



Energy Security in the 1990s

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Fall 1988



Lining up for gas, 1979
Courtesy Wikimedia Commons

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Fifteen years after the October 1973 oil embargo first catapulted energy security to the top of the international agenda, and a decade after the Iranian Revolution worsened the situation, concern is again growing about energy security and the potential for new crises in the 1990s. Are the seeds now being planted for revived problems in the next decade? Or has the response to the harsh experiences of the 1970s so fundamentally altered the landscape that consumers can look forward to a decade in which energy supplies will be neither economically nor politically constraining? If new crises do emerge, are the consuming countries better prepared to weather them than they were in the 1970s?



percent of consumption, and seem headed back toward the high levels that were reached in 1979, at the time of the Iranian Revolution. Overall, oil demand in both the United States and the world is rising again. As a telling commentary on the significance of petroleum and the instability of the region possessing 70 percent of total free-world oil reserves, U.S. naval vessels took to patrolling the Gulf in 1987 to protect oil shipments against Iran's "tanker war." Meanwhile, the use of coal and nuclear power—two of the most important alternatives to oil—appears increasingly stymied, and environmental considerations could put increasing pressure on the whole energy supply system.

Yet there are many no less persuasive indicators pointing in the opposite direction. Oil prices, which almost three years ago collapsed from \$28 a barrel to between \$10 and \$11 a barrel, and then recovered to about \$18, now seem to have settled at around \$15 and could just as easily decline again as rise. Consumers are benefiting from the lower prices, as are the balance-of-payments accounts of industrial and non-oil-producing developing countries. World oil production is far more diversified than in 1973. Production outside the Organization of Petroleum Exporting Countries (OPEC) has actually risen since the price collapse, and production capacity persists at between nine million and ten million barrels per day in excess of market demand. Oil itself has lost a significant share of the total energy market—down from 54 percent of total energy demand in the developed countries in 1973 to about 44 percent today.

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These latter indicators make clear that the world has changed substantially in the 15 years since the oil embargo so emphatically brought considerations of energy security to the fore. Conditions in the marketplace are radically different from those of the early 1970s. Markets then were tight; now they are dominated by surplus. Then they were relatively rigid; now they are much more flexible. Energy security measures that were then ignored



over the world almost instantaneously. This means that reaction times are much shorter and that various energy markets are linked more closely and interact more immediately with each other.

The objective of energy security is to assure adequate, reliable supplies of energy at reasonable prices and in ways that do not jeopardize major national values and objectives. It is not very hard to conceive of the kind of event that could trigger a crisis. Indeed, the question is not whether there will be events that could threaten energy supply—for surely there will, be they political, military or technological—but rather how resilient energy markets themselves will be and how effective energy security measures will prove. Yet there is much that is uncertain about how markets will develop in the 1990s—ranging from the level of non-OPEC supply, to economic growth in both the developed and the developing world, to technological developments that can affect energy consumption, supply and transportation. The resolution of these uncertainties will determine whether or not the balance between capacity and demand will tighten, especially in the second half of the 1990s. Preliminary data, however, suggest that the price collapse of 1986 marked an end to the retreat from oil consumption that began in October 1973, a slowing of the progress in conservation that has been made since then and a shift back toward high levels of oil consumption—though certainly not at the pell-mell rate of the 1960s.

Present circumstances require a balanced perspective. There is a much more secure base to the world's energy economy than was the case in 1973, and—under the right conditions—that base could well extend to the end of this century and into the next. Yet the risks are real and, under certain plausible circumstances, could become much more significant in the next decade. The present period of calm provides an opportunity to make a series of commitments that will enhance the long-term position of oil consumers. Experience, caution and simple self-interest all dictate reasonable attention to energy security.

II

The focus of energy security concerns is on the shocks—interruptions, disruptions and manipulations of supply—that can lead to sudden, sharp increases in prices and can impose heavy economic and political costs.



which, in transportation, there is no significant ready substitute. The second is the basic asymmetry of trade in oil—the fact that most of the world’s proven reserves are located far from the world’s major consumers. Oil crosses borders and makes long voyages by sea. Oil, more than any other commodity, is intimately intertwined with nationalism and national power, and is subject to political and military struggles for its control.

The issue of security of supply first emerged on the eve of the First World War, when Britain’s first lord of the Admiralty, Winston Churchill, wrestled with the decision of whether to convert the Royal Navy from coal to oil. To burn oil would give the British an advantage in speed and flexibility over the Germans. Yet Churchill was all too aware of the risks Britain would be taking on:

To build any large additional number of oil-burning ships meant basing our naval supremacy upon oil. But oil was not found in appreciable quantities in our islands. If we required it we must carry it by sea in peace or war from distant countries. We had, on the other hand, the finest supply of the best steam coal in the world, safe in our mines under our own land. To commit the Navy irrevocably to oil was indeed "to take arms against a sea of troubles."

