

58. H.F. French, "Industrial Wasteland," *World Watch*, 1 (November–December 1988), pp. 21–30.
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60. For the above two paragraphs: Goldman, *Enigma of Soviet Petroleum*, pp. 60–1; Kozlov, *Socialism and Energy*, pp. 32–5; Park, *Oil & Gas*, pp. 168–9, 171–2, 180–7; Hewitt, *Energy in the Soviet Union*, pp. 157–65; J. Stern, "East European Energy and East–West Trade in Energy," in Belgrave, ed., *Energy*, pp. 48–50; Hoffman, *European Energy Challenge*, p. 10.
61. For the above two paragraphs: Hewitt, *Energy in the Soviet Union*, pp. 96–7; *New York Times*, January 16, 1983, April 11, 1984; Goldman, *Enigma of Soviet Petroleum*, pp. 66–7, 107–8; WRI, *World Resources 1988–90*, pp. 119–20, 311; Hoffman, *European Energy Challenge*, pp. 14–15.

9

A second energy crisis: the Iranian Revolution and its aftermath

A year or two of relative energy price and supply stability ended in 1978 and 1979 with the outbreak of the Iranian Revolution. A decade of wild fluctuation in price and supply followed, punctuated by political crises of varying intensity and longevity, mostly centered around the volatile Persian Gulf. Buyer's panic first forced prices upward to \$40 per barrel, weakening the economies of energy importing states sufficiently to induce a significant reduction in the demand for oil and a concomitant increase in the employment of substitutes for oil. Despite Iraq's attack on Iran in 1980, an oil surplus had accumulated by 1981. The availability of non-OPEC oil and reduced oil and energy consumption in the leading oil importing nations added to the surplus and depressed oil prices in 1982–83. Thereafter, powerful deflationary pressures dominated. Oil prices plunged as low as \$8–\$9 in mid-1986, rose to the \$20 range in 1987, but slipped below \$14 in fall 1988. By late 1989 OPEC had fashioned a new production agreement that stabilized prices just under \$20.

Sudden, sharp price gyrations created new groupings of winners and losers and forced new quandaries to the fore. OPEC grappled with the thorny problem of production quotas. Price deflation blunted the incentive to explore and develop high cost oil or to hurry along the commercialization of synthetic fuels. Oil at \$20 and abundant supply deadened the impulse to conserve. The remarkable revenue windfalls enjoyed by the exporting states from 1973 through 1981 afforded no final cure for underdevelopment and little protection against subsequently shrinking revenues. Neither did greatly reduced energy import bills smooth the path to development for the importing LDCs. Lower energy costs after 1982 permitted renewed economic growth within OECD but did not

much affect the balance of power among the highly developed countries.

Reinvigorated economies in the West and elsewhere, but particularly in southeast Asia, in the absence of conservation and environmental policies quickly spawned interrelated ecological crises. Fossil fuel consumption was ever more positively linked with acid rain, ozone depletion, and global warming. The nuclear power industry buckled under the reaction to Chernobyl, but it could not be counted out in the future. The heavy oil importers, as of 1989, appeared no better prepared than in 1978 to withstand another energy supply crunch. Worse still, in ignoring environmental stresses during the 1970s and 1980s, they had squandered two whole decades. This happened because of their myopic focus on short-term economic growth.

The Iranian Revolution and panic in the West

Protests and violent acts against the Shah's government erupted in Iran in 1978. Striking oil workers, virtually shutting down Consortium production in late 1978, hurried along the demise of the Pahlavi dynasty. The Shah was deposed in 1979 and the victors, adhering to Shiite teachings, proclaimed the establishment of a Muslim republic, as pure a fundamentalist theocracy as the world had witnessed since John Calvin's Geneva. Panic spread throughout the West as Iranian exports dried up. Spot prices of \$15 per barrel in December 1978 surged upward to a peak of \$42 by May 1979 and remained at about \$40 throughout 1980.

The Iranian shortfall, amounting to some 2 million barrels a day, or 100 million metric tons annually, reduced world production by only 3 percent, but precipitated a tripling in price. It is difficult to understand why such a modest shortfall engendered such distorted behavior. True, Iranian exports were heavily concentrated in the USA, western Europe, and Japan. Iranian exports to the USA were halved from 1978 to 1979 and then virtually ended. Japan lost some 25 mmt and Europe some 50 mmt. Panicked purchasers, particularly European and Japanese, searched frantically for oil in the spot market. Other producers rushed into the spot market to fill the void, only too happy to receive the extreme bids of nervous buyers. Bidders outbid one another, propelling prices upward in spite of the overall adequacy of oil supplies.¹

The West in 1979 was as unprepared to act in concert to minimize the impact of the Iranian shortfall as it had been in 1973 to counter the embargo. The International Energy Agency's emergency oil allocation program was not invoked. Little had been essayed to moderate de-

pendence upon oil from the Middle East (Table 7.2). Total energy use had not diminished (Table 7.1). Most of the West had recovered from the dog days of 1974 and 1975, enjoying renewed economic growth in 1977 and 1978. The West easily absorbed the modest price increase imposed by OPEC in 1978. The new equilibrium seemed durable.

Sharply declining Iranian production (Table 7.4) resurrected the fear of oil shortage in Japan, Germany, France, and Italy. Dependent on the MNOCs for a large portion of their supply, they searched elsewhere for oil. Since much oil was under contract, the Japanese entered the spot market. Suppliers, particularly OPEC members, reneged on their contracts with the MNOCs to secure spot prices that shot ahead of official OPEC prices. The MNOCs also entered spot markets and upward bidding for oil gained an irrespressible momentum.

OPEC's price setting authority disappeared. Each producing state exploited the panic to maximize its income. Saudi Arabia, the most powerful OPEC state, preferred price and production stability as a general rule. But the Saudis only half-heartedly resisted the price explosion. Saudi irritation over the Israeli-Egyptian Peace Treaty of 1979 numbed their motivation to hew faithfully to a moderate course. Indeed, the Saudis lowered their output in April and May 1979, thereby quickening the price escalation.²

OPEC's official prices moved upward in response to spot prices with the Saudis lobbying for unified prices. Even more threatening to the West, OPEC reopened discussions about production quotas. At the Caracas meeting of OPEC in December 1979, members agreed to maintain demand and supply in balance to protect current high prices. Should demand continue to rise at pre-1978 rates, OPEC would wield enormous power. The frightening possibility loomed of the Arabs again employing an embargo to support the Palestinians. In 1980, few in the West foresaw an absolute decline in oil-energy consumption. A covey of prognosticators predicted many years of \$40 oil (or worse) and persistent oil scarcity. A Venezuelan official in mid-1980 advised the USA and the West to "get ready for awesome oil problems during the '80s. The worst is still to come—in price and supply."³ Much appeared to depend upon Saudi policy. If the Saudis won OPEC to a policy that maintained production at the level of demand, prices would remain stable, albeit in the \$40 range. If OPEC repulsed the Saudi strategy, as western analysts gloomily warned, Arab producers could keep the West on tenterhooks and the oil market in chaos by merely threatening another embargo.⁴ In retrospect, this fear appears exaggerated. The Arabs were already exploiting an apparent oil scarcity and raking in profits.

Fortunately, the astounding price ratcheting of 1979–80 had ended

by 1981. The effects of \$40 oil proved severe but not irremediable, catalyzing, as they did, natural defense systems that had only imperfectly responded in 1973–4.

The total energy import bill of the largest OECD countries more than doubled from 1977 through 1980 (Table 7.9), forcing, except in Germany and Japan, annual inflation to levels comparable with those of 1974 and 1975. With the exception of the latter states, unemployment rates surged upward, equaling or surpassing rates in 1974. GDP declined in several states and grew at slower rates in others.⁵ Retarded economic growth combined with explicit conservation measures to reduce overall energy use. TPER in OECD-Europe fell by 8 percent from 1979 to 1982 and by 9 percent in both Japan and the USA (see Table 7.1). Oil imports plummeted more radically than TPER, invigorating the natural gas and primary electricity industries and, in some countries, the coal industry. New sources of oil, foreign and domestic, emerged. By 1982, the Middle Eastern and North African share of the western oil market had declined from 71 percent in 1979 to 53 percent while total imports contracted by 31 percent (Table 7.2).

In the West, recovery was well along by 1984. The great bonanza had ended for the oil exporters, few of whom had used their great wealth with sufficient skill to guard against the day of declining oil revenues. Falling prices offered some relief to the oil importing LDCs, but so endemic were their problems that the future of many remained uncertain.

Persian Gulf instability took a turn for the worse when Iraq attacked Iran in 1980. While this war did not unleash another round of price hikes and supply shortfalls, oil importers anticipated the worst. Iraq struck at Iranian oil installations and Iran launched attacks on Gulf shipping, a tactic that prompted US naval intervention in the Gulf in 1987.

Shock and uncertainty about energy and natural resources, the LDCs and their accumulated debts, and about the global environment characterized the ten years, 1978–88. But, in 1988, most westerners viewed the future complacently. As America ran up to a November 1988 presidential election, the two candidates, Michael Dukakis and George Bush, the winner, articulated no new, or even old, thoughts about energy or the environment. For almost all Americans, energy was not an issue.

The Iranian crisis and western energy security

Western responses to the price and supply challenge of 1979–80 consisted of involuntary knee jerk reactions as economic growth slowed or

ceased and a varied set of energy programs that amounted to more than a mere elaboration of policies stimulated by the price and supply crunch of 1973. Exorbitant oil prices speedily reduced demand for oil. But the key national policies of OECD members almost without exception emphasized security of energy supply, a goal sought but not attained since 1973.

To the conventional supply side approach were appended measures that promoted fuel substitution, including use of renewables, energy use efficiency, and explicit conservation incentives. Conservationist measures, however, were vulnerable to short-term changes in supply and price as well as to the hostility of supply side ideologues. Environmental considerations also retreated before the superior political strength of supply siders and business interests. The electoral victories of Margaret Thatcher in 1979, Ronald Reagan in 1980, and Helmut Kohl in 1982, and their subsequent reelections, attested, at least in part, to the appeal of supply siders who remonstrated against intrusive government.

The continuing quest for security of oil supply

Discovering new sources of domestic oil and/or exploration for oil outside the endemically chaotic Middle East afforded the most direct route to oil security. Projections of energy requirements from 1979 to 2000, which assumed an increase ranging from 25 to 50 percent within OECD, made new oil discoveries imperative.⁶ With prices so elevated, national oil companies and private firms pushed ahead in the North Sea and Alaska, searched for new reserves in Venezuela and Mexico, initiated costly exploratory ventures in the South China Sea and other promising Asian sites, and even explored the forbidding waters of the Barents Sea.

