Colombian Petroleum, 1920–1940," *Canadian Journal of History*, 9 (August 1974), pp. 179–96; Rippy, "US and Colombian Oil," pp. 19–35; Chester, *US Oil Policy*, pp. 144–7; Wilkins, *Multinational Enterprise*, pp. 255–72.

56. J. Foreman-Peck, *A History of the World Economy: Inernational Economic Relations since 1850*, Brighton: Wheatsheaf Books (1983), p. 213; for a concise analysis of the worst years of the depression, see P. Fearon, *The Origins and Nature of the Great Slump, 1929–1932*, Atlantic Highlands, N.J.: Humanities Press (1979).
57. For the above three paragraphs: S. Takahashi, *Japan and World Resources*, Tokyo: Kenkyusha Press (1937) and Royal Institute of International Affairs, Information Department, *Raw Materials and Colonies*, New York: Oxford University Press (1936) summarize the conflicting positions of the Axis powers and their antagonists. See also, Schumpeter, *Industrialization of Japan*, pp. 43–4, 373–5, *passim*; Takahashi, *Japan*, p. 29; C.C. Concannon *et al.*, *World Chemical Developments in 1935*. US Department of Commerce. Bureau of Foreign and Domestic Commerce. Trade Information Bulletin No. 832, Washington, DC: GPO (1936), pp. 19, 23, 29, 36; M. Erselcuk, "Japan's Oil Resources," *Economic Geography*, 22 (January 1946), p. 16; Anderson, *Standard-Vacuum*, pp. 80–7; Chester, *US Oil Policy*, pp. 297–301; *World Petroleum*, 13 (January 1942), pp. 23–7.

4

Energy flows in a politically polarized world

World War II strongly influenced the energy future of the world. To the victor come the spoils. Had the war commencing in 1939 been concluded on terms favorable to the Axis powers, one might imagine them in possession of the Soviet Union's Baku fields, much of the Middle East, and the Netherlands East Indies. What an impact such an outcome would have had on the Allied powers and on the giant firms that dominated the world oil industry. Far more was at risk than oil or other natural resources, but one can still conjecture that the economies and societies of Britain, the USA, and other nations would have evolved quite differently had the Axis dictated terms of access to Middle East oil.

Energy and World War II

Each of the major belligerents committed substantial resources to securing a fuel supply sufficient for the prosecution of a highly mobilized conflict fought on distant and shifting fronts. Germany and Japan, without domestic oil reserves and the latter without adequate coal, planned campaigns to conquer fuel-producing regions while investing heavily during the 1930s in the development of synthetic fuel technologies. In both nations the production of coal, the chief feed stock for synthetics, enjoyed high priority.

Neither Britain nor the United States made provisions before 1939 for an emergency fuel supply. The UK felt reasonably secure. British companies controlled the largest oil fields in the Middle East and operated successfully in safe regions in the western hemisphere. A more than adequate domestic coal supply was available. For its part, the USA

possessed large and accessible petroleum and coal reserves and dominated the oil industries of South America and Saudi Arabia, the latter's potential still unrecognized. The USSR, with enormous productive potential in all fuels, experienced the destruction or seizure of much of its western based coal industry and its Baku oil fields. With great effort and the provision of several lend lease refineries by the USA, the Soviet Union produced and refined about 60 percent of its petroleum needs.[1]

The belligerents grossly miscalculated their energy requirements. Germany and Japan possessed stocks and access to supplies sufficient only for a relatively short war. Germany's conquests in Europe added the sizable coal production of Poland and France, some part necessarily devoted to sustaining the conquered populations, the oil fields of Romania, and the Maikop fields of the northern Caucasus, the latter so thoroughly destroyed by retreating Soviets that they added nothing to the oil stock of the Third Reich. Neither did the other conquests yield more than marginal increments to fuel supplies. By 1943, heavy and sustained Allied air attacks pulverized Germany's fuel industry, particularly the synthetics complex, and its transportation links. Oil became desperately short by 1944. Shortages of aviation gasoline severely hampered the operation of the Luftwaffe during the last year of the war. As labor productivity declined, partially due to malnutrition among miners, coal production in occupied France and Belgium fell off severely by 1943. Maintenance and transportation services also became increasingly inadequate. Forced labor in German mines maintained the labor force at adequate levels, but dreadful working conditions resulted in low productivity. Falling supplies of coal in 1943 and 1944 hamstrung the production of iron and steel and synthetic fuels.

Japan launched its war against the USA and other European states with a natural resource base more limited than that of Germany. The need for oil determined that Japan would strike south to seize the Netherlands East Indies. Japan's hopes rested on the fatally optimistic assumption that the USA would not persist in a long and costly struggle. With a much less developed synthetic fuel industry than Germany, Japan depended upon ocean transport for the bulk of its oil and some of its coal. American control of the sea lanes by late 1944 placed virtually each Japanese oil tanker at risk. By early 1945, Japan's oil stocks had dwindled to under one million barrels. An almost total blockade of the home islands by US naval and air forces denied Japan access to the oil of Southeast Asia. Shortages of oil and coal severely constrained war industries. Perhaps even more deadly in 1945 was the looming specter of widespread starvation.[2]

British complacency in 1939 about fuel supplies gave way to despair by 1940. As German planes pounded the UK, submarines sunk an

increasing tonnage of tankers. The intercession of the USA in 1940 through the exchange of American destroyers for bases in British possessions, the Lend Lease Act of March 1941, and the transfer of fifty oil tankers to Britain in May 1941 relieved the situation. Petroleum stocks climbed well above the danger zone. Although Nazi submarines destroyed an enormous tonnage of tankers after America's entry into the war, supplies from America were not jeopardized. The destruction of Axis armies in North Africa in 1942 eliminated the threat to the Suez and the Persian Gulf oil fields. Thereafter, American production supplemented by Venezuelan and Middle Eastern oil provided more than adequate fuel to Allied forces.

Military demands for fuel compelled the heavy intervention of the British and American governments in their energy industries. In the USA, a complex of federal agencies successfully maintained adequate production of fuels, particularly aviation gasoline and chemical feedstocks for synthetic rubber, distributed fuels to the Allies and to domestic wartime industries without totally denying supplies to non-critical industries or the civilian sector, and moderated inflationary pressures. But these agencies and the policies they implemented were swiftly abandoned in 1945 and 1946. America preferred, as in 1918, to return to an essentially unregulated regimen for petroleum and coal.[3]

A prewar heritage in the UK of intermittent government intervention in the coal industry and in the energy utilities combined with severe wartime conditions to propel Britain toward national ownership. Beginning in 1939 all energy was strictly rationed, far more so than in the USA. By 1943, the Ministry of Fuel and Power controlled coal prices and miners' wages, an intervention necessitated by inflationary pressures, labor scarcity, and other operational problems. The government operated the mines while the mine owners retained financial responsibility. The Labour Party called for the immediate nationalization of coal. While the Conservative Party resisted this demand, it supported continuing state authority to compel industry rationalization. Labour's electoral victory after the war led immediately to the nationalization of coal and the electric and gas utilities.[4]

While petroleum remained in private hands in both Britain and the USA, the foreign policies of both nations presumed continued access to cheap oil, thus assuring a competitive/cooperative Anglo-American relationship concerning foreign fields. Britain's dependency upon foreign oil was total but the national energy mix during and immediately after the war still reflected the dominance of coal which, in 1950, provided 90 percent of total primary energy requirements.[5] America's consumption of oil was far greater, with all but a fraction supplied domestically. In both nations, knowledgeable government and oil

industry officials foresaw a dramatic rise in domestic oil consumption. Americans worried that domestic oil demand might outstrip additions to reserves, thus reducing the margin of oil security. Both governments also evinced vague fears about Soviet intentions in the Middle East and about the nationalistic aspirations of both independent and colonial oil producing countries. The USA and the UK attempted individually and cooperatively, under the untrusting eyes of France and other nations, to guarantee Anglo-American domination of the key foreign oil fields, safeguard private investments abroad, and assure private investors further opportunities in secured areas. One need not assert that postwar Anglo-American policies marched to a tune orchestrated by the powerful oil companies to recognize that concern about oil supply and investments contributed to the shaping of policy.[6]

Two specific oil policy initiatives—the Petroleum Reserves Corporation and the Anglo-American oil treaty—make clear the evolving purposes of both governments and reflect, as well, the inability of the US government radically to alter its traditional oil policies. Both programs demonstrated American awareness of the great significance of Persian Gulf oil wealth, a gnawing doubt about the extent of domestic oil reserves, suspicions about the intentions of the MNOCs operating in that area, and skepticism about the willingness of Britain to allow US companies to participate in Iraqi and Iranian production.

The Petroleum Reserves Corporation (PRC) issue involved a contract between PRC and the Aramco partners in 1943 providing government financing of a refinery and a pipeline to the Mediterranean Sea in exchange for an exclusive federal oil reserve. Arousing intense opposition from independent oil companies and others hostile to federal intrusion in the oil industry, the idea was abandoned. But the larger objectives of national security and security for American oil interests survived in a new policy, that of hammering out an oil treaty with the UK that would preserve and enlarge American participation in the world oil industry.

Between 1944 and 1947, American and British negotiators concluded two agreements, both of which suffered defeat in the American political arena at the hands of a coalition of domestic oil companies and opponents of American entanglement in such international arrangements. The agreements themselves suited the interests of both governments by establishing a mechanism to assure bilateral control over Middle Eastern fields by American and British firms.

Britain gained the implicit commitment of American power to defend the fields. Grave doubts about the devotion of the MNOCs to the national interest motivated American negotiators, particularly Harold L. Ickes, Secretary of Interior (1932–46). To Ickes, the political ramifications of Middle Eastern oil required an active federal presence to counterbalance the egocentric multinationals. For the American MNOCs, the proposals offered equal participatory opportunities in areas dominated by the Anglo–Iranian Oil Company (AIOC) and the Iraq Petroleum Company (IPC). For AIOC, the accord minimized the risk of dangerous price competition and political turmoil in the Middle East, a threat attributed to Soviet machinations. However, the US Senate rejected the treaty in 1947.[7] Agreements relative to Middle Eastern oil would depend in the short-term on inter-firm arrangements. Over the long-term, the resounding impact on the producing governments of nationalism, anti-Zionism, and calculations of national self-interest would radically alter the shape of the Middle Eastern oil industry.

Anticipating a Nazi drive toward Middle Eastern oil fields, in 1941 British troops seized the fields of Iraq and Iran, including the great Abadan refinery. Thereafter, Anglo-American forces assured the security of Persian Gulf production. By the end of the war, Iranian, Iraqi, and Saudi oil production reached 27 million metric tons (mmt), an 88 percent increase over 1941, and provided about 10 percent of Allied oil needs.[8] When the Axis collapsed in 1945, the fields of Iran and Saudi Arabia were poised to enter an era of explosive production. Allied victory solidified the position of the MNOCs in that region, permitted their return to areas occupied by the Axis, excepting eastern Europe, and appeared to strengthen their bargaining position in Latin America. For a time the MNOCs exercised an informal governance over overseas oil. But this restored hegemony engendered the intense antagonism of host governments toward the MNOCs and their home governments.

Trends in world and regional energy use to 1960

However measured, world energy consumption soared after World War II. Between 1945 and 1950 primary commercial energy use rose by 25 percent, comparable to the growth rate of the 1920s. From 1950 to 1960 energy use rose by 55 percent (Table 4.1). During the first fifteen postwar years, total primary energy requirements (TPER) advanced by 1,600 million metric tons oil equivalent. This enormous leap in energy use, accelerating through the 1960s, occurred within particular national contexts and was, therefore, constrained by unique circumstances.

Energy consumption stormed ahead in the most highly industrialized countries of western Europe, Japan, the United States, and the Soviet Union. The USA assumed the key role in the political and economic reconstruction of western Europe and Japan, motivated by

Table 4.1 World total primary commercial energy requirements, 1938–70 (million metric tons oil equivalent)

	Mmtoc	Percent				
	TPER	Solid fuels	Oil	Natural gas	Hydro-electric	Nuclear
1938	1217	72	21	6	1	0
1945	1600	66	23	10	2	0
1950	2059	62	25	12	1	0
1961	3185	48	33	16	2	<1
1970	5170	33	45	20	2	<1

Sources: Constructed from J. Darmstadter *et al.*, *Energy in the World Economy: A Statistical Review of Trends in Output, Trade, and Consumption Since 1925*, Baltimore: The Johns Hopkins University Press for Resources for the Future (1971), p. 652; Gilbert Jenkins, *Oil Economists' Handbook 1985*, London: Elsevier Applied Science Publishers Ltd (1985), p. 76; *BP Statistical Review of World Energy*, June 1986.

humanitarianism, fear (obsession in the view of some) of global communist expansion, and economic self-interest. Conversely, the less developed nations, many gaining their independence after the war, failed to achieve self-sustained growth. They remained mired in economic backwardness, characterized by high birth rates, declining death rates, marginal and primitive agriculture, grossly inadequate employment opportunities, an elitist and exploitive political leadership, and dependence upon the technological, managerial, and capital inputs of wealthier countries, including the former colonial masters. Only a minority of the world's population, then, enjoyed the fruits and encountered the frustrations of a more energy intensive round of life.

The more highly developed nations, without exception, if at differing paces, adopted oil intensive patterns of energy use. This emerging energy regime damaged coal industries in the West while stimulating the expansion of the global oil industry, still dominated by a handful of American, British, French, and Dutch multinationals. Within this context, the critical factor was the shift of the USA from a net oil exporter to a net oil importer. This shift further consolidated the producing power of the MNOCs operating in the Middle East even as it evoked noisy political controversy in the USA. Middle Eastern governments quickly challenged the MNOCs and forced a drastic revision of the oil pricing system. Permeating all of this in the West were consumer preferences and governmental efforts to define the national interest with regard to a particular energy mix. An array of international and regional military/political/economic organizations operated on the fringes of the energy arena. The United Nations Organization, the Arab League, the European Coal and Steel Community (the European Economic Community in 1957), and the Organization of Petroleum Exporting Countries (OPEC, established in 1960) sought with varying degrees of success to intervene in energy issues.

The extraordinary rise in world energy use occurred during years of unprecedented general economic growth, the one both cause and effect of the other. The total value of world exports more than doubled from 1945 to 1958, reaching $109 billion, and had doubled again by 1967 while energy's share of world trade advanced from under 9 percent during the early 1950s to almost 10 percent in 1965. At that time the value of exported mineral fuels exceeded $18 billion.[9]

To appreciate the transformation in the composition of energy entering world trade requires greater specificity. Table 4.2 traces the demise of coal as the leading energy export, accomplished prior to World War II, and the remarkable relative position achieved by oil by 1965. Table 4.2 establishes the largely domestic character of the world coal industry in contrast to the predominantly international reach of the oil industry. By 1965, only 7 percent of mined coal entered foreign trade compared with 60 percent of oil production, a volume covering 89 percent of all energy exports.

Soaring statistics characterize analyses of world trade in general and of energy traffic in particular. Aggregate energy figures and the conclusions they support obfuscate the limited scope of energy traffic. Relatively few nations measurably participated or profited from energy trade. The favored nations, all intensive users of commercial energy, owned large shares of world trade and manufacturing output. As late as 1970, non-commercial (organic) fuels composed at least 35 percent of TPER in Brazil, India, Indonesia, and South Korea.[10]

Measurements of global energy trade are of marginal value unless

Table 4.2 Energy and world trade, 1925–65 (percent)

	1925	1938	1950	1960	1965
Commercial energy exports as percentage of world energy production	14	16	18	23	28
Coal exports as percentage of world energy production	9	7	4	3	3
Crude/refined oil exports as percentage of world energy production	4	9	14	20	25
Exports as percentage of total energy exports for:					
Oil	32	56	76	87	89
Coal	68	43	24	13	10
Exports as percentage of total production for:					
Oil	30	40	46	53	60
Coal	11	10	7	7	7

Source: Constructed from Darmstadter, cited in Table 4.1, pp. 224, 423

Table 4.3 National–regional shares of world primary energy production, 1925–65 (percent)

	1925	1938	1950	1965
USA	49	39	44	31
Western Europe	34	32	19	10
USSR	2	9	11	18
Middle East	<1	1	5	11
Latin America	3	4	6	7
Eastern Europe	4	5	7	6
All others	7	10	8	17

Source: Same source as Table 4.2, pp. 224–62.

framed comparatively. Production of mineral fuels occurred within certain countries and specific fuels passed to individual markets. The number of national or institutional actors that influenced those transactions were few. A handful of nations consumed the bulk of the world's energy. In 1950 and 1970, the USA and Canada, OECD-Europe*, the USSR, and Japan accounted for 80 and 73 percent, respectively, of global TPER.[11] Similarly, the USA, USSR, and a few Middle Eastern states contributed 60 percent of the world increase in primary energy production from 1950 to 1965. As Table 4.3 suggests, the locus of world energy production shifted to those nations with substantial oil reserves.

Energy in western Europe after World War II

World War II left continental Europe in a shambles, with much of its industry and infrastructure destroyed, with the eastern regions about to be isolated from the western by force of Soviet arms, and with its potentially most powerful state utterly prostrate and soon to be divided into an eastern and a western Germany. By the mid 1950s, western Europe had risen from the ashes and was poised on the brink of remarkable economic growth. A transformed energy mix accompanied European recovery, one that further cracked the foundations of the coal industry, greatly expanded the market power of the oil industry, and intensified each nation's dependence upon energy imports.

Table 3.1 depicts the centrality of coal in Britain, Germany, and France in 1938. For the nations that formed the European Coal and Steel Community (ECSC) in 1952 – Germany, France, the Benelux

* Including Austria, Belgium, Denmark, Finland, West Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom. Unless otherwise specified, references to western Europe include the above nations.

nations and Italy – coal provided 87 percent of TPER in 1937, 81 percent in 1950, and 74 percent in 1955. In Britain, coal accounted for 85 percent of TPER in 1955. Crucial to European recovery, then, was reconstruction of the coal industry which had suffered severe damage toward the end of the war. An impressive effort through 1947 reconstructed and equipped the mines of Belgium, France, the Netherlands, and West Germany, but only in France did production equal prewar output. Shortages of coal caused widespread suffering during the winters of 1945–8 while seriously impeding the rebuilding of electric utilities and the iron and steel and other heavy industries.

The coal producing nations devised individual and collective strategies to overcome the bottlenecks and were joined in this campaign by the USA. Despite the frequent and debilitating strikes that wracked the American coal industry in 1946–8, the USA shipped a significant tonnage of coal to ECSC states during this emergency. In 1947, US coal provided 94 percent of ECSC coal imports. To coordinate these deliveries, the USA and the UK made use of the European Coal Organization (ECO), set up in 1945. ECO possessed full allocative powers, duties absorbed after 1948 by administrative units involved in the Marshall Plan. Britain and France nationalized their coal industries in 1946. British occupation forces terminated the prewar Ruhr coal cartel but ultimately failed to prevent the concentration of German coal output in the hands of a few large mining and steel companies.

These initiatives notwithstanding, European economic recovery required the massive input of the Marshall Plan. Marshall Plan funds permitted the large scale reconstruction of the coal industry and the achievement of coal sufficiency by the late 1950s. Thereafter, the national coal policies of Britain, France, and West Germany and the coal stabilization programs of ECSC proved incapable of resisting a slippage in coal demand that began during the late 1950s and early 1960s (Tables 2.2 and 4.4).

In the UK, inadequate capital investment in new mines and new equipment prevented the industry from meeting demand and kept coal prices relatively high, thus attracting imports from the USA. British coal exports withered away to insignificance (see Table 3.3). West Germany's increasingly efficient coal industry produced a surplus for export to its ECSC partners, particularly France. But Germany also imported a sizable tonnage; in 1960, for instance, imports equaled 38 percent of exports. As was the case before the war, French coal production fell short of domestic demand by 25 to 30 percent with the deficit supplied primarily by the USA and Germany. Overall, ECSC members required more coal than they produced.

American coal remained competitive in Europe during the 1950s

Table 4.4 Coal production in world and selected nations, 1945–73 (million metric tons)

	1945	1950	1955	1960	1965	1973
World[1]		1861	2191	2486	2861	3029
USA[2]	578	516	465	416	512	543
UK	186	220	225	197	191	130
West Germany[1]	70	188	223	240	239	222
France	35	53	57	58	54	36
USSR[1]	149	261	390	510	578	615
East Germany[3]	108[4]	137	201	225	251	246
Poland	49[4]	83	101	114	142	195

[1] All coals
[2] Bituminous only
[3] Brown coal or lignite equivalent
[4] 1946

Sources: Darmstadter, cited in Table 4.1, p. 191; U.S. Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1970. Bicentennial Edition. Part 1*, Washington, D.C.: USGPO (1975), p. 589; B.R. Mitchell, ed., *European Historical Statistics*, 2nd revised edition, London: Macmillan (1981), pp. 365–8, 386–8; A.R. Griffin, *The British Coal Mining Industry: Retrospect and Prospect*, Buxton, Derbys: Moorland (1977), p. 186.

despite the distance; from 1947 through 1958, the USA supplied from 44 to 65 percent of annual imports. After World War II, US aid packages fostered the use of American coal. As this political advantage waned, the rapid mechanization of American mines and the progress of strip mining raised productivity to levels far superior to even the most advanced German mines. While coal prices in the USA declined markedly from 1947 through 1960, domestic coal became more dear in western Europe. The higher fixed costs of European coal mines were partially attributable to ECSC and national efforts to protect the standard of living of miners by supporting prices. Western European nations did not consider reducing the number of miners by scaling down national coal industries. Coal was still viewed as essential to national security. Miners still possessed considerable political clout. Into the 1960s, then, the European coal industry could neither defend itself against foreign coal nor, and more threatening in the long run, counter the price and efficiency advantages of fuel oil.[12]

Between 1945 and 1953, even before the sudden reversal of coal industry fortunes in western Europe, oil consumption advanced sharply. OECD-Europe's coal use increased by some 100 mmt between 1948 and 1960, or by 24 percent, but coal's share of TPER fell from 83 percent in 1950 to 61 percent in 1960 (Table 4.5). Over the same period, oil's share moved from 14 to 30 percent and natural gas from less than 1 percent to almost 3 percent. In the Netherlands, oil use equaled coal use by 1960.[13]

Favorable oil prices relative to coal prices, the convenience of oil for

residential and industrial purposes, and the flood of Marshall Plan dollars accelerated an energy use transition initiated prior to the war. Competitive oil prices generated positive responses among consumers. Several factors help explain the attractiveness of oil prices: the availability of Middle East oil (not so secure as Europeans learned during the 1950s), the abandonment of a price system designed to protect the overseas marketability of US oil, the construction of a European refining industry that quickly reduced the need to import more expensive refined products, and, as some insist, the effort of the US government to

Table 4.5 Total primary commercial energy requirements of selected countries, 1950–75 (percent)

	1950	1955	1960	1965	1973	1975
OECD–Europe						
Solid fuels	83	75	61	45	23	23
Liquid fuels	14	21	30	45	59	55
Natural gas	<1	<1	2	3	10	13
Hydroelectric	2	3	3	3	6	6
Nuclear	0	0	<1	<1	1	1
UK						
Solid fuels	92	85	74	62	37	38
Liquid fuels	8	14	25	35	48	44
Natural gas	0	0	0	<1	11	15
Nuclear	0	0	<1	2	3	3
West Germany						
Solid fuels	95	90	76	57	32	31
Liquid fuels	4	9	23	41	55	51
Natural gas	0	<1	<1	2	10	14
Nuclear	0	0	0	0	1	2
France						
Solid fuels	77	68	54	41	17	17
Liquid fuels	20	29	32	46	68	63
Natural gas	<1	<1	3	4	8	10
Hydroelectric	3	3	10	9	6	8
Nuclear	0	0	<1	<1	2	2
Italy						
Solid fuels	49	33	19	15	9	8
Liquid fuels	32	42	56	62	72	74
Natural gas	4	14	15	8	9	11
Hydroelectric	15	11	10	14	9	7
Nuclear	0	0	0	<1	<1	<1
USA						
Solid fuels	42	31	25	25	21	21
Liquid fuels	38	43	42	42	44	45
Natural gas	19	25	29	30	30	28
Hydroelectric	1	1	3	3	4	4
Nuclear	0	<1	<1	<1	1	2

Table 4.5 (cont.)

	1950	1955	1960	1965	1973	1975
USSR						
Solid fuels	77	76	52	44	36	34
Liquid fuels	20	20	30	35	37	39
Natural gas	3	3	8	19	23	24
Hydroelectric	<1	<1	1	1	4	3
Nuclear	0	0	0	<1	<1	<1
Japan[1]						
Solid fuels	70	68	53	34	17	18
Liquid fuels	21	22	31	53	75	71
Natural gas	<1	<1	<1	1	1	2
Hydroelectric	9	9	15	13	5	6
Nuclear	0	0	0	0	0	2

[1] TPER figures would be lower if firewood and charcoal use were included. In 1953, in Japan, wood and charcoal provided at least 8 percent of energy supply. In Russia, in 1955, wood provided at least 7 percent of energy supply.

Sources: Largely constructed from J. Darmstadter *et al.*, cited in Table 4.1, Table 11, and IEA, *Energy Balances of OECD Countries, 1970/1982*, Paris: OECD/IEA (1984), pp. 387–9, 404, with occasional reference to annual issues of *BP Statistical Review of World Energy*.

restrict oil imports, this shortly after the USA became a net importer of oil.

Oil formed the largest single commodity in the dollar budget of most Marshall Plan recipients.[14] Few dispute the necessity of such a massive infusion of money into Europe in 1947–8, both as a humanitarian act and as a program that served the political and economic interests of western Europe and the USA. Certainly it stabilized and then induced growth in the North Atlantic economies, an achievement closely associated with US-led efforts to remedy severe foreign exchange shortages and worrisome balance of payments deficits that developed during and after the war.

American firms, drawing oil from the Middle East, supplied at least 70 percent of funded oil to Europe, paid for in dollars. To ease the acute dollar shortage which plagued the UK and other European nations, the Economic Cooperation Administration (ECA) campaigned with some success to force American MNOCs to reduce prices on Marshall Plan crude delivered to Europe. The US Department of State, pursuing a somewhat contradictory purpose, spearheaded American efforts to pry open British dominated sterling markets for the sale of "dollar" oil. Britain, desperate to preserve dollars, wished to replace "dollar" oil with "sterling" oil. ECA did not wholly subscribe to the State Department position which better served the interests of American MNOCs than the objectives of the Marshall Plan. Related to the sterling drain

and impinging upon US oil interests was the issue of European refinery construction. ECA argued that such a program would reduce the dollar drain by substituting cheap crude for expensive refined products. The resistance of US refinery interests successfully restricted the application of Marshall Plan funds to refinery construction. European refining expanded nonetheless. These developments further eroded the justification for the so-called Gulf oil price system and, by widening the access of Europe to Middle Eastern oil, vastly increased the value of the concessions of the MNOCs.[15]

Western Europe, by the 1950s, had recovered from the worst effects of depression and world war. Gross national products rose steadily, driven principally by a dynamic manufacturing sector. By 1960, primary energy consumption in OECD-Europe exceeded use in 1950 by 43 percent, compared with a US growth rate of 26 percent. While 1960 *per capita* energy use in the USA was at least double that of any Western European nation excepting Britain, such highly industrialized states as Belgium, France, and West Germany produced a larger volume of gross national product per energy input than did the USA, attesting to superior energy use efficiency in those states. Accompanying accelerated economic growth and energy use was a persistent shift from oil to coal and slight increases in total natural gas and hydroelectric use.

The energy mix of European and other industrialized nations is summarized on Table 4.5. Substantial differences are apparent; compare Italy to the norm for OECD-Europe. The dissimilar patterns stem from the varying natural resource endowments of each nation. Italy, with little coal, emphasized hydroelectric development (the largest component of the "other" category) and quickly shifted to oil. France nationalized coal and the electric and gas utilities, and focused on reducing coal imports by the expansion of domestic coal mining and hydroelectric capacity. Still, French coal production remained inadequate and costly while oil seemed cheap and plentiful. France, therefore, adopted a goal of energy independence during the 1960s, emphasizing control of foreign oil fields, continued expansion of refinery capacity, and, finally, nuclear power. Germany and Britain, without domestic oil or gas, both of which the USA and USSR had in abundance, continued to rely primarily upon coal until the late 1960s. Both shored up the coal industry through various subsidies and protection against oil competition. Nonetheless, as Table 4.4 shows, coal production in Britain fell off substantially after 1955–6 while it plateaued in West Germany. In both countries and in the USA as well, electric generation emerged as the largest single market for coal but it was never immune from the competition of natural gas and fuel oil. During the 1960s, Britain, Holland, and Norway launched ambitious exploration ventures in the North Sea.

Substantial oil and natural gas fields were discovered. Dutch gas became a factor in the European energy mix during the 1960s and British and Norwegian oil during the 1970s.

The Treaty of Rome, creating the European Economic Community in 1957, committed the Common Market to a common energy policy. Critical differences in national energy wealth, as between the coal producers and the non-coal producers, obstructed the formulation of a unified approach to energy. Members desired cheap and secure energy but could not discover an acceptable policy to attain that objective. The problem of coal overcapacity and shrinking markets remained unresolved through the 1960s. Members protected their key energy industries without regard to the collective good, none volunteering to dilute full sovereignty over those crucial sectors.[16]

The recognition of dissimilarities in national energy use should not obscure the relentless progression toward rough congruence depicted on Table 4.5. Energy users in western Europe had fewer options from which to choose — and Japan fewer yet — than consumers in the USA or Soviet planners. But the choices became ineluctably convergent by the mid-1960s. There are only so many ways to produce energy economically. Thus, the generation and use of electricity, whatever the primary energy employed, exploded in the industrial countries after World War II, a process replicated by the lesser developed countries as expeditiously as possible. Nation pursued nation along roughly parallel paths.

The energy mix of Japan

Japan possesses the poorest energy and non-fuel mineral resource base of the world's fully industrialized economies. Troublesome import dependency, a factor in Japan's decision in the 1930s to acquire an empire, intensified after World War II. If only commercial fuels and hydropower are considered, Japan in 1950 imported almost 30 percent of TPER, a proportion rising to 40 percent by 1960 and 86 percent in 1970. Policy choices of a radical nature emerged in Japan during the 1960s, resting on assessments of national economic performance during the late 1950s.[17]

American occupation of a devastated Japan democratized Japanese politics. American policy also consciously aimed at the further consolidation of the power of multinational corporations, proffering direct benefits on the oil companies. Under American supervision, the reconstruction of Japanese industry hastened the shift to fuel oil and away from coal. American firms supplied the fuel oil. However, and pregnant with meaning for the future, the USA failed to destroy the zaibatsu. Once Japan became master of its own house, the zaibatsu reasserted their dominion in all leading industrial sectors, including the petroleum, electrical equipment, and nuclear industries. Japanese managers speedily rebuilt iron and steel using only the newest technologies. Concurrently, intense efforts and channeled investments flowed into the shipbuilding, chemical, auto, and electrical equipment industries, all of which fell under the sway of reborn zaibatsu.

The consequences for energy use in Japan were momentous, fully apparent as the catalytic effects of the Korean War propelled the economy into a great boom, underwritten in large part by swelling export earnings. The Japanese coal industry responded feebly to rising demands from industry, especially for coking coal for steel, and coal shortages caused occasional crises in electric generation. By 1960, such conglomerates as Mitsubishi were fully committed to petroleum as the leading industrial fuel and were importing growing volumes through subsidiary trading firms. As a result of occupation policies American oil companies reaped substantial rewards from this surge in oil consumption.[18]

The US government prohibited the operation of Japanese refineries until 1949 and then pressured the Japanese to permit the MNOCs to participate in refining on a 50:50 basis, an exaction not imposed upon Germany. American capital flowed into Japan and the American MNOCs secured the right to supply the required crude oil. Only gradually during the 1960s did the powerful Ministry of International Trade and Industry (MITI) assert national control over the participation of foreign firms in the oil industry. By this time, Japan was securely bound to oil (Table 4.5).

The security implications of oil import dependence fostered Japanese initiatives during the late 1950s and early 1960s to modernize the electric power industry, limit the freedom of electric utilities to import foreign electrical equipment, encourage research and development in nuclear power, nurture energy conservation practices, and support Japanese-owned ventures in foreign oil exploration and discovery. Not all of these policies bore immediate fruit. The Japanese surrendered to the siren-song of cheap oil during the 1960s. Nonetheless, they reflected the aims of successive governments. When an energy crisis struck in 1973, the Japanese government, directly connected through MITI to the powerful zaibatsu, wielded sufficient power to buffer the economy from the worst of the oil price shock. Japan's OECD colleagues could not make such a claim.[19]

The energy mix of the Soviet bloc

With its armies in place, the Soviet Union quickly imposed its rule over eastern Europe. From the Baltic States to Poland and south to Bulgaria, Soviet power forced the integration of eastern European economies with its own. Resources and technology from the bloc nations flowed eastward, some simply expropriated as the reward of victory and some gained on terms imposed on the powerless, to contribute to the massive task of rebuilding the Soviet economy. Such was the devastation visited on the USSR by advancing and retreating Nazis, that the ill effects of the war lingered on for decades, with recurrent shortages of critical goods and glaring industrial and agricultural inefficiencies exacerbated by a rigid economic system.

For all the difficulties facing the nation after 1945, not the least being the bloody paranoia of Joseph Stalin and the gulf separating East and West, the Soviets reconstructed their economy and greatly expanded primary energy production. In the immediate postwar years planners concentrated on the coal industry but peat and wood remained important supplemental fuels. Transportation inadequacies, lack of modern equipment and spare parts, and, perhaps, the insecurities of Stalin's last years hampered the rehabilitation process. But sheer muscle power, some no doubt belonging to forced laborers, pushed production up-

Table 4.6 World crude oil production, 1945–70 (million metric tons)

	1945	1950	1955	1960	1965	1970
World	365	528	781	1066	1536	2322
USA	238	274	345	357	396	488
Venezuela	45	78	109	145	176	188
USSR	21	38	71	150	248	354
Iran	18	32	17	54	96	194
Mexico	6	10	12	14	16	25
Romania	6	4	11	12	13	14
Iraq	5	6	35	49	67	79
Saudi Arabia	3	26	49	63	103	180
Canada	1	4	18	26	41	64
Indonesia	<1	7	12	21	25	43
Algeria	<1	<1	<1	9	29	52
Kuwait	0	17	55	83	110	138
China			<1	3	7	20
Nigeria			0	<1	14	55
Libya				0	62	168
United Arab Emirates				0	14	39
Above percentage of world production	95	94	94	93	92	90

Source: DeGolyer and MacNaughton, *Twentieth Century Petroleum Statistics*, Dallas, Texas: DeGolyer and MacNaughton (1984), pp. 4–11.

ward. By the mid-1950s, the Soviets prepared to mineralize thoroughly their energy system, initiating a great campaign to exploit oil and natural gas resources. Coal production—Table 4.4—rose by 242 percent between 1945 and 1965. Oil production, at 21 million metric tons in 1945, shot upwards, reaching 248 mmt in 1965 (Table 4.6). Natural gas production also surged ahead after 1955, climbing from about 9 billion cubic meters (bcm) to 45 bcm in 1960 and 128 bcm in 1965.[20]

The changing Soviet energy mix displayed in Table 4.5 mirrored these production gains. But unyielding bottlenecks somewhat constrained output. While enormous reserves of fossil fuels existed, their distance from centers of population and industry severely challenged the capabilities of the delivery system. Electric power generation lagged sadly behind demand because of coal shortages—a prompt for the development of nuclear power. Throughout the Soviet coal industry, mechanization, and, therefore, labor productivity, lagged behind western standards. The key oil fields of the Urals–Volga region produced low quality crude necessitating the opening of the far distant oil and gas fields of Siberia and the construction of thousands of miles of pipeline by a pipeline industry hampered by technological and materials shortcomings. Similarly backward technologically, the refining industry produced inferior products, particularly lubricants, compared with western or even Romanian refineries.[21]

Eastern Europe depended far more heavily upon coal than the USSR or western Europe. In 1965, solid fuels composed 82 percent of TPER, a substantially greater coal dependency than in western Europe (Table 4.5). Only Romania possessed significant oil reserves, but these were rapidly depleted by the Soviet Union which disposed of at least 60 percent of Romanian production, obtained at a fraction of the world price. Into the 1950s, eastern European resources, technologies, captive scientists and technicians, and manufactured goods streamed into Russia. This traffic was conducted under the terms of bilateral trade agreements, or Soviet reparations imposed upon such formerly hostile countries as Czechoslovakia, Hungary, and Romania. So great were internal Soviet needs, that bloc countries received relatively little in return, and that on unfavorable terms. Western European nations, economically more advanced than all but Czechoslovakia prior to the war, sped far ahead of eastern Europe, which lacked a generous Uncle Sam.