That asymmetry remains today a succinct metaphor for the basic problem. To Churchill, the gains outweighed the risks, and he went ahead and ordered the conversion. The issue was made vividly clear in the Second World War, when oil not only determined capabilities, but also defined strategic objectives.

The events of the 1970s have borne out the significance of oil in the overall energy security equation. As a result of the 1973 embargo and other market conditions, oil prices increased from about \$2.50 a barrel to over \$10. The turmoil that accompanied the Iranian Revolution in 1979 drove oil prices from \$13 a barrel to \$34. The implications of these price increases were very heavy. They were a strong force in driving inflation to the point where it seemed to be the intractable political problem of modern industrial democracies. The abrupt price increases also had grave recessionary effects, leading to high unemployment and the deepest economic downturn since the Great Depression. The recycling to developing countries of the burgeoning financial surpluses of the oil exporters



countries, created some of the most serious rifts ever among them, and threatened a loss of national autonomy and independence in foreign policy.

Many of the effects, of course, have since passed. At one time the oil crises seemed destined to realign international politics, but much of that impact has dissipated in today's market, where the threat to withhold oil is likely to injure the exporter much more than the importer.

Still, future threats to oil supplies and thus to energy security could arise from wars and revolutions, or from unexpected technological problems, or from a conjunction of such developments in different parts of the world. But it is not only to the supply of oil that threats could arise. In the early 1980s, the Reagan Administration worried that high dependence on Soviet natural gas would make Western Europe vulnerable to Soviet attempts to gain political advantage through the manipulation of supplies. Currently, some in the electric power industry worry that a future nuclear power plant disaster like that at Chernobyl in 1986, occurring anywhere in the world, could lead to a strong political drive to "turn off" nuclear power. This in turn might disrupt the economies of many nations that now rely on nuclear power, force a quick return to oil, and result in a rapid surge in oil prices. The escalation of environmental worries—concerning, in particular, the "greenhouse" effect and global warming—could lead in the opposite direction, to an accelerated drive away from fossil fuels, creating considerable quandaries for energy policy, great confusion in the energy industries and additional costs for consumers.

Ensuring the availability of oil at reasonable prices remains the primary concern, and it is on that we must focus.

III

We might usefully think in terms of a security margin, an excess of available supply and production capacity over demand that cushions shocks to the system and, not incidentally, makes futile any efforts to manipulate supplies for political advantage. A taut balance between consumers' needs and the availability of supplies is also a precarious balance.



1967 all had, in retrospect, relatively minor effects on the oil market—despite initial expectations to the contrary in each case. In all three cases, there was enough unused production capacity elsewhere in the world to make up for supplies that were not available for physical and political reasons.

After the Six Day War the situation was transformed by a great increase in demand for oil—because of its low price and rapid economic growth—and relatively low investment in diversified sources around the world. By the early 1970s there was virtually no spare capacity in the United States or anywhere else in the world. Thus, when a new Middle East war sparked the Arab oil embargo in October 1973 and the first "oil shock," there were hardly any additional alternative supplies around the world on which to call.

Half a decade later, near the end of the 1970s, the oil market was still caught in this transition. The price increases and security-oriented government policies that followed the embargo had not yet made their full effects felt. U.S. oil imports were at their highest levels ever; U.S. and world oil demand was starting to rise again. Major new sources—Alaska, Mexico and the North Sea—were only just beginning to have an impact. At that moment, the Iranian Revolution toppled the shah, interrupted exports, disrupted long-standing supply arrangements, created panic in the oil market, drove prices to the \$34-a-barrel level—and thus delivered the second oil shock.

Yet this second oil shock gave powerful impetus to the reactions that had already been set in motion by the 1973 embargo. The combined responses generated today's surplus. The higher prices and perceptions of grave insecurity provided a tremendous stimulus for the development of alternative oil and other energy supplies. At the same time, conservation had a profound impact on energy consumption throughout the world. In the late 1970s, my colleagues and I argued that the United States could use 30 to 40 percent less energy per unit of GNP—that is, become that much more energy-efficient—than had been the case in 1973 without much, if any, effect on the standard of living. At the time, this was a novel and very controversial statement, and one that stimulated much contention and criticism. Today, however, the United States uses 27 percent less energy—and 32 percent less oil—per unit of GNP than it did in 1973. Indeed, conservation—improved energy efficiency—has turned out to be the most important incremental energy "source" of all. If the United



The buildup of new supplies and the rise of conservation have created surpluses throughout the energy system. Yet the surplus is most evident in terms of oil. OPEC is producing 17.5-18.5 million barrels a day (though it produced as much as 20 mbd this past summer); it could produce 27-29 mbd.