Success attended some of these endeavors, but none were so remarkable as to alter radically world reserves. Many exploratory sites were abandoned as prices softened after 1982. With some ballyhoo, China awarded exploratory contracts to western firms in the South China Sea and in Quandong Province but little oil was found. Penzoil closed down its mainland China rigs while BP, RDS, Exxon, and Japanese interests demanded better terms for continued operations. A similar lack of success discouraged exploration off Taiwan, South Korea, and the Philippines. Japanese ventures in the above areas as well as in Malaysia and Australia only marginally improved the security of oil supply.⁷

Global reserves in 1986 reached 100 billion metric tons (bmt), greater by 2 bmt than reserves in 1981. The Middle East contained some 55 percent of the total in 1986 as in 1973. US reserves suffered steady depletion through 1979 and grew slightly between 1979 and 1981, but

in 1986 were only 70 percent of the peak reserve estimate in 1970 of 5.4 bmt. North Sea reserves of 2.7 bmt in 1986 were lower by one-third than the 1978 peak, and had declined by 5 percent from 1985 to 1986. Venezuelan finds, especially in 1985 and 1986, raised proven reserves to 7.7 bmt, compared with 1.8 bmt in 1973. Mexican reserves shot upward between 1977 and 1981 and then held steady at about 7.5 bmt through the 1980s. Soviet reserves declined by 23 percent from 1976 to 1986. Middle Eastern reserves, on the other hand, grew by 5 bmt between 1979 and 1986.

World reserves in late 1989 were about the same as in 1986. But global consumption had advanced steadily. In 1987, world consumption was in its third consecutive annual decline (see Table 7.4, p. 246). Consumption then began its current ascension. Whereas in 1988 world production equaled 86 percent of estimated world productive capacity, estimates for 1990 suggested that production would exceed 90 percent of capacity. Early in 1990, many oil industry analysts predicted sharp oil price increases by 1995 as growing demand outpaced additions to reserves and caught up with pumping capacity.

Declining North Sea and US reserves accompanied steadily falling production. Britain's North Sea production peaked in 1986 while oil withdrawals from Alaska's Prudhoe Bay and other American fields fell off in 1987–8. High prices had sustained development in those difficult fields; lower prices in 1981 and thereafter, especially 1985–6, discouraged exploration. As well, the policies of both the Thatcher and Reagan governments precluded any interference with the production decisions of the private firms operating in those fields. Falling production resulted from physical depletion in the fields, not from decisions of the MNOCs to seek price stabilization through conservation. In these very high cost fields, with the equipment in place, maximum production at almost any price is preferred to reduced production.

Total western oil imports declined after 1979, as did the share of oil in domestic fuel mixes. North Sea oil bestowed energy self-sufficiency upon Britain and Norway. Through 1987, France, Germany, and Italy reduced the share of TPER derived from energy imports. Japan's energy imports, however, claimed a higher share of TPER in 1985 and 1986 than in prior years (Table 7.1). Reliance upon oil, while narrowing after 1979, remains above 40 percent in western Europe and 55 percent in Japan. US energy import dependence jumped sharply in 1987 to 16 percent, reversing a downward trend initiated in 1978. Table 7.1 suggests no marked improvement in lowering oil's share of American TPER. In 1990, oil imports again exceeded domestic production. Mobil Corporation, an Aramco partner, viewed this as unexceptional. The advocates of nuclear power depicted America as the pathetic hostage of

foreign oil producers. Few, save environmental groups, called for policies that would reduce oil (and other fossil fuel) consumption through substitution and efficiency improvements.⁸

Table 9.1 indicates that the leading importers, by 1986, drew from a few suppliers not used in 1973. The western market share of OPEC and the Arab OPEC states contracted, but remained above 50 percent. Western diversification efforts produced no striking changes. Not including the North Sea, French diversification policies added one new supplier, Mexico. Germany, too, drew heavily upon the North Sea and sought oil from Venezuela, its sole new supplier. Italy received 72 percent of its imports from OPEC in 1986, of which 38 percent came from Saudi Arabia and Libya. Japan acted most vigorously to diversify its sources of oil, turning to China, Mexico, and Malaysia. But Japan still purchased 72 percent of its oil from Arab OPEC states. None of the "secure" sources of supply, including the Soviet Union, were capable of significant production on short notice. Moreover, most experts agreed that North Sea and Alaskan fields had already achieved their peak output. Potential new fields in the Gulf of Mexico contained about the volume remaining in the North Sea.⁹

By decade's end, the West fell far short of attaining oil security. Oil remains the leading source of energy. The Middle East contains over one-half of the world's oil, and the cheapest oil at that. Far from advancing its energy security, the West narrowly escaped disaster. At any moment before the truce of 1988, the Iraqi–Iranian war could have engulfed neighboring oil producers. This war demonstrated that regional instability was to be anticipated, that any one nation in the area in a moment of frenzy could swiftly reduce the 7.5 million barrels per day passing through the Persian Gulf to a trickle. One-half of that oil is destined for western Europe and Japan. The West turned an almost absolute dependence upon Arab-OPEC oil in 1973 to acute and dangerous dependence in 1988.

In obtaining oil, consuming nations could not anticipate favorable treatment from the MNOCs, the latter increasingly reduced to serving as oil cans for the producers. By 1986, producing state oil companies sold Japan more than one-half of its supply while the share of the major oil companies—75 percent in 1972—fell to under 40 percent. Japan further limited the power of foreign firms by consolidating a dozen or so firms into seven groups, the better to manage imports, refining capacity, and emergency stockpiling. In the USA, the major oil importing firms were suspected of withholding oil from the domestic market in order to realize higher prices. The swollen profits of the MNOCs convinced many of their culpability in contriving the oil shortages of 1979–80. Opponents of the giant firms demanded anti-trust indictments and

Table 9.1 Sources of crude oil for developed states, 1973 and 1986 (percent)

	1973				1986					
	France	Germany	Italy	Japan	USA	France	Germany	Italy	Japan	USA ²
UK and Norway	0	0	0	0	0	25	35	2	0	8
USSR	2	3	5	0	0	8	6	12	0	0
Mexico	0	0	0	0	0	4	0	<1	6	14
Venezuela ¹	1	2	<1	0	11	0	9	1	0	11
Indonesia ¹	0	0	0	18	6	0	0	0	12	6
Malaysia ¹	0	0	0	0	0	0	0	0	4	0
China	0	0	0	0	0	0	0	0	7	2
Canada	0	0	0	0	30	0	0	0	0	14
All OPEC of which	92	95	89	95	63	59	56	72 ¹	72	50
Saudi Arabia	22	23	27	19	14	21	11	21	13	13
Iran	8	13	13	33	7	4	3	9	7	2
Iraq	14	2	14	0	0	7	1	6	5	2
Libya	4	24	20	0	4	3	11	17	0	0
UAE	10	5	2	9	2	3	0	2	22	1
Kuwait	11	4	9	8	1	0	0	5	3	1
Algeria	8	13	3	0	4	4	8	4	0	2
Neutral Zone	0	3	0	6	0	0	0	0	6	0
Nigeria	10	9	0	0	14	8	15	6	0	8
Total crude imports (mmt)	135	110	128	245	161	71	66	82	166	249

¹ OPEC members² Qatar, 5%³ Trinidad, 2%Sources: OECD, *1973 Oil and Gas Statistics. Supply and Disposal*, Paris: OECD (1973) and *1979 and 1987. Now entitled Quarterly Oil and Gas Statistics*.

unsuccessfully sponsored legislation to compel the firms to divest themselves of all but one phase of oil operations and to give up their holdings in other energy resources.¹⁰

The MNOCS lost further ground in their relationship with the producing states. The trends of the 1970s intensified as the national oil companies of the LDC producers sold a greater share of production directly to clients in crude or refined form. Most dramatically, Iran's convulsions terminated the Iranian Consortium, a heavy blow to BP which lost its 40 percent interest (see Table 8.6). Consumers neither mourned the Consortium's demise nor joined the USA in boycotting Iranian oil in response to the year-long captivity of American hostages in Teheran. Instead, customers flocked to the National Iranian Oil Company, paid the premiums demanded, and with the restoration of production following a temporary halt as war erupted with Iraq, competed heatedly for a share of Iran's much reduced production.¹¹

Producing countries in the Middle East and North Africa owned 60 percent of the 1981 output. Mexico and Venezuela owned and marketed 100 percent of their production. The British National Oil Company and Norway's Statoil owned above 50 percent of North Sea production. A thorough update of Table 8.6 was not possible, but the new data available suggests the appreciation of control exercised by the producing countries, despite the privatization of BNOC in 1987. BP and RDS owned a volume of crude production at least equal to product sales. The four Aramco partners—the first four firms listed in Table 8.6—owned only one-half of the crude necessary for their markets; in the 1970s, they had enjoyed rough self-sufficiency. Direct Saudi ownership of crude during the 1980s contributed a large percentage of the crude production lost to Aramco.

As the direct sales of Saudi Arabia's Petromin reached and exceeded 1 billion barrels (some 140 mmt) during the 1980s and as Saudi output declined from 490 mmt in 1980 to about 250 mmt in 1986, the share of the Aramco partners shrank. Aramco drew from the oil remaining after Petromin's take—called residual oil—but was not guaranteed all of that. A portion of the residual crude defined as incentive oil, amounting to as much as 25 mmt, was allocated among the partners in proportion to their direct investments in Saudi refining and industrial projects. Non-Aramco firms could receive incentive oil as well as oil purchased from Petromin. Mobil and Exxon, Aramco partners, RDS, a non-partner, and Celanese, a chemical company, each ventured 50:50 with Petromin to modernize or construct refineries. The Saudis employed incentive oil to force Aramco investment in development projects. By 1987, Aramco could no longer be considered the backbone of Saudi Arabia.¹²

The producing LDCs maintained a high level of investment in refinery and petrochemical operations even as reduced consumption caused refinery overcapacity. Several major oil companies closed their European refineries or sold them to Arab oil firms. The Kuwait Petroleum Corporation marketed refined products in western Europe and Britain. To the consternation of the British, Kuwait became the largest shareholder of BP, owning 22 percent by late 1988. Allowing an OPEC member such a strong voice in BP could not be countenanced. Britain ordered Kuwait to reduce its holdings by more than half. KPC also acquired a large American exploration business and invested in Conoco, Phillips, Schlumberger, and other oil and oil service firms.

In Britain, the Tory government successfully privatized the national oil and gas industries, scheduled the sale of the electric industry in 1990, and planned for the sale of British Coal in 1992. Similar instincts prevailed in the USA and Germany and even captured the Socialist government in France. Conservatism held sway, at least for the moment. Liberal welfare governments, whether actually socialist or not, failed during the 1970s to deal effectively with energy crises, stagflation, and unemployment. Backlash thrust into power such free marketeers as Thatcher and Reagan. What had happened, Prime Minister Thatcher asked, to the billions of pounds of government oil and gas revenues? Had the opportunity been taken to moderate current accounts deficits? Neither Labour nor Tory governments seemed capable of dedicating those windfall revenues to special and productive purposes. Both Thatcher and Reagan made certain that any special costs of denationalization or deregulation would be born by all taxpayers rather than by the industries benefited. Among their other accomplishments were continued national environmental degradation, rising exports of pollutants overseas, and policies that distributed income to the wealthy.