Persistent energy scarcity obstructed eastern European modernization. The use of bloc resources to strengthen the Soviet economy contributed to the backwardness of all bloc economic sectors as did the national totalitarian political regimes. The properties of foreign oil companies in Romania were nationalized in 1948 under the aegis of

Sovrompetrol, a joint Soviet–Romanian company fastened on Romania in 1945 for the purpose of funneling oil to the USSR. Denied foreign capital and technology, neither of which the Soviets could (would) furnish, crude production fell during the late 1940s, reaching prewar levels only in 1953. Existing fields were pumped vigorously, but new drilling equipment was unavailable, exploration languished, and reserves declined.[22]

The captive resources of eastern Europe contributed to the diversification of a Soviet energy mix that moved toward a three-fuel balance during the 1960s (Table 4.5). Soviet oil exports, initially to bloc and allied countries, but then to the general world market, rose dramatically from the late 1950s through the 1960s, precipitating an adverse reaction from the USA and her allies. Americans, in particular, accused the Soviets of dumping oil in order to disrupt western markets and otherwise sow confusion and discord in the West. All of this reflected the impressive performance of the Soviet energy sector, accomplished partly at the expense of bloc members.[23]

The Soviets did not escape certain final costs. Dissidence in the leading bloc states forced concessions to national economic aspirations. Resources, notably oil, began to flow in large volumes from Russia to its partners. In the 1970s, Soviet officials complained loudly about the oil drain and fretted about the intrusion of western capital and influence. Such was the outcry that one would think that the captives had captured the captor.

The US energy mix

America's seemingly insatiable energy appetite developed well before World War II. Somewhat dampened by the depression and the war, energy use gathered momentum after 1945. Tables 3.1 and 3.2 documented the gross prewar trends. Although the USA share of world TPER declined steadily from 47 percent in 1929 to 40 percent in 1950 and 30 percent in 1970 (Table 6.1), America's share of world oil consumption remained above 60 percent in 1950, but had declined to 38 percent by 1965. To maintain this reduced share of oil use in 1965, Americans required 236 mmt more than consumed in 1950. Western Europe's total annual consumption only equaled 236 mmt in 1962. US *per capita* consumption of primary energy exceeded global *per capita* use by 7.6 times in 1929 and was still 6.6 times greater in 1970 (Table 6.4). Domestic production of primary energy supplied all but a fraction of TPER: 95 percent in 1950 and 91 percent in 1970.[24]

From 1945 well into the 1960s, as the mantle of US economic and military power enveloped the so-called free world, US energy and economic policies emphasized the cheapness and abundance of energy supplies.[25] American foreign policies focused intensely on the containment of international communism, exemplified by the Truman Doctrine, the Marshall Plan, the creation of the North Atlantic Treaty Organization, and the commitment of US forces in Korea. These strategies affected oil, but they were hardly oil-driven. Energy formed only one of myriad considerations during the presidential administrations of Truman, Eisenhower, Kennedy, and Johnson.

To mold a reasonable generalization that integrates energy matters with foreign policy, one must emphasize an unflinching dedication to anti-communism, global free trade, and free enterprise. In the view of American policy makers, the achievement of those *overarching goals* would benefit all American industries at home and abroad. Thus, the Truman Doctrine in serving notice to the Soviets that communist conspiracies would be strenuously resisted also reassured American investors of the security of their Persian Gulf properties. Nothing in this implied federal subservience to the MNOCs.

During and after the war, the USA adopted a conciliatory attitude toward both the Mexican and Venezuelan governments, the former having nationalized oil before World War II and the latter, in 1948–49 and again after 1958, maneuvering to obtain a better deal from the MNOCs. In these and other Latin American states, the US government refrained from applying full leverage to protect American firms from the nationalism of host governments. The USA, particularly after the Cuban Revolution in 1959 and the rise of Fidel Castro to power, dedicated itself to arrest the spread of communism even if this mandated recognition and support of governments that threatened foreign investments or that trod upon civil liberties. In Latin American and elsewhere, the USA responded passively to the nationalization of American interests. The USA exerted little influence over its multinationals and often remained uninformed of multinational policies until after the fact, as was the case in the Middle Eastern price cuts of 1959–60.[26]

After the war, the US government assigned energy policy a low priority and eschewed the formulation of a coherent national energy policy. Instead, successive administrations tinkered with energy on a fuel-by-fuel basis, only rarely considering the effect of any one fuel policy on the other primary energy sources. Efforts to deregulate natural gas succumbed to Truman and Eisenhower vetoes. That the artificially low natural gas prices fixed by the Federal Power Commission and by dozens of state and municipal regulatory bodies robbed the coal industry of markets, encouraged wasteful use of a premium fuel, and acted as a disincentive to the development of new reserves seemed

a matter of supreme indifference to everyone save the gas industry. Electricity remained highly regulated. Prices were kept low, partially by using cheap natural gas and fuel oil as boiler fuels. Electricity use shot upward; US *per capita* consumption rose from 1,136 kwh in 1937 to 5,947 kwh in 1965, 2.6 times greater than average EEC consumption.

Analysts of US energy policies have lavished especial attention on the emergence of the USA as a net oil importer after 1948 and on the imposition of voluntary oil import quotas in 1955 and mandatory quotas in 1959. Suffice it to remark here that quotas were adopted at the behest of the domestic oil industry and aimed at raising domestic production, stimulating exploration, and shoring up domestic prices, all of which, it was argued, were necessary to national security. A rare breed these quotas, perhaps the only fully implemented federal energy policy before the 1960s. This, rather than their intrinsic importance, may partly explain their magnet-like attraction for analysts.

Perhaps more important in the long run, defense considerations stymied research on the peaceful application of nuclear energy until President Eisenhower's Atoms for Peace address at the UN in 1953 partially raised the lid of secrecy. This new tack encouraged the private sector and the Atomic Energy Commission to cooperate in research and development. While private sector markets for nuclear reactors failed immediately to materialize in the USA or in Europe, the new policy did promote bilateral agreements and led to subsequent payouts. Prior to the speech, the tightly veiled nature of atomic research fostered the pursuit of dead ends and less efficient reactor technologies. By the mid-1950s, the USA, France, Britain, and the USSR were committed to their own schemes, as Canada and Sweden would be soon after. Once the USA adopted a policy of promoting nuclear power it pursued this goal without regard to its impact on coal, with inadequate attention to reactor safety and siting, and with callous indifference to the inevitable need to dispose of irradiated waste and obsolete equipment.

Great publicity and ballyhoo attended the "freeing" of nuclear energy for peaceful uses. The American public, however, received little information about costs, about federal subsidies, about the concentration of research funds and knowledge in very few firms, about who should own and pay for nuclear plants, or about safety and environmental impacts. Scientists and government officials in the USA and elsewhere apparently believed the general public incapable of understanding such complex technical issues.

The forces governing the energy mix of the USA were well recognized prior to the war. Coal's share declined after World War I as oil and

natural gas use spread. This process was essentially complete by 1955 (Table 4.5). Overall, the US energy mix reflected the domestic availability of fossil fuels and consumer preferences for gas or oil rather than coal, choices abetted by gas prices that were fixed too low and by access to cheap oil. The absence of focused energy policies in the USA encouraged results similar to the more comprehensive policies of European nations, that is a growing dependence upon oil imported from potentially insecure countries and a coal industry in disarray.[27]

The energy mix of the lesser developed countries (LDCs)

Dozens of former colonial peoples trod the exhilarating but painful path to independence after World War II. Other peoples, possessed of sovereignty for generations, as in Latin America, labored under economic, social, and political disadvantages hardly less burdensome than those shouldered by the recently liberated. In some countries, Indonesia and Algeria for example, independence only came as a result of bloody revolutions. In few places did independence pour forth the sweet fruits of economic prosperity and political stability. Decades, if not centuries, of exploitative colonial rule had not prepared the newly free nations for the competitive conditions of the modern world. Internal divisions, based on class, race, and tribe, precluded the evolution of political stability and spawned recurring coups and counter-coups. Overwhelmingly rural and agricultural, engaged in primitive, subsistence farming, enmeshed in a colonial economy even after independence, with high fertility rates and declining death rates unaccompanied by the creation of sufficient employment, these peoples remained mired in abject poverty.

The energy mix of the LDCs reflected their economic backwardness. Indonesia, with significant oil reserves, depended in 1970 upon non-commercial (organic) energy sources for 75 percent of its total energy requirements, a proportion that remained over 50 percent in 1982. Brazil, energy dependent, consistently used non-commercial fuels for over 30 percent of TPER from 1970 through 1982, a share that exceeded 50 percent until the mid-1960s. In 1970, India relied on traditional organic fuels – wood, cow dung – for 90 percent of its energy and managed to reduce that figure to 70 percent by 1983.

Raising the *per capita* consumption of commercial energy necessitated the introduction of new technologies, both large and small. More easily accomplished in urban areas than rural, LDC governments naturally focused their efforts on the cities, foolishly permitting rural

areas to stagnate. Nothing seemed to work. Shortages of funds, ignorance of technologies, autocratic governments, landed elites, a smothering illiteracy, and on and on, obstructed steady progress. Within each LDC a few benefited from modernization, but most did not. Rural villagers unable to make a living on their small plots fled to the permanent unemployment and cultural despair of life in Lagos, São Paulo, or Manila.[28]

The wealthy nations of the West provided insufficient development aid via bilateral arrangements or through such institutions as the International Bank for Reconstruction and Development (World Bank) and the International Monetary Fund. The World Bank preferred to support giant projects when less complex and smaller-scale technologies might have been more suitable. Into the 1970s, the World Bank refused to lend money to national oil companies, always advocating development through private enterprise. Neither India nor Brazil, seeking a modicum of oil independence through state ownership of production and refining, were able to secure financing from the West. Electrification efforts in the LDCs received support if the utility was privately owned, which usually meant that it was a subsidiary of a British or American holding company.

For the most part, the energy importing LDCs remained captive markets for the MNOCs. India, countries in West Africa, and other LDCs entered into importing and refining agreements with the MNOCs when weak and ignorant of the oil industry. Competition was eliminated and prices kept high. India's effort to break this stranglehold by building national refineries and importing Soviet oil at cheaper prices encountered stiff MNOC resistance. The question for India (and other LDCs), as Dasgupta suggests, was the binding nature of agreements concluded when India possessed neither knowledge nor leverage and which fastened disadvantageous terms on the nation.

During the 1950s, a mixed response to that question emanated from the LDCs. Iran answered with a resounding "no" and nationalized the oil industry in 1950. This step was not emulated by other Middle Eastern nations. Host government resentment smoldered for a time. Latin American states waffled, motivated on the one hand by nationalistic pressure for state control over resources and key economic sectors, and, on the other hand, by a persistent and increasing need for foreign capital. India forced the American & Foreign Power Company to relinquish control of its electric plants; confiscations occurred in Colombia and Argentina. By 1960, national oil companies in Latin America operated in Colombia, Peru, Uruguay, Venezuela, Argentina, Bolivia, Chile, and Mexico.[29] A stiff and ill-wind blew into the face of the international energy companies.

The post World War II oil boom

Into the 1960s American and British commentators on oil affairs wrote with exuberant optimism of the fantastic upsurge in oil consumption and of the performance of the oil companies in filling that demand. Observers were particularly attentive to the benefits bestowed by the MNOCs upon the producing nations in the form of wages and social and welfare services. This positive appraisal was dampened only by an amorphous fear of Russian aggression in the Middle East and distrust of producing government intentions regarding concessionary terms.[30] Non-westerners penned less charitable assessments of western and MNOC policies in the Middle East, questioning their motives and their performance and accusing them of ignorance of and indifference to the aspirations of producing states.[31] To such criticisms, the MNOCs responded by emphasizing the sanctity of contracts, the Russian menace, and the inability of host states to manage an industry as complicated as oil.

For a time after World War II, the industry's impressive growth deflected criticism. Global withdrawals more than doubled from 1945 to 1955 and almost doubled again by 1965 (Table 4.6). As Table 4.2 demonstrates, oil ruled global energy exchanges after the war. The 53 percent of total oil production exported in 1960 equaled 87 percent of total energy exports and was accompanied by a dramatic transformation in national roles.

Oil production in the USA declined from 52 percent of world output in 1950 to under 20 percent after 1970. In 1973, the USSR surpassed the USA as the largest producer. US liftings, although rising, were inadequate to domestic demand. Formerly the leading exporter, the USA became a net importer in 1948. By 1960, US exports and imports of oil formed 2 percent and 21 percent, respectively, of the world total. Simultaneously, America's production-reserve ratio fell off again after 1958, following a trend visible since World War I. Oil lifted from the well-worked American fields cost much more per barrel than oil taken from Venezuela or the flush fields of Saudi Arabia or Kuwait. From 1953 to 1962, a $42 billion investment in domestic fields added 4 billion metric tons to reserves; in the Middle East, an investment of $2 billion added over 19 bmt.[32]

While domestic American producers inveighed against New Deal production regulations, the rising costs of exploration and production, and the competition of cheaper foreign oil, the MNOCs focused their efforts overseas. The average daily output of a Middle Eastern well reached 3,860 barrels in 1958 compared with 250 in Venezuela and 12 in the USA. Middle Eastern fields produced 28 percent of world

production in 1965, compared with 7 percent in 1938. Those fields contained 61 percent of world proven reserves. Kuwait, Saudi Arabia, Iran, and Iraq, each the preserve of a consortium of MNOCs, led the way (Table 4.6), exporting, in 1960, 233 mmt of oil, or just over one-half of all oil moving in international trade.[33]

Venezuela reigned as the premier oil producer in Latin America, with Mexico a distant second (Table 4.6). Venezuela produced 80 percent of Latin American oil in 1960 and accounted for over 90 percent of regional exports, a large portion in the form of crude transfers to refineries in Aruba and Curacao. Regional demand for oil was far greater in Latin America than in the Middle East; thus a rising proportion of oil remained in the region after World War II. The most marked trend, however, was the growing global marginality of Latin American oil. Between 1950 and 1960, the volume of Venezuelan oil entering the USA rose by over 8 mmt, but the share fell from 69 percent to 51 percent. The Middle Eastern contribution rose from 21 to 30 percent. The position of Venezuela in the US market suffered further attenuation in subsequent years. In Europe and Latin America, competition from cheaper Middle Eastern oil steadily eroded Venezuelan sales during the 1950s and thereafter. Within the region, oil producing but importing nations such as Argentina, Brazil, and Mexico strove to reduce oil imports by developing production capacity. Only marginally successful, they shifted from Venezuela to the Middle East for oil. Brazil, by 1960 the region's largest importer, trimmed its purchases from Venezuela by 25 percent during the 1960s while quadrupling its imports from the Middle East. The shift away from Venezuela intensified during the 1970s.[34]

Following World War I, an outraged western oil industry had watched helplessly as the Soviet Union nationalized its oil industry, refused to compensate former owners, and revitalized the industry in the face of invasion, civil war, and boycotts. Soviet oil production plummeted during World War II but recovered quickly, increasing by 3.4 times from 1945 to 1955 and more than doubling again by 1960 (Tables 2.7 and 4.6). New fields discovered in the Volga–Urals region and developed at great expense supplied 58 percent of total production in 1955 and 71 percent in 1965. Pushing further east into the incredibly difficult topography of the Siberian and Central Asian fields challenged the technological capabilities of the nation during the 1980s. Despite severe obstacles, Soviet exploratory drilling, accounting for some one-third of total oil industry investment, added substantially to Soviet reserves. By 1983, Russia held three times the reserves of the USA and 13 percent of world reserves.[35] The reappearance of Russian oil in western European markets in the 1950s, reflecting production successes and foreign exchange needs, caused consternation within some circles of NATO. What were Soviet intentions?

The multinational oil companies

In 1965, western Europe, the USA, and Japan purchased two-thirds of the $17.9 billion in mineral fuels entering world markets, receiving 598 mmt of oil compared with 191 mmt in 1955. OPEC members sold 51 percent of the value of fuel. Fully integrated MNOCs produced, refined, and marketed virtually all of the oil sold by OPEC states and others, excepting the USSR.[36]

The eight firms appearing in Table 4.7 lifted some 165 mmt in 1950, a volume constituting 85 percent of world producton, excluding the USA, Canada, the Soviet bloc, and China, and 100 percent of Middle Eastern, Indonesian, and Venezuelan production. Table 4.7 summarizes the non-US production and refining shares of the MNOCs. Although their portion gradually narrowed, the MNOCs retained a strong predominance. SONJ produced 74 mmt in 1950 (14 percent of world total) of which 50 mmt originated outside of the USA. SONJ's global share equaled 13 percent in 1965. SONJ, BP, and RDS produced 71 percent of non-US oil in 1950 and 56 percent in 1966 while the remaining five listed in Table 4.7 withdrew 23 percent in 1950 and 44 percent in 1966. As of the late 1950s, these MNOCs sat on 92 percent of proven reserves, owned 75 percent of world refining capacity, and marketed over 70 percent of oil products.

The MNOCs retained the organizational configuration described earlier, adding to it as units were created to reflect entry into new concessions or marketing areas.[37] The MNOCs listed on Table 4.7 wielded enormous financial strength, owning almost 40 percent of world fixed assets in petroleum of $97.2 billion in 1960, of which SONJ accounted for $10.6 billion. While SONJ's share of global fixed assets declined, the value of its holdings doubled from 1950 to 1960. To the assets of these giants could be added those of five additional firms, four of which were American—Standard Oil of Indiana, Phillips Petroleum, Continental Oil Co., and Marathon Oil Co.—and one, Petrofina, a Belgian firm. Together these five possessed assets worth $10.1 billion in 1966, $3 billion less than SONJ reported for that date.[38]

Investments in the petroleum industry soared after World War II (see Table 3.8 for US direct investments abroad). Annual total investments of $2.7 billion in 1946 reached $8.2 billion in 1955, for a ten-year total of $56.2 billion, of which the US oil industry received $38.1 billion. US direct investments abroad from 1946 to 1960 rose from $7.2 billion to

Table 4.7 MNOCs' shares of crude production and refinery throughput, 1950–66 (million metric tons)

	1950		1957		1960		1966	
	Production	Refining[2]	Production	Refining[2]	Production	Refining	Production	Refining
SONJ	50	38	79	67	96	88	158	150
BP	40	30	50	30	75	45	125	80
Shell	23	44	61	79	80	97	120	137
Gulf	20	3	51	8	59	15	89	29
Texaco	10	20	24	25	40	33	72	58
SOCAL	10	6	26	13[3]	28	16	74	26
Mobil	6	5	17	15	29	22	48	42
CFP	2	na	9	na	na	na	36	na
Above total[2]	165	146	317		407		722	
Percentage of production[1]	100		100					
Percentage of production[2]	85	72	81	68	72	53	76	61

[1] Including Iran, Iraq, Saudi Arabia, Kuwait, Qatar, Indonesia, and Venezuela
[2] Excluding USA, Canada, USSR, eastern Europe, and China except where otherwise noted
[3] Eastern hemisphere only

Sources: Constructed from data in E. Penrose, ed., *The Large International Firms in Developing Countries: The International Petroleum Industry*, London, Allen and Unwin (1968), pp. 78, 98, 107, 115–33, and M.G. Adelman, *The World Petroleum Market*, Baltimore: The Johns Hopkins University Press for Resources for the Future (1972), pp. 80–1.

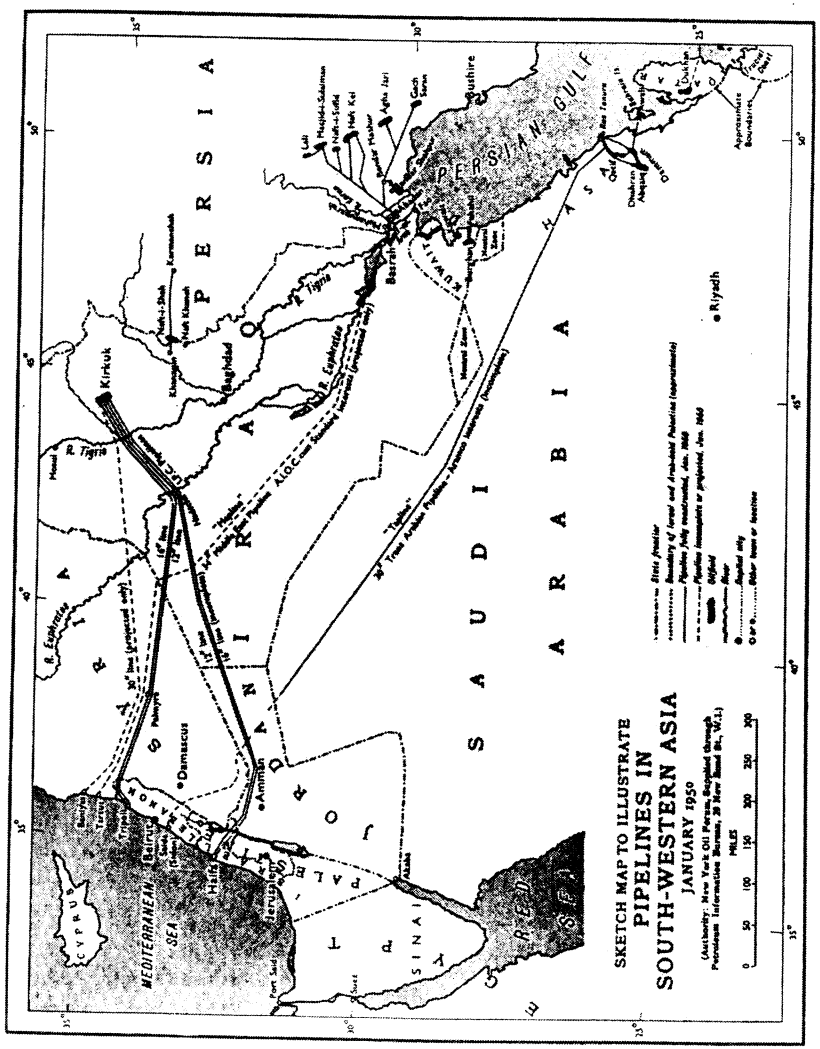
$31.8 billion with petroleum's portion climbing from 15 to 34 percent and reaching $10.8 billion in 1960. Then, from 1955 to 1970, the industry invested some $215 billion in the search for and marketing of oil. The share devoted to production in the USA fell off sharply in response to more lucrative opportunities elsewhere.

The investments of individual MNOCs cannot be tabulated but reference to capital expenditures hints at their magnitude. From 1950 to 1966, SONJ's capital expenditures totaled $13.9 billion out of a net income of $21.8 billion. Standard's income–expenditure ratio averaged 0.63 over that period, reflecting its self-financing capability and its low long-term debt, a characteristic of other giant oil companies as well. In 1960, the firms listed in Table 4.7 provided 30 percent of a total global oil investment of $10.8 billion.[39]

Suffocation by numbers? Perhaps! But such figures, at the least, capture the essence of aggregate and individual Big Eight dominance. Few observers, excepting oil industry officials and inveterate advocates of giant enterprise, perceived such control of the industry as a natural consequence of economies of scale and as a boon to consumers.[40] Adelman, Al-Otaiba, Leeman, Luciani, Odell, Penrose, among others, each specified the political and institutional forces that permitted the evolution of such concentrations of power in the oil industry.[41]

Historically, the early concessions in Latin America and the Middle East resulted from the application of overwhelming US and European economic and political pressure on the weak governments in those areas. Ruling cliques in Turkey and Persia (and then Iraq and Iran), Saudi Arabia, Venezuela, and Mexico, entranced by visions of immense royalties and other payments, turned the national patrimony over to foreigners on terms wholly favorable to the MNOCs. Furthermore, western governments deliberately fostered the emergence of such giant firms as AIOC and RDS. In the USA, anti-trust legislation and occasional anti-trust indictments failed to retard industrial concentration at home or abroad. Rarely were American MNOCs inconvenienced by anti-trust proceedings. In an oblique way, then, the US government fostered the evolution of the highly concentrated structure of the post World War II oil industry.

Into the 1950s, Big Eight concessions in the Persian Gulf encompassed the entire producing area with the only significant deviation occurring in Iran as a result of the revolutionary turmoil of the early 1950s. The concessionary status in 1950 was as follows: Iran, AIOC with 100 percent; Iraq, IPC, a consortium of all the firms listed in Table 4.7 except Texaco, Gulf, and SOCAL with 100 percent; Kuwait, divided between Gulf and BP; Saudi Arabia, exploited by Aramco, a joint venture of SOCAL and Texaco (the original partners) and SONJ and



Map 4.1 Middle Eastern pipelines, 1950. (*Source:* Olaf Caroe, *Wells of Power: The Oilfields of South-Western Asia. A Regional and Global Study*, London: Macmillan (1951), facing p. 94. Reprinted with permission.)

Socony–Vacuum (soon Mobil); and Venezuela, where SONJ, RDS, and Gulf accounted for 78 percent of production.

The production and marketing capacity of each MNOC determined its attitude toward consortium participation. SOCAL and Texaco, awash with Saudi oil, gained stability and much needed capital by taking in SONJ and Socony–Vacuum. SONJ's agreement with AIOC to purchase a large volume of crude over twenty years defused AIOC's opposition to the expansion of Aramco. The Gulf–BP partnership in Kuwait protected each from the market competition of the other. In 1947, Gulf and RDS negotiated a contract in which the crude-long Gulf produced huge quantities for the crude-short RDS. The latter refined and marketed that crude and the two divided the profits evenly. As RDS and BP already marketed jointly, RDS functioned as a *de facto* partner in the Kuwait concession. No less than the Aramco relationship, the Kuwait arrangement and other market sharing agreements constrained competition in many parts of the world.[42]

The MNOCs also controlled the transportation of crude by tanker and pipeline with almost 90 percent of carrying capacity owned by the Big Eight. A spectacular expansion of total tanker tonnage and in the size of tankers occurred after World War II. By 1960, deadweight tonnage reached 64 million long tons and tankers of over 100,000 dead weight tons (dwt) were being launched. Pipelines such as Aramco's Tapline, connecting Saudi Arabia and the Mediterranean, were completed. Some 65 percent of Middle Eastern oil moved toward Europe via the Suez Canal and the Mediterranean pipelines, routes vulnerable to closure by the transit states. The remaining 35 percent was shipped via the Indian Ocean. Into the 1950s, the MNOCs successfully thwarted penetration of this near monopoly. A Saudi Arabian scheme to create a national tanker company fell afoul of Aramco opposition. The MNOCs successfully repelled producing state efforts to enter downstream operations until the 1970s.[43]

Consortia and contractual arrangements afforded each MNOC member intimate knowledge of the operations of its partners and greatly reduced the possibility of an intra-Big Eight oil war. The MNOCs, an oligopoly, globally, but exercising monopolistic power in the Persian Gulf fixed the revenues of producing states by controlling liftings and by defending a price structure that served their collective interests. The American multinationals justified their performance through recourse to free market arguments. Few, outside America, believed them.

The hegemony of the MNOCs did not go unchallenged during the 1950s and challenges intensified during the 1960s. Independent oil companies such as Continental and Phillips sought concessions in Libya and other newly discovered oil fields. Long on crude but short on markets,

partly as a result of the US import quotas, the new producers competed with the MNOCs in Europe. State oil companies proliferated after World War II, following the precedent of Argentina, France, and Mexico. Some, such as Italy's Ente Nazionale Irdocarburi (ENI) sought concessions in the Middle East. With government encouragement and protection, Japan launched an exploration venture in Saudi Arabia that discovered a rich field in 1959. French state companies monopolized production in colonial Algeria. National and private sector firms slowly whittled away at MNOC control over production. But the most dire threat to MNOC monopoly originated in the key producing states. At first demanding a larger financial share from their oil wealth, they next asserted their right to equal participation in their oil industry, and eventually asserted full control over all phases of the industry.

The price of oil

In 1959 and 1960, the MNOCs unilaterally reduced the posted price of crude. This radical step followed several years of selling at concealed discounts from the posted price. The price cuts, inimical to the interests of Middle Eastern producers and to Venezuela whose revenues were linked to the price of oil, precipitated the formation of OPEC.

Free market theorists and MNOC officials offered a market-driven explanation for crude oil production and prices. They argued that supply (and the exploratory endeavors undergirding supply) and price, its minimum level determined by the cost of production, fluctuated in conjunction with the demand of the moment. Producers, attuned to market logic, would always produce the next barrel of oil that had a purchaser. Because substitutes for such products as motor fuels and lubricants were lacking, the price elasticity of oil was low. The purchaser would always be there. Refiners, for instance, ran at full capacity regardless of price. Consumers lacked the flexibility of energy substitution. Inherent to this interpretation was the operation of a free market in which competition moderated price. Producers, whether private sector or state, set prices rationally to reflect supply and demand factors rather than establishing prices that conformed to institutional, political, or ideological imperatives.

A free market in oil has never existed. Posted prices,* a convention invented by Rockefeller's Standard Oil Company, were only loosely related to actual costs of production which were only imperfectly

* Posted prices, set by the largest producers of crude, established the price buyers would pay for crude. The dominant buyers were also the largest producers.

known. The old Standard Trust utilized prices to drive competitors from business. The posted price system evolved into the Gulf-plus system whereby MNOCs fixed the price of internationally traded oil at the price of US Gulf Coast crude plus the cost of delivery from the Gulf. The landed cost of Persian Gulf oil to Japan equaled the price of more expensive Gulf Coast oil shipped over a much greater distance. The Gulf plus system, adopted at Achnaccary in 1928, prevailed during a time of weak and unorganized opposition to the MNOCs and when the US served as the world's leading exporter. However serviceable to the MNOCs, the Gulf system did not reflect market-driven pricing.

The Gulf system collapsed under the pressure of exploding Middle Eastern production and the transition of the USA from exporter to importer. The cost of Middle Eastern production rose less rapidly after World War II than production costs in the USA and then actually fell. The disassociation of Middle Eastern crude prices from Gulf prices quickly followed, matching the interests of the MNOCs who imported Middle Eastern oil into the USA and somewhat reducing import costs in Europe and Japan. But the abandonment of the obsolete Gulf system did not usher in an era of free market prices. It was simply replaced by a new system that conformed to MNOC interests.[44]

Price inelasticity favored the producers who were also the transporters, refiners, and marketers. The MNOCs, frequently partners in production and marketing, manipulated production within their concessions and avoided price competition in world markets. The price of Middle Eastern crude during the 1950s fluctuated in response to the institutional needs of the MNOCs, but always guaranteed the companies an immense profit per barrel as production costs declined and liftings rose. The cash dividends of SONJ rose by 145 percent from 1950 to 1956 and by another 66 percent over the next decade while RDS's cash dividends tripled between 1955 and 1966. After the war, posted crude prices peaked in 1947 at $2.20 per barrel and did not again reach that level until 1971. Between those anchor years, prices first fell through 1952, rose in response to the Iranian Crisis, the Korean War, and the Suez closure, fell in 1959–60 and then held firm at $1.80 per barrel from 1960 to 1970.[45] But posted prices from the mid-1950s through the 1960s inaccurately defined the price paid for oil.

The great bulk of Middle Eastern and Venezuelan crude passed to affiliates of the producing unit at a nominal, book-keeping, price that corresponded with the posted price of the moment. This price was not meaningful since the holding companies manipulated the book returns of downstream affiliates to meet corporate interests. Increasing quantities of oil were sold on long-term contracts to other MNOCs, an example being the Gulf–RDS contract noted above. Large discounts

from posted prices characterized these sales. Spot market (open or arms length market) prices also diverged radically from posted prices, perhaps by as much as $0.35 to $0.50 per barrel. When independent oil companies became significant players in international markets, discounting became rampant, a practice further encouraged by the appearance of cheap Soviet oil and by the imposition of import quotas by the USA. Posted prices, then, were artificially high. They failed to reflect other price-shaving devices such as freight rate bargains that also lowered the terms of sale. Through the 1950s, the MNOCs jealously protected their power to manage prices.

Until the 1970s, most oil moved under contract. As ascending independent production sought buyers, spot markets for non-contract oil became more important. The largest spot market emerged at Rotterdam, the point of entry for crude purchased by an enormous number of giant refiners and other processors. With the breakdown of the old pricing system and the capture of the MNOCs by the producing countries—part of the drama of the post-1973 years—spot market prices became the key determinant of contract prices.

The subtle tactics employed by a handful of firms impinged hardly at all on the final price of oil products (minus such variables as import duties or excise taxes) relative to which there was little real competition. Shell and Esso (SONJ) regular gasoline cost the same within any given market area and were of equivalent quality. In uncontested markets, often uncontested because of an agreement among particular MNOCs, product prices were notably higher than in contested markets. Crude oil in Saudi Arabia and Kuwait could be produced at $0.10 per barrel compared with $1.51 in the USA, yet US crude prices in the 1950s were only $0.40 to $0.60 per barrel higher. Obviously, the MNOCs enjoyed great latitude in determining the posted price. The internal needs of the firms and agreements between firms provided criteria for establishing prices. An internal logic prizing stability and order prevailed over a market logic seeking enlarged market shares through price competition.

The MNOCs, as producers of the crude they bought, decided the timing and the dimension of price changes. From 1954 to 1960, world oil production jumped from 697 mmt to slightly over 1 bmt, an increase in volume almost two times larger than the increase from 1948 to 1954. As production surpassed demand, the US import quotas, said to restrict supply in that market, and Soviet exports exerted competitive pressure, especially in the European market. Companies new to international trade sought and gained concessions throughout the Middle East. The MNOCs reacted to the future threat of that production. Slack demand prompted the MNOCs to lower the posted price of Middle Eastern and Venezuelan oil in 1959 and 1960 without consulting the host governments, a grave error as it turned out. Outraged producing states quickly formed OPEC. Host governments, whose revenues were linked to posted prices, complained bitterly and concocted plans to restore revenues by gaining a larger share of oil wealth. This was the first step to wholly dispossessing the MNOCs.[46]

Trends in marketing to 1960

The oil markets of the USA, western Europe, and Japan absorbed two-thirds of world oil exports in 1955 and over three-quarters in 1965. The UK, France, West Germany, and Japan, lacking domestic production, contrived to reduce the cost of imports by developing a refining industry that met domestic needs. The USA engaged in a rancorous debate over the national security implications of foreign oil imports.

Demand for oil accelerated so sharply in the USA after World War II that imports exceeded exports in 1948. By 1959, net imports of 90 mmt equaled 18 percent of total demand. Refined products composed 44 percent of total imports, the larger part refined in the Caribbean refineries of MNOCs from Venezuelan crude. Venezuela crude accounted for 47 percent of crude imports and Middle Eastern for 30 percent. In 1950, virtually all of this oil was shipped by US MNOCs to their American affiliates for refining and marketing. SONJ and Gulf accounted for 41 percent of total imports in 1950. Eight other major firms shared 57 percent. By 1957, a number of new firms had entered the importing business, shaving the portion of the ten largest MNOCs to 64 percent.

In America, the high cost independent domestic producers and refiners without access to foreign oil bitterly opposed this invasion, charging the MNOCs with conspiracy to drive independents from the market. The coal industry jumped into the fray, blaming enormous dollar and tonnage losses on imported oil dumped at cutrate prices into coal's traditional markets. Skillfully appropriating the national security argument, the independents struck a sensitive nerve, as the Eisenhower administration was agonizing over the implications of the Iranian Revolution, the Suez closure, the Soviet threat in the Middle East, and Arab antagonism toward the US–Israel connection. These considerations, far more than independent rhetoric about MNOC conspiracy, convinced the Eisenhower administration that domestic production, the only truly secure source, demanded protection. Initially eschewing compulsion, the administration implemented voluntary import quotas which operated ineffectually from 1956 to 1959. A mandatory system went into effect in 1959.[47]

While the US market for imported oil increased by two times from 1955 to 1965, western European imports tripled and those of Japan multiplied by eight times. Within Europe, the UK, West Germany, France, Italy, and the Benelux states accounted for about 90 percent of imports. As noted earlier, western Europe developed a large refining complex during the 1950s so as to shift from costly refined imports to cheaper crude imports from the Middle East and thus realize significant savings in import bills. The USA possessed 55 percent of refinery capacity in 1952 and 39 percent in 1960; western Europe's share improved from 11 to 18 percent. By 1970, Europe's refining capacity accounted for 28 percent of world capacity, compared to 25 percent for the USA. In the non-Soviet bloc and non-US world, the MNOCs listed on Table 4.7 owned 67 percent of capacity. Into the late 1960s, those MNOCs handled an only slightly smaller percentage of total crude runs. European nations depended upon the MNOCs for initial refinery construction, employing a variety of tactics to induce MNOC cooperation.