If there had been, over the last few years, a closer balance between demand and the availability of supply, the world oil market would have reacted much more sharply to the Iran-Iraq War. But, with so large a cushion, the market—again despite initial expectations—shrugged off the war, even when oil fields, refineries and tankers were attacked.

As a result of its policy of price maintenance and production restraint, OPEC quickly lost market share as buyers sought out the cheapest barrel. OPEC's portion of total free-world supply declined from 64 percent in 1979 to 42 percent in 1985. In 1985 and 1986 the OPEC countries moved to regain lost market share. As a result of their increased production, the oil price collapsed, in the process revoking completely the second oil price shock of 1979-1981. Adjusting for inflation, the oil price today, in dollar terms, is below where it was in the mid-1970s.

Yet, despite the price collapse, a surplus of capacity and supply remains. OPEC still has 9 to 10 million barrels per day of unused, or "shut-in," capacity. This surplus, which is market driven, continues to contribute to the security margin. Moreover, several countries have added substantially in recent years to their proven reserves.

IV

This surplus is, however, only part of the security margin. Emergency stocks of oil constitute a second part, much more narrow, but highly significant, flexible and sharply focused. Ever since the British Navy converted from coal to oil, governments of oil-importing countries have periodically pursued policies of building up strategic reserves—oil in government-owned or -controlled storage that can be used in an emergency. There has always been a debate as to how much is enough. Marcus Samuel, the founder of Shell Oil and a leading proponent of Churchill's decision to convert, argued, "You cannot have too much storage—I do not think you can go too far in that." Budget-conscious treasury



suggestion was considered wholly impractical. In the late 1960s, the shah of Iran—keen to increase his country's output and thus revenues—offered to provide the United States a million barrels a day for ten years, at a dollar a barrel, that could be stored in salt domes for emergencies. The United States passed up the offer.

It was only after 1973 that the United States—in coordination with other Western governments in the International Energy Agency—established a strategic petroleum reserve. Today, it contains about 550 million barrels—which would cover about 92 days of U.S. imports at current levels. Other industrial governments—principally Japan and West Germany—hold or control another 380 million barrels of stock. These emergency reserves constitute an insurance policy whose maintenance costs look modest indeed when compared to the costs of the interruptions of the 1970s.

While government stocks have risen, private stocks have fallen. As a result, total stocks—government and private—are at roughly the same level that they were in 1978. Because of the fall in demand since the late 1970s, the current stock level covers about 95-100 days of total forward consumption in the industrial countries, compared to 70-75 days in 1977-78. This increase is a contribution to security.

There is a further element of security margin—dual-fired capacity. This is the ability of combustion equipment in power plants and factories to switch easily from reliance on oil to gas or coal. This capacity has become much more widespread since 1973. The prime reason has been price; dual-fired capacity gives the industrial consumer access to what is, at any given moment, the cheapest energy source. But such capability also adds to security by enabling the consumer, in the midst of a crisis, to switch away from oil—primarily to gas—on very short notice.

Finally, the oil transportation system has become more flexible over the last few years. Since the mid-1940s, there has been a continuing debate about the safest way to transport oil from the Gulf. With the memory of tanker vulnerability during World War II, the initial emphasis was on pipelines to the Mediterranean, but it soon shifted back to tankers. The Suez crisis and the Six Day War—as well as economic forces—provided the motivation to



The Iran-Iraq War reversed the trend and provided powerful impetus to develop pipelines that would eliminate the need to keep open the Strait of Hormuz, at the mouth of the Gulf. In practical terms, this has meant the construction of pipelines to the Red Sea and the Mediterranean. At the outbreak of the Iran-Iraq War, pipeline capacity was two million barrels a day, equivalent to about 20 percent of current Gulf exports. Today's capacity is 4.7 mbd, equivalent to about 50 percent of current exports. These projects do not eliminate risks to transportation, but the diversification certainly greatly reduces those risks.

V

When all is added up, the current margin of energy security is quite considerable. Much of it, however, depends upon the surplus of production capacity over consumption. It is that surplus that we must explore.

The first thing to observe is its distribution. Of the total surplus production capacity, about 75 percent is in the Middle East and 65 percent of the total is concentrated in the Gulf region alone. This means that there are only 2.5-2.7 million barrels per day of surplus capacity outside the Middle East—roughly equivalent to Iran's current production quota. Overall, 70 percent of free-world reserves are in the Middle East. The concentration of the surplus in a tense, violence-prone region means that the security margin needs to be viewed with some caution.

The second question to ask is at what rate will the surplus erode. After all, the issue is not constraints tomorrow but in the 1990s. There is considerable debate within the oil world about that question. The dominant view is that the surplus in capacity will shrink considerably in the first half of the 1990s, setting the stage for higher prices and for increased vulnerability to political shocks. A minority view holds that the surplus capacity could well stretch out to the end of this century, or even beyond.