Elsewhere, however, governments and national companies grasped more authority during the early 1980s. The China Petroleum Corporation fed refined oil to Japan where the Japan National Petroleum Corporation closely monitored refined and crude imports. Japan preferred to produce its own gasoline rather than to import cheaper foreign gasoline. Governments the world over whittled away at the discretionary authority of the MNOCs. No longer could the latter claim a monopoly of expertise. Petroleum engineers and geologists from Petroven and Petrobras and oil platform engineers from China and Pemex were in the field hustling business for their countries. The Saudi oil industry gradually became "Saudi-ized" at all levels. Petromin called on South Korea, Japan, and Italy for expertise. Each nation evaluated the role of the MNOCs from the context of its immediate energy, income, psychological, and ideological objectives. Most usurped MNOC functions,

often at some cost. Americans preferred to leave them alone, but that was not proof of essentiality.¹³

The diversification of internal energy use

Energy policies and practices in the developed states that emphasized fuel substitution, energy use efficiency, and conservation earned larger energy security dividends than did the search for new oil and gas. Transforming internal energy mixes, however, touched off contentious political debates as numerous interest groups promoted their own versions of appropriate goals and policies. Policy responses to the 1973 crisis assigned the highest priority to energy supply. The crisis of 1978–80 compelled the further elaboration of that principal objective but also stimulated public and private action to reduce TPER and, especially, to lower oil consumption by fuel substitution and conservation. Protecting the environment imposed a new constraint upon and rested in tense juxtaposition to the supply side and substitution elements of energy policies.

Overall results for the western nations can be derived from Table 7.1. TPER declined after 1979. Energy import dependence was somewhat moderated through 1985. The proportion of oil to TPER fell. In Japan and western Europe, natural gas use rose. Nuclear plants generated a higher share of electricity (Table 9.2). Coal's position remained ambiguous, as attested to by Japan's augmented coal use after 1979 and the inability of Britain and Germany to define the role of coal. In its annual report of 1986, the IEA expressed confidence that the energy policies of its members were "well designed" to achieve "lower energy and oil prices, while realizing continued development of indigenous energy resources and improvements in the efficiency of energy use." IEA counseled its members to resist backsliding as oil prices softened.¹⁴

The domestic energy mix of the industrialized states in 1986 and 1987, while altered in detail since 1973, reflected missed opportunities, minimalist politics, and the power of vested interests. Natural gas and nuclear power were thrust to the fore. In western Europe, the two combined to provide 26 percent of TPER in 1986, compared with 11 percent in 1973; in Japan, the advance was from 2 to 21 percent. Extraordinary controversy enveloped nuclear power, leaving it with a dubious future. Current supplies of natural gas preclude much greater consumption. Since the industrialized countries devoted little attention to renewables, they are left with petroleum and coal. Together, in 1986–7, those fuels provided over 65 percent of TPER in the West (Table 7.1), a diminution since 1973 of insufficient dimensions to take comfort in.¹⁵

Table 9.2 Aspects of the fuel mix of industrialized states, 1973–87

	USA	Japan	Germany	UK	France	Italy
<i>TPER*</i>						
1973	1742	340	270	231	181	132
1985	1792	372	267	202	194	141
<i>Coal as % TPER</i>						
1973	21	23	32	37	17	8
1985	24	20	32	31	13	12
<i>Industrial fuel use*</i>						
1973	514	158	85	71	61	50
1985	436	128	72	45	49	41
<i>Coal use as % of industrial energy use</i>						
1973	15	23	21	22	20	8
1985	13	28	26	18	19	15
<i>Electric utility fuel use*</i>						
1973	467	103	75	72	42	32
1985	609	149	96	69	77	41
<i>Coal use as % of electric utility TPER</i>						
1973	46	12	67	63	25	5
1985	58	14	57	61	14	6
<i>Nuclear as % of electric generation</i>						
1973	5	2	4	10	8	2
1985	16	24	31	20	65	5
1987	17	26	31	20	70	0

* Million tons oil equivalent

Sources: IEA, *Coal Information 1987*. Paris: OECD/IEA (1987), *passim*; IEA, *Energy Policies and Programmes of IEA Countries. 1987 Review*, Paris: OECD/IEA (1987), *passim*.

Not surprisingly, the IEA, EC, and America's Carter administration called for the doubling of coal use by 1990. World coal production advanced more rapidly between 1973 and 1980 than in subsequent years (Table 7.6). The USA and China mined one-half of the new tonnage. South Africa, India, and Australia also recorded impressive production gains.

Earlier projections of coal consumption for the leading OECD states during the 1980s did not materialize. Neither did the international coal trade expand as rapidly as anticipated. Coal exports from the USA, the leading shipper, rose from 49 mmt in 1977 to 100 mmt in 1981 and then fell to under 80 mmt in 1986. OECD-Europe and Japan provided the largest global markets, taking 136 mmt of the 195 mmt traded in 1975 and 215 mmt of 236 mmt in 1986. Poland shipped coal to western Europe and, with the USSR, met eastern Europe's needs. New markets in Hong Kong, Singapore, South Korea, and Taiwan drew from the USA,

Canada, South Africa, and Australia. The share of steam coal to total coal exports rose from 80 to 85 percent between 1973 and 1986, reflecting a stagnant world steel industry, improved efficiency in coke burning, increased coal use by electric utilities, and the slowdown in nuclear plant additions.

In the industrialized states featured in Table 9.2, the role of coal diminished after 1973 in Japan, Britain, and France, rose in Italy and the USA, and remained unchanged in Germany. French policies discouraged coal use in all but a few basic industries while rapidly substituting nuclear for fossil fuel fired plants. In Britain, Germany, and the USA ambivalence reigned. Each acknowledged the dangerous polluting effects of coal burning, yet each contained a large domestic coal industry, considered a hostile political force by Britain's Conservative government. Each manifest doubts about the wisdom of pursuing the nuclear alternative.

Germany persisted in subsidizing the use of domestic coal, more expensive than imported coal, in the iron and steel and electricity industries. From 1985 through 1987, subsidies protected one-third of production. Britain, like Germany, engaged in the process of phasing out uneconomic collieries, protected its coal industry through coal conversion incentives and long-term contracts between the national coal and electric authorities. Those policies discouraged coal imports. In Germany and Britain, unlike the USA, the governments offered some support to miners affected by mine closures. In addition, Britain's Tory government tentatively scheduled the sale of British Coal in 1992 or 1993. Just how this will be done and its impact on coal costs, of great moment to the soon-to-be privatized electric industry, remains unclear. At the least, one can surmise that privatization will be managed so as to dilute the power of the national miner's union. The latter has received more government attention than the polluting effects of continued large-scale coal burning.¹⁶

US coal policies under President Carter focused upon converting industries and utilities to coal, raising coal production, launching a monumental program to develop a synthetic fuels industry, and promoting coal exports. President Reagan abandoned the legislative foundations of these initiatives which had yielded meager results. Exports and utility use accounted for 60 to 70 percent of the gain in US production from 1973 to the peak year, 1984. The federal government offered only passive support to exports. Power plants consumed more coal, amounting to about 75 percent of coal production during the years, 1984–6, for reasons that had little to do with federal coal policies. Demand for electricity rose and coal prices per Btu were lower than oil or gas prices. Utility company disenchantment with nuclear power

forced them back to the fossil fuels. The objectives of federal coal policies were glaringly at odds with the central goals of environmental legislation.¹⁷

Recent revelations that irrefutably link fossil fuel burning to fearsome environmental degradation have not retarded fossil fuel use which still provides about 80 percent of the world's energy. Britain has been labeled the "world's worst air polluter" by Friends of the Earth and stands accused by Germany and the Scandinavian states of exporting acid rain to those and other countries. Canada has similarly cited the USA as the source of acid deposition that, as in western Europe, destroys lakes and forests. American and British governments claimed the evidence linking pollution and climate change to be inconclusive. Each refused to formulate programs to reduce emissions of sulfur and nitrogen dioxides from coal fired power plants, ore smelters, and automobiles. However, the Thatcher government in 1987–8 laid the groundwork for a great expansion of nuclear generating capacity. The government justified this expensive program as a sure way to reduce acid rain and the greenhouse effect. Along the way, lowering coal use, however achieved, would also weaken the political power of the militant miners union.¹⁸

Under the auspices of the United Nations, fifteen European countries, Canada, and the USSR agreed in 1985 to reduce their sulfur dioxide emissions by 30 percent by 1995. Britain, Poland, and the USA declined to sign this treaty. Now, Norway and Sweden aver that a 60 or even 80 percent reduction is imperative to protect their environments. Germany, in 1984 and 1986, mandated stringent controls that promise to diminish the sulfur dioxide emissions of 1982 by two-thirds. However, Germany continues to subsidize coal burning in power plants.¹⁹

After four years of negotiations with Canada, the Reagan administration refused to engage in more than a dilatory research program. In 1986, a US Department of Energy spokesperson insisted that the USA pursued "reasonable measures for dealing with acid rain at this time."²⁰ Only in 1987 did Reagan agree to freeze nitrogen dioxide emissions at current levels. In Congress, efforts to control acid rain were stonewalled by members from polluting and coal mining states. Reagan's insensitivity to environmental degradation was reflected in his indifference to the warning voices of scientists about the warming of the atmosphere, the so-called greenhouse effect, expressed most forcefully by Dr James Hansen in June 1988. Hansen told a US Senate committee that greenhouse warming was not a threat but a reality. The US Department of the Interior acceded to energy industry demands by greatly increasing oil and gas leasing in fragile or hitherto protected areas. In

1987 and 1988, oil interests and the Reagan administration staunchly opposed a bill that would prevent drilling in the Arctic National Wildlife Reserve, on the Beaufort Sea in northeastern Alaska.²¹

The advent of the Bush administration has not produced a marked change in government policy. Attitudes, though, have been slightly modified. While the administration admits the need for an international agreement to resist global warming, it refuses to implement domestically the reduction of CO₂ emissions agreed to internationally. Presidential calls for clean air and water are hollow, unsupported by federal action to reduce fossil fuel use or to improve its efficiency. Prime Minister Thatcher seems more aware of the urgency of the matter than President Bush. In an impressive display of knowledge and analytic ability, Prime Minister Thatcher, in summer 1989, led a seminar on the relationship between energy policy and global warming. Perhaps, in 1990, the OECD states will unite on an enforceable policy to protect the ozone layer, reduce the emission of noxious chemicals, and deal with deforestation. In all of this, it is unfortunate that two of the largest polluters, the USA and the UK, must be dragged along reluctantly by other nations.

What action most be taken to reduce significantly the accumulation of pollutants on the land, in the sea, and in the air? Voluntarism is only marginally effective. On occasion, grass-roots organizations can stop pollution. Opposing coercive measures on the grounds of laissez-faire or individual freedom is the defense of the worst polluters, individuals, in their cars and in their creation of other wastes, ranking high among them. Doing next to nothing, apparently the preferred position of most nations, is life-threatening. The cost of reducing environmental pollution to levels that the earth can absorb will be enormous. But the annual costs of pollution are already horrendous and rising. Forest damage from acid rain in western Europe was reckoned at 22 percent of the total forest area as of 1986. Germany estimates pollution costs of \$51 billion yearly, or 8.3 percent of GNP. The annual bill for soil erosion and water pollution in the USA is calculated at \$26 billion.

