are not oblivious of the economic facts of life. A perceptive slow-down in the growth rate of their exports is less likely to encourage future excessive price increases than a continuation or acceleration of the current growth rate. Of course, this would require not only the U.S. but also Western Europe and Japan to take measures designed to reduce the growth in oil consumption. It would also require the speediest possible development of alternate commercial energy resources both here and abroad so as to cut further into the growth in oil demand in the mid and late 1980's. If most of these things are done we may be able to pay for our oil import needs in the 1980's without weakening our international economic position. To get through the mid-1970's may prove a bit more difficult.

Chairman REUSS. Thank you, Mr. Lichtblau and gentlemen. You have delivered some sobering evidence here this morning, all three of you have, and I am much impressed by it all. And particularly, as a sometimes critic of the petroleum industry, I want to speak well of an industry that can produce the kind of testimony that Exxon gave this morning, and the Petroleum Industry Research Foundation, which is, as I understand it, supported by oil companies big and little.

Mr. LICHTBLAU. Big and little, yes, sir.

Chairman REUSS. As you gave us, and that is not to say that I am not also grateful for Mr. Croly's testimony.

Mr. Hanson and Mr. Croly, do you agree with Mr. Lichtblau's conclusion that the real crunch in our balance of payments picture due

to oil, and the problem of the dollar internationally, is likely to come concurrently with our bicentennial celebration in about 1976?

Mr. HANSON. Mr. Chairman, I would support, I think, what Mr. Lichtblau indicated there, in that 1980 should be far enough in the future that by that time we can realize some significant fallout from setting things straight today; whereas I think the 1975-77 time frame is honestly too early to expect any significant results from either conservation measures or new energy sources. So, I would think this is achievable, but I certainly would not say it is most probable. But it certainly would be achievable.

Chairman REUSS. You do, you would in general agree with the conclusion of Mr. Lichtblau that 1976 and thereabouts, 1975 to 1977 is the time when we are going to have a real problem, and that we had better start correcting these potentially disastrous movements right now?

Mr. HANSON. Yes, sir. And I think 1980 will be worse than 1976 and 1977 if we do not pull up our socks in 1973.

Chairman REUSS. And you do not disagree with Mr. Lichtblau either? You were just saying there was a greater sock pulling potential by 1980?

Mr. LICHTBLAU. Yes. So it could be worse by 1980. The projection is admittedly an optimistic one, but as I say, it can be achieved if we start today. But we have not got much time to lose on this. But I do not see much we can do, as Mr. Hanson says, over the next 2 years to avoid something like a \$20 billion outflow on oil imports.

Chairman REUSS. Mr. Croly, do you differ?

Mr. CROLY. No, Mr. Chairman. Under today's set of assumptions, I agree with Mr. Lichtblau's conclusions. I look, however, for some very, perhaps, spectacular things to happen in the international scene. For example, and admittedly some of this may sound like a fantastic projection, but at a 25 percent reduction in Middle East production, Japan, for example, and West Germany, the rest of Europe may well suffer an enormous economic collapse. Perhaps not collapse, but enormous economic consequences.

The OPEC countries, the oil OPEC countries, the Arabic countries in particular have now a taste of what their real power is in the world. However, the rest of the world will look in wonder how 12 or 15 million people can control perhaps 800 million people, Japan, Western Europe, North America, and the balance of the industrialized free world. And this may produce an enormous backlash. I am sure it will. The United States, as powerful as it is, was forced in large measure to bow to world opinion on Vietnam. What will the consequences be? It may get into some very dangerous political situations.

I think the more we can reduce our consumption, or become self-reliant, the greater favor we do the rest of the world, because the rest of the world does not have the opportunities that we have, or most of the rest of the world does not have the opportunity that we have to redress our balance of payments, which is in a way a secondary or tertiary consequence of what this energy situation is, and in the power politics of the world. I know that it is necessary to study every aspect of this energy situation, but I think some very serious thoughts should be given not only by the government and by the Congress at large, but by your subcommittee on the subject. Just a little scuffle in the Mideast

would probably cost the United States \$40 or \$50 billion. Think what could be done with that in research and development.

And these are some of the more exotic perhaps, and in a way I suppose people might say fanciful things that can result from this. But, when you saw in 1946 the British's determined effort to keep its great ally, the United States, out of Kuwait, or the Kuwait neutral zone, trying to control, politically control oil. If allies were reduced then to scuffling among themselves for oil, think what may happen in the future as a consequence of what is going on now.

I therefore would inject, and I am not prepared to do this at the time, some very large modifiers in a study. You might say gross sensitivity analysis far beyond economic consequences. I think it is a very serious problem in the United States.

One last thing. I listened to Gen. Ibnu Sutowo in a speech in New York last night at a dinner, and he said—

Chairman REUSS. Who was that?

Mr. CROLY. Gen. Ibnu Sutowo, who is the Director General of the State Oil Co. of Indonesia, a very staunch friend of the United States, and he made a remark that in very few of the energy studies of the United States has he seen any mention of Indonesia. As a matter of fact, we concentrate on those people who are not helping us, and our attention is on those people who are not helping us rather than the people who are helping us, Venezuela, Iran, Indonesia, Nigeria, and a lot of the other places in the world.

Another factor we should study is how we can aid those countries.

Chairman REUSS. Well, I do not want to digress too much from my main line of inquiry, but it certainly is true that we behaved idiotically toward Indonesia by our own indefensible oil import quotas. And Indonesia has clean oil which we could have burned, yet Mr. Nixon, the man who overruled the report of the Shultz committee, kept on import controls. The Indonesian Ambassador kept telling me. "What are you doing to us, you are bankrupting our country and preventing the United States from developing stockpiles of low-sulfur Indonesian oil and at low prices." That seems to me to have been indefensible, and has contributed in part at least to our present past.

But, getting back on the main issue, and since it does seem that we are in trouble across the board. The balance of payments aspect is important, but not the only facet of our troubles. While we have some chance by 1980 of working our way out, the situation in 1975 and 1976 is considerably more alarming simply because there are only three years to work on there instead of eight.

Let me ask my question. Are we not being Rip Van Winkle? I do not know what the President's program is going to say this noon when it comes up, but so far, not only the administration program, but even most alternative suggestions that you hear have been farcical. Drive a little slower, please, and other things which people totally disregard. In short, do we not need in this country, starting at once—and I would hope in concord with similar programs in other great oil consuming countries, Europe, Japan—a comprehensive program of allocation and rationing which will cut down on dispensable uses, accompanied by a stockpiling program? By this I mean a gasoline rationing program, or a governmental program which has strong positive and negative incentives toward car pooling, which markedly cuts down on pleasure

driving—tough, but I think we have got to do it—and which, for example, prevents the deplorable wastage of natural gas in the gas producing States where it is used for low efficiency electricity production and marginal manufacturing operations. Do we not need, without getting too much into the details of it, a program of eliminating waste and frivolity in order to avert the situation which will otherwise likely occur in 1976? Whereby not only do we have shortages, but the high dollar cost for necessary oil imports is so disastrous to our trade position that we go into a severe trade deficit once again, unredressed by black ink factors in our balance of payments, and, hence, if we continue to float, which I hope we do, the dollar floats down alarmingly.

Or if we are so foolish as to go back to fixed or near fixed rates, which I hope we do not, the dollar some Monday suddenly collapses when the then Secretary of Treasury's fibs are discovered, and we do have to devalue. In either event, our soybean, scrap, and lumber and other scarce commodities are going to be sucked away at bargain prices unless we put on export controls. We are going to be in a bad inflationary situation, worse than that which we now have, I should think, as a result of that kind of depreciation or devaluation of the dollar. I want your reaction that the situation is, indeed, serious, and that we have to stop fooling around, and instead save right now on oil consumption.

Mr. Lichtblau.

Mr. LICHTBLAU. Well, I fully agree with you, Mr. Chairman, that the situation is serious, and the sooner we start the better. And I think we could have started 2 years ago.

Chairman REUSS. Amen.

Mr. LICHTBLAU. I think that whatever merits the import program had, and at one time I think had merit, I would say that by the beginning of 1971 at the very latest, it had completely outlived its usefulness, and it should have been scrapped then. There were at least 2 years wasted between then and May 1973 when it was finally scrapped as a reflection of what was obvious and there was no longer any possibility to keep out foreign oil when we had a shortage of domestic oil and foreign oil prices were in excess of domestic prices. But I think by the beginning of 1971 this was already clear, because oil production in this country peaked in 1970. From 1970 on we have had declines in production. In previous years, we had vast excess producing capacity and there may have been possibly a rationale for this. But from the end of 1970 on this no longer existed. Had the oil import program been canceled 2 years earlier I think a number of refineries would have been built in this country. It takes 3 years to build a refinery. By next year some of these plants would have been on stream. As we have seen, within a few weeks after the President announced the cancellation of the existing program in May of this year, there were a whole flurry of announcements of new refinery expansion programs throughout the industry. Independents, majors, everyone wanted to build plants, which to me is an obvious sign that had this same action been taken a little earlier by the Government the same reaction from the industry would have come a little earlier.

So, here we have a lag of 2 years, which is historically not very significant. But right now when you are in that period where every 2 years count, it is of great significance.

As far as rationing is concerned, I think we may have to go to rationing. If our oil embargo lasts there is no choice. The problem with rationing is that somebody always gets hurt. There is no way of avoiding somebody being hurt by rationing, and that is important. It must be important for politicians because you always hurt a large group of people. Senator Jackson the other day suggested that all gasoline stations be closed over the weekend. Well, how do I get up to my ski resort in New Hampshire if all of the gasoline stations are closed? How do the people who make their living off skiing, how do they get through the winter? How do a number of other industries that live off Sunday driving, and there are quite a few such service industries, how do they get through the winter? I am not saying you cannot do it, but the problem with rationing is that somebody is going to get hurt, because we have an awful lot of nonessential activities and industries in this country. And if you focus in on them, and maybe we will have to, those nonessential industries are going to be very badly off. They employ people and they have a lobby. So there are problems with rationing. I am not saying it should not be done, but it is a difficult problem.

There are some things we can do, however. For instance, I am thinking about Elk Hills, which is, you know, the Elk Hills Naval Reserve. Here we have quite a lot of oil shut in, and it has been shut in for I don't know how long, ever since before World War I, I believe. We can develop Elk Hills to about 270,000 barrels a day within a matter of months, maybe 8 or 12 months. This is domestic oil. There is an oil shortage in this country at the moment.

Suppose there were no shortage, and suppose the Arab oil boycott did not exist. We could take this oil and store it. We can bring it around to Louisiana and store it in these salt caves, salt domes, which is very low-cost storage. We would have it available in an emergency. It would not cost us one penny in terms of our balance of payments. Or we could sell the oil. But this oil has been shut in, and nobody has been permitted to do anything with it because there is some kind of a sacred image that this is a naval reserve which the Navy must have available in a future war. I think this is an antiquated concept, and it is not a major factor in terms of supply. But it might save us a few hundred million dollars in imports. And above all, each year of production gives us, if we do not use it but put it in storage, 100 million barrels of stored oil. So, if you can store this oil for 2 or 3 years, and then we are faced with an emergency again, be it a balance-of-payments emergency or a physical emergency as a result of some foreign action, we would have 300 million barrels of storage oil available which could be drawn on. And as I say, it would cost us nothing in terms of our dollar outflow.

This is one action I can see, and there are many others. Some comment has been made that perhaps our agricultural exports will more than offset the cost of oil imports because our agricultural prices have gone up almost as much in some cases as the cost of oil imports. But I think this is shortlived. I think oil import prices are only going in one direction. They do not fluctuate once they go up, because they are based on the Government policies adopted by a number of sovereign governments. Agricultural prices fluctuate with supply and demand, so our present high price of export commodities might not last if we have a few very good harvests around the world.

Chairman REUSS. Is this not due to one important difference between let us say soybean oil and fossil oil? Soybean oil you can regrow every year.

Mr. LICHTBLAU. Precisely.

Chairman REUSS. Fossil oil, once you take it, you have to wait quite awhile—what is it, thirty million years or so?

Mr. LICHTBLAU. Something like that.

Chairman REUSS. Past the bicentennial period.

Mr. HANSON.

Mr. HANSON. Yes, Mr. Chairman. I think that was the gist of my message, that we tend to have longer leadtimes in trying to develop additional energy resources than we do in developing additional agricultural resources.

I might comment briefly on the U.S. import control program. I think that the facet that Mr. Lichtblau was particularly critical of, and I certainly would support this, was not the crude quota system per se, because the quotas were progressively increased in essence along the lines of the prevailing program for the west coast—though a formal change in it was more in the area of refining capacity location where clarification was sorely needed. There had been an equivocal position as to whether our policy would be that of encouraging the development of capacity offshore or onshore, and I am afraid that in the confusion and misunderstanding, and the uncertainty as to which was the policy neither was undertaken. As a consequence, as Mr. Lichtblau said, our principal crunch over the next 3 years is in having adequate product availability. In time there is also a problem of basic resource, having the crude oil itself to feed into the refineries.

I certainly agree, Mr. Chairman, that in the short term we do have to work very hard on the demand side of the equation, and perhaps this does mean allocation and rationing schemes. But it also goes by definition that this does not generate additional supply one iota. So, I think concurrent with efforts to meet the immediate crisis situation through perhaps some forced demand conservation measures, we also get on the ball and stimulate additional supply.

Chairman REUSS. Well, I think one surely has to agree with that, because if you recall the little formulation that I just tried to make, 1975 to 1976 are very, very critical years. So, we agree that 1980 is also critical because we have got 8 years between now and 1980, and presumably we will have the wit to do something about the supply by then.

Mr. HANSON. I would hope so, sir.

Chairman REUSS. So I think you have answered that very well.

Mr. HANSON. My only concern about stockpiling is whether it would be on the basis of cost-benefit analysis, better to devote what additional production might be forthcoming from Elk Hills into a stockpile, or whether it should be used to offset our current import bill?

Chairman REUSS. It may well be that we will just have to run the risk of not having adequate stockpiles and that is how we pay for our past sins.

Mr. HANSON. It is difficult to justify stockpiling when supplies are scarce to begin with.

Chairman REUSS. Congressman Widnall.

Representative WIDNALL. Thank you, Mr. Chairman.

I would like to welcome all three of you on the panel before us this morning. You are making a major contribution on a very vital subject, as far as the present and the future of the United States is concerned.

I would like to ask, first, Mr. Hanson, a more or less personalized question. I think you would want to set the record straight and put into proper context the fact that Exxon Corp. posted an 80-percent gain in profits for the third quarter of 1973, compared with the third quarter of 1972. What is the reason for this phenomenal growth in profits at a time of an energy crisis?

Mr. HANSON. Well, sir, I am sure you have seen some analysis of profitability of Exxon as well as other companies in the petroleum industry comparing this year's experience with that of last year, which was a year of inordinately low profitability. It is true that the demand-supply situation has been very, very tight this year, particularly developing during the second and third quarters of this year. Relative to this year, this fact has not gone beyond the notice of the OPEC member governments, as we found out just in recent weeks.

I think it is well to place industry profitability in some overall perspective. As I understand it, the results of some 28 U.S.-based companies, and covering their worldwide operations, suggest that profits after tax during the first three quarters represented about 14 percent of year beginning equity—on an annualized basis—for those 28 companies as a whole. And this is just about the rate of return these same companies were realizing in the early 1950's, at which time the industry began to experience hard times.

We do know that the industry's future capital requirements are tremendous. If we are to accomplish this increase in capability, that seems to lie as a challenge before us, not only conventional but new energy forms—oil from shale, and oil and gas from coal—must be developed. Based on some figures that the Chase Manhattan Bank has developed, an aftertax margin in excess of a dollar a barrel would be required to finance the industry's tremendous cash requirements over the next decade or so. and our experience even during the first three quarters of 1973 would not be up to that level.

What will happen in the future, obviously, no one knows, but it is certainly true that individual year-to-year comparisons can be misleading. So far this year, profits in the first three quarters are significantly higher than the first three quarters of last year, but this says nothing about what might happen next year.

Representative WIDNALL. I ask the question as a person who has used nothing but Esso gas, and then Exxon, and fuel oil for my own house, and heating oil. So I have been a longtime patron of yours.

Mr. HANSON. Thank you, sir.

Representative WIDNALL. However, as a consumer, I do not enjoy the increase in price any more than anybody else does.

Now, I have one other question I would like to ask while I am on that. I have several longtime independent dealers who are handling Exxon products who have come to me about the fact that they were being cut down on the amount they were going to get, and some were going to be cut off as they understood it. And yet at the same time, the very same Exxon people were going around trying to solicit new business from others while they were giving up on the old, tried and true dealers who had been operating for them and with them for years. I just do not understand the company policy on a thing like that.

Mr. HANSON. Well, certainly the company policy, as I understand it, Congressman Widnall, was to, before there were any mandatory allocation schemes, treat each class of customer in the same fashion. And I have every reason to think that that was the case.

Representative WIDNALL. Well, I just ran across this in my own little specific area in which I operate as a Member of Congress, and it is very difficult to understand.

Mr. HANSON. I might say, Congressman Widnall, getting back to the profitability, that it is true that most of the gain of an international company, such as our own, has taken place outside of the United States rather than in the United States, in part, because the profit performance outside of the United States was so weak up through 1972.

Representative WIDNALL. Now, what is very interesting in the statements that you three have made is that there has been no mention at all of the possibility of solar energy. Now, it seems to me that is really the hope of the future. I have been up to the Forrester Lab up in Princeton, and I have seen the magnificent work they are doing in trying to harness solar energy both for heating purposes and for energy. It seems to me that that is really the inexhaustible resource which we have. Yet nobody seems to pay any attention to it.

Mr. HANSON. Congressman Widnall, in my prepared statement I did mention that, for the longer term future, this is the type of resource that is most important for Americans, as well as the Europeans and the Japanese who do not have the benefit of an abundant fossil fuel source. Thus, it is very important that these opportunities be pursued not just nationally, but perhaps internationally. I just did not happen to mention it in my remarks here.

Representative WIDNALL. Mr. Croly, I would like to get your assessment of our present energy situation with special attention to the immediate future; namely, this winter. What do you think we might be facing this winter if the Arab oil embargo continues this winter?

Mr. CROLY. There will be some very serious economic dislocations, some very real physical discomforts. We can cope with it. To take some extreme cases, we will have to cut out heated swimming pools. In the competition in the container ship industry, for example, each company and each country tries to escalate, and now we have 33-knot ships, aircraft carrier speed, moving junk, and when I say junk I do not mean to characterize our exports as junk, but mousetraps, and machinery from New York to London in 4 or 4½ days, burning 4,000, 3,300 to 4,000 barrels per day on these ships. If they took a mere 6 days to cross, the consumption would be probably about 800 to 1,000 barrels a day. If they took 8 or 9 days, it would probably be 600 barrels a day. These sort of things can be cut out. And we will have to have a very fair allocation program. And Mr. Lichtblau is certainly correct, rationing is going to hurt everybody. The people in Beirut did a very simple thing. All of the cars with licenses that end in odd numbers are permitted to drive on odd numbered days, and the fellow with the even license is permitted to drive on the even numbered days. Of course, we can imagine probably that 10 percent of the population would cheat, but probably 90 percent would not.

But we have in 1973 the very rough figures of 10.9 million barrels per day of crude oil and gas condensate production within this country. There is a little argument as to what our refining capacity is. Let us say it is 13 million. Our consumption was projected to be 17.4 million barrels. These figures were from last summer, assuming no international emergency. So, we have a shortfall here from 11 to 17 million. Of course, we can make a lot of that up from some of our friends. But, our friends will be trying to sell their oil to Europe and Japan and so forth. I would guesstimate that we would survive on about 13.5 million barrels a day without very serious economic dislocation. But anything less than that will have very major impact and, incidentally, there is no coal available. Con Edison is trying to secure permission to convert their Ravenswood plant from oil to coal, but it is highly doubtful that the coal is available, I mean physically available. And, of course, we are going to pay very much higher prices for gas-oil, that is home heating oil which is already up to 25 cents per gallon.

Representative WIDNALL. If we are to guarantee adequate fuel for homes, schools, and public buildings, what will happen to industry?

Mr. CROLY. They will be the ones that suffer.

Representative WIDNALL. So there is a possibility of triggering a substantial slowdown.

Mr. CROLY. It is a question of whether you want your house warm or keep your job in many cases.

Mr. HANSON. Just to pick that up, I think that to the extent that we can adjust to the temporary shortfalls through reducing our home thermometers, and less pleasure driving, the adverse impact on the economy would be minimized, relative to having to close down or curtail operations of industry and commerce. I might say that Europe and Japan have far less of their total energy consumed by consumers as a personal matter, and hence any shortfall probably would have more of a direct and immediate impact on overall economic activities than would be the case here.

Representative WIDNALL. Can any of you enlighten me on this? Just recently I saw in the paper a statement that even when we get the Alaska pipeline going the majority of that oil is going to go to Japan and other places and not to the United States. Is there any basis in truth to that?

Mr. LICHTBLAU. No.

Mr. HANSON. No, sir. I think it would be only good economics that it would go to the United States. I was not aware of any thought that that oil would be moving to Japan.

Mr. LICHTBLAU. You go into a deficit, an oil deficit on the west coast in 1978 of approximately the volume of oil that would come from Alaska by then. So, shipping oil to the west coast would just displace oil imports, and I think that makes sense. There is no reason to continue to import oil into the west coast from the Middle East and Indonesia on a large scale and exporting Alaskan oil to Japan. So I think, as Mr. Hanson says, from the purely economic point of view, since you do have a market, a ready market on the west coast for virtually all of the oil that comes in from Alaska, it will be consumed there.

If it were different, if a lot of oil had been found in the offshore area of California so that California would not be able to absorb all of this oil, I think it is likely that some of it would have been exported to Japan. Personally it would not worry me very much if we export oil to Japan, and instead some Middle East oil that now goes to Japan comes to us. There would be some logistical savings. It would not have any negative impact on the United States, because in an emergency that oil from Alaska is still available for domestic consumption. But as it is, I think there is no need, no economic need for that oil to look for a market outside of the United States.

Representative BROWN. Would you yield on that?

Representative WIDNALL. Yes; I yield.

Representative BROWN. However, isn't there sort of a displacement factor here that works sometimes wherein if it becomes more economic to ship that oil to Japan, and trade what you find in Alaska with Middle Eastern oil, for instance, which might come into the east coast, if one of the participants in extracting the Prudhoe Bay oil would be an east coast refiner and user, you can ship the oil to Japan and get more oil in from the Middle East for the east coast and just, in effect, trade it around like you trade dollars and use the economics of the cheaper or reduced transportation costs to an economic benefit? Now, that is only if you have got the Middle East supplying oil.

Mr. HANSON. Yes, sir, Congressman Brown. This is certainly a theoretical possibility. And I would just say one might rationalize what Canada has been doing in recent years in those very terms, that Canada has been exporting crude oil to the U.S. Midwest and Far West, while at the same time importing into eastern Canada as being a more economical overall balance. But, for this to be economical on the west coast would require, in essence, a surplus of indigenous capability on the west coast, which might have been the case if the Alaska pipeline had been built in the late sixties. But that is certainly not in the cards today.

Mr. LICHTBLAU. The west coast can absorb all of the oil, and it is logically the best place.

Mr. HANSON. You have a reverse flow in your economics.

Representative BROWN. I understand, but there is though the possibility? It is possible that you could have gotten some Arabian oil in Japan which would more economically come to the east coast of the United States, and then we ship our Alaskan oil to Japan, and we bring that Arab oil into the east coast of the United States? That could happen? But given the kind of circumstances it is unlikely now, is it not?

Mr. LICHTBLAU. Yes.

Mr. CROLY. Mr. Chairman, one remark.

Representative WIDNALL. I have this question. In your prepared statement, Mr. Croly, you stated a determined effort must be made to enhance exploration in the United States for oil resources. Has not the United States been pretty well explored with regard to oil resources with the exception of offshore? Where would it be worth while in your view?

Mr. CROLY. That is an overall statement, Mr. Widnall, meaning—

Representative WIDNALL. Well, where should the money be going for exploration?

Mr. CROLY. Well, meaning perhaps that we will have to give some additional financial incentive for very deep oil. Perhaps we will have to increase prices, and certainly we will have to explore offshore and those areas in which we are now prohibited from exploring. That is an overall broad statement upon which a volume could be written.

Representative WIDNALL. As one Member of Congress, I just do not understand the refinery situation. I do not know why there was a refinery up in Maine which was blocked for 5 years. What was in back of that? You certainly know more about it than I do.

Mr. CROLY. I followed that quite closely at the time and still do. The people in Maine simply did not want a refinery marring the scenic coast of Maine, despite the fact that there were large areas, and one county which had one of the most severe, economic underdevelopment problems in the United States. Nobody wanted a refinery there. There was some industry opposition to it. One of the problems that we have in the oil industry is we still have some destructive competition, which is overall perhaps harmful to the social body of the United States. But that is part of the economic system of the United States.

But then the Maine refinery was a well-conceived project. It should have been built. We would have had a couple hundred thousand barrels a day of heating oil coming from it now. But the people in Maine simply did not want it.

Representative WIDNALL. Mr. Lichtblau, I think you mentioned the fact they are now building additional refineries throughout the United States; 20 or more?

Mr. LICHTBLAU. Pardon me.

Representative WIDNALL. Did you say 20 or more?

Mr. LICHTBLAU. There could be that many. Yes; I have seen in terms of barrels a day, I have seen estimates of 2½ million barrels a day of announced new capacity. Not all of this will come off, not all of this will actually be built. Some of these are projects that may not be permitted for ecological reasons. Some are independent marketers and refiners who simply may not be able to get the crude oil necessary to build their refineries. But a good many of these projects will be built so that by 1980 we could again be able to supply almost all of our gasoline and our distillate heating oil for domestic purposes, which we always did until 1973. We never imported gasoline until this year, and we imported very little distillate heating oil until 1972. So, we are brand new in the import market for finished oil products, except for residual fuel oil which we have been importing for many years.

But, right now, this winter, we expected, before the Arab embargo, to bring in about half a million barrels a day of heating oil from outside sources. We are not going to get this. We will only get a small part of it, and to this extent we will have a heating oil shortage this winter. The Europeans will probably not let any heating oil out to the United States because they are being affected by this embargo. Yet, we expected to get some 200 to 250,000 barrels a day of heating oil from Europe this winter, and if this does not come, and it is not likely to come, to this extent alone we will have a shortage. As you know, we entered the heating season with a very inadequate supply. Even before the Arab embargo there was some real concern whether we would not have a heating oil shortage.

Representative WIDNALL. I just want to ask one more question of all three of you panel members, and that is that if you were a Member of Congress what would you do at this time to get the most immediate results as we face this winter and the future? I do not think it is going to do any good for us right now to say what might have been 2, 3, 4, or 5 years ago. What can we do now, and how expeditiously can the lead be obtained?

Mr. LICHTBLAU. Well, the immediate thing we would have to do is curtail consumption in some form. And I do not think it is enough to just ask the public to do any of these things. People simply will not turn their thermostats down if you just ask them. I do not know what the President is going to say, but you need more than that. I think if you, for instance, required heating oil dealers to only supply each consumer 90 percent of last year's oil, every homeowner could get along on that. I mean, people used to get along on somewhat less than they would like to in almost any commodity. But they have to know it, and you have to do it now. You cannot tell them in January that you are going to give them only 90 percent of the entire year's supply when they have already used up two-thirds of their supply, because then in February they will have no oil. Every home that is oil heated already has at least a 3 months supply in the ground, so that it is already getting late. So, unless actions are taken immediately, taken immediately to curtail our consumer demand, to force people to reduce their thermostats, it will not be done, and then we will be some time in early January facing a real significant crisis.