Which view is correct? Reasonable scenarios can be developed for both positions. The answer will be determined by the evolution of supply and demand, a subject that is dominated by major uncertainties.



demand grew at 1.5 percent annually, compared to no growth in 1985. This year, demand should also grow about 1.5 percent—or about 700,000 barrels per day. Yet the connection between lower prices and increased consumption is confused by the fact that many consumers around the world are not seeing the full effect of the lower prices. When oil prices fell, some industrial countries took the opportunity to increase taxation on gasoline.

There are two major uncertainties on the demand side. One is the degree of continuing momentum in the improvement of energy efficiency—conservation. Will lower prices and the current perception of surplus reduce efforts to maintain and increase energy efficiency, or is increased efficiency now built into the system? The obvious answer is some of both. Preliminary data for 1987 and 1988 suggest a slowing of conservation. There is not enough evidence to decide if this constitutes the beginning of a new trend or only reflects some immediate behavioral reactions to the 1986 price collapse. Still, one can look back and see that the conservation response lagged behind the price increases of the 1970s, in part because of the time it takes to turn over capital stock. This leads some observers to expect a similar lagged response in the other direction, as a result of lower prices.

Yet three points can be made in reply. First, prices that are considered low today are still much higher than the prices of the early 1970s. Second, technological change and innovation will continue to improve energy efficiency, both as a direct objective and as a by-product. Third, while energy security and sheer cost were the driving forces pushing conservation in the 1970s and 1980s, a new imperative is now entering the scene—environmental concern. Atmospheric and climate issues—air pollution, global warming and the greenhouse effect—could provide a strong motive to improve energy efficiency, thus reducing the amount of hydrocarbon combustion that is required and so gaining time to understand the environmental phenomena better. Such concerns are becoming increasingly prominent on the political agenda in the United States and other industrial countries and also in international negotiations.

It should be observed that one area in which strong demand is asserting itself is electricity consumption. Growth rates have been high in many parts of the United States, and in some areas peak demand is getting close to available capacity.



substantially within the Third World. This did not happen, in large part, because of the poor economic performance in many of these countries—the result of weak industrial-world markets for commodities, balance-of-payments problems and debt-related austerity. Yet the potential for growth in oil consumption in these countries remains enormous. For instance, while in the United States there is one car for every 1.8 people, in the developing world, there is one car for every 81 people. If the developing world overcomes its current stagnation and resumes growth, the growth rate for oil demand would be pushed higher.

In a strong conservation scenario, daily oil demand could grow by about four million barrels by 1995—equivalent to about 40 percent of the current surplus. In a high consumption-growth scenario, demand could grow by 7.5 mbd by 1995—equivalent to 75 percent of the current surplus. Prices will not be stationary during this period, of course, and any price increases that do occur will temper demand. Moreover, production capacity itself is not a static concept. While the general view is that production capacity will inevitably decline in the first half of the 1990s, there are forces that could, even in a low price environment, maintain or even expand capacity.

VI

This brings us to the other side of the equation—supply. Here we must look at the broad range of energy sources, not just oil. In both absolute and relative terms, the world has moved away from oil to natural gas, coal and nuclear power. This shift reflects both economic forces and highly focused strategies on the part of the industrial countries. Yet what are the prospects for the major alternative sources of supply in a low-price environment?

Natural gas is being found in abundance around the world. Proven reserves have increased by a third since 1978. There are important growth opportunities for gas in North America. In Western Europe, gas consumption has grown, and a more integrated distribution system is emerging across the Continent. Still, many more market opportunities wait to be exploited. One of the consequences of the squabble between the United States and Western Europe over Soviet natural gas has been a commitment to build more flexibility into the natural gas distribution system.



transport over long distances. The cost of establishing new liquefaction projects based on current technologies is quite high. The conditions required for new liquefied natural gas projects to go ahead would be some mixture of the following: a strong, environmentally based drive to use natural gas; advances in liquefied natural gas technology; a realism on the part of sellers as to what markets will bear in terms of price; and a judicious view on the part of exporting governments as to what they can expect as their take in taxes. Looking toward the end of the century, some potential suppliers are seeking to move into new markets—Norway, and possibly Venezuela, into the United States; Nigeria into Western Europe.

Coal is widely abundant. It has greatly increased its share of the market in electricity generation, and is a beneficiary of stalemate in nuclear energy. The main obstacles to further coal use are environmental considerations. Unless there is progress on clean-burning technologies, coal will be the big loser, with increasing restrictions and disincentives placed on its use.