West Germany did not intervene in the domestic oil market until the mid-1960s when it sought to mitigate the effects of oil use on its coal industry. France employed state power in all energy sectors. French regulations stipulating that foreign marketers obtain at least 90 percent of their product needs from local refineries compelled the foreign firms to build refineries in France. Import licenses and quotas protected CFP's share of the French market. France also attempted with minimum success to induce foreign refiners to increase crude oil purchases from the franc zone. Whether in response to these directives or not, French refining capacity expanded by 180 percent from 1955 to 1965. Britain permitted BP, RDS, and SONJ to expand refining at their own pace. UK refining capacity more than doubled between 1952 and 1960, doubling again by 1970. RDS, BP, and SONJ owned 98 percent of refinery capacity into the 1970s.

Britain's refiners developed substantial product markets in western Europe, particularly in West Germany, Sweden, and Italy, and in Japan. Three MNOCs divided Britain's market while many more sought German customers. In these markets, crude and products originated for the most part with MNOCs who engaged in product competition but evinced little interest in active price competition.[48]

Refining and marketing in postwar Japan evolved under the self-interested supervision of the USA. Policies were imposed that guaranteed US firms a substantial share of the product market and which endowed the US MNOCs with the right to supply the crude needs of the refineries jointly owned by the MNOCs and Japanese firms. As a result,

about 80 percent of Japanese crude imports were supplied by US MNOCs. Ultimately, Japan reduced its foreign exchange drain by developing the refining sector. Remarkable growth occurred upon termination of the occupation. A capacity of 10 mmt in 1955, smaller than Iran's Abadan refinery, attained 88 mmt by 1965, inferior only to the USA and the USSR. By 1960, four of Japan's largest refineries were wholly owned by nationals. During the 1960s, the government intervened directly to bring all phases of the petroleum industry under comprehensive regulations and to develop Japanese-controlled foreign oil fields. Spectacular success eluded the latter strategy; only 10 percent of Japan's oil imports originated from its Saudi Arabian concession in 1974. Japan remained dependent upon Middle Eastern oil sold by MNOCs.[49]

Cold War jitters assured a paranoid reaction to the appearance of Soviet oil in western markets. Between 1951 and 1959, Italy, Sweden, Greece, Austria, India, and Japan received Russian oil, amounting to about one-half of Soviet exports. Altogether, Soviet exports to the West constituted about 5 percent of world imports, but in the eyes of the US government the implications loomed larger. Some foresaw dumping of cutrate Soviet oil to disrupt western firms and damage western economies. Others perceived Soviet oil as a weapon to divide NATO. As interpreted by H. Williamson, Soviet oil exports reflected the "everpresent possibility of a Russian attempt to undermine the free world petroleum industry."[50]

A simpler and less conspiratorial explanation for Soviet exports suffices. The Soviets produced a surplus and they needed foreign exchange in order to finance the purchase of machinery and technology. Western Europe required oil and responded favorably to offers from the Soviets. To the French or Italians, particularly after the Suez Crisis of 1956, the USSR appeared a more secure source of supply than the Middle East. Moreover, the importers wished to diminish their dependence upon the American MNOCs. Thus, the exchange offered benefits to both parties.

Soviet oil sales corresponded with a general improvement in western European trade with the Soviet bloc. However, the USA, during the John F. Kennedy presidency, succeeded in gaining the cooperation of its NATO allies in reducing the trade of strategic items to Soviet countries. Europeans lacked enthusiasm for this policy and frequently circumvented it. Soviet oil sales, at low but not giveaway prices, contributed to the pressures that prompted the MNOCs to reduce their posted price in 1959–60. That single act disrupted the oil industry in the Middle East more than anything done or contemplated by the USSR.[51]

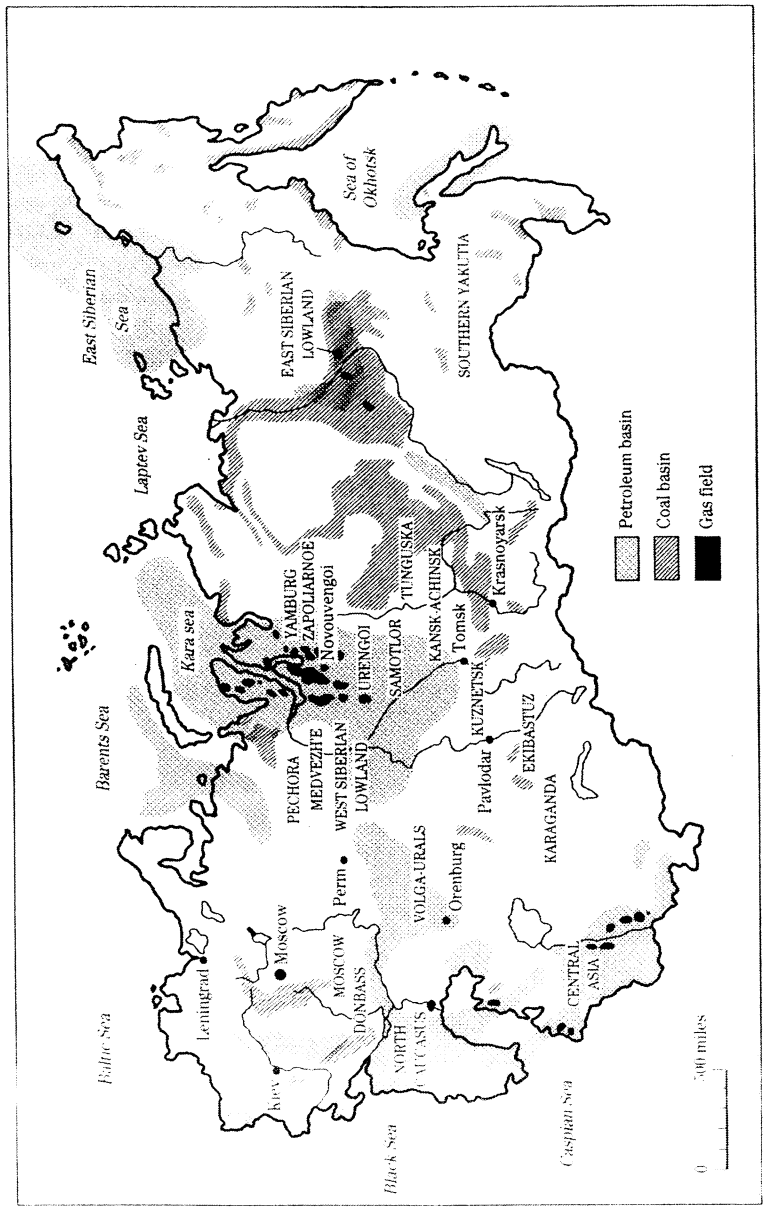
The discontented producing LDCs

The MNOCs obtained the bulk of their oil after World War II from societies caught in a vortex of nationalistic fervor. The major producing states of Iran, Iraq, and Saudi Arabia, nominally independent but virtual dependencies of Britain before the war, cast off that inferior status and pursued their own national and regional goals. Elsewhere in that region, Kuwait and future producing states in north Africa would achieve independence by 1962. Algeria won its independence through armed struggle, as did Indonesia. Long established and fully independent states such as Venezuela and Mexico struggled to assert their national rights against the economic and political might of the USA.

Autocratic Middle Eastern regimes, frequently claiming an ancient heritage, sought to absorb the proto-nation into the regime or dynasty. Unlike the nations of Latin America, Middle Eastern states lacked strongly articulated demand for political democracy. Other imperatives moved those governments, none exciting fervor equal to anti-Zionism which must be considered an intrinsic component of their nationalism. Entrenched and apparently powerful regimes in the Middle East—Iran, Egypt, Iraq, Libya—disintegrated in a nationalist and anti-Zionist whirlwind, replaced by equally autocratic, if secular, strongmen. These regimes all escalated their demands against the oil companies. So, too, did the intermittent democratic governments of Venezuela. It was the totalitarian cliques in Venezuela that courted and feted the MNOCs.

Middle Easterners perceived the MNOCs from a different perspective than Latin Americans. In part, the distinction stemmed from cultural factors, in part from developmental potential and objectives. Most important, the MNOCs and the USA stood condemned in the Middle East as the allies of Zionism. In Latin America, democracy's advocates identified the oil oligopoly as hostile to free government and national goals. National self-interest, however defined by the contending political groups in Latin America, determined policies toward the multinational corporations. Transnational loyalties in the Middle East and inward-looking nationalism in Latin America, as well as economic markers, targeted the adversary.

The special requirements of economic modernization in Latin America and the Middle East clashed with political and ideological realities. Americans and Europeans lived in societies that recognized the primacy of private property, of contracts, and of individual rights. The peoples of Latin America and the Middle East exalted other values. Expropriation and nationalization strengthened the collectivity and asserted national sovereignty. However much those peoples were oppressed and exploited by their rulers, however meagerly



Map 4.2 Soviet energy fields. (*Source*: E.A. Hewitt, *Energy, Economics, and Foreign Policy in the Soviet Union*, Washington, D.C.: Brookings Institution (1984), p. 30. Reprinted with permission.)

nationalization advanced standards of living for the masses, the act was a legitimate expression of national integrity. This final solution might also be essayed prematurely, the child of ideological compulsion rather than rational economic calculation.

From the perspective of the MNOCs, the birth of Israel in 1948 and its quick recognition by western governments loomed as events designed to subvert their carefully nurtured dominance in the Middle East. Distancing themselves from Israel by abandoning her as a terminal for a Persian Gulf–Mediterranean pipeline and as a market or by not assigning Jews to jobs in the producing countries left unresolved the larger question.[52] Would Arab hatred of Israel and the equation of Zionism with imperialism drive Middle Eastern governments to acts that contradicted their economic interests?

The Arabian Peninsula producers evolved an agenda after 1948 that balanced precariously between demonstration of ardent anti-Zionism and the exigencies of national economic development. Whichever way policy tilted, furthering this agenda conflicted with the status quo. From 1948 through the Suez War of 1956, a tilt first in one direction and then in the other occurred, but for the most part the essence of Arab oil policy resembled the programs of Venezuela and Indonesia. Producers demanded as large a share of proceeds from oil as was politically realizable at a given moment, pressing forward step by step toward that day when full operational control could be established. At issue were rates of withdrawal, exploration, concessionary terms, including economic rents, pricing, the training of local personnel, and downstream development.

Oil nationalism emerged prior to World War I, achieving some successes during the interwar years, particularly in Argentina and Mexico, but serving in Iran and Iraq and the new producing states of Saudi Arabia and Kuwait largely as rhetorical devices. The AIOC and IPC as well as SONJ and RDS in Venezuela and Mexico asserted the sanctity of long-term concessionary contracts while accepting the necessity of renegotiating royalty and tax formulas and acknowledging host state ownership of sub-surface minerals. MNOCs admitted the theoretical right of nationalization at the conclusion of a concessionary contract but did not anticipate such results. Mexican nationalization failed to instill in the MNOCs a sense of foreboding or even of caution.

From 1945 into the late 1950s, a raging nationalism assaulted colonialism, feeding the ambitions of producing governments to function autonomously, win greater control over the oil industry, and realize higher oil revenues. The renegotiation of monetary terms occurred with increasing frequency during this period as the gains made by one state became the minimum demands of other states. Failed

negotiations in Iran triggered a revolution, nationalization, and a counter-revolution. Egypt's daring nationalization and closure of the Suez Canal in 1956–7 satisfied both nationalistic and anti-Zionist injunctions, as well as inflating the domestic and Pan-Arab credibility of President Nasser. By 1959–60, widening fissures radiated throughout the structure of the international oil industry.

The Latin American experience is less susceptible to generalization. Oil alone drew multinational firms to the Middle East while agricultural and mineral products as well as such large urban markets as São Paulo and Rio de Janeiro, Caracas and Buenos Aires attracted a melange of international corporations to South America. Further along the tortuous path of economic development than all Middle Eastern states save Iran, states such as Argentina, Brazil, and Venezuela required the constant infusion of multinational capital, technology, and management expertise. Goodsell emphasizes the hardening stand of Latin America toward foreign companies, citing several examples of nationalization and of stringent controls imposed on multinational operations. But inconsistency appeared as well. Venezuela as the largest producer and Argentina and Brazil as the most developed states wavered in their posture toward the MNOCs, now hostile, now receptive. A short-lived, democratically oriented government in Venezuela forced a larger payoff from the oil companies. But this government fell in 1948 and was succeeded by a decade long dictatorship that treated MNOCs tenderly. The necessity of attracting private capital counseled moderation but pervasive nationalism demanded activism.[53]

In 1948, a democratic government in Venezuela imposed a tax system on the MNOCs which divided operating profits on a 50:50 basis. SONJ, RDS, and Gulf accepted this change without protest while fearful of greater exactions in the future. Venezuela's success in 1948 stimulated Middle Eastern governments to confront the MNOCs with similar demands. While the Venezuelan precedent buttressed the Arab case, the Arab producers prior to the Venezuelan contract had launched aggressive campaigns for a larger share of the take. Negotiations between Saudi Arabia and Aramco spanned the years 1946–9, with Saudi officials insisting that Aramco could afford to pay more. The Iraqi government criticized IPC for the slow development of the industry, demanding higher production and revenues. In 1950, Saudi Arabia and Aramco concluded a 50:50 arrangement which was replicated in Iraq and Kuwait and which replaced the fixed per ton royalty.

For the MNOCs, the 50:50 arrangement seemed the simplest solution for several reasons. The impact of the higher payments was softened for the American firms by the decision of the US government to grant a $1 credit on domestic income taxes for each $1 paid in taxes to a foreign

government. Secondly, production was rising to meet the voracious demand of major consuming regions while costs declined. As SONJ's Middle Eastern liftings rose from 12 percent of total production in 1950 to 23 percent in 1960, its net income doubled. Finally, the MNOCs proclaimed the 50:50 agreement a principle, equitable to both parties and conducive to continued capital investment. But hardly had the new arrangements taken hold than host governments advanced additional claims against the companies and secured superior terms from the independents and state owned oil firms. Host governments denied the immutability of the 50:50 arrangement, none more so than Iran's.[54]

Longrigg considers Iranian nationalism misguided and irrational. Fesharaki portrays Muhammed Khan Mussadiq as a ruthless dictator. Shwadran views Mussadiq as an ambitious but patriotic politician. Mussadiq and nationalism coalesced in 1950, disrupting the oil industry until 1954. The crisis in Iran began when AIOC and Iran reached an impasse in renegotiating the terms of the AIOC concession. The national legislature, dominated by ardent nationalists, was determined to force terms on AIOC rather than negotiate. AIOC, amenable to a 50:50 division, refused to budge from the letter of past contracts. The uncompromising position of both parties precipitated the overthrow of the government, the ascension of Mussadiq to power, and the nationalization of AIOC.[55] Iran employed nationalization as a weapon against AIOC and Great Britain rather than as a strategy to achieve economic modernization. The Iranian example did not change the opinions of those who taught that market driven forces precluded actions that damaged economic self-interest.

Old regimes inevitably label as Jacobins dangerous challengers. In this unequal contest between a new, isolated, and naive Iranian regime and a coalition of MNOCs and the USA and British governments, Mussadiq's opponents deftly cast him as a Soviet tool, equating opposition to the West with support for the USSR. Levy, Hassmann, and Chester assumed that the Soviets pursued a policy in the Middle East designed to force Western abandonment of its regional interests. In fact, little evidence exists to support this contention. The first Iranian Revolution was home-grown. Communists in Iran supported but hardly controlled Mussadiq's government. Far more disruptive were the Arab–Israeli wars, the invasion of Suez by Britain, France, and Israel, the war in Algeria, the policies of the MNOCs, and the myopic and decidedly unsympathetic western response to LDC nationalism.[56]

In the short-term, the Iranian Revolution and nationalization severely damaged both the Iranian oil industry and the national economy. After the withdrawal of AIOC personnel in 1951, Iranian production fell from 38.1 mmt in 1950 to under 3 mmt in 1952, 1953, and 1954 and only

surpassed the 1950 figure in 1957. The great Abadan refinery was virtually inoperative during the revolutionary ferment, depriving European and Asian markets of some 20 mmt annually for three years. Moreover, the MNOCs, with the blessing of the US government, imposed an effective boycott on Iranian oil. The shortfall was barely felt in oil markets. Production from Iraq and Kuwait climbed from a combined total of 24 mmt in 1950 to 80 mmt in 1954 while Saudi Arabian production increased by 20 mmt. This surge in withdrawals, in addition to advances elsewhere more than compensated for the absence of Iranian oil.

In 1953, Mussadiq fell to an army coup, contrived as some assert by America's CIA. Negotiations then recommenced between the Iranian government of the restored Shah and, at the insistence of the USA, a consortium of oil companies in which American firms were well represented. The USA exploited this opportunity to appropriate for Americans firms 40 percent of the old AIOC holdings. The Iranian Consortium consisted of BP with 40 percent, RDS, 14 percent, CFP, 6 percent, Gulf, Mobil, SOCAL, SONJ, and Texaco, each with 7 percent, and a group of eight American independents, organized as Iricon Agency Ltd, that held the remaining 5 percent.

The Consortium operated under a contract with the National Iranian Oil Company (NIOC) which owned all the oil in Iran. While the nation's oil moved through the Consortium, NIOC rapidly improved its skills. In 1957, a law endowed it with broad discretionary authority in planning for future oil development. Shortly thereafter, NIOC signed pioneering joint venture exploration and development contracts with Italy's ENI and Standard Indiana. During the 1960s, Saudi Arabia, Kuwait, and other states emulated these agreements. The Consortium appeared to exercise firm control over Iranian oil. Iran won nothing financially that had not been offered in 1949, that is a 50:50 split. But during the 1960s, NIOC expanded its purview, undertaking marketing, acquiring tankers, and concluding new joint venture contracts that mandated the sharing of technology and that improved Iran's take of oil. By the 1970s, NIOC possessed the necessary experience and skills to operate without the Consortium.[57]

Hardly had the Iranian Consortium restored normal operations than Egypt nationalized the Suez Canal in July 1956 and, in November, Britain, France, and Israel invaded with the intention of capturing the canal. President Nasser blocked the waterway through which passed nearly one-half of Middle Eastern oil. Simultaneously, the Syrian army blew up the IPC pipeline to the Mediterranean. Together, the two transportation systems carried some 85 percent of western Europe's oil supply. An acute, if temporary, oil shortage buffeted Europe.

exacerbated in Britain and France by the imposition of an oil embargo by Saudi Arabia which Aramco could only obey. Prices rose. Only strenuous efforts by the MNOCs to marshal additional tankers for the long haul from the Persian Gulf, the renewal of European purchases in the western hemisphere, and transfers of American stocks to Europe prevented a scarcity of crisis proportions. Western Europe, with rationing imposed in several countries, made do with 80 to 85 percent of its normal oil supply.[58] In 1958, Suez traffic was resumed. The crisis ended, and memory of it soon faded.

Walter J. Levy perceived the Suez crisis as radically changing the context of the world oil trade.[59] But normal supplies for western Europe, by-passing the Suez, had been restored by 1957. The affected nations neither reformed their energy use practices nor moderated their oil dependency. In Britain, for example, shortages failed to stimulate interest in the coal industry. The USA and its European allies did not prepare plans for future contingencies. The Suez closure in 1956 was considered an aberration. But it was not; the past arrived again in 1967. The MNOCs and their governments ignored the lessons of the Iranian Revolution and the Suez closure. The MNOCs were powerful. However, during the late 1950s, host demands and the appearance of new oil firms in the Middle East demonstrated that the MNOCs no longer occupied unassailable heights.

NIOC denied new concessions to the Consortium, preferring to contract with newcomers so as to reduce the Consortium's hold on the industry. Iraq engaged the IPC in a vituperative controversy from 1958 to 1962 in which Iraq dictated terms and IPC slowed down production. In 1958, the government of Rómulo Betancourt replaced a dictatorial regime in Venezuela. Betancourt championed an oil policy that would diminish the autonomy of the foreign concessionaires and that envisaged the creation of an organization of oil exporting countries. Before its fall, the military junta raised the 50:50 division to 60:40, thus disabusing the oil firms of their faith in the immutability of the 50:50 arrangement. Betancourt urged Middle Eastern producers to adopt the new split.

Meanwhile, independent and state-owned or state-encouraged oil firms competed with the MNOCs for concessions. ENI in Iran, the Arabian Oil Company (Japanese) in off-shore Saudi Arabia and Kuwait, the Ohio Oil Company, Amerada Petroleum Company, and Continental Oil Company, partners in Libya, among others, won concessions by awarding superior financial and participatory terms to the hosts. RDS, in 1960, joined Kuwait in the first MNOC–host partnership to develop an off-shore concession.[60]

More exacting financial terms, joint ventures, the receptivity of host

governments to independent and state oil company offers, the intensification of nationalistic rhetoric, the Iranian and Egyptian examples, the coalescence of LDCs into a loose anti-western bloc, thus formalizing the so-called north–south dichotomy, the willingness of anti-communist states to turn to the USSR for aid in an effort to apply leverage against the US. . . . How many signs were necessary to force recognition among the MNOCs that times had changed and to elicit a more balanced reply to LDC grievances?

The MNOCs, model capitalistic organizations, lacked the intellectual flexibility to evaluate external stimuli that controverted their simple-minded economic faith. People or institutions or nations that refused to maximize economic gain, that chose ideological goals over market goals, thus imperiling the beneficial results of MNOC investments, were incomprehensible to them. How else to explain their abrupt lowering of the posted price of oil in 1959 without consultation with either their home or host governments?

For the MNOCs, large surpluses of oil seeking market outlets required a price reduction. No matter that reduced posted prices lowered the revenues of producing state governments. No matter that this occurred just as the USA imposed mandatory import quotas. No matter that the Arab League (1945), seeking to politicize oil, had created in 1951 an Arab Oil Exporting Committee to foster Arab control over oil and the use of oil power against Israel. In 1959, the Arab League sponsored the first Arab Petroleum Congress in Cairo, with Iran and Venezuela in attendance. High on the agenda, and vigorously promoted by Venezuela, was the creation of a permanent oil-coordinating body. One year later, participants in a conference in Baghdad established OPEC.[61]

Conclusion

The West and Japan careered down the road of energy import dependency. For OECD-Europe and Japan in 1960, the percentage of net imports to TPER reached 35 and 40 percent, respectively, rising to 45 and 67 percent just five years later.[62] But the West, and particularly the USA, mesmerized by the cheapness of oil, ignored the rumblings of LDC producer states. Wilson poses a germane question: can oil (energy) issues be dichotomized into categories of foreign policy problems and domestic problems?[63] The USA did this by opting for oil import quotas. Europeans and Americans, MNOCs and governments, discounted the menace of thwarted nationalism throughout the Third World while neglecting to relate the anti-Zionist compulsion of Arab

states to the security of oil flow. Cold War warriors in the USA accused the Soviets of fomenting instability in LDC states, immediately labeling Mussadiq and Nasser as puppets of the USSR.

The price reductions of 1959 and 1960 reflected the great power of the MNOCs. But their ability to act unilaterally in production and price faced implacable challengers, both within the industry and without. Price reductions, notwithstanding, the MNOCs wielded less power in 1960 than in 1945. If the US government consciously depended upon American MNOCs to so manage affairs in producing areas that sources of supply remained secure, it was tied to an unreliable agent. A realignment of power had transpired, with OPEC a sign of the times. Some westerners sensed the drift and voiced warnings to a disinterested public. In Britain, an energy planning unit doubted the advisability of aggravating the nation's oil dependence upon producers that evidenced frightening instability. But this message emphasized new and reliable sources of oil rather then energy use diversification.[64] As a rule, only those with a particular stake in such forms of energy as coal or natural gas deplored the absence of diversification.[65]

Supply-siders ruled during the 1960s as they had in the past, exercising command from conference rooms in Washington, D.C., London, Amsterdam, and New York, and newly armed with the beguiling possibility of infinite energy through nuclear power. Oil in abundance existed. The optimism of supply-siders refused to accord any validity to either warnings of resource scarcity or of collective action by oil producers to withhold supplies.

Notes

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5

The owners of the world's petroleum resources

The Anglo-American oil treaty (1944–7) has been described as an initiative to devise a liberal (Painter's word) system of international control over Middle Eastern oil that would avoid debilitating competition and bring stability to the region. Of the manifold constituents of a liberal system, which I interpret as meaning a fair and just order, the indispensable principle would be full control over this resource by its owners. A liberal international agreement, then, should recognize the rights of ownership. Instead, the treaty validated concessionary contracts and the equal opportunity to acquire exploration and development rights. Nor did the treaty promise full producer state control over the industry in the future. In a vague provision, the treaty assured the safeguarding of producer economic interests.[1]

As it stood when finally rejected in 1947, the treaty offered little more to the producing states than they already possessed. It was not in the perceived interest of the USA or the UK to become parents of a liberal oil order. Nor did developing producer states concern themselves with consumer equity, the less so as most consumers were citizens of states considered hostile to the national goals of producer states. In the absence of a liberal settlement, the adversarial relationship between consumer interests, the MNOCs, and the producers smoldered after the Iranian crisis, flared momentarily in 1959–60, and then flamed uncontrollably by the end of the 1960s.

Violent confrontations during the 1950s in Iran, Egypt, and Syria and radical producer demands combined with the appearance of aggressive new players on the international oil stage to exert intense pressure on the MNOCs. Without warning, the MNOCs unilaterally lowered

posted prices in 1959–60. The uproar over that indiscreet act guaranteed escalated producer demands and further discord.

The forces emerging during the 1950s that, in combination, caused concern among the MNOCs gained momentum during the 1960s. What had been an irritation became a direct threat to MNOC concessionary authority. Extremely nationalistic and assertive new producers such as Libya and Algeria joined with older producers to challenge the concessionary status quo. Individual members of OPEC succeeded in wringing improved terms from the Big Eight firms (see Table 4.7), in part because of the willingness of numerous new international oil companies, such as the Oasis Group (Continental, Marathon, Amerada, and Shell) and Occidental, to offer terms to the host governments far superior to established concessionary agreements with the MNOCs. These and other newcomers sought markets just as the USA imposed import quotas and during a time of rising Soviet oil exports to the non-Communist world. Discounting and other price shaving tactics further alienated producer governments, particularly Venezuela.

The oil crisis of 1973 actually began in 1967 when yet another Arab–Israel war erupted. Between 1968 and 1972, producer demands, backed by potent oil power, emasculated MNOC control over oil. Buoyant western economies that gorged themselves on oil proved vulnerable to the application of producer state power. This chapter pivots on the intensifying confrontation between the MNOCs and members of OPEC; it reveals the evanescent quality of MNOC power.

Old and new sources of oil

During the 1960s, oil production was initiated in the United Arab Emirates (UAE, formed in 1971), Libya, and Nigeria while output from Algerian fields rose quickly (Table 4.6). Iran, Iraq, Saudi Arabia, and Kuwait achieved notable gains in production. By 1970, the above states contributed 39 percent of world oil production (47 percent of non-Communist production), compared with 24 percent in 1960. Simultaneously, Venezuela's global contribution declined by 6 percentage points, mirroring a decline in production growth rates first experienced during the 1950s. The US global share also fell, by 12 percentage points, even though total production rose by 37 percent. But US domestic output fell so far short of satisfying domestic demand that impressive production gains faded to insignificance compared with import requirements. US imports more than doubled from 1960 to 1972, rising from 91,000 metric tons (mt) daily to 237,000 mt daily. By 1970, US imports amounted to about one-half of domestic production. Furthermore, as

American oil demand rose, additions to reserves stagnated so that the reserve to production ratio fell from 12.8 in 1960 to 9.4 in 1969. Alaskan slope reserves reversed that decline only temporarily.[2]

International oil companies rushed into Libya, Algeria, the UAE states, and Nigeria while vast quantities of oil poured from the established fields of the older Persian Gulf producers. Each of the newer producers adopted different exploration and recovery policies. Libya consistently utilized the services of consortia. These consortia, some with a distinct Libyan interest, frequently joined independents with MNOCs. The only firms operating alone were Phillips, Amoco and the largest single concessionaire, Continental. Libya denied the MNOCs the degree of control over oil production that they possessed in older producing states. In Algeria, independent in 1962, the national firm, Sontrach, replaced the state companies of France as the principal operator. Until 1971, France received a significant portion of domestic demand from Algeria, but on more and more onerous terms. By 1973, Libya and Algeria had essentially cast off dependency upon the larger western oil firms.

For the most part, the UAE and Nigeria relied upon the MNOCs for all phases of oil development. A subsidiary of Iraq Petroleum Company controlled Abu Dhabi's oil industry. Led by an RDS–BP joint venture, each of the Big Eight except SONJ launched exploratory efforts in Nigeria. The location of Nigeria and Libya and the low sulfur content of their oil gained them ready access to markets in Europe and the USA.[3]

Soviet oil production roared ahead during the 1960s as enormous volumes poured from the Volga–Urals fields (Table 4.6 and Map 4.2). The fields located between Kazan in the north and Orensburg in the south accounted for some 70 percent of annual output, drawn chiefly from the Tatar Republic. Beginning in the late 1960s, the Soviets launched an intensive oil and gas exploration program in western Siberia. Proven reserves in those giant but remote fields rose by over fifteen times between the mid-1960s and 1975 while production rose from 31 million metric tons in 1970 to 148 mmt in 1975. By then, western Siberia contributed some 30 percent of total oil production and 81 percent of natural gas. Siberian oils yielded superior grades of gasoline, naphtha, and middle distillates.[4]

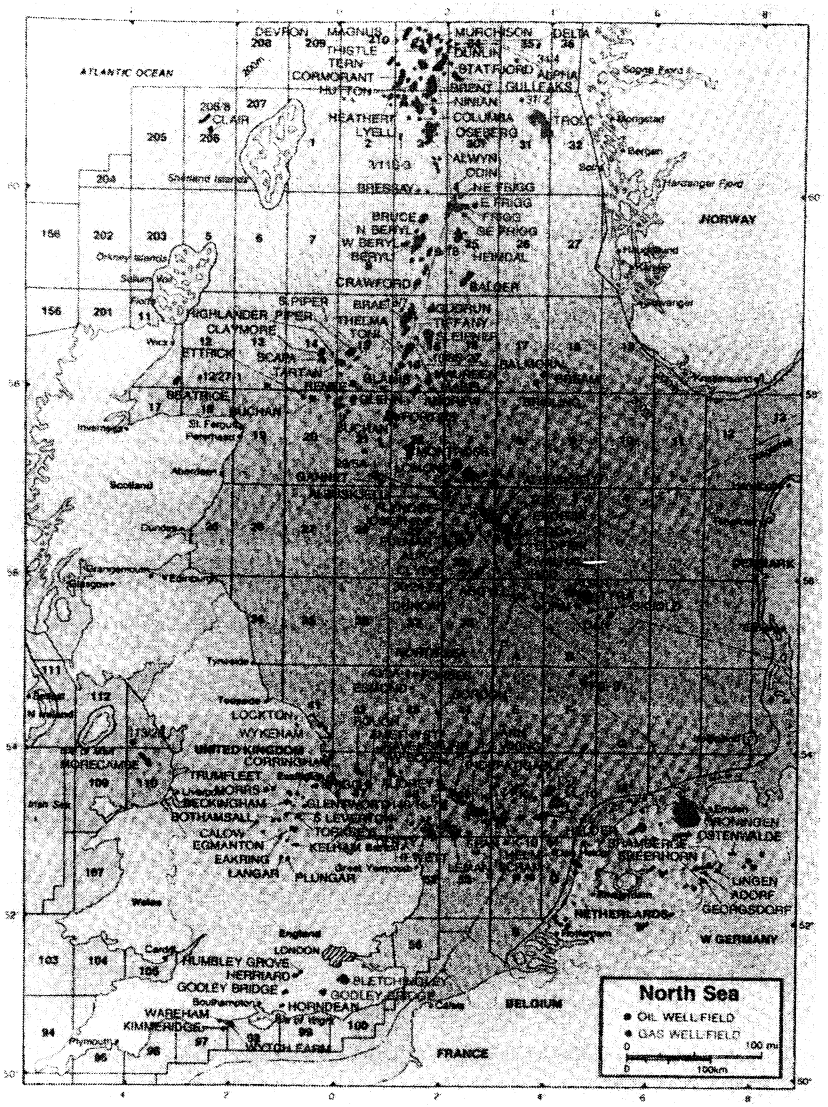
Vast natural gas reserves in western Siberia spurred the Soviets to search for markets in western Europe, an initiative arousing strong opposition from the Reagan administration in the early 1980s. The Soviets pressed forward with a massive pipeline construction program. While falling short of planned goals, the Soviets nonetheless built some 51,000 kilometers of oil and gas trunklines between the late 1960s and 1975. High on their list of priorities were lines from the giant gas fields of Urengoi to the borders of western Europe.[5]

Exploratory efforts in other parts of the world promised short-term benefits. Americans lavished attention on Alaskan fields, but as late as 1976 those distant pools yielded no more than 2 percent of US demand. Closer to the USA, investments in Canada by US firms escalated during the 1950s and garnered payoffs in the following decade, but profits there were by no means as lucrative as in Libya or the older producing states (Table 4.6). Exploration and discovery in Latin America fell afoul of the chameleon-like transformations of national policies toward MNOC investments. Peru's major firm, the International Petroleum Company (SONJ), harassed by the government, ceased drilling during the late 1950s. President Betancourt of Venezuela refused, in 1958, to grant new concessions which led directly to a sharp reduction in recoverable reserves and a level of production that actually fell during the 1970s. Notwithstanding Mexico's exploratory efforts during the 1950s and 1960s, the nation remained dependent upon foreign imports into the 1970s. Oil production in the western hemisphere, then, became ever more marginal to the international oil trade.[6]

In 1962, a number of oil companies initiated negotiations with the UK and Norway to obtain exploratory rights in the North Sea (Map 5.1). Between 1964 and 1972, Norway and Britain approved a number of contracts with various MNOCs, frequently operating in consortia, and reached agreement on partition of the North Sea with the Netherlands, Denmark and West Germany. Both Norway and Britain rejected traditional concessionary contracts, opting for terms that lodged control in the producing country. The licenses issued divided relatively small concessionary tracts among numerous MNOCs, the larger independents, and such state firms as France's Elf Acquitaine. Both states chose firms with successful exploratory records and financial resources capable of underwriting expensive operations.

Numerous oil and gas fields were discovered in the North Sea between 1965 and 1972. Among the joint venturers, Shell and Esso, Amoco and the UK Gas Council, Phillips and Petronord (Statoil, in 1972) led the way along with BP which operated independently. New discoveries by still other firms occurred after 1972. Natural gas production from the British sector commenced in 1967. Four years later, the Norwegian sector produced oil and gas. Oil from the British sector was first landed in 1975. The high risks assumed by these developers paid off in the mid-1970s as liftings rose just as prices ratcheted upward. Prior to the price revolution, Norway and Britain independently had decided to increase the participation of the state and/or national companies. In 1972, Norway created Statoil to manage its oil properties. Britain raised the participatory shares of British oil companies and, in 1976, created the British National Oil Corporation.

During these years, the early tentativeness evinced by the British and



Map 5.1 North Sea oil and gas fields. (*Source: World Oil*, August 1987, p. 51. Reprinted with permission.)

Norwegian governments toward the experienced international oil companies disappeared, replaced by a confident stance that more precisely defined the national interest in North Sea oil and compelled obedience from the licensees, numbering almost 150 by 1972. As Kuczynski points out, by 1972, Norway "had significantly hardened its terms for exploration and discovery," establishing a contractual system that assured Norway fair remuneration from foreign lessees for its oil. Britain's terms were more lenient until 1973, but did have the advantage of quickening development and securing a large British stake in future production. Compared with Norway, Britain had more interests to serve, including British oil companies and American firms with the expertise to open difficult fields. Also, by the time oil flowed from the North Sea, the concessionary terms had been amended in favor of the British government.[7]

Noreng argues that the early and risky decisions and agreements struck between the governments and the firms reflected a dynamic assessment of future oil demand and prices.[8] For my part, I would suggest that the firms, endowed with no particular power of foresight, experienced incredibly good luck, plunging into a physically treacherous but politically secure area during the late 1960s when oil prices hovered around $2 per barrel and, then, reaping a bonanza when unpredictable political events forced oil prices to spectacular levels in 1973 and thereafter.