Nations will not, generally, act alone to battle environmental threats that are transnational in cause and effect. They correctly point to the ineffectiveness of unilateral action. Any increment to production costs, they argue, would weaken their competitiveness. That leaves cooperative action with the costs prorated according to the quantity of pollution exported. Unless the industrialized states assume the burden of financing a global assault on pollution—the USA, Europe, and the Soviet bloc are responsible for two-thirds of global emissions from fossil fuels—the quality of the environment will continue to deteriorate.

Egocentric nationalism in the USA, Britain, the Soviet bloc, China, Japan, and Brazil, and a regiment of other states stands as the great deterrent to a cleaner world.²²

The many disadvantages attending augmented consumption of coal, nuclear power, and imported oil prompted western Europe to utilize an expanding volume of North Sea, Dutch, and Soviet natural gas after 1973 (see Chapter 7). The share of TPER filled by natural gas grew rapidly in OECD-Europe and, in the form of LNG, in Japan. In the USA, where natural gas was in widespread use before 1973, gas price deregulation by Presidents Carter and Reagan did not reverse the decline in proven reserves. Since 1985, nothing has occurred to improve the limited capacity of natural gas to further reduce coal and oil use. In 1988, analysts of the US gas industry predicted a bright future for the fuel, pointing to accelerated residential use and, stimulated by the repeal in 1987 of the Fuel Use Act of 1978, the shift to gas by such industries as glass and chemicals. Besides ignoring the low quality use of a high quality fuel, these analyses focused on the next year or two and neglected to account for the steady shrinkage of US reserves, in 1987 down 7 percent from 1982 (Table 7.1). With gas consumption outrunning additions to reserves, a run of severe winters could raise demand above the delivery capacity of the pipeline companies. The industry, of course, would not utter a word of caution.

In Germany, France, and Italy, large importers of natural gas, the volume of gas burned and its share of TPER have plateaued since 1985. Those governments have sought contracts with their suppliers, the Netherlands, Norway, and Russia for Germany and France, and Algeria, Holland, and Russia for Italy, that sustain current levels of consumption. Japanese imports of LNG leveled off after 1985. Japan plans to increase LNG use. To further reduce dependence upon imported oil which is cheaper than LNG, the Japanese are investing heavily in the development of gas production and liquefaction facilities in Australia, Indonesia, and Malaysia.²³

Coal and gas proffer but limited possibilities for dampening reliance upon imported oil. Gas, clean and efficient, exists in insufficient volume to broaden its use in western Europe or the USA. At this moment, the polluting qualities of coal negate the advantages of abundance. However, an energy crisis or a steady, guided series of oil price increases and OPEC-induced tightness of supply, predicted by some authorities for the 1990s, could trigger a coal binge.²⁴ A similar scenario could resurrect a presently debilitated nuclear power industry despite its costliness, inefficiencies, and clear dangers.

The energy crisis of 1979 did not revive the moribund nuclear industry in the USA. In western Europe, the intense opposition of organized

environmentalists and others, a decline in the growth of electricity consumption, and the ever increasing costs of nuclear construction obstructed the addition of planned installations. France, with the most ambitious nuclear program in the world, forged ahead, bringing four new stations on line in 1987. But, the 1986 accident at Chernobyl convinced several European countries to cease new construction, close plants, and, effectively, to reject the nuclear option. The fearsome uncertainties unveiled at Chernobyl also constrained nuclear growth in the Soviet Union and in such densely populated and industrializing LDCs as South Korea and Taiwan.

Japan intends to double current nuclear capacity by 1995.²⁵ Britain and Germany plan fewer facilities than originally projected. For most of the OECD states, however, the contribution of nuclear power to electric production (see Table 9.2) has about peaked. Italy, in 1986, drew 5 percent of its power from three nuclear plants; in 1987, all three plants were closed. Austria abandoned its only plant. Nuclear generation will also recede in Belgium, Finland, Scandinavia, Switzerland, and the USA as older plants are retired and fewer new plants, or none at all, come on line. Britain plans to construct at least four nuclear plants, but this assumes the continued electoral success of the Conservatives. Current public opposition to new construction runs at over 50 percent in France and over 60 percent in several other OECD states.²⁶

The nuclear moratorium in the USA severely damaged the technological competitiveness of American nuclear suppliers. General Electric, for example, confines its nuclear activities to servicing existing plants and is not a leader in developing advanced reactors. Indeed, America's electrical equipment manufacturers are also losing out to foreign suppliers. Foreign firms are buying American firms. Domestic power plants increasingly import heavy equipment. In 1988, no American companies produced extra-high voltage circuit breakers. Both GE and Westinghouse market Japanese breakers. A similar erosion of American technological leadership is apparent in other industries, as well.

While President Bush asserted the need for nuclear power, his constituents, in a Fall 1989 poll rejected new construction. Even more telling, voters in Sacramento, California, decided to close an operating nuclear plant because of its excessive cost and inefficiency. Construction and operating costs make nuclear power twice as costly as conventional coal plants. But more than costs are involved. Public opinion, in America or Italy, will only support the technology if industry and government can unequivocally demonstrate their ability to guarantee plant safety and to dispose of nuclear wastes safely. Public relations campaigns orchestrated by nuclear advocates blamed Chernobyl on human error rather than flawed technology, touted nuclear power as the only

immediately viable substitute for imported energy, and heralded it as the answer to acid rain and global warming. Even if hopes materialize for a new generation of less dangerous reactors, a highly improbable accomplishment for the US industry, there remains the ever-present difficulty of waste disposal. Thus far, these appeals and promises have not altered the minds of those who distrust and fear the technology.²⁷

When Italy shut down its nuclear plants in 1987, the government revealed plans to increase natural gas imports from the Soviets and North Africa. Coal imports were ascending prior to Chernobyl. Ominously absent from Italy's response was a renewed commitment to the conservation provisions of the 1981 National Energy Plan and the conservation law adopted in 1982. Indeed, softening energy prices in 1985-6 so obscured any recognition of conservation's benefits that a revision of the plan in 1986 assigned much lower priority to the development of renewable energy.²⁸

Remissness in exploiting the potential energy savings of conservation characterized the energy policies of the industrialized states following the crisis of 1973-4. Falling Iranian exports and the ratcheting of prices in 1979-80 forced attention, for a time, to conservation. Some progress followed. Table 7.1 documents the decline in TPER between 1979 and 1985 while Table 7.8 demonstrates improved energy use efficiency. These coordinate trends, however, were as much the consequence of world recession and slower economic growth as of specific conservation measures.²⁹ Moreover, actual energy savings as of 1985, measured against consumption in 1973, were not evenly distributed among all domestic uses.

Table 9.3 denotes industry as the source for virtually all of the energy savings in each country. The table depicts a chronological pattern: the most pronounced savings occurred between 1979 and 1984 after which TPER (Table 7.1) again rose and energy use in industry ceased its downward slide. The transportation sector proved most resistant to conservation.

OECD economies stagnated from 1979 into 1983. The price of crude oil in 1981 exceeded that of 1973 by ten times and the annual growth of OECD GDP fell from 3.9 percent in 1978 to 0.3 percent in 1982. Slumping sales of metals and fabricated goods, an enormous rise in the energy costs of heavy industry, and intense competition for markets induced industries to pare energy costs. Closing obsolete plants and introducing newer production technologies, as in the US aluminum, copper, steel, and chemical industries, improved productivity and energy efficiency. Soaring electricity costs stimulated the aluminum industry to introduce energy saving procedures that improved energy efficiency by over 20 percent between 1975 and 1985, with three-

Table 9.3 Total final energy consumption of developed states, by economic sector, 1973-85 (million tons oil equivalent)*

	Industry	Transport	Other
<i>UK</i>			
1973	71	31	51
1979	61	34	58
1984	44	36	54
1985	45	37	58
<i>Germany</i>			
1973	85	34	79
1979	85	41	87
1984	73	43	77
1985	72	43	81
<i>France</i>			
1973	87	na	77 ¹
1979	81	na	77
1984	69	na	69
1985	70	na	72
<i>Italy</i>			
1973	50	20	32
1979	49	26	35
1984	42	27	36
1985	41	28	36
<i>Japan</i>			
1973	158	41	52
1979	146	54	61
1984	129	57	66
1985	128	58	65
<i>USA</i>			
1973	514	411	497
1979	523	447	418
1984	448	442	402
1985	436	445	400

* Total final consumption = TPER - net losses in production and use

¹ All other

Sources: IEA, *Energy Policies and Programmes of IEA Countries. 1986 Review*, Paris: OECD/IEA (1987), *passim*, and *Coal Information 1987* (1987), p. 350.

quarters of the gain occurring after 1979. With a fuel bill of \$475 million in 1979, Du Pont introduced an energy savings regimen consisting of conservation, often requiring new equipment, and fuel substitution, including cogeneration. German and Japanese industries responded to similar imperatives and won similar results. Germany and Japan applied a set of conservation rules and inducements to industry, including grants and loans for improvements in energy efficiency. American industries received few direct financial incentives to conserve. Indeed, just as energy prices began to slide, signals from the Reagan administration suggested the unimportance of conservation.

Between 1975 and 1980, the USA enacted a number of conservation

laws, subsequently ignored or repealed by President Reagan, the most important being the Energy Policy and Conservation Act of 1975. In addition to setting energy efficiency standards for new buildings, this law imposed gasoline mileage standards for new autos. By 1985, fuel efficiency had improved from 13 miles per gallon (mpg) in 1973 to 25 mpg, lower by 2 mpg than the goal stipulated in the legislation, and far below western European or Japanese achievements. The Reagan administration, however, eased the standards for the car makers so that no improvement in the USA above the 1985 figure is likely during the 1990s. Unfortunately, cheaper oil since 1983 has drawn consumers away from fuel efficient cars, an inclination fostered by the world's auto-makers. Reagan's refusal (unreversed by his successor) to sanction higher, and readily achievable gasoline mileage standards coincided in time with the rise in the share of American petroleum consumption attributable to transportation to almost two-thirds between 1979 and 1987. In 1987, the USA contributed 22 percent of the world's carbon emissions from fossil fuels, an increase of 55 percent since 1960. Private autos alone are thought to contribute something over 30 percent of US carbon emissions.³⁰

In the western industrialized countries, industrial conservation, recording savings of 10 to 20 percent between 1973 and 1980 and equivalent savings from 1979 through 1984, far exceeded savings in other use sectors. Industrial savings were permanent gains and complimented by the somewhat improved energy efficiency of household appliances and new residential and commercial buildings. But transportation as a whole did not improve (Table 9.3). Governments preferred not to challenge the myopic preference of consumers for larger and less efficient vehicles. To an extent, the force of Japan's energy savings were dissipated by inefficiency in transportation and agriculture. Japan remained heavily dependent upon imported oil, costing above \$35 billion annually and exceeded only by the \$46 billion US bill (1988). Two-thirds of Japan's oil originated in the Persian Gulf and met over one-half of TPER (Table 7.1). Energy security remained an elusive goal for Japan.³¹

The illusion of security

Softening oil prices between 1983 and 1985 and the sudden plunge of prices in 1986 blunted the conservationist trend in the industrialized states as well as the incentive to search for new energy supplies. Optimists gleaned comfort from the fall in TPER after 1979, the marked reduction in oil import bills (Table 7.9), the diversification of internal

energy mixes, and the improvement in energy use efficiency. These positive signs, coupled with global oil reserves sufficient for 30 years and the mid-1988 truce between Iran and Iraq, dissipated fears of a third oil shock. Pessimists, however, considered this security illusory. Was the Middle East more stable in 1990 than earlier? Had the West won the battle to contain oil imports? Were the largest consumers significantly less dependent upon fossil fuels in 1990 than in 1973?³²

Sufficient fossil fuel reserves exist to meet demand into the twenty-first century. But can the global environment survive the burning of coal and oil at current, and probably rising, rates for such a prolonged period? Western governments directed woefully inadequate attention to this most critical issue. While recognizing the savings possible by conservation, they clung to the primary goal of securing supply against a future disruption. To prepare for such an eventuality is imperative. The surest method of diminishing the likelihood or the impact of a new price-supply squeeze is not to stockpile some months supply of crude or to cast covetous eyes on the Arctic Circle, but to consume significantly less oil without turning to coal or nuclear power. Conservation, including the development of renewables, promises to contain the use of fossil fuels within safe limits without damaging economic efficiency. Britain's government proclaimed that the nation's annual energy bill of \$38 billion could be reduced 25 percent through greater end use efficiency.³³ However, an expansive view of conservation, encompassing its geo-political, economic, and environmental impacts, appealed less to governments than adding to the supply of fossil fuels and, somehow, breathing new life into nuclear power.