Nuclear power appeared a very attractive energy source to government policymakers in the early 1970s because of its promise of national autonomy and low cost. Around the world, about 430 plants are licensed for operation, with another 120 or so under construction. That, however, will probably mark the limit of nuclear power development, at least in its current technological form. Costs have been anything but low, partly because of recurrent changes in environmental regulations. The last order for a nuclear power plant in the United States that has not been canceled was placed in 1973; plans for the expansion of nuclear power have been continually curtailed.

Currently, nuclear power provides about 18 percent of total electricity in the United States. Somewhere between a half dozen and a dozen plants will eventually be added to the 109 now licensed for operation. But some partially built plants in the United States either are or may be converted to natural gas. The Swedish government is currently under a mandate to phase out its existing plants by the year 2010, and an effective moratorium exists in West Germany. Although the governments of several industrial nations have maintained a commitment to nuclear power, in practical terms only France and Japan are moving ahead with nuclear power, although in both cases at a reduced pace. The Chernobyl disaster only



development of a new generation of smaller, inherently safer nuclear reactors. But this will be a long-term option. As circumstances are today, the additional contribution of nuclear power to the energy mix in the next decade will be much more modest than what was anticipated even a few years ago.

VII

This brings us back to oil. The 1973 embargo and resulting jump in price stimulated worldwide exploration and development of non-OPEC oil, facilitated by technological advances. In 1973, non-OPEC production totaled around 19 million barrels of oil a day. By 1981—with the surge of production from Mexico, Alaska and the North Sea—it had reached around 24 mbd. It continued to grow in the 1980s, reaching 28.5 mbd by 1985.

Perhaps the biggest surprise since the oil price collapse has been the resilience of non-OPEC production, which has continued to increase. This year, despite the price drop, it could be about 29.5 mbd—about one million barrels per day higher than the 1985 level. For the future, the question is what the level of investment in non-OPEC development will be. This, in turn, will be affected by the contemporary price environment and future expectations.

But "non-OPEC" is a singular term for a very mixed world. It includes widely disparate areas, from North America and the North Sea to India, Malaysia and Colombia. And one crucial distinction stands out—between the United States and everywhere else.

In the late 1970s, a production decline was widely expected for the United States. It did not occur. Production continued to increase on the North Slope of Alaska. The high prices also provided a tremendous incentive for oil development in the "lower forty-eight." This explosion of investment and activity propped up production, including some that was highly marginal in economic terms and that depended on high prices. In 1986, the price collapse removed this already crumbling prop, and U.S. crude-oil production has since fallen by almost 10 percent since the beginning of 1986—by about one million barrels a day. The general expectation is that U.S. production will continue to drop, though the prediction for the rate of decline has been tempered—to perhaps 100,000 to 200,000



The major uncertainties about U.S. production—and the potential offsets to a decline in the "lower forty-eight"—lie offshore and in Alaska. Currently, there is a considerable battle in Washington about opening up the Alaskan Natural Wildlife Refuge to exploration. The controversy has arisen because that part of Alaska is considered to be the last truly promising oil province in the United States—and one of the country's outstanding wilderness areas. If large reserves are found and development is permitted, then—given lead times—additional Alaskan production could offset further declines elsewhere by the mid-1990s.

The significant decline to date in U.S. production makes the overall increase in non-OPEC production all the more remarkable, for it means that production outside OPEC and the United States has actually risen about two million barrels per day since the price collapse. Although the general view is that this merely reflects a lag and that non-OPEC production will soon start to decline, another prospect is no less plausible. Non-OPEC production could increase by 1.2-2.0 million barrels per day by the mid-1990s, even in a low-price environment. The reasons are three-fold. First, exploration and production have become much more efficient, and supply costs are down substantially. Second, governments around the world have shown a willingness to reduce their tax take on companies, improving the commercial economics even in a low-price environment. Indeed, the only major non-OPEC country not to have adjusted the fiscal environment to make it more attractive to producers is the United States. Third, many companies are willing to invest now to be in position for what they regard as the likelihood of higher oil prices in the next decade.

The current disparity between share of production and share of reserves would suggest an eventual shift back to reliance on OPEC and the Middle East. But the result of all this continuing activity around the world could be the persistence well into the 1990s of a diversified, highly competitive oil market. The end to the Iran-Iraq War could mean additional production from both these countries. While a cessation of hostilities between those two countries will, presumably, relieve one of the main stresses within OPEC, it will not reduce the drive by the various oil exporters to protect and increase their market shares. Moreover, both Iran (which has been producing at about a third of its pre-1979 levels) and Iraq will have an incentive to increase production to gain revenues.



way, the oil market will again become more susceptible to crises than is the case today. Violence, wars, technological hazards, political eruptions, regime changes, religious or ideological conflicts—all of these can affect access to oil, or ability or willingness to supply oil, translating, in turn, into supply disruptions and price shocks.