Representative WIDNALL. Mr. Croly, what would you say?

Mr. CROLY. I would second what Mr. Lichtblau has said. And in addition, if I were a Member of Congress I would try to support, try to commence legislation that would bring to the United States almost a repeat of the Petroleum Administration for War, the PAW during World War II, with vast powers to do all of the things that have been suggested here, under the leadership of the chairmanship of a very strong, competent man, probably from industry. I think he would have a much greater comprehension of the problems than a man from the military or from the Government. I think the Office of Oil and Gas, as it stands now, has some of the most able men in the U.S. Government working for it. Many of them have been in private industry. They know their business. They are already 50 or 60 percent geared up. I should not quote a figure like that, but they are already partially geared up for the job, and so if very strong legislation were enacted creating an independent agency, with vast powers, answerable perhaps to the Congress and managed, of course, by the Executive branch.

Representative WIDNALL. Mr. Hanson.

Mr. HANSON. Oh, I'm sorry, Congressman Widnall. Mr. Lichtblau mentioned some of the conservation measures. Clearly they need to be done in the short run. But we also need to move promptly with various supply stimulation measures. For instance, decontrol of wellhead natural gas prices is long overdue and should never have been imposed in the first place. Crude prices themselves should be permitted to reach international market clearing levels. Rather ironically during the 1960's we had an oil import program which tended to protect the U.S. producing industry from the lower world crude prices, and now we have just the reverse where there seems to be an effort to keep the U.S. consumer insulated from world prices.

The Outer Continental Shelf should be made available for oil exploration on an accelerated basis. This seems to be well underway. You talked about additional acreage that should be susceptible and made available for private exploration. Some 3 to 5 percent of our Outer Continental Shelf acreage has been opened up for exploration whereas I believe in the North Sea it is better than half, and in the Indonesian waters it is perhaps over 90 percent.

Looking further down in the future, we certainly need to expedite the development of our synthetic fuels, oil and gas from shale and coal. Finally, we need to make the most of our greatest resource that is immediately available, and that is coal. We need to perfect ways of burning coal directly in an environmentally acceptable fashion. Beyond that, we need to give further thought to what really is environmentally acceptable in this critical period that we face.

I would like to make another quick point on the refining capacity issue. I tried to suggest before that one very important element of the President's message this spring was clarification regarding preference on refinery capacity location, that it should be on the U.S. mainland rather than offshore, and hopefully that policy will be maintained. And if it is, additional capacity should be forthcoming, assuming the necessary site approvals are obtained and the like.

Representative WIDNALL. Thank you. Thank you, Mr. Chairman.

Chairman REUSS. Thank you.

Congressman BROWN.

Representative BROWN. Well, this has paved a nice way into the area of interest I wanted to explore, and that is the question of coal. First, I gather that none of you are competent to speak to the environmental aspects of coal and its impact on the health of the Nation if we were to lift our environmental restrictions at this point, is that correct? Or do any of you have any background in this area?

Mr. LICHTBLAU. Not on the medical aspects, at least, speaking for myself.

Mr. HANSON. Did you mean the health of the citizens or the economy?

Representative BROWN. The environmental impact of the lifting of our current restrictions on the utilization of coal, high-sulfur content coal?

Mr. CROLY. Well, Congressman Brown, coal per pound has about two-thirds as many Btu's as oil so, therefore, you have to burn more coal to produce the equivalent amount of energy. Therefore, a 3-percent sulfur coal is equivalent, say, offhand, to 4.3-percent sulfur oil, something of that magnitude. But, one thing we could certainly do is—

Representative BROWN. Could you explain on this 4.3 percent-sulfur oil, what that means?

Mr. LICHTBLAU. It is very high.

Mr. CROLY. It is very high, and it is very dangerous. It forms sulfur dioxide in the atmosphere, and when breathed by humans it is quite dangerous. But, a lot of work can be done, of course, to eliminate this sulfur from coal, and coal will be used increasingly.

Representative BROWN. Now, Mr. Hanson, in your testimony you talked about stack desulfurization. Are there processes that might desulfurize the coal prior to its combustion so that there would not have

to be stack desulfurization technology, but rather the technology in either the desulfurization and/or the liquefaction of the gas, or the gasification of the coal?

Mr. HANSON. Yes, sir, there is research and development underway with reference to all of these, as I understand it. I am not really qualified to pose as an expert, but I know our research affiliate is engaged in attempting to perfect both the stack gas cleaning; that is, removing the sulfur from the emissions themselves, as well as an improved combustion process wherein the sulfur can be removed as the coal is being burned rather than having to extract it from the stack.

Another way out is so-called low-Btu gas where you gasify the coal virtually at the mine mouth itself. And then utilize that low-Btu gas for power generation on the site.

These problems are surmountable, and I think that it is most urgent that we get on with them. There are also environmental problems on the production of coal, as you well know. Surface mining should certainly be permitted, it would seem to us, provided that there are stringent regulations concerning restoration.

Representative BROWN. Can you give me a time frame on the technology? If we wanted to get into a crash program to develop coal gasification, desulfurization, liquefaction, that would make coal as usable a resource environmentally as oil is currently? Do you have any idea?

Mr. CROLY. Three to 5 years.

Mr. LICHTBLAU. On stack gas desulfurization there is an argument as to whether that now is in existence or not. The EPA insists that stack gas desulfurization of coal can now be commercially undertaken. The utilities on the whole deny that. There is a real confrontation between the two, and there is no agreement at all. The utilities say that it simply cannot be done yet, and there is no technical evidence that a stack gas desulfurization plant could perform satisfactorily. The EPA disagrees and says that there is evidence, they say that they have seen it in Japan, that they have looked at these plants over in Japan and that they work well, and that the same thing should be done here.

Representative BROWN. It seems to me that that is a problem that might be resolved by the National Academy of Sciences and the National Research Council. But, as I understand the problem, it is not whether or not it can be done in the technological sense, but whether or not it can be done concomitantly with the removal of the particulate matter, and that when you do the two things together, or try to do them together they become mutually exclusive, or if not mutually exclusive, then technologically exclusive. Is that a fair statement?

Mr. LICHTBLAU. The EPA decided that the particulate matter and the sulfur can be removed, and the utilities say it cannot.

Representative BROWN. Well, I am asking if it is an economic matter in relation to the utilization of oil over coal?

Mr. LICHTBLAU. No, it is not entirely economic. The utilities claim it cannot be done, that the technology is not available yet. There is where the dispute lies. It is not a matter of whether it costs too much. And as you say, maybe it should be decided by some outside body of scientists. But there is a real disagreement between the entire power industry and a Government agency on this very important subject, because if the EPA is right then you can shift back to coal without

affecting the environment, in a very short period. If the EPA is wrong, then we should pursue this to find the right method.

Well, you know, I am not an engineer, I am not an expert, but following this dispute I have been impressed by the fact that there are two groups of experts, the utility experts and the EPA experts who basically disagree on whether this is a useful process to reduce air pollution by using coal. And I think it should not be left there.

Representative BROWN. Again, I would think that is a problem that might be resolved in a technical sense by the Government, but it might also be by another arm of the Government other than EPA. But it might also resolve itself economically if the price of oil gets so high that the sulfur content coal can, in effect, be desulfurized and the particulate matter removed.

Mr. CROLY. I do not want to interrupt you, but you said 3 to 5 years. Could you give me some reason for that figure, or some analysis of why you said 3 to 5 years?

Mr. CROLY. Yes. I was just in the process of locating it in yesterday's Journal of Commerce, a very fine article entitled "Coal Could Offset Loss of Arab Oil," and Mr. Donald Cook has made some very interesting remarks which might well be reviewed by your staff as to the time frame. He said in $3\frac{1}{2}$ years the coal production of the United States could double, and this would be equivalent to $5\frac{1}{4}$ billion barrels of oil, and all of that sort of thing.

Representative BROWN. I wonder if you might supply that, or if you do not have it available, supply it to the staff and then, Mr. Chairman, if I do not ask the staff to supply it for the record.

Mr. CROLY. Surely.

[The following article was subsequently supplied for the record:]

[From the Journal of Commerce, Nov. 6, 1973]

COAL COULD OFFSET LOSS OF ARAB OIL

ACHIEVEMENT WOULD NECESSITATE CHANGE IN THE CLEAN AIR ACT

(By Sidney Fish)

Production of coal in the U.S. could be increased sufficiently in three years to completely offset the loss of Arabian oil imports, according to coal company executives.

This achievement would require legislation that would relax the provisions of the Clean Air Act, and would permit strip mining on land owned by the government in Montana, Idaho and Wyoming. In these states, coal reserves are very large, and coal seams under the ground are much thicker than in most eastern states.

Legislation requiring all major power plants and industrial facilities to switch to coal as their primary fuel was introduced last week by Senators Jackson, D-Wash., and Jennings Randolph, D-W. Va. The bill, called the National Coal Conversion Act of 1973, went immediately to the Senate Interior Committee, of which Senator Jackson is chairman.

Coal currently accounts for about 18 per cent of all the energy consumed in the U.S., while oil and gas account for around 75 per cent. Production of coal this year is estimated to be 595 million tons. An additional 166 million tons of coal would be needed to offset the Arabian oil imports, currently estimated at 2 million barrels a day. Each additional ton of coal produced would be the equivalent, in British thermal units, of 4.4 barrels of oil.

The electric utilities of the United States represent the largest single energy market, and the market which can most quickly be switched from oil to coal. Electric utilities consumed 25 per cent of all U.S. energy in 1970. By 1980, it is estimated that utilities will be consuming 32 per cent of all U.S. energy, if recent growth rates in the use of energy are maintained.

Ample coal is available under the ground to switch utilities and other fossil fuel users from oil to coal. But getting coal out of the ground in sufficient quantity will require many months, possibly as much as two or three years.

Under the Clean Air Act, utilities have been forced to increase their dependence on oil—in many cases on Arab oil which has a low sulfur content. Utility executives believe the United States can have clean air, and still allow utilities to burn coal with a sulfur content of at least 3 per cent.

Donald S. Cook, chairman of American Electric Power, says the United States, with one half of the world's coal reserves, has enough of this fuel to last at least 500 years.

"We should be able to double our production of coal in three years," Mr. Cook told *The Journal of Commerce*.

American Electric Power has capacity for 14½ million kilowatts of electricity a year. Of this AEP total, less than one million kilowatts is oil based, and the rest is all coal based.

"We examined the entire fuel situation," Mr. Cook said, "and we re-examined it. And we came back to coal. Not many people agreed with us. But we have enough coal to take care of our needs for hundreds of years."

Mr. Cook believes that with an all-out national effort, coal production of the U.S. could be doubled in about 3½ years. This would bring national output to nearly 1.2 billion tons a year. This would be the equivalent, in heating capacity, to 5.28 billion barrels of crude and would more than offset Arabian oil imports. At recent levels, Arabian oil imports were running at an annual rate of about 700 million barrels.

Prior to the Middle East crisis, oil imports were scheduled to rise sharply over the next two decades. It had been forecast that the U.S. would be importing 60 per cent of its oil by 1985. Not taking into account increased oil prices, which have been imposed by the Arabian countries, such a rise in oil imports would have increased the balance of payments deficit by \$25 to \$30 billion. Few economists knew how the United States would be able to foot the bill for such an enormous deficit.

The Middle East crisis, while imposing a temporary energy shortage, has shown how the United States can overcome its future balance of payments problem—by greatly increasing its production and use of domestic coal. Coal could actually become a much more important export commodity, by 1985, than it is today, when only 50 million tons are shipped overseas annually.

To achieve a quick response in coal output, Mr. Cook believes that the air quality laws should be changed. The latter should be based on the quality of the "ambient air," rather than on the quality of the air that goes up the smoke stack of the energy user, Mr. Cook said. The government should stop harassing coal mines, and should seek to end labor unrest at the mines, he said.

Most important of all, the oil-replacement program will require the opening of large new strip mines in Montana, Wyoming and Idaho, Mr. Cook said. The government is the largest owner of coal reserves in these states, and it should resume the policy of leasing these reserves to mining companies, he said.

Strip mining in the western plains is much different from strip mining in the mountainous areas of the Kentucky, Pennsylvania and West Virginia. The western coal runs in veins from 60 to 400 feet thick. Much of this coal has an overburden of only 20 to 30 feet. When this is stripped away, the thick seams can be mined with much greater productivity than the thin seams of the eastern mines. Wyoming has a strip mining law, administered by an environmental council, setting up revegetation standards, etc., to avoid the creation of permanently unsightly areas.

Representative Brown. The other thing I would like to ask you and we have a quorum call on and I will not be able to pursue it in detail, and maybe you can give me a quick answer now, and if not submit something for the record, and that is—and it is a complicated question, if you can follow me on it—given the impact of the balance-of-payments problem that we might have in the future as a result of our continued reliance on oil, what would be the equivalent or the loss to our economy of reducing our oil consumption, and thereby turning down the economic growth of this country, or at least slowing it down? What would be an equivalent investment in terms of public dollars to the

resolution of these technological problems of either sulfur, desulfurization of coal or the development of an alternative source for fuel from solar energy, or from turning the steam on to increase our effort in getting nuclear fuel sources that are economically and technically practicable and so forth? Can you give me an equivalent here that might see us developing national policy toward resolving our energy and dollar dependence abroad on sources abroad?

Mr. HANSON. I think that probably an economic case can be made for us is to reduce our dependence on foreign imports. Prices have risen and will continue to be sufficiently high abroad that the principal impediment to developing an improved self-sufficiency ratio, is less economic than it is public policy, regulatory and the like. In regard to developing synthetic fuels, there is a case to have a national synthetic fuels development corporation, along the lines of Mr. Croly's suggestion here, that it have representation from all three sectors—public, government, and industry not just to see that there are adequate economic incentives, but also to see that some of these other barriers, environmental and local regulatory, are removed. I do not know that it would be so much an economic handicap as one of establishing a critical path to get on with these alternatives.

Representative BROWN. I am not sure you understood my question. My question is that there is a terrific economic cost in terms of balance of payments to continue our reliance on oil. Now, how does that compare to making a terrific economic investment now in developing other energy sources, or making the reduction in our dependency on oil simply by cutting back our economic development which is going to provide a severe economic cross to our society also? Do you understand my question?

Mr. HANSON. I was merely trying to suggest that we would probably have less economic resources committed to developing our own indigenous energy endowment than continuing to pay for increasingly costly energy imports.

Mr. CROLY. Congressman Brown, I do not see how we can avoid doing some of the things that you suggest, implementing a national policy on development of synthetic fuels, for instance. Of course, a lot of people get into a quality of life discussion, that sort of the philosophical thing, but unless we want to go back to riding bicycles, and much lower energy output per citizen—of course, we have by far the highest energy consumption of any people in the world, and unless we, as a matter of national policy, want to cut that scale of living back, it is absolutely essential that we develop programs such as you suggest for a great many reasons. Military security alone might justify it.

But, I would estimate that the recovery might be on the order of 10 to 1 over in terms of cost.

Chairman REUSS. Thank you very much, Congressman Brown.

Representative BROWN. I will be happy to have you address yourself to that in written form if you would like to.

Thank you, Mr. Chairman.

Chairman REUSS. We will have a number of additional technical questions which we will present you with, and then when you correct your testimony if you could take a stab at answering them? You have given us a remarkable morning, and I congratulate each one of you on

the very real contribution you have made. I share Congressman Widnall's hope that this Princeton Laboratory will get on with its development of solar energy, and if we can make it by 1975 that would be fine with me. And I will give them a certificate of appreciation. But I do not think that you gentlemen will have to get ready for an early retirement.

Thank you very much.

We stand in recess until 10 o'clock tomorrow morning in room S-407.

[Whereupon, at 12:10 p.m., the subcommittee recessed, to reconvene at 10 a.m., Thursday, November 8, 1973.]

[The following information was subsequently supplied for the record:]

RESPONSE OF WILLIAM G. CROLY TO ADDITIONAL WRITTEN QUESTIONS POSED BY
CHAIRMAN REUSS AND REPRESENTATIVE BROWN

Question 1. In noting the recent price increases, you imply that producing company profits will be held *fixed* at a rate of 35-50 cents per barrel. I assume that although this does not provide companies with the "windfall" profits previously earned on Persian Gulf oil, that this still leaves their operations viable? Do you agree with the Commerce Department's assumption in its balance-of-payments study that U.S. companies will continue to earn service royalties at about one half present profit rates in cases where their operations are nationalized?

Answer. I have implied that producing company profits will be held at around 35-50 cents per barrel because various OPEC spokesmen have discussed this figure as being the maximum amount oil companies are entitled to. I think that the producing countries feel anything more than this amount is unjust enrichment to the oil companies involved, notwithstanding the fact that the countries may be taking as "rent" as much as \$6/barrel. As for "windfall" profits to oil companies, I do not really think that to date, aside from one or two isolated instances, that U.S. oil companies have made exaggerated profits overseas. The bulk of their profits exists because of their "tax credits" from other countries' taxation so that they do not have to pay as high a corporate tax here as otherwise would be the case. I think it is most important to realize that it is U.S. taxpayers in effect subsidizing the old 27½% depletion allowance in domestic production that financed oil exploration in Arab countries so that in one way, most of the overseas oil production was found and developed by U.S. tax dollars.

I think the Department of Commerce is probably correct in saying that U.S. companies will earn about one half present profit rates to service nationalized oilfields.

Question 2. Can you explain the \$21/barrel crude cost you cite? Do you think there is any limit to price OPEC countries can and will demand? At what price will there be a supply response, i.e., more vigorous search for oil worldwide and/or development of alternative sources of supply?

Answer. The \$21 figure is not my estimate of future prices, but I have stated merely that with crude oil costs at \$21/barrel, the following product prices would emerge:

Gasoline	\$1.00 per gallon (incl. 11¢ taxes)
Distillate	\$0.60 per gallon
Fuel Oil	\$10.00 per barrel (0.5% sulfur)

I have no way of knowing whether crude oil prices will reach that figure or not, although in some instances they have reached \$17 or \$18 per barrel c.i.f. already (Nigerian and Libyan crude).

To demonstrate how the foregoing product prices would result from \$21/barrel crude oil would require a minor treatise in refinery, distribution and retailing economics. If the Committee desires this sort of exposition, I would undertake to at least make a summary of such economics.

As to the price OPEC countries can and will demand, it would appear that at present currency values and cost of living indices in industrialized countries that the OPEC countries have perhaps reached the limit that can or will be paid for oil. For example, if, as widely predicted, the Japanese run out of foreign ex-

change to pay for oil before 1975, I do not think that the Western World will permit such an economic catastrophe to occur and that the upper price limit of oil is about that price where people would just as soon fight and die as to linger and die. Of course, peace is the most important international issue, but I don't suppose peace will last if the world is thrown into a great depression because a group of six million unarmed people, i.e. Saudi Arabia, Kuwait and the United Arab Emirates, have jacked the price of oil to an outrageous level. I realize the Iranians, Venezuelans and others have followed or moved in conjunction with these Persian Gulf countries, but the upper price limit is a political or military one, not an economic one.

You have asked at what price will a more vigorous search for oil commence. At each price increase, more marginally profitable production situations are developed. In today's WALL STREET JOURNAL (1/4/74), for example, there is an article discussing at what price level of crude oil does shale oil development become economically feasible.

There is no doubt, however, that many oil production situations are now being developed that two years ago were absolutely shunned.

Question 3. You have requested that I address myself to Congressman Brown's question concerning investment costs required for desulfurization of coal, development of solar energy resources, and nuclear fuel sources.

Answer. I am not qualified to make that estimate (other than I estimated that the return would be better than 10:1 in terms of dollars), because neither cost of these projects nor energy costs have settled down enough to develop meaningful investment figures. We all know, however, that this investment must proceed at virtually any cost if we are to survive as the foremost nation in the Western World. The United States simply cannot afford to neglect any longer this most important question—from where will the energy to run this country's economy originate?

ENERGY IMPORTS AND THE U.S. BALANCE OF PAYMENTS

THURSDAY, NOVEMBER 8, 1973

CONGRESS OF THE UNITED STATES,
SUBCOMMITTEE ON INTERNATIONAL ECONOMICS
OF THE JOINT ECONOMIC COMMITTEE,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10:05 a.m., in room S-407, the Capitol, Hon. Henry S. Reuss (chairman of the subcommittee) presiding.

Present: Representative Reuss.

Also present: William A. Cox, Sarah Jackson, and John R. Karlik, professional staff members; Walter B. Laessig, minority counsel; and Michael J. Runde, administrative assistant.

OPENING STATEMENT OF CHAIRMAN REUSS

Chairman REUSS. Good morning. The International Economics Subcommittee will be in order for a continuation of hearings on oil imports and our balance of payments.

Yesterday we focused on the prospects for oil supply and likely prices through 1980. We had some sobering testimony. The United States has almost no control over world crude oil prices and can expect little relief from soaring prices. The burden on our balance of payments of increased oil import costs, however, may be greatest in the near term, in the 1975 period, because among other reasons there are going to be shortages in refinery capacity that cannot very quickly be rectified. This means that by, say, 1976, our bicentennial year, the U.S. trade position once again will be drenched in red.

The witnesses also said that unless adequate measures were undertaken now, to develop alternative sources of supply and particularly to curb excess demand the situation in the long run will be no better.

In today's hearings we shall be focusing on the U.S. demand for oil imports given the sharp rise in world prices. The latest increase by oil producers on the Persian Gulf raised the cost of foreign oil delivered here significantly above domestic crude prices. In the light of yesterday's testimony it is in order that we consider the range of options which we have domestically both on the supply and demand side.

We are happy to have with us today Mr. Hendrik Houthakker, of Harvard, who is a veteran witness before this committee and has shared with us his great wisdom and learning over the years. He is accompanied by Philip Verleger, of Data Resources, Inc.

We are also pleased to have with us Mr. Joel Darmstadter and Mr. Milton Searl, of Resources for the Future.

Thank you very much for preparing the very helpful prepared statements which you have presented to us, which, under the rule, without objection, will be received in full into the record.

We would now like to hear first from Mr. Darmstadter.

**STATEMENT OF JOEL DARMSTADTER AND MILTON F. SEARL,
RESOURCES FOR THE FUTURE, INC.**

Mr. DARMSTADTER. Perhaps you would allow Mr. Searl to summarize our prepared statement at this point of the hearing. Then, we will be both glad to join in any subsequent discussion.

Chairman REUSS. Fine.

Mr. SEARL. Mr. Chairman, ladies and gentlemen, energy consumption in the United States has continued to grow steadily and strongly upward in recent years. Concurrently, domestic output of oil and gas has leveled off in the wake of declining exploration and development of new reserves; coal has encountered major restrictions in its use; and nuclear power has failed to develop at the rate foreseen a few years ago.

Greatly increased imports of oil have been necessary to balance the emerging energy deficit. The pressure on oil supplies has been intensified by a market acceleration of demand in the transport sector, which accounts for 25 percent of nationwide use; and by a rapid shift from coal to residual fuel oil by electric utilities whose total consumption represents another 25 percent of U.S. energy use. East coast power stations have become disproportionately dependent on foreign oil.

Until the past year or two, real energy prices in the United States declined. By international standards, prevailing energy prices are still low in the United States. Conversely, per capita energy use relative to per capita income is extremely high in comparison with numerous other industrial countries. Although real energy prices may rise sharply in the years ahead, in the short run, a greater reliance than now on market forces cannot bring about the desired demand/supply balance; for example, there is no substitutability for natural gas in homes equipped for gas heat and no significant alternative to private car usage. Higher prices may, however, help curtail consumption and perhaps reduce the allocation problem even if they cannot bring about a balancing in the short run. Similarly, higher producer prices can evoke significant increase in producible supplies only after an interval of, say 3 to 5 years. But even in the short run, they can slow the decline of existing production by maintaining facilities in operation and perhaps accelerating completion of some production operations already underway.

The standard representation of U.S. energy demand-supply balances to 1985 shows overall fuel and power consumption continuing to grow at 4 percent or more per year, a sustained plateau in domestic output capability in oil and gas, and oil imports amounting to possibly as much as 50 to 60 percent of U.S. oil consumption—two-thirds of these imports having to come from the Middle East and North Africa.

This is a scenario which discounts the potentiality for dampening demand growth and which precludes, as well, the initiation of policies designed to substantially increase this Nation's indigenous energy-producing capability. In our judgment, we are not inexorably locked into such a scenario.

On the demand side, it is true that perhaps only modest energy "savings" are feasible in the short run. The initiation of vigorous and sustained energy conservation efforts, which can begin to have significant results after a lapse of years, seems to us a most desirable course on which to embark. Transport and buildings are priority candidates for more efficient energy usage.

Appropriate as a policy of demand restraint may be, in order to achieve a more balanced long-term demand/supply situation, it is at least as urgent that we bring into play a forceful set of measures addressed to supply expansion in the United States.

We have recently completed the first draft of a major study, the principal objective of which was to examine the resource, economic, and environmental feasibility of moving the United States back to a position of relative self-sufficiency by 1985, and to maintain that position until the year 2000. Our conclusions follow:

From the standpoint of undeveloped resources in the ground, there is little question but what they are adequate to support any level of production the Nation might desire in 1985. This conclusion applies separately to natural gas, to crude oil, to coal, and to uranium. The uncertainty increases as one attempts to look further into the future, however, as far as crude oil and natural gas is concerned, probability is high that resources of each are adequate to support increasing production for several decades after 1985.

If we consider coal and oil shale, the total resources are so large compared to current and prospective consumption rates that resource depletion can hardly be considered a significant factor in production decisions for the next few decades. This is not to deny that there are serious environmental problems in connection with both coal and oil shale, perhaps so serious that we would prefer to accommodate ourselves to substantially less energy than to use these resources on a significant scale.

Considering both that our undeveloped resources of oil and natural gas are believed to be large and that resources of oil shale and coal, which are known to be large, can be converted into oil and gas, there should be little concern about the extent to which our resources are being exhausted.

The cost at which future production will be available is quite uncertain and depends significantly on Government tax and leasing policies. It appears likely that the Nation can produce 16 million barrels per day of liquid fuels in 1985. This production plus 4 million barrels per day of imports could meet our needs on what we would regard a reasonably secure basis.

The 20 million barrels per day total is not far above the present consumption level of 17 million barrels per day and implies a shift away from oil to gas. The projected range of prices for this volume of output in 1985 in constant dollars is from \$4 to \$7 per barrel. A special analysis made for our study indicates a price of about \$5.70 per barrel in 1985 but the methodology is new and we are not sure how much confidence to place in the calculations.

A major finding is that the Nation should go for a policy of major increases in natural gas output. From both an economic and an environmental standpoint, this appears the way to go. It appears that domestic natural gas production might increase by about 50 percent

by 1985, rising to about 33 trillion cubic feet. This would take much of the pressure off of oil. Our expectations are that this gas could be available, given favorable Federal policies, at prices of from 60 to 70 cents per 1,000 cubic feet. This is a tripling in natural gas prices at the wellhead—even so, natural gas at the wellhead in 1985 would be no more expensive on an energy content basis than crude oil is today.

If we are to be, say, 80 percent self-sufficient in oil and natural gas in 1985, coal and nuclear power will have to make major contributions. Production of coal will need to increase about 50 percent. The output of nuclear powerplants will need to increase by a factor of about 15, implying an installed capacity growing from around 20,000 megawatts, to say, 120,000 in 1980 to 280,000 megawatts in 1985.

It does not appear that the new technologies such as oil shale and coal gasification and liquefaction—not to mention the more distant possibilities of solar power, geothermal power, the breeder reactor, and nuclear fusion—will play much of a role by 1985. However, from an economic and resource standpoint, oil shale, providing it can gain adequate policy support, appears to be in the best position among these sources to make a major contribution to the Nation's energy supply in the next 15 years.