Energy in the Soviet bloc during the 1980s

Within the Soviet bloc during the 1980s, overall energy supply and demand experienced no marked change from the trends sketched in Chapter 8. A decline in Soviet oil production after 1980 was apparently reversed by late 1986 while serious difficulties impeded the substantial increase of coal output (Table 7.6). The tragic Chernobyl reactor explosion of April 26, 1986 tarnished Russia's reputation in the West, nurtured anti-nuclear attitudes around the world, and defeated Soviet plans to supply at least 20 percent of Russian and bloc electric needs with nuclear power by 1990. Natural gas provided the bright spot in energy development: planned output for 1985 sought 630 billion cubic meters (bcm), actual production reached 643 bcm and, in 1986, 686 bcm.

Russia exacted immediate economic benefits from the price hikes and supply fears accompanying revolution in Iran. Although the

volume of Soviet oil exports to the West exceeded exports in 1978 by only 5 percent, hard currency earnings rose by 2.5 times, reaching \$14 billion. Natural gas earnings more than tripled to \$3.7 billion, carrying the contribution of energy exports to total hard currency earnings in 1982 to 80 percent, compared with 54 percent in 1978. Arms sales boomed and the cost of Russia's largest import, grain, fell sharply. Believing, as did most western governments, that high oil prices and tight supplies would persist, Russia invested heavily in oil exploration in an effort to lift production to levels permitting greater exports to western Europe. Concurrently, the Soviets initiated an enormous natural gas pipeline program that would sharply accelerate production and shipments to the West. Ambitious economic modernization plans rested on the rapid advance of nuclear power and on augmented receipts of western money and technology.

Concomitantly, the Soviet Union, desirous of freeing oil for sale to the West and providing a market for Soviet nuclear technology, exerted pressure on CMEA-6 states to develop an energy regimen based on gas and nuclear power. To secure gas and oil imports required bloc commitments to Russia of foodstuffs and of capital, equipment, and labor to joint venture nuclear construction. Eastern European energy requirements, however, prohibited the achievement of phased cutbacks in Russian oil exports. Even before Chernobyl, nuclear expansion proceeded at a snail's pace, a victim of high costs and manufacturing deficiencies.³⁴

Faced in 1981 with mounting oil import bills as Soviet prices rose by 10 times over 1976 prices, the German Democratic Republic exploited its large lignite reserves to raise coal production (Table 7.6). Thus, GDR avoided the intense energy dependence upon Russia that plagued other, less well endowed bloc states. In 1986, GDR relied on coal for 72 percent of TPER and suffered from intolerably high levels of pollution.³⁵ West German and UN sources estimate that nearly 30 percent of East Germany's forests have been destroyed by acid rain, a proportion similar to Poland's. Poland's internal instability obstructed gains in coal output while western European imports diminished. French imports of Polish steam coal declined from 3.5 mmt in 1979 to 280,000 mt in 1980—a consequence of Solidarity action—rose to 1.9 mmt in 1983 and plunged again in 1985 to 883,000 mt. In 1986, Polish coal exports to the West equaled 57 percent of 1984 shipments.

Poland's foreign indebtedness and current accounts deficits, inflation of 60 percent, deep-seated labor unrest, smoldering consumer and political discontent, and the tantalizing vision of *glasnost* and *perestroika* gradually eroded the credibility of a regime that had demonstrated singular ineptness in managing the economy. In Fall 1989, the ruling

Communist government was repudiated in an exciting general election. An ex-Solidarity leader became Polish premier. Poland's economy, however, requires immediate treatment. The USA and its western allies must be generous with grants and credits that avoid fostering further environmental damage.

Soviet intentions to reduce oil exports to its allies proved impossible to accomplish. To avoid the further deterioration of weak CMEA-6 economies required Russia to sustain its annual exports at about 80 mmt from 1981 through 1986. That volume composed some 90 percent of CMEA-6 imports and 75 percent of total oil demand. Gas imports, all from Russia, rose from 29 bcm in 1981 to 38 bcm in 1986. None of this energy was obtained at bargain prices.

A dependent-subordinate linkage—apparently as intense in 1988 as in 1973—defined the relationship between CMEA-6 and Russia. Soviet greed and Romanian irrationality combined to deny the latter the fruits of its oil, coal, and gas resources. Each winter, Bucharest and other areas suffer prolonged electricity and gas shortages. The West, too, shares culpability. Western creditors provided the late Ceausescu's regime a \$10 billion loan which was used most foolishly. Canada sold nuclear plants to Romania on extended credits despite the gross inefficiency of the electric distribution system. To repay these debts, Ceausescu ordered the export of everything not bolted down. Romanians faced a regressing standard of living: food remains in very short supply and malnutrition is widespread. Heavy dependence upon coal constrains East German industrial efficiency and pollutes at home and abroad. Imports, largely from Russia, satisfy one-half of domestic energy consumption in Hungary which, along with Czechoslovakia, is concerned that nuclear power will not meet incremental electric demand during the 1990s. Unless accompanied by sweeping modifications, economic improvement resting on a more diversified internal energy mix will not be easily achieved in eastern Europe.³⁶

Russia reaped a bountiful harvest in oil and gas sales between 1980 and 1982 but now confronts depleted hard currency earnings. Sales realizations from those fuels dropped from \$16 billion in 1982 to under \$7 billion in 1986, reflecting not only lower prices but also reduced western European oil imports (Table 7.5). Oil production fell while internal energy use advanced (Table 7.1). Should the decline in hard currency earnings persist over a prolonged period, economic modernization will be retarded, the more so unless substantial gains in cereal production are achieved. To speed up new oil discoveries through the application of state-of-the-art technologies, the Soviets are now contemplating joint ventures with foreign partners, a prospect that has attracted the interest of several large western firms.³⁷

Great success rewarded the USSR's campaign to increase gas exports from its supergiant Yamburg-Urengoi field, located north of the Arctic Circle, via a 3,500 mile pipeline through the heart of European Russia to Prague and connections with western Europe. Initially conceived in 1978, the scheme quickly won the approbation of western European banking and industrial interests and their governments. The new line would carry an additional 40 bcm to Germany, Italy, France, and four other European countries by the late 1980s, compared with annual receipts of 25 to 27 bcm between 1978 and 1981. Russian gas, by 1990, would furnish some 20 to 25 percent of western Europe's gas requirements, thus lessening reliance upon Middle Eastern oil.

The proposal appealed to Europeans for several reasons. The Soviets offered gas at prices below North Sea and Dutch gas. Bankers in Britain, the Netherlands, France, Germany, Italy, and Japan extended loans covering virtually the whole cost of construction. In return, Russia purchased necessary equipment and pipeline valued above \$15 billion from the creditor countries. Sales of turbines, computerized measuring equipment, heavy construction vehicles, and large diameter pipeline guaranteed thousands of jobs at Germany's A.E.F.-Telefunken, Britain's John Brown Engineering, France's Creusot-Loire, and Japan's Komatsu.

The Carter administration evinced no enthusiasm for the Soviet-European gas deal. In the name of human rights, Carter backed away from the less restrictive trade policies of his predecessors even before Russia's invasion of Afghanistan impelled him to suspend trade with the USSR. Unable to compete for Soviet orders, Caterpillar Tractor, GE, and other American firms lost millions of dollars in sales.

As presidential candidate, Ronald Reagan explicitly condemned the pipeline contracts. In July 1981, President Reagan embargoed the shipment of pipeline to Russia and extended the sanctions to the foreign subsidiaries and licensees of American firms in July 1982. Reagan's pipeline politics derived from unswerving hostility toward the USSR and from ill-founded assumptions that posited a direct link between the gas contracts and Soviet geopolitics. America's ideological response momentarily fractured the western alliance. Europe rebelled against the presumptuous American campaign to compel adherence to ideologically rooted policies and America's refusal to recognize Europe's economic and energy interests. France and other western European states prepared to ignore the sanctions and to retaliate if Reagan persisted along this course. He did not; in November 1982, the sanctions were abrogated.³⁸

Scores of Japanese earth movers prepared the Siberian turf for the laying of German pipe while the USA pursued its futile policy. As it

transpired, softening oil prices after 1983 and a stabilized rate of gas consumption led customers to lower their take from Russia. Moreover, the Netherlands and Norway, in 1985-6, offered gas at competitive rates which Germany and Austria accepted, thus reducing requirements from the USSR.³⁹

The Soviets in 1987 and 1988 apparently reversed the downward slide in oil production. They cannot, however, anticipate augmented hard currency earnings from energy exports. Modernization, if it survives in the Soviet political arena, must proceed through the wise utilization of internal resources. Energy supplies should not pose severe problems. Indeed, energy pales to insignificance when compared with the unknowns faced by the Soviet Union as long suffering populations in eastern Europe abandon communism and initiate the task of shaping new political and economic structures.

Revelations in Moscow, in 1989 and early 1990, admitted to the feeble condition of the economy. The radically changed and changing relationships between the USSR and eastern Europe will undoubtedly compel the Soviets and eastern Europe to renegotiate their economic relationship. CMEA may not survive. In the USSR, plans for energy modernization will be affected by the particular decisions of former satellites. It seems unlikely that Moscow will subsidize oil shipments to CMEA-6. Eastern Europeans are unlikely to continue money or labor investments in giant Soviet nuclear and pipeline projects. In the near future, East Germany will merge with West Germany. While nervous Poles may likely continue for a time as members of the Warsaw Pact, their country, alone with Hungary and Czechoslovakia, will look to the West for aid. Western expertise and funds might be productively engaged in restoring Romania's oil industry. Poland desires to revitalize its coal industry. While eastern European peoples look forward to a time of greater material satisfaction, their economies are already among the world's greatest polluters. Like other advanced LDCs, demands for a higher standard of living will confront ecological imperatives.