There is an important additional point about the oil-exporting countries that has generally been overlooked. Their rapid population growth means that, in a low-price scenario, many of them will experience declining real incomes per capita—at a time when their demographic structures are heavily skewed toward the young. This could threaten the social and political order in oil-exporting countries, in turn influencing their capability and interest in exporting oil.

If a survey were taken today of those in charge of oil policies in the OPEC countries, many would ruefully say that the second round of price increases, during 1979-81, ended up being a tremendous mistake from the viewpoint of their own countries. Those increases damaged the long-term market for their oil, brought new competitors into the market, led to a great deal of very wasteful spending, created inflation and dislocation within their economies and societies, generated expectations that could not possibly be met and finally forced the adoption of severe austerity policies. There are still those in OPEC countries who would seize any opportunity to force up prices quickly and sharply, both for economic gain and to advance their own political and ideological objectives. But these, today, are in the minority in terms of influence, if not in numbers.

However, as time goes on, collective memories will fade; new personalities will come onto the scene who did not experience directly the second oil shock and its consequences, and who will not have an intuitive grasp of the lessons it taught. When the market tightens, or when there is again a major disruption in supply, these successors could well decide that the opportunity is at hand to make up for lost time, especially if they see sharply higher prices as the quick solution to difficult domestic political and social conditions, as the avenue to international power and influence, and as the means of "righting the scales" against the industrial world. Thus, another element of increasing risk through the 1990s will be the progressive unlearning of the lessons of the 1970s and 1980s.



All this provides a context for considering the most visible and vexing part of the energy security debate—U.S. oil imports. Rising U.S. imports in the 1970s were one of the most important factors in the tightening of the world oil market. U.S. imports rose from 3.2 mbd in 1970 to 6.0 mbd in 1973, and then to 8.6 mbd in 1977-1979. As a result of conservation, switching to other fuels, and rising domestic oil production, petroleum imports declined to as low as 4.3 mbd in 1985. Since the 1986 price collapse, they have risen significantly, averaging six million barrels a day in the first half of 1988—the same level as 1973 and, today, equivalent to 36 percent of total consumption. This rapid rise brings back memories of the late 1970s—the eve of the Iranian Revolution and the second oil shock—when oil imports, on a net basis, reached 46 percent of total consumption.

TABLE I

U.S. PETROLEUM CONSUMPTION AND NET IMPORTS

Consumption Net Imports Imports as a Percentage

Year (in MBD)^a (in MBD)^a of Consumption

1972 16.4 4.5 27%

1973 17.3 6.0 35%

1974 16.7 5.9 35%

1975 16.3 5.8 36%

1976 17.5 7.1 41%

1977 18.4 8.6 46%

1978 18.8 8.0 42%

1979 18.5 8.0 43%

1980 17.1 6.4 37%

1981 16.1 5.4 34%



1983 15.2 4.3 28%

1984 15.7 4.7 30%

1985 15.7 4.3 27%

1986 16.3 5.4 33%

1987 16.7 5.9 35%

1988b 16.9 6.0 36%

a Millions of barrels per day.

b First half-year only.

Source: U.S. Department of Energy.

One thing that looks very sure is that U.S. oil imports will continue to increase because of growing demand and falling production. If current trends last, sometime in the 1990s the United States will cross the "continental divide" and become dependent on imports for more than 50 percent of its total oil consumption—and, indeed, will be heading toward 60 percent. This is quite a change for a country that, as late as 1953, produced more than 50 percent of *all* the oil consumed in the world.

Do growing imports make the United States more vulnerable? That question will be asked with increasing frequency as the import numbers mount. As the Administration's recent energy security study pointed out, the import level of oil is used "as something like a shorthand indicator of oil vulnerability." But, as the report added, the import-proportion indicator can be something of an oversimplification. The United States imports many products—many of them at levels that are a very high proportion of total consumption. This does not necessarily mean that security is threatened.

Oil is only part of the total U.S. energy mix. At current rates of consumption, oil imports account for 16 percent of total U.S. energy demand (and imported natural gas, another one percent), meaning that the United States is over 80-percent self-sufficient in energy. If oil imports rise to 50 or 60 percent of total consumption, the United States will still be close



for oil in the transportation sector.

Oil imports also have to be put into a larger economic context. We need to consider economic efficiency. One reason that imports are rising is that they are cheaper than the cost of developing new domestic oil production. There are overall economic and competitive benefits to the nation in relying on less expensive foreign oil rather than relatively costly domestic supplies. For forty years a debate has continued as to whether it is wiser to push U.S. production to its utmost or to rely more on imports and husband domestic supplies. Current circumstances have again made this debate more contentious. It is complicated by the fact that oil supplies are not like light from a bulb that can be turned on and off with a switch. In order to assure domestically produced supplies at some point in the future, sources must be identified and developed at an earlier date.