Splendid natural gas discoveries thrust first the Dutch and then the British into the natural gas business. The Netherland's Groningen field and then North Sea fields in the Dutch, Norwegian, and British sectors supplied northern Europe. The Dutch rapidly converted to natural gas use, a course followed by Britain during the late 1970s, and completed arrangements for export of gas to Germany and elsewhere. By 1970, natural gas provided 33 percent of Dutch TPER while for OECD-Europe that proportion rose from 2 to 10 percent from 1960 to 1970. As with oil exploration and development, the North Sea gas lessors awarded production contracts to MNOCs working in partnership with agents of the host governments; the government owners also participated in transport and sales.[9]

The MNOC hegemony

As in the past, the MNOCs lifted, transported, refined, and marketed most of the oil moving internationally. While their shares declined somewhat as both government-owned and independent firms entered the business, as of 1972 the Big Seven (Table 4.7 minus CFP) still

produced 73 percent of non-Communist oil, refined 56 percent, and marketed 54 percent. State oil companies and independents enjoyed the largest share gains in refining and marketing but purchased a large portion of their crude from the MNOCs. American MNOCs controlled virtually all of Venezuela's oil. Aramco pumped, refined, and distributed just under 100 percent of Saudi oil. The Iranian Consortium shared the area with several NIOC–non-Consortium firms but the latter produced a mere trickle compared with the Consortium. Throughout the Persian Gulf and in Nigeria, the same results obtained. Only in Algeria, where an increasingly tenuous special relationship with France held, and in Libya, where first a traditional monarchy and then a radical revolutionary regime ruled, were the MNOCs denied concessionary hegemony.[10] The crude poor independents relied heavily on Libyan production to meet market requirements. In the mid-1960s, Libya shrewdly exploited this dependence.

World refinery capacity doubled between 1960 and 1970. Of a total increase in throughput of 1.3 bmt, the USSR and the USA added 18 and 13 percent respectively while western Europe added 39 percent and Japan 10 percent. The developed world, then, provided 80 percent of new refinery capacity during the decade. Although producing 39 percent of world oil, Middle Eastern capacity advanced by only 49 mmt. The Caribbean basin, including Venezuela, and South America added a capacity of 109 mmt, or 8 percent of the increase. By far the lion's share of Latin American and Middle Eastern capacity remained under MNOC control. The Iranian Consortium operated Abadan, Aramco owned Ras Tanura, and SONJ, RDS, SOCAL, and Texaco dominated the Latin American industry.

The ambitions of producing LDCs to raise their equity in downstream operations were frustrated. Into the late 1960s, the Big Eight controlled about 80 percent of Middle Eastern refining, a proportion technically reducible by the *de jure* ownership of Abadan by NIOC. In Latin America, new and old state companies carved out somewhat larger shares at the expense of the MNOCs. In Argentina, the Big Eight's share fell from 55 percent in 1955 to under 35 percent by 1970. In Venezuela, however, the share of SONJ and others remained above 95 percent until nationalization in 1975.[11]

A diminution of MNOC shares characterized production. From 1961 to 1971, the portion of state-owned and independent firms rose from 16 to 23 percent while the proven oil reserves of the MNOCs shrank from 92 percent to 67 percent of the total. Formerly, the MNOCs accounted for an overwhelming part of capital investment in foreign oil fields but that decreased from a 75 percent share in 1948 to 35 percent in 1970. Despite these share reductions, less than 20 percent of oil moving internationally during the late 1960s managed to bypass the MNOCs. However aggressively such independents as SOIND, Continental, Marathon, Occidental, or Getty battled for a niche in the industry, they were, more often than not, forced to seek either crude, refinery space and/or products, or transportation from the MNOCs.[12]

Developing pressures on world oil markets

Students of the world oil scene have chronicled during the 1950s and 1960s numerous shifts and turns that cumulatively eroded the dominance of the MNOCs. Maull observes an industry poised on the verge of restructuring by the late 1950s. He cites such catalysts as the intrusion of the independents in the Middle East, accelerated Soviet exports, the aggressive national policies of France, Italy, and Japan, the impact of US oil import quotas in stimulating competition in Europe, further discounting and rebating in the 1960s, and the formation of OPEC. Cowhey, Odell, and Mendershausen acknowledge such pressures while advancing their own priorities and dating significant restructuring to the late 1960s or early 1970s. Odell and Cowhey assign responsibility to the USA for this radical transformation and are of the opinion that the USA successfully defended its oil interests until the 1970s. Cowhey identifies the USA as the initiator and conservator of the postwar oil regime.[13]

These authorities weave masses of informative detail into their multifaceted tapestries. Painter's focus on US foreign oil policy complements the work of Cowhey and Odell but with an emphasis on the central role of the US oil industry in influencing that policy. Depicting an oil regime reflecting government–industry cooperation, Painter follows the older work by Nash. According to Painter, key areas of cooperation included control of Middle Eastern oil, containment of the Russians, and opposition to nationalization. Madelin, Tugenhadt and Hamilton, and Leeman note an earlier erosion of MNOC hegemony, essentially attributing this to the successful entry of state-owned and independent oil companies into Middle Eastern and other fields.[14] Invariably, these excellent studies highlight the same events and trends. Each provides a slightly different focus, no one of which offers a markedly different interpretation.

Competition for markets intensified during the 1960s, particularly in western Europe and Japan and in such developing countries as Argentina and Brazil. The immense American market for imported oil also beckoned to producers but access was somewhat limited by the oil import quotas of 1959. The West's unquenchable thirst for energy

conjured up an image of market forces at work that reflected reality only partially. In 1987, an article by Ernest J. Wilson, III, offered perceptive criticisms of various models of world oil markets that purported to explain the recent and radical structural changes.[15]

One such model, termed "neoclassical economic," is faulted for its indifference to all but market forces. A second construct, the regime model, directs attention to the key institutional and political players that establish the essential rules under which all participants engage. Cowhey, for example, casts the USA as the guarantor of the system into the 1960s. The regime model allows for the introduction of new players and for shifts in power among the participants. According to Wilson, Mendershausen and Noreng[16] have contributed studies that strengthen the regime approach. Penrose's study of the internal institutional needs of the MNOCs exhibits an affinity for the interpretive intent of the regime model.[17] Wilson objects to this model as ignoring "the chaos of the market" and as attributing excessive rationality and purpose to firms and governments.[18] A third model, labeled "policy/political" and associated with such authors as Quandt and Yergin,[19] seems very similar to the regime model with, perhaps, a heightened attention to the role of policy-making elites. It is criticized on the same grounds as the regime model.

Wilson offers his own interpretive framework, the "petro-political cycle," which appears to be an amalgam of the three discarded models.[20] It accommodates the interacting influences of markets, political pressures, and industrial organization within the context of a particular (temporal) demand–supply situation. In a period of rising market expectations, sellers gain an advantage and the politics will differ from periods of falling markets and expanding purchaser power. Buyers and sellers exact maximum advantages when the market turns in their favor. The moment of opportunity for the producers occurred in 1970–71 when Libya and Algeria rode a rising market and changed the rules of the game.

Wilson may attribute excessive significance to that "moment" in 1970–1. The presumed advantages derived from a seller's market that producers had much to do with creating and from a series of past political decisions reaching back to Mexican nationalization in the face of American and British opposition. During the 1950s, producer states persistently upped the ante in the battle for control over oil even though competition was minimal and prices stable. In seeking the causes of structural change, Wilson, Cowhey, and others attribute an aggressive and formative role to the West while assigning a far too passive role to the major producer states. Apposite here are the Six Day War (1967), the second closure of Suez, another partial Arab embargo (including the turning off of Aramco's Tapline), Qadhafi's seizure of power and the subsequent radicalization of Libyan oil policies, the onset of Vietnam-induced inflation in the USA, and the supine response of western governments and MNOCs to the incremental demands of the oil producers, notably Libya.

The producers marched to their own drumbeat. Neither prices nor western policies deterred them. A reduction in price in 1959–60 led to the formation of OPEC as a counterforce to the western core. True the producing states were not prepared, yet, to act in concert; each was locked into financial and technological dependency upon the MNOCs. But their ultimate objective, complete control over their oil with a downstream capability, was not hidden from view. Nationalistic aspirations could be temporarily deflected but not defeated. Anti-Zionism could not be moderated.

Prices remained low during the 1960s; little spot market oil sold at posted prices. The competitiveness of the 1960s was not a manifestation of a suddenly liberated free market but rather a consequence of government policies. Consumer governments in the USA, Europe, Japan, India, and elsewhere fostered high energy use at the cheapest price. Europe and India welcomed cheap Soviet oil while the USA maintained natural gas and electricity prices at low levels. The consumer governments evidenced no intention to develop policies that moderated oil import dependence. The producing states, increasingly incensed at what they perceived as an unfair return on their oil, intensified their pressure on the MNOCs. Led by Iran, Middle Eastern governments invited newcomers to participate in oil development. Libya, then, exploited the absence of oil company unity by establishing new terms by fiat rather than through negotiations. The MNOCs, without support from their governments could only bow to producer demands or pull out.

The initiative, then, began to shift to the producing states well before the critical Tripoli and Teheran negotiations of 1970–1. The well-chronicled impact of the newcomers—consuming state-owned companies and independents—furthered the interests of the producer states but did not dramatically lessen the hold of the MNOCs on Middle Eastern oil. Indeed, only in Libya did the newcomers, mostly American firms, account for a significant portion of the withdrawals. Of the leading US independents only Continental, Marathon, and Occidental (Oxy) in 1973 drew over one-half of their oil from outside the USA, with Oxy, the largest single producer in Libya, obtaining 97 percent of its oil from overseas. Oxy's Libyan withdrawals accounted for 20 percent of Libyan production in 1970. Oxy was especially vulnerable to a Libyan action that threatened a reduction in production. As the

largest Libyan producer, Oxy's exposed position may have weakened other producers.[21]

The importance of the state-owned companies has been somewhat inflated. Excepting the French firms in Algeria and CFP as a member of the Iranian Consortium, they produced miniscule amounts of oil compared even with the larger independents such as Continental. Only for a brief moment during the 1960s did French controlled Algerian oil satisfy a significant part of domestic demand. Italy's ENI obtained most of the its oil from the Libyan concessionaires and from the USSR. The Japanese met with continuous disappointment in pursuing a policy of disengagement from reliance on the MNOCs. By 1974, some 49 Japanese exploration and development companies were operating. From these efforts the Japanese received 13 percent of their total imports in 1965 and 8.5 percent in 1973.[22] The MNOCs ruled the roost. Only one adversary, the producing states, could tumble them from their perch.

Numerous studies have ascribed to the US oil import quotas an extraordinary influence on world oil markets in the 1960s. The following consequences are cited as typical:[23]

1. Quotas burdened US oil independents with surplus oil production from the Middle East (Leeman, Odell, Vietor).
2. This spurred intense competition for western European markets through price cutting and discounting (Longrigg, Odell, Tughenhadt and Hamilton).
3. The market shares of MNOCs were reduced while shares of independents expanded (Vietor).
4. These results antagonized Middle Eastern producers whose revenues were diminished due to price cutting (Al-Otaiba, Mikdashi, Odell, Vietor).
5. Quotas severely damaged Venezuela and precipitated retaliation (Barber, Coronel, Lieuwen, Odell, Rabe).
6. The above led directly to the formation of OPEC (Al-Otaiba).
7. Quotas conferred great price benefits upon western Europe and Japan (Blair, Hartshorn, Hoffman, Odell).
8. Conversely, quotas disadvantaged the USA in its economic competition with western Europe and Japan (Gisselquist, Blair).
9. The above prompted the USA to conspire with MNOCs and OPEC in the early 1970s to raise prices so as to disadvantage the industries of Japan and western Europe (Gisselquist, referred to in Park).
10. Quotas stimulated a Soviet export campaign in western Europe that triggered US anti-Soviet trade policies (Jentleson).

A book would be required to substantiate, qualify, or refute each point. My own view is that all of these assertions require at least modest qualification.

Competition for western European markets (points 1–3) by means of discounting, rebates, and other price shaving devices antedated the mandatory quotas. The unilateral cuts in posted prices of 1959–60 generated such consequences as modestly falling product prices before the quotas could have had an impact. By 1963 or so, the quotas might have reinforced these lower prices. Landed crude in the UK fell to the pre-Suez price in 1959. From 1959 to 1961, the price of crude imports to the UK declined by 10 percent. For the next four years, 1961–4, prices fell by 2 percent. Then, from 1964 to 1966, prices dropped by 12 percent, perhaps partly in response to an additional supply available as a result of the quotas. Landed crude prices to EEC countries displayed a similar pattern. But product prices in EEC nations from 1960 to 1967 did not manifest a pattern that suggests a strong quota influence.[24] Middle Eastern enmity toward the West evolved quite naturally well before the quotas (points 4–6). Neither OPEC, the organization spawned by the price cuts of 1959–60, nor producer disgruntlement over reduced revenues can be attributed to the quotas because posted prices were frozen during the 1960s. However, Venezuela did suffer a diminution of exports to the USA. The effects of the quotas on Venezuelan oil nationalism are unclear. Venezuela occupied an advanced position in the confrontation with the MNOCs (recall the 50:50 split and Betancourt's dedication to the founding of a producer's organization) before the US policy took effect. The quotas only added to the Venezuelan list of grievances against the MNOCs.

US imports from the Middle East continued to increase, as did on a far smaller scale imports of Canadian oil. Venezuela absorbed those losses. But Venezuelan oil cost much more than Middle Eastern oil. Moreover, Venezuela and the MNOCs were engaged in a vituperative controversy over the alleged neglect of the MNOCs to pay past taxes. That issue combined with a niggardly concessionary policy provoked the MNOCs to reduce exploratory efforts and hold production down. Between the two Suez crises, Venezuelan production rose by 21 percent compared with 164 percent in the Middle East.[25]

The quotas hardly staunched American imports. Crude and product import growth rates are shown on Table 5.1. The larger reductions in this chronology occurred in 1957–8 (the Suez Crisis), 1962–3, 1966–7 (Arab–Israel War and Nigerian Civil War), and 1969–70 (unilateral producer cutbacks in production, embargo by Middle Eastern producers, and continued impact of the Nigerian war). Imports

Table 5.1 Annual growth rates of US crude and product imports, 1955–70

	Crude imports annual growth rate %	5-year average %	Product import annual growth rate %	5-year average %
1955–6	20		8	
1956–7	9		10	
1957–8	−6	1.2	35	12.2
1958–9	1		9	
1959–60	6		−1	
1960–1	3		9	
1961–2	8		9	
1962–3	<1	3.8	5	9.6
1963–4	6		7	
1964–5	3		18	
1965–6	<1		10	
1966–7	−8		4	
1967–8	14	1.6	10	11.2
1968–9	9		13	
1969–70	−6		19	

Source: De Golyer and MacNaughton, *Twentieth Century Petroleum Statistics 1984*, Dallas, Texas: De Golyer and MacNaughton (1984), p. 51.

contributed to 18 percent of total US supply in 1959, 21 percent in 1965, and 26 percent in 1971, at which time domestic production peaked and went into decline. Between 1970 and 1976, US production dropped by 13 percent.[26]

As for the prices paid for oil by the USA and her economic competitors (points 7–8), it is not possible to detect any telling advantages for the latter. Crude and product prices declined after the Suez Crisis of 1957. The second Suez Crisis of 1967 jacked prices upward during the final two quarters of the year. In most European markets and in the USA, prices then fell moderately in 1968, thereafter holding steady until the first marked price increases in late 1970 and 1971. Those advances reflected the price agreements concluded at Tripoli and Teheran. Wholesale price indices for all goods closely paralleled those for oil. The landed price of crude oil in Europe exceeded that in Japan but neither price differed significantly from the wellhead price in the USA. During the years, 1962–6, the retail price per gallon of gasoline in Germany exceeded that in the USA by about two times while the French price was over three times higher. The wholesale price of heavy fuel oil in the USA averaged about $15 per barrel for the five years, 1962–6; in six major German cities, prices ranged from a low of $19 to a high of $31. Heavy government taxes in Europe accounted for a major part of

these differentials. It may be true that high cost producers in the USA were buffered from the competition of low cost producers by the quota system as well as by market demand prorationing. These programs may have somewhat inflated oil prices in America. But energy inputs accounted for only a tiny fraction of the cost of manufactured products.[27] Whatever competitive superiority Germany and Japan achieved over the USA during those years did not derive from lower oil costs.

Americans managed to inflate the threat from Soviet oil exports out of all proportion, consistently attributing the most devious motives to their enemy. Competitively priced Soviet oil did win a place in the Italian, Greek, Austrian, and Swedish markets and penetrated Japan and other markets as well. But the Soviets did not leap wildly into the disturbed markets of 1967–8. Soviet exports, at 51 mmt in 1963, rose in the following increments: 1963–4, 5.3 mmt; 1964–5, 7.8 mmt; 1965–6, 9.2 mmt; 1966–7, 5.4 mmt; 1967–8, 7.2 mmt; 1968–9, 4.6 mmt; 1969–70, 5 mmt. These steady advances reflected a gradually widening circle of buyers. But in 1970 OECD-Europe received only 6 percent of total oil imports from Russia. As for dumping, Soviet prices were not always the lowest nor her discounts the highest. To impute to the Soviets an oil policy of purposeful disruptiveness, as Levy does, is untenable, blithely ignoring the benefits to all non-Soviet bloc trading partners and the foreign exchange requirements of the USSR. In any event, Soviet oil exports owed little to US oil import quotas (point 10).[28] The ninth item on this list, a typical example of unproven, if not unprovable, conspiracy, flies in the face of extant evidence and clothes the conspirators with a skill in covert manipulative diplomacy worthy of John le Carré.

India during the 1960s managed to reduce the costs of oil imports by applying pressure on the MNOCs. Soviet oil was imported despite MNOC claims that contracts prohibited such imports. The nationally owned Indian Oil Corporation (1959) launched a refinery construction program that prompted the MNOCs to lower prices modestly.[29] Even a weak nation, with a small market and just commencing the tough journey toward economic development, could extract concessions from the powerful MNOCs.

The grievances of the producing LDCs

The so-called rules of the game, imposed by the West–MNOC coalition, were challenged and fractured well before 1969–73. The oil regime as depicted by Cowhey, or by Roncaglia who packages the MNOCs, producer governments, and major consuming governments

into a "trilateral oligopoly," is difficult to detect by the mid-1960s.[30] Encroachment on the domain of the rule-setters, manifest prior to World War II in Argentina, Bolivia, Mexico, and Spain, gained further ground after the war. The Venezuelan and Saudi Arabian profit sharing agreements represented notable infractions of the rules. So, too, did nationalization in Iran and the creation of NIOC, Brazil's establishment of Petrobras, and the formation of the Indian Oil Corporation, all achieved prior to the organization of OPEC. A well-conceived case against continued MNOC dominance braced these outbreaks of LDC nationalism.

Resource nationalism encompasses more than oil and reflects aspirations far transcending control over resources. The battle for control over oil, however, unleashed its most vigorous expressions. Lax, Maull, and Morse agree on the essential elements that comprise resource nationalism. They stress the enhanced risks to transnational firms and the danger to the national security of the industrial states explicit in the doctrine. For the LDCs, assertion of permanent sovereignty over resources accentuates three basic imperatives: to proclaim the integrity of the nation; to reverse the unfair terms of trade that the West defended; in other words to change the rules of the game; and to speed economic growth by employing the earnings gained by redistributing the take from resource exploitation. Lax views as unsavory the identification of foreign companies as agents of imperialism by the LDCs. He condemns the proclivity of LDC governments to use the firms as scapegoats to divert attention from domestic policy failures and/or political repression.[31] Deplorable though this may be in the abstract, it is a tactic with which developed democracies are familiar.

In drawing attention to Arab proclamations of full sovereignty over their oil wealth, Hurst clearly evokes Arab perceptions of the MNOCs as monopolistic agents of western imperialism. Latin Americans, according to Goodsell and Penrose, never doubted this claim and, as Fatemi demonstrates, the belief transfixed Iranians by 1950. These and other authors, particularly Mikdashi and Salazar-Corrillo, translate nationalist goals into more specific economic development objectives. As Mikdashi suggests relative to the Middle East, by 1960 the earlier demands of kings, shahs, or sheikhs for a larger cash income to distribute as they pleased had metamorphosed into a demand for income for development and to finance the eventual takeover of the oil industry. This requires some qualification: neither Cadillac sheikhs nor elites engorged with wealth disappeared; the military competed effectively for their share of oil revenues. Still, takeover or participatory arrangements that replaced the old concessions would endow the producing state with the authority to adjust production and price to the

dictates of the market, a point cogently made by Alnasrawi, Hartshorn, and others. The massive outward flow of oil income to the MNOC-consuming states would be much reduced, with the producers retaining the bulk of the earnings.[32] How producing states employed this augmented income is a separate question from that of their right to that income.

Oil income and LDC economic growth

The leading non-industrial oil exporting countries were essentially single-crop economies, oil constituting by far the largest, if not the only, export. The economy of each nation rested firmly on the value of oil export earnings. As of 1970, for the nations included in Table 5.2, petroleum exports comprised in excess of 90 percent of the value of all exports, except in Nigeria where it accounted for 58 percent but would rise to 93 percent by 1974. Oil was virtually the only export of Saudi Arabia and Libya.

That portion of the export value retained by the producing states as economic rent consisted of payments from the MNOCs in the form of royalties, taxes, and profit sharing. At first royalties were calculated on the basis of a sum per barrel of production, then as a percentage of the value of gross sales, and, increasingly after 1960, as a percentage of the volume sold multiplied by the posted price. Tax rates rose steadily and a profit sharing breakthrough occurred when Venezuela gained a 50:50 split in 1948, a division that producing countries inexorably widened in their favor in subsequent years. This income formed an ever larger share of producer government revenue during the 1950s and 1960s (Table 5.2). For Venezuela, the share never dipped below 50 percent after 1956 and ranged between 65 and 70 percent during the 1960s. In Iran, the portion reached 87 percent in 1971, an advance from 30 percent in 1960. Kuwait's revenues from oil exceeded 95 percent of total revenues in 1954 while Saudi Arabia's oil revenues contributed 75 percent of total revenue in 1953 and over 85 percent by 1972.

Table 5.2 summarizes the substantial revenue gains attained by the leading OPEC states from 1956 to 1972 and the phenomenal addition after 1973. In each nation a greater share of the total value of exports remained at home. For the seven countries listed the proportion of revenues to total export value rose steeply: 33 percent in 1961; 49 percent in 1970; 60 percent in 1972; and 73 percent in 1974. The ability of the producing governments to recapture an ever greater share of the value of oil exports attests to the radical tilt of the balance of oil power in favor of the producers.[33]

Table 5.2 Producing country oil revenues and value of exports in parentheses, 1958–75 ($ million)

	1956	1961	1965	1970	1972	1975
Iran*	98	291 (900)	514	1109 (2600)	2396	17821 (21600)
Iraq*	169	265 (500)	368	521 (800)	575	5700 (5600)
Kuwait*	194	461 (1000)	598	820 (1700)	1403	6542 (9900)
Saudi Arabia*	362	378 (1000)	664	1214 (2400)	2745	22575 (31200)
Libya	<1	3 (na)	351	1351 (2800)	1563	5999 (7100)
Venezuela*	na	843 (2200)	1097	1378 (2600)	1902	9270 (11100)
Nigeria		19 (na)	36	247 (1200)	1117	6654 (9900)
Total above	843	2439 (7500)	3906	7526 (15458)	13673	87197 (119400)

* Founding members of OPEC in 1960

Sources: G. Lenczowski, *Oil and State in the Middle East*, Ithaca, N.Y.: Cornell University Press (1960), pp. 37–9; A. Al-Sowayegh, *Arab Petropolitics*, London: Croom Helm (1984), p. 47; J.W. Mullen, *Energy in Latin America: The Historical Record*, Santiago de Chile: CEPAL (1978), p. 40; A. Alnasrawi, *OPEC in a Changing World Economy*, Baltimore: Johns Hopkins University Press (1985), p. 108.

The producing governments, then, depended to an extraordinary degree on the revenues and foreign exchange earnings from oil sales. However, they were not alike in their revenue requirements. Saudi Arabia and Kuwait, with small populations and no resources other than oil, possessed much less capital absorptive capacity than Venezuela or Iran. The latter two, while quite different, ambitiously embarked upon costly modernization programs that required more capital than oil earnings provided. Iraq, Syria, and Libya, with considerably less economic potential than Iran or Algeria, espoused a radical brand of anti-Zionism. Iraq and Syria, as front line states, required huge sums for military purposes. Colonel Qadhafi of Libya also planned expensive adventures supported by a costly armaments program. Iran's hegemonic ambitions in the Persian Gulf and its role as a US surrogate against Soviet aggression encouraged the Shah to create a massive war machine while simultaneously launching a gigantic economic modernization effort. Both objectives were to be funded from oil revenues. In Iran, Iraq, Syria, and Libya, political goals based on military power increased the capacity to absorb capital far above the investment required for economic development.

The so-called low absorbers, too, sought to maximize income prior to the price and revenue explosion of 1973. The direct investments of MNOCs and other oil companies were but a fraction of the total foreign investments of the industrialized states. Earnings from oil investments as a share of all foreign investment earnings were substantially greater than oil investments as a proportion of total foreign investments. The direct investments of OECD members in the Middle East accounted for 9 to 10 percent of the OECD total in 1967 and in 1973. While the Middle East received between 10 and 15 percent of US investments in foreign oil, the region contributed one-third of all foreign investment earnings. US investments in Latin America dropped off sharply as a proportion of global investments. Venezuela, in particular, felt the pinch. MNOCs retaliated against Venezuelan tax and concessionary policies by reducing investments in exploration just as the initial impact of the US import quotas was being recorded.[34]

The West and the MNOCs were investing elsewhere, were disinterested in financing producer state projects, and were positively hostile toward the emergence of downstream capabilities among the producers. To raise oil income by revising concessionary agreements, increasing tax rates, tying royalties and profit sharing to posted prices, and opting for nationalization would resolve, producers argued, foreign exchange and indebtedness difficulties and would provide funding for defense and development. Many of the producer states, however, were sorely disappointed during the 1960s in their efforts to transform the oil industry into the leading sector of industrial growth.

The challenge was to stimulate growth in other economic sectors through the direct investment of oil incomes. Obviously, the circumstances of individual countries dramatically affected performance. Algeria, independent in 1962, determined to force oil revenues to serve national development. Through Sonatrach, Algeria controlled all oil operations. Algeria received substantial aid from the USA but the critical factor was the annual investment of a large part—over 30 percent—of oil earnings in natural gas pipelines and liquefication plants, petrochemicals, refining, light industry, and infrastructure. By the early 1970s, Algeria's import substitution tactics were progressing rapidly and would, or so planners believed, reduce dependence upon oil earnings and provide a firm economic base when the nation's relatively small oil reserves were depleted.

On a far larger scale, Iran moved along a parallel path, but one which tied her very closely to the strategic interests of the USA in the Middle East. Prior to 1973, inadequate revenues and a political structure that, in effect, rested on personal rule constrained both modernization and militarization. NIOC did improve forward and backward linkages to the national economy. Iran ranked as among the more assertive states in demanding a larger share of oil earnings, a posture exaggerated with the price ratcheting of 1973, and after, when Iran always supported prices that maximized oil revenues. Enormous revenues after 1973 fed the Shah's ambitions and the combined costs of economic modernization and militarization escalated wildly. The value of Iranian arms imports from the USA, under $500 million annually prior to 1973, climbed to $1 billion by 1975 and peaked at almost $4.5 billion in 1977. Iran's dependence upon oil earnings intensified. Unlike Algeria, Iran lacked the ability to employ import substitution to save foreign exchange. Virtually all oil industry and other equipment was imported, along with military hardware. These huge imports necessitated substantial borrowing with oil earnings serving as collateral, thus binding Iran ever more tightly to oil. Modernization's psychological shocks spawned increasing political dissent and threatening socio-economic factionalism, neither of which the Shah accepted passively.[35]

Both Iran and Algeria owned and operated their oil and gas industries, and during the 1960s they implemented policies to improve their share of downstream activities, aiming at independent sales of both crude and products and, in Algeria's case, liquefied natural gas. Nigeria and Venezuela had not nationalized their oil industries. While they expanded oil revenues by imposing more exacting terms on the MNOCs, the linkages between oil and the economy remained more tenuous than in Algeria or Iran. Nigeria's colonial experience left behind a small commercial agricultural sector, a vast multitude of subsistence farmers,

and very few trained and technologically sophisticated people. Tribalism and deep-rooted cultural differences between the north and the south led to the Biafran rebellion against the central government in 1967, a tragedy that took many lives and severely stunted economic and oil industry growth. Nigeria had no option but to turn over the oil industry to the MNOCs, albeit on terms more and more advantageous to the government.

Prior to the Biafran conflict, Nigerian authorities committed the nation to rapid economic growth financed by oil revenues. But no miracle occurred then, or after Biafra. *Per capita* GDP and *per capita* energy consumption in Nigeria remained very low (see Table 8.7, p. 300). As late as 1982, non-commercial fuels provided 71 percent of TPER. Connections failed to evolve between the economy and oil revenues that rose by thirteen times between 1961 and 1970 (Table 5.2). The absence of a large consumer market frustrated the implementation of import substitution policies. A developmental focus on large-scale industrial and urban projects obstructed the emergence of economic self-reliance. Lagos, Port Harcourt, and Bonny, for instance, benefited from investments in infrastructure and petrochemicals while the rural–agricultural sector suffered from egregious neglect. True, Nigeria had just gained its independence. Much more time was required. But time alone would not suffice. Balanced political and economic policies were required before oil wealth could be transformed into broadly shared national wealth.[36]

Venezuela, with a more advanced economy, a far less volatile society, and long experience with oil, worked no magic in turning oil income into balanced economic growth. An in-depth analysis of petroleum's contribution to Venezuelan economic development by Salazaar-Carrillo argues that from 1945 to 1973 revenue from oil exports spurred growth in other economic sectors through the creation of a modern infrastructure. Missing from this economic evaluation is attention to such critical political and social factors as the shifts between dictatorial and democratic governments that happened between 1947 and 1958, Venezuelan–MNOC relationships, economic nationalism, oil market weaknesses, and slackening oil exploration during the 1960s.

Rabe portrays Venezuela as a petroleum factory during the 1950s, controlled politically by the Jiminez dictatorship and economically by the MNOCs favored by Jiminez. Venezuela entered and emerged from the 1960s a very poor country. Betancourt's democratic government did confront the MNOCs over taxes and concessions but this resulted in diminished MNOC investments just as US import quotas and cheaper Middle Eastern oil undermined Venezuela's market position. Petroleum induced growth rained benefits upon economic sectors—steel and

urban electric services—that meant little to the vast majority of the population. Agriculture received minimal notice from the developers. Rural migrants fled to the cities from stagnating rural areas. By the 1970s, with one-third of the population in Caracas, the nation was 75 percent urban. But wages remained very low and urban employment absorbed but a small portion of the new city dwellers. Urban elites emulated the lifestyles of the affluent in New York and Paris. To the extent that such populous LDC producers as Nigeria, Venezuela, and Indonesia neglected agricultural development and emphasized industrial development over the construction of a basic national infrastructure, to that extent oil wealth was misused. The mistaken belief that a solid industrial structure could be quickly developed produced an exacerbated maldistribution of income and created festering concentrations of urban poor and deepening rural poverty.[37]

For the producing nations, expansion into downstream operations promised a means of retaining a larger share of oil earnings while cashing in on the rising market of the 1960s. As noted earlier, however, the industrialized nations accounted for the greater part of new refining construction during the 1960s. In Latin America, for example, oil refining capacity more than doubled from 1954 to 1970, with Argentina and Venezuela responsible for most of the increase, but as a percentage of world capacity the region's share fell from 6 to 5 percent. Moreover, outside of Mexico and Argentina, MNOCs operated the refineries. In Iran, nationally owned refineries supplied only the domestic market. A Kuwait plan to foster downstream capabilities with the cooperation of the Kuwait Oil Co. (BP–Gulf) was rebuffed by the latter. Kuwait proceeded on its own; the Kuwait National Petroleum Co. (1960) opened its first refinery in 1968. During the 1960s, the MNOCs had every reason to discourage producer entry into downstream activities. MNOC power flowed from their command over necessary technologies. World Bank policies aided and abetted the MNOCs by refusing credits for oil and gas development and by denying funding to nationally owned ventures.[38]

More forceful producer government policies toward the MNOCs and more purposeful development strategies were imperative if producer economies were to improve. Nigeria advanced a step with the Petroleum Decrees of 1969 which mandated a great increase in the employment and training of Nigerians in managerial and technical jobs. But during the 1960s, a thin strand bound large oil sectors to national economies. Oil wealth was well-integrated in the economies of the industrialized states, but in the producer states that wealth generated little sound economic progress. In Indonesia, the successive dictatorships of Sukarno and Suharto turned Pertamina into a fief, unconnected with

the economy. As in Nigeria and Venezuela, Indonesia's oil and other resources favored a few, widening already gross income disparities. The government ignored most farmers and encouraged the start-up of inefficient heavy industries. Clearly, the MNOCs were but one obstacle to LDC advancement. LDC political instability, corruption, and embedded structural inequity proved more intractable, seemingly impervious to remedy, than powerful foreign corporations.[39]

The transfer of oil power to host governments

The structure of the international oil industry underwent striking transformations during the 1960s. In the face of unrelenting pressure, the MNOCs, by 1972, were stripped of their hegemonic authority over production and price. Leeman, in 1962, accurately predicted the steady movement toward nationalization by Arab producers.[40] Each host cleared its own path and not all chose immediate or total nationalization. Each state did compel the abandonment of the old concessionary system. The vaunted solidarity of the MNOCs, manifest in their stand against Iranian nationalization, crumbled like an empty wasp's nest.

Such was the success of the producers that Sheikh Yamani, Saudi Arabia's oil minister, observed in 1971 that "the role being played by the oil companies is now properly that of purchaser, refiner, and provider of technology."[41] Of the major producers, the states of the Arabian Peninsula viewed total nationalization as a step to be taken very cautiously. Saudi Arabia and Kuwait felt no immediate need to threaten their MNOC-operated consortia with expropriation. Venezuela eschewed nationalization until 1975 largely because of the lack of sufficient capital to undertake independent exploration and development. In impoverished and populous Nigeria, the government also approached nationalization warily until the second price shock of 1978–9 precipitated a flurry of expropriations. Algeria, Libya, Iraq, Peru, Bolivia, and Indonesia all nationalized, at least partly, prior to 1973.

Nationalization represented the final step in asserting full producer sovereignty over their valuable resource. But whether taken or not, the host states effectively diluted MNOC control by first winning a larger than 50:50 share of the profits from concessions and then by upgrading their role from lessor to that of full partner in the working of established concessions. Saudi Arabia achieved this in 1959 when it seated two nationals on Aramco's board of directors and participated, as did Kuwait, in the management of the Japanese-owned Arabian Oil Co. Iran's NIOC negotiated similar arrangements with ENI and SOIND. New concessions of the traditional type were offered less and less frequently.

Table 5.3 Producing government national companies

Argentina	Yacimentos Petroliferos Fiscales	1922
Peru	Empresa Petrolera Fiscal	1934
Bolivia	Yacimentos Petroliferos Fiscales Bolivianos	1936
Mexico	Petroleos Mexicanos	1938
Colombia	Empresa Colombiana de Petroleos	1951
Brazil	Petroleo Brasileiro	1953
Iran	National Iranian Oil Company	1954
Kuwait	Kuwait National Petroleum Company	1960
Venezuela	Corporación Venezolana del Petroleo	1960
Saudi Arabia	Petromin	1962
Algeria	Sonatrach	1963
Iraq	Iraq National Oil Company	1965
Indonesia	Pertimina	1965
Libya	Libyan National Oil Company	1969
Nigeria	Nigerian National Oil Company	1971

Sources: H. Madelin, *Oil and Politics*, translated by M. Totman, Farnborough: Saxon House (1975), pp. 16–17; A. Al-Sowayegh, *Arab Petropolitics*, London: Croom Helm (1984), p. 42.