The energy importing LDCs after the Iranian Revolution

Tanzania's external debt soared after 1973 and again after 1979, reaching \$2.6 billion in 1984, three times the level of 1975 and equaling 68 percent of GNP. Simultaneously, high birth rates and declining death rates yielded an average annual population increase of 3.6 percent while food output *per capita* fell. Brazil's economic woes were of a different order of magnitude: a foreign debt of \$69 billion in 1984, almost five

times greater than in 1975; energy imports worth more than one-half of all exports (Table 8.4); population growth and rural poverty that generated a tidal wave of migration to unprepared cities (Tables 8.1 and 8.2); and a regressive agricultural sector.⁴⁰ The immediate future promised but slight amelioration of the dire poverty in which most Tanzanians and Brazilians lived.

The Iranian price hikes exacerbated the economic woes of many oil importing LDCs. Dozens of poor countries relied upon imported oil as their primary, or only, commercial fuel. Modernization demanded oil, but the exorbitant prices of 1978–81 compelled the slashing of imports. In Jamaica, Costa Rica, Sri Lanka, and the Philippines, the added burden forced postponement of road and other infrastructure construction, triggered rising unemployment, and encouraged efforts to increase food and raw materials exports. But the export value of raw commodities remained far below the cost of imported oil. In 1980, seven bushels of wheat purchased a barrel of oil that in 1973 cost less than a bushel.

The slackening of oil prices after 1983 afforded only temporary respite for such LDCs as Tanzania, Brazil, and India. Oil import bills declined, but the earning power of those nations improved only marginally. The total debt of Latin America, not including Venezuela and Mexico, reached \$218 billion in 1985, 63 percent held by western banks. Schemes to avoid debt repudiation offered by western governments, the World Bank, and IMF uniformly called for fewer but more precisely dedicated loans, longer payment periods, lower interest rates, and a primary reliance upon internal capital formation. All of this sounded reasonable to a western ear. But who in Tanzania has such savings to be mobilized? Will the incredibly rich few in Brazil or Mexico voluntarily unlock their wealth for public purposes? In return for international aid, the debtor countries would introduce austerity programs, cut budget deficits, reduce inflation, and increase the role of the private sector at the expense of state owned companies. Inherent in these nostrums were political dangers for shaky LDC governments. The burden of service cuts and new unemployment caused by austerity and anti-inflationary recipes always falls most harshly on the underemployed and working poor and on the lower middle class. Those calling for retrenchment almost never feel any of its effects.

Few miracles occurred during the 1970s and 1980s to relieve the chronic poverty of the poor oil importing LDCs. A handful of LDCs—Taiwan, South Korea, Singapore, the colony of Hong Kong, each heavily dependent upon energy imports, fought their way out of the permanent poverty that afflicted all too many LDCs. Led by the manufacturing sector and exports, both protected by government policies,

those Southeast Asian societies achieved impressive economic growth. Most other LDCs suffered from firmly embedded disabilities. Demand for their goods—Kenyan coffee, Sri Lankan rubber—shrank as did the prices received. Development faltered as the costs of imported modernization exceeded the ability of commodity exports to meet the bills.

The poor LDCs lacked the flexibility to respond to economic fluctuation. Although dozens of states, from the Congo to the Philippines, hired foreign developers to hunt for oil, few were so fortunate as Malaysia. Most, like Thailand, contained marginal reserves of limited attractiveness during a time of surplus.⁴¹

Several LDCs sought World Bank and other loans during the 1970s to initiate vast electrification programs, intending to create a strong nuclear component. The productive capacity of the nuclear industry in America and western Europe far surpassed demand. Whole markets disappeared under the fallout from Chernobyl. Framatome, Westinghouse, Kraftwerk Union, and a few other firms scoured the globe in search of business. The LDCs seemed to present sales possibilities but these proved mostly chimerical.

For most LDCs, nuclear power is not an option. A plant costing from \$2 to \$5 billion, requiring highly trained personnel and an efficient distribution system, is beyond their reach. In Africa, a nuclear plant costing \$3 billion equaled at least one-half of the 1985 GNP of 39 of 45 countries. In Central and South America, the GNP of 16 of 24 states fell under \$10 billion. Asian countries such as Pakistan and the Philippines, with GNPs above \$30 billion, are mired in poverty. Potential purchasers were few. Eastern Europe, with seventeen plants and forty-seven in process in 1985, was the world's largest regional market. With the emergence of independent eastern European states, the market for nuclear plants might open up to western firms and nations willing to offer substantial credits.

Several of the LDCs decided that nuclear power made little sense. The increasing availability of gas and the cheapness of coal prompted Mexico to construct one rather than two plants and to plan no others. Venezuela never seriously considered a nuclear program. Iran, in 1980, abandoned the whole of the Shah's ambitious nuclear policy. Brazil, encumbered with a gigantic debt, reduced its nuclear program from eight reactors to two, and then suspended work on both. The primary contractor, Kraftwerk Union, lost billions of dollars in sales. Brazil's decision rested on several salient considerations: the high cost of borrowing money, unanswered questions concerning safety and waste disposal, reasonable doubts about the economic benefits of nuclear power and domestic hydroelectric potential.⁴²

A primitive infrastructure and poverty precluded the emergence of a large nuclear component in such states as Pakistan and the Philippines. The paucity of energy resources, and in Pakistan's case, the desire to develop nuclear weapons, pushed them initially to embrace that option. Even India and China, both owning nuclear weapons, can marshal but limited funds to develop nuclear energy. Within India, an articulate opposition to nuclear power questioned its relevance to the enormous mass of poor rural people. The fall of the oppressive Marcos regime in the Philippines and revelations of corruption in the awarding of nuclear contracts to US firms caused the termination of work on the reactor under construction. Moreover, Filipinos voiced cogent objections to the intensified dependency upon the USA that would accompany nuclear power. China, after exciting western hopes of a vast nuclear market, turned instead to coal and hydroelectric. In the Chinese view, smaller scale hydro and coal units better fit the needs of its farming masses than giant facilities.

China well reflects the dilemma facing many LDCs. Rejecting nuclear power made sense; turning to coal, while the only substitute available, will severely retard global efforts to slow the warming of the atmosphere. In 1987, China ranked third in carbon emissions, fixing a greater tonnage in the atmosphere than West Germany, Britain, and Italy combined. These emissions will sharply increase as new coal fired electric plants are constructed. Meanwhile, already a food poor nation, air pollutants destroy a rising tonnage of grain.

Successful nuclear programs emerged in South Korea and Taiwan, both highly dependent on energy imports, which benefited US firms. However, they are small nations. South Korea's intention to derive 65 percent of its electricity from nuclear by 2000—the nuclear contribution in 1984 reached 20 percent—will almost be achieved with the commissioning of seven reactors currently under construction.⁴³

India, Pakistan, and Argentina, non-signatories to the 1968 Treaty on the Non-Proliferation of Nuclear Weapons (NPT), pursued the nuclear option most aggressively. India's explosion of a nuclear device in 1974 highlighted the essential weaknesses of the treaty. The USA, in 1978, responded forcefully, if not successfully, by adopting strict non-proliferation legislation that denied American nuclear fuel and technologies to non-signers of NPT. The USA also objected strenuously to the involvement of western European firms, especially German, in the nuclear projects of Brazil, a non-signer, and Argentina. President Carter's aims were easily circumvented. With the help of Canada, Germany, and Switzerland, Argentina mastered the entire nuclear fuel cycle by 1980.

President Reagan abandoned most controls over the export of nuc-

lear fuel and plants. By the early 1980s, America's monopoly of re-processed fuel had been breached and its technology surpassed by France and Japan. America acted inconsistently, aiding Pakistan, a NPT non-signer, while convincing Belgium in 1984 to forgo a nuclear contract with Libya, America's *bête noire* but a NPT signatory. The NPT and American policies hardly affected the spread of nuclear technologies. Mandated inspections by the International Atomic Energy Agency cover but a portion of the nuclear plants within NPT nations, rarely monitoring facilities in the USA, UK, France, Russia, or China. India and China possess weapons capabilities; South Africa, Israel, Pakistan, Brazil, and Argentina may also. Whatever the weapons potential of these NPT non-signers, their decisions to proceed more slowly, if at all, with nuclear energy derived from the evaluation of more germane, non-military factors.⁴⁴

The market potential of the LDCs for nuclear plants fades away under analysis. Most of those states cast aside their nuclear fantasies. Fossil fuels will meet the inevitable expansion of their energy needs. Some—Argentina, China, Malaysia—possess sufficient reserves to fill domestic requirements and even sell oil abroad. Others must rely upon imports. A variety of energy use initiatives such as small scale and locally managed hydro facilities, demonstration projects involving renewable energy, and a less obsessive desire for automobiles promise future benefits.

Criticism of Brazil's giant hydroelectric projects from both internal and external sources have caused a reassessment of power needs. Plans for dozens of new dams in the Amazon basin which would destroy a vast area of rain forest within which indigenous tribes live have been obstructed by the refusal of the World Bank to approve necessary start up loans. Instead, the Brazilian government and Brazilian utilities, with Bank aid, will dedicate \$8 billion to transmission and end use efficiency improvements which should eliminate the need for much new generating capacity while saving 1,200 square miles from flooding. Brazil faces pressure from many quarters to adopt strong environmental policies. Developed states have a stake in Brazil's responses. This stake should translate into financial and technological aid to Brazil. Concurrently, Brazil needs to reciprocate by directing, as an example, investments away from the hydro-mining-ranching ventures that benefit the few while doing unalterable damage.⁴⁵

A more realistic assessment by LDCs of domestic finances and energy requirements erects a natural defense against the promotion of large scale technologies by western vendors. However, the Brazilian and similar hopeful initiatives will wither unless population growth subsidies.

Price fluctuations and the oil exporters during the 1980s

The average price of crude shot upward from about \$17.50 per barrel in January 1979 to a peak of \$42 in the last half of 1980, provoking a contraction in the global volume of oil traded of 3.4 million barrels per day, or 10 percent, from 1979 to 1980. The enormity of the price increase generated equally enormous earnings for the exporters (Table 8.5). A moderate, but steady, diminution of prices to the \$32–\$34 range occurred during 1982–3 as recession and conservation abated demand in the USA, western Europe, and Japan (Tables 7.2 and 7.5). In 1983, global oil shipments of 24.3 mbd fell short of the 1980 volume by 7.5 mbd.