Although the press of the immediate crisis is uppermost in our thinking and while R. & D. may solve our more distant problems, there is an imperative need to deal with the intermediate 5- to 10-year term. Otherwise, we will be going from one ad hoc solution to another and in the process make policies even more disruptive in international consequences than we are presently witnessing.

Thank you.

Chairman REUSS. Thank you.

[The joint prepared statement of Mr. Darmstadter and Mr. Searl follows:]

JOINT PREPARED STATEMENT OF JOEL DARMSTADTER AND MILTON F. SEARL¹

THE OUTLOOK FOR U.S. ENERGY DEMAND AND SUPPLY

In assessing the balance-of-payments implications of greatly increased U.S. energy imports, the Subcommittee is tackling an issue of immense importance, yet one of limited public knowledge and understanding. While a proliferating series of private and governmental studies have dealt in depth with various other aspects of the U.S. energy dilemma, the international trade and finance side of the problem has been, at best, quite crudely explored. We therefore think the Subcommittee's initiative in this undertaking is most timely.

Our own contribution covers some necessary background information on alternative U.S. energy demand-supply prospects, for it is within the context of such alternatives that the balance-of-payments outlook must be viewed.

Within just a few years, Americans have been compelled to ponder what must surely seem like a novel turn of events: our traditional ability to furnish abundant, cheap energy—largely from domestic sources and unencumbered by "environmental constraints"—has been seriously questioned. A leveling out in net additions to domestic gas and oil reserves has forced us to turn increasingly to overseas fuel supplies—a trend compounded by growing environmental restrictions on the use of coal, the country's most abundant conventional energy source. This increased reliance on imports coincides with suddenly heightened bargaining power on the part of the petroleum exporting nations, raising the prospect of increasingly stiff terms for imported energy.

Environmental issues have been a factor impeding offshore oil leasing, power plant siting, and electricity generation, particularly for nuclear facilities, whose

¹ Views expressed are those of the authors and not Resources for the Future.

problems have been intensified by technical difficulties. For this and other reasons, energy costs and prices are under upward pressure. For example, electric power shows every indication of reversing its long-term historical trend toward falling real and absolute prices. Similar prospects hold for gasoline and probably other petroleum products. As noted below, however, even higher prices may not bring about equilibrating demand-supply adjustments quickly.

The nub of the problem, as already indicated, is clear enough: this nation's aggregate consumption of energy resources has in recent years continued to grow very rapidly, so much so that the progressively declining relationship between energy growth and GNP growth which has characterized the past quarter century appears—for the moment, at least—to have turned around. At the same time, the leveling off in domestic output of oil and gas, and restrictions against the use of high-sulfur coal, have led—necessarily—to rapidly rising imports, largely of crude and refined petroleum.

To judge the prospective foreign component of future U.S. energy supplies, we need to note that oil accounts for around 40 percent of U.S. energy consumption and, together with gas, currently makes up nearly four-fifths of nationwide energy use. Supply and demand factors have both contributed to the suddenly heightened degree of import dependence. While domestic production of oil and gas have both flattened out (in the wake of declining levels of exploration and development and consequent declining reserve levels), demand for oil—the balancing energy source in times of stringency—has accelerated. For example, oil has rapidly supplanted coal as a power plant fuel. If coal had provided the same share of electric generating fuels in 1972 as in the mid-1960s, 1.1 million barrels of oil per day would have been "saved"—some 7 percent of nationwide oil consumption or 23 percent of oil imports. But environmental restrictions against the use of coal foreclosed that possibility.

We have also witnessed a burgeoning demand for motor gasoline. This demand rose at 2.8 percent yearly between 1960-65. In recent years it has accelerated to more than twice that rate. Continuation of the 1960-65 growth rate would have "freed" another 630 thousand barrels of oil per day in 1972—another 4 percent of U.S. oil consumption or 13 percent of oil imports. Decreasing automotive efficiency stemming from pollution control devices are supposed to have been one of the key factors in this development. Of course, depending on where in history you begin, the higher gasoline requirements of large-horsepower cars are certainly a reason for the high level (if not the recent growth rate) of U.S. oil consumption.

One could add to these examples still other factors contributing to the tight oil situation. A halt to the expansion of U.S. natural gas output may have added to oil demand to the tune of 1½ million barrels per day. At the same time, the availability of some oil from the North Slope and Santa Barbara Channel, not to mention expanded offshore leasing in general, could have contributed, say, 2 million barrels per day. Moreover, the development of these areas would undoubtedly have stimulated additional exploration and development. All told, various combinations of these hypothetical cases could have greatly diminished the level of import dependence we are now experiencing. Without impugning the merit of environmental constraints or undertaking a critical dissection of regulatory policies (such as federal control over natural gas prices), both of these have clearly exerted marked impact in the current dilemma.

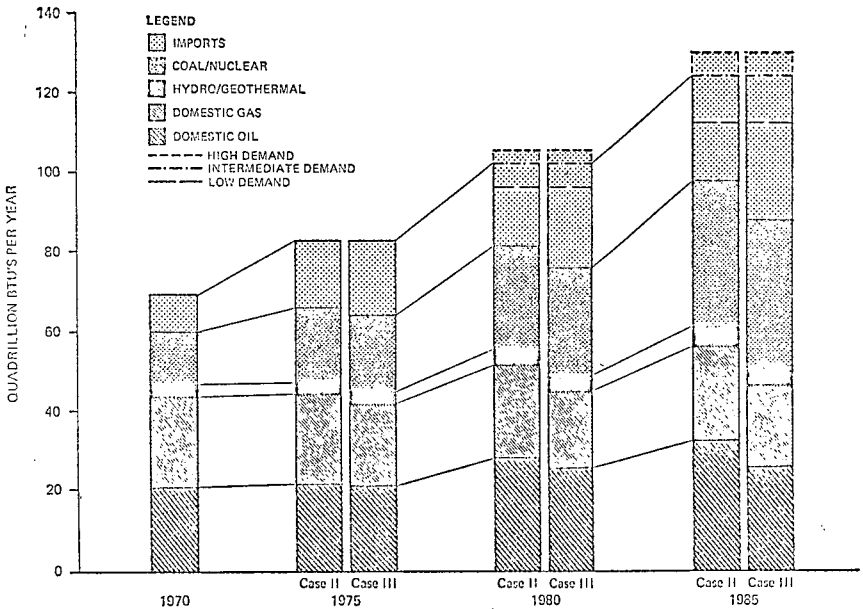
The ability, through market adjustments, to cope with these problems in the short run is limited for one reason or another. In the case of natural gas for space and process heat, for example, it is not easy to quickly switch to substitute energy forms; nor, within the existing regulatory system, are prices permitted to bring about quick allocative adjustments. Even where the price of an energy commodity rises substantially—as is now the case with gasoline—substitutes are not smoothly obtainable, demand restraint is not assured, and productive capacity (in this case refineries) is not rapidly expandable. In other words, conventional economic forces—although an important, and probably increasingly necessary, element in the longer-term energy situation—cannot be looked at as too expeditious a means of overcoming current problems. However, each year that we delay allowing conventional economic forces to begin to operate likely means another year of ad hoc measures to contain demand.

Thus, given these demand-supply developments, and the associated policy framework into which they fit, foreign sources of energy supply have suddenly begun to loom as a major factor on the U.S. scene. The immediate postwar years marked the transition of the nation's energy position from a net exporter to a net importer, and the net import share has risen steadily since. In the case of

oil alone, the country depended upon overseas sources for around 30 percent of our oil in 1972. The 1973 figure may be 35 percent or more.

Most recent attempts to scan the future energy-demand supply situation in the United States have concluded that the relative U.S. dependence on imported oil seems likely to continue rising for years to come. A recently completed comprehensive report by the National Petroleum Council analyzed a variety of U.S. demand-supply "scenarios" up to 1985. Total energy consumption is projected to increase at annual growth rates ranging from around 3½ to 4½ percent to 1985, with a most likely "intermediate" demand case at a 4.2 percent growth rate. As against its essentially single-minded concern with this "intermediate" demand case, the NPC examined a variety of alternative supply possibilities, ranging from pessimism to optimism as to domestic output capability.

Two intermediate supply evaluations (see chart) yield figures on oil import dependency in 1985 ranging from 38-53 percent, or 9 to 14 million barrels/day. A major portion—perhaps two thirds—of these imports would have to come from the Middle East and North Africa. Hence, the frequent references to a possible annual U.S. oil import bill in the tens of billions of dollars by the 1980s. To the extent that these estimates were correct when made, the prospects are now that they are too low as a result of the October 1973 price increases in the Middle East, Venezuela, and Canada.



Energy Supply and Consumption, Cases II and III.

Source: National Petroleum Council, *U.S. Energy Outlook*, Final Report (December 1972), p. 28.

It is important to underscore the fact that such a projection flows directly from certain implicit or explicit assumptions: growth in energy demand and compositional shifts in energy sources and forms not unlike those of recent years; minimal contribution from synthetics; some real price increases are expected but these are assumed neither to significantly dampen demand growth nor to stimulate domestic output to levels sufficient to keep imports below the 38-53 percent range indicated in the NPC's intermediate supply cases.

The state of affairs foreseen for the 1980s has prompted debate on three alternative policy directions for the future. These center on (1) the possibility of solving these prospective shortfalls by restraints in energy demand; (2) the possibility, implicit in the NPC's intermediate supply cases, of greatly heightened import dependence and its implications; and (3) the possibility for sub-

stantially increasing the availability of domestic energy supplies. It seems a reasonable judgment that no option is sufficiently tidy to yield unequivocal and totally preclusive answers. However, the third line of development deserves serious attention. We will revert to that in a moment, after first talking briefly about the other two avenues that some believe are open to us—conservation and/or more imports.

On the question of curtailment in U.S. energy consumption, one can point to diverse sectors of the economy where, in principle, substantial savings in energy use are possible—e.g., in transportation (through smaller cars, increased use of public transport, and more car pooling); and in space heating (through improved insulation). Moreover, practices towards energy conservation eventually yield monetary savings, and—though the point is arguable—frequently will do so without significant intrusion into perceived standards of well-being. At projected levels of U.S. energy consumption in 1980, the Office of Emergency Preparedness (in a 1972 study) calculated theoretical energy savings possibilities equivalent to 7.3 million barrels per day oil equivalent, equal to a major portion of prospective oil imports foreseen for that period. Such savings would have the effect of reducing the U.S. energy consumption growth rate by one-half percentage point—from, say, 4 percent a year to 3½ percent.

Few would question the desirability and importance of bringing about savings in energy use, for these could contribute to both improving the environment and easing resource stringency. The question is: how can they be brought about? No doubt, the market mechanism—higher consumer prices for fuels and power—can and will contribute, perhaps to a greater extent than the NPC acknowledges in its analysis. Because of historically low energy prices, past emphasis has been on holding down investment costs for energy-using equipment rather than on fuel efficiency.

That is, historical real energy prices have been very low, and fuels and power are normally utilized by capital-intensive equipment—e.g., cars, furnaces, air conditioners. The low cost of energy has prompted most consumers to try and hold down the investment cost of energy-consuming equipment. Consequently, there has been little impetus to design equipment for more efficient use of fuel at somewhat higher first cost. This past emphasis on investment costs rather than fuel efficiency almost certainly means that as energy prices rise and as we look more carefully at energy consumption there will be much that can be done to reduce energy consumption on a sound economic basis without seriously interfering with the functional use of the energy. Numerous examples of this have already been identified by those studying means to conserve energy.

Beyond the price-induced route, a variety of purposeful measures to limit demand have been suggested: horsepower taxes on new cars, building insulation standards, and so on. These deserve serious attention. There remains, however, the inevitable time delay before such measures can have visible effect. For example, even if all new residential buildings in the United States were insulated in the most ideal way, this would cover only around 2 percent per year of the nation's housing, and thus would, for some years into the future, contribute only sparingly to reduced energy use in space heating. Because of the lower life span of cars, improvements in the automotive sector might proceed somewhat faster. What follows from this is that energy conservation measures should reinforce, but cannot supplant the focus that should also be accorded other ways of steering a sensible course in our energy demand-supply policies in the next few years.

The consequences of high-import dependence—another conceivable option for the future—figure as a major topic at the hearings of the Subcommittee, so our remarks on that will be brief. Other witnesses will no doubt note that a greatly enlarged flow of Middle Eastern oil to the United States would occur alongside expanding flows to other consuming nations which are already heavily dependent upon the area's petroleum—principally Western Europe and Japan. From a purely physical standpoint, and apart from any political and monetary disruption, the Middle East region as a whole, along with areas of lesser reserve holdings, seems likely to be able to accommodate demands made for their oil during the next decade or two. It is the two sets of qualifiers—"region as a whole" and "political and monetary disruption"—which cause concern. Even though the Middle East and North African countries may, in their entirety, be judged capable of meeting future oil demands from consuming countries, it is important to consider the extent to which that overall capability may be sensitive to the actions of individual countries. It has recently been pointed out how production in any one of six Middle East-North African countries, along with Venezuela, now exceeds combined spare producing capacity in the rest of the

world. That is, unless offset by increased output by the other six, or by the creation of spare capacity elsewhere, the loss of output from one of these seven countries could cause at least a significant short-term oil shortage in the world.

One must, in addition, assess the implication of huge and rapidly growing monetary flows going to the oil-exporting countries—particularly to the extent that they are perceived by these countries as not being productively investible within their economies.

We do not suggest that any of these problems cannot be rationally managed. But this would require that the attitudes and motivations of the producer and consumer nations move along mutually beneficial and constructive lines. You must concede that the new developments to which we have referred do at least raise a variety of complex economic, political, and strategic issues of major international significance with which we may or may not be successful in coping. Coupled with apprehension over U.S. balance-of-payments impacts of greatly increased oil imports into this country, this justifies a look at U.S. supply expansion as a feasible alternative to, or at least moderating element in, this picture, especially since *some* expansion in imports is inevitable. This is what we turn to last.

Our primary focus here will be on domestic supply options through 1985 rather than on the immediate future (with its own, unique set of problems) or the very long term. We are reporting here on tentative judgments flowing from a current research project at Resources for the Future, which is being done on behalf of the Ford Foundation's Energy Policy Project.

The supply analysis confirms the view that present shortages of domestically produced energy are not the result of any shortage of undeveloped resources in the ground. The nation simply has not followed policies conducive to the development of domestic supply in the last fifteen to twenty years. Certain policies, for example import controls and special tax provisions, were supposed to stimulate domestic supply and no doubt they did have some effect. However, it takes a consistent package of policies to bring about increased supply and in the last fifteen years the incentive of a favorable rate of return has been missing from the package. Oil and natural gas prices have been directly and indirectly kept too low. Oil and gas producers found it more profitable to invest abroad, in real estate, petrochemicals or various other activities. Indeed, the domestic oil producing industry has actually been liquidating its assets. The drilling of oil and gas wells has lagged. In 1956, the postwar peak year, the industry drilled over 57,000 wells. Last year only 29,000 wells were drilled—we are now almost back to the 1946 level of well drilling. This can hardly be said to be a vigorous program of developing domestic capacity.

There are indications that the situation is improving. Crude oil prices which in constant dollars have declined almost continuously since 1957 are turning around. Natural gas prices are beginning to increase although natural gas, a premium fuel, in 1972 was priced at 20 cents per million Btu at the wellhead while oil was selling at 60 cents. However, natural gas prices in particular and oil prices to some extent are still subject to the hazards of regulatory, judicial, and political processes.

Various estimates of the amount of oil and gas remaining to be found, developed, and produced exist. We believe that industry estimates such as those made in the National Petroleum Council Future Petroleum Provinces report and in the reports of the Potential Gas Committee underestimate the magnitude of the resources available to the nation. Be that as it may, there does not seem to be any serious question about the adequacy of our resources of oil and gas to support any desired degree of self sufficiency in energy during the next few decades. Finding, developing, and producing those resources will, of course, be a monumental task. As yet there is no assurance that the nation will decide to undertake the task.

Coal resources are undeniably large, although increased utilization of coal is hampered by serious environmental problems in both production and utilization. Resources of low-cost uranium may well be much larger than we have been led to believe by the Atomic Energy Commission figures. In any event uranium costs are such a small portion of the cost of nuclear power that the need to go to higher-cost uranium resources would not be economically disastrous.

It does not appear that such new technologies as coal gasification, coal liquefaction, the breeder reactor, solar energy, geothermal energy, or fusion energy will make a major contribution to commercial energy supplies before the 1990's at the earliest. For the great bulk of domestic production we will have to continue

to depend on oil, natural gas, coal used as coal, and conventional reactor types—assuming their problems can be solved.

The new source and technology which is perhaps most likely to make a contribution to domestic supply in the next several decades is shale oil. Vast resources of oil shale are available in the United States to satisfy liquid fuel demands for a very long period of time. (High quality resources indeed are of the same order of magnitude as total proved oil reserves in the Middle East.) Production costs of oil from shale cannot be known with certainty because nothing even close to a commercial-scale plant has yet been built. However, based upon extrapolation of data from small experimental plants, it appears that oil could be produced in commercial plants at a cost of about \$4.50 to \$5 per barrel after the first two plants are built. However, the operators of the first two plants may require some subsidization to avoid financial loss. The \$4.50 to \$5 price would result in delivered prices at East Coast consuming centers of around \$5.50 to \$6.

This is a highly significant figure because, by reason of the very large resource base, it sets an upper limit on the long-run cost of liquid fuels in the United States. Even if resource grade were to decline somewhat, the resulting cost-increasing pressures would likely be offset by the cost-reducing effects of improvements in the technology of extracting and processing the materials. And the rate at which producing countries are increasing their per barrel income suggests that the cost to the United States of imported crude oil clearly is heading towards levels that would make shale oil competitive.

This is not to say that the United States is inevitably moving toward a massive commercial shale oil industry. Actually, crude oil and natural gas are likely to provide lower-cost means for enlarging domestic supply than would oil shale. Shale oil production, it should be noted, causes severe environmental problems. This may result in substantial delays in starting a commercial shale industry while ways are sought to overcome its environmental drawbacks—mainly, how to dispose of the spent rock. It is worth noting that this would be our third attempt to develop shale oil into a commercial source. The nation was on the verge of a shale oil industry in the 1920s and again after World War II. Each time, new supplies of crude oil dimmed shale's prospects. It could happen again.

Supply difficulties in natural gas have been a basic cause of the overall energy supply problems now being experienced in the United States. As gas supplies languished, other fuels, particularly oil, were diverted to markets that gas would otherwise have served, leading to supply shortfalls all along the line (abetted, to be sure, by supply restricting influences that were affecting other fuels). We must note, however, that gas continues to be greatly underpriced in the United States. U.S. government policies have severely limited the rise of gas prices producing a severe shortage aggravated by the stimulus to gas demand resulting from its attractive characteristics from an environmental standpoint.

Our analysis suggests that major expansion of natural gas output can within five to seven years begin to limit the rate of growth of oil consumption and thus decrease the extent of potential dependence on foreign oil. The costs of such gas, discussed below, will be regarded by some as scandalous. However, according to our calculations it still represents the nation's best buy from an environmental and economic standpoint.

Possibilities for a substantial expansion of crude oil output at costs below those of shale oil are also indicated in the RFF supply analysis. Thus, if RFF's tentative findings are correct, it would appear that growth of both crude oil and natural gas production could lead to an expanded domestic supply capability in the United States at costs below those of shale oil. Moreover, these prices might not be much, if at all, higher than current imported costs for Persian Gulf crude. However, if these expectations do not materialize, ample supplies of shale oil, at a somewhat higher price, eventually could be made available.

Although we have not attempted to cover the matter in our testimony here, we believe that it is important that comparisons of the cost of domestic and foreign energy supply, as well as comparisons among domestic sources of supply, take into consideration resource costs—that is, costs excluding transfer payments such as lease bonuses and taxes which do not themselves constitute a drain on the nation's material or labor resources. To the extent that transfer payments reflect such things as large economic rents or monopoly profits, policies designed to curb excesses may be in order.

In summary, although the period of low-cost energy is over, we are optimistic that long-term domestic energy prices need not increase nearly as sharply as sometimes predicted, given a favorable tax climate and moderate environmental requirements. Measured in constant 1972 dollars and given our tax and environ-

mental assumptions, our analysis indicates that the nation can produce 80 percent of its oil and natural gas requirements in 1985 at crude oil prices not higher than \$6 per barrel and at natural gas prices in the 60¢ to 70¢ per thousand cubic feet range. These prices, although twice the crude oil price and three times the natural gas price of a few years back, seem very low in light of current price quotations and the rate at which they seem to be increasing. In judging current price trends, it must be remembered that they represent a movement up the short-term supply curve having little relationship to long-term equilibrium prices.

Our price and quantity estimates should be taken as predictions of the future. While we believe that the nation's resource position is good and that the basic economics of expanded domestic output are acceptable, we are pessimistic about the nation adopting the policies necessary to lead to these results on the schedule we have assumed. Moreover, it must be realized that our projections, like all others, are subject to considerable uncertainty.

Chairman REUSS. Mr. Houthakker, please proceed.

STATEMENT OF HENDRIK S. HOUTHAKKER, PROFESSOR OF ECONOMICS, HARVARD UNIVERSITY, ACCOMPANIED BY PHILIP VERLEGER, DATA RESOURCES, INC.

Mr. HOUTHAKKER. Mr. Chairman, it is always an honor and a pleasure to appear before your subcommittee which has established a well-deserved reputation for careful and balanced appraisal of international monetary affairs.

Chairman REUSS. Why, thank you, sir.

Mr. HOUTHAKKER. These hearings are being held at a time when the energy situation is on everybody's mind and when there is widespread concern about its impact on the balance of payments. Unfortunately, they are also being held at a time when the situation is unusually difficult to analyze and when major decisions are pending.

The long-threatened interruption of oil supplies from the Arab countries has now become a reality, and we cannot say at the moment how long it will last. It is not yet clear either how much disruption of the world petroleum market this embargo actually will cause. Presumably there will be some substitution among different sources of crude oil, stimulated in large part by the large price increases posted by those exporters that continue to supply us. There can be little doubt, however, that the world petroleum market will never be the same again. The Arab embargo may well have reduced many of the projections that have been made to date to wastepaper, for it is unlikely that we shall place as much reliance on uncertain sources of supply as had been commonly assumed in these projections. I shall return to this subject later in my statement, but first I would like to sketch the general balance of payments background for the next several years as I see it.

This committee has followed the vicissitudes of our international transactions as closely as anybody, so there is no need for me to go back into the history of our balance of payments. Let me start, therefore, by expressing my conviction that our balance of payments has turned around and is likely to improve further in the next few years. This, of course, is mostly the result of the exchange rate alignment through which we have gone during the last 3½ years, starting with the Canadian float in 1970 and probably ending with the appreciation of the German mark and some other European currencies during the summer of this year. There will be further adjustments in exchange rates in the future, but the depreciation of the dollar appears to have

come to an end, and indeed may give way to some appreciation. The recent weakening of the Japanese yen appears to point in this direction. For purposes of projection, the pattern of exchange rates that emerged during the last several months can therefore be adopted as a working hypothesis.

About 6 months ago I made some projections of our balance of goods and services through 1980. This balance, which is common to the national accounts and the balance of payments statistics, includes merchandise trade, earnings from investment, transportation, tourism and some other current items. It is only a part of our overall balance, but a very important part, and one that for technical reasons can be analyzed more conveniently than most other balance of payments concepts. In these projections I assumed continued growth with some inflation in the United States and its major trading partners, together with approximate stability in exchange rates from then on. These projections are based on equations relating the demand for U.S. imports and exports of goods and services to income and relative prices. The effect of income and relative prices—which include the effect of exchange rates—is assumed to be spread out over time.

The projections for 1973 through 1980 are given in table I. Like all econometric projections they are subject to considerable error but I believe them to be a reasonable extrapolation from historical performance. Taken at face value they certainly do not warrant concern about balance of payment deficits during the remainder of this decade. From next year on we will be running large surpluses, indeed larger than we have ever run before. It is conceivable that these surpluses will be offset by unfavorable developments in other components of the balance of payments, but this does not seem likely. There are already signs, for instance, that long-term capital, which has been a major item in previous deficits, is now turning around. There may be outflows of short-term capital, but these will probably come to an end when the existing "overhang" is worked off. If the projections of the table are realized, therefore, an appreciation of the dollar over the coming years is almost inevitable.

[Table I follows:]

TABLE I.—PROJECTION OF U.S. EXPORTS AND IMPORTS OF GOODS AND SERVICES

(In billions of dollars)

Year	Quantity ¹		Value ²		Balance on goods and services ³
	Exports	Imports	Exports	Imports	
1973.....	66	62	94	94	0
1974.....	73	61	108	98	+10
1975.....	77	62	120	106	+14
1976.....	81	66	130	113	+17
1977.....	85	71	142	125	+17
1978.....	90	77	155	137	+18
1979.....	97	83	171	150	+21
1980.....	104	88	188	164	+24

¹ Value at 1958 prices.

² At current prices.

Mr. HOUTHAKKER. The projections are based on total U.S. imports and exports not on a breakdown by commodity group or area. It could therefore be objected that they do not take sufficient account of

our increasing dependence on imports of petroleum. I do not believe this objection to be valid, since our petroleum imports have been substantial and growing for a number of years. Consequently they are taken into account at least implicitly. Nevertheless, it is worth pointing out that even if increased petroleum imports are regarded as a new phenomenon, there is still plenty of room in our exports to accommodate them. The National Petroleum Council, for instance, has suggested that net energy imports in 1980 may be about \$20 billion, still less than the surplus I projected.

The question is frequently raised, "How are we going to pay for our energy imports?" The answer from table I is that the demand for exports is likely to grow fast enough to provide the necessary foreign currency. If this turns out not the case the dollar will have to go down somewhat more, but I consider this highly unlikely. Moreover, as we know from the Commerce Department study made available to this committee, there are a number of offsets to the gross value of petroleum imports, which would by themselves reduce the balance-of-payments drain significantly.

It also appears from recent data that the projections I made 6 months ago are already turning out to be conservative. For the whole of 1973 we are likely to have a surplus on goods and services of between \$3 and \$5 billion, instead of the zero balance projected here. This is partly the result of abnormally large agricultural exports at abnormally high prices, but other components of our exports are also showing satisfactory growth. Yet, it is almost certain that the full effect of the devaluation of 1973 has not yet been seen, so we have not simply borrowed exports from subsequent years. In fact, the improvement in our trade balance is attributable to a marked slowdown in imports as well as to the rapid growth of exports.

As far as the balance of payments is concerned, therefore, there is no need to worry about the energy problem. The widespread concern on this score appears to be based on unduly pessimistic notions concerning the potential for our exports. In any case, it might be said that the balance of payments is not one of the more important criteria by which economic developments should be judged. Vastly more important is the effect of the energy situation on our overall output and the general price level. Under a contract with the Ford Foundation, my colleague Dale Jorgenson, our collaborator Mr. Verleger and I have been working on models which could clarify this impact. Our results are not yet available for circulation, but I can go so far as to say that on the whole they are reassuring. While there are likely to be some temporary dislocations due to energy shortages during the next few years, in the longer run our growth prospects do not appear to be significantly affected by deficiencies in domestic energy supplies. It does not appear either that higher energy prices, which appear to be inevitable for the next few years, will be a major inflationary factor. For both these aspects it is important to realize that the demand for energy shows considerable price elasticity as does its supply. In other words, as the price goes up production increases and consumption falls short of its normal growth. Many of the projections that are currently circulating, including the National Petroleum Council projection just mentioned, do not adequately take account of these facts, and thus tend to overestimate the future demand for energy.