Rising oil imports are and will continue to be an important and volatile part of the trade deficit. U.S. oil imports in 1987 amounted to \$42 billion—equivalent to about 27 percent of the total 1987 trade deficit. At current prices, every million barrels per day of additional imports adds between \$6 billion and \$7 billion to the trade deficit and would certainly work against the efforts to reduce that deficit.

But the most important question about imports is not whether imports make the United States vulnerable or not, as if the United States could be insulated from the rest of the world, but how they fit into the global context. There is essentially only one world oil market, and disruptions and shocks in supplies from a given region will reverberate throughout the market and affect all consumers, whether they draw heavily from that specific region or not. After all, in 1973, the countries that embargoed the United States were supplying only about five percent of total U.S. demand. Moreover, a rising level of U.S. oil imports will increase the vulnerability of the overall market, to the degree that it helps tighten the market. Rapidly rising U.S. oil imports will not only erode the security margin, but will also destabilize the market.

IX

The underpinnings of energy security are also affected by structural changes in the oil market. The events of the 1970s broke up the integration of the upstream (production) and



futures market. Moreover, the major oil companies have for the most part gone through considerable contraction and restructuring.

But the vacuum created by the retrenchment of the international oil companies is now being filled. A new feature is downstream integration—"reintegration"—by state oil companies. Some of these companies, originally created to embody the nationalistic aspirations of oil-exporting countries, are becoming significant international refiners and marketers—in effect, the new integrated oil companies of the 1990s. Already, motorists in the United States and other industrial countries can find themselves filling their tanks at gas stations owned or partly owned by oil-exporting countries—and the proportion of such enterprises is likely to grow. Kuwait itself is virtually an integrated oil company, possessing not only huge oil reserves and a large export-refinery capacity, but also overseas refineries and thousands of gas stations in Western Europe, all operating under the name of "Q8." Saudi Arabia and Texaco have agreed in principle to establish a joint venture to take over Texaco's refining and marketing operations in 23 states in the United States. Venezuela owns refining and marketing joint ventures in the United States, West Germany and Sweden, and will be adding further to its system. The Norwegian state oil company, Statoil, is building up its own system in Scandinavia, and some other exporters are considering downstream investments.

The objective of the exporters is to ensure for themselves access to consumers in competitive markets—"security of demand." They may not be able to protect the price, but they can protect the volumes they sell, or even expand them in markets dominated by surplus. Thus they can ensure that they will at least do relatively better than their competitors. Countries taking the lead in reintegration are those that during the past decade lost market share to newer exporting countries and are now intent on regaining their share.

Some will worry that these investments could be Trojan horses, opening up oil markets in consuming countries to new manipulation and sharp price increases. In order to do that, however, the exporters would have to gain a considerably larger share of markets than appears likely. Others—competitive refiners and marketers, and domestic oil and gas



Yet, on the other hand, such deals can enhance energy security if they embody a new pragmatism and create more durable economic bonds between consumers and producers. After all, this movement represents a recognition on the part of the exporters, in the aftermath of the shortages and nationalistic fervor of the 1970s, that customers matter after all, and that customers have choices. These investments embody a long-term commitment to supply markets, and a stake within those markets; it would be shortsighted for an oil exporter to jeopardize its holdings and position by pursuing short-term gains and behaving in an unbusinesslike manner. These new vertical links will create new interests for the exporter, interests that can run counter to those implied by the horizontal links of OPEC.

However, as more such arrangements develop, we can be sure that the commercial logic of some will be tested and buffeted by politics. After all, these new integrated entities are state-owned flagship enterprises. There could be turmoil in some producing countries; others could have political rifts with the consuming countries in which their outlets are located. Also, as these arrangements grow in number, they will be tested in the United States and some other countries on two further grounds: their conformity with antitrust and antimonopoly laws, and their reliability as suppliers and distributors in the consuming markets. In addition, they will give rise to calls for reciprocal access, in some form, to "upstream" oil-production opportunities in the investing oil exporters, which in many cases were closed off by the wave of nationalizations in the 1970s.

X

To talk of uncertainty in assessing energy security is not to avoid the issue, but rather to face the fundamental reality. The identification and understanding of the key uncertainties is essential to good energy policymaking, both in government and in the private sector. Between the early 1970s and the mid-1980s, the dominant consensus about the future of the oil market changed four times. Each successive consensus seemed to promise some certainty about the future; yet each collapsed within three years or so because of shifts in underlying factors or political developments—or because, since most players in an industry act on the basis of a shared expectation, the cumulative effect can be to transform the conditions that gave rise to the expectation in the first place.