Reasonably stable prices prevailed between 1983 and mid-1985. Although the rate of decline of western oil imports moderated, oil from non-Middle Eastern sources filled a rising proportion of western oil requirements. Then, in mid-1985, oil prices slipped more precipitously than they had risen in 1979–80, plunging to about \$10 in early 1986. The development plans of the LDC exporters, already shaken by the earlier slackness in price and demand, were deranged by plummeting oil revenues. The damage sustained by the exporters, unrepaired by a price recovery to the \$18–\$20 range in 1987, were further aggravated by prices sliding toward \$13 in September 1988. By early 1989, OPEC had adopted a viable quota system; prices rose again to \$20.⁴⁶

Estimates of the oil revenues of the LDC exporters differ from source to source. Pachauri's calculation of \$288 billion for OPEC in 1981 exceeds the IMF figure by \$48 billion.⁴⁷ This abbreviated discussion of OPEC revenues employs estimates derived from the latter. OPEC's revenues of \$176 billion in 1979 rose to \$250 billion in 1980. With the exception of Iran, each member gained income, but Saudi Arabia's increment of \$42 billion equaled 57 percent of the total revenue increase. Only Saudi Arabia, and perhaps Kuwait, accumulated significant cash reserves. Total revenues slid in 1981 to \$240 billion, a decline of only 4 percent. The gain by Saudi Arabia of \$12 billion and of Indonesia of \$6 billion masked larger percentage losses for wartime Iraq (–60 percent), Kuwait (–20 percent), Libya (–27 percent), Nigeria (–19 percent), and Venezuela (–18 percent). Substantial revenue slippage occurred in 1982 and 1983 among all OPEC states except Iran which steadily improved its sales despite the war. By 1983, OPEC's earnings had fallen to some \$156 billion, still larger than 1978 but well below the bonanza years of 1979–82. Among the leading non-OPEC exporters, the oil revenues of Mexico, Norway, Britain, and Russia reached flood tide during the latter years.⁴⁸

The elixir of windfall revenues aroused a renewed commitment to

development among exporting LDCs, intoxicated by high prices that seemed durable. But the morning after the great binge arrived in 1983. Nine of OPEC's members, including Iran, Iraq, Libya, Nigeria, Saudi Arabia, Kuwait, and Venezuela, derived over 90 percent of export earnings from oil; Indonesia's dependency was 60 percent and non-OPEC Mexico's, 75 percent.⁴⁹ Diminished revenues presented a clear hazard to such populous and poor states as Nigeria, Indonesia, and Mexico whose development projects depended upon high oil earnings and the foreign loans secured by those earnings. For a number of LDC exporters, the boom of 1979–83 had become a bust by 1986. An oil glut, plunging prices, and overreaching development ambitions fueled the collapse. OPEC attempted to achieve consensus on workable production controls and an orchestrated market share campaign.

Oil moneys poured into the exporting countries between 1979 and 1982. The surprisingly high capacity of Saudi Arabia and Kuwait to absorb income had about reached its upper limit. Both accumulated adequate revenues to complete the massive non-oil and oil sector developments initiated after 1973. Of these two savers, Kuwait's employment of oil revenues reflected better balance. Kuwait invested more diligently than her neighbor, acting as a strong buyer in the financial markets of Europe and America and purchasing interests in a variety of foreign oil and non-oil companies. Less inclined to invest at home in monumental, non-oil related projects, Kuwait centered its efforts on refining and marketing its own oil. Kuwait, more than Saudi Arabia or any other LDC exporter, improved its natural strengths and, consequently, created a more balanced economy than other OPEC countries. Nonetheless, Kuwait remained an insecure country, dependent upon US naval forces in 1987 and 1988 to protect its oil exports from overt Iranian aggression. Neither did Kuwait's economic policies purchase immunity from the effects of falling oil prices.

The domestic use of Saudi Arabia's swollen oil revenues yielded only a marginal advance toward the goal of a diversified economy and the integration of its vast isolated parts. Its objectives differed conspicuously from Kuwait's, especially in the realm of foreign affairs and in OPEC's internal politics where the Saudis coveted the leading role. Ample expenditures—\$19 billion spent in the USA and UK from 1980 to 1985—bolstered its armed forces against the danger of an expanded Gulf war as well as for internal security purposes.⁵⁰ While Saudi Arabia's policies may have reasonably served its interests, as Quandt suggests, those policies manifested an external rather than internal orientation. In Pachauri's opinion, those policies left the nation with an economy that was generally weak and still wholly dependent upon oil earnings.

Kuwait and Saudi Arabia proved vulnerable to weakening oil prices,

both experiencing current accounts deficits after 1982. For a year or so, the magnitude of their reserve funds allowed the continuation of internal development, but in 1985, both states reduced domestic spending and purchases of goods from abroad. Cuts in welfare expenditures, the firing of civil servants, the repatriation of foreign workers, and the cessation of work on infrastructure and non-oil industrial projects followed.⁵¹

The autocratic ruling houses of Kuwait and Saudi Arabia feared the democratic and liberalizing influence of the West as acutely as the fundamentalist Muslimism of Iran or the Marxism of the USSR. High oil incomes offered only material goods to their people, serving as an imperfect barrier against internal political and social changes that might flow from demands for expanded participatory rights. High oil incomes protected the family regimes. Lower oil earnings harmed the interests and imperiled the future expectations of the general public, of workers, of students, of lower and middle rank bureaucrats, of small entrepreneurs. Dissatisfaction could nurture disaffection.

Development projects funded by the windfall profits of 1979–82 carried the more populous LDC exporters only fractionally closer to their goals than had the programs initiated after 1973. The prerequisites for balanced growth in a diversified economy could not be purchased in a decade. Growth programs ignored the prevailing maldistribution of wealth and welfare. Maladroit use of new revenues contributed to the great debt burden pressing on several exporters even before the price collapse of 1982.

Nigeria, for instance, won a Pyrrhic victory in forcing the price of oil sky-high in 1979–80 and in threatening its largest buyer, the USA, with reduced supply unless it adopted correct policies toward southern Africa. The USA turned toward Mexico and Alaska and western Europe to the North Sea and the USSR, thus depriving Nigeria of markets just as prices and demand diminished. To protect its market share, Nigeria, in 1981 and after, undercut OPEC's official prices and ignored its quotas.

By 1983, Nigeria's oil based economy sagged badly, fomenting a military coup which accelerated economic decline. Nigeria's *per capita* gross domestic product slumped by 50 percent between 1980 and 1984 while the foreign debt jumped from about \$7 billion in 1980 to above \$20 billion in 1984. Debt service absorbed one-half of all export earnings. Development stopped. Construction of the new capital, Abuja, ceased. No highways entered that city and cattle grazed on abandoned building sites. Some one million workers lost their jobs. In 1986–7, the military government announced a severe austerity program. More workers, particularly white collar, were released. Food scarcity threat-

ened many locales. Foreign creditors demanded greater retrenchment and less government activity in business as the price for restructuring the debt package. Predictably, those least able to earn an adequate income shouldered the greater burden.⁵²

Nigeria's plight typified the pitfalls of sudden, great wealth that waylaid other LDC producers. Mexico and Indonesia counted on high oil earnings to fund growth and to attract foreign capital investment and loans. Indonesia, with a more diversified export base than Nigeria or Venezuela, reeled from the shock of tumbling oil earnings in 1984 and after. Oil revenues fell from \$18 billion in 1981 to \$9 billion in 1986 while exports of rubber, tea, tin, and other commodities remained at low levels. Sinking revenues forced postponement of work on large LNG facilities and other industrial projects. Unemployment rose as jobs failed to materialize for the two million people entering the work force each year. In all probability, the average annual income of Indonesians, the lowest in OPEC, declined.⁵³

Mexico fell captive to the belief that oil earnings, spiced with large foreign credits, could carry the burden of economic growth. The nation's internal needs, however, far outstripped the earning ability of oil exports. The notion of oil as panacea for internal economic problems had been discredited by 1982. A foreign debt of under \$30 billion in 1979 reached \$108 billion in 1987, with American banks holding one-quarter of the total. Oil revenues declined after 1982, but most severely from 1986 to 1988, forcing intensified austerity and threatening Mexico's ability to service its debt. Retrenchment compelled a drastic cutback in subsidies that held food prices low. Rising food and other prices and a debt service burden exceeding 8 percent of GNP pushed inflation to 159 percent in 1987 and thoroughly eroded the incomes of workers and white collar groups.

Only the extension of new credits, organized by the USA, prevented Mexican bankruptcy. The creditors demanded, as they had in Nigeria, the opening of Mexico to private capital. Staggering from the price collapse and the devastation of the Mexico City earthquake, the government submitted. Japanese and American investments in oil and gas, hitherto the province of Pemex, rose. State owned industries were put up for sale. Mexico prepared to enter the General Agreement on Tariffs and Trade, requiring liberalization of restrictive import policies. Perhaps the most salient consequence of the economic crisis was the emergence of an apparently viable two-, or multi-, party system in 1988. In the short-term, the spread of internal opposition to government policies may exacerbate economic malaise. Resolution of vexing social and economic difficulties is unlikely, however, if the interests of the majority are ignored.⁵⁴

OPEC loses control, 1979–88

The readiness of OPEC members to profit from western panic over supply drove oil prices to their upper limits in 1979 and 1980. The decision of Saudi Arabia, the so-called price dove, to reduce production in spring 1979, contributed to the price crunch. During the next two years, recession in the West and more efficient energy use reduced demand (Tables 7.2 and 7.5) while dearness of oil stimulated non-OPEC production and lessened western imports of OPEC oil. Something of an oil glut emerged in 1981, apparently induced by Saudi Arabia's efforts to maintain its global market share by shaving prices below those of OPEC colleagues. In demonstrating its power to dramatically raise output, Saudi Arabia pursued a broader purpose, that is to force upon OPEC a lower, uniform oil price and production quotas. Algeria, Libya, Iran, and Iraq, each seeking maximum revenues, resisted the Saudi campaign to determine OPEC policies.

The adverse consequences of diminished western oil consumption quickly spread among the producing LDCs as export earnings dropped and balance of payments deficits mounted. In 1982, and following a reunified price decision in 1981, OPEC tentatively agreed to reduce production by 10 percent, thus paving the way for the adoption of production quotas in 1983 (Table 9.4). Price stability and production quotas would, OPEC anticipated, moderate the pernicious effects of intra-

Table 9.4 OPEC's quotas and actual production, 1982–9 (million barrels per day)

	Quota	Production
March 1982 to November 1982	17.5	18.0 July 1982 19.0 November 1982
December 1982	18.5	20.0 January 1983
March 1983	17.5	20.0 1983
1984	16.0	17.5 1984
1985	16.0	16.2 First quarter 17.0 Third quarter 15.5 Last quarter
First quarter 1986	15.0	20.0 August 1986
November 1986	15.8	21.0 November 1986
Last quarter 1987	17.5	18.5 Last quarter
April 1988	17.5	
April proposal 1988	16.6	18.0 April 1988
August 1988	15.0	20.0 August 1988
November 1988	18.5	
September 1989	19.5	22.5 September 1989

Sources: *The Middle East and North Africa 1987*, 33rd edn, London: Europa Publication Limited (1987), pp. 115–22; *New York Times*, October 4, 1985, April 29, 1988, September 24, 1989; *The Guardian*, October 23, 1986; *Time*, September 19, 1988, p. 45 and January 30, 1989, p. 53.