On the demand side we have made detailed studies of two of the principal forms in which energy is consumed; namely, gasoline and residential electric power. For both of these we find that the price elasticity of demand in the long run is around three-fourths, which is to say that a 10-percent increase in price reduces consumption by somewhere between 5 and 10 percent after a few adjustment years have passed. In the case of gasoline the adjustment period appears to be not more than 2 or 3 years, for electric power it is rather longer. We have already had considerable increases in gasoline prices and these are probably already depressing gasoline consumption below its normal growth path. Further reductions in consumption could be achieved by imposing an additional excise tax on gasoline, or some form of tax on electric power. Let me make it clear, though, that I am not advocating such measures at the present time since they also have macroeconomic effects which I have not adequately analyzed. By way of illustration let me mention that according to our calculations the imposition of an additional 7½-cent excise tax on gasoline on July 1, 1973, would have reduced consumption in 1975 by about 7 percent, thus keeping it at the 1973 level.

Unfortunately, we do not know as much about the response of supply to price increase, although earlier studies have indicated that the response is substantial after an appropriate period of time. Some studies suggest that the longrun elasticity of supply of petroleum may be as high as 1, which would mean that a 10-percent increase in the crude price would increase domestic production by 10 percent. The main difficulty in applying such an elasticity is that crude prices are already at a level outside the range of historical observation, so that we cannot extrapolate with much confidence. Again by way of illustration, let me consider a longrun supply elasticity of 1 in conjunction with what we know or can guess about demand elasticities and about the growth of the economy generally. It turns out that under these assumptions, and postulating a \$3 royalty per barrel on Persian Gulf crude, the United States could be self-sufficient in petroleum in 1980¹ at a crude price of somewhat less than \$5 per barrel and a daily consumption of 15.47 million barrels, somewhat less than the 1973 level. This calculation, for which I am indebted to my collaborator Mr. Michael Kennedy, who is working on a model of the world petroleum market, does not assume any synthetic production from oil shale, although it does assume that the Alaska pipeline is operating. The additional U.S. production would presumably come from new fields both onshore and offshore, deeper wells in existing fields, and increases in secondary and tertiary recovery, all of which would be encouraged by the higher price. An alternative calculation with the same demand elasticities but assuming there is no increase in crude production outside of the Persian Gulf—where a \$3 royalty is charged—as before suggests that U.S. consumption would fall to 14 million barrels per day; our imports under these assumptions would be only \$3.2 billion.

It is too early to say whether these are realistic projections. They do suggest, however, that in energy prices the sky is not the limit, given sufficient time to make the necessary adjustments in supply and

¹ Subsequent review has indicated these numbers apply to 1978 rather than to 1980; see the letter from Mr. Houthakker, dated Dec. 7, 1973, beginning on p. 125.

demand. We are not irrevocably committed to increasing dependence on foreign energy sources, whether they be in the Persian Gulf, in Venezuela, or even in Canada. Consequently we do not have to accept whatever prices our suppliers see fit to charge. Let me make it clear, however, that I am not advocating self-sufficiency: A domestic price of \$5 per barrel is still very high compared to prices abroad, or rather costs abroad. What I am saying is that the potential for self-sufficiency puts a constraint on our import prices.

In the short run, supply and demand elasticities are small and it is therefore possible for exporters to raise the price substantially without immediately causing a large reduction in consumption or a large increase in U.S. production. In the short run, too, an interruption of supply such as the embargo now enforced by the Arab exporters can cause a certain amount of dislocation. After a few years, however, supply and demand do adjust to the new situation and this puts a limit both on the price that exporters can exact and on the harm they can do by withholding supplies.

We can have confidence that a combination of patience and a reasonably free market will tide us over most of the problems we now face in the energy area. To deal with the immediate problem, however, government action is also needed. The existence of price controls adds greatly to the existing difficulties. To obtain more domestic crude, we may have to allow the domestic crude price to rise further, and to curtail consumption price rises in petroleum products, electric power and natural gas are also indicated. Such measures may not be enough in the short run, however, and we may also have to introduce rationing, especially if the international petroleum situation deteriorates further. It is at least as important to prepare the way for additional domestic production: Much of this will come in response to higher prices, but the Government can also facilitate the development of new energy sources such as oil from shale by making appropriate price guarantees. In testimony before the Senate Interior Committee last July, I outlined a scheme to this effect. Further, the highest priority should be given building the Alaska pipeline and to opening the naval petroleum reserves in California and especially in Alaska for general use. Few things are more likely to improve the international situation than a show of determination on our part.

Apart from these domestic measures we also have to reconsider our posture with respect to foreign suppliers. Now that the Arab embargo has become a fact we may have to discriminate between more and less reliable suppliers. This could be done, for instance, by giving a deferred rebate from the proposed tariff to those suppliers who provide uninterrupted flows at prices unaffected by any interruptions that other suppliers may cause. Our market is sufficiently large to make a preferred position attractive to countries such as Iran or Nigeria. In the past we have given preferred treatment to Canada and Venezuela, so there is precedent, though in the latter two cases we have perhaps not insisted sufficiently on reciprocity. The recent increase in the Canadian export duty is especially troublesome. Perhaps we should give more thought to the status of the two major Canadian pipelines that cross our territory; the introduction of a transit fee might provide an offset to the Canadian export duty. This is just one of the many difficult decisions that we face as a result of the present turmoil in the world petroleum market.

Thank you very much.

Chairman REUSS. A fascinating presentation.

That transit fee against the Canadians is a little unlike you, Mr. Houthakker, but I suppose you could point out a passage in Adam Smith that says something about reciprocity being a two-way street. And, if your trading partner takes advantage of you, you may have to do things that aren't in your ordinary catalog of good behavior.

Mr. HOUTHAKKER. I would say that the transit fee is intended mostly to encourage the Canadians to a greater emphasis on free trade.

Chairman REUSS. What do you have to say about the Governors of Oklahoma, Texas, and Louisiana who at a recent Governor's conference said that they might restrict the shipment of natural gas over their State borders?

Mr. HOUTHAKKER. I would say this is definitely in violation of what I understand to be the commerce clause in the Constitution which makes it illegal to apply restrictions to interstate shipments.

Chairman REUSS. A constitutional lawyer would talk about the natural resources clause which enables the pheasant rich State of South Dakota to forbid hunting to nonresidents and enables the shrimp rich State of Louisiana to embargo its shipping exports, unfortunate though that may be.

Mr. HOUTHAKKER. Well, I am not a lawyer and you may well be right. But there are other clauses in the Constitution which would give some semblance of legality to these measures. I would say that it is really quite unwise from the point of view of those States too, since it is unlikely they will be able to consume their petroleum production within their own borders. They are dependent on the rest of the United States for other things and reciprocity would apply there too. Now it is true that there is an increasing tendency for industry to locate in the gulf coast area. That may well be all right; there is nothing wrong with that as long as it is not encouraged by artificial favoritism for intrastate sales.

Chairman REUSS. That brings me to a question I want to ask the whole panel because a lot of people are saying—and I believe both witnesses have advocated—to take the lid off natural gas prices and bring in more natural gas that way. And with that general principle I am not unsympathetic, but surely we just don't want to remove the ceiling on natural gas prices at a time when we permit the natural gas producing States of Texas, New Mexico, Oklahoma, and Louisiana to squander their natural gas for utility boilers, for nonnecessitous manufacturing and so on. Surely if we are going to take the ceiling off we ought to cut down on that part of the demand part of the equation which allows frivolous use of natural gas. Shouldn't we?

Mr. SEARL. I am not sure that Mr. Houthakker, although Mr. Houthakker can certainly speak for himself, called for just taking the lid off natural gas prices. Actually our study suggests that Congress may want to consider setting market clearing prices for new natural gas. This, of course, assures that if you don't get any gas you don't have to pay for it.

Chairman REUSS. You mean a two-price bulk line system?

Mr. SEARL. Yes.

Chairman REUSS. Well, having said that, that is very interesting since you didn't say much about that, nor were you asked to this morning. Do your studies and conclusions exist on paper?

Mr. SEARL. Well, they have been submitted to the energy policy project. You see, we have a grant from the Ford Foundation energy policy project and the study is now in their hands for preliminary review.

You said the word "useless" in those States and you may have a point, but on the other hand I would hate to go hunting through the country for frivolous uses in any State. I think we would find all sorts of frivolous uses not only in natural gas but in a lot of other things. That is very much, I think, of value judgment.

Chairman REUSS. Well, I get paid to make value judgments and so do you.

Mr. SEARL. Right.

Chairman REUSS. What is your value judgment on this one then? Should we allow frivolous uses?

Mr. SEARL. If you could give me a specific one?

Chairman REUSS. Well I forget what the percentages are but one-third to one-half of the natural gas not used for homeheating in this country is used in those three or four States for utilities in manufacturing. Aren't people agreed that it is an awfully poor way of using gas?

Mr. SEARL. You are talking about the natural gas?

Chairman REUSS. Well, using that for a unit of electricity, getting a unit of electricity by burning natural gas. Aren't most people agreed that is a poor way to do that?

Mr. SEARL. I think people are pretty well agreed that now that is the case. Historically it was not. Natural gas was low priced, partially due to the Federal Power Commission control but also the capital cost of a gas fired powerplant is much less than an oil or coal fired plant. So you had a double advantage here. I think my response to your question would be the price of intrastate gas is going up very high and a lot of new powerplants in these States are looking at coal and nuclear energy and the like.

And the taking of the gas away from existing powerplants is a pretty tough proposition because it is hard to convert them to coal firing and certainly they cannot be converted to nuclear fuel. Maybe gas can and should be phased out over a period of years, but one would think carefully before he made the change.

Chairman REUSS. I am also thinking carefully, but there is nothing now to stop a proliferation of this as long as those States are allowed to embargo in effect the export of their gas in order to permit use for these purposes at home because they are going to keep right on doing it. And natural gas will continue in those States to be an artificially advantageous form of fuel.

Mr. SEARL. I think that there is a definite trend already away in these States and in the new powerplants away from natural gas due to the high intrastate price but I would have to check the statistics on that.

Chairman REUSS. Let me say now, before turning to Mr. Houthaker, that I am very encouraged by your answer to my question, particularly by being told that you have developed a study on that and

I would be very anxious to see it, this study on a bulk line two price system.

So I now turn to Mr. Houthakker to ask him first, what about the alleged wasteful use of natural gas in the natural gas producing states, shouldn't we concurrently with letting the price mechanism determine how valuable natural gas really is—and if it is more valuable than the present price would indicate, so be it, because it will encourage more production if we lift the ceiling—but concurrently with doing that, shouldn't we eliminate a skewing of the equation which now adds on the surprise side not simply those uses which nationally we think are valid; namely, home heating, because you can't quickly change a home that has been built with a gas furnace to a coal furnace or oil furnace, shouldn't we eliminate that? Well, to finish my question up, doesn't the existence of heavy reliance on lower priority uses like utility use, mean that we should concurrently move to make the gas producing states conduct themselves on a par with the other states?

Mr. HOUTHAKKER. Well, I have not studied this question as much as Mr. Searl has. I would like to say that, under the system of regulation we have had for the last several years, intrastate prices of gas were higher than interstate prices. Therefore, I would be somewhat surprised if there were widespread waste in the sense you mentioned. It is undoubtedly true that the gas is used more extensively for utility purposes in the gulf coast area than elsewhere in the country. But this may be just because there is an awful lot of gas down there. However, it should be added that a great deal can be said about State restrictions not only on prices but also on production. I, myself, have long been opposed, for instance, to the pro rationing practiced by the States of Texas and Louisiana in particular, which has had a very adverse effect on our whole energy situation. Perhaps some tradeoff could be achieved under which deregulation of natural gas, and possibly also a decontrol of petroleum, could be traded off against some relaxation of State intervention. I believe the States of Texas and Louisiana in particular have gone far beyond what can be justified.

Coming back to our previous point, the States of Texas and Louisiana and the other States that have prorationing but no longer practice it actively, did need special legislation to enforce it. This suggests to me that there is a legal problem here than can only be overcome by legislation.

Chairman REUSS. May I say that you are quite right that whatever may be the constitutional ability of a State to keep its shrimp or its natural gas at home, or its pheasants, that certainly there is no constitutional inhibition on Congress in repealing existing legislation which it has passed which gives intrastate a pat on the back to such restrictive policies.

Mr. DARMSTADTER. I only want to reinforce what Mr. Searl said. The pricing anomaly, the regulation of wellhead natural gas prices, in the context of a relatively free market in coal and oil, means that there are powerplants that still today, on a Btu basis, pay considerably less for gas than they do for oil and coal. Deregulating the price of gas, however that is brought about, will in itself have a self-correcting impact on users, particularly in the industrial and utility areas which will dampen their reliance on gas. There could be a very strong impetus to shift toward alternative fuels, once the Btu price of the three alternatives takes on a more balanced picture.

This would be certainly true in incremental additions to generating capacity in utilities and in factory furnaces; it would probably apply as well to those facilities now equipped with a dual firing system which can shift back and forth between oil and gas.

Chairman REUSS. Let me turn that to Mr. Houthakker for a variant of what we were discussing. You say in your statement: "To obtain more domestic crude, we may have to allow the domestic crude price to rise further."

There is obvious logic to that statement as there is to the statement that has been made that to obtain more natural gas, we will have to allow the natural gas price to rise. Now, as one who is interested in the lowest possible price for the consumer, consistent with getting new crude oil and new natural gas on the market, Resources for the Future has apparently been flirting with the idea of a two price system; one that says, OK for that oil or gasoline which you can produce cheaply, Mr. Producer, as you always have done, for that you don't get the whole price increase, but we are going to try to work out a system whereby you get a plentiful return on your added production. Thus, that would give the producer plenty of incentive to go out and look for more, but not give him a free ride on that which he has already been producing.

Is that a fair statement, Mr. Searl, of what you were talking about before?

MR. SEARL. I think that is a fair statement on gas. We did not go into it so deeply on oil. Oil has been in a different pricing situation than gas, and we did not really deal with a two-tier system there.

It has some merits and possibly some problems.

Chairman REUSS. Well, let me then turn to Mr. Houthakker and have his views, if he has some, on the possibility of the two-tier method as a fair compromise in the energy crisis.

We've got to give higher prices for new production, but at the same time we don't want to milk the consumer, industrial or individual consumer, more than he needs to be milked.

MR. HOUTHAKKER. Well, a two-tier system was incorporated in the phase IV rules for gasoline prices under which you can get a higher price for new petroleum. There are evidently some difficulties enforcing a system like this.

One of the ways in which we can get higher production is by improving tertiary and secondary recovery. Now, this may often serve to maintain production rather than increase it because many old wells are naturally running down. So that a distinction between new and old becomes somewhat difficult to make.

Chairman REUSS. Certainly if an oil company is going to rework its slag in effect by going into expensive carbon dioxide injections, tertiary recovery, and so on in order to make a gone-dry well produce once again, then they ought to get and deserve to get more per barrel than they got during the balmy days when it was gushing freely.

Isn't it possible to work something like that out?

MR. HOUTHAKKER. I don't know enough about the technicalities, but I think this is definitely one problem that we face.

There is also the problem of whether the buyer will not keep the resulting increment rather than the owner of the well. There clearly are going to be considerable windfalls if the price of old crude is al-

lowed to go up, and these windfalls will appear at some point or other anyway.

While I am not quite sure there is a reason for shifting it to the user, who may just be an intermediary, rather than to the owner of the well, a lot depends also on what use the well owner will make of this.

If they use the additional profits to go into new drilling, that is just one of the many, many ways in which production can be stimulated.

So I would say there is some point to a two-tier system.

I am not quite sure whether in practice it will accomplish what it is supposed to accomplish because the value of the product will, to a large extent, be set by the market. Therefore, if you keep the crude price down for old wells, then you will just be creating an increased margin between the crude price and the product price.

Chairman REUSS. I wish you gentlemen would put on your thinking caps and give us as much help as you can on this; not this morning, necessarily, but from here on out, I wish you would try to come up with some way of doing this.

You could, for instance, put a tax on oil or gas generally so as to raise it by a taxation for all consumers and then give subsidies and grants to those companies which either explore for new sources or use more expensive methods of reworking existing sources.

You could figure out what the incremental costs of carbon dioxide injections are, for instance, and write a check to the oil company for the difference between the price on the market on the crude he has been marketing and the price which he is going to get for his carbon dioxide produced crude.

As you know, we have in agriculture worked out methods, not always good ones, for compensating farmers for additional costs they incur. Sometimes we do that with soil conservation methods, for instance.

And there's just got to be some way of seeing that producers of oil and gas in this country get a fair return at a good incentive to get into tertiary recovery, explore for new crude, and so on, without at the same time giving them a windfall through higher prices just across the board at the expense of the consumers on the stuff that doesn't cost so much to produce.

Mr. HOUTHAKKER. I agree there ought to be some method. But what you say about agriculture, of course, is not all that encouraging, considering what we have done there.

What happens with schemes of this kind is that they work well for a few years, and then they are awfully hard to get rid of.

If the crude price were just allowed to rise in response to increased demand, then it will presumably fall again, if our projections are correct, once the present transitional problem is over. And in that case the Government will not be blamed to the same extent as it is blamed when price guarantees or price supports are dropped. I believe that is one important advantage of going the free market route.

Now I agree with you that some way of doing this can be devised. In fact, before the Senate Interior Committee I proposed an option scheme which was particularly geared to new sources of energy, but could also be done for old sources. That would be a price support scheme that would be self-limiting and not very costly.

But I suspect that once we put these things in, they tend to become more or less permanent, and that worries me a great deal.

That is why I am more inclined to the self-limiting mechanism that the free market provides.

There is one other point which perhaps your remarks suggest. We have to remember that in our oil-producing industry the wells themselves are typically not in the hands of large companies. They are owned by thousands of small producers, although often corporations, too, but nevertheless relatively small and generally rather free wheeling operations.

Now, it isn't so easy to devise schemes that will work in an industry of that kind. Perhaps if we had just a few large oil companies dominating the domestic industry, which fortunately is not the case, it would be easier to make a deal with them, but given the great variety and independence of the well-owners it would be much more difficult.

MR. SEARL. May I make just a quick comment?

CHAIRMAN REUSS. Surely.

MR. SEARL. You remember in the case of natural gas, I think we had a miserable failure of an attempt to determine costs there on a lease-by-lease or well-by-well or a company-by-company basis.

Now for secondary and tertiary recovery I think you might be able to do more, but when you get into exploration and development—and I think oil is every bit as bad as gas in that respect—you really can't do that in my opinion.

CHAIRMAN REUSS. Let me turn now to some of the observations about our balance of payments.

MR. HOUTHAKKER. In your statement in discussing this you said: "There may be outflows of short-term capital"—and you are talking about in the next 7 or 8 years ahead—"but these will probably come to a head when the existing 'overhang' is worked off."

Now that existing overhang is on the order of \$100 billion the last time I looked.

Do you really foresee that that will go down to zero, that the other countries will sit still for the kinds of trade surpluses that you envision?

MR. HOUTHAKKER. Well, of course, when you add up the surpluses, which I have in table I,¹ then you come close to \$100 billion.

CHAIRMAN REUSS. That is true and that is why I asked about that. I suppose I could have asked do you think that we will in fact realize surpluses on this order?

To me they sound higher than I would expect the rest of the trading world to sit still for.

Who is going to be running these?

Have you got a table II on who is running these deficits? Who are these poor fellows?

MR. HOUTHAKKER. I don't know yet. I hope to have that in a few months but I don't have that yet.

However, let me say something about the overhang. I believe \$100 billion is really much too large a figure for what is really overhang. The rest to a large extent is a transition balance, a working balance, which the countries in question would like to retain. As long as the

¹ See table I, p. 109.

dollar has a vehicular role in international transaction, they would retain dollar balances.

I don't see a serious competitor to the dollar as a vehicle currency on the horizon at the moment. I believe we will have this important financial role for many years to come. And therefore people will want to hold dollars which will absorb a very large part of the \$100 billion which we now owe on short-term accounts.

Chairman REUSS. I would surely agree with that and isn't what you are saying that even if your balance-of-trade surpluses that you projected in table I turn out to be optimistic, that you don't foresee any great problem inherent in the current overhang?

Mr. HOUTHAKKER. That is right.

Chairman REUSS. Unless we are foolish at home, in which case all bets are off.

Mr. HOUTHAKKER. Right. I would say that interest rates have, of course, a great deal to do with this too. At the moment there is no hardship involved in the overhang. We pay a good rate of interest on it. I don't really think there is any complaint at the moment. Undoubtedly some countries would like to see some more definite disposition of this amount of money, but the pressure doesn't seem to be overwhelming. We have made it clear in our negotiations that this is part and parcel of an international monetary reform.

So far other countries have been apparently not sufficiently interested in getting the overhang settled to accept our ideas on international monetary reform.

Given the fact that after all we pay good interest on it, I don't regard the overhang problem as really that pressing.

Chairman REUSS. I will digress from the immediate subject of this hearing for just long enough to get your views on the current status of international monetary reform, a subject on which you have been so helpful to our subcommittee in the past. I think the general view of this subcommittee currently is that the present system of floating rates for the U.S. dollar, modified by Federal Reserve intervention only in the case of disorderly markets, so-called, is a workable system and that it would be a mistake for the United States to get boxed into any international monetary reform, so-called which would make the availability of the current option to the United States less than it is today.

In other words, if the world is going back to a system of "stable" but adjustable exchange rates, and if one could float only under exceptional circumstances and with somebody else's permission, we think that this would not be a good thing, and that our country should not get drawn into such a position. Would you agree with that?

Mr. HOUTHAKKER. Yes; I agree with that. I believe the system we have now is working reasonably well. Perhaps we are more satisfied with it than, say, the Europeans and/or the Japanese, but even there the horrors that many people foresaw have just not materialized. There have been some excessive exchange rate movements, but by and large we have had pretty good performance. And I was very happy to see that in Nairobi, Secretary Shultz made it clear again that we are not going to depart from the position that we took about a year ago on the kind of system we would like to see in place.

If we can't get that system, which has symmetric adjustment in response to underlying development then we might as well go on with the present one, and leave the overhang in place. I don't think the overhang causes us any great worries.

We do pay interest on it, but we would probably need some short-term borrowing anyway. So far as we are concerned the present situation does have a degree of stability to it, which we would like to see continued.

Now if unexpectedly the system of floating rates does turn out to go wrong somewhere, that would change the picture. I suspect that the prospects for international monetary reform, as distinguished from a settlement of the overhang on the part of the Europeans, may become somewhat better if the kinds of projections I have presented here become reality. At that point they will undoubtedly want to see some appreciation of the dollar and this might actually amount at least to an informal enactment of the proposals we made a year ago.

Chairman REUSS. Well let me get back to oil now and ask you a little bit about the very interesting studies you have made on the elasticity of the price of oil and gasoline. You say that your studies show that you find a price elasticity of demand in the long run of about 3—

Mr. HOUTHAKKER. No; three-fourths.

Chairman REUSS. Yes; three-fourths, which is to say that a 10 percent increase in price reduces consumption by somewhere between 5 and 10 percent after a few adjustment years have passed.

In the case of gasoline, the adjustment period appears to be not more than 3 years; for electric power it is rather longer.

Well, I think it is an enormously large study you are embarked on. Is there anything in writing, on paper, which you can give us at this time that will bear out your testimony?

Mr. HOUTHAKKER. Well, we are in the same difficulty that Mr. Searl referred to earlier. This work was also done for the Ford Foundation's energy policy project, which quite appropriately insists on a review of the report before it is released. If they don't like it, they will undoubtedly ask for revisions. So at the moment I am not at liberty to say much more than what we have said here.

However, we have had many requests of this kind, including one from another House Committee, and perhaps I can send you a letter similar to the one I sent to the other two subcommittees—working together—who made a similar request.

We have done some more work since then and Mr. Verleger reminds me that we are also engaged in another contract, that the Ford contract has run out. It is now in the review stage. We are no longer working for them.

But we do have a contract with the Council for Environmental Quality dealing specifically with gasoline and so it is possible that CEQ at some point may release the report which we are producing for them. So we will certainly try and give you as much as we can but I am sure you realize we are under some constraint here.

Chairman REUSS. Surely. I think what we ought to do, and what we will do, is to ask both the Ford Foundation and the Council of Environmental Quality whether we may have and when may we have the edited results of the studies.

Mr. HOUTHAKKER. There is one other problem I should perhaps mention. The Ford Foundation is planning to publish most of the studies, and, of course, if they are going to go into a congressional document, then the copyright is somewhat impaired.

Chairman REUSS. Well, let us work with them on that. They are usually very good about letting us have it.

Pending that time, I would just have a question about how much we can learn from the past on gasoline price increases. There have been in the past gasoline price increases but not of the order that we are unfortunately likely to get in the future. I think that is so.

Mr. VERLEGER. That is correct.

Chairman REUSS. Therefore you can't really tell at what point people are going to say that no, I am not going to take this trip with my automobile because it costs this much.

Mr. HOUTHAKKER. Well, I would like to say that although we haven't had prices such as we have right now and may get in the future, there have been considerable variations in gasoline prices. We have made these analyses on a State-by-State basis, and individual States certainly have variations.

Gas wars have broken out from time to time and they provide us with some information as to the response of consumers. Also, as Mr. Searl has said earlier, gasoline prices are relatively low; well, they were low until last year. Although there has been some increase, it is not in a way out of range. Historically, gasoline prices have been low, and even with the increases, we consider the relative price of gasoline as far as all other commodities, we consider it not to be as far out of the range as one would think.

Chairman REUSS. Speaking as one consumer, however, of course if there is a gas war going on, I will go buy it where it is cheapest, but that doesn't induce me, and I don't know of anyone else frankly, whom it has induced, to go on a binge of driving than I had otherwise contemplated, or to reduce my driving.

I don't think that is the way it has worked so far. I think it has been very inelastic.

Mr. HOUTHAKKER. I would say that the trend toward larger cars which we had through 1972 was at least in part encouraged by the fact that gasoline was relatively cheap.

Chairman REUSS. That is true with large cars but I think that once you have got your car, large or small, I don't think so far American consumers have paid much mind to the price in terms of how many miles they will drive that car. Am I atypical?

Mr. VERLEGER. No. You are very typical and we have been examining our data just to see whether we could pick up this trend. Another trend that would also exacerbate this is the decreased gasoline mileage one gets in the new cars with the pollution control devices so that even with the econometric models, although one would expect them to undercut the consumption of gasoline, during the period between 1970, 1971, and 1972, we have not found that.

I think there are three basic explanations for this price increase and elasticity of demand. I think there are three basic explanations: First, Professor Houthakker has noted consumers are showing a much stronger preference for smaller cars. The reduction in new car sales reported for the month of October fell mostly in the large cars, the cars over 3,000 pounds.

Second, most families are now two-car families and there seems to be some reallocation of use between the large car and the small car to reduce consumption.

Finally, and I do think that this is important, a little more care is taken in planning trips.

So far the prices haven't risen that much. Even this year we have only seen the gasoline go up by 3 cents a gallon in most communities. In Dallas, for example, it has gone from 30.9 to 33 or 34 cents a gallon whereas in Vermont; it has gone from 29 to 32 cents a gallon. This is what gives our difference across State lines in gasoline prices.

So I am sure there will be a reduction in gasoline production, perhaps even more than we have predicted if, in fact, such gasoline tax increases of 20 to 30 percent, as some experts have talked about, are instituted.

Mr. DARMSTADTER. What this seems to suggest on intuitive grounds is that big increases in the price of gasoline will have a dampening effect on future demand. The increases may be the consequence of greatly increased gasoline taxes or of actual price rises.