The new contracts also designated a date for the relinquishment of concessions to the host government. Most dramatically, in 1961 Iraq wrested from IPC 99 percent of the concessionary area. Quietly, Qatar and Kuwait reclaimed one-third and one-half, respectively, of their concessionary areas in the same year. Libya's contracts with oil companies contained relinquishment provisions as did virtually all Middle Eastern contracts by 1973.[42]

In a striking departure from the norm, several host states replaced old style concessions with joint-venture contracts between the producer's national oil company (Table 5.3) and foreign firms in which the former shared fully in management and profits while the foreigners provided most of the capital and technology. In contracts of this type negotiated by the state companies of Algeria, Libya, and Nigeria, the foreign firms held equal rights of ownership. The terms of these cooperative enterprises were considerably less favorable to the oil companies than the joint-venture arrangements pioneered by Iran in 1957 and 1958. The new versions bound the producer governments for a shorter period of time, tied royalty payments and other bonuses to actual production, and linked all payments to posted prices. Contracts frequently bound the foreign partners to purchase at posted prices all of the host's share of production. Such buy-back provisions were necessary only until the producer governments developed their own marketing networks.[43]

Participation in the management of older concessions and joint-ventures in the development of new fields were not considered as permanent alternatives to nationalization. Such contracts normally vested the foreign firms with property rights in the oil fields. Second, even

though the hosts shared in management decisions, the MNOCs retained control over the introduction and operation of technologies and, thus, over most production decisions. Also, the hosts as yet lacked refining, transportation, and marketing facilities and expertise. The oil had to be sold and only the MNOCs possessed worldwide distribution networks. Still, joint venture operations emerged as a favored form of participation. These arrangements promised full sharing of information between the expert—the firm—and the learner—the host government—minimizing the likelihood that the less competent partner would be exploited. Gradually, participation and the initiation of direct government-to-government sales diminished historical MNOC advantages.

Iran and Indonesia, among the major producers, and Brazil, Latin America's third largest producer and largest oil market, adopted policies that further attenuated the MNOC role. Brazil's Petrobras, formed in 1953, was a well-capitalized and financially independent firm that monopolized all phases of the oil industry. While Petrobras's production fell far short of meeting national demand, its record was impressive, advancing from a mere 127,000 metric tons in 1953 to 8.3 million metric tons in 1970. Refining profits financed exploration and paid for a large tanker fleet. The firm's refining capacity substantially reduced oil product imports. Unfortunately, production in Brazil leveled-off during the 1970s just as prices soared. Trade imbalances and debts plagued the nation into the 1980s. As of 1973, however, Brazil had successfully consolidated its control over the national oil industry.[44]

Total nationalization threatened negative consequences, among which were the flight of the larger firms and their expertise and technology. Reasonable contractual commitments led to retention of the MNOCs without vesting in them any property rights. Iran and Indonesia pioneered contractual arrangements that avoided the disadvantages of total nationalization without diminishing national authority.

Into the 1960s, Caltex (SOCAL and Texaco) and RDS controlled 90 percent of Indonesian oil production. In 1963, the MNOCs rejected Indonesian demands that the split in profits be raised to something above the 60:40 division agreeable to the companies. In 1965, the state seized British and American oil properties. RDS sold out to Indonesia which created Pertimina as an integrated state company. Caltex hung on, but no longer as an autonomous operator. Pertimina assumed full legal control over all operations. To retain Caltex and to attract other foreign firms, Pertimina then negotiated a series of contracts with Caltex, Japanese, French, and Italian firms, and with several American independents.

Caltex, the leading producer and responsible for at least one-half of

production, functioned under a work (service) contract. The firm provided all the financing and technology for exploration and development and received about 60 percent of all production as reimbursement for expenses and as buy-back oil. Pertimina received title to all production equipment. Management was legally vested in Pertimina but, recognizing its lack of expertise, the firm rarely exercised that prerogative. The service contract framework persisted into the 1980s, although by then Pertimina's share had risen to 85 percent, a division still considered advantageous to the foreign firms.[45]

Iran and other producers utilized variations of the Indonesian model. Iran often required guaranteed loans to finance further exploration by NIOC. In a 1966 contract with ERAP, Iran received 90 percent of all profits. Gradually, joint-ventures with various foreign firms were transformed into service contracts. In Iran's case, the service contracts covered a much smaller proportion of national production than in Indonesia. Consortium wells yielded 93 percent of Iran's oil in 1973. Using the leverage of the work contracts, improved terms were pried from the Consortium. Venezuela, too, through its Corporacion Venezolana del Petroleo (CVP; Petroven since 1975) concluded long-term service contracts with foreign firms to work the national oil reserves. CVP, however, did not develop a strong national presence. Prior to 1975, the year in which Venezuela nationalized oil, the MNOCs dominated the industry.[46]

Work contracts endowed state firms with flexibility in managing their oil domain without relinquishing any rights. Complementary to nationalization, these arrangements turned the oil companies into hired hands. Joint-venture operations required mixed management. A service contract might stipulate foreign management but on terms that suited the employer. Service contract incentives could be frequently changed. They might even provide for sales that bypassed the MNOC networks, as was the case in a sales contract negotiated in 1965 between Pertimina and Japan's Far East Trading Company, endowed with the exclusive right to import Indonesian oil. By then, Japan was committed to a ten year investment program in North Sumatra from which Japan would receive 40 percent of withdrawals.[47] For the LDC producer, work contracts kept an avenue clear for foreign capital and expertise, regularized relationships with large oil companies or government agencies, commonly stipulated a training program for LDC personnel, and could embrace any or all phases of operations. Once the LDC firms developed marketing strengths, the old style arrangements with the MNOCs were doomed. Direct sales between Indonesia and Japan presaged the future.

Algeria, Iraq, Libya, and Peru nationalized their oil industries prior to 1973. In each case a successful revolution had replaced an old regime

during the 1960s. The new governments quickly struck at the vulnerable concessionary companies. Algeria followed its own development rhythms in expropriating French and other firms between 1967 and 1971. Rapid improvement in Sonatrach's proficiency, Algeria's less intense dependence upon oil earnings, and a potentially valuable foreign trade in natural gas offered some economic justification for nationalization at that time.[48]

Iraq and Peru were veterans of oil wars against a single large concessionaire. When Iraq, in 1972, decided to nationalize a portion of IPC, consortium members imposed a boycott against Iraqi oil and drastically reduced production. This, in addition to antagonism toward US support of Israel in the Yom Kippur War of 1973, led to the expropriation of Exxon and Mobil, both partners in IPC, and the effective termination of the consortium.[49] Peruvian politics rather than economics explains the nationalization of SONJ's subsidiary in 1968–9. As part of a campaign to drive foreign businesses from the country, Peru, in a series of acts, struck at the USA and at multinational enterprise while simultaneously broadcasting its independence from foreign control. Pinelo claims that Peruvian self-assertiveness reflected political maturity and the ability to confront injustice, an astounding conclusion. He offers no evidence, nor does Goodsell, that the International Petroleum Company during the 1960s acted as an agent of imperialism or was other than a model employer. The company had long been the political football of the ruling elites that struggled for power in Peru. These wealthy factions had oppressed and exploited the Peruvian people. Nationalization represented nothing more than elite manipulation of anti-foreign sentiments for their own ends. With one of the lowest *per capita* incomes and one of the highest infant mortality rates in South America during the 1970s and 1980s, it appears that Peruvian nationalization spread few benefits among the impoverished population.[50]

In Libya, piecemeal nationalization between 1971 and 1973 garnered few economic benefits that had not already been won by forcing price increases and favorable joint-venture agreements. Nationalization, however, conformed to the dictates of Colonel Qadhafi's eccentric socialist ideas, served anti-Zionist purposes, and enhanced his Pan-Arab reputation. Of the above four nations, only Algeria developed persuasive arguments for nationalization. But, of course, nationalism, wherever expressed, derives little sustenance from logic.

The role of OPEC

Participation in the operation of older concessions and joint ventures and service contracts negotiated by national companies with foreign

firms endowed the hosts with the power to influence the rate of production. While identifying nationalization as the ultimate means of controlling withdrawals, most approached that first step with caution. Libya, in 1971–2, erased the power of the oil companies to fix production rates, but the MNOCs remained entrenched in Iran, the Arabian Peninsula, and Venezuela where they lifted 90 percent of the oil in 1970.

Concurrently with the enhancement of their managerial role, the producers desired to establish the price they received for oil. By the mid-1960s, producer state demands reflected their belief that demand in the West warranted both augmented production and higher crude prices. In pressing relentlessly for both after 1965, the producers benefited from the activities of OPEC. As the most influential voice of producer opinion, OPEC's policy formulations, its consistency, and its organizational competence added substantially to its reputation during the 1960s.

OPEC,* however, did not set policy; individual states did. In its armory, OPEC stockpiled only the weapon of moral suasion. The action of separate states squeezed price hikes from the transnational firms. OPEC emerged as choreographer only in 1970–2. Representing a diverse constituency including non-Arab LDC producers, OPEC's survival required non-entanglement in the Arab–Israel vendetta. The establishment of the Organization of Arab Petroleum Exporting Countries in 1968 provided a vehicle to carry the war to Israel and its supporters. OPEC concentrated on price, production, and management.[51]

Although OPEC achieved an immediate victory in forestalling the further lowering of posted prices after 1960, the organization experienced but modest success until 1970–1. For example, it viewed overproduction as a threat to price stability, but proved unable to generate a consensus in favor of production quotas among members whose revenue needs and proven reserves varied widely. This issue was dropped—for a time. With regard to the price issue, while OPEC contributed strong advocacy, Libya and Algeria, the leading risk-takers after 1965, served as the shock troops. OPEC did intrude forcefully in the Libyan–oil company dispute of 1966 when its members agreed to deny new concessions to operators who refused to accept Libyan terms.

On a very practical level, OPEC developed acceptable positions on income tax rates and the use of posted prices for the payment of taxes,

* Saudi Arabia, Iran, Venezuela, Iraq, and Kuwait in 1960 and Qatar (1961), Libya (1962), Indonesia (1962), UAE (1967), Algeria (1969), Nigeria (1971), Ecuador (1973), Gabon (1975).

the expensing of royalties, and on revenue security in general. It agitated among its members for renegotiation of all revenue-related issues, particularly income tax rates, capitalizing upon the imposition of 60 percent tax rates by Venezuela and Indonesia during the 1960s. Similarly, in 1968, OPEC orchestrated demands for expanded producer participation, already achieved by Iran, Indonesia, and other members.

OPEC's "Declaratory Statement of Petroleum Policy" of 1968 codified its price policies, leaving no doubt as to its objectives. Pointedly, the declaration asserted the right of producer governments to determine the posted (tax reference) price. Reflecting a sensitivity to the erosive impact of inflation on government revenues, OPEC further demanded that the posted price be indexed against the value of imported goods and services. Indexing never became common. Rising spot market prices after 1973 and again after 1978 minimized the advantages of this technique, as did the moderate inflation experienced by the developed countries during the later 1980s. In addition, the statement called for the general extension of producer government control over petroleum policies, for relinquishment, and for expanded participation in established concessions.

The members of OPEC through collective and individual initiatives improved their revenue security after 1960. Demonstrating a sound understanding of political realities, OPEC abandoned discussions of prorationing while pressing ahead on issues conducive to consensus building. Members adopted OPEC's decisions voluntarily, applying them at the opportune moment. Lacking power over price and production, OPEC did not act as a cartel before 1973. The organization did establish itself firmly as the voice of the producers. Trailing in the wake of members during most of the 1960s, OPEC's pronouncement of 1968 strongly influenced the pivotal negotiations at Tripoli and Teheran in 1970–1. OPEC's strategy, fleshed out by Libya and Saudi Arabia, of turning the oil firms against one another and of separating price talks about North African oil from discussions of Persian Gulf prices succeeded spectacularly. In late 1973, the moment arrived to demonstrate producer power now lodged in OPEC.[52]

The producer drive toward full control

A series of strikes against the MNOCs beginning in 1966 undermined the foundations of MNOC power and subverted their will to resist producer demands. The host governments, especially in the Middle East, exploited these openings, playing one firm against another, threatening all with closure, escalating demands for larger shares of profits,

stiffening the terms of service contracts, and colluding in OPEC. Were not the producers nearing a conjunction capable of propelling the incremental process of industry restructuring into a wholly new phase? Producer spokespersons and OPEC did not hide their objectives: total producer power.

A Libyan law of 1965 provided that the assessment of income taxes on oil profits be calculated on the basis of posted prices regardless of the actual price realized on the oil sold. At that time twenty-four companies worked Libyan concessions. SONJ, one of the largest producers, readily agreed to conform to the law but the Oasis group balked. Oasis and other independents lacked international marketing networks and were forced to sell their Libyan oil at discounted prices. Libya had absorbed the discounts as reduced income. To compel acquiescence, Libya's monarchy threatened to halt all exports; the firms gave in.

Hartshorn ascribes pivotal influence to this confrontation. For the first time since the Iranian Revolution, a producer broke a contract. By coercing some companies to accept terms agreed to by other companies, the custom of renegotiation of contracts was abandoned. Alterations in terms were now achievable by command. The fragility of the producing company position was apparent to all. Nor did the hard terms deter a continuing scramble for new concessions in Libya: thirty-seven concessionaires operated in 1968 with an output—150 mmt—only slightly inferior to that of Iran and Saudi Arabia.[53]

Libya exerted pressure on the MNOCs just as an invigorated sellers market emerged and just prior to renewed warfare between Israel and the Arabs. By 1970, World TPER exceeded that of 1961 by 62 percent, reflecting an absolute increase equivalent to total TPER in 1950 (Table 4.1). While the demand for oil in the industrialized nations rose steadily during the years, 1960–5, demand increased even more sharply between 1965 and 1970. Refined product requirements in the USA, OECD-Europe, and Japan advanced by 300 mmt from 1960 to 1965 and by over 500 mmt from 1965 to 1970.[54] For the years, 1960–70, the West accounted for 68 percent of the global increase in demand for refined products.

Less dramatic but no less crucial than the Six-Day War of 1967 was the declining value of the US dollar, the currency used to fix oil prices and, therefore, to determine the value of producer government revenues. Into the late 1980s, the American dollar continued to weaken. The nation's falling dollar fostered the deterioration of its foreign trade account and stimulated the sale of American assets to foreign owners and the flight of American manufacturing capacity to lower cost industrializing nations such as Korea and Brazil. The "deindustrialization" of America attracted much attention but no policies to counter it. The

cost of petroleum imports formed a major component of the burgeoning current accounts deficit from 1970 to 1990.

The falling dollar of the late 1960s reduced producer income. OPEC, articulating the opinion of its members in its "Declaratory Statement" of 1968, demanded the upward adjustment of oil prices as compensation for the dollar's weakness, a weakness made official by US devaluations between 1971 and 1973.[55] The Arab–Israel War of 1967 afforded the opportunity to force higher prices, and to achieve even more.

The Six-Day War of 1967 further radicalized Arab attitudes toward the USA and its western allies. As in 1956–7, Egypt closed the Suez Canal; it remained closed until 1974 at great cost to Egypt. Gradually, the route lost its primacy in oil traffic to supertankers traveling around the Cape of Good Hope. Oil flow through the IPC pipeline was disrupted. The diversion of western hemisphere and Indonesian oil to Europe averted a serious supply crisis. A poorly organized Arab embargo on oil exports to the USA, West Germany, and Britain proved costly and temporarily inconvenient to the latter. As in 1956, prices increased sharply but quickly fell again. Oil from Libya, Algeria, and Nigeria plus unused capacity in Venezuela substituted for embargoed supplies and, after the termination of the political crisis, provided crude that did not require Suez passage. At the peak of the crisis, Saudi Arabia, without enthusiasm, reduced production by 10 percent and threatened to shut down altogether if US aid to Israel persisted. The USA, as Chester observes, ignored this threat.[56]

Remedial steps minimized the war's dislocative effects on oil flow. But the conflict brought the cauldron of Arab nationalism and anti-Zionism to near boiling point and energized the confrontational attitude of the Arab producers. Much had changed since 1965. Greater changes followed at a dizzying pace.

The haphazard use of oil as a political weapon disturbed the conservative regimes of Saudi Arabia, Libya, and Kuwait. In 1968, they created the Organization of Arab Petroleum Exporting Countries (OAPEC) as an instrument to prevent the political use of oil. However, the overthrow in 1969 of the Libyan monarchy, neutral in the war of 1967, by Colonel Qadhafi and the admission of other Arab producers to memberships by 1972 subverted OAPEC's original purpose. Despite Saudi resistance, OAPEC in 1972 thoroughly subscribed to the political exploitation of oil power. It awaited only another war. By 1969, then, Arab and non-Arab producers were prepared to confront the MNOCs through OPEC while OAPEC marshaled its collective power for use against Israel's supporters.[57]

Western MNOCs and governments relinquished control over events

in 1970 and after. Chester's study depicts frequent intervention by the US government in behalf of the American MNOCs.[58] But from 1965 forward, the MNOCs steadily retreated before the host government offensive. The US government, despite its presumed influence in Iran and Saudi Arabia, watched passively as producer states encroached upon the managerial rights of the oil companies. The USA responded hardly at all to OPEC or OAPEC. The Libyan Revolution of 1969 spawned a zealous antagonist in Colonel Qadhafi. As with Castro, US efforts to isolate and neutralize Qadhafi were futile. Without a voice in Libya, the USA offered little protection to American oil investments of over $1 billion. Producer state nationalization of American properties in Peru, Indonesia, and Libya generated no useful response. The USA at this time was preoccupied with Vietnam and inflation. In the Middle East, the USA maintained a presence in the Mediterranean and the Persian Gulf, built up the military power of Iran, guaranteed the security of Saudi Arabia, and honored its commitment to Israel. So imperfectly had the USA assimilated the meaning of past events in the Middle East that a House of Representatives report of 1972 concluded that the states of the Persian Gulf were more concerned with local problems than with the Arab–Israel conflict.[59]

American passivity, the bowing of France before Algerian demands, the non-influence of Britain, and the enormous oil dependence of Japan exposed the MNOCs to attack and defeat *en ensemble* and in detail. As Cowhey perceptively observes, the shared interests of the MNOCs and their hosts vanished after 1967. Algeria and Iran reduced their reliance upon the companies. Iraq, in 1968, disposed of them altogether. The hosts realized that new oil from the North Sea or Alaska would not be forthcoming in sufficient volume to dilute their collective strength.[60]

Qadhafi and the Algerian government first sensed these fissures in the MNOC battlements. French dependence upon Algerian oil, peaking at 35 percent of domestic demand in 1963 and still at 27 percent in 1970, and Algeria's ambitious schedule for economic development encouraged the latter's complete nationalization of oil between 1968 and 1971. Elf withdrew totally while CFP accepted the *fait accompli* and reached an agreement with Sonatrach. But the upward ratcheting of the per-barrel tax on Algerian oil greatly reduced the company's margin of profit and drove French receipts from Algeria down to 7 percent of total imports in 1971. The end of France's preferred position in Algeria forced France into greater oil dependency upon Libya and other Middle Eastern states. This, coupled with the events of 1970–3, greatly enhanced the attractiveness of nuclear power.[61]

Oil production advanced more rapidly in Libya during the 1960s than in other producing countries (Table 4.6). Western Europe looked to

Libya as a primary source of supply; in 1970, Italy received 35 percent of crude imports from Libya, Britain, 25 percent, France, 14 percent, and West Germany, 12 percent. The Libyan monarchy had wisely divided the earliest concessions among seven producing groups, of which the Oasis consortium, Oxy, and SONJ accounted for 66 percent of liftings in 1970. Qadhafi, flushed with the success of the 1969 *coup* and ardently anti-Zionist and anti-western, challenged the concessionaires in 1970 over the issue of price and production.

Qadhafi demanded an increase in posted prices. Oxy and others initially refused, whereupon Qadhafi ordered a stringent reduction in Oxy's production from 800,000 barrels daily to 400,000. Completely dependent upon Libyan production, Occidental sought to purchase its requirements from SONJ. According to Roncaglia, Jersey refused, thereby committing a serious blunder, the consequence of a myopic view of Oxy as a competitor rather than as a defender of operator interests. Wall, however, offers a different and better documented account. Oxy sought oil at cost. Jersey demurred, but offered oil at the lowest contract price and, additionally, volunteered to help Oxy obtain similarly priced oil from RDS. Oxy snubbed this offer, later claiming that SONJ's refusal to sell forced the capitulation of all concessionaires to Qadhafi's terms. Jersey, however, insisted that even a sale at cost would not have deterred Qadhafi who was willing to assume great losses to achieve his goal. As he said, "we must show we are the masters here." Roncaglia, then, identifies MNOC disunity as the reason for Libya's success. Wall, adopting Jersey's view, discounts the utility of MNOC cooperation in this instance.[62]

Qadhafi's coercive tactics shattered the current price structure. The Persian Gulf states and Venezuela imposed similar terms. In one rapid assault, the MNOCs were denuded of authority over price and production. With the MNOCs reeling, OPEC seized the opportunity to demand direct producer government negotiations with all the companies. The MNOCs favored a single bargaining encounter but OPEC insisted on regional negotiations, one for North Africa at Tripoli and the other for Persian Gulf states in Teheran. OPEC shrewdly separated the negotiations involving the volatile Qadhafi and the radical Algerians from those of the more conservative Arabian Peninsular states and non-Arab Iran. The MNOCs would not be able to pit those two groups against one another. The companies deferred to OPEC's ultimatum.

The consequences of the Tripoli and Teheran agreements of 1971, soon overshadowed by the Yom Kippur War of 1973, the OAPEC embargo, and the price explosion forced by OPEC, were nonetheless momentous. The producers achieved the power to legislate price increases. Posted prices were jacked up in 1972 and 1973 by over $1 per

barrel. Equally critical, tax rates moved to an average of at least 55 percent for all producers, with escalator clauses adopted to compensate for inflation. The improved bargaining position of the hosts encouraged them to demand larger equity rights in established concessions. When the companies balked at this, Saudi Arabia threatened to reduce Aramco's liftings. Aramco then agreed to sell a 20 percent interest to Saudi Arabia and to grant the latter the option of raising that equity to 51 percent by 1982. In 1973, similar terms were accorded to other Arabian Peninsula states. With the oil industry in Algeria, Iraq, and Iran already nationalized and Libya in process, the remaining producer states now embarked along that path. In Venezuela, new legislation in 1971 and 1972 assigned to the state penultimate control over the industry with the final transfer of ownership completed in 1975.

Finally, guided by Libya's imposition in 1971 of strict production controls, other states recognized oil as a non-replenishable resource. They discovered that income could be raised without increasing production. Libya permitted the withdrawal of 32 percent less crude in 1972 than in 1970 and reduced liftings again in 1973 and 1974. The Kuwait Oil Company's planned increases in production for 1971 were restricted by the government; production stabilized between 1970 and 1973 and actually fell in 1974 and 1975.[63]

Alnasrawi characterizes OPEC as a follower in all of this. However, it did accelerate action, exploiting Libya's successes by orchestrating the Tripoli and Teheran conferences. At the Caracas meeting of 1970, OPEC adopted a minimum 55 percent tax rate. One year later, OPEC urged members to demand greater equity shares. Perhaps, as Odell suggests, the MNOCs accepted the principle of collective bargaining through OPEC, believing that the agreements reached would more likely be honored by individual members. Indisputably, OPEC's status was markedly enhanced between 1960 and 1972.[64]

Conclusion

The producer states seized power from the MNOCs during the 1960s while western governments watched helplessly. A number of Arab producers, first united in the Arab League and then in OAPEC, challenged western support of Israel. The unilateral cut in posted prices in 1959–60 produced OPEC. These producer actions engendered a weak response in the West and no motion toward consumer government cooperation. By 1971, as Levy asserts, the MNOCs were required to act as if they were owned by the host states.

Producers generated the initiatives that shifted power in their favor.

Each MNOC protected its interests as best it could, viewing other firms as adversaries rather than as firms entangled in the same web. Acquiescence to each demand held out the hope that the final demand had been made. Western governments were, in Tugenhadt and Hamilton's view, unwilling to jeopardize supply by taking the side of the MNOCs. Consumer governments were incapable of substantially reducing demand for oil or of stockpiling oil against future contingencies.

Finding the causes of MNOC–western vulnerability in the entry of newcomers in the international oil business, mandatory US import quotas, or, as with Levy, in the machinations of the Soviet Union is less rewarding than charting the consequences of the swollen energy demands of the industrialized states, the subject of the next chapter. It is also essential to understand producer government objectives.[65] Nationalism and anti-Zionism combined with specific development objectives to motivate some producers to confront the MNOCs. Peru, Iran, and Indonesia were no less adversarial toward the domineering MNOCs than the Arab front line states. While often permitting expectations to overreach capabilities, the host nations correctly perceived increasing oil revenues as a prerequisite of autonomous economic growth. Individually and through OPEC, they won not only higher revenues but control over price and production—power.

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5. M.I. Goldman, *The Enigma of Soviet Petroleum: Half-Full or Half-Empty*,

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26. *Ibid.*, p. 51.
27. Jenkins, *Oil Handbook 1984*, pp. 20–1, 35, 37, 42; De Golyer and MacNaughton, *1984*, pp. 98–9; Maull, *Europe and World Energy*, p. 208. In the USA, market demand prorationing was initiated in 1935 with the organization of the Interstate Oil Compact. Actually, each state member of IOC determined its own quota. Moral suasion kept the states more or less in line.
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6

Cheap energy, security, and the industrialized nations, 1960–73

With the industrialized states far in advance, the world economy experienced exponential growth rates between 1950 and 1970. Cheap food, raw materials, and energy nourished a boom in the advanced economies and spurred rapid industrial progress in such modernizing nations as South Korea, Brazil, and Argentina. World population growth, a mixed blessing, averaged 2 to 4 percent annually while economic output advanced at an annual rate of 4 to 5 percent. Sustained growth in the industralized states seemed assured; green revolutions and expectations of steady economic growth promised unprecedented prosperity in the lesser developed countries. The failure of the LDCs to realize their hopes further embittered relations between the so-called North and South. In the West, where performance appeared to satisfy wants, a confident atmosphere prevailed.

However, the dominant position of the USA in the world economy, the product of its industrial and military might, sagged during the late 1960s. The cost of war in Vietnam and new social programs at home swelled budgetary deficits just as stiff competition in international markets and accelerating foreign penetration of domestic markets occasioned worrisome balance of payments deficits. A weakening US dollar triggered an import spree; wages and interest rates rose and labor productivity fell. The global consequences of American economic and political frailty were manifest during the 1970s and 1980s.[1]

Energy policy common denominators

The energy policies of the industrialized states reflected the conviction that rapid economic growth was the norm. Within those states, such

high energy intensive industries as chemicals–plastics and light metals and the mass producers of consumer goods led the charge during this prosperous period. With fuel and other raw materials prices stable or declining, few devoted much attention to the question of finite resources. A surfeit of food and fuel seemed available. While the leading industrial and military nations necessarily factored resources into calculations of national security, national policies in the USA, western Europe, and Japan promoted consumption and the virtually uninhibited use of resources. Visions of long-term abundance made tolerable increasing energy import dependence and submerged warnings of future scarcity.

Energy deficient states, now including the USA, relied upon market mechanisms and the subtle touch of diplomacy and economic aid to maintain access to raw materials. Supremely confident in the power of technology, the major consumers of raw materials assumed that materials substitution (plastics for scarce metals) and efficiency improvements in the burning of fuels and in reducing ores to usable metals would dramatically extend the life of mineral resources. Few challenged the dogma that energy at the cheapest price was a positive good for national economies.

Cheap and abundant energy and raw materials over the long run formed the common denominators linking the economic policies and development goals of both advanced and industrializing states. The LDCs, too, imbibed this optimistic spirit. In general, voters in the stable democracies emphatically demanded and endorsed policies productive of higher wages, more jobs, improved economic security, and controlled inflation. The age of high mass consumption, anticipated by Rostow, enshrined by Galbraith, and eyed ruefully by Riesman and Bell precluded serious consideration of possible resource shortages.[2]

High living in the USA and its emulation in western Europe muzzled concern over inequities in the international distribution of wealth. Americans, having rediscovered poverty at home, focused on its amelioration. In Japan, less inclined than the West to induce high domestic consumption of consumer goods, workers and managers worked so efficiently that their high quality and low cost consumer goods flooded occidental markets. In the West, rising incomes for more people even nurtured, and especially in the USA, a politically potent environmental protection movement. Masses of people, now able to vacation at the seaside or lake, demanded clean water. During the 1960s and early 1970s, US administrations implemented a host of environmental protection policies mandated by a plethora of laws designed to protect the air, water, and land. These policies, and similar ones later adopted in western Europe, had proved inadequate by the 1980s. The crucial

weakness with virtually all of the early environmental laws was that they did not yield an absolute decline in fossil fuel burning.

OECD-Europe, the USA, and Japan accounted for one-half of the global growth of total primary energy requirements (TPER) from 1950 to 1970. Table 6.1 displays the significant shares of TPER ascribable to the West and to the Soviet bloc and verifies the rapid switch from coal to oil as well as the greater employment of natural gas. A glance back to Table 4.5 suggests that the USA and the USSR accounted for the larger part of the natural gas increase shown in Table 6.1. The transition from coal to oil occurred swiftly within OECD (Tables 4.4 and 6.6) but much more slowly in Eastern Europe.[3]

The national energy policies of the leading OECD states during the 1950s and the 1960s reflected acceptance of common assumptions concerning present and future availability and costs of energy. Of course, each country shaped policies to conform to its individual resource endowment, energy requirements, and political customs. The fact that the governments of France, Great Britain, and Italy owned or

Table 6.1 Global and national total primary energy requirements, 1950–75

	1950	1960	1970	1973	1975
World TPER[1]	2059	3185	5170	5923	5957
Percentage of:					
Solid fuels	62	48	32	30	29
Oil	25	33	43	47	46
Natural gas	1	16	19	19	18
Nuclear	0	<1	2	2	6
Hydroelectric	<1	2	2	2	6
Percentage share of World TPER:					
USA	40	33	30	29	28
OECD-Europe	22	20	21	20	19
Japan	2	3	5	6	6
USSR	12	14	14	15	16
Eastern Europe	6	7	6[2]	6	7
All Others	18	23	24	24	24

[1] All TPER in million metric tons oil equivalent
[2] 1971

Sources: *BP Statistical Review of World Energy, June 1986*, pp. 31–3, passim; IEA, *Energy Balances of OECD Countries, 1970/1982*, Paris: OECD/IEA (1984), pp. 387–9, 404; D. Park, *Oil and Gas in Comecon Countries*, London: Kegan Paul (1979), p. 45; UN, *World Energy Supplies, 1955–58*, New York: UN (1963), p. 35; *ibid., 1960–1963* (1965), p. 33; *ibid., 1961–1970* (1972), pp. 55, 57; G. Jenkins, *Oil Economist's Handbook 1985*, London: Elsevier (1985), pp. 125–7; J. Darmstadter *et al.*, *Energy in the World Economy. A Statistical Review of Trends in Output, Trade, and Consumption Since 1925*, Baltimore: The Johns Hopkins Press for Resources for the Future (1971), pp. 622–32.

Table 6.2 Net energy imports as percentage of TPER for OECD states, 1960–75

	1960	1965	1970	1973	1975
USA	6	8	9	17	17
Japan	40	67	86	93	91
OECD-Europe	35	50	63	65	59
West Germany	11	34	49	55	56
Britain	26	37	47	48	44
Netherlands	61	78	60	26	−6
Italy	65	83	85	87	83
France	44	56	72	81	75

Source: IEA, *Energy Balances for OECD Countries, 1970/1982*, Paris: OECD/IEA (1984), pp. 387–9, 404.

controlled most of their energy industries did not yield results markedly different from the less interventionist governments of West Germany and the USA. The search for secure and cheap energy supplies impelled each nation to react to Middle Eastern instability and producer government demands, the policies of MNOCs, the rundown of the coal industry, the uncertainties of nuclear energy, and to other energy matters impinging upon national security.

France, Italy, and Japan sponsored adventurous projects to provide oil produced by nationally controlled firms. The USA and West Germany relied wholly on the MNOCs for their oil imports. As Table 6.2 attests, these divergent policies produced strikingly similar results. Energy import dependence, mirroring enormous increases in petroleum imports (Table 6.3), escalated steeply in western Europe and Japan. America's enormous production of energy masked the impact on the dependency ratio of a doubling of oil imports during the 1960s. The sudden turnaround in Holland's situation and the initial reversal in Britain's position resulted from the development of North Sea gas and oil, a boon that would have occurred without direct government participation.

Indigenous political structures and practices influenced energy policy outcomes. In the coal producing states of western Europe sensitivity to the well-being of the coal industry, virtually the only source of domestic energy, and the political power of sizable miner unions somewhat retarded the displacement of coal by other fuels. But until the oil price hikes of 1973 and after, the lure of cheap oil, the increasing availability of natural gas, and the promises of nuclear energy were difficult to resist. In the USA, regulated and artificially low natural gas prices, relatively cheap domestic and imported oil, huge public subsidies for nuclear power, and consumer preferences critically affected the unprotected coal industry.

Each state recognized the relationship between energy costs and

Table 6.3 Net national crude oil and product imports, 1955–73 (million metric tons)

	1955	1960	1965	1970	1973
USA	45	85	116	160	305
Japan	12[1]	30	89	211	292
OECD-Europe	117	201	392	657	776
West Germany	7	26	68	118	139
Britain	31	50	76	106	117
Belgium and Netherlands	10	16	33	63	86
Italy	12	21	49	83	97
France	20	27	52	96	130
World	300	456	759	1263	1656[2]
Percentage rows 1–3 to World	58	69	79	81	83

[1] 1956
[2] 1974

Sources: DeGolyer and MacNaughton, *Twentieth Century Petroleum Statistics 1986*, Dallas, Tex.: DeGolyer and MacNaughton (1984), pp. 58–9; Y. Matsumura, *Japan's Economic Growth, 1945–1960*, Tokyo: Tokyo News Service Ltd (1961), p. 89; G. Jenkins, *Oil Economist's Handbook 1985*, London: Elsevier (1985), p. 57; B.R. Mitchell, ed., *European Historical Statistics, 1750–1975*, 2nd revised edn, London: Macmillan (1981), pp. 442–3.

industrial output. In iron and steel, chemicals and petrochemicals, in aluminum and other industries applying electrolytic processes or other process heat, the costs of energy to total input could reach 25 or 30 percent. In the transportation industries the costs of energy were still higher. The industrial nations, particularly those heavily reliant upon foreign trade such as West Germany and Japan, would not increase energy input costs by buffering domestic coal industries against oil or natural gas.[4]

In the following pages, I discuss the generally parallel evolution of national energy mixes in the leading economies and the tactics that led to similarity. The chapter will conclude with a discussion of the international trade in thermal electric equipment and the changing circumstances that first retarded and then stimulated the growth of nuclear power, a technology that promised cheap, safe, and reliable power.

The western European energy equation

European economic recovery from the destruction of World War II was in full swing by the late 1950s and the momentum was sustained during the 1960s. The economies of western Europe surged forward, although the UK experienced less dramatic and, to many Britons, inadequate

progress. Cities were rebuilt, transportation networks re-established and modernized, and new industries emerged and older industries were revitalized. Crude steel output in West Germany almost tripled between 1950 and 1960 and did triple in Italy. In France, steel production rose twofold during that decade. Belgium and the Netherlands experienced similar rates of growth. Less spectacular but still impressive growth occurred from 1960 to 1970. Britain, however, recorded lower growth rates in steel and in other sectors of the economy.

Foreign trade increased markedly in Germany, France, Italy, the Low Countries, Denmark, and Norway. While serious balance of payments deficits retarded British domestic growth and were a recurrent problem in France and Italy, Germany's industrial prowess and foreign demand for her products fashioned a surplus in the external trade account. Throughout western Europe, gross national product ascended more rapidly than in the USA, as did *per capita* GNP. European standards of living approached the heights of American standards of living and far exceeded those of other nations and regions.[5]

The rebuilding of Continental Europe's economic and social infrastructure required massive inputs of energy. OECD-Europe's TPER expanded from 624 million metric tons oil equivalent (mtoe) in 1960 to slightly over 1.2 billion mtoe in 1973, an increase of 92 percent. In 1960, Germany consumed 114 percent more energy than in 1950 and consumption climbed an additional 82 percent by 1973. French energy use in 1960 exceeded use in 1950 by 64 percent; from 1960 to 1973, French TPER rose by 108 percent. Italy's TPER advanced fivefold between 1955 and 1973, with a tripling of consumption occurring between 1955 and 1965. In the Netherlands, energy use tripled from 1955 to 1973. In contrast, British growth in energy use lagged far behind, rising only 15 percent from 1950 to 1960 and 29 percent from 1960 to 1973, a record in keeping with lower economic growth rates. These countries accounted for 77 percent of OECD-Europe's TPER in 1960 and 72 percent in 1973; Germany, alone, used 23 percent of TPER in 1973.[6]

In Chapter 4, I noted that the energy mix of particular European nations varied noticeably during the 1950s, reflecting different national energy resource endowments. Table 4.5 depicts the heavy coal dependency of OECD-Europe during the 1950s, a reliance radically diminished during the next decade. Each western European nation, whether a major coal producer or not, moved from coal to other fuels. By 1973, solid fuels provided but one-quarter of OECD-Europe's TPER. Britain and Germany, with large coal reserves and a high fixed investment in the coal industry, relied upon coal for more than 30 percent of energy requirements. Coal use in the Netherlands declined from 69 percent of TPER in 1955 to 5 percent in 1973.[7]

In Germany, the UK, France, and Italy, among other nations, the process of oil substitution for coal was far advanced by 1973 while natural gas had become a key component of national energy mixes (Table 4.5). Cheap and accessible oil poured into European markets. Net oil imports for OECD-Europe reached 726 mmt in 1973, compared with 201 mmt in 1960 (Table 6.3) while coal production stagnated and fell (Table 4.4). By 1973, Dutch natural gas supplied 13 percent of TPER in OECD-Europe. Domestic natural gas significantly moderated Dutch reliance upon oil and permitted the termination of coal production in 1975.