OPEC competition for markets into which poured Alaskan, North Sea, Mexican, and Russian oil. In reaching this accord, OPEC evinced far greater resilience than many in the West anticipated, or wished. But, OPEC, a voluntary confederation of states, could not impose policies that seriously disadvantaged any of its members.⁵⁵

Recognizing that the production and price policies of non-OPEC oil exporters impinged sharply on the effectiveness of its decisions, OPEC sought the cooperation of Mexico, Britain, Norway, and the Soviets. In 1983, Mexico acceded to OPEC's request, at the sacrifice of some revenue. Britain, Norway, and the USSR, however, led the price break in 1983 with reductions of as much as 10 percent, taking oil down to \$29–\$30 per barrel. Saudi Arabia undermined OPEC's approach to those exporters by producing 25 percent more than its quota. OPEC and non-OPEC producers moved quickly to defend their market shares.

A modicum of price stability obtained in 1983 and 1984, but OPEC states, including the Saudis, constantly cheated, ignoring quotas (Table 9.4), shaving prices, and, as the Saudis preferred, bartering oil produced above the quotas for goods. The large foreign exchange reserves of the Saudis and their ability to raise and lower production at will enabled them to adapt to falling revenues, a flexibility absent in Nigeria, Indonesia, or Venezuela. In 1983 and 1984, the latter nations cut prices and produced above their allowable in a desperate attempt to stem revenue attenuation and maintain social and economic programs. Venezuela and Nigeria, for instance, both faced intense competition in the USA and European markets from non-OPEC oil. British and Norwegian price cuts in 1983 precipitated Nigeria's break with OPEC's posted price. The desertion of Nigeria sabotaged OPEC's strategy. In 1985, virtually all OPEC states, and especially Saudi Arabia, ignored the quotas. The Saudis had decided to maintain their 25 percent portion of OPEC production and protect their market share regardless of the effect on price. By default, this became OPEC's policy in 1985 and 1986.⁵⁶

By 1985, OECD-Europe and the USA received a much diminished portion of lower total imports from the major OPEC exporters. OPEC's share of world oil production dropped from about one-half in 1979 to 30 percent in 1985 while its share of a shrinking global trade in oil—excluding the USSR and bloc states—declined from 88 percent in 1979 to 55 percent in 1982, but then improved to 64 percent in 1985. The Saudi decision to exceed its quota, thereby repudiating its role as swing producer, threw an additional 75 million metric tons of oil on the market in 1986, almost the whole of the OPEC increase from 840 mmt in 1985 to 925 mmt in 1986. OPEC's quota system self-destructed (Table 9.4).

As Saudi production forced prices toward \$10 in spring 1986, the Saudi regime believed that it now commanded the leverage to win adoption of viable quotas that would push prices upward. Once again, OPEC approached non-OPEC producers. Informal talks between OPEC and Norway, Britain, and the USSR met with resistance in Britain and tacit commitments to cooperate in limiting production by Norway and Russia. But OPEC could not induce internal cooperation. In April 1988, OPEC met with a group of seven LDC exporters, including Mexico and Malaysia, proposing that an OPEC production cut of 5 percent be matched by non-OPEC states. Mexico, for one, agreed but OPEC failed to fulfill its end of the bargain. The great gap between quotas and production reversed the trend toward firmer prices commencing in 1987; prices dipped to around \$14 in September and October 1988.⁵⁷

Saudi Arabia acted as the leaven of change in the events just described. What purposes were served by Saudi machinations? Most agree that the Saudis sought to consolidate its dominance in OPEC by means of its productive power.⁵⁸ Prior to 1979–80, westerners viewed the Saudis as price moderates, seeking stability rather than profit maximization. However, Saudi Arabia did not perfectly fit that model before 1979 and certainly not after. By 1985–6, it sought revenue maximization through reduced prices and increased production. But, having brought about the great glut and price slide of 1986–7, Saudi power waned and the economy slipped into recession. Unable to herd other producers toward price stability, if that was their true objective, the Saudis defended their market share by producing above their ostensible quota.

The current era of relatively low oil prices directly benefited US, European, and Japanese oil companies. Aramco's take expanded as the Saudis defended their markets. Other LDC producers offered liberalized oil exploration and recovery contracts to foreign firms. Producers in 1988 were less concerned with ideological purity than with shoring up revenues and augmenting reserves. Of course, with prices at \$10 in 1987 and at \$14 in late 1988, the oil firms demanded stronger inducements to explore. Argentina, in 1985, sought foreign off shore exploration, signing risk contracts favorable to an Exxon-led group, Occidental, and others. Faced with a reduction of oil company drilling in 1987, Indonesia permitted foreign exploration in areas previously the preserves of Pertamina. Sinking oil revenues persuaded Egypt to improve production sharing terms for Texaco, Conoco, and other firms. Algeria, in 1987, offered the USA reasonable prices for delivery of LNG.⁵⁹

OPEC lost control over prices after 1979 and was unsuccessful in preventing an erratic fluctuation between \$10 and \$20 per barrel until

November 1988, prior to which OPEC quotas and official prices were irrelevant. Economic decline and budget deficits among the rich Arabian Peninsula producers thwarted the expectations of their citizens (or wards) as less welfare trickled down from the top. In Saudi Arabia, the encroaching Gulf war stimulated large military expenditures and reduced service, welfare, and food subsidy spending. Economy remained, however, an alien term to many conspicuous consumers in the Saud family. With the possible exceptions of Algeria and Libya, the non-Peninsular members of OPEC suffered grievously from the price slump. But a remedy eluded OPEC. In Fall 1988, an accord to limit production seemed improbable. But OPEC confounded the experts. In November 1988, a new quota was adopted to which members adhered closely in January 1989.

At the end of 1989, as Table 9.4 indicates, a large deviation occurred between the OPEC quota and actual production. At that time, excess production in Kuwait, UAE, Nigeria, and Saudi Arabia accounted for the difference. Yet prices have remained reasonably stable which suggests that consumption is up and/or that other sources of oil are in decline or incapable of increase. Both seem to be the case. US oil consumption has risen while domestic production has declined. Simultaneously, western Europe's demand has increased while North Sea production has plateaued. Consumption in both South Korea and Japan rises steadily and can only be satisfied with Middle Eastern oil. As the final decade of this century of adversity commenced, OPEC producers alone possessed the productive ability to meet rising demand in the West and in East Asia. Within OPEC, the Arab producers along the Persian Gulf controlled vast reserves. It is not unreasonable to expect that new demand and Arab producer power will propel oil prices upward again, toward \$30 per barrel or more over the next few years. Are the economies of western nations sufficiently stable to avoid the inflation, recession, and stagnation that accompanied the price hikes of 1979–80?⁶⁰

Conclusion

The likelihood of a severe energy crunch seemed remote to consumers everywhere as 1989 ended. In the West, governments and energy experts acted as though open market forces could be relied upon to provide sufficient energy into some distant future. Advances in energy use efficiency were highly touted. Each new auto, building, or factory consumed less energy per unit of output than in 1973. Electricity captured a larger share of energy use. Despite Chernobyl, a new dawn

for nuclear energy lit the horizon. Western economies roared ahead. In 1988, oil slid under \$15 and those economies showed no ill effects even when prices rose to \$20 at year's end. Analysts noted recent increases in western TPER but considered this trend of little consequence. They also pointed to the relative inefficiency of US energy use *vis-à-vis* other industrial states but neglected to link that to growing absolute demand for energy in the USA. They assumed that technology had created "an entirely new environment for energy users."⁶¹

As recently as 1988, many viewed OPEC as a mere shadow of its former self, wracked by internal divisions, members undercutting each other, and incapable of fashioning viable production quotas. OPEC's fall was attributed to greed. Squeezing the industrial states in 1973 and 1979 compelled them to seek new and efficient energy technologies, to conserve, and to draw oil from secure sources. The revenues of OPEC's members sank rapidly, lessening the international influence of such states as Saudi Arabia. Severe price wars wrecked OPEC's unity. OPEC appeared incapable of harming the West. Lulled into somnolence by energy supply forecasts, most western governments ignored their persistent oil import dependence.

The possibility of an even more formidable energy threat slowly penetrated the consciousness of governments and citizens during the 1980s. The accumulated impact of decades of uninhibited energy use and uncontrolled disposal of wastes seemed to achieve critical mass in the 1980s. Mounting evidence instructed global societies that rising fossil fuel use damaged, perhaps irreversibly, the environment. Individual states might devise some protection for their own space, but the potentially catastrophic effects of global warming and depletion of the ozone layer demanded immediate international action. This was the exact message of an ignored publication by the US Environmental Protection Agency in 1983, *Can We Delay A Greenhouse Warming?* — not "Is There a Greenhouse Warming?" Acknowledging the polarization of opinions, the authors argued the high risks of a wait-and-see attitude. Uncertainty regarding the precise character of the greenhouse phenomenon ought not to prevent an "expeditious response" to global warming that "is neither trivial nor just a long-term problem."⁶² President Reagan, however, essentially rejected these findings while President Bush addresses these issues with the speed of a glacier.

Signs that nations recognized the danger gradually surfaced. Thirty-seven countries signed a treaty in 1987 to protect the ozone layer. In November 1988, the USA joined other industrial nations in Geneva to negotiate a treaty reducing carbon emissions. The UN and other groups have sponsored conferences on the climate. The popular magazine, *Time*, dedicated an issue in January 1989 to the "Endangered Earth."

US Senator Albert Gore, Jr, introduced a comprehensive, globally oriented environmental protection program at the opening of the 101st Congress.

Great obstacles, political and economic, faced even those wealthy nations disposed toward a cleaner world. Even more severe constraints impeded the poorer nations. Using less fossil fuel would retard the development of many LDCs while the more advanced countries worried that it would slow economic growth. The rape of the great rain forests evoked universal concern. But poor people demanded land to clear for farms and, unable to afford commercial fuels, chopped down more trees for firewood. While *Time* featured the essential biological role of tropical forests, it fell short of advocating that the wealthy nations assume most of the costs of forest preservation. Others were not so timid. Massive reforestation, exchanging part of the LDC debt for conservation programs, permitting continued LDC fossil fuel use while reducing it dramatically in the industrial countries were among the adventurous proposals of the *World Watch* staff.⁶³

Nuclear energy's adherents offered that technology as a partial solution to environmental pollution while discounting the fear of future Chernobyls as the nightmare of the uninformed. At present, referendums in several industrialized states indicate that public opinion opposes new nuclear plants. Governments had abided by that opinion by canceling further construction. But nuclear proponents argue that it is the only alternative to thermal plants. That is not so. Conservation reduces noxious emissions. Solar electricity is not far from widespread commercial practicality. The technology exists to double the efficiency of automobile engines in the USA. But these concrete options to nuclear and thermal electricity and augmented fossil fuel use have no assured place on national agendas. Britain's recent commitment to the construction of numerous new coal burning and nuclear plants well-reflected the view of most western governments that high-tech solutions to future energy needs are more politically expedient than conservation. Conservation has yet to develop a constituency that matches evenly with electrical equipment manufacturers, electric utilities, miner unions, investors, or financial interests.

A respected voice assured his audience that while "future generations won't have the rich inheritance of natural resources that we have known... we can leave them rich technological capabilities to offset that loss."⁶⁴ A different, equally respected voice warned that "Unless we can quickly reduce our dependence on fossil fuels, cut back the loss of topsoil, reverse the deforestation of the earth, and check population growth a broad-based decline in the human condition may be inevitable."⁶⁵

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