Whatever happens, these are all emerging trends that can't possibly show up in a pronounced way in the kind of historical data that enter into econometric models. Our whole past experience has been with declining prices inducing greatly increased demand. But, now, we face a sharp turnabout in that pattern. And if you add to people's expectations of big price increases, additional apprehension over the possible imposition of horsepower taxes and other conceivable policy restraints on automotive travel, then I think the movement to better performance cars and more sparing gasoline use may occur pretty quickly. But, as I say, all this follows less from statistical analysis and proof than it does from intuitive judgment.

Chairman REUSS. That is certainly my own intuition.

Mr. SEARL. I would like to make a quick comment, too. We may be making a little much of a male viewpoint on this business. I know our electric bill went up a little last summer and my wife got very upset about it and was cutting the air conditioner down. It made absolutely no sense in terms of our financial situation because it wasn't that much of an increase, but she didn't like it and she was cutting the air conditioner down.

Also if you have a housewife operating on fixed budgets and she has to go back to her husband and argue about budget increases, she might make fewer trips in the family car.

I think there are things of that sort which we may tend to lead to an underestimate of elasticity.

Chairman REUSS. You should meet my family.

Mr. HOUTHAKKER. In our study we have definitely found that some of these things in the short run might not make too much difference, but, nevertheless, they add up. Carpools are another thing which may show up.

Chairman REUSS. Mr. Houthakker, in your statement you calculated U.S. consumption comes to 14 million barrels a day by 1980. Now could you spell out your rationale for that a little bit? This would be down from the 17 or 18 million barrels a day currently and most estimates, which obviously you think are wrong and who knows, but most of them are on the order of 22 or 24 million barrels a day by 1980.

Obviously you have a built-in factor there of a dampening effect on consumption, what with higher prices and other things, very much along the lines that we have been discussing, but maybe you could focus a little bit on this question because your figures are markedly different than the other estimates that we have seen.

Mr. HOUTHAKKER. Yes; it indeed is different, and particularly different from the National Petroleum Council's, which has become more or less a standard for the industry because it was done by the industry itself, using several hundreds of experts. That is a study that certainly has its usefulness. However, it is very weak on the demand side. The study, for instance, envisions much larger price increases than we are talking about here. The study talks about a crude price of about \$6.50 a barrel by 1985 as being necessary to bring forth the domestic supply. Now, at the same time it extrapolates demand simply on a percentage basis. It goes by the growth trend established in the 1960's and just projects that into the future without any allowances for prices.

No doubt our study is open to objections, but we believe we have done a much more careful job than has been done so far in the case of gasoline. And we find that the price does make an important difference and it is price increases that would account for this projected fall in consumption.

Now it may well be that when we do further studies we will revise our ideas but at the moment this is the kind of answer that we get, i.e., that the price effect is large enough to lead to an actual turn-around in our petroleum consumption and that accounts for the major difference with the National Petroleum Council.

Now I don't want to suggest that these figures here are exact to the last billion, but we are convinced that there is an important effect there. We shall soon see whether there is any effect at all, because the price increases are by now about a year old and should be showing up to some extent, of course as yet to a minor extent, in the published consumption data.

Now maybe Mr. Verleger wants to say something about what he had so far detected in the monthly consumption data, but anyway, in the next few months we shall see whether there is any elasticity at all or whether this is just imagination on our part. Perhaps Mr. Verleger should be given a chance to supplement that right now before you ask another question.

Mr. VERLEGER. I was going to say, if anything, we have underestimated the short-run price elasticity of demand for gasoline. Our preliminary evaluation indicates that is the case.

The problem we are still trying to disentangle is whether our underestimating is due to the shortages of gasoline supplies on the east coast, particularly in Petroleum Administration District One, during May and June, so the answer is still tentative.

For this year at least we have the problem of a warm spring so that farmers out in the Midwest got out into the fields earlier and so that put the gasoline consumption above the expected rate in some States and the east coast is below the expected rate.

Chairman REUSS. Did you wish to add anything?

Mr. DARMSTADTER. Very quickly. Are we encouraged or sanctioned to ask one another questions?

Chairman REUSS. Yes.

Mr. DARMSTADTER. Whose answer may clarify an issue that may be of interest to the committee as well as to ourselves.

Chairman REUSS. Yes.

Mr. DARMSTADTER. I am curious whether, in the model, the postulated level of U.S. oil consumption at 14 million barrels per day as mentioned in your prepared statement, took into consideration an associated diversion of demand to other energy sources and, to the extent that it did, will it result in increased demand for other energy sources—that is, natural gas—which we may also have trouble in accommodating?

And if this was not the case in the analysis, shouldn't it have been the case? That is, shouldn't the levels of oil demand be viewed within the total energy picture?

Mr. HOUTHAKKER. I would say implicitly there certainly is a substitution amongst fuels, and in particular the use of coal. That according to some of our projections, not this particular one but other ones, will certainly increase, and there of course we do have a lot of room for maneuver.

Coal production right now has actually fallen. In 1973 it is below 1972, and the only reason for this is the decline in demand. The capacity for producing more coal is there even though we may have problems when we go into large-scale strip mining in the West. At the moment we could produce more coal, though, if there were the demand. So this estimate does envision more coal use and also greater use of nuclear power, which already now is in the cards. The plants are already being built and they will also take up some of the oil demand.

Chairman REUSS. Let me in this fascinating inquiry now ask you, Mr. Houthakker, to break down your 1980 projection into gasoline for motor vehicles and all other uses. You see, you are saying that contrary to the conventional wisdom which says that we are going to be consuming 22 million to 24 million barrels a day in 1980, that being more or less, I think, a projection of past trends, you are saying we are actually going to be consuming about 3 or 4 million barrels a day less than we now do. How do you divide that between gasoline for motor vehicles and all other uses?

Am I right that it is now about 50-50?

Mr. HOUTHAKKER. Something like that. Roughly speaking.

Chairman REUSS. I am speaking very roughly. How do you break that down?

Mr. HOUTHAKKER. Let me first say, that this, of course, is not really a forecast. It is based on the assumption that there is no increase in crude production anywhere in the world except in the Persian Gulf. That means also no increase in crude production in the United States. This means that any petroleum that would come from Alaska would be at the expense of production in the lower 48 States. So this is a very extreme case in which the price of petroleum in the United States would be relative high.

Chairman REUSS. I understand that.

Mr. HOUTHAKKER. So I would like to answer your question in writing, if I may, because I do not have the breakdown by products with me today. However, this is available at Harvard from Mr. Kennedy and I would be glad to write you a letter giving the details of this

projection and perhaps also of the other projections which we have here.

It is a projection based on four major products, including gasoline, heating oil, and so forth.

Chairman REUSS. That would be most helpful and I would appreciate your furnishing that for the record at this point.

[The following information was subsequently supplied for the record:]

HARVARD UNIVERSITY,
Cambridge, Mass., December 7, 1978.

HON. HENRY S. REUSS,
Chairman, Subcommittee on International Economics,
Joint Economic Committee, Washington, D.C.

Dear Mr. CHAIRMAN: At the hearing of November 8 you asked me for some further information concerning simulations with a World Petroleum Model. In the first place I must make a correction in my testimony, with apologies for any confusion that may result. It appears that the projections in the final part of my prepared testimony refer to 1978 rather than 1980. This does not affect the numbers as such.

As regarding the composition of consumption, the total of 15.47 million barrels a day consumed in the United States would be 40% gasoline (compared to 44% in 1972), 11% kerosene and jet fuel, 22% light heating oil and 15% residual fuel oil (in 1972 kerosene, jet fuel and heating oil together accounted for 24% and residual fuel for 14%). Other products would account for 13% in 1978 compared to 18% in 1972. This change in composition reflects the greater price elasticity of gasoline compared to middle distillates assumed in this simulation.

Since the demand elasticities assumed in our projections are sometimes considered too high, we have also made two other runs with a demand elasticity of 0.3 for all products. If supply does not increase outside of the Persian Gulf and if the Persian Gulf royalty is again taken to be \$3 per barrel, then the price for the United States will be \$4.67, with a United States consumption of 18.1 million barrels a day. Our imports would then be 6.7 million barrels a day at a cost of \$12.2 billion. If the supply assumption is changed to an elasticity of 1, the United States price and consumption remains the same, still being determined by the landed price of Persian Gulf crude. However, our imports in the second case would be 1.8 million barrels a day at a cost of \$3.9 billion.

Yours sincerely,

HENDRIK S. HOUTHAKKER,
Professor of Economics.

Chairman REUSS. It would seem to me, however, that in view of the fact that gasoline accounts for about 50 percent of our current disappearance of oil, that gasoline for motor vehicles is currently about 50 percent, and in view of that, if you are going to get total consumption down from 18 million to 14 million barrels a day, that gasoline for motor vehicles certainly can't be expected to increase in 1980 over today. It must be at least stable.

Mr. HOUTHAKKER. Right.

Chairman REUSS. Is that not your impression?

Mr. HOUTHAKKER. That is certainly true.

Chairman REUSS. And maybe go down some, but probably not as much as oil for manufacturing and industrial and utility purposes where one hopes that coal will come to the rescue by 1980 or at least a little bit.

Mr. HOUTHAKKER. Yes. The elasticity in energy demand we have is mostly in gasoline and residential electricity.

Chairman REUSS. Now, your somewhat conservative projection that bringing in Alaskan oil might be very largely offset by the playing out of some of our current oil resources in this country, despite all of the offshore exploration you do, despite exploration in Oklahoma, or

wherever, you say that the existing trend downward of domestic oil production would continue so that bringing in Alaskan oil would merely work out about even. Is that what is in your mind when you say, that overall, you predicate your 1980 assumption on world oil production merely being stable except for some increases in the Persian Gulf?

Mr. HOUTHAKKER. Yes, but I should point out that we have two projections here, and this is in a way the more extreme one.

There certainly will be some increase in domestic production.

Chairman REUSS. And with the extreme example there you come out with a consumption of 16 million barrels a day?

Mr. HOUTHAKKER. That is correct.

Chairman REUSS. Which is still markedly under the 17 or 18 million barrels a day we are now burning?

Mr. HOUTHAKKER. Yes. And if we take cases where there are imports, then we don't get consumption going down as much as that, although there will be a very definite slowdown.

Chairman REUSS. Well, I now come down to my next question which is that your projections, both the more conservative one and the more extreme one, if they are both valid, doesn't this country have to make right now vast soul-searching new judgments on the automotive industry, the construction of freeways, origin-destination surveys, made by 1,000 highway authorities throughout the country, vast new judgments with respect to the motor car supplying industries and other mind-boggling microeconomic judgments? I see nothing wrong with having to do that. I happen to think we have to do that, and I hope you are going to tell us right now that we have to do that because not enough people have been telling us that.

Mr. HOUTHAKKER. Well, let me answer this somewhat indirectly. In the first place, neither of these projections are the one which I consider to be the most likely ones. I believe that by 1980 we will not be in the position of not being able to import at all. By that time the world petroleum market may be somewhat easier and as a result we will not have to increase prices as much to be self-sufficient. However, as regards the automotive industry, there a great deal can be done by just concentrating on better gasoline mileage. It doesn't necessarily mean that there will be fewer cars on the road. At the moment, the average American car probably consumes something like 12 miles to the gallon. Is that right?

Mr. VERLEGER. A little less than that.

Mr. HOUTHAKKER. A little less than that. As we know, many foreign cars get 20 miles, and therefore, if our cars were to become more like foreign cars in that respect, then we could still use about as many cars, although they might be somewhat cheaper per unit. However, I have sufficient faith in the ingenuity of Detroit to make a car that is both expensive in capital costs and, nevertheless, low in gasoline consumption. I am thinking something along the lines of the Mercedes-Benz.

Mr. SEARL. May I comment just a second? I think maybe at some point we should check our statistics here. In my view, if we are talking about private cars, we may be overestimating somewhat the amount of fuel that goes to private cars. I think 45 to 50 percent of the crude oil goes to all vehicles, including aviation and—

Chairman REUSS. Right. And trucks and buses.

Mr. SEARL. So I think if we are talking about 50 percent private cars, we are somewhat high. It might be around 25.

Chairman REUSS. No, we said motor vehicles though.

Mr. SEARL. OK. I just wanted to point out it goes to planes and the like. also.

Chairman REUSS. Now, Mr. Searl, last night the President proposed a new Manhattan project to make us self-sufficient in energy. He had previously proposed expenditures of some \$10 billion over 5 years, about three-fourths of which is already in the long-term budget projections. These funds would not be concentrated but on a whole spectrum ranging from solar energy to coal mine safety. Do you at Resources for the Future consider this program, this new program, sufficient to achieve the necessary rapid technical advances?

Mr. SEARL. Well, perhaps I better speak chiefly for myself.

Chairman REUSS. Please do.

Mr. SEARL. However, I would note, some of my other colleagues agree with these views. We are quite concerned that these energy R. & D. programs and the like may solve the energy problems of the 1990's. We are not so sure how we are going to get to the 1990's. Most of these big energy R. & D. projects—although not all, because there are some that would help us in the short run—but I think the bulk of the money when we see where it is going to go and have some realistic estimates of getting these things into commercial operation in any volume will support the fact we are not going to be getting much before the 1990's out of them.

And it is fine to solve the problems of the 1990's, and we clearly have got to deal with this winter's problems, but as we said in our testimony here, we are quite concerned about what are we going to do in between now and the 1990's. We don't think R. & D.'s really are the answer, and it may be distracting us from doing something in the intermediate term.

Chairman REUSS. Mr. Houthakker, let's have your views on that.

Mr. HOUTHAKKER. Well, I very much agree with Mr. Searl on this. And I can understand his diffidence speaking for Resources for the Future because—

Chairman REUSS. Well, we restricted the question just to Mr. Searl.

Mr. HOUTHAKKER. But it is no secret that Senator Jackson's plans, which were adopted by the administration, are based in large part on a study by Harry Perry, of Resources for the Future, which lays out a plan for spending a large amount of money. I think he has hit the nail on the head by saying that this will solve problems which are problems way down the road. Now, I am not saying we should not consider what will happen in the 1990's because it is important, too, but the transition problem in my mind is a much more difficult one, and it is not one that can be solved by spending large amounts of money at all.

We should be thinking more in terms of things that are available by 1980 rather than things that are available for the 1990's. This is why I made the proposal to the Senate Interior Committee of having an option system that will remove some of the price uncertainty that is now a disincentive for development of oil from shale or coal gasification or a few other developments of that kind. I believe that is the

direction in which we should be looking and not toward the nuclear breeder or fusion or solar power types of things.

Those are interesting research things, and we should be spending some money on them, but I hope that the President was not suggesting that all of our emphasis should be there. I found, incidentally, the President's speech somewhat unclear in respect of whether he sees this Project Independence as the answer to our present problems. I just think it is an answer to problems that are not with us yet, which may be with us one day, although we can't even be sure of that, but certainly they will not happen before 1980 or 1990 even.

Chairman REUSS. Mr. Darmstadter, I would welcome your comments as an individual, too. You indicated, for example, that coal gasification and liquefaction, two very promising sources of new energy, will play little role in our energy picture before 1990?

Mr. DARMSTADTER. Yes.

Chairman REUSS. In light of that, and particularly, I am wondering what would be your view on the proposition just articulated by Mr. Searl and Mr. Houthakker?

Mr. DARMSTADTER. My understanding of the prospects for coal gasification and liquefaction of these is such that I would join with the statements both of Mr. Houthakker and Mr. Searl to the effect that those are avenues that should not be subordinated. They should get vigorous attention. But not at the expense of the kinds of policy directions we believe are indicated for dealing with intermediate term situations to 1985.

At best, as I recall, I think it is the conclusion of the work for the Ford Foundation that coal gasification can contribute at best something like a million barrels a day—in the oil equivalents—by 1985.

Mr. SEARL. We haven't even cast it in those terms. The basic reason for this finding is that we think that 60 or 70 cents per 1,000 cubic feet for natural gas as compared to a present average price of 20 cents and, of course, new prices are being set, but given the time for the drilling to be done and the like, that you will find and produce very large additional amounts of natural gas and that gas from coal just cannot compete at that 60 or 70 cent price and probably not even at the price of \$1.

Now this doesn't mean that there may not be some coal gasification plants built. There are at least one or two proposed now that may be built. Their owners may make money on them. I wouldn't criticize the companies at all there. They are responding within the framework we have of still basically controlled prices. Some of these companies also have pipelines that they need to get gas into.

But just from an economic basis it doesn't seem likely coal gasification can compete with natural gas.

Mr. DARMSTADTER. This, then, takes you back full circle to the issue of natural gas prices because, by the same token, this kind of economic calculation really brings into question the rather aggressive effort to import liquefied natural gas from other countries at prices that no one disputes will be any less than \$1 or \$1.20 per 1,000 cubic feet.

Chairman REUSS. Well, I would like as my last question to ask for your help on the following. It has just been said and I think agreed to by the entire panel, that important as research and development programs for the 1990's for developing energy sources may be, they

don't come to grips with what we need to do in the next 10 years or so starting with tomorrow.

Now, I will let you start Mr. Searl on this. What would your 3 point program or your 10 point program, however many points you've got, what would that be?

I am going to ask you yourself—and then I will ask the others—to add or to subtract from or modify what you have indicated earlier.

Mr. SEARL. I guess I haven't counted how many points we have. But anyway it is quite clear to us that increased domestic production must come from crude oil, from natural gas, from coal, from increased use of light water and high temperature gas cooled reactors in the next 10 to 15 years. These are really the only established sources that can make a dent in the supply problem. There is a potential for oil shale, although serious environmental problems may result, but if the Nation really wanted to do it, I think we could clearly get a lot of oil from shale.

To do this we are clearly going to have to do a number of things. It will require a lot higher price whether it means going to a gas decontrol or going to a two-tier-price system or what.

Chairman REUSS. You are talking now about crude natural gas and oil?

Mr. SEARL. Yes.

Chairman REUSS. All right. You say we need higher prices no matter what they come from, whether they are obtained from decontrols or the two-tier system or just a free market?

Mr. SEARL. Also for oil and gas you are going to need to lease the offshore Federal land anyway about as fast as anybody wants to develop it. In other words, Federal policy must not hold you back in this.

Chairman REUSS. And you would favor and believe that it is possible to have sensible environmental precautions?

Mr. SEARL. We think we would favor them. We think it is possible to take environmental precautions. On coal I am somewhat ambiguous, more ambiguous than I am on oil and gas, I guess. You do have the problem of surface mining which is pretty severe and some other problems with coal. I just don't know what to say.

Chairman REUSS. But at least where the terrain is not precipitous, if you pay a little more, you can fix it up pretty good?

Mr. SEARL. We think basically that at costs that would not be prohibitive, you can go ahead with these things.

Also the industries very much need a stable reference framework of what governmental policy is going to be, including tax policy.

Now I guess I don't really care quite as much what the tax policy is, what the depletion allowance and the like is, although I am a little bit reluctant to upset the industry by changing them right now, but I think the policy needs to be fixed. The industry needs to know what these items are going to be in the future so they can do their long-range planning. These oil and gas wells have 25 to 35 years as their life span. A coal mine has a life span from 10 to 30 years. And if you are doing the planning in the industry and you have to deal with government uncertainties as well as natural uncertainties, it is very troublesome. You are liable to wind up with investing less. I think that is probably the major points that we would make.

Chairman REUSS. Fine.

Mr. SEARL. That is pretty standard economics.

Chairman REUSS. So you really have made two points. One is higher prices with as much savings for the consumers as human ingenuity can figure out and without outrageous environmental spoilage, and two, stable government policies which maybe involve a look at depletion allowances to see that they really are aptly suited to encouraging, are things we want to encourage. You are saying we need a prompt decision and then let it alone for a generation.

Mr. SEARL. Right.

Chairman REUSS. Well, first, Mr. Darmstadter, do you have anything to add?

Mr. DARMSTADTER. Relatively little. I just don't want to subordinate, to the degree that may here be emerging, the concurrent pursuit of some of the longer range R. & D. goals. I think it is very important, for example, that we don't neglect the fusion route, which offers ultimately plentiful and clean energy in the United States. Obviously there are leadtimes of decades in the development of those new processes, just as there are leadtimes of say 10 or 5 years for the development of new oil wells, all of which necessitate action today.

So the total strategy should contain a balanced representation of long-term R. & D. pursuits along with the shorter term policies.

I think I would agree that this need not involve a convulsive precipitous, and massive funding effort but it does deserve, and should be accorded, high priority.

I would add only that the emphasis that we will accord to the supply picture ought in some measure to be also directed to policies designed to restrain demand for energy.

Increased prices, of course, will automatically induce some of those desirable responses, but there is a place for additional elements in the area of energy conservation—policies that can result in reducing the amounts of energy required without any real intrusion into people's perceived standard of welfare.

Incidentally, numerous things that we ought to be doing is to address not merely energy conservation targets but broaden social goals as well. Look at the mess that the automobile is creating in our central cities. We should be shifting gradually away to a system of public transportation, and in doing so, keep in mind what this would imply for energy conservation as well as making life more pleasant.

In short, I would also like to see a pronounced effort in the years ahead toward energy conservation measures.

Chairman REUSS. All right. I think you have added a couple of things. One, you have reinforced the unexpressed hypothesis of this question; namely, that the course perceived for the 1990's should proceed with all dispatch. And one can differ about how much or how many billions to spend on the programs in any fiscal period, but putting that to one side as an area of small disagreement, then one has again the two points that Mr. Searl stated: One, higher prices with all of the qualifications, and two, stable governmental policies with all of the qualifications.

I think you have added a third one now which is an immediate and meaningful allocation and rationing and voluntary conservation

measures designed to cut down on marginal uses and less important uses?

Mr. DARMSTADTER. Well, I wasn't really addressing myself to the immediate priority allocation program for the winter of 1973-74. I was dealing again with a more intermediate but sustained effort. A phased introduction of horsepower taxes is one example which obviously can't do very much before the existing car population begins to turn over measurably.

Chairman REUSS. It could do something about it starting in the next 3 or 4 years?

Mr. DARMSTADTER. Right.

Chairman REUSS. Even before 1990.

Mr. DARMSTADTER. Right. But rationing or the more precipitous immediate needs, which I don't deny exist, weren't in my mind as much as a conservation strategy, which would begin to yield important results after a 5- or 10-year period.

Chairman REUSS. But you also had a shorter range in there too, I hope, because what are we going to do in the near future?

Mr. DARMSTADTER. Like next month?

Chairman REUSS. Yes. Next month. And in 1974 and 1975. I don't want to get us into a discussion of specific means, but wouldn't you agree with the addition of a third point to the two points we have already got, which point is short-term and intermediate-term conservation methods which will reduce reliance on all sources of energy during the period from now to 1990?

Mr. DARMSTADTER. Oh, sure.

Chairman REUSS. And is that addition all right with you, Mr. Searl?

First, let's present these three points to Mr. Houthakker and ask if he would differ from those?

Mr. HOUTHAKKER. No. I don't differ with what my colleagues here have said. I think there is a lot of merit to this. I would perhaps put a little more emphasis in the development of those new resources that promise an immediate or relatively immediate payoff such as oil from shale. A lot of work is being done by private industry already there, but I believe that the Government could give a helping hand there by removing some of the price uncertainty and taking on some of the risks. There are also various other forms of private research at the moment which may need some more active encouragement. One which I happen to like is cryogenic transmission of electric power which may in due course lead to much greater efficiency of our generating industry.

I believe this is all a candidate for some immediate support, but I would not put billions of dollars into these things. Maybe tens of millions or at most 100 million or so, but not billions.

In addition to that I would like to stress a few more immediate matters. The most important one of these is the Alaskan pipeline, which is now before this Congress in conference. I would hope that a start on that could be made next spring without further intervention. I believe a great deal has been done to satisfy the very legitimate environmental complaints about the initial formulation, but now it is most important that we should go ahead.

In the second place I believe we need to do something with our Naval petroleum reserves. These are resources which we know to exist, but which are not being used to anything like their full extent.

Naval petroleum reserve No. 4, in northern Alaska, is particularly promising. A report by the Navy recently estimated reserves there at 33 billion barrels, which is about equal to 5 years' consumption. Now this is a resource which the Navy, by all accounts, no longer needs.

A lot has happened in military technology since the 1920's when this reserve was established, and by now we have to do something else with it. Now this leads me to a second point or maybe a third—I have forgotten which—namely, that we need to develop standby capacity. This is true especially if we do continue to rely on imports to some extent, as I think we should. If we go the self-sufficiency route, then we need it much less, but as long as we do have imports in our overall picture, then we need some standby capacity which we can draw on in case of supply interruptions.

And finally I would put the emphasis on a drilling program which is already in existence right now but which I think does need to be supported more. It should include a program—I say so at the risk of being banished from Massachusetts—of drilling in the Atlantic area. That is most important. I think we have to know whether there is something there and I would hope that there will be no longer the exaggerated opposition to a few exploratory wells that we have seen so far. At the moment we still know virtually nothing from actual tests as to how much oil there might be off Cape Cod and some other areas.

Let me just add one other thing. The President in his speech last night mentioned one other thing that was quite important and that is a reduction in the time needed for licensing nuclear plants. He talked about a reduction from 10 to 6 years. Now that may not be feasible, but it seems clear that these licensing procedures are being stretched out inordinately. Just doing this by itself may help our supply picture quite considerably too, if we could just move up some of the plants that are in the works now and have them in operation.

If we could have that, then our overall energy picture would also be much better.

Chairman REUSS. Well, you gentlemen have been extremely helpful—did you wish to add anything?

Mr. VERLEGER. May I just say this?

Chairman REUSS. Please add as much as you want.

Mr. VERLEGER. There has been a good deal of talk about the need for additional coal for the next few years and that carries with it the joint problem of a rail transportation system. I think Congress has before it right now a bill to help restructure the northeast rail network, and if things continue going the way they are, I think Judge Fullam in Philadelphia may be forced to begin dismantling the Penn Central sometime this winter just when we need more coal transportation to some areas in the Northwest. And I have heard no talk among the experts in Washington dealing with the energy problem relating to the rail transportation network, but if we are going to bring the coal from the Rockies and if we are going to rely heavily on Appalachian coal, providing we can meet the strip mining problems there, we also have to worry about increasing the capacity of the rail networks even in terms of double tracking some of the western routes and also fixing up the east coast network.

Chairman REUSS. Does anyone want to comment on that?

Mr. SEARL. I agree. I would say each 1,000 megawatt nuclear plant unit is equal to about 2.7 million tons of coal operating weight, so that is your tradeoff between coal and nuclear energy per 1,000 megawatts.

Mr. VERLEGER. I am worrying about the fact also the next 2 years for energy from the nuclear plants are pretty fixed.

Mr. DARMSTADTER. Part of the President's set of proposals deals with the possibility of relaxing air quality standards so as to permit the reversion to coal burning in petroleum using electric utility plants. It looks like that constitutes a quantitatively fairly important element in meeting some of the immediate problems.

The figure that I heard mentioned is one of 50 million tons of coal a year, which would be the equivalent of something like 750,000 barrels of oil a day. So though I hadn't been aware of the problem of constraints that may be posed by the rail situation. But if these are a constraint, as Mr. Verleger suggests, I would also add my voice in alerting our authorities to deal with that problem.

Chairman REUSS. How do you convert those oil-burning utility plants to coal anyway?

Mr. DARMSTADTER. A substantial number of them have dual-firing capacity. Some of them have standby facilities. With a lapse of time—and in some cases it takes as little as 3 weeks, while in others a more extensive period of time to convert—they can go back to coal. This is true of two plants in the Con Edison system in New York City, for example.

Chairman REUSS. Is it easier to convert their plant from an oil-burning utility to a coal-burning utility than it is to convert a natural gas burning utility plant to either oil or coal?

Mr. DARMSTADTER. Definitely. The inherent nature of the storage facilities makes it so.

Chairman REUSS. In one case you have a pilot light and a little flame I guess.