These shifts in national energy mix were not entirely market driven. Comparative fuel costs shaped political decisions. Consumer preferences, prospective technological advances, and the imperatives of national security could speed up, slow down, or abort what might appear as a natural process. Hefty government subsidization was essential to the birth and growth of the nuclear power industry. European governments after 1945 directed the rehabilitation of coal industries and several Continental states banded together in the European Coal and Steel Community. Having invested substantial capital in this rebuilding program, the UK, Germany, and France were understandably reluctant to permit the uninhibited use of a competing and imported fuel to damage the major domestic fuel producing industry.

European governments, with the exception of Germany, owned and operated their coal and energy utility industries which, combined with the existence of partly or wholly owned state oil companies, afforded potential leverage over energy consumption, both in the aggregate and in specific end uses. West Germany intervened directly least of all, pursuing policies more similar to the USA than to Britain or France.

Innumerable factors contributed to the evolution of national energy policies, including: energy resource endowment; comparative fuel costs; the political influence of energy industries, whether or not nationalized; the mix of foreign and native in energy industry ownership; the condition of the economy and its various components, each with some political clout; assessments of foreign competitive pressures; assessments of the reliability of foreign energy suppliers; customary practices regarding government economic authority; and nationalistic sentiments. These can be subsumed within two objectives: national security and self-sustained economic growth.[8]

Table 6.4 indicates that *per capita* consumption of energy in OECD increased far more rapidly from 1950 to 1970 than world *per capita* consumption. *Per capita* consumption in the USSR and eastern Europe replicated only the gross pattern of OECD. Given the necessary dedication of western European governments to rapid and permanent econo-

Table 6.4 *Per capita* consumption of energy, 1950–83 (metric tons coal equivalent)

	1950	1960	1970	1975	1981	1983
World	1.0	1.4	1.9	1.5	1.5	2.1
USA	7.9	8.6	12.5	12.2	12.0	10.8
OECD-Europe		2.8	4.3	4.5	4.6	
Germany	2.5	3.7	6.0	5.8	6.2	5.9
UK	4.4	4.9	5.4	5.0	4.9	5.0
France	1.9	2.6	5.0	4.6	5.1	5.0
Italy	0.4	1.2	4.0	4.3	3.0	4.3
Japan	0.6	1.2	4.0	4.3	3.1	4.3
USSR	1.7	3.0	4.5		4.4	
Eastern Europe	1.8	3.0	4.3			
Argentina	0.9	1.2		2.5[1]		
India	0.1	0.1		0.4[1]		

[1] 1972

Sources: IEA, *Energy Balances of OECD Countries 1970/1982*, Paris: OECD/IEA (1984), pp. 387–9, 404; *ibid.*, *1983–1984* (1986), pp. 120–1, 135; IEA, *Energy Balances of Developing Countries 1971/1982*, Paris: OECD/IEA (1984), pp. 190–3; Statistical Office of the European Communities, *Energy Statistics Yearbook 1969–1973*, Luxembourg: SOEC (1974), p. 33; G. Jenkins, *Oil Economist's Handbook 1985*, London: Elsevier (1985), pp. 99, 117, 132, 135–6.

mic growth, high employment, and higher wages, each nation's voracious energy appetite demanded satisfaction. OECD-Europe did not have the option of choosing between high and low energy intensive paths. Opting for the latter would have necessitated a revolution in values and, perhaps, spawned revolution in the streets as well. The higher energy intensive course had already been set. One-half century of death, destruction, and economic crisis elevated the anticipation of western Europeans for the material benefits of a high energy intensive society. An energy intensive strategy promised prosperity and economic power, achievable, in a period of stable and low energy prices, at modest cost.

European governments could manipulate the energy mix, and that is what they attempted. As observed above, most states held common assumptions about energy, chief among them being its cheapness and abundance. During the first postwar decade, Britain, Germany, France, Belgium, and Holland, each with large coal industries, relied on a resurrected coal industry for the bulk of domestic energy needs. Through 1955 or so the diminution of coal's contribution to TPER was slight; thereafter, coal's share fell precipitously. This reversal in coal's fortunes, concurrent with the first Suez crisis, compelled the producing states to reassess the national stake in a vigorous coal industry.

The lesson of Suez might have suggested the wisdom of protecting coal's role through research that would enhance its value by improving its efficiency as a fuel and reducing its polluting effects, and through

programs that improved rates of productivity and lowered the cost of coal. The Suez crisis did not inspire such a practical response. The policies that did emerge from western Europe's re-evaluation of the role of the coal industry necessarily encompassed more than coal's proper share in meeting national energy needs. The policies of each state differed in detail but, as Cowhey observed, the consequences were similar. Gordon criticized European governments for retarding the rundown in coal production, suggesting that the industry should have been consolidated and reduced to special purpose mining.[9]

Might not criticism of national coal companies for delaying the rundown of coal as reasonably be directed at government policies that permitted and encouraged the decline of the coal industry? Having assumed ownership of a valuable resource, the individual governments and ECSC neglected to improve its worth by increasing its utility. Dreams of nuclear power, hints of rising natural gas supplies, and the short-lived effects of the Suez closing precluded the application to coal of value-enhancement programs.

Gordon asserts that decades of reliance on coal, national ownership in the UK and France, significant state participation elsewhere in Europe, and mine employment numbering in the hundreds of thousands obstructed policies founded on a realistic projection of comparative price and demand. A rundown that permitted mass miner unemployment and that jeopardized the security attending domestic coal availability was politically unacceptable. The thorough-going reform of the industry was similarity unattractive.

Coal, however, cost more than oil per Btu produced. Suez notwithstanding, oil supplies seemed secure. Cheapness, accessibility, and obvious consumer preferences tilted the case in oil's favor, but politicians accepted the results slowly and reluctantly. ECSC, assuming the inevitability of coal contraction, provided financial assistance for scaling down the industry to Belgium, France, and the Netherlands, the first two deciding to reduce coal production drastically, and Holland opting to abandon it entirely.[10]

Dutch natural gas production permitted the termination of domestic coal production in 1975. Between 1965 and 1970, coal's share of Dutch TPER declined from 31 to 10 percent, oil's share dipped from 63 to 57 percent, and the share of natural gas rose from 4 to 31 percent. Neither France, Belgium, nor Germany possessed an alternative domestic energy source. The North Sea promised both gas and oil to the UK during the 1970s. Italy, with the poorest energy endowment of the European states, switched rapidly during the 1950s from imported coal to imported oil and gas while developing a substantial hydroelectric capacity.[11]

France fashioned the most highly defined energy policy in western

Europe; Germany, the least. In 1946, France nationalized the coal, electric, and gas industries. Initially, policy focused on rebuilding the coal industry (Table 4.4) and obtaining ECSC sanction for price controls for coal that protected it from oil competition. Concurrently, France reorganized the state owned oil companies, preparatory to launching a grand exploratory campaign throughout the French empire. While oil from French colonial territories and French companies participating in Middle Eastern consortia received preferential treatment in the domestic market, the primary concern into the late 1950s was with coal, and secondarily with expanding hydroelectric capacity. However, coal's defenses were inadequate against the advantages of oil. By 1960, penetration of the home market by oil products had damaged coal's marketability. Coal production, peaking in 1958, began to slide (Tables 4.4 and 4.5).

Bowing to the reality of oil competition, France revised its energy policies after 1960, vesting government agencies with augmented powers of implementation and administration. The emphasis shifted from protecting high cost coal to the importation of low cost oil, preferably produced in French possessions by state oil companies. During the 1960s, France favored coal with less protection against competition than Britain or Germany.

In opting for cheaper imported energy, France announced its intention to defend the international competitiveness of national industries and its confidence in the security of its overseas oil concessions. Hardly initiated, the Algerian revolution cast this policy into disarray. Nonetheless, the new policies encouraged vastly increased oil use. Table 6.3 shows that imports rose by 7 mmt from 1955 to 1960, 25 mmt from 1960 to 1965, and almost doubled from 1965 to 1970. French import quotas and other regulations guaranteed the domestic market share of French produced crude. Natural gas received no particular attention. Hydroelectric production grew more rapidly than total electric production from 1950 to 1960 but fell thereafter while a modest nuclear power complex emerged (Table 6.5).[12]

To strengthen the competitiveness of French industry, Lucas suggests, France designed its energy policy to obtain secure energy at the lowest possible price. Hatch interprets French intentions more narrowly. Although articulated in terms of independence and security of supply, French policy, Hatch believes, "had less to do with the total amount of domestic energy consumption that was supplied by imports than with control over the domestic oil market and assured 'French' crude oil production."[13] Import dependence (see Table 6.2) was an acceptable risk given French company control over a substantial portion of oil imports and the persistence of low oil prices.

The policies of Germany, Italy, and Britain while less dirigiste than

Table 6.5 Electricity production, 1950–84

	1950	1960	1970	1980	1984
OECD-Europe					
Total[1]	257	569	1146	1743	1925
% hydro	41	40	28	24	24
% nuclear	0	<1	4	17	26
Germany					
Total	47	119	243	369	395
% hydro	19	11	7	5	5
% nuclear	0	0	2	12	23
France					
Total	37	75	147	258	343
% hydro	47	55	39	27	21
% nuclear	0	0	4	24	59
UK					
Total	67	139	249	285	283
% hydro	2	2	2	2	2
% nuclear	0	2	10	13	19
Italy					
Total	25	38	83	186	183
% hydro	88	81	35	na	25
% nuclear	0	0	3	1	4
Japan					
Total	46	116	396	576	649
% hydro	82	51	23	16	12
% nuclear	0	0	1	14	21
USA					
Total	410	892	1740	2401	2563
% hydro	25	17	15	12	13
% nuclear	0	<1	1	11	14

[1] All totals in billion kwh

Source: IEA, *Energy Statistics 1983/1984*, Paris: OECD/IEA (1984), pp. 130–2.

the French were all characterized by state intervention. Until the late 1960s, Germany confined its activities to shoring up the coal industry. But various tax disincentives to fuel oil use, incentives to such coal users as power plants and steel, and concentration of the coal industry into larger and more efficient units were rather ineffectual. Stagnant coal demand during the late 1950s was followed by decline during the 1960s. Between 1957 and 1968, coal employment plunged from 604,000 to 272,000. By 1973, coal provided only one-third of German TPER while coal production descended to a tonnage below that of 1955 (Tables 4.4 and 4.5). Germany relied upon the MNOCs for oil. By 1969, foreign oil companies, led by Esso (SONJ), BP, and RDS, owned 75 percent of German refining capacity.

Policy directions altered markedly after 1968. Germany decided to establish a national oil company, Deminex, to explore and develop overseas oil concessions. Oil regulations were imposed that aimed to

guarantee German-owned firms at least one-quarter of the domestic market. These innovations reflected German distrust of the supply performance of the MNOCs during the second Suez crisis. Policy makers in the Federal Republic decided to reduce supports for coal and invest large sums in the nuclear industry. Germany moved slowly in the French direction but without essential reliance upon national energy firms or agencies.

Italy's policies resembled those of France. ENI, the state owned oil company, dominated an energy market that confined coal use to electric generation. Italy sought natural gas suppliers more assiduously than either France or Germany. Italy's nuclear development program, however, yielded disappointing results.[14]

Britain's less dynamic economy relied more heavily on coal than her Continental neighbors (Table 4.5). *Per capita* consumption of energy in the UK recorded negligible growth from 1950 to 1970, compared with her European allies (Table 6.4). Britain did not become more energy efficient. Indeed, the reverse occurred. Government policies that improved welfare failed to stimulate managerial and technological initiatives necessary to confront an increasingly competitive global economy. TPER in Britain advanced 45 percent during those years while TPER in Germany, only 57 percent of Britain's in 1950, exceeded the latter's by 10 percent in 1970. The invasion of domestic coal markets by oil and by American coal met resistance in the form of imported oil and coal licensing requirements, high excise duties on fuel oil, and restraints on the use of fuel oil by power plants. But coal's disadvantages—pollution, ineffective marketing, poor reputation among consumers—were beyond the remedial powers of purely fiscal measures. Protecting the electric power market of coal while simultaneously promoting the rapid introduction of nuclear power (Table 6.5) made sense as an employment policy but not as an energy policy. In any event, oil was cheaper per Btu than coal. Left to its own devices, coal's rundown would have been even more rapid. As it was, coal production fell sharply after 1965 (Table 4.4).

By late 1960s, however, the energy outlook for the UK was superior to that of most other European countries. British oil companies commanded a sizable production in the Middle East and Venezuela and considered those to be secure sources. Native firms controlled one-half of the domestic oil market. About one-half of Britain's £700 million net oil import bill in 1970 was payable to British firms, notably BP and RDS. Moreover, the UK could anticipate a flow from the North Sea that promised oil independence. The British Gas Council in joint ventures with several American firms actively explored the North Sea for natural gas. By 1973, natural gas supplied 11 percent of TPER (Table

4.5) and a thorough-going conversion from manufactured to natural gas was in midcourse. The British government orchestrated and managed the exploitation of North Sea energy.[15]

Throughout western Europe the transition from coal to other fuels accelerated. The Netherlands moved expeditiously to complete this transition with the discovery of the Groningen gas field in 1951. This enormous field, with reserves equal to the Hugoton field in the USA but less than one-half the size of the three major Soviet fields, provided sufficient gas for Dutch use and a large surplus for export to western Europe. The Dutch immediately incorporated Gasunie, a state owned company, which, in association with RDS and Esso, organized the market in Europe. Exports of 5 million cubic meters in 1963 climbed above 11 billion cubic meters (bcm) in 1970 and reached 31 bcm by 1973. From 1963 through 1973, German distribution firms purchased about 35 percent of Dutch exports with the remainder piped to France, Belgium, Switzerland, and Italy.[16]

The quantity of Dutch gas sold abroad in 1973 equaled in caloric value about 47 mmt of coal, much directly substitutable for coal, and oil as well, in homes, commercial buildings, factories, and power stations. In Europe, the price of gas, pegged to fuel oil, was cheaper than coal.[17] Tables 6.6 and 6.7 summarize the consequences for coal of conversion to natural gas and oil.

Demand for coal by the electric power industry ceased expanding in the mid-1960s as gas became available (Table 6.6). The marginal growth of coal use in Germany occurred only because of various taxes on oil use and laws passed in 1964, 1965, and 1973 that subsidized coal burning in power plants.[18] In 1969, natural gas produced 4 percent of thermally generated electricity; in 1973, 12 percent (Table 6.7). Holland, understandably, turned to natural gas. France and Italy converted rapidly to fuel oil and Belgium to oil and natural gas. Britain slowed the replacement of coal by oil by limiting oil burning in power plants and selling coal to electric authorities at the lowest possible prices. The policies of Tory and Labour governments did not prevent the capture by fuel oil of 29 percent of the thermal power plant market in 1973 (Table 6.7). Without this protection, the power market for coal probably would have slipped badly, perhaps justifying lower electricity rates and stimulating the more thorough electrification of the realm (Table 6.5).[19]

Steady decline characterized coal use in industrial, residential, and commercial sectors (Table 6.6). The steel industry was the second largest consumer of coal. The unimpressive pace of steel industry growth in France and the UK combined with new technologies, adopted rapidly in Germany, that lowered coke inputs per ton of pig iron output to reduce overall coke consumption.[20] For the nations detailed in Table 6.6, coke making demanded 24 mmt tons less coal in 1973 than in 1960. Adding to coal's woes by 1970, as Tables 4.5 and 6.5 suggest, nuclear power made its presence felt and expanded swiftly in succeeding years. In Germany and in Britain, public moneys devoted to nuclear power development diluted the protective effects of subsidization of the coal industry.

Table 6.6 Coal use in western Europe, 1960–73 (million metric tons)

	1960	1964	1968	1973
West Germany				
Consumption	227	262	223	217
Converted to:				
Electricity	61	92	102	113
Manufactured gas	7	7	3	2
Coke	60	58	48	44
Briquettes, etc.	43	44	28	7
Final Deliveries to:				
Steel industries	24	28	21	21
Other industries	14	11	6	6
Domestic–commercial	12	11	10	10
France				
Consumption	61	61	50	36
Converted to:				
Electricity	8	13	14	9
Manufactured gas	1	<1	0	0
Coke	18	18	16	15
Briquettes, etc.	<1	<1	<1	<1
Final deliveries to:				
Steel industries	15	16	14	9
Other industries	14	15	9	4
Domestic–commercial	11	12	9	6
UK				
Consumption	197	187	143[1]	116
Converted to:				
Electricity	51	67	65	62
Manufactured gas	22	20	5	<1
Coke	29	26	20	24
Briquettes, etc.	1	1	1	1
Final deliveries to:				
Steel industries	[3]	[3]	11	9
Other industries	[3]	[3]	19	11
Domestic–commercial	30[2]	20[2]	34	21

[1] 1969
[2] House coal only
[3] Jackson's categories do not correspond with EC categories

Sources: Statistical Office of the European Communities, *Energy Statistics Yearbook, 1958–68*, Luxembourg: SOEC (1969), pp. 26–8; *ibid., 1969–1973* (1974), pp. 34–8.

Table 6.7 Western European thermal electric production, by source of fuel, 1960–73

	1960	1969	1973
Germany			
Total thermal production[1]	106	192	254
% all coal	92	70	59
% oil	2	13	14
% manufactured gas	5	3	4
% natural gas	<1	4	12
France			
Total thermal production	34	74	113
% all coal	67	61	24
% oil	8	24	61
% manufactured gas	13	6	6
% natural gas	12	8	9
Italy			
Total thermal production	8	60	95
% all coal	20	10	3
% oil	47	77	89
% manufactured gas	6	3	3
% natural gas	27	9	4
Netherlands			
Total thermal production	17	35	49
% all coal	76	28	3
% oil	20	39	13
% manufactured gas	3	4	3
% natural gas	1	28	81
Belgium			
Total thermal production	15	27	38
% all coal	76	39	13
% oil	12	46	53
% manufactured gas	12	10	10
% natural gas	<1	5	24
UK			
Total thermal production	139	192	234
% all coal	99	82	69
% oil	<1	17	29
% manufactured gas	<1	<1	1
% natural gas	0	<1	1

[1] All totals in billion kwh

Sources: Statistical Office of the European Communities, *Energy Statistics Yearbook 1958–1969*, Luxembourg: SOEC (1969), pp. 289–93; *ibid.*, *1969–1973*, pp. 226–7; G.L. Reid *et al.*, *The Nationalized Fuel Industries*, London: Heinemann Educational Books (1973), pp. 186–7.

Table 6.8 Sources of OECD-Europe oil, 1961–75 (percent)

	1961	1966	1970	1971	1973	1975
Middle East	64	51	48	57	68	70
North Africa	8	25	34	24	16	12
West Africa	2	5	7	8	7	7
USSR	9	8	6	6	6	7
Latin America	16	9	4	4	2	3
All other	1	3	1	1	1	1

Source: G. Jenkins, *Oil Economist's Handbook 1985*, London: Elsevier (1985), pp. 59–64.

The price, performance, and convenience advantages of competing fuels caused the stagnation or decline, and even abandonment, of western European coal industries. Britain and Germany retarded the decline while the Netherlands, France, and Belgium hurried it along. The cost of this policy in heightened dependence upon imported oil and natural gas resonated into the 1970s and the 1980s. By 1973, each of the European nations detailed in Table 6.2, except Holland and Britain, relied upon imports for over one-half of TPER, a dependence chained to imported oil.[21]

The strategies employed by western European governments to develop secure oil sources and to lessen the burden of oil imports yielded meager results. The consistent intervention of France and the less comprehensive policies of Germany led to a similar vulnerability by 1973. Oil imports by OECD-Europe rose from 117 mmt in 1955 to 776 mmt in 1973 (Table 6.3). The UK, France, the Low Countries, and Germany, the recipients of almost 90 percent of western Europe's imports in 1959, still received over 80 percent in 1973. As Table 6.8 specifies, the Middle East provided two-thirds of this oil except during the latter half of the 1960s when North African oil poured into Europe. Libya, alone, supplied 21 percent of western Europe's oil in 1971. From 1960 to 1970, France received some 30 percent of its oil and Italy and Germany, together, some 10 percent from Algeria. But, during the early 1970s, Algeria and Libya reduced their output compelling their customers to turn again to the Persian Gulf.

Representative of the Continental European position were the drastic shifts in the sources of French oil that occurred between 1970 and 1974. During the 1950s, France derived over 80 percent of its oil from the Persian Gulf. As Algerian and then Libyan oil came in, France substituted Algerian oil and as much Libyan oil as possible for the more costly Persian Gulf crude. The Persian Gulf share of the French market slipped to 44 percent in 1970 while Algeria and Libya, combined, provided 45 percent. One year later, the Persian Gulf portion rebounded

to 61 percent, reaching 77 percent by 1974. At that time, Algeria's share rested at 7 percent and Libya's at 3 percent. Algeria's nationalization of all French companies 1970–1 and the virtual withdrawal of those firms from the country in addition to Libya's decision to severely limit output produced this change. It signified the defeat of French oil policy.

These events affected Britain, ensconced in Kuwait, Iraq, and Iran, less dramatically than France, although Britain had turned to Libya and also to Nigeria and Venezuela in an effort to diversify her sources of oil. Germany, importing twice as much from Libya as the UK, was constrained to turn to Algeria and the Persian Gulf to replace the lost Libyan tonnage. Reliance upon Libya for 43 percent of German requirements in 1968 diminished to 24 percent in 1973; the Persian Gulf percentage, at 68 in 1961, fell to 38 in 1968, and then climbed above 50 percent in 1973. Italy was forced to make similar adjustments in oil purchases.[22]

Western European energy policies fell far short of success if avoiding, or at least moderating, energy import dependence was the central objective. Only the Dutch, and only because of Groningen, actually reduced net energy imports as a proportion of TPER (Table 6.2). French efforts to develop secure sources of oil seemed fulfilled in 1961 as Algerian production rose, but the French position eroded as Algeria won independence in 1963, raised prices in 1969, and nationalized in 1970–1, thus terminating whatever special relationship France had enjoyed. Germany, relying on the MNOCs, exercised little control over its crude oil supply and permitted foreign firms to dominate the domestic market. Europe did not alleviate its dependence upon a few volatile nations in an unstable region. The exposed position of Europe encouraged Middle Eastern producers to raise prices in 1970–1 and again in 1973.

Achieving energy security through the diversification of oil supplies was not feasible for western Europe. Only Middle Eastern producers could satisfy swollen European demand. The USSR, Venezuela, and Nigeria, regarded as more reliable, filled only a marginal part of demand. Unfortunately, the European draw upon those states actually declined during the 1960s (Table 6.8). Diversifying the domestic energy mix offered a method of dampening oil demand. Holland, alone, enjoyed the developed resource flexibility required for that approach. Although North Sea gas deliveries to Britain mounted after 1967, flexibility lay in the future. Even at the higher prices of 1970–2, oil and natural gas were cheaper than coal. Coal's environmental impacts counseled against more coal burning with available technologies. Moreover, to raise coal production in 1970, reversing a decade of neglect, would require substantial capital investment. Given the price of oil and gas, and in Britain the promise of North Sea gas and oil, the diversion of funding and other resources to coal was adjudged uneconomical.

To reduce the risks of interruption in oil supply, already experienced on two occasions, and enhance the security of domestic supply, Europeans could have: offered attractive political and economic concessions to the Arab producers; pursued Soviet supplies more assiduously; cultivated Latin American production, even at higher prices; reduced the share of oil in national energy mixes through substitution and conservation; stockpiled oil; cooperated through the European Community to eliminate contradictory energy policies and the duplication of energy research. These real options were not discussed because of the cheapness of oil in the summer of 1973. Cooperation through the Community produced rhetoric but no common policies. Non-coal producers opposed the subsidization of coal. The Community played no role in North Sea development. Despite Euratom, Community members competed in the nuclear field instead of cooperating to reduce US technological and marketing supremacy. European nationalisms precluded the exploration of the above possibilities. In fall 1973, each European state found itself in a similar predicament.[23]

Japan's oil dependency

The Japanese economy expanded at a prodigious rate during the 1960s, attaining an average annual growth rate in real output of over 10 percent from 1963 to 1973; few other industrial countries reached 5 percent. Exports pulled Japanese growth along. The rapid absorption and creation of new production technologies and innovative and high quality products enhanced the price advantages and marketability of Japanese wares. Unencumbered by enormous military expenditures, in contrast to the USA, Britain or France, and the Soviet Union, the reinvestment of earnings in industry yielded new earnings, high savings, and a consistently high rate of investment in research and development. As remarked in Chapter 4, a coalition between government and business generated carefully wrought industrial policies that included the coordination of all mineral imports and the refusal to protect domestic energy industries against foreign competition, the latter necessitating the gradual rundown of the domestic coal industry.

Japan's energy import dependence comprised only part of its general resource import dependence. By 1973, Japan imported more than 90 percent of its energy (Table 6.2), aluminum, copper, nickel, iron ore, and manganese. Most of these strategic materials were imported, processed, and fabricated into products by giant zaibatsu. These

conglomerates, Mitsubishi and Mitsui being the largest, controlled the general trading companies that essentially monopolized external trade. The Ministry of International Trade and Industry (MITI) possessed the authority to subsidize or invest directly in mining ventures, support new technologies, and in general nudge the zaibatsu into conformity with national policies, a power almost unheard of in the USA and even in Europe. In this era of low natural resource prices, Japan's purposeful economic policies produced a bonanza. From 1958 to 1968, Japanese gross domestic product rose from $32 billion to $142 billion. Japanese GNP equaled 20 percent of the GNP of the original six European Community members in 1958 and 37 percent in 1968. In 1966, Japan matched and then exceeded British GNP. Japan's external trade advanced from $10 billion in 1961 to $26 billion in 1968. But, one cost of high economic growth rates was almost total energy import dependence.[24]

This striking economic growth increased Japan's share of global TPER, in contrast to a falling share for the USA and western Europe (Table 6.1). Japan, strongly influenced by US policies during the occupation, swiftly turned from coal to oil, and by 1973 was more dependent upon oil than its OECD partners (Table 4.5). TPER in Japan tripled between 1950 and 1965 and more than doubled again by 1973. Japanese energy consumption in 1960 equaled 9 percent of American use, 64 percent of German, and 53 percent of British. By 1973, that comparison read: 20 percent, 125 percent, and 147 percent, respectively.[25] In 1960, Japan ranked third as an oil importer, behind the USA and UK; in 1965, Japanese imports surpassed Britain's and Japan ranked first in 1970 (Table 6.3). By 1973, three-quarters of TPER derived from oil.

The costs of oil imports were monumental, in current dollars rising from $673 million in 1960 to $2.8 billion in 1970, $6.5 billion in 1973, and over $15 billion in 1975. These sums represented an ever larger portion of the total imports bill: 9 percent in 1960, 16 percent in 1973, and following the OPEC price shock, almost 35 percent in 1975.[26] Until 1973 these costs seemed bearable because energy prices remained relatively low and because Japan utilized its energy with an efficiency superior to the USA and equal to OECD-Europe. In 1973, Japan produced $2,391 of gross domestic product per input of one metric ton of TPER oil equivalent, compared with $1,226 for the USA and $2,552 for OECD-Europe.[27] Japan enjoyed little maneuverability in energy decision making. Other than oil, no feasible fuel options existed. To moderate oil dependence, Japan could reduce internal consumption and pursue nuclear and liquefied natural gas (LNG) opportunities. To better secure its oil supply, Japan could explore for oil independently, own its own tankers, and spread its purchases among numerous suppliers.

The domestic energy mix of Japan mirrored its intense oil dependency. During the 1960s, oil was cheaper by one-third than coal as a boiler fuel for industry and thermal electric generation. Hydroelectric production stagnated after 1965 (Table 6.5) while oil burning power plants, producing 17 percent of electricity in 1960, generated well over one-half in 1973. *Per capita* consumption of energy in Japan advanced at a faster pace from 1950 to 1970 than in the USA or most of OECD-Europe (Table 6.4). But the distribution of internal energy consumption differed from American and European patterns.

In Japan, direct personal consumption of energy in the home and in private transportation accounted for a much smaller proportion of total end use than in the USA or Europe. In America, transportation, alone, consumed 29 percent of primary energy in 1970 and residential–commercial burned another 25 percent. Together, those uses composed only 25 percent of Japanese TPER. A wide variance in the proportion of total oil consumption claimed by gasoline distinguished the USA from both Japan and western Europe: 39 percent, 15 percent, and 16 percent, respectively. This reflected, in part, the superior public transit systems of the latter two and the importance of commercial trucking in the USA distribution system. Japanese industry ran on fuel oil, consuming 56 percent of all oil compared with 16 percent for European industry and 38 percent for American. American industry burned large volumes of natural gas, unavailable in Japan, and much more coal than Japanese counterparts.

Electricity consumption replicated oil use patterns. The bulk of power was fed to Japanese industry. In America, residential–commercial use was larger by a small margin than industrial use, reflecting increasing numbers of families lodged in single-family housing packed with electric appliances. In western Europe, industrial uses of power exceeded domestic–commercial use more narrowly than in Japan.[28]

It is worth noting here that the concentration of energy use in Nipponese industry offered a highly defined target for conservation during the decade following 1973. The Japanese could achieve significant savings through more efficient industrial energy use. In the USA, the personal character of energy use presented a diffused target for government commands and/or moral suasion and yielded disappointing results.

Resource scarcity in the home islands elicited vigorous government responses beginning in the 1930s. The pre-World War II solution, conquest, led to disaster. Following the war, and once American occupation terminated, Japanese resource policies concentrated on the cultivation of diverse sources of supply and on winning some control over supply through direct investments or long-term contracts. To secure raw materials, Japanese capital and management and technical

expertise spread throughout the world. By 1970, Mitsui was engaged in dozens of overseas mining operations to extract iron ore, copper, tin, salt, and petroleum at an investment cost of $25 billion. Mitsubishi possessed three energy companies, one involved in natural gas development in Indonesia, and the others exploring for oil around the world.

Recognizing its limited energy options, the Japanese government induced and supported nationally owned oil discovery ventures but did not create a state owned oil company. The first and most successful firm was the Arabian Oil Company, operating concessions jointly with Saudi Arabia and Kuwait in 1957. Interest then slackened until 1967 when MITI created the Japanese Petroleum Development Corporation (JPDC) to assist private investors with guaranteed loans and technological aid. JPDC spurred dozens of firms to initiate overseas exploration. The four largest conglomerates and the five largest electric utilities were involved in 26 of the 49 joint ventures active in 1974. The utilities were particularly interested in gas development, viewing LNG, expensive though it was, as preferable to coal or oil. Both Mitsubishi and Mitsui formed oil development subsidiaries to consolidate their exploration endeavors. In turn, these development companies negotiated joint venture agreements with the large MNOCs. In Abu Dhabi, Mitsubishi owned the Middle East Oil Company and JPDC bought out the BP interest in the Abu Dhabi Marine Areas Ltd.[29]

JPDC's goal of importing 35 percent of oil requirements from national producing firms seemed far from realization in 1973. Japan remained dependent upon a few producers and on foreign oil companies. American firms and BP and RDS delivered almost 75 percent of the oil while Japanese firms brought in 10 percent. In 1973, the Persian Gulf states, including Iran, supplied 78 percent of imports and Indonesia provided another 18 percent. The Indonesian relationship had developed after 1965 when Sukharno seized British and American oil properties and established a special oil relationship with Japan. An oil deal concluded in 1972 committed Japan to a $234 million oil development loan to Indonesia in return for a guaranteed ten-year supply of 51 mmt annually, or about 17 percent of oil imports. Japan also drew on Indonesia for bauxite, nickel, lumber, foodstuffs, and, commencing in 1972, LNG.[30]

In Wu's opinion, Japan's efforts to diversify its sources of oil were disappointing. In 1973, investments of 131 billion yen in foreign oil field operations yielded 8.5 percent of oil imports. Indonesian oil deliveries rose but reliance upon the Persian Gulf remained fixed. In 1961, 1973, and 1978, the latter region provided 74, 78, and 77 percent, respectively, of oil imports. To some extent, Japanese firms and government to government contracts lessened the role of the foreign MNOCs as deliverers and as refiners.[31] Into the 1970s, Japan doggedly held to these policies, turning to Latin America, the USSR, West Africa, Australia, and other places for energy. But the quantities available were a trickle, and higher priced than the volumes received from the Middle East. The great price shock of 1978–9 catalyzed Japanese conservation efforts and in the 1980s receipts from the Middle East dropped to about two-thirds of a reduced internal demand. LNG imports also rose, filling some 10 percent of TPER by 1985 while nuclear filled 9 percent. But for all of this, an interruption of Persian Gulf supplies remained a clear and present danger to Japan.

Energy in the Soviet bloc

Energy production and consumption accelerated smartly in the Soviet Union during the 1950s and 1960s, propelled by annual GNP growth rates that excelled those in both the USA and the European Community. In the eastern European satellites, however, economic and energy growth rates use trailed behind those of the dominant partner. The bloc states continued to rely heavily on coal which, as late as 1965, still accounted for 82 percent of TPER. Soviet bloc coal production soared between 1950 and 1965. Total output reached 760 mmt. The bloc contributed 53 percent of the increase in world coal production of which the Soviets accounted for one-third (Table 4.4). Thereafter, the role of coal declined more quickly, falling to 66 percent of TPER in 1973 while oil and natural gas climbed to 21 and 12 percent, respectively. Meanwhile, the USSR brought to maturity a three-fuel energy system that superficially resembled the primary energy mix of the USA (Table 4.5).

The Soviet decision of the late 1950s to shift resources from coal to petroleum and natural gas production, while by no means reducing coal production, resulted in marked increases in oil (Table 4.6) and natural gas supply. Gas production, at 128 billion cubic meters in 1965, reached 289 bcm in 1975. Production advances of such magnitude necessitated enormous annual investments in exploration, pipeline construction, and the expansion of refining capacity along with a progressive improvement in Soviet technologies or access to western technologies. Modernization of the railroad net, particularly between eastern sources of oil and western points of consumption, further taxed available Soviet capital. Hewitt suggests that as the costs of energy development increased, additional capital was withheld from other economic sectors. Oil pipeline mileage tripled between 1950 and 1961 and doubled again by 1970 while the tonnage of oil hauled by rail also grew rapidly. Refining capacity expanded at an equal rate: a capacity of 89 mmt in 1957

reached 189 mmt by 1965. Spurring both oil and gas production, in addition to general economic growth, was Soviet recognition of market possibilities in western Europe, the greater efficiency of those fuels in industrial processes, and eastern European demands for energy that required satisfaction to some degree.[32]

Costs rose and technological demands intensified as older coal and oil reserves were depleted, as exploration and development moved ever eastward after 1960, and as the Soviets concentrated on exploiting their enormous natural gas fields in western Siberia. As noted earlier, the need to import foreign equipment, particularly large diameter pipe and turbines for pipeline compressor stations, persuaded the Soviets to seek markets in western Europe for their surplus oil and gas. Simultaneously, the real politick of hegemonic power required increasing energy exports to their bloc partners. The fuel surplus was not a true one, available as it was only at the expense of domestic consumption.

The domestic energy mix of the USSR resembled America's in that coal remained a significant fuel, natural gas use increased, and a relatively low degree of oil dependence obtained—all of those fuels drawn from domestic fields (Table 4.5). But the similarities cease at that point. The Soviet bureaucracy planned and directed each aspect of energy production, distribution, and end use. Little or no central planning intruded into the American system. The ability of Americans to substitute one fuel for another, as in the residential shift from coal to oil, natural gas, and electricity, could not be replicated in the USSR, nor was it considered desirable. Ideology and the exigencies of Soviet economic growth demanded the programmed distribution of energy among users. Given the high priority of industrial development and defense, the Soviet domestic sector was the loser in energy allocation. In the USA, hospitals, homes, and schools were favored over industry during periods of tight natural gas or electricity supply.