Slow the growth of U.S. oil imports. Rapid growth in U.S. imports would be destabilizing, and efforts should be made to prevent this. The immediately available policy tools that will be debated include some mixture of the following: a gasoline tax, an oil import fee, an improved fiscal environment for domestic oil and gas exploration and production, and incentives to reduce the dependence on oil in the transportation sector. Each has its advantages and disadvantages. An increase in the gasoline tax may be politically more acceptable in the current price environment than it was in the late 1970s. A gasoline tax is already in place and is administratively more simple than an import fee. It does not give rise to the political battle over exceptions, as would be the likely case with a tariff. An increase would also be an important source of revenues for an administration and Congress serious about attacking the budget deficit; each cent of additional gasoline tax translates into an additional one billion dollars in revenue. Gasoline taxation in the United States is far below the level of other nations—29 cents a gallon versus, for instance, \$1.61 in Japan, \$1.68 in Britain, and \$2.44 in France.

Strengthen the domestic oil and gas industry. It is important to maintain a strong domestic oil and gas industry, even though it will certainly be a smaller industry than in the late 1970s and early 1980s. The same applies to the often overlooked oil services sector, so that skills and technology will be maintained and developed further.

TABLE II

COMPARATIVE GASOLINE TAXES

Tax

Country Consumer Cost Component

United States \$0.98 \$0.29

West Germany \$2.28 \$1.48

Japan \$3.60 \$1.61

Britain \$2.60 \$1.68



Italy \$4.12 \$3.31

a Per gallon, including tax.

b Per gallon.

Source: Cambridge Energy Research Associates.

Increase natural gas use. Gas can substitute for oil in many uses, and such an expansion would contribute to the vitality of the domestic oil and gas industry and the regions dependent on it. Conditions are ripe under the new U.S.-Canadian free trade agreement for a much more integrated North American gas market, in which Canadian supplies would play a growing role in the 1990s. This would be very favorable from the viewpoint of energy security. In the longer term, the large gas supplies on Alaska's North Slope, now bottled up by lack of transportation, could provide a significant security reserve.

Promote energy efficiency. Conservation has gone from being treated with derision, or at best not being taken very seriously, to a status of universal high regard, at least in terms of rhetoric. Yet the preliminary post-1986 energy trends, environmental considerations, possible pressures on electricity supply, the spread of technology into the developing world—these are some of the factors that provide a rationale for putting particular emphasis on renewed progress in energy efficiency.

Support R&D. Vigorous research and development programs should be carried out in energy efficiency technologies and know-how, clean combustion of coal, gas utilization, alternative technologies and new nuclear design. The objective should be to support a diversified portfolio of activities—some with nearer and some with longer-term time horizons—recognizing the uncertainty in predicting technological advance. Growing environmental concerns provide further impetus for such research.

Fortify the Strategic Petroleum Reserve. The SPR should contain supplies at least equivalent to 100 days' worth of imports. Provisions should be made for the possibility of "early release" in a crisis.

Renew U.S. commitment to the International Energy Agency. The United States should revitalize its participation, even during these sultry energy days, in the IEA. Nationalistic



crisis. This is particularly important because the international oil companies have made clear, in the aftermath of the 1970s, that they will not and cannot take political responsibility for coordination and sharing in a crisis. The IEA also provides a forum for longer-term coordination of energy policies and technologies, and of shared research and development efforts, which is important in an era of budgetary pressures throughout the industrialized world.

Ensure competitive markets. Free and flexible energy markets should be encouraged. The U.S. oil price controls of the 1970s may have had important political support. But they also served to shield American consumers from the realities of the marketplace, and certainly slowed up conservation and market responses. Consumers were partly protected from the immediate price increases, but at the expense of impaired access to oil products—e.g., rationing by waiting in line. Many who advocated price controls in the 1970s now recognize, in retrospect, the logical inconsistency between supporting energy efficiency and trying to repress price signals.

XI

In the early 1980s, the world's energy markets—and its economic and political order—were suspended between crisis and adjustment. Today, at the close of the 1980s, it is clear that adjustment won out, convincingly and at a much more rapid rate than was generally expected, as the effects of the second oil shock were overlaid on the first. Crisis itself—and the expectation of future difficulties—engendered a double-time response. Consumers are now enjoying the benefits: today, energy supply and price levels do not constrain economic growth.

Energy has a special significance in the economy. It is the basis of industrial society. Oil, in particular, carries special importance and thus special risks because of its central role, its strategic character and its geographic distribution—and the recurrent pattern of crisis in its supply. Current circumstances allow us to view the energy scene dispassionately, and to recognize how much has changed. It will be remarkable if we get to the end of the 1990s without our energy security being tested by political or technical crises. Today, however, we do have a considerable security margin, and that allows us the hard-earned luxury of



...not with pain, but with prudence.

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