Mr. DARMSTADTER. Well, that is the way it is in my mind at least.

Chairman REUSS. That is the way it is in my mind, too. Is that the way it is in reality?

Mr. VERLEGER. The Federal Power Commission has issued a report—they issued it in September—indicating that one could save almost—and I think the number of 500,000 barrels a day of residual oil on the east coast within 3 months, although that number may be incorrect—but we could save that by switching back to coal. These are electric plants that previously used coal up until 1966 or 1967 when the oil import quota on residual oil into Petroleum Administration District One had been shifted, and so these can be shifted back. Some of them have the coal yards and the other equipment already.

Chairman REUSS. Well, now, let's talk about pollution and dirt. To what extent can scooping devices and other devices be installed so that we can switch over without too much environmental degradation?

Mr. DARMSTADTER. Well, within the short-run framework of the President's message and within the time span I think that is implied in our discussion here, I don't think that the technology or the installation of scrubbing devices is at all feasible.

Chairman REUSS. Why not? There are scrubbing devices I assume?

Mr. DARMSTADTER. Well, Mr. Searl can talk about sulfur stack gas cleaning more ably than I can.

Mr. SEARL. This was a great argument between the utility industry and the Environmental Protection Agency and I will admit I don't know where the truth lies—probably in between—but these do almost certainly not operate reliably at the present.

The stack gas cleaning devices you can't keep on the line. That is to say, they corrode and fall off and have all sorts of problems.

I have great confidence though that these problems can be solved, but we are talking about reliable stack gas cleaning sometime in the 1980's, 1978 or 1979, and I am sure it is not here yet.

Besides I don't think we have the manufacturing capacity to put such a program on in such a massive way.

Chairman REUSS. You know, the air is full of fine talk about the Manhattan project and so on, but why not have as many Manhattan projects designed to get as good as possible stack cleaners on as many utilities, which are about to be compelled to convert to coal, as possible?

Why not give the stack cleaning industry priority, like a Manhattan project, and provide that if the darn things clog up and don't work that the utility may dirty the community for a few days without going to jail as long as it is reasonably trying to get the thing going again. Why not do that? You know, what is the big hangup here?

Mr. SEARL. I think—

Chairman REUSS. Why don't we do the commonsense thing, which is to achieve the best possible tradeoff between the energy crisis? We've got to give a little on the environment, but not everything the way some people want to.

Mr. SEARL. Well, basically—

Chairman REUSS. Is there anything wrong with that?

Mr. SEARL. As I was saying. I agree with you. If one gets a positive program of doing something here, I think you can implement it.

Now, there is not even agreement at the minute though, as you well known on how much damage this sulfur is doing. We are talking about sulfur particularly I guess. But once we do make up our minds as to what we need, sir, I think then we can move ahead and do it rather rapidly.

I have no basic disagreement with what you are saying.

Chairman REUSS. Well, as I have already said, we are most grateful for our memorable morning.

Thank you. All four of you who have been so helpful.

We will now stand in adjournment.

[Whereupon, at 12 noon, the subcommittee adjourned, subject to the call of the Chair.]

[The following information was subsequently supplied for the record:]

RESPONSE OF JOEL DARMSTADTER AND MILTON F. SEARL TO ADDITIONAL WRITTEN QUESTIONS POSED BY CHAIRMAN REUSS

Question 1. You have noted that the price mechanism may *not* bring supply and demand into equilibrium and yet you also have stressed the importance of letting "conventional economic forces" take effect. Can you explain? Could consumption-oriented taxes finance development of more energy-efficient equipment and subsidize adjustments by poorer Americans?

Answer. The Statement should have referred to the time interval needed to achieve demand-supply equilibrium. *In the short run*, higher fuel and power prices may neither evoke additional output nor repress demand to market-clearing levels of supply. (Of course, vastly higher prices can achieve that goal, but

at the cost of substantial industrial dislocation and unemployment.) Allowing for a greater period for adjustment, conventional economic forces could be expected to perform their equilibrating function: e.g. after a lapse of, say, 4 years higher natural gas prices could begin to elicit incremental output and help dampen demand in "non-premium" uses. Consumption-oriented taxes could, in principle, finance energy-efficiency advances, although to the extent that such taxes yielded large proceeds, they would concurrently be failing to restrain demand. It should be noted that numerous potentialities for more efficient energy utilization do not await R&D breakthroughs—e.g. better insulation, smaller cars operating at higher load factors, and more efficient air-conditioning equipment than is on the average employed. In all these cases, the higher operating cost associated with higher fuel and power costs should alert users to the more efficient practices of which they can avail themselves. We have no real basis for judging the need to compensate poorer families for what may be an inequitable burden of higher energy costs. In general, we tend to feel it would be better to deal with these issues in a broad context rather than fragmenting them into a host of specific policies related to specific household budget items.

Question 2. In your prepared statement, you suggest that we have enough oil and gas to support any desired degree of self-sufficiency in energy in the next few decades. What does this mean in real terms; what would be the costs environmentally; what would be the costs in terms of commitment of national resources?

Answer. Analyses by teams of geologists from oil companies, state geologic surveys, and the U.S. Geological Survey, as well as separate analyses by the U.S. Geological Survey, while varying widely, all estimate that large amounts of oil and gas remain to be found and produced. Moreover, about two-thirds of all the oil ever discovered in this country is still in the ground in known fields. Much of it can be produced at somewhat higher costs and with modest improvements in technology. There is thus adequate reason to believe that the resources in the ground, if developed, are adequate to support any desired level of domestic production.

For the oil and gas which must be found and produced from new fields, an accelerated program of exploration and development will be necessary. Between now and 1985 new well completions (oil, natural gas and the inevitable dry holes) will need to average twice the current (1972) rate. This means we will need to drill as many wells each year as we did in 1956. Difficult? Yes. Impossible? Hardly, considering that the U.S. economy is now 1.8 times as large as in 1956.

Obviously, a rapid expansion from the about 30,000 wells a year drilled now will create problems. Government leasing policies must be such as to make favorable acreage available with minimum delay; some priorities on steel and other materials may be necessary; for optimum performance government tax policies should be set and some assurance given that they will be stable; and finally prices must be adequate. Indeed economic experience with many commodities has shown that profit is one of the best stimulants to supply.

Supply response will be faster if development is permitted in areas where oil is known but development is prohibited for environmental reasons—e.g. the Santa Barbara Channel. This is not to recommend for or against such developments but merely to note that they can accelerate supply response.

Environmental costs of accelerated development of oil and gas resources appear to us to be largely a matter of value judgment. It is our view that if the best control technology now available is used environmental damage need not be severe. Moreover, oil and gas production may well be the least objectionable sources from an environmental standpoint assuming that the nation is to meet a given level of energy production.

The costs of a program of moving toward self sufficiency in terms of a commitment of national resources requires a more precise definition. In terms of exhaustion of oil and gas resources, the cost is a very long term one. The nation can always expect to have oil and gas resources left in the ground which could be recovered at higher costs. We will move to other technologies for cost reasons before we exhaust all our oil and gas resources. Moreover, it is possible even now to produce any hydrocarbon we desire from oil shale and from coal as well as through the use of other forms of energy, particularly nuclear, but also with solar and geothermal energy. There is thus no real prospect of some desired hydrocarbon being unavailable—it will simply be higher in cost than at present. In terms of the broader meaning of national resources the cost can be roughly

measured by the price, although the true cost to the economy—the resource cost—is somewhat lower. However, considering that in 1972 crude oil at the wellhead was about \$3.45 a barrel even a tripling of the 1972 price would not seem prohibitive.

Question 3. In mentioning a possible \$6 barrel cost for oil shale, you note that its production will depend on finding an environmentally acceptable way of disposing of the slag. What then would you consider a realistic overall cost at which shale oil could be produced in an environmentally acceptable manner?

Answer. Our estimate of a possible \$6/barrel cost for shale does embody those environmental costs considered by the Interior Department and the National Petroleum Council, whose analyses served as a basis for our own calculations, plus a somewhat arbitrary addition for further environmental costs. Our remark was meant to allow for the fact that what others may ultimately regard as an “environmentally acceptable” production process may not be wholly reflected in our own estimates and those we adopted. Fluidity in environmental objectives has characterized past policy, and prudence suggests that we ought to be prepared for such a contingency in our thinking about the future.

APPENDIX

INTRODUCTION TO THE COMMERCE DEPARTMENT TECHNICAL NOTE ENTITLED "ENERGY AND THE BALANCE OF PAYMENTS"

The Commerce Department's Task Force on Balance of Payments Implications has developed a computer model to illustrate possible flows for all oil-related accounts. The model projects oil related current account balances and basic payments balances for 1975, 1980 and 1985 for the United States, Western Europe, Japan, Canada, and other free-world countries and for the eleven major oil-exporting countries. In its technical note, "Energy and the Balance of Payments,"¹ the Commerce Department has provided an "illustrative case" for possible flows through its model given certain stated assumptions. The choice of an "illustrative case" rather than a likely range of costs is made to avoid the possibility that this kind of forecasting could be really taken as predictive. There are so many assumptions involved that varying any one of them could produce decidedly different results. Furthermore any specific assumption, particularly those relating to price, which had the endorsement of the U.S. Government, might in itself lead to the expectation and even realization of the higher costs. While there may be disagreement on the various specific assumptions chosen, this technical note provides a valuable analytical tool for illustrating some of the problems involved in measuring an energy account.

In summary, this study shows that if the United States were to import 11.6 millions barrels a day of oil in 1980 at a cost of \$6.25 per barrel landed in the United States, the total gross import bill for that year would be \$26 billion. However, using the Commerce model to show all oil related flows, \$10 billion of this would be offset by U.S. exports to oil producers, and another \$1.7 billion worth of exports might be sold to countries receiving assistance from oil producing countries. A further \$6.3 billion would be returned in remitted profits and earnings on transportation, leaving a current account deficit of only \$8.5 billion. Finally, the study predicts an additional \$5.4 billion might be expected in long-term investments by the oil producing countries in the U.S. Hence, for an oil import cost of \$26 billion, the basic payments balance would be an approximate deficit of \$3.1 billion.

The Commerce study also shows a similar deterioration in the current accounts of other consuming countries relative to the oil producing countries by 1980. Western European oil imports are expected to exceed 20 million barrels per day by 1980 (versus 12 million barrels per day in 1970) and Japanese imports to rise to 12 million barrels per day by 1980 (versus 4 million barrels per day in 1970). At crude prices relative to those used to calculate U.S. import costs and after offsets for new exports and remitted profits, Western Europe and Japan would show current account balances in 1980 of \$14.6 billion and \$12.9 billion respectively. Long-term capital movements by producer governments might reduce these deficits in both cases to an approximate \$9 billion. In sum, although the U.S. payments position will deteriorate somewhat due to increased energy imports, those of Western Europe and Japan will deteriorate even more.

The net gainers would, of course, be the oil producing countries. Oil revenues of all producing countries will increase to an approximate \$105 billion in 1980 given the price assumption of the "illustrative case" (\$6.25 a barrel landed U.S. cost or \$5.20, Persian Gulf price f.o.b.). This unprecedented flood of wealth will result in excess revenues of some \$55 billion by 1980, (i.e., revenues remaining after the producing countries' expenditures on merchandize imports but before their distribution of economic assistance to neighboring countries or long-term invest-

¹ This technical note on oil and the balance of payments was released by the Department of Commerce at the request of the Subcommittee Chairman. The study was circulated to all the witnesses and the members of the subcommittee to provide a common base point for discussion.

ments). Saudi Arabia will accumulate the largest share of producer country surpluses, with the United Arab Emirates, Iraq and Kuwait, accumulating the remainder.

Because the numbers are frequently changing, it will be useful to look more closely at the specific assumptions in the Commerce study's "illustrative case" to understand how realistic are the projections for balance of payments flows and what might be their policy implications.

OIL IMPORT REQUIREMENTS

The Commerce projections for the United States assume that imports of oil and petroleum products will grow from a level of 3.1 million barrels a day in 1970 to 8.4 and 11.6 million barrels a day in 1975 and 1980 respectively. Petroleum imports for the first half of 1973 already were 5.9 million barrels a day.² These figures presume energy consumption increases of 4 percent per year reflecting partial success of conservation measures,³ a decline in domestic oil production to 10 million barrels per day in 1975 and then an increase to 11 million barrels a day in 1980 reflecting new Alaskan North Slope production; modest increases in coal and gas production and increases in operative nuclear capacity of 7 and 13 percent in 1975 and 1980 respectively.⁴ These estimates are primarily an extension of present trends including the most likely policy actions such as the Alaska pipeline, deregulation of natural gas, and some off-shore drilling on the continental shelf.

Basically the oil imports are the difference between U.S. energy needs and available supply in all forms. Any change in import requirements will have an immediate effect on the balance of payments. If a conservation effort were successful enough to limit annual demand increases to 3.5 percent, the resulting improvement in the current account balance of the "illustrative case" would decrease the deficit from \$8.5 billion to \$4 billion in 1980. Conversely an equivalent failure to dampen energy demands to less than a 4.5 percent annual increase would raise imports to 14 million barrels a day and increase the current account deficit to \$13.5 billion.

After 1980 the range of possible imports becomes even greater as the options for increasing alternative domestic sources of supply broaden. A crash program of research and development begun now could produce commercial quantities of alternative energy sources by 1980, thus decreasing U.S. import dependence. A similar effort at energy conservation could also begin to show marked effects after 1980.

The Commerce model projects imports only in the form of oil rather than a total energy balance. The exclusion of small but increasingly costly amounts of liquified natural gas (LNG) which are expected to be imported by 1980, and exports of coal or reexports of oil products may be reasonable as the two are likely to off-set each other. One limitation in the model's projections, however, which does influence the balance of payments is the growing need for refined petroleum products. For the first half of 1973, nearly half of all oil imports were in the form of refined products. Major oil companies have found it more economical for the last several years to locate new refineries in Europe and in the Caribbean, leaving the U.S. short of refining capacity. Because of the relatively long leadtime required in building a refinery, or in converting old refineries to process higher sulfur imported crude oil, the U.S. will continue to import growing amounts of refined products at least through 1976-77.

Imports of refined products average 20 percent higher than those of unrefined crude. Not only does this lack of refinery capacity place an added drain on the balance of payments, it also illustrates some of the inflexibility contained in our projected import requirement. After 1977 the proportion of refined product to crude imports could rise or fall, depending on policies favoring domestic refinery location, and provided that the producer countries do not increase substantially their own refining capacity.

Because the Commerce Department model is a mere accounting model, it does not reflect any of the relationships which may exist between the basic variables. In particular, the projections do not show any effect which the higher prices for foreign oil imports might have on domestic supplies, both conventional fossil

² While average imports for 1973 were expected to reach 6.3 million barrels a day, the present embargo may produce a lower yearly average about equal to the first half year.

³ The present consumption for 1973 has been 6 percent overall.

⁴ This projected nuclear capacity is consistent with 1972 AEC projection published in the Joint Atomic Energy Committee report "The National Energy Dilemma" (May 4, 1973).

fuels and alternative sources or on consumption. The projections do, of course, presume that there is a more or less unlimited supply of foreign oil—i.e., that there would not be an embargo or any severe cutback in oil production for any length of time. While there is little reliable information on the elasticity of supply and demand for oil in today's rapidly changing environment, the magnitude of possible changes in import costs would suggest that there may be significant alterations in expected import volumes.

The Commerce study presumes that the U.S. will continue to get oil from its historical suppliers, Canada and Venezuela, with any increases coming primarily from the Middle East. Canadian imports have historically gone mainly to the mid-West and the West Coast by pipeline while Venezuelan imports have been brought to the East Coast of the U.S. and Canada. Today, Canadian export policies are being seriously challenged because of the rising foreign prices; an export tax of \$1.90 a barrel has been applied to all exports and serious debate has begun on the construction of a trans-Canadian pipeline. The possible curtailment of Canadian exports in response to the Arab embargo of oil shipments to Canada as well as the U.S. would accelerate this trend. While this policy of self-sufficiency makes sense for Canada, it is likely to aggravate U.S. energy problems, both in the distribution of crude to mid-western refiners particularly and in increased cost of overseas imports. Venezuelan production has peaked, forcing the U.S. to depend more and more on Eastern Hemisphere sources. While the Arab embargo may stimulate development of non-Arab supply sources—Nigeria, Iran, Indonesia; there is little evidence that any real substitute exists for Middle East reserves, and hence for additional imports.

OIL PRICES

As the Commerce study's illustrative case was developed primarily in the first half of 1973, the price assumptions are based on the sharp increases since 1970 and, in particular, on the agreements negotiated between the western oil companies and the Organization of Petroleum Exporting Countries (OPEC), at Tehran (February 1971), Tripoli (April 1971), and Geneva (April 1972).⁵ In its "illustrative case" the Commerce Department has used figures of \$3.35 and \$8.15 per barrel in 1975 and 1980 respectively (tax paid costs plus average margin—f.o.b.)⁶ representing \$1 per barrel increase in prices for Persian Gulf oil for 1975 agreed to under Tehran and Geneva Agreements and 10 percent annual increase in cost from 1975 to 1985. Prices for crude from elsewhere in the world reflect a constant differential from these prices to indicate transportation and quality costs. The price for Persian Gulf crude landed in the United States (c.i.f.) would be \$4.80 and \$6.25, per barrel in 1975 and 1980 respectively. By comparison the first half of 1973 actual crude imports have averaged about \$3.50 per barrel.

While these prices seem astronomically high compared to \$1.45 per barrel paid for Persian Gulf oil in 1970 (approximately \$2.50 per barrel landed in the U.S.), they have already been exceeded by the mid-October announcement by Persian Gulf producers that raised f.o.b. cost, effective as of October 1, 1973, to \$3.65 per barrel—or \$.30 a barrel more than was considered for 1975. Other producers—Venezuela, Nigeria and Indonesia—followed suit with sizable price hikes to reflect the changed market. These price changes represent a radical departure from the Tehran and Geneva agreements, which negotiated increases to reflect changes in the terms of trade, and inflation and devaluation losses. Taking a very pessimistic assumption of 11½ percent total annual increase in the tax paid cost plus margin based on the new prices, the prices for 1975 and 1980 would be \$4.07 and \$7.03 respectively. Using the Commerce model these new prices would produce sizably larger import costs and current account deficits for the U.S.

⁵ The Tehran Agreement between Persian Gulf producers and the oil companies increased the total producer share and increased oil prices sharply providing for additional annual rises through 1975. The Tripoli Agreement provided the equivalent agreement for the Mediterranean producers. The Geneva Agreement provided a formula for compensating producers for dollar devaluation; oil prices are dollar-denominated.

⁶ Tax paid cost plus margin provides the most agreed formula for calculating actual cost of oil imports. This cost includes production cost plus an allowance for development expenditures, all royalties and taxes to producer government and an average profit per barrel. Posted price is only the base figure used to calculate taxes and royalties. The price quoted for Persian Gulf oil is also an average of prices reflecting different oil qualities (sulfur content, weight, etc.).

U.S. BALANCE OF PAYMENTS SUMMARY

[In billions of dollars]

	Illustrative case		New assumption ¹	
	1975	1980	1975	1980
Oil imports:				
Million barrels per day.....	8.4	11.6	8.4	11.6
Cost, insurance and freight price (dollars per barrel)....	4.80	6.25	5.57	8.53
Current account.....	-4.6	-8.5	-15.7	-34.1
Basic payments balance.....	-2.0	-3.1	-3.1	-4.9

¹ Prices are projected at 11½ percent from new 1973 f.o.b. price of \$3.65 plus \$1.50 tanker cost. Slight increase in producers margin is figured into 1980 figure.

The latest price increases have pushed oil imports above the domestic price for oil (\$4.35 at the wellhead). Historically, imported oil has been cheaper than domestic crude. Until the spring of 1973, the import quota system controlled the level of imports in order to meet supply short-falls but to prevent the cheap foreign oil from displacing any domestic supply capacity. As domestic production peaked in 1972, the problem now is getting enough imports to meet the widening gap between declining production and ever increasing demand. Simultaneously, foreign prices have risen rapidly although actual production costs abroad, particularly in the Middle East, are often dramatically lower than those in the continental U.S.; the price actually paid is increased by taxes and royalties paid to the producer government and by the cost of transporting the oil to the United States. Not only has world supply not expanded as fast as world demand creating a tight market situation but the producer nations have effectively joined together in a producer cartel, OPEC, in order to demand a greater return on their scarce resource. The cutbacks in production levels by Arab oil producers, in conjunction with their embargo on oil shipments to the U.S. clearly indicates the ability and willingness of the producers to manipulate supply for economic and political gain.

Most analysts are hesitant to make projections on price and even more reluctant to publish these estimates for fear of the impact on future OPEC demands. While low price projections may head off demands by the producers or the oil companies for higher prices on grounds that the increases are expected, the low price estimates may so understate the real import bill that adequate measures will not be undertaken soon enough to offset the effects. World oil prices, however, are almost certain to continue to rise, at least by amounts sufficient to offset inflation and exchange losses. Brisk competition among major consumer countries during the spring of 1973 was one of the key factors behind the October unilateral price increase. With the tight supply situation—now severely aggravated by the progressive cutbacks in production in Arab countries in support of their embargo against the U.S.—prices will probably rise even more.

Profit Remittances From Production and Transportation

One of the principal offsets for oil import costs for the United States is the earnings which the U.S. oil companies remit on their overseas operations. Profits are distributed according to percentage of ownership giving the U.S. 60 percent of the total. It is important to note, however, that these profits are not earned on a per barrel basis relative to U.S. imports but rather on the basis of total profits earned by U.S. companies abroad in oil activities from production to refining and marketing. Although U.S. companies have met with increased competition from European and Japanese companies, the real challenge to the continued flow of remitted profits has been the growing momentum in the producer countries to gain ownership of their own production facilities; under the participation agreement signed in early 1973 Persian Gulf producers agreed to buy 25 percent ownership now rising to 51 percent by 1980. However, in the Commerce study payments to the U.S. for its share (\$500 million and \$600 million by 1975 and 1980 respectively), are reflected separately in the capital account rather than as part of the profits. The Commerce study assumes that the producer countries will hire U.S./European firms to run their production operations on approximately the same percentage as present ownership. These earnings, however, would be only about one-half the present margin. There is a

possibility that outright nationalization may further cut the oil companies' profits; if nationalizations are politically motivated, as in Iraq and Libya, they might eliminate these companies from production completely.

As oil costs are figured inclusive of insurance or transportation costs to the United States, related transport earnings are subsequently broken up amongst the various countries according to the origin of tankers, financing crews, fuel, etc. In this distribution the United States' share of 14% is relatively small. Accounting transportation flows are one of the most controversial aspects of an oil balance of payments' analysis. One disagreement with the Commerce formula is that, given the nature of the integrated industry where major oil companies mostly own their own tankers, transportation costs are nothing more than a billing entry paid from one pocket to the other never leaving the country.

EXPORT EARNINGS

The U.S. is estimated to maintain its share of all oil producer imports which average out to be 20% of the total; the U.S., of course, captures a larger share of the market in Canada (100%), Venezuela (70%), and a smaller one in the Persian Gulf. It is important to note here also that exports are not figured as earnings directly related to oil income from U.S. imports on a barrel by barrel basis but rather are figured as the U.S. share of all oil revenues earned by those countries. Imports by the producers—attributed to their oil income—increase on the average between 15-20%. On the whole, the oil producers will spend all that they earn on imports. In Libya, Kuwait, United Arab Emirates, and Saudi Arabia, however, where revenues will far exceed any possible level of imports, a maximum absorption capacity has been used to approximate levels of imports. The category "other exports" divides exports which can be attributed to aid from the oil producer governments to other countries. Again, the bluntness of the calculations must be noted.

The calculations on export expenditures are rough at best. For one reason most of the data available on economic development is derived from circumstances where revenues have been a constraint. Kuwait provides development of an oil economy with large revenues; however, it presumes a certain political structure, a small size and a commitment to income distribution. It is unclear whether Saudi Arabia, for example, will follow this path. There are also serious differences of opinion as to whether Iraq and Libya are correctly classified; because of certain institutional and political difficulties either country could find its ability to spend its earnings reversed.

More important, however, are the implications of the actual market share forecast. If the U.S. share were to increase by 25%, export earnings to both producers and their client states might increase by \$2.5 billion in 1980. This would decrease the current account balance to \$6.0 billion. However, if the U.S. were to lose 25% of its share of the market, the current account and basic balance would worsen. This assumption may well be the more realistic unless the U.S. mounts an aggressive export effort. Western Europe and Japan will also be feeling the burden of increased oil imports. Competition in all non-oil items is likely to accelerate; export initiatives, particularly in the Middle East—such as Japan now practices—may become commonplace.

CAPITAL OUTFLOWS FOR PRODUCTION AND DEVELOPMENT

Estimates of the capital account are necessarily less dependable because these flows are much more sensitive to slight shifts in economic and political climate. However, because of the large current account imbalances which oil imports will produce the capital account becomes the main relief valve. In this technical note the capital account shows an estimated \$600 million in new capital leaving the U.S. to finance oil exploration and production development overseas in 1975 and 1980. These figures supplement the retained earnings and funds internally generated (i.e., from amortization and depreciation) by the international oil industry. On the basis of 5 cents a barrel, the Commerce study assumes that about \$1 billion will be generated annually by 1980. The study also presumes that investment expenditures in the oil exploration and development will be borne equally by the consuming and the producing countries. Although the actual distribution of funds among the consuming countries will depend on the conditions of the capital markets from year to year, U.S. financial institutions are likely to continue their involvement as long as U.S. companies maintain their large involvement in oil exploration, development and operations. However, even

so, the estimates for these funds seem relatively small compared to the total overall capital requirements which have been projected for the world petroleum industry. The First National Bank of New York has estimated that annual capital outlays for oil and gas requirements for the total non-communist world outside the United States would be an approximate \$36 billion in 1980. While this amount includes all expenditures on refining, marketing, and transportation, as well as production, the larger magnitudes of outlays should perhaps be considered as the profit remittances included in the model for the entire range of petroleum activities abroad.

EXCESS REVENUES

By 1980 the producer countries might accumulate current account balances totaling \$55 billion under the illustrative case assumptions or, under the new higher price assumptions, as much as \$180 billion. (This latter assumption should be taken cautiously because it does not reflect the very real possibilities for some of the producer countries—even those whose maximum absorption is predicted—to increase their expenditures if their revenues rise sharply.) Nevertheless the amounts in surplus held primarily by Saudi Arabia, Kuwait, United Arab Emirates and Libya will be significant.

Already the key producer states with excess revenues give aid to their poorer neighbours; the Commerce study assumes economic assistance will be on the order of 10–25 percent of excess revenues. Although pressure will certainly mount for the richer oil producers such as Saudi Arabia to be more generous in their political and economic assistance, 25% is probably a high estimate in the near term. The Commerce model has already included the effects of these distributions on the consuming countries' current accounts—by estimating exports to the recipient countries which could be ascribed to these aid flows. It is important to note that if no aid were given, in the illustrative case there would be a corresponding worsening of the U.S. current account balance by \$.8 and \$1.7 billion in 1975 and 1980 respectively in lost exports.

Although compared to free world capital formation (about \$500 billion in 1970 and projected to rise to \$800 billion by 1980) surplus funds on the order of \$55 billion would not seem overwhelming. The excess revenues could prove somewhat more destabilizing if left in short term funds or if channeled into specific industries or countries. Clearly the investment decisions made by the producer countries will depend on finding a hospitable investment climate both in the economic and political sense. Under the Commerce Department's illustrative case the U.S. would get 25 percent of the long-term funds, a share second only to Europe (30%). Although the U.S. capital market may be considered the most attractive, and the only one large enough to absorb substantial amounts of Arab investment, it is important to note that few producers have invested significant amounts in the United States to date; security of deposits is still a serious inhibition for some producers. The majority of producer funds are still invested primarily in Europe or at least through Europe. If the U.S. share of the total investment flow were to drop by 9%, reflecting the greater attractiveness of European and Japanese capital markets, the U.S. basic balance for 1980 would worsen from \$3.1 billion to \$4.9 billion. Clearly reliance on the inflow of sizable amounts of foreign capital to provide adequate adjustment may have somewhat uncertain results.