In the Soviet system, price was of no importance to most domestic consumers. Agencies of the state, for example, supplied coal or fuel oil to other state agencies for distribution to public housing authorities. Virtually everyone lived in public housing whether a high-rise in the city or in a collective in the countryside. Gasoline or diesel fuel powered trucks, tanks, buses, and a handful of autos driven by or for officials. Soviet apartments were not furnished with the latest kitchen appliances as was French working class and middle class housing beginning in the 1960s. In the Soviet Union, energy was moved around according to centrally determined priorities. The producers and distributors of energy felt no particular urgency to move energy expeditiously to end use points. Bottlenecks proliferated in cities and industrial regions.

The Soviet industrial sector claimed in excess of one-half of energy use in 1970, compared with one-third in America. The industrial fuel mix also differed. By 1970, natural gas accounted for one-half of the fuel burn in American factories while the Soviets relied essentially on coal and oil. Private transport was not a factor in the USSR. All transportation in America consumed about 30 percent of TPER compared with 11 percent in the Soviet Union. The residential–commercial sectors of both nations required similar proportions of TPER. But the quality of American residential fuel was far superior. Until the late 1970s, little natural gas entered Soviet residences while it was the leading American residential fuel. In Russia, chemical and industrial uses of natural gas predominated. By the late 1970s, however, Soviet plans included the reduction of domestic oil use and the increase of natural gas, not in response to consumer demand but in order to free more oil for export. At the end of the 1970s, the domestic market for natural gas remained largely untapped. *Per capita* electric consumption in Russia reached 3,074 kwh in 1970. In Germany, that figure stood at 3,984, in the UK, 4,259, and in the USA, 8,487. Non-industrial electric use in the USSR lagged even further behind America and western Europe.

Soviet energy use conformed to a self-imposed preoccupation with the build-up of heavy industry and the industrial-transportation infrastructure. If GNP per unit of TPER did not vary substantially from the US—$1,380 to $1,231 (US), it should have. A vast amount of US energy flowed toward such non-productive uses as private transportation and residential heating, cooling, cooking, and lighting. In western Europe and Japan, less locked into private consumption patterns than Americans, GNP per unit of TPER far surpassed that of Russia. Moreover, so inflexible were Soviet energy use habits that, during the 1970s, while the USA significantly improved the efficiency of energy use, the Soviet Union hardly improved at all.

The Soviets were more concerned with gross industrial output and less concerned with maximizing GNP/TPER than Japan or western Europe because fuel was so plentiful for industrial purposes and because industrial output neither entered non-bloc foreign trade nor catered to consumer needs. Fuel use efficiency in the steel industry, for example, was of little significance compared with total production of steel ingots. GNP per unit of TPER in American industry attained a figure more comparable with that of Japan and western Europe than of Russia because US manufacturers operated under constraints similar to those affecting their OECD competitors.[33]

Net Soviet energy exports as a percentage of total energy production rose from 7 percent in 1960 to 12 percent in 1970: oil accounted for 85 percent and coal for all but a fraction of the remainder.[34] Tables 6.9 and

Table 6.9 Soviet crude oil and product exports, 1955–75 (thousand metric tons)

	1955	1960	1965	1971	1975
Total	8006	32318	64419	105200	130448
Eastern Europe	2201	9200	22397	44760	63280
Other bloc	1997	6000	6529	7520	9920
Western Europe	2364	14395	23833	33100[1]	34250[1]
West Germany	0[2]	1240		6090	7630
Italy	290[2]	4703	7345	9000	6880
Finland				8570	8770

[1] Includes only EC-9 plus Austria, Sweden, and Yugoslavia
[2] 1956

Sources: R.W. Campbell, *The Economics of Soviet Oil and Gas*, Baltimore: The Johns Hopkins University Press for Resources for the Future (1968), p. 238; D. Park, *Oil and Gas in Comecon Countries*, London: Kegan Paul (1979), pp. 168–9; B.W. Jentleson, *Pipeline Politics: The Complex Political Economy of East-West Energy Trade*, Ithaca: Cornell University Press (1986), pp. 91–113.

Table 6.10 Soviet oil exports as a factor in world oil trade, 1955–75

As percentage of:	1955	1960	1965	1971	1975
World exports	3.0	7.2	8.4	7.7	8.8
Soviet production	11.0	22.0	26.0	27.0	26.0
OECD-Europe net imports	2.0	7.2	6.0	6.8	7.6
West German net imports	0	4.7		4.9	6.5
Italian net imports	2.0	21.9	14.5	10.2	7.8

Sources: G. Jenkins, *Oil Economist's Handbook 1985*, London: Elsevier (1985), pp. 57–64; B.R. Mitchell, ed., *European Historical Statistics 1750–1975*, 2nd revised edn, London: Macmillan (1981), p. 442; sources for Table 6.9.

6.10 summarize global Soviet oil exports which expanded more rapidly than the world total until 1965 or so and again after the embargo of 1973. Accelerated oil deliveries to eastern Europe pushed the volume of exports upward while their world share leveled off. The bloc states received 46 percent of Soviet oil exports in 1960, 50 percent in 1971, and 56 percent in 1975. Deliveries were far more crucial to bloc states than were western European imports of Soviet oil. OECD-Europe receipts from the USSR in 1971 composed 7 percent of all imports; for Germany, 5 percent. Westerners paid in hard currency or in essential manufactured items, particularly producer durables, and that provided the compelling reason to develop the energy trade with the West.

Until 1973, Soviet exports of machinery and equipment ranked first in value earned while ores and concentrate metals equaled fuels in value earned. But, whereas the value of fuel exports accounted for 18 percent of the ruble value of all exports, compared with 22 percent for machinery, fuel brought in 27 percent of hard currency, with oil, alone accounting for 22 percent. A large proportion of exported machinery, ores, and fuels flowed to bloc nations in return for other products, particularly foodstuffs. With the price shock of 1973 and the emergence of a large trade in natural gas with western Europe after 1974, the ruble value of fuel exports climbed substantially above other export product groups: fuels accounted for 50 percent of hard currency earnings in 1976 and 80 percent in 1982. Oil and gas were among the very few Soviet products of any value to western Europe.[35]

Italy, Germany, and Austria during the 1960s and France and other OECD states during the 1970s benefited from the availability of Soviet oil. Hewitt concludes that after 1971 Soviet prices adhered closely to world spot market prices. During the 1960s, however, Moscow offered prices competitive with the discounted prices quoted by the MNOCs. To Italy's ENI, mindful of the Suez crisis of 1956–7, the USSR proffered secure contracts for large volumes at prices below discounted Middle Eastern oil. ENI's receptivity was the greater because the deal diminished dependence on the MNOCs. While substantial Italian reliance on Soviet oil tapered off during the 1960s (Tables 6.9 and 6.10), in part due to US pressure, the Russian reputation for reliability persisted into the 1970s, prompting western nations to continue Soviet oil imports and to commence natural gas purchases. This exchange suited both parties, however it may have angered US strategists who viewed the trade as a plot to fracture NATO.[36]

The USSR possesses some 40 percent of known natural gas reserves, including the biggest field, Urengoi, and four of the six largest, all discovered in the 1960s and all far to the east of consuming territories. During the 1960s, Soviet policy makers decided to utilize this gas to replace oil used internally and to export the freed oil to western Europe and the bloc states. Such were the volumes of gas available that exports were also feasible. Pipeline construction, despite difficulties, accelerated. By the mid-1960s, 50,000 kilometers of trunk line existed and another 12,000 were being laid. Production soared. Concurrently, gas use in Europe quickened because of the availability of Dutch gas. In the European Community of Nine, gas consumption climbed from 10 billion cubic meters in 1964 to 74 bcm in 1970 and 140 bcm in 1973. The Netherlands accounted for one-half of total consumption, so some 70 bcm (minus fractional non-Dutch production) represented the size of the import market. Dutch gas filled that demand until the early 1970s. The Soviets planned to share that large market.

An erratic American opposition, especially during the administration of John F. Kennedy, confronted Soviet oil and gas export plans. US leverage in NATO succeeded in temporarily blunting the Soviet oil

export campaign and in limiting western European exports of vital energy equipment to Russia. Such barriers, serving only ill-defined American purposes, quickly toppled. Presidents Johnson, Nixon and Ford liberalized trade restrictions with the Soviets, permitting American firms to negotiate lucrative energy equipment sales with their erstwhile enemies. Moreover, the Soviets proved adept at either producing their own equipment or circumventing American restrictions. Americans, unwilling to allow this and other business to escape by default to Europe and Japan, could not sustain an embargo.[37]

The Soviet–western Europe gas trade commenced in 1968, with shipments to Austria exchanged for steel products. These exports remained fairly insignificant until 1974. Since then, and following a decade of careful planning, impressive growth has characterized the volume and value of Soviet gas exports. As an example, in 1970 energy officials arranged to import Iranian gas for use in the southern regions, thus freeing Siberian gas for sale to western Europe.[38] The flowering of the gas trade during the 1980s and US efforts to impede it will be returned to in subsequent chapters.

Eastern European economies lagged far behind the leading OECD-European states through the 1980s. Continued Soviet political control, exercised through minions of Moscow and propped up by the might of the Red Army (manifest in Hungary in 1956 and during the Prague Summer of 1968) was deemed essential to the security of the USSR. This political reality determined the pace and character of economic growth in the European bloc states. Beginning in the late 1950s, the Soviets orchestrated a force-fed campaign of Soviet-style industrialization which, as at home, immediately felt the retarding influence of backward agriculture. To modernize and hopefully to allay the deep-rooted disaffection of national populations toward their heavy-handed regimes required the transfer of energy and other resources from the USSR to its subject states.

An imperative of modernization was the rapid substitution of oil and natural gas for coal in both industrial and domestic sectors. Poland, East Germany (GDR), and Czechoslovakia contained sufficient coal, but aside from Romania's diminishing oil reserves, the region overlay little oil or gas. Although sizable oil imports from Russia commenced during the 1960s (Table 6.9), followed by gas imports during the 1970s, coal remained the leading regional fuel, composing 66 percent of TPER in 1973 and still at 60 percent in 1985. In the coal states mentioned above over 70 percent of TPER derived from coal in 1975. As oil and gas use rose, eastern Europe became more dependent upon the USSR. Energy import dependence, low relative to OECD-Europe or Japan (Table 6.2), increased from less than 10 percent in 1960 to 16 percent in 1970

and continued upward during the 1970s. Poland, GDR, and Czechoslovakia, in 1970, imported from Russia 85, 87, and 70 percent, respectively, of total energy imports.

Energy supplies from the Soviet Union during the 1960s carried a stiff price, literally. According to Hewitt, until 1974 eastern Europe paid substantially more for Soviet oil than western Europe and more than world spot prices. In 1971, GDR, Poland, and Czechoslovakia each received between 9 and 10 mmt from the Soviet Union, or 97 percent of all oil receipts. Oil, cheaper by 50 to 60 cents per barrel, was available but the Soviets prohibited purchases from the Middle East. Beginning in the late 1960s, the Soviets also compelled their partners to help finance energy development projects. Czechoslovakia, as an example, invested 500 million rubles in Russian oil exploration in exchange for guaranteed deliveries of costly oil. Bloc states also diverted funds from weak domestic sectors to the construction of Soviet nuclear power plants. Into the 1970s, eastern Europe contributed an estimated $5 billion to assure the continued flow of Soviet oil and gas.[39]

Left to their own devices, eastern Europe would have embarked upon a program of industrialization that attracted western capital and technology. North African and Persian Gulf oil was readily available and little Russian oil would have been imported. Deals would have been struck for Soviet gas. The financing of electric generation and transmission facilities, too, would have drawn in western financial and technological aid. Some of the advantages of a free relationship with Russia might have dissipated between 1973 and 1979 when Soviet oil prices to eastern Europe were held below world spot prices. As for the Soviets, it is difficult to ascertain the economic advantages of the energy traffic with the bloc states. Each barrel of oil shipped to eastern Europe had a more productive use at home. In the Soviet view, such valuable commodities as fuels constituted goods to exploit politically. Oil and gas earned western currencies and technology. Oil could also be used as a weapon. The Soviets curtailed oil deliveries to Czechoslovakia in 1968, and to Cuba which opposed the invasion of Czechoslovakia. In later years, Moscow employed an oil embargo to force the Polish government to crush internal dissidence.

Energy policy confusion in the United States

Compared with its OECD partners, the USA luxuriated in energy and mineral wealth. As in western Europe and Japan, the supply of energy and minerals was firmly linked to the goals of national security and sustained economic growth. The USA assumed that its worldwide

market power, managed by giant oil and mineral multinationals and protected by a global military presence, would assure the continued inward flow of necessary natural resources at low prices. Since abundant domestic reserves of fossil fuels and other minerals existed, a comprehensive national resource policy failed to emerge for lack of compelling reasons.

By the 1960s, however, US dependence on imports of critical metals and oil reached unprecedented levels. Prices, however, remained low; supply remained adequate. Assertions of producer sovereignty in Mexico and Iran were treated as isolated incidents. The USA, then, was unprepared for the disintegration of US–MNOC hegemony in Middle Eastern oil fields during the 1960s. As producer governments acted in concert to control production and price, the USA did nothing to protect its vested interests, sanguinely believing that producers always sold their wares at market determined prices.

The belief that energy supply was basically secure precluded serious consideration of resource policies that would extend the life of reserves or moderate demand through conservation, resource substitution, processing or refining improvements, and recycling.[40] Whatever was essayed in the energy policy arena was inspired by internal energy politics rather than by a realistic appraisal of global energy politics. Despite prior warnings, American officials rejected the possibility that Saudi Arabia would turn its oil power against the USA.

The energy transition in America, initiated during the 1920s, manifested persistent fluctuations in the shares of TPER distributed among primary energy sources into the 1980s (Tables 4.5 and 7.1). The energy crises of the 1970s encouraged a modest revival of coal use that seems to have settled at a stable level since 1980, as it has in OECD-Europe and Japan. Sporadic shortages in gas supply, declining reserves, and higher prices caused a reduction in both the share of gas in TPER and in the amount consumed. The fall in gas use was compensated by rising coal and nuclear contributions to supply. In Japan and OECD-Europe, as in the USA, the troublesome factor lay in the inability substantially to reduce the proportion of net energy imports to TPER, specifically petroleum imports (Table 6.3). US oil imports doubled from 1960 to 1970, despite the oil import quotas. For the four years, 1970–3, oil imports rose by 91 percent, carrying import dependence to 17 percent in 1973 (Table 6.2). Oil import dependence moved from 36 percent in 1970 to 40 percent in 1973, and 51 percent by 1975.[41]

America recorded an average energy use growth rate of about 5 percent annually during the 1960s, compared with 6 to 7 percent in the USSR, West Germany, and OECD-Europe, and certainly unremarkable compared with Japan's 21 percent.[42] The USA, notwithstanding its plentiful oil and gas reserves, a superabundance of coal, and strong

nuclear technology, found itself with less energy than it required. It joined a lengthening list of oil importing industrialized and industrializing nations. The magnitude of the American demand did not mark it off from all other markets. Japan's oil imports often equaled and even surpassed America's while the cumulative imports of OECD-Europe greatly exceeded America's (Table 6.3).

America's prodigious consumption of energy, documented in Tables 6.1 and 6.3–6.5, must be placed within the context of the nation's global economic position. Trade deficits accumulated during the late 1960s as the competitive strength of American industry weakened both at home and abroad. For the five years prior to the OPEC price hike, 1968–72, the value (1980 dollars) of American imports surpassed exports by an annual average of $68 billion, small potatoes compared with the 1987 deficit of $211 billion.[43] The escalation of the war in Vietnam and a moderately expensive campaign to create a poverty- and pollution-free Great Society yielded budgetary deficits. After 1968, an inflationary surge ripped into the purchasing power of many Americans whose real incomes declined. The Vietnam conflict fractured domestic political unity and, combined with such issues as inflation and social reform, left energy issues smoldering in a forgotten corner of the backyard. The ramifications of OPEC's victories at Teheran and Tripoli induced little discussion and no action.

R.H.K. Vietor and C.D. Goodwin offer insights into and details of domestic energy politics since World War II that cannot be duplicated here.[44] The American government, after World War II as before, perceived energy resources simply as commodities. Concern about competitiveness within each industry, deviations from the mandates of antitrust legislation and, in the case of coal, anxiety over the volatility of labor–management relations, defined the paramount issues. Energy, as a thing in itself, as the bedrock upon which the economy rested, hovered indistinctly at some far edge of American political consciousness.

The American coal industry offers a convenient point of entry since US policies toward other fuels keenly affected its fortunes.[45] Table 6.11 shows the decline of coal and its partial recovery from 1965 to 1973. The rundown was most pronounced between 1947 and 1961, years in which intense competition from fuel oil and natural gas eroded coal's markets. As the railroads dieselized and electrified, coal disappeared as a railroad fuel. Between 1947 and 1965, residential and commercial demand plunged by over 80 million metric tons as former users happily replaced dirty and inconvenient coal furnaces with fuel oil or natural gas apparatus. Total industrial consumption fell off by a significant margin: demand in 1947 for 251 mmt dropped to 172 mmt by 1973. These losses were not recovered through exports.

Only power plant demand rose, and quite rapidly at that. In this

Table 6.11 Consumers of US coal, 1947–73 (million short tons)

	1947	1955	1961	1965	1970	1973
Production	631	465	403	512	603	543
Electric utilities	86	141	180	243	320	387
Railroads	109	15	0	0	0	0
Coke plants	105	107	74	95	96	94
Cement and steel	22	16	15	16	13	6[1]
All other manufacturing	124	90	77	86	75	72[2]
Residential–commercial	97	53	28	19	12	11
Exports	69	51	35	50	71	50

[1] Steel only
[2] Includes cement

Sources: U.S. Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1970. Bicentennial Edition. Parts 1 and 2*, Washington, D.C.: USGPO (1975), pp. 589–91; R.H.K. Vietor, *Environmental Politics and the Coal Coalition*, College Station, Tex.: Texas A & M University Press (1980), p. 129; Ching-yuan Lin, "Global Pattern of Energy Consumption before and after the 1974 Oil Crisis," *Economic Development and Cultural Change*, 32 (July 1984), pp. 781–802.

market, too, stiff competition was encountered, but coal successfully increased the tonnage sold to buyers that consumed 71 percent of production in 1973, a far higher proportion of total production than the norm in western Europe (Table 6.6). But thermal plants burned a rising volume of natural gas and fuel oil as boiler fuels, reducing the market share of coal from 69 percent in 1955 to 56 percent in 1973. In that year, an amount of oil and natural gas equivalent to 300 mmt of coal produced 655 billion kwh, a severe deprivation from the perspective of the coal industry.[46]

Excluding coal demand in the utilities and overseas markets, coal consumption fell from 457 mmt in 1947 to 183 in 1973 (Table 6.11), compelling a shrinkage in the labor force from 416,000 in 1950 to 140,000 in 1970. This occurred despite coal prices that declined from an average of about $15 per ton, f.o.b. mines, in 1947 to under $8 in 1969, the result of increasing mechanization and reduced labor costs. Improving productivity per man hour did not, however, lower coal prices by a margin sufficient to compete with fuel oil or natural gas.

Coal operated in a market in which regulated natural gas and electricity prices were fixed, according to critics of regulation, at levels below the intrinsic value of those energy forms. Lin's calculations indicate that the price of oil relative to coal declined by more than 40 percent between 1955 and 1973. In power plants, the technology of coal burning raised the kwh output per unit of coal. The coal industry remained labor intensive and the bargaining power of its dominant

union precluded the wage slashing that characterized the industry during the 1920s and early 1930s. Coal's disabilities included very high freight rates compared to the pipeline rates prevailing for oil and natural gas.[47]

Coal, an unregulated industry, felt the heavy hand of government. Legislative efforts to deregulate natural gas failed during the Truman and Eisenhower administrations. Gas remained tightly regulated until the Carter and Reagan presidencies. Artificially low prices encouraged the inefficient use of natural gas as a boiler fuel and discouraged the search for supplemental reserves. Withdrawals consistently exceeded new discoveries after World War II with rapid depletion occurring after 1969. Some sections of the country suffered gas delivery curtailments in 1970 and from the interdiction of new service hookups. The coal industry vigorously supported gas deregulation and emergency curtailments, hoping that uncertainty of gas supply would attract new orders for coal. Demand for coal did rebound during the 1960s (Table 6.11) as some older thermal power plants switched from gas to coal and as wartime demand reinvigorated a hitherto slumping steel production.

The National Coal Association mobilized industry opposition to both public hydroelectric projects and to subsidization of nuclear power. Pursuing, as it had during the 1920s and 1930s, an inveterately self-interested course, its self-serving position elicited little sympathy from government circles. Federal promises to support research in coal synthetics and to promote overseas markets came to nothing.[48]

In 1963, the Clean Air Act presented a new danger to coal. Although not immediately threatening to coal interests, this law, as Vietor explains it, engendered further efforts to put teeth in it, resulting in the Clean Air Act of 1970. Mounting concern over the deleterious effects of coal burning on air quality formed but a part of a more comprehensive crusade to protect natural ecosystems. In addition to the air quality acts, Congress responded to public demands for environmental protection by enacting laws regulating the disposal of solid wastes and controlling water pollution. In 1969, the National Environmental Policy Act won passage and, in the following year, the Environmental Protection Agency was established. This flurry of legislation, much of it amended during the 1970s to improve its effectiveness, promised to add substantially to the cost of coal burning. Air quality standards affected coal burning power plants, water quality controls impinged upon mines that contaminated surface water and groundwater supplies, and health and safety regulations required investments in and around the mines to bring units into compliance. Other laws provided compensation to many thousands of miners (or their survivors) who suffered from black lung disease. The cost of compliance to these regulations, though still fairly

light in 1973, became progressively steeper thereafter, perhaps dampening a resurgence in coal production stimulated by the sharp increase in oil prices in 1973.[49]

Coal's dilemma, traceable to the ubiquitous use of oil and natural gas and exacerbated by environmental protection legislation, seemed irreversible during the 1960s. The earlier failure of gas deregulation did not prompt renewed efforts during the 1960s. Both the Kennedy and Johnson administrations emphasized natural gas rate reductions, despite industry-wide concern over reserves and general agreement that only higher wellhead prices would induce exploratory drilling. Gas curtailments to industrial consumers, beginning in 1970, became more serious in subsequent years. Although beneficial to the coal industry, curtailments raised fuel prices, adding to the burden of the OPEC price increases after 1973, forced plant closings and worker layoffs, and jeopardized municipal service. But these untoward consequences struck most sharply after 1973.[50]

Back in the 1920s and again in the 1930s, the independent oil firms, enthusiastically supported by the coal industry, demanded federal action to reduce or prohibit the import of cheap foreign oil. The Suez closure of 1956 and augmented sensitivity to the connection between national security and America's domestic oil industry led to the adoption of voluntary import quotas in 1957 and mandatory quotas in 1959. By limiting oil imports to growth rates matching internal consumption, prices would be raised sufficiently, or so it was averred, to stimulate domestic exploration and, secondarily, to improve the competitive situation of coal. The reinvigoration of domestic energy industries would reduce dependence on foreign oil and fasten national energy security to a firm domestic foundation.[51]

The international ramifications of the quota system were discussed in Chapter 5. Domestic impacts are no easier to isolate. Crude oil production rose by 34 percent during the ten years, 1961–70 and then began to fall; during the previous ten-year period, production had risen by only 14 percent. However, the number of producing wells drilled declined from 30,641 in 1956 to 12,398 in 1970 while the number of exploratory wells dropped from 16,173 to 7,693. The quotas failed to induce domestic exploration. Crude oil reserves in 1970 were even lower than in 1959 while the reserve–production ratio, holding at 12 from 1958 to 1963, fell off to under 10 in 1969 and 1970. Old fields and old wells provided the new production.[52]

Eisenhower's successors tinkered with the import quotas. The northeastern seaboard, the nation's largest fuel oil market, was permitted to import more fuel oil than the quotas allowed, a trend reflected in the growth rates of product imports provided by Table 5.1. Refined

product imports more than doubled from 1961 to 1969 and rose by an additional 71 percent from 1969 to 1973. Fuel oil shortages in 1969–70, a result of the lingering effects of the second Suez closure, production cutbacks in Libya, and aggravated by natural gas scarcity in 1970, convinced Nixon to open the dike even wider. By this time, significant pressure was exerted from within the Nixon administration to abandon the quotas. Nixon finally terminated the program in April 1972.[53]

American energy import dependence intensified between 1970 and 1973 (Table 6.2) even as the share of domestic oil demand filled by imports reached 40 percent in 1973. Natural gas and fuel oil shortages occurred after 1969. The coal industry was besieged by competitive and environmental forces. The caustic touch of Vietnam eroded national unity. Inflation sapped the strength of the domestic economy, compelling President Nixon to impose a nationwide wage and price freeze in 1971 and successive price controls thereafter. Holding oil prices down from 1971 through the embargo of 1973 (oil controls remained in effect until 1981), just as world prices rose, further discouraged domestic oil exploration and development and stimulated even greater volumes of imports, thus worsening dependence upon a few producing countries.

Many policies impinged upon America's energy supply from 1960 to 1973, but an energy policy did not surface. The regulatory practices affecting natural gas conformed to consumer demand for low rates. Pressure from within the domestic oil industry and a poorly conceived notion of national security produced oil import quotas which achieved nothing positive. The federal government hardly responded to the transfer of production and price power to the oil producing states. The short-term implications of soaring energy use appeared on few agendas in Washington, D.C. From 1971 to 1973, the Nixon anti-inflation program treated oil as just another commodity. On the bright side, a surge of new orders for nuclear power plants occasioned some optimism regarding future energy supply. But in 1973, America's glaring energy vulnerability, replicated in western Europe and Japan, invited radical Arab action following the Arab attack on Israel during the Yom Kippur holy days.

International traffic in electrical equipment and plant

Burgeoning electricity production in the OECD states and in various industrializing countries characterized the 1950s and 1960s. Thermal plants and hydroelectric facilities generated the great bulk of new production, the share for each type dependent upon the water power resources of particular countries. Argentina, Brazil, Colombia, Mexico,

and Venezuela generated four-fifths of a Latin American output that in 1975 was eight times larger than in 1950. In 1975, thermal plants in Argentina produced 82 percent of the total while in Brazil hydropower generated 92 percent. Impressive advances were achieved in Turkey, India, and other LDCs. Expansion required huge investments in plant and equipment and, for the LDCs, necessitated the importation of technology and technicians and large amounts of capital from the developed states.[54]

Fewer than a dozen firms located in the USA, UK, West Germany, Switzerland, Italy, and Japan dominated the electrical equipment industry, with the USA clearly the leader in nuclear into the 1970s and West Germany replacing the USA as the leading exporter of thermal plant equipment by 1969. For such large firms as General Electric, the world's largest electrical equipment manufacturer, and the merged Siemens-AEG of Germany, the world market was divided into several parts.

Western European and US firms dominated their national markets. So powerful and capable were GE and Westinghouse that the USA, which installed over one-half of global generating capacity between 1955 and 1969, composed but a small fraction of the international market for such large items as steam turbine generators. Conversely, only a small part of US turbine production left the country. Western European manufacturers exported one-half of electrical equipment output to other European countries. Firms such as Switzerland's Brown Boveri relied almost wholly upon exports while German and Japanese firms such as Siemens-AEG and Hitachi defended market shares at home and successfully cultivated sales around the world, including sales in the USA. In the US market, sophisticated buyers selected the best technology available. Siemens-AEG and Brown Boveri discovered a thriving US market for high voltage transmission equipment when US manufacturers carelessly failed to meet delivery schedules. Japanese firms won contracts in the USA for hydroelectric equipment. These incursions cost American firms a share of the home market that could have been retained by better management.[55]

In addition to the markets of western Europe and the USA, demand in Latin America, South Korea, South Africa, and elsewhere afforded opportunities for the sale of entire plants as well as for specific equipment. Electrification, considered essential to economic modernization, provided a standard by which to measure progress. Brazil nationalized the assets of the American and Foreign Power Company in 1963 and 1964, assumed responsibility for all investments in new facilities, and launched a massive electrification program. From 1967 through 1973, Brazilian investments in power rose from $474 million to $1.4 billion, and totaled $5.7 billion. Electricity production reached 80 billion kwh,

up 3.5 times since 1960. Other Latin American governments also bought out American and Foreign Power and promoted electrification, although on a scale more modest than Brazil.

The World Bank loaned significant sums to the LDCs for power planning. Bowing to the trend toward government ownership of power systems, the Bank encouraged the development of autonomous government power agencies, the construction of nationwide grids, and the employment of rate structures designed to attract private investment. US, European, and Japanese firms competed vigorously for consulting and construction contracts in the LDCs. Hitachi and Mitsubishi vied for Brazil's hydroelectric contracts, employing a low price strategy backed by decades of experience in hydroelectric operations. World Bank regulations required open bidding and Bank approval of the victors, requirements that caused serious decline in the Commonwealth business of British electrical firms. European and Japanese firms penetrated such former British markets as Hong Kong, Australia, and South Africa.[56]

Until the mid-1960s, LDC projects consisted largely of thermal and hydroelectric construction. At that time, the cost of nuclear generation appeared to have fallen to a level competitive with a thermal plant of equivalent capacity. Based entirely on the reduction in the price of a complete plant per unit of generating capacity, these cost estimates neglected a host of pertinent factors. Nonetheless, such cost analyses presented a new power option to the LDCs and, during the 1960s, India, Pakistan, Argentina, Brazil, Egypt, South Korea, and Taiwan decided to pursue the nuclear alternative. India pushed ahead rapidly, its Canadian contractors bringing a plant on line in 1969.[57]

Nuclear power contributed a negligible portion of global and national TPER in 1973 (Table 4.5). Only in Britain did nuclear stations produce as much as 10 percent of electricity (Table 6.5). During the 1950s and 1960s, the American attempt to monopolize the technology collapsed in the face of nuclear development in Britain and the USSR. Abandoning a monopolistic stance, President Eisenhower's "Atoms for Peace" speech to the UN in 1953 announced America's willingness to share nuclear technology for peaceful purposes with non-hostile nations, both developed and undeveloped. Reactor technology and research capabilities were transferred to civilian firms. The USA obviously anticipated that GE and Westinghouse would dominate the global market for nuclear plants and that the US monopoly of enriched uranium would provide the leverage to prevent the spread of nuclear weapons.

Initially, the USA employed bilateral agreements, as with India and Pakistan, to regulate the transfer and use of nuclear technology and fissionable materials. Then, in 1957, more than 100 nations founded the

International Atomic Energy Agency (IAEA), each signatory pledging to abide by IAEA's non-proliferation safeguards. The explosion in 1964 of a nuclear device by China, a non-IAEA member, galvanized a joint US–USSR campaign to obtain worldwide ratification of a Non-Proliferation Treaty in 1968, an achievement marred by the failure to gain the adherence of China and France, each the possessor of nuclear weapons, and Argentina, Brazil, India, Pakistan, South Africa, and Israel, each with the potential for nuclear weaponry. The American interest in international safeguards stemmed from a somewhat egocentric desire to prevent the spread of such destructive weaponry to states considered unstable and aggressive and to strengthen the competitiveness of its nuclear industry in world markets. India's triggering of a bomb in 1974 and subsequent weapons development in Israel, Pakistan, and perhaps elsewhere accentuated the shortcomings of the Non-Proliferation Treaty and IAEA's safeguard procedures.

A large market for reactors in western Europe and the USA did not immediately materialize following the implementation of the Atoms for Peace program, despite an agreement between the USA and Euratom that favored American equipment and promised large US subsidies. From 1957 to 1961, GE and Westinghouse exported only seven plants, all under bilateral agreements, to Japan and western Europe. Neither did a domestic market emerge in the USA, which possessed only three operational plants in 1963. Britain's nuclear industry exported plants to Japan and Italy, but its prospects dimmed when further orders did not arrive. Although the sales atmosphere seemed poor, Canada, France, and West Germany supported an active nuclear research and development program. Nationally owned agencies in Canada and France and Kraftwerk Union, one of Germany's three largest electrical equipment firms, achieved the capability of producing an entire plant. From 1951 to 1960, those nations received seven orders for plants, Britain, twenty (all but one domestic), and the US firms, ten. During the 1960s, Sweden and Japan joined the club of nuclear plant exporters.

Increasing confidence in the safety and cost effectiveness of nuclear power produced a market breakthrough in the mid-1960s, accompanied by a rush of orders through 1974 which revitalized the American and European nuclear industries. By far the larger share of orders originated from the highly industrialized nations. The USA logged 186 new orders from 1966 through 1974, western Europe, 84, and Japan, 14. By 1974, 53 plants were operational in the USA, and 44 in OECD-Europe (with an additional 30 under construction). Many of the non-US plants were constructed during the 1960s under licensing agreements with GE or Westinghouse. But American supremacy waned thereafter. Siemens-AEG abrogated its licensing arrangement with Westinghouse in 1970

while Japanese firms quickly developed their own competence and became independent of their American mentors. France, Canada, Britain, and Sweden vigorously searched for orders. Competition intensified just as inflation and the rise of organized opposition to the safety and environmental hazards of nuclear power brought to a sudden halt this avalanche of orders for new plants. New orders in the USA fell from 109 (1971–5) to 12 (1976–80). Equally sharp declines were experienced in Germany and Japan. Hard times plagued the nuclear industry into the late 1980s; only France and the Soviet Union sustained a relatively high level of new construction.[58]

The advocates of nuclear power claimed that it would be too cheap to meter. Costs, however, spiraled to unimaginable heights during the 1970s. Nuclear electricity was no cheaper than hydro or thermal. Moreover, as opponents emphasized during the 1970s, the hidden costs attending plant safety, nuclear waste disposal, plant decommissioning, and public subsidization pushed the real price of nuclear electricity well above thermal generation. Even more damaging than cost inflation, there arose a ubiquitous public disenchantment with the assurances of nuclear adherents concerning the safety of the technology. But Three-Mile Island and Chernobyl were in the future. As of 1973, organized opposition was only emerging in the USA and almost unheard of in Europe or Japan. To many, nuclear power looked good.[59]

Conclusion

The industrialized states of the West experienced impressive economic growth after the Korean War. Economic policies promoted high employment and rising wages while dampening inflationary pressures. Constant economic growth was predicated on cheap, abundant, and uninterrupted energy and mineral supplies. The western nations, and others, recognized the close relationship between energy supply and national security. But none of the OECD states were self-sufficient in energy resources. Rapid economic growth, sought by all, fostered energy consumption which intensified energy import dependence. Rising levels of energy imports during the 1960s weakened national security, but policies promoting domestic consumption overrode equally weighty objectives of national security. Abundance and cheapness made energy import dependence acceptable.

Energy policies in the capitalist West served domestic political demands. In the Soviet Union, energy policies had to take cognizance of basic needs in the satellite states, but not to the detriment of Soviet industrial and defense goals. Each nation pursued narrow and short-

term goals, thus precluding the possibility of formulating even intermediate-term plans. Thus, in western Europe and in the USA, the coal industry was allowed to deteriorate even though it was the largest and most valuable internal source of energy. In the USA, artificially low natural gas prices harmed the coal industry while speeding the depletion of gas reserves and discouraging exploration.

Interventionist and non-interventionist nations had all tumbled into the same empty barrel by 1973 when oil import dependence reached high levels. Western countries neglected to formulate policies protective of domestic energy resources or to foster the development of renewable energy. Aside from very controversial and costly nuclear technology, no substitute energy forms appeared on the horizon. New oil and gas finds in the North Sea and Alaska promised a few nations temporary amelioration of energy import dependence. As the oil producing states of OPEC gained control of production and prices in 1970–1, western consuming nations observed, lethargically. Professional politicians, whatever their personal beliefs, were quick to spot a non-issue.