In sum, the Commerce Department model shows the United States balance of payments position is relatively sound compared to those of the other major industrial economies. Even at higher prices the same relative positioning of the different industrial economies remains. Despite all the criticisms of such a linear computer model, both for its specific assumptions and for its attempt to project balance of payments as much as seven and twelve years into the future, it does provide a useful tool for analyzing some of the changes which are taking place in the world energy market.

POSTSCRIPT

In December 1973 the Persian Gulf producers, led by Iran, again posted new oil prices raising the average f.o.b. cost to \$7.65 a barrel. Other OPEC producers fell rapidly in line with higher prices. These increases boosted prices to 300% more than those used as the base in the Commerce study's "illustrative" case. Adjusting the projections—as was done above for the October 1973 increase—will give multiply larger import bills and much larger trade deficits for all consuming countries. While most producers will spend all of their additional earnings on development, the few surplus revenue countries will have to channel an in-

creasingly larger share of the total earnings into foreign investments of one kind or another. The resultant capital flows in aid to the poor countries or in the form of long term investments both in the industrialized and developing world will have to provide the necessary escape valve.

The magnitude of the recent price increases are so much greater than those forecast in the Commerce Department model that certain modifications must now seriously be considered. Clearly the higher prices alone will curb consumption and thus import demand even without further crash efforts to increase domestic production or to promote conservation. Already the higher prices and the threat of shortages have sharply slowed the rate of growth in consumption not only in the U.S. but in the other major industrialized countries. Higher domestic crude prices should stimulate domestic production. The quantities imported are now running lower than projections although the import costs will be substantially higher.

The outlook for future prices remains uncertain. The higher prices announced in December brought contract prices in line with new market demand. Spot prices had skyrocketed as a result of cutbacks in production by some of the Arab producers in October and November and acute anxiety about future availabilities. Spot prices have fallen off and no further increases—or decreases—have been announced. While it is impossible to predict whether prices will rise again in the near future or whether they may decline slightly, it seems reasonable to expect that, given the prices of alternative energy sources and time it will take to develop them, prices may remain at present high levels. In the longer term, present prices may be on the higher side. The actual course of oil prices will depend on policies of the consuming countries towards production and conservation, as well as those policies of the producer nations.

TECHNICAL NOTE: "ENERGY AND THE BALANCE OF PAYMENTS" ¹

(By the Research and Planning Staff, Domestic and International Business Administration, U.S. Department of Commerce, October 18, 1973)

SUMMARY

A comprehensive computer program developed by the DIBA Research and Planning Staff, Department of Commerce, has been designed for the systematic examination of balance of payments impacts of various national and global energy projections. The oil-related current account and basic payments balances and their elements have been projected for 1975, 1980, and 1985 for five oil-consuming countries/regions and eleven major oil exporting countries.

Factors taken into account include total energy production and consumption, oil prices, transportation costs and patterns, oil earnings, imports of oil producing countries, and capital flows for oil exploration, participation payments and long-term investments by the producing countries. The analysis has many limitations, and considerable uncertainty surrounds many of the assumptions; accordingly, appropriate sensitivities have been developed.

The computer program and assumptions will be updated periodically as economic environment changes dictate. The program can be used at anytime to examine the balance of payments impacts of variations in underlying policy or economic assumptions, both quickly and at minimal cost.

The "Illustrative Case" described in this paper indicates how the oil-related annual current payments accounts of each of the United States, Western Europe, and Japan react relative to the oil producers' current accounts from 1970 to 1980 under a given set of assumptions. The data used is also illustrative and may not necessarily agree with comparable data used in other applications.

INTRODUCTION

This is a technical staff paper detailing the methodology of one analytical tool for understanding the magnitude and direction of the future energy problem. It does not represent the official views of the Department of Commerce or the U.S. Government.

¹ This technical staff paper details the methodology of one analytical tool for understanding the magnitude and direction of the future energy problem. It does not represent the official views of the Department of Commerce or the U.S. Government.

Starting in February 1973, the Research and Planning Staff of the Domestic and International Business Administration, Department of Commerce, undertook the assembly of appropriate input information and the development of a computer program to calculate current account and basic payments balances for five oil importers and eleven oil exporters. The balances are keyed to oil because oil is the incremental energy source. However, examination of the impact of non-oil energy sources is possible because the input includes all basic energy sources (coal, gas, nuclear, hydroelectric, and other) for the free world.

The main value of the program and the output is the quantification of differential effects for the various countries—over time and relative to each other. The computer program covers the years 1970, 1975, 1980, and 1985, but the time periods can be changed if desired. The absolute balances of each case have been drawn from the assumptions. Considerable efforts has been expended to insure that each assumption is stated explicitly. As a result, the differences between cases are meaningful.

METHODOLOGY

The computer program calculates the oil-related current account balances and basic payments balances for the following consuming and producing countries or regions.

Oil Consumers (5)

United States
Western Europe
Japan
Canada (also an exporter)
Other Free World

Oil Producers (11)

Venezuela
Algeria
Libya
Nigeria
Iran
Iraq
Kuwait
Qatar
Saudi Arabia
United Arab Emirates
Indonesia

By definition the total, oil-related, current account deficit of the consuming countries matches the total, oil-related, surplus of the producing countries. The total, oil-related, basic balances are also equal and opposite.

Factors taken into account in determining the 1970, 1975, 1980, and 1985 payments balances include:

1. Total energy consumption by country/region.
2. Non-oil energy consumption.
3. Oil production.
4. Oil prices (f.o.b.).
5. Transportation costs and distribution patterns.
6. Oil earnings (repatriated).
7. Transportation monies distribution.
8. Import potentials of oil producing countries.
9. Import patterns of oil producing countries.
10. Capital flows to oil producing countries for oil exploration.
11. Participation payments and oil ownership.
12. Producing countries economic aid and investment patterns.

The above input requires thirteen separate matrices containing about 500 individual pieces of information for each of the four time periods. Additional discussion of the methodology is contained in the Appendix.

ASSUMPTIONS

An "Illustrative Case" has been developed using a 3-4 percent per year inflation rate and current dollars. The major assumptions are:

U.S. energy consumption increases at 4 percent per year, down from 4.5 percent, reflecting partial success of conservation measures.

Operative nuclear capacity increases to 50 and 132 gigawatts in 1975 and 1980 providing 7 and 13 percent of U.S. energy requirements. (This assump-

tion is consistent with the 1972 AEC projection contained in the May 4, 1973 Joint Committee on Atomic Energy report on the "National Energy Dilemma"). Domestic coal and gas production increase moderately—3 and 1.8 percent per year, respectively.

U.S. oil production declines to 10 million barrels per day in 1975 and increases to 11 million barrels per day in 1980 and 1985.

Persian Gulf crude costs (tax-paid cost plus average margin-f.o.b.) are \$3.35, \$5.20 and \$8.15 per barrel in 1975, 1980, and 1985, representing a \$1.00 per barrel increase over the currently agreed-to Persian Gulf crude prices in 1975 and a 10 percent per year increase from 1975 to 1985 for the tax-paid cost of the crude. Other crude costs maintain current differentials. Sensitivities to \$1 per barrel crude cost changes are shown (U.S. c.i.f. equivalents: \$4.80, \$6.25 and \$9.15).

U.S. exports maintain their share (about 20 percent) of oil producers' imports, which increase 15–20 percent per year.

The U.S. capital market remains attractive for foreign investors, and the United States receives 25 percent of oil producers' long-term capital while importing less than 20 percent of their oil.

Additional descriptive information and the detailed assumptions for all the consuming and producing countries are in the Appendix.

RESULTS

The assumptions completely define the oil-related current account and basic payments balances and their elements over the payments situation that would exist but for the energy problem. The results for the given "Illustrative Case" are summarized in Tables 1–6. Appropriate sensitivities are summarized in Table 7. The consuming countries' position follows:

ILLUSTRATIVE CASE NO. 1

[In billions of dollars]

Consuming countries	Current account balances			Basic payments balances		
	1970	1980	1985	1970	1980	1985
United States.....	2.4	-8.5	-10.0	2.3	-3.1	1.2
Western Europe.....	-4.0	-14.6	-23.2	-3.9	-9.0	-10.8
Japan.....	-4	-12.9	-40.0	-3	-9.1	-31.4
Canada.....	-2	-1.3	-2.0	-0	-9	-1.6
Other free world.....	-2	-7.3	-20.1	.3	-5	-5.3
Total.....	-2.5	-44.6	-95.4	-1.7	-22.6	-47.9

Although the changes in payments position are large, they are moderated by such factors as:

North Sea and other Western Europe oil production which is forecast to reach 4 million barrels per day by 1980.

A booming Japanese tanker construction industry that generates \$4.4 billion in earnings by 1980, thus offsetting the cost of some oil imports.

Producers' position

Saudi Arabia has the largest oil reserves and is projected to have the largest oil production—nearly 20 million barrels per day by 1980. This results in oil earnings of \$36 billion (Table 3). Even though Saudi imports are projected to rise at 20 percent per year, the excess revenues grow much faster.

The oil revenues of all producing countries increase from \$14 billion in 1970 to \$105 and \$215 billion in 1980 (Table 4) and 1985. This results in excess revenues (after producing countries' merchandise imports, but before aid distribution or long-term investments) of \$55 and \$117 billion in 1980 and 1985.

Summaries of accounts

The payments account summaries (Table 5) show reductions in the current accounts of the consuming countries while Saudi Arabia acquires over half the

producing country surplus with the remainder being divided mostly among the United Arab Emirates, Iraq, and Kuwait.

The basic balance total is about half the current account total (Table 6). The assumptions about long-term capital investment favor the United States and reduce the U.S. basic balance deficit to \$3 billion in 1980 whereas the Western European and Japanese deficits are \$9 billion.

Sensitivities

Sensitivities have been developed for many of the important variables. As shown in Table 7—

Annual increases of 4.5 percent (versus 4 percent) for U.S. total energy consumption increase 1980 oil imports by 2.4 million barrels per day and cause an additional \$5 billion reduction of the U.S. current account. At 3.5 percent per year growth, there is \$4.5 billion improvement.

If currently-agreed-to crude prices for 1975 are not changed and if Persian Gulf prices escalate at 10 percent per year from 1975 to 1980, the 1980 U.S. current account deficit is improved by \$3.2 billion.

A \$1 per barrel increase in crude costs would cause a \$3.9 billion deterioration in the U.S. 1980 current account balance.

A 25 percent higher (lower) market share for U.S. exports would raise (lower) the U.S. 1980 current account balance by \$2.5 billion.

CONCLUSIONS

The selected methodology enables realistic quantification—and projection—of the oil-related balance of payments accounts. Consideration of not only the oil movements but also the associated transportation, merchandise trade, capital, and economic aid accounts provides a meaningful perspective. Although uncertainties exist about energy demand, oil availability, oil prices, transportation rates, global economic conditions, and international capital accounts, these limitations do not preclude a systematic analysis of various energy assumptions.

TABLE 1.—U.S. PAYMENTS SUMMARY (ILLUSTRATIVE CASE NO. 1)

	1970	1975	1980	1985
Oil imports:				
Millions of barrels per day.....	3.1	8.4	11.6	12.0
Cost, insurance, and freight price (dollars per barrel) in billions of dollars.....	2.33	4.80	6.25	9.15
Annual cash flows (in billions of dollars):				
Oil earnings.....	2.2	3.0	4.3	3.5
Transportation moneys.....	.8	1.4	2.0	2.7
Exports to oil producers.....	1.9	5.0	10.0	21.0
Exports to others.....	.1	.8	1.7	3.3
Subtotal.....	5.0	10.2	18.0	30.5
Oil import (cost, insurance, and freight).....	-2.6	-14.8	-26.5	-40.5
Current account.....	2.4	-4.6	-8.5	-10.0
Capital outflows.....	-4	-6	-6	-6
Participation payments.....	0	.5	.6	0
Capital inflows.....	.3	2.7	5.4	11.8
Basic balance.....	2.3	-2.0	-3.1	1.2
Memo items:				
Balances with no distribution:				
Current account.....	2.1	-5.4	-10.2	-13.3
Basic balance.....	1.8	-5.5	-10.2	-13.9
Balances with \$1 per barrel higher price:				
Current account.....	2.5	-7.2	-11.6	-12.8
Basic balance.....	2.1	-3.6	-4.5	.5

TABLE 2.—1980 CONSUMING COUNTRIES PAYMENTS SUMMARY (ILLUSTRATIVE CASE NO. 1)

	United States	West Europe	Japan	Canada	Other	Total
Oil imports:						
Millions of barrels per day.....	11.6	20.6	11.5	1.8	9.2	54.7
Cost, insurance, and freight price (dollars per barrel).....	6.25	6.35	5.83	6.24	5.83	6.13
Annual cash flows (billions of dollars):						
Oil earnings.....	4.3	2.3	0	2.7	0	9.3
Transportation moneys.....	2.0	3.8	4.4	.1	.9	11.2
Exports to oil producers.....	10.0	21.1	5.4	0	8.6	47.1
Exports to others.....	1.7	4.1	1.6	0	2.8	10.2
Subtotal.....	18.0	33.3	11.4	2.8	12.3	77.8
Oil import cost (cost, insurance, freight).....	-26.5	-47.8	-24.5	-4.1	-19.6	-122.4
Current account.....	-8.5	-14.6	-12.9	-1.3	-7.3	-44.6
Capital outflows.....	-6	-5	-1	0	0	-1.2
Participation payments.....	.6	.3	0	0	0	.9
Capital inflows.....	5.4	5.8	3.9	.4	6.8	22.3
Basic balance.....	-3.1	-9.0	-9.0	-.9	-.5	22.6
Memo items:						
Balances with no distribution:						
Current account.....	-10.2	-18.7	-14.5	-1.3	-10.1	-54.8
Basic balance.....	-10.2	-18.9	-14.6	-1.3	-10.1	-55.1
Balances with \$1 per barrel higher price:						
Current account.....	-11.6	-20.1	-16.4	-1.4	-9.6	-59.1
Basic balance.....	-4.5	-12.8	-11.6	-1.0	-.9	-30.8

TABLE 3.—SAUDI ARABIA PAYMENTS SUMMARY (ILLUSTRATIVE CASE NO. 1)

	1970	1975	1980	1985
Oil production:				
Millions of barrels per day.....	3.8	10.0	19.6	27.0
Export price (dollars per barrel).....	1.45	3.35	5.20	8.15
Annual cash flows (billions of dollars):				
Oil exports.....	1.9	13.3	36.4	78.4
Transportation moneys.....	.2	.7	1.3	1.8
Oil earnings.....	-.6	-1.2	-2.2	-2.0
Imports.....	-.7	-2.0	-5.0	-10.5
Economic aid.....	-.2	-2.7	-7.6	-17.0
Current account.....	.7	8.1	22.9	50.8
Capital inflows.....	-.1	.1	.1	.1
Participating payments.....	0	-.2	-.2	0
Capital outflows.....	-.4	-4.8	-13.7	-30.5
Basic balance.....	.3	3.2	9.1	20.4
Memo items: Excess oil revenues.....	.8	10.7	30.4	67.9
Balances with no distribution:				
Current account.....	.9	10.8	30.5	67.8
Basic balance.....	.8	10.7	30.4	67.9
Balances with \$1 per barrel higher price:				
Current account.....	.7	10.8	28.2	58.1
Basic balance.....	.3	4.3	11.2	23.3

TABLE 4.—1980 PRODUCING COUNTRIES PAYMENTS SUMMARY (ILLUSTRATIVE CASE NO. 1)

	Venezuela	Algeria	Liberia	Nigeria	Iran	Iraq	Kuwait	Qatar	Saudi Arabia	United Arab Emirates	Indonesia	Total
Oil production:												
Millions of barrels per day.....	3.5	2.0	3.0	4.0	8.0	4.4	3.0	1.0	19.6	5.0	2.5	56.0
Export price (dollars per barrel).....	5.90	6.10	6.10	6.95	5.20	5.20	5.20	5.20	5.20	5.20	6.36	-----
Annual cash flows (billions of dollars):												
Oil exports.....	6.3	4.2	7.0	8.5	14.0	8.0	5.3	2.0	36.4	9.0	4.3	105.0
Transportation Moneys.....			.1	.2	.5	.3	.2	.1	1.3	.3	-----	3.0
Oil earnings.....	-3	-1	-2	-4	-9	-5	-3	-1	-3	-6	-4	-6.0
Imports.....	-6.0	-4.2	-4.4	-7.0	-10.8	-2.5	-1.7	-6	-5.0	-1.2	-4.3	-47.7
Economic aid.....			.6				.9		7.6	.8		-9.9
Current account.....	0	-.1	2.2	1.3	2.6	5.3	2.7	1.1	22.9	6.7	0	44.0
Capital inflows.....		.1		.3	.1			.1	.1	.1	.1	1.0
Participation payments.....			.3	.1					.2			1.0
Capital outflows.....			.7		1.0	1.9	1.6	.5	13.7	3.0		21.0
Basic balance.....	0	0	1.2	1.5	1.7	3.4	1.0	.6	9.1	3.8	.1	23.0
Memo items: Excess oil revenues.....			2.5	1.5	2.7	5.3	3.5	1.3	30.4	7.6	-----	55.0
Balances with no distribution:												
Current account.....	0	-.1	2.8	1.3	2.6	5.3	3.6	1.1	30.5	7.4	0	53.9
Basic balance.....	0	0	2.5	1.5	2.7	5.3	3.5	1.2	30.4	7.5	.1	53.9
Balances with \$1 per barrel higher price:												
Current account.....	0	.1	3.0	2.7	5.2	6.8	3.4	1.4	28.2	8.2	0	59.1
Basic balance.....	0	.1	1.8	2.9	3.5	4.4	1.3	.8	11.2	4.7	.1	30.8

TABLE 5.—BALANCES ON CURRENT ACCOUNT SUMMARY (ILLUSTRATIVE CASE NO. 1)

[In billions of dollars]

	1970	1975	1980	1985
Consuming countries:				
United States.....	2.4	-4.6	-8.5	-10.0
West Europe.....	-4.0	-10.7	-14.6	-23.2
Japan.....	-4	-4.5	-12.9	-40.0
Canada.....	-2	-5	-1.3	-2.0
Other free world.....	.2	-2.1	-7.3	-20.1
Subtotal.....	-2.5	-22.3	-44.6	-95.4
Producing countries:				
Venezuela.....	0	.7	0	0
Algeria.....	0	.4	-.1	-.1
Libya.....	.9	2.6	2.2	1
Nigeria.....	-.2	1.0	1.3	1.4
Iran.....	.1	3.7	2.6	1.3
Iraq.....	.2	.1	5.3	21.8
Kuwait.....	.5	1.9	2.7	4.5
Qatar.....	.1	.9	1.1	1.3
Saudi Arabia.....	.7	8.1	22.9	50.8
United Arab Emirates.....	.2	2.8	6.7	15.2
Indonesia.....	0	0	0	0
Subtotal.....	2.5	22.3	44.6	95.4
Total.....	0	0	0	0

TABLE 6.—BASIC BALANCES OF PAYMENTS SUMMARY (ILLUSTRATIVE CASE NO. 1)

[In billions of dollars]

	1970	1975	1980	1985
Consuming countries:				
United States.....	2.3	-2.0	-3.1	1.2
West Europe.....	-3.9	-8.1	-9.0	-10.9
Japan.....	-.3	-3.1	-8.1	-31.4
Canada.....	0	-.1	-.9	-1.6
Other free world.....	.3	.9	-.5	-5.3
Subtotal.....	-1.7	-12.4	-22.6	-47.9
Producing countries:				
Venezuela.....	.2	.7	-0	0
Algeria.....	0	.2	0	0
Libya.....	.7	1.6	1.2	1
Nigeria.....	0	1.2	1.5	1.7
Iran.....	0	2.5	1.7	.2
Iraq.....	.1	.1	3.4	14.2
Kuwait.....	.1	.8	1.0	1.8
Qatar.....	.1	.5	.6	.7
Saudi Arabia.....	.3	3.2	9.1	20.4
United Arab Emirates.....	.1	1.6	3.8	8.7
Indonesia.....	0	0	.1	.1
Subtotal.....	1.7	12.4	22.6	47.9
Total.....	0	0	0	0

TABLE 7.—SENSITIVITY OF ASSUMPTIONS, 1980 AND 1985 U.S. PAYMENTS BALANCES

[In billions of dollars]

	Current account		Basic balance	
	1980	1985	1980	1985
Case description: Illustrative case No. 1.....	-8.5	-10.0	-3.1	1.2
Changes in illustrative case for—				
1. U.S. energy consumption increases at 4.5 percent per year instead of 4 percent (2,400,000 and 4,400,000 barrels per day more imports).....	-5.0	-13.8	-4.6	-12.5
2. U.S. energy consumption increases at 3.5 percent per year instead of 4 percent (2,200,000 and 4,200,000 barrels per day less imports).....	+4.5	+13.2	+4.1	+11.9
3. Already agreed to price changes hold through 1975 (\$1 per barrel lower 1975 prices) and 10 percent per year increase 1975-85.....	+3.9	+3.9	+1.4	-.7
4. \$1 per barrel higher prices.....	-3.1	-2.8	-1.4	-.2
5. U.S. increases market share of crude producers by 25 percent.....	+2.5	+5.2	+2.5	+5.2

APPENDIX

BASIC FORMULA

The computer program calculates the oil-related current account balances and basic payments balances for the oil consuming and producing countries according to the following formulas, which are additive both vertically and horizontally.

Consuming countries	Producing countries	Total
	Oil exports.....	Oil exports.
Transportation moneys.....	Plus transportation moneys.....	Transportation cost.
Plus oil earnings.....	Minus oil earnings.....	Zero.
Plus merchandise exports.....	Minus merchandise imports.....	Zero.
Plus other exports.....	Minus economic aid.....	Zero.
Minus oil import cost.....		Minus oil import cost.
Current account.....	Plus current account.....	Zero.
Minus oil exploration capital outflows.....	Plus oil exploration capital inflows.....	Zero.
Plus participation payments.....	Minus participation payments.....	Zero.
Basic balance.....	Plus basic balance.....	Zero.

By definition, the total current account deficit of the consuming countries matches the total surplus of the producing countries. The total basic balances are also equal and opposite. A brief discussion of each of the input items follows. The quantitative assumptions are in Attachments 1-12.

OIL EXPORTS

Oil exports represent the value received for the oil in the producing countries. Allowance is made for domestic oil consumption. Included in current dollars are the tax-paid oil cost and the apparent margin. The tax-paid costs for 1970 are a matter of record. For 1975 the Persian Gulf and African oil costs include the escalations agreed to in the Tehran, Tripoli, and Geneva meetings, full adjustment for the recent devaluation, plus \$1.00 per barrel to reflect further adjustments. For 1980 and 1985, tax-paid costs are escalated by 10 percent per year from 1975. Apparent margins are held constant, and producing countries are assumed to share the apparent margin as they assume oil ownership. For Venezuela, Indonesia and Canada, constant differentials are based on quality and transportation factors.

OIL DISTRIBUTION PATTERNS

Oil is assumed to be imported from traditional country suppliers to the extent that availability considerations permit. Canada exports to the United States, and Canada imports from Western Hemisphere sources—in this case from Venezuela. African crudes go mostly to Europe, but some Nigerian and Libyan crudes do go to the United States. Indonesian crudes go mostly to Japan, but some also to the United States. The Middle East supplies crude shortfalls.

TRANSPORTATION COSTS

Transportation costs are based on a viable tanker industry. Long-term rates are consistent with an adequate investment return on very large crude carriers. Subsequent distribution of transportation monies is based on fueling tankers at their loading points, current ownership patterns, and reinvestment of financial flows in new tanker construction. Japan's resulting financial flow on transportation monies is indicative of current tanker building activity, and her 1970 inflows match her income on 1970 tanker deliveries.

OIL EARNINGS

Oil earnings represent the apparent margin earned by the owners of the producing companies. Oil earnings are distributed to the consuming countries according to ownership. Although the margin per barrel produced is assumed constant, the producing companies' unit earnings fall as participation begins. Presumably, downstream operations will become more profitable. The somewhat optimistic assumption is made that the producing countries will require assistance in selling their oil in 1975 and 1980 and will pay the producing companies one-half of the apparent margin for this service.

MERCHANDISE EXPORTS

Oil producers can use their oil-related receipts for merchandise (consumer, capital, and military goods) imports, for economic aid, for long-term investment, or for building their financial reserves. The populations and/or needs of many countries are large enough so that merchandise imports will require nearly all the foreign exchange. These countries are: Venezuela, Algeria, Libya, Nigeria, Iran and Indonesia. However, the other five countries—Iraq, Kuwait, Qatar, Saudi Arabia, and United Arab Emirates—have spending limitations. Their populations are small, and their revenues are large. Procedural problems, delivery times, and a cautious approach will slow expenditures. Accordingly, maximum import potentials have been estimated for these countries based on their expanding merchandise imports at 15–20 percent per year.

One simplifying assumption is that merchandise exports equal merchandising imports. To the extent that merchandise exports are carried in foreign ships, some consuming countries' (mainly the United States) balances will be slightly overstated, and others' will be understated. This second order factor is believed to be offset by the assumption that no U.S. exports to Canada are associated with U.S. imports of Canadian crude. Although Canada is a net crude importer and Canada has had and should continue to have trade and payments surpluses, about \$100–200 million per year of U.S. exports probably are associated with Canadian oil activities.

AID ASSISTANCE

"Other exports" represent those exports to other developing countries bought with economic aid from Libya, Kuwait, Qatar, Saudi Arabia, and United Arab Emirates. These latter countries are assumed to use 10–25 percent of their excess revenues for economic aid. A sub-case is developed for no economic aid. The program contains no provision for other secondary spending of oil monies. Rather the assumption is made that Japanese, Western Europe and Canadian imports will be independent of receipts from their exports. If this secondary effect does come into play, presumably the changes in the rest of the world's trade patterns would be similar to the changes in the oil producers' patterns as all buyers attempt to get the best bargains. This would increase trade and payment swings.

CAPITAL FOR OIL EXPLORATION AND DEVELOPMENT

Long-term capital flows include oil exploration and development capital flows from the consuming countries to the producing countries. Such capital flows supplement the internal funds generation from depreciation and amortization. At 5¢ per barrel, the funds generated from depreciation and amortization will total about \$1 billion per year by 1980. Both consuming countries and producing countries are projected to add about the same amount for oil exploration and development. Sensitivities have been developed for no flows of consuming country capital to the producing countries. In any event a \$1 billion per year capital outflow for oil exploration and development is small relative to the excess revenues which are \$55 and \$117 billion per year in 1980 and 1985.

PARTICIPATION PAYMENTS

Participation payments for acquiring 51 percent of their oil production have been agreed to by Kuwait, Qatar, Saudi Arabia, and the United Arab Emirates. A similar arrangement is envisioned for Nigeria. Different arrangements appear likely in the other oil producing countries. These payments are included in the long-term capital flows. Just as with the oil exploration monies, the participation payments are small relative to excess oil revenues.

PRODUCERS' LONG-TERM CAPITAL INVESTMENTS

The assumptions about long-term capital investments by the oil producers are critical to the analysis. In this "illustrative case," where oil prices increase 10 percent per year, excess funds are generated at phenomenal rates—\$55 billion in 1980 and \$117 billion in 1985. About 20 percent of these funds are assumed to be used for economic assistance, and the rest are available for long-term investments or for increasing financial reserves.

ILLUSTRATIVE CASE ASSUMPTIONS

A methodology summary showing the formulas may be found in Attachment 13. The assumptions—or input—for the "Illustrative Case" are summarized in Attachments 1-12.

METHODOLOGY SUMMARY LIST OF ATTACHMENTS

Attachment Number and item	Units	Source
1. Energy consumption by country.....	Million barrels per day...	National Petroleum Council, BP Statistics, OECD, Interior.
2. Nonoil energy consumption.....	do.....	Do.
3. Domestic oil production.....	do.....	Do.
4. Oil export prices (f.o.b.).....	Dollars per barrel.....	Interior.
5. Transportation costs.....	do.....	Estimated.
6. Oil earnings.....	do.....	Do.
7. Distribution of transportation monies.....	do.....	Do.
8. Import potentials of oil exporters.....	Billion dollars.....	Do.
9. Import patterns of oil exporters.....	Percent.....	OECD and Commerce.
10. Capital flows for oil exploration.....	Billion dollars.....	Estimated.
11. Participation payments.....	do.....	Do.
12. Capital flows for excess oil revenues.....	do.....	Do.
13. Methodology summary—Formulas.....	.....	.....

ATTACHMENT 1

TOTAL ENERGY CONSUMPTION (ILLUSTRATIVE CASE NO. 1)

Country	Per capita consumption (barrels per year)		Growth rate percent per year	Total consumption (million barrels per day equivalent)			
	1970	1985		1970	1975	1980	1985
United States.....	58.5	89.7	4	32.8	39.8	48.5	59.0
West Europe.....	24.5	45.3	5	22.4	28.6	36.5	46.5
Japan.....	20.5	72.7	10	5.8	9.3	15.0	24.2
Canada.....	46.0	86.0	6	2.7	3.6	4.9	6.5
Other free world.....	4.1	6.5	6	11.3	15.1	20.3	27.3
Subtotal.....	16.5	26.0	.....	75.0	96.4	125.2	163.4
Venezuela.....	10.5	25.9	10	.3	5	.81	1.35
Algeria.....	1.5	3.6	10	.06	.1	.16	.25
Libya.....	5.6	13.8	10	.03	.05	.08	.13
Nigeria.....	.2	.8	10	.04	.06	.10	.17
Iran.....	4.7	12.8	10	.37	.62	1.0	1.51
Iraq.....	3.5	9.0	10	.09	.15	.23	.38
Kuwait.....	81.6	110.0	5	.17	.25	.30	.35
Qatar.....	.....	.....	.....	.....	.....	.....	.....
Saudi Arabia.....	9.4	26.0	10	.2	.32	.53	.84
United Arab Emirates.....	.1	.5	10	.14	.23	.36	.58
Indonesia.....	.6	1.6	10	.2	.32	.53	.84
Subtotal.....	2.3	6.1	.....	1.6	2.6	4.1	6.4
Total.....	14.6	23.2	.....	76.6	99.0	129.3	169.8

ATTACHMENT 2

NONOIL ENERGY CONSUMPTION (ILLUSTRATIVE CASE NO. 1)

[In millions of barrels per day equivalent]

	1970	1975	1980	1985
United States:				
Coal.....	6.3	7.0	8.0	10.0
Gas.....	10.7	11.5	12.0	14.0
Water.....	1.3	1.4	1.5	1.6
Nuclear.....	.1	1.5	3.9	8.0
Other.....			.5	2.4
Subtotal.....	18.4	21.4	25.9	36.0
West Europe:				
Coal.....	6.1	5.5	5.0	4.0
Gas.....	1.4	2.5	4.0	6.0
Water.....	1.8	2.0	2.5	3.0
Nuclear.....	.3	.7	1.6	3.0
Other.....	.1	.1	.3	.5
Subtotal.....	9.7	10.8	13.4	16.5
Japan:				
Coal.....	1.2	1.6	2.1	3.0
Gas.....	.1	.2	.3	.4
Water.....	.4	.5	.6	.7
Nuclear.....		.2	.5	1.0
Other.....				
Subtotal.....	1.7	2.5	3.5	5.1
Canada:				
Coal.....	.3	.4	.5	.6
Gas.....	.6	.8	1.0	1.3
Water.....	.3	.3	.4	.5
Nuclear.....		.1	.2	.3
Other.....				
Subtotal.....	1.2	1.6	2.1	2.7
Oil Exporter: Gas¹	.5	.8	1.3	2.1
Other free world:				
Coal.....	3.6	3.6	3.6	3.6
Gas.....	.4	.6	.8	1.0
Water.....	1.0	1.2	1.4	1.6
Nuclear.....			.3	.6
Other.....				
Subtotal.....	5.0	5.4	6.1	6.8
Free world:				
Coal.....	17.5	18.1	19.2	21.2
Gas.....	13.7	16.4	19.4	24.8
Water.....	4.8	5.4	6.4	7.4
Nuclear.....	.4	2.5	6.5	12.9
Other.....	.1	.1	.8	2.9
Subtotal.....	36.5	42.5	52.3	69.2

¹ See attachment 2A.

ATTACHMENT 2A

GAS USAGE BY EXPORTER COUNTRIES (ILLUSTRATIVE CASE NO. 1)

[In millions of barrels per day oil equivalent]

	1970	1975	1980	1985
Venezuela.....	0.11	0.18	0.28	0.45
Algeria.....	.02	.03	.05	.08
Libya.....	.01	.02	.03	.04
Nigeria.....	.01	.02	.03	.04
Iran.....	.10	.16	.26	.42
Iraq.....	.02	.03	.05	.08
Kuwait.....	.05	.06	.13	.20
Qatar.....				
Saudi Arabia.....	.05	.08	.13	.22
United Arab Emirates.....	.05	.08	.13	.22
Indonesia.....	.08	.14	.21	.35
Total.....	.50	.8	1.3	2.1

ATTACHMENT 3
OIL PRODUCTION (ILLUSTRATIVE CASE NO. 1)
 [In millions of barrels per day]

	1970	1975	1980	1985
Exporting countries:				
Venezuela.....	3.8	3.5	3.5	3.5
Algeria.....	1.0	1.5	2.0	2.5
Libya.....	3.3	3.0	3.0	3.0
Nigeria.....	1.1	2.5	4.0	6.0
Iran.....	3.8	6.6	8.0	10.0
Iraq.....	1.6	2.9	4.4	9.0
Kuwait.....	3.0	3.0	3.0	3.0
Qatar.....	.4	1.0	1.0	1.0
Saudi Arabia.....	3.8	10.0	19.6	27.0
United Arab Emirates.....	1.3	3.0	5.0	7.0
Indonesia.....	.9	1.5	2.5	3.6
Subtotal, exporters.....	24.0	38.5	56.0	75.6
Consuming countries:				
United States.....	11.3	10.0	11.0	11.0
West Europe ¹.....	.3	2.0	2.5	4.0
Japan.....				
Canada.....	1.3	2.0	2.5	3.5
Other free world.....	3.2	4.0	5.0	6.5
Subtotal.....	16.1	18.0	21.0	25.0
Total.....	40.1	56.5	77.0	100.6

¹ Includes Soviet imports.

ATTACHMENT 4
OIL EXPORT PRICES (ILLUSTRATIVE CASE NO. 1)
 [In dollars per barrel, free on board]

	¹ 1970	² 1975	³ 1980	³ 1985
Venezuela.....	1.90	4.05	5.90	8.85
Algeria.....	2.10	4.27	6.10	9.07
Libya.....	1.78	4.27	6.10	9.07
Nigeria.....	1.74	4.10	5.95	8.90
All Persian Gulf.....	1.45	3.35	5.20	8.15
Indonesia.....	1.60	4.51	6.36	9.31
Canada.....	2.80	5.00	6.66	9.70

¹ 1970 basis—1970 tax-paid cost plus 1970 apparent margin.

² 1975 basis—Tax-paid cost per various agreements plus 10 percent for devaluation plus constant 1970 apparent margin for Mideast and African crudes plus \$1 per barrel. Venezuela, Indonesia, and Canadian crudes reflect quality and transportation differentials.

³ 1980-85 basis—1975 tax-paid cost increased by 10 percent per year for All Persian Gulf crudes; margins and crude differentials remain constant for other crudes.

ATTACHMENT 5

TRANSPORTATION COSTS AND DISTRIBUTION PATTERNS (ILLUSTRATIVE CASE NO. 1)

Destination	United States	West Europe	Japan	Canada	Other
Transportation cost (dollar per barrel):					
Venezuela.....	0.24			0.40	0.26
Percent of world scale rate ¹	(90)			(110)	(100)
Nigeria.....	.62	.57			
Percent of world scale rate ¹	(100)	(100)			
Mediterranean.....	.57	.39			
Percent of world scale rate ¹	(100)	(100)			
Persian Gulf.....	1.13	1.07	.60		.62
Percent of world scale rate ¹	(85)	(85)	(85)		(100)
Indonesia.....	.82		.38		.38
Percent of world scale rate ¹	(90)		(90)		(90)
Distribution patterns (percent of oil exports):					
Venezuela ²	(b)70			(a)	(a)30
Algeria.....		(a)100			
Libya.....	(e)10	(b)90			
Nigeria.....	20d	80c			
Persian Gulf ³	(f)	(d)	(b)		(c)
Indonesia.....	(c)20		(a)70		(b)10
Canada.....	(a)100				

¹ World scale rates have been increased to reflect the 1973 dollar devaluation. Rates should allow adequate return for new tankers. Suez remains closed.

² Venezuela supplies Canada before supplying United States and "Other."

³ Persian Gulf supplies any shortfall.

Note: Lower case letters indicate sequential patterns for oil imports.

ATTACHMENT 6

OIL EARNINGS TO CONSUMING COUNTRIES (ILLUSTRATIVE CASE NO. 1)

	Percent distribution		Total earnings (cents per barrel produced)			
	United States	West Europe	1970 ¹	1975 ²	1980 ³	1985 ⁴
Venezuela.....	80	20	40	40	36	10
Algeria.....		100	17	17	10	8
Libya.....	90	10	30	22	19	20
Nigeria.....	20	80	40	35	32	20
Iran.....	40	60	40	35	32	20
Iraq.....	20	80	40	35	32	20
Kuwait.....	50	50	40	35	32	20
Qatar.....		100	40	35	32	20
Saudi Arabia.....	100		40	35	32	20
United Arab Emirates.....	20	80	40	35	32	20
Indonesia.....	100		10	10	10	10
Canada.....	100		50	50	50	50

¹ 1970 oil earnings or apparent margin based on above earnings and attachment 3 production:

[In millions of dollars]

	Total	United States	Survey of current business	Comments on the survey
Venezuela.....	555	445	417	Includes all Latin America.
Africa.....	584	358	600	Tanker earnings.
Middle East.....	2,060	1,170	1,778	Good check.
Canada.....	237	237	342	Gas and refinery earnings.
Total.....	3,469	2,243	2,537	

² 1970 basis—Distribution of 1970 apparent margin per ownership.

³ 1975 and 1980 basis—Same margin as 1970 on oil companies' barrel and 50 percent of same margin on producing countries' barrels per attachment 11.

⁴ 1985 basis—No oil company revenue on producing countries' barrels.

Note: Other ranges to be investigated include constant earnings and increasing earnings.

ATTACHMENT 7

DISTRIBUTION OF TRANSPORTATION MONEYS (ILLUSTRATIVE CASE NO. 2)

[In percent]

Item	Total	Oil exporting countries	United States	West Europe	Japan	Others
Fuel.....	15	15				
Crews.....	5	1	1	1	1	1
Financing.....	40	5	5	10	20	
Profit and taxes.....	20	2	5	5	4	4
Other.....	20		3	10	5	2
Total.....	100	23	14	26	30	7

Note: These approximate distributions are based on: (1) Largely foreign construction and foreign financing of new tankers; (2) foreign fueling; (3) European and Japanese maintenance, and largely European insurance.

ATTACHMENT 8

IMPORT POTENTIALS—OF OIL EXPORTING COUNTRIES (ILLUSTRATIVE CASE NO. 1)

[Dollar amounts in billions]

Oil producers	Actual imports		Projected potential imports			Growth rate (percent year) 1970-85
	1966	1970	1975	1980	1985	
Venezuela.....	\$1.5	\$2.0	\$4.0	\$8.0	\$16.0	15
Algeria.....	.6	1.2	1.4	4.8	9.6	15
Libya.....	.4	.6	1.5	3.7	9.5	20
Nigeria.....	.7	1.1	2.8	7.0	17.5	20
Iran.....	.9	1.7	4.3	10.8	27.0	20
Iraq.....	.5	.5	1.0	2.0	4.0	15
Kuwait.....	.5	.7	1.4	2.8	5.6	15
Qatar.....	0	.1	.3	.6	1.5	20
Saudi Arabia.....	.6	.7	2.0	5.0	10.5	20
United Arab Emirates.....	.2	.3	.6	1.2	2.4	15
Indonesia.....	.5	.9	2.3	5.7	14.0	20
Canada.....			0	0	0	

ATTACHMENT 9

IMPORT PATTERNS OF OIL EXPORTING COUNTRIES (ILLUSTRATIVE CASE NO. 1)

[Percent share of total import market]

Base case (1970 pattern)	Import source			
	United States	West Europe	Japan	Other
Venezuela.....	40	29	7	24
Algeria.....	7	78	2	13
Libya.....	21	64	6	9
Nigeria.....	13	54	7	26
Iran.....	22	52	12	14
Iraq.....	5	44	4	47
Kuwait ¹	18	37	18	27
Qatar.....	17	58	14	11
Saudi Arabia ¹	25	44	13	18
United Arab Emirates.....	17	58	14	11
Indonesia ¹	30	29	37	4

¹ 1970 U.S. share adjusted to be more consistent with historical pattern.

ATTACHMENT 10

CAPITAL FLOWS FOR OIL EXPLORATION (ILLUSTRATIVE CASE NO. 1)

	Percent distribution from consuming country sources			Total capital from outside (million)				
	United States	West Europe	Japan	1970	(United States)	1975	1980	1985
Venezuela.....	80	20		\$200	(\$160)			
Algeria.....		100		50		\$100	\$100	\$100
Libya.....	90	10		100	(90)			
Nigeria.....	20	80		200	(40)	300	300	300
Iran.....	40	60		-100	(-40)	100	100	100
Iraq.....	20	80						
Kuwait.....	50	50		-100	(-50)			
Qatar.....		50	50	60		50	50	
Saudi Arabia.....	80	10	10	-100	(-80)	100	100	100
United Arab Emirates.....	20	60	20	50	(10)	100	100	100
Indonesia.....	80		20	25	(20)	50	50	50
Canada.....	100			200	(200)	400	400	400
Total.....				585	(350)	1,200	1,200	1,150

Note: These capital flows are for exploration and development investments that increase foreign capitalization; i.e. funds over and above depreciation or amortization.

ATTACHMENT 11

PARTICIPATION PAYMENTS AND OIL OWNERSHIP (ILLUSTRATIVE CASE NO. 1)

	1975	1980	1985
Estimated participation payments (in millions of dollars):			
Venezuela.....			
Algeria.....			
Libya.....		300	300
Nigeria.....		100	100
Iran.....			
Iraq.....			
Kuwait.....		57	67
Qatar.....		27	33
Saudi Arabia.....		193	220
United Arab emirates.....		88	100
Indonesia.....			
Total.....		765	720
Estimated producing country ownership (percent):			
Venezuela.....	0	10	100
Algeria.....	77	90	90
Libya.....	51	75	75
Nigeria.....	25	40	51
Iran.....	10	40	51
Iraq.....	100	100	100
Kuwait.....	25	40	51
Qatar.....	25	40	51
Saudi Arabia.....	25	40	51
United Arab emirates.....	25	40	51
Indonesia.....	100	100	100

Note: Participation payments are current as of February 1973 (Petroleum Press Service) and include adjustment for Feb. 12 devaluation. Nigeria and Libya are assumed to make indicated participation agreements. Iran and Venezuela are assumed to take partial and total ownership at end of current concessions. Iraq nationalization assumed to have no net exchange of funds, but a lower purchase price that allows continued "profits" to former owners.

ATTACHMENT 12

DISPOSITION OF EXCESS OIL REVENUES (ILLUSTRATIVE CASE NO. 1)

[In percent]

Producing country	Current account items including aid to foreign countries ¹				Long-term capital investment ²				Reserves and short-term investment
	United States	West Europe	Japan	Other	United States	West Europe	Japan	Other	
Venezuela.....					10	10			100
Algeria.....									50
Libya.....					5	5		15	50
Nigeria.....									100
Iran.....					15	15			65
Iraq.....					10	15			65
Kuwait.....	4	10	4	7	15	15			30
Qatar.....	2	5	2	3	10	10	10		50
Saudi Arabia.....	4	10	4	7	10	10	10		30
United Arab Emirates.....	2	5	2	3	10	10	10		50
Indonesia.....									100
Canada.....									100

¹ These items are 12c in attachment 13.² These items are 12b in attachment 13.

ATTACHMENT 13

METHODOLOGY SUMMARY—FORMULAS

Item	Formula ¹
I. Total oil consumption.....	I = 1 - 2.
II. Oil imports.....	II = I - 3. ²
III. Oil exports.....	III = 3 - I. ²
IV. Oil import cost.....	IV = II(4+5).
V. Oil investment earnings.....	V = (3)(6).
VI. Transportation earnings.....	VI = II(5)(7).
VII. Imports of oil producers by source.....	VII = (9)(8) or 9(III(4)+VI-V+10-11).
VIII. Current account balances:	
VIIIc—Consuming countries.....	VIIIc = V+VI+VII-IV+12 _a .
VIIIp—Producing countries.....	VIIIp = (II)(4)+VI-V-VII-12 _a .
IX. Excess oil revenues.....	IX = (VIIIp+10-11).
X. Basic balances:	
Xc—Consuming countries.....	Xc = (VIIIc-10+11+12) _b .
Xp—Producing countries.....	Xp = (VIIIp+10-11-12) _b .

¹ Arabic numbers refer to input attachments which follow.² Except for Canada.

SUPPLEMENT A-1

ALTERNATIVE PRICE ASSUMPTION¹

[Illustrative price and balances in parentheses]

	1970	1975	1980	1985
Persian Gulf.....		4.07	7.03	12.08
F.o.b. price (dollars per bbl).....	(1.45)	(3.35)	(5.20)	(8.15)
Current account balance (billions of dollars):				
United States.....	(2.4)	-15.7(-4.6)	-34.1(-8.5)	-51.6(-10.0)
Western Europe.....	(-4.0)	-30.5(-10.7)	-58.9(-14.6)	-116.5(-23.2)
Japan.....	(-4)	-13.4(-4.5)	-39.0(-12.9)	-115.5(-40.0)
Basic payments balance:				
United States.....	(2.3)	-8.5(-2.0)	-16.5(-3.1)	-12.4(1.2)
Western Europe.....	(-3.9)	-22.6(-8.1)	-39.3(-9.0)	-71.6(-10.8)
Japan.....	(-3)	-10.0(-3.1)	-82.7(-9.1)	-91.9(-31.4)

¹ Prepared at the request of the subcommittee to reflect price increases of October 1973 (DIBA/IERA case 370).

SUPPLEMENT A-2

DEPARTMENT OF COMMERCE, DIBA/IERA; CASE 370, OCT. 29, 1973; BALANCE ON CURRENT ACCOUNT

[Billions of dollars]

Assumptions: (1) Illustrative; (2) Δ MPC (9 percent) \div inflation (2½ percent) = 11½ percent

	1974	1975	1980	1985
Posted price.....	5.11	5.69	9.81	16.87
Tax paid.....	3.15	3.51	6.05	10.40
Producer margin.....	.50	.56	.98	1.68
F.o.b. price.....	3.65	4.07	7.03	12.08
Tanker charge.....	1.50	1.50	1.50	1.50

SUPPLEMENT A-3

OILBOP I—DEPARTMENT OF COMMERCE, DIBA/IERA CASE 370—OCT. 29, 1973

BALANCE OF CURRENT ACCOUNT

[In billions of dollars]

	1970	1975	1980	1985
Consuming countries:				
United States.....	2.4	-15.7	-34.1	-51.6
West Europe.....	-4.0	-30.5	-58.9	-116.5
Japan.....	-4	-13.4	-39.0	-115.5
Canada.....	-2	-5	-2.1	-3.4
Other free world.....	-2	-7.8	-25.4	-68.1
Subtotal.....	-2.5	-67.9	-159.5	-355.1
Producing countries				
Venezuela.....	0	5.5	5.6	3.9
Algeria.....	-0	2.5	4.3	8.4
Libya.....	.9	6.0	7.8	9.7
Nigeria.....	-2	4.7	11.3	27.3
Iran.....	.1	12.8	21.2	38.7
Iraq.....	.2	2.2	16.1	60.2
Kuwait.....	.5	5.1	8.1	13.9
Qatar.....	.1	2.2	3.4	5.2
Saudi Arabia.....	.7	19.0	59.9	138.1
Union of Arab Emirates.....	.2	6.5	17.5	41.0
Indonesia.....	-0	1.5	4.2	8.7
Subtotal.....	2.5	67.9	159.5	355.1
Total.....	-0	-0	0	0

SUPPLEMENT A-4

OILBOP I—DEPARTMENT OF COMMERCE, DIBA/IERA CASE 370—OCTOBER 29, 1973
BALANCE ON CURRENT ACCOUNT AND LONG TERM CAPITAL (BASIC BALANCE OF PAYMENTS)

[In billions of dollars]

	1970	1975	1980	1985
Consuming countries.				
United States.....	2.3	-8.5	-16.5	-12.4
West Europe.....	-3.9	-22.6	-39.3	-71.6
Japan.....	-3	-10.0	-28.7	-91.9
Canada.....	0	-1	-1.7	-3.0
Other free world.....	.3	-.2	-5.7	-23.6
Subtotal.....	-1.7	-41.4	-92.0	-202.5
Producing countries:				
Venezuela.....	.2	5.5	5.6	3.9
Algeria.....	0	1.3	2.2	4.2
Libya.....	.7	3.8	5.0	6.5
Nigeria.....	0	4.9	11.5	27.6
Iran.....	0	8.4	13.8	25.2
Iraq.....	.1	1.4	10.5	39.1
Kuwait.....	.1	2.0	3.2	5.6
Qatar.....	.1	1.3	1.9	2.9
Saudi Arabia.....	.3	7.6	23.8	55.3
Union of Arab Emirates.....	.1	3.7	9.9	23.3
Indonesia.....	0	1.6	4.3	8.8
Subtotal.....	1.7	41.4	92.0	202.5
Total.....	0	0	0	0

SUPPLEMENT B-1¹

DISTRIBUTION OF LONG TERM CAPITAL BY PRODUCER COUNTRIES

[Percent distribution total]

	Alternative case	Illustrative case
United States.....	16	25
Western Europe.....	34	30
Japan.....	20	15
Other.....	30	30

BASIC BALANCES OF CONSUMING COUNTRIES

[In billions of dollars]

	1970		1975		1980		1985	
	Alternative case	Illustrative case	Alternative case	Illustrative case	Alternative case	Illustrative case	Alternative case	Illustrative case
United States.....	2.2	(2.3)	-3.1	(-2.0)	-4.9	(-3.1)	-2.6	(1.2)
Western Europe.....	-3.8	(-3.9)	-7.5	(-8.1)	-8.0	(-9.0)	-8.8	(-10.8)
Japan.....	-3	(-.3)	-2.6	(-3.1)	-8.2	(-9.1)	-29.5	(-31.4)
Canada.....	0	(0)	-.1	(-.1)	-.9	(-.9)	-1.6	(-1.6)
Other.....	.3	(.3)	.9	(.9)	-.5	(-.5)	-5.3	(-5.3)

¹ Prepared at the subcommittee's request to reflect possible alternate flow of excess surplus revenues (DIBA/IERA case 371).

SUPPLEMENT B-2

CASE NO. 371, DISPOSITION OF EXCESS OIL REVENUES

[In percent]

Producing country	Current account items including aid to foreign countries ¹				Long-term capital investment ²				Reserves and short-term investment
	United States	West Europe	Japan	Other	United States	West Europe	Japan	Other	
Venezuela.....					2				100
Algeria.....					1	48			50
Libya.....	5	10	3	7		9		15	50
Nigeria.....									100
Iran.....					5	20	5	5	65
Iraq.....					2	19	4	10	65
Kuwait.....	4	10	4	7	4	20	5	15	30
Qatar.....	2	5	2	3	2	14	14	8	30
Saudi Arabia.....	4	10	4	7	8	11	11	15	50
Union of Arab Emirates.....	2	5	2	3	10	10	10	8	50
Indonesia.....									100
Canada.....									100

¹ These items are 12c in attachment 13.² These items are 12b in attachment 13.

SUPPLEMENT B-3

OILBOP I—DEPARTMENT OF COMMERCE, DIBA/IERA CASE 371—NOV. 1, 1973

BALANCE ON CURRENT ACCOUNT

[In billions of dollars]

	1970	1975	1980	1985
Consuming countries:				
United States.....	2.4	-4.6	-8.5	-10.0
West Europe.....	-4.0	-10.7	-14.6	-23.2
Japan.....	-4	-4.5	-12.9	-40.0
Canada.....	-2	-5	-1.3	-2.0
Other free world.....	-2	-2.1	-7.3	-20.1
Subtotal.....	-2.5	-22.3	-44.6	-95.4
Producing countries:				
Venezuela.....	0	.7	-0	-0
Algeria.....	-0	.4	-1	-1
Libya.....	.9	2.6	2.2	1.1
Nigeria.....	-2	1.0	1.3	1.4
Iran.....	.1	3.7	2.6	1.3
Iraq.....	.2	.1	5.3	21.8
Kuwait.....	.5	1.9	2.7	4.5
Qatar.....	.1	.9	1.1	1.3
Saudi Arabia.....	.7	8.1	22.9	50.8
Union of Arab Emirates.....	.2	2.8	6.7	15.2
Indonesia.....	-0	-0	0	0
Subtotal.....	2.5	22.3	44.6	95.4
Total.....	-0	-0	0	0

SUPPLEMENT B-4

OILBOP I—DEPARTMENT OF COMMERCE, DIBA/IERA CASE 371—NOVEMBER 1, 1973
BALANCE ON CURRENT ACCOUNT AND LONG TERM CAPITAL (BASIC BALANCE OF PAYMENTS)

[In billions of dollars]

	1970	1975	1980	1985
Consuming countries:				
United States.....	2.2	-3.1	-4.9	-2.6
West Europe.....	-3.8	-7.5	-8.0	-8.8
Japan.....	-3	-2.6	-8.2	-29.5
Canada.....	-0	-1	-9	-1.6
Other free world.....	.3	.9	-5	-5.3
Subtotal.....	-1.7	-12.4	-22.6	-47.9
Producing countries:				
Venezuela.....	.2	.7	-0	-0
Algeria.....	0	.2	0	0
Libya.....	.7	1.6	1.2	.1
Nigeria.....	0	1.2	1.5	1.7
Iran.....	0	2.5	1.7	.2
Iraq.....	.1	.1	3.4	14.2
Kuwait.....	.1	.8	1.0	1.8
Qatar.....	.1	.5	.6	.7
Saudi Arabia.....	.3	3.2	9.1	20.4
Union of Arab Emirates.....	.1	1.6	3.8	8.7
Indonesia.....	0	0	.1	.1
Subtotal.....	1.7	12.4	22.6	47.9
Total.....	-0	0	0	0