Notes

1. For the above see: W.W. Rostow, *The World Economy: History and Prospect*, Austin: University of Texas Press (1978); P.F. Chapman and F. Roberts, *Metal Resources and Energy*, London: Butterworths (1983); W.M. Scammell, *The International Economy Since 1945*, 2nd edn, London: Macmillan (1983).
2. W.W. Rostow, *The Stages of Economic Growth: A Non-Communist Manifesto*, 2nd edn, Cambridge: Cambridge University Press (1971); J.K. Galbraith, *The Affluent Society*, Cambridge, Mass.: The Riverside Press (1958); D. Riesman, *Abundance for What? And Other Essays*, New York: Anchor Books (1965); D. Bell, *The Cultural Contradictions of Capitalism*, New York: Basic Books (1976).
3. OECD-Europe included: Austria, Belgium, Denmark, *Finland*, France, West Germany, Greece, Iceland, Ireland, Italy, Luxembourg, The Netherlands, Norway, Portugal, *Spain*, Sweden, Switzerland, Turkey, and Britain. Other members include: *Australia*, Canada, *Japan*, *New Zealand*, and the United States. *Yugoslavia* is an associate member. In 1960, OECD superseded the Organization for European Economic Cooperation which was established in 1948. The original members of OEEC included all of the above excepting those in italics.
4. The points alluded to in the above four paragraphs are treated in greater detail in subsequent sections. A few of the studies dealing with these matters are: P.F. Cowhey, *The Problems of Plenty: Energy Policy and International Politics*, Berkeley: University of California Press (1985); R.L. Gordon, *The Evolution of Energy Policy in Western Europe: The Reluctant Retreat from Coal*, New York: Praeger (1970); L.E. Grayson, *National Oil Companies*, New York: Wiley (1981); M.T. Hatch, *Politics and Nuclear Power: Energy Policy in Western Europe*, Lexington: The University Press of Kentucky (1986); G.W. Hoffman, *The European Energy Challenge: East and West*, Durham, N.C.: Duke University Press (1985); W.G. Jensen, *Energy in Europe, 1945–1980*, London: G.T. Foulis (1967); H. Maull, *Europe and World Energy*, London: Butterworths (1980).
5. B.R. Mitchell, ed., *European Historical Statistics, 1950–1975*, 2nd revised edn, London: Macmillan (1981), pp. 423, 518–19.
6. IEA, *Energy Balances of OECD Countries, 1970/1982*, Paris: OECD/IEA (1984), pp. 387–9, 404; *BP Statistical Review of World Energy, June 1986*, pp. 31–3; J. Darmstadter *et al.*, *Energy in the World Economy: A Statistical Review of Trends in Output, Trade, and Consumption Since 1925*, Baltimore: The Johns Hopkins University Press for Resources for the Future (1971), pp. 624–7.
7. IEA, *Energy Balances, 1970/1982*, pp. 387–9, 404.
8. Cowhey, *Problems of Plenty*, pp. 134–44; Gordon, *Energy Policy in Western Europe*, pp. 63–94; N. Lucas, *Western European Energy Policies: A Comparative Study of the Influence of Institutional Structures on Technical Change*, Oxford: Clarendon Press (1985), pp. 9–17; H. Mendershausen, *Coping with the Oil Crisis*, Baltimore: Johns Hopkins University Press for Resources for the Future (1976), pp. 22–35; P.R. Odell, "The Energy Economy of Western Europe: a return to the use of indigenous resources," *Geography. Journal of the Geographical Association*, 66 (January 1981), pp. 1–14.
9. Cowhey, *Problems of Plenty*, pp. 134–5; Gordon, *Energy Policy in Western Europe*, pp. 52–8.
10. The High Authority of the European Coal and Steel Community *et al.*, *Memorandum on Energy Policy (June 25, 1962)*, np (August 1962), pp. 17–21; Gordon, *Energy Policy in Western Europe*, pp. 67–71, 244; L. Lister, *Europe's Coal and Steel Community*, New York: Twentieth Century Fund (1960), pp. 50–1, 280, 336; Hoffman, *European Energy Challenge*, pp. 2–4.
11. IEA, *Energy Balances, 1970/1982*, pp. 387–9, 404.
12. For the above three paragraphs: Lucas, *European Energy Policies*, pp. 9–11, 16–17; Gordon, *Energy Policy in Western Europe*, p. 62; Grayson, *National Oil Companies*, pp. 26–8, 34–6; Hatch, *Politics and Nuclear Power*, pp. 16–19.
13. *Ibid.*, p. 19; Lucas, *European Energy Policies*, pp. 14–15.
14. For the above two paragraphs: Hatch, *Politics and Nuclear Power*, pp. 12–14, 27–30; Mendershausen, *The Oil Crisis*, p. 26; Grayson, *National Oil Companies*, pp. 115–24; C. Tugenhadt and A. Hamilton, *Oil, the biggest business*, revised edn, London: Eyre Methuen (1975), p. 317.
15. For the above two paragraphs: IEA, *Energy Balances, 1970/1982*, pp. 387–9, 404; Political and Economic Planning, *A Fuel Policy for Britain*, London: PEP (1966), pp. 29–31, 97–101, 203; M.P. Jackson, *The Price of Coal*, London: Croom Helm (1974), p. 127; G.L. Reed *et al.*, *The Nationalized Fuel Industries*, London: Heinemann Educational Books (1973), pp. 18–19, 23; P. Hepple, ed., *The Petroleum Industry in the United Kingdom*, London: The Institute of Petroleum (1966), pp. 42–3; M. Peebles, *Evolution of the Gas Industry*, London: Macmillan (1980), 33–41.
16. Jensen, *Energy in Europe*, pp. 108–9, 112–14; J.D. Davis, *Blue Gold: The*

Political Economy of Natural Gas, London: Allen & Unwin (1984), pp. 14, 183–5; Peebles, *Gas Industry*, pp. 139–40.

17. O. Noreng, *The Oil Industry and Government Policy in the North Sea*, London: Croom Helm (1980), pp. 95–6.
18. Mendershausen, *The Oil Crisis*, p. 24.
19. Lucas, *European Energy Policies*, pp. 17–18; PEP, *Fuel Policy for Britain*, pp. 62–3.
20. G. Manners, *Coal in Britain*, London: Allen & Unwin (1981), p. 69.
21. R.M. Burrell and A.J. Cottrell, *Politics, Oil, and the Western Mediterranean*, Beverly Hills, Calif.: Sage (1973), p. 47; E.S. Simpson, *Coal and the Power Industries in Postwar Britain*, London: Longmans (1966), pp. 98–100.
22. For the above three paragraphs: Burrell, *Oil and the Mediterranean*, pp. 45–9; Grayson, *National Oil Companies*, p. 40; Mendershausen, *The Oil Crisis*, pp. 21, 26–7, 30; H. Madelin, *Oil and Politics*, translated by M. Totman, Farnborough: Saxon House (1975), p. 182; Hepple, *Petroleum Industry in UK*, p. 34; PEP, *Fuel Policy for Britain*, p. 227; Tugenhadt, *Oil*, p. 251; F.A. Olaloku, *Structure of the Nigerian Economy*, London: Macmillan (1979), p. 58.
23. For the above two paragraphs: Mendershausen, *The Oil Crisis*, pp. 19–21; Hatch, *Politics and Nuclear Power*, pp. 30–1; Grayson, *National Oil Companies*, p. 166; E.A. Hewitt, *Energy, Economics, and Foreign Policy in the Soviet Union*, Washington, DC: Brookings Institution (1984), p. 153; I. Kuczynski, *British Offshore Oil and Gas Policy*, New York: Garland Publishing (1982), p. 6–12; ECSC, *Memorandum on Energy*, pp. 14–16; Tugenhadt, *Oil*, pp. 251–7.
24. For the above two paragraphs: Ching-yuan Lin, "Global Pattern of Energy Consumption before and after the 1974 Oil Crisis," *Economic Development and Cultural Change*, 32 (July 1984), p. 792; Rostow, *World Economy*, p. 273; J. Foreman-Peck, *A History of the World Economy: International Relations since 1850*, Brighton: Wheatsheaf Books (1983), p. 297; J. Hirschmeier and T. Yui, *The Development of Japanese Business, 1600–1980*, 2nd edn London: Allen & Unwin (1981), pp. 292–5, 322–3; J.A. Wolfe, *Mineral Resources: A World Review*, New York: Chapman and Hall (1984), pp. 16–17; Chapman, *Metal Resources and Energy*, p. 163; Z. Mikdashi, *The International Politics of Natural Resources*, Ithaca, New York: Cornell University Press (1976), pp. 27–30; H. Shibata, "The Energy Crises and Japanese Response," *Resources and Energy*, 5 (June 1983), pp. 130–4; Statistical Office of the European Communities, *Basic Statistics of the Community . . . 1968–1969*, 9th edn, Luxembourg: Statistical Office (1970), pp. 23, 73–5.
25. IEA, *Energy Balances 1970/1982*, pp. 387–9, 404; Darmstadter, *Energy and the World Economy*, pp. 623–4, 627, 642.
26. Y-I. Wu, *Japan's Search for Oil: A Case Study in Economic Nationalism and International Security*, Stanford, Calif.: Hoover Institution Press (1977), p. 27; United Nations, *1983 International Trade Statistics Yearbook, vol. I. Trade by Country*, New York: UN (1985), p. 1087.
27. IEA, *Energy Balances 1983/1984*.
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7

The West and the energy crisis of 1973–8

Simultaneous Egyptian and Syrian attacks on advanced Israeli positions on October 6, 1973 coincided with a scheduled OPEC meeting in Vienna on October 8. The Arab assault, launched as Jews celebrated the high holy day, Yom Kippur, precipitated a protracted energy crisis, the causes of which are still debated and the consequences of which are still being sorted out. This chapter describes the varied responses of OECD-Europe, the USA, and Japan to a sudden and steep rise in the price of oil, a temporary embargo and resultant oil scarcity, and gnawing uncertainty about the security of oil supplies. The chapter concludes as Moslem fundamentalists in Iran overthrew the Shah's government, sending the Shah into exile in July, 1979, and thereby precipitating an astounding jump in oil prices. The following chapter employs the same time frame to investigate the impact of these events on the Soviet bloc and on the producing and non-producing LDCs.

The OPEC price hikes and the OAPEC embargo

OPEC officials wending their way to Vienna in early October were firmly resolved to set prices above those established at the Tripoli and Teheran meetings by producer fiat. The Yom Kippur War presented a propitious moment for OPEC to jack prices up without negotiation or consultation with the MNOCs or their governments. The energy supply and demand predicament of the industrialized states assured the success of OPEC's price decisions and encouraged the Organization of Arab Petroleum Exporting Countries (OAPEC) to impose an oil embargo on October 17, 1973.

As energy use in the West became ever more intensive and ever more oil based, reliance upon energy imports intensified. Net energy imports as a percentage of total primary energy requirements (TPER) for the USA, Japan, and OECD-Europe stood at 17, 93, and 65, respectively (Table 6.2). Oil composed the bulk of those imports. Together, those three markets received 1,373 million metric tons of oil in 1973, or 83 percent of world imports (Table 6.3). As Table 7.1 indicates for 1973, oil provided well over half of TPER in OECD-Europe and Japan and 44 percent in the USA.

Had this oil been obtained from many sources, each supplying but a small proportion of overall demand, the West would have been less vulnerable to OPEC and OAPEC pressure. Table 7.2 identifies the key regions from which the West obtained its oil. It appears that the USA drew from more diverse and less insecure producers than its OECD associates. But, as it happened, that offered little protection. In the USA, the world's largest energy and oil producer (in 1973), output from aging domestic fields declined between 1970 and 1973 while TPER and oil's share of TPER rose (Table 7.1). American crude oil imports soared from 67 mmt in 1970 to 164 mmt in 1973. Members of OPEC supplied 74 percent of the latter tonnage. OPEC sellers dominated western European and Japanese markets even more completely. Europe drew 89 percent of its crude and Japan 80 percent from OPEC which provided 64 percent of world supply.

Surging western demand for oil, particularly in the USA where both oil and natural gas production exceeded discoveries, created the moment for OPEC price action. Supplies were tight and transportation fully employed in 1973. The West evinced no capacity for united resistance to an OPEC price increase. The producing states were convinced that the MNOCs would not object to higher prices and would follow orders. The Yom Kippur War, then, did not cause a price increase but did, in association with the OAPEC embargo, cause a higher price to be selected. The West had no choice but to acquiesce to the OPEC price. Readily available alternatives to petroleum did not exist.[1]

The political might of oil was used by OAPEC to punish the friends of Israel. On October 17, OAPEC announced a production cutback of 5 percent each month until Israel both withdrew from the territories seized in 1967 and agreed to recognize Palestinian rights. The next day, Saudi Arabia, the erstwhile friend of the USA, reduced oil production by 10 percent and imposed a total embargo on the USA which, by then, had undertaken the resupply of Israel's armed forces. Libya followed suit. Saudi Arabia then reduced production by 25 percent. By October 22, OAPEC's members had joined Saudi Arabia in the embargo and

Table 7.1 TPER and fuel mix of industrialized states, 1970–87

	TPER*	% Solid fuels	% Oil	% Natural gas	% Hydro	% Nuclear	% Net imports to TPER
USA							
1970	1563	21	42	33	4	<1	9
1973	1742	21	44	30	4	1	17
1979	1916	25	45	25	3	3	21
1985	1792	24[1]	40	25	5	6	12
1987	1840	24	43	23	4	6	16
Japan							
1970	282	23	69	1	7	<1	86
1973	340	17	75	1	5	<1	93
1979	377	15	70	5	6	5	90
1985	372	20	55	10	6	9	84
1986[4]	380	18	56	10	5	11	86
OECD-Europe							
1970	1044	30	57	6	7	1	63
1973	1197	23	59	10	6	1	65
1979	1286	22	54	14	7	3	54
1985	1236	20	46	16	8	10	40
1986[4]	1277	20	44	15	7	11	40
USSR[3]							
1970	789	38	35	22	4	<1	
1973	874	36	37	23	4	na	
1979	1134	30	38	27	4[2]	1[2]	
1985	1376	26	33	35	4	3	

* Million metric tons oil equivalent

[1] 28 percent in 1984
[2] 1980
[3] The Soviets were net exporters
[4] Estimates

Sources: IEA, *Energy Balances Of OECD Countries, 1970/1982*, Paris OECD/IEA (1984), pp. 387–9, 404; *ibid.*, *1983/1984*, pp. 16–17, 76–7, 120–1, 135; *BP Statistical Review of World Energy*, *1981*, *1982*, *1984*, *1986*, *passim*; IEA, *Coal Information 1987*, Paris: OECD/IEA (1987), *passim*.

production slashes. Also subject to the embargo were the Netherlands, Portugal, Canada, Rhodesia, and South Africa.

The aggressive Saudi response should not have taken the USA by surprise. In April, 1973, the Saudi government had warned the Nixon administration that oil would be used politically against the USA if it persisted in favoring Israel over the Arabs. The Aramco partners, trying to distance themselves from America's commitment to Israel, publicly criticized Israel's Arab policies. But the Nixon administration, preoccupied with the Watergate scandal, dismissed the Saudi warning as a bluff. American foreign policy in the Persian Gulf rested on the assumption that the Soviet menace tied Saudi Arabia and Iran so firmly to the USA that neither could afford to weaken their protector. American policy makers shared the belief that Saudi self-interest and, by extension, Arab Persian Gulf self-interest, precluded radical action on behalf of anti-Zionism. The USA was wrong. As Al-Sowayegh asserts, the Arab world was less concerned with the Soviets than with Israel and the Palestinians.[2]

Oil withdrawals by the OAPEC states declined from 19.8 million barrels daily* in September 1973 to 15.5 mbd in December. After subtracting from this loss the increased production of the non-Arab producers, the net loss approximated 3.5 mbd. The non-embargoed industrialized nations suffered supply deficiencies along with the embargo's targets. The 5-month embargo denied the USA about 25 mmt, or 8 percent of 1973 crude imports while domestic production fell from 480 mmt in 1972 to 444 mmt in 1974. This loss sufficed to cause real oil shortages in America.

Diminished production, distribution inefficiencies, and MNOC decisions combined to deny normal supplies of oil to most western European nations and to Japan. While France was not included in the embargo, minimally reduced shipments were experienced as the MNOCs diverted some oil intended for France to embargoed markets. France complained mightily of discrimination and blamed oil difficulties on the machinations of foreign oil companies. Oil scarcity was more onerous in Germany than in France or the UK. MNOCs and the independents delivered 12 mmt less to Germany in 1974 than in 1973, a reduction of 8 percent. Japan, reliant upon a few producing countries and a few Anglo-American oil firms for most of her oil, was in a precarious position. Japan's largest producing firm, the Arabian Oil Company, like Aramco, was forced by Saudi Arabia to reduce production. The MNOCs, too, notified Japanese refineries of a diminution in crude

* Multiply by 50 to obtain the metric ton equivalent for twelve months.

Table 7.2 Sources of oil for industrialized states, 1973–85 (percent)

	1973	1979	1982	1985
USA				
Net imports (mmt)	305	420	249	248
Middle East	13	25	15	8
North Africa	6	15	5	4
Latin America	43	30	41	41
Canada	21	5	9	15
All others	17	25	30	32
OECD-Europe				
Net imports (mmt)	776	647	466	412
Middle East	68	66	49	35
North Africa	16	14	16	20
West Africa	7	8	7	12
Soviet Bloc	6	9	16	20
All others	3	3	12	13
Japan				
Net imports (mmt)	292	276	206	202
Middle East*	76	74	66	64
Southeast Asia	19	21	21	19
Western hemisphere and China	3	4	11	13
All others	2	1	2	4

* Includes North Africa

Source: BP Statistical Review of World Oil Industry, 1970–86.

deliveries. The foreign MNOCs delivered a larger proportion of available crude to their Japanese affiliates than to Japanese owned firms.[3]

Arab oil politics elicited immediate diplomatic responses from the beleaguered OECD states. To curry favor with the Arabs, both the European Community and Japan hurriedly assured the world of their sympathy for Palestinian rights. An EC meeting in November, 1973 called upon Israel to withdraw her troops from Egyptian lands seized in late October and early November, a demand seconded by Japan in December. Both EC and Japan, in keeping with a 1967 United Nations' resolution, stated that Israel should withdraw from the lands conquered in 1967. The EC also undertook joint meetings with the Arabs, culminating in a 1974 gathering with the Arab League and the Palestinian Liberation Organization (PLO). In return, OAPEC exempted Japan and EC members from the production cutbacks of November and December. Neither was the USA wholly immobile. Despite its scream of blackmail, the USA pressed Israel to reach an immediate accord with Egypt, permitting the Sadat government to retire from the field with some honor. As a result of this subtle American shift, the OAPEC states, excepting Libya and Syria, ended the embargo in March 1974.[4]

The pro-Arab maneuvering of EC and Japan secured fewer benefits than the initiation of direct bargaining for oil supplies with the governments of the producing states.

As intended, the production cuts and an effective embargo shocked the industrialized states. Panicky buyers, unassured by their governments or the oil companies, imagined the disappearance of oil from local markets. But the psychological consequences of the embargo had evaporated by 1974 or 1975. The impact of the price weapon lasted longer and had greater effect. National economies had hardly accommodated to the first round of price increases when the Iranian Revolution precipitated an even more extreme ratcheting upwards of oil prices in 1979–80. The price increases of 1973 and following years were programmed by OPEC; western panic rather than OPEC design precipitated the price explosion of 1979–80.

Opinions regarding OPEC's prices from 1973 through 1978 range from the wildly accusative which cast OPEC in the role of an arrogant price gouging cartel blamable for all the ills—inflation, in particular—of the 1970s to those essentially absolving OPEC of all responsibility for the economic maladjustments of that decade.[5] Most analysts avoid the polar positions, recognizing western and OPEC responsibility for unstable and, in many LDCs, damaged national economies. But even on the middle ground, disagreements abound regarding the motivation of OPEC. Some emphasize profit maximization objectives and others focus on political goals. Still others have concluded that OPEC, the USA, and the MNOCs conspired to raise prices to serve the profit maximization objectives of OPEC and the MNOCs and to weaken the competitive position of western Europe and Japan *vis-à-vis* the USA.[6] These interpretations will be explored in Chapter 8. To provide context for the ensuing discussion of the energy crisis in the OECD states, I merely mention at this point a set of goals to which OPEC's members seemed to adhere.[7]

OPEC and OAPEC cannot be considered truly distinct bodies. The key members of OAPEC were equally important to OPEC. The pursuit of higher oil incomes for development purposes and anti-Zionist political goals were not mutually exclusive. OAPEC wielded its oil weapon while driving prices up through OPEC. Prices soared without linkage to either proven reserves or costs of production. These price hikes reflected:

1. A producer assessment of the true value of crude to users.
2. Producer insistence that oil prices move with the inflated costs of imports from the industrial nations.
3. Producer intention to gain compensation for earlier losses resulting

from MNOC price and production authority and the relatively weak bargaining power of the producers.

4. A compromise between producers such as Iran, desirous of the highest possible price, and Saudi Arabia which sought to avoid price increases that severely damaged the West or that stimulated active conservation and/or the search for alternative fuels.
5. Internal political rather than market forces.

Prior to the oil price revolution of late 1973, a gnawing inflationary pressure troubled the economies of the industrialized states. In western Europe, annual rates of inflation during the 1960s had been held, for the most part, under 5 and even 4 percent. By 1972, however, the rate exceeded 5 percent and surpassed 6 in France and 7 in Britain. In the USA, the wage and price controls of the Nixon administration temporarily checked inflation. Wage increases and a buoyant consumer demand in Europe coupled with a contracting surplus of raw materials and a 70 percent increase in crude oil prices between 1970 and the summer of 1973 thrust general prices upward. These trends were exacerbated in the USA by large annual domestic budgetary deficits, rising interest rates, and, spurred by an increase in the exchange value of the dollar, a swelling balance of trade deficits. Inflation rates in both Germany and Japan reached higher levels than in the USA. Unlike America, however, industrial expansion continued in the former Axis partners and unemployment rates advanced less severely. Higher wages in Germany and Japan were justified by improved productivity and the successful marketing of technologically advanced goods and services in international markets. In the USA, and in the UK, France, and Italy as well, soaring wages accompanied industrial stagnation or decline and the loss of foreign markets. Both Germany and Japan demonstrated greater capability in redirecting industrial emphases and thus proved more resilient when confronted by the OPEC price hikes than the American, British, French, or Italian economies. None of the latter could so easily counter the blow of rising import bills by throwing their export sectors into higher gear.[8]

Table 7.3 encapsulates the course and volatility of oil price changes during the years since 1973. Posted prices (OPEC's official prices) quadrupled from August 1973 to 1975. A second price revolution followed between 1978 and 1981. A third period of instability commenced in 1986 with prices plunging as low as $9 and then gradually rising to a somewhat stable level during 1989.

The striking oil price bargains enjoyed by the West during the 1960s ended in 1973. Until then the net cost of oil imports comprised a small, if unavoidable, part of the total import bill. In Germany which, alone

Table 7.3 Oil prices, 1973–88

	Annual average regular gasoline prices			
Date	Posted crude price ($ bbl)	UK (Pence per UK gallon)	USA (Cents per US gallon)	Germany (Cents per US gallon)
August 1, 1973	3.07	36	40	150
October 16, 1973	5.12			
1974*	11.25	52	53	
1975	12.38	72	57	
1978	12.70	75	63	195
1979	24.00	116	86	209
1980	32.00	128	119	253
1981	34.00	145	131	
1983	29.00	180	116	
1985	28.00		112	
1986	14.00		86	
1986 low	9.00			
1987†	18.00		90	
1988	18.00			

* Year end prices
† Saudia Arabian light

Sources: G. Jenkins, *Oil Economists' Handbook 1985*, London: Applied Science Publishers Ltd (1985), p. 20; De Golyer and MacNaughton, *Twentieth Century Petroleum Statistics 1986*, Dallas, Tex.: De Golyer and MacNaughton (1986), pp. 13, 41; Energy Information Administration, *Monthly Energy Review November 1987*, Washington, D.C.: USDOE (1988), p. 96; Congressional Quarterly, *Energy Policy*, 2nd edn, Washington, D.C.: CQ (1981), p. 43; L.R. Brown *et al.*, *State of the World 1988*, Washington, D.C.: W.W. Norton (1988), p. 26; *Lawrence Journal World*, March 10, 1988.

of the major OECD-European states, maintained a positive current accounts balance, the oil bill was hardly noticed. The staggering oil price advances of 1973–1975 worsened the trade deficits of the UK, France, Italy, and the USA while transforming a favorable balance in Japan to a negative balance.

Imported oil as a percentage of the value of all imports climbed swiftly between 1972 and 1975. In 1972, that percentage rested under 9 in Germany, France, and Britain and at 12 percent in energy poor Italy. By 1975, oil's share had reached 22 percent in Italy, 18 percent in France, 15 in Britain, and 14 in Germany. In Japan, in 1974, imported oil accounted for 32 percent of the import bill. Translated into dollars this meant that the Japanese oil import bill rose from $4.4 billion in 1972 to $24 billion in 1975. The US oil import tab leaped from $3.3 billion in 1970 to $27 billion in 1975. By 1978, the annual import bill of over $35 billion represented 20 percent of the cost of American imports that had more than doubled in value since 1973.[9]

The economic consequences of the oil price explosion while varying

in detail and duration within OECD were most severe from 1973 through 1975. Current accounts deficits fostered deflationary policies designed to reduce the currency drain. The ensuing economic slowdown, especially in such energy intensive industries as chemicals and steel, pushed unemployment within OECD from 11 million in 1973 to above 18 million in 1976. The contraction of the US economy was attested to by negative growth in 1974 and 1975, declining growth in productivity rates between 1973 and 1978, and unemployment rates that rose from 5 percent in 1973 to over 8 percent in 1975. Rising oil prices in the industrialized states further exaggerated existing cost-push inflationary pressures by impelling consumer prices upward to levels far exceeding actual new costs of production and distribution. Consumer prices in Japan rose by as much as 30–35 percent in both 1974 and 1975. Italy's 6 percent rate of inflation in 1972 jumped to an average of 18 percent for 1974 and 1975. The British faced 24 percent inflation in 1974, three times higher than in 1972. France, also, experienced double-digit inflation in 1974 and 1975. Since wage increases rarely matched the rate of inflation, the real wages of workers stagnated or declined, resisting improvement until the mid-1980s.

Excepting Germany, which contained inflation and sustained a favorable balance of trade, economic malaise, characterized by recession and inflation, belabored the industrial world in 1974 and 1975. Many billions of dollars were drained from the oil importing countries by the oil exporting countries. The global value of OPEC's oil exports in 1978 reached the stupendous sum of $136 billion, compared with $15 billion in 1970. The European Community contributed 30 percent of this increase, the USA, 22 percent, and Japan, 17 percent. The three, together, paid out $83 billion more for oil in 1978 than in 1970. Japan's fuel imports consumed 5 percent of gross domestic product in 1975. OPEC received 4 percent of Japan's GDP, OPEC captured 3 percent of the GDP of the EC-9 and 1 percent of US GDP. Money shifted in extraordinary amounts to states with limited spending ability, at least in the short-term. Chapter 8 will discuss the employment of those petrodollars, a portion of which the oil producing countries returned to the industrialized importing nations in the form of investments.

The siphoning from the industrialized states of tens of billions of dollars, most of which languished in savings in 1973 and 1974, contributed to a severe contraction of spending, causing reduced inventories, investment, and production, and spawning high unemployment. These developments, instead of forcing prices down were accompanied by galloping energy and other costs that propelled prices skyward. The term "stagflation" was coined to describe this strange amalgam of industrial recession and inflation.[10]

The inflationary pressures directly attributable to huge increases in oil prices terminated in 1975, with stable oil prices holding into 1978. The levels attained by 1975, justifiable in the opinion of OPEC, had intensified inflation and had retarded economic growth. However, as Alnasrawi convincingly argues, OPEC alone cannot be blamed for stagflation. Western economic difficulties, particularly American and British, and widespread import dependence were entirely self-inflicted, exposing the unshielded West and the even more vulnerable oil importing LDCs to the full force of OPEC's prices. The stability of pre-1970 prices ended. The MNOCs, formerly the price managers, were replaced by a cohort of oil producers with widely divergent interests but joined in OPEC. While not the only cause of stagflation, OPEC was the prime mover in 1973–5.[11]

The embargo and price revolution signaled the final transfer to the leading oil producers of control over their oil industries. The powerful MNOCs, and the larger independents as well, were casualties of a forced structural transformation of the international oil industry. Chapter 8 offers a more elaborate discussion of the transformed functions of the MNOCs. Here several questions are posed that relate to the effects of the energy crisis on the industrialized states and their MNOCs.

Under the regime of the MNOCs, the oil supply of the West seemed assured. After 1973, however, the national companies of producing states encroached upon or assumed the functions of the MNOCs as principal lifters. What role would the MNOCs play in exploration and development? How would their enormous investment potential and technological expertise be utilized? Would they respond to the political risks of Middle Eastern oil operations by withdrawing to more stable, if more costly, oil fields? Producer governments harbored downstream ambitions. How successfully would the producing states penetrate refining and marketing sectors? The MNOCs confronted not only the producing state oil firms but new or revitalized consumer state companies. Importing states exhibited distrustful or skeptical attitudes toward the policies of the MNOCs and demanded that they serve national interests. Did the MNOCs possess sufficient acumen to serve their own interests as well as those of producer and consumer governments?

The crisis of 1973 encouraged government intervention in energy that went beyond the formation of state energy companies. Rising oil prices enhanced the value of other forms of energy. Was it possible for consumer states to loosen the OPEC stranglehold through the substitution of coal, natural gas, nuclear power, or other forms of energy? Did effective fuel substitution require state intervention? Were supply side solutions adequate or was it imperative that the consuming states

shave total energy use by practicing conservation? Were western nations politically capable of responding forcefully and purposefully to the energy challenge, including the possibility of irreversible environmental damage posed by their own voracious appetite for energy?

The coordination of western energy policies

Scarcity of oil in the ground formed no part of the crisis of 1973–5. The producing states contained sufficient reserves to supply global demand into the twenty-first century. The OAPEC embargo caused temporary inconvenience and demonstrated the ability of united producing states to disrupt oil flows. The OPEC price increases were enduring and costly. Cast into oblivion were western assumptions about the security and cost of oil. While the response of the West to the two-pronged assault of the producers varied from state to state, they continued, for the most part, to embrace similar energy objectives.

Critical to each nation was strengthening security of energy supplies. This encompassed relations with traditional suppliers, the foremost of which were the source of current problems, active efforts to exploit domestic energy sources, and the development of new and more secure sources of overseas oil. Dependence upon unstable and/or hostile suppliers could be reduced; the volume of oil imports could be cut. This required either replacement by some other fuel or a diminution of TPER or some combination of both. Diversification of the internal energy mix, earlier recognized in the abstract as desirable, emerged after 1973 as a "new" policy objective. The crisis also thrust into prominence an appreciation, long taken for granted because of plentiful and cheap energy, that the energy sector was vital to national economic stability and growth. Higher costs of energy affected the competitiveness of industries in world markets.[12]

Within OECD this congruence in broad energy policy goals was filtered through and supported or constrained by the political configuration, resource endowment, and current economic strength of each nation. Unique national situations also seriously impaired western cooperative endeavors through such existing institutions as the European Community, expanded to nine states in 1973, OECD, and NATO. National attitudes, egocentrism and jealousies, leaders reflecting the collective limitations of their constituents, all obstructed the formulation of collective responses to protect the developed consumer states from new disruptions of supply or to dull the price power of the producers. The International Energy Agency (IEA) did emerge in 1974 as an autonomous organization housed within OECD, but its usefulness has still to be tested.

The producer campaign gave birth to two cooperative approaches to the western energy dilemma. An aggressive anti-OPEC strategy, reflecting the US proclivity to label OPEC as the author of its economic woes, underlay a US proposal to create an international energy organization among the industrialized importers that would confront producer power with consumer power. Europe and Japan drew back, however, from the adversarial nature of the US initiative. The European states, and France in particular, preferred a conciliatory approach to OPEC and the Arab states. EC envisioned the development of a special relationship with Arab producers, one that would buffer them from the taint of America's pro-Israel policies and, perhaps, undermine the dominant position of the USA in Iran and Saudi Arabia.[13]

A conference attended by the USA, Canada, Norway, Japan, and the EC states in February 1974 revealed profound disagreements over suitable policies. The USA advocated the application of collective pressure against OPEC and opposed individual national arrangements with the producers that would further weaken the MNOCs. The EC bloc regarded this position as self-serving. France, intensely nationalistic and a welcome host for the virus of anti-Americanism, refused to sign an initial communique and ultimately eschewed membership in IEA. While this diluted the collective influence of EC in IEA, French objections forced the USA to moderate its demands and mute its public expressions of hostility of OPEC. The USA won the adoption of a plan to share oil among IEA members during an oil supply emergency. France seized upon this scheme to justify its refusal to join. In truth, France, jealously guarding a narrow conception of national sovereignty, rarely accepted the lead of any other state. Norway, about to become an oil producer, displayed no enthusiasm for oil sharing and choose a partial rather than full membership in IEA. With an EC–Arab dialogue already in progress, the USA agreed to a non-confrontational approach to OPEC by the new organization. In November 1974, IEA was constituted as a part of OECD. In 1975, IEA met with OPEC and accomplished nothing; thereafter, OPEC ignored IEA.

IEA has played no discernible role in international energy affairs. The oil crisis management system has not been applied. For the most part, IEA functions as an information dispenser and as a voice of persuasion, preaching oil import reduction and advocating realistic domestic energy prices, conservation, fuel switching, nuclear development, and vigorous energy R&D. IEA's members pledged in 1975, and frequently thereafter, to pursue those goals. They were only honor bound to do so. During the 1980s, the utter indifference of successive American administrations towards IEA's objectives further obscured its relevance.

EC courted the Arab states but gained little thereby. Neither did the

evolution of the European–Arab discussions into conferences between the EC and the lesser developed nations—the so-called North–South dialogue—produce more than mutual recrimination. The oil producing countries, led by the OPEC states, presumed to speak for the LDCs and defined the agenda to include all natural resources, LDC indebtedness, and economic development. The South's demands, in European eyes, were unreasonable. So acrimonious did the talks become that OPEC, in 1975, threatened to raise prices unless Europe adopted the Arab position, the gist of which would guarantee the commodity prices of exporters, and thus their incomes, and liberalize the extension of credit to LDCs while easing up on debt collection. Meetings continued under UN auspices but the developed and underdeveloped states were unable to reach a consensus. An international treaty was signed in 1982 to regulate the uses of the deep seabed but American, German, and Japanese refusal to sign thwarted implementation.[14]

The European Community has been unsuccessful, in the opinions of El-Agraa and Kohl, in fashioning a significant role in international energy decision making. A common energy policy failed to emerge after 1973. Norway, a key North Sea producer, rejected membership in 1973. Britain, the major North Sea oil and gas producer and achieving energy self-sufficiency in 1981, uncovered few reasons to shape its energy policies in conformity with Community wishes. The energy policies of members with significant energy resources and technological strength fostered national rather than collective goals. Members competed rather than cooperated in developing nuclear energy, despite Euratom. Britain and the Netherlands adopted oil and gas production and price policies that aroused the resentment of their Community partners. The oil crisis of 1979 generated mere reiterations of previously announced objectives. Grayson, writing in 1981, doubted that future EC energy initiatives would amount to much.[15] National interests subdued collective energy interests.

Alone among the multi-state energy organizations, OPEC possessed the power to influence events. Of the western energy organizations, the International Atomic Energy Agency (IAEA) appeared to be the most active because of its responsibility to verify the peaceful uses of nuclear materials moving across national boundaries. But the IAEA does not formulate broad energy policies. Policies after 1973, as before, originated with the separate states. Although the developed states shared energy policy objectives, the detailed agenda of any one nation frequently clashed with that of other nations. American price controls on domestic oil encouraged consumption and rising levels of oil imports after 1973, thereby supporting OPEC's high prices. In the view of other OECD members, US price controls damaged their interests.

National responses to the energy crisis

The OECD nations were acutely vulnerable to an oil action by the Persian Gulf and North African producers, the suppliers of 80 percent of OECD-Europe's oil imports, 74 percent of Japan's, and 40 percent of America's (Table 7.2). Prior to 1973, the industrialized states had recognized the implicit danger of heavy oil import dependence (Tables 6.2 and 6.3), but low prices and plentiful oil dissipated any sense of urgency to moderate that dependence. More compelling was the commitment to sustained economic growth. The embargo and price increases shattered assumptions about security and constant economic growth. Continued reliance upon the MNOCs now seemed foolhardy to Europeans and Japanese. The risks attending production ventures in the Middle East and other LDCs became glaringly apparent. Among political goals, the containment of inflation assumed paramountcy. The beguiling lure of nuclear energy, the renewed attractiveness of coal, the production of North Sea oil and gas became critical agenda items in various OECD states. Conservation and renewable energy, even in the short-term more promising sources of energy than the fossil fuels, struggled, mostly unsuccessfully, for a prominent place on the agenda.

In one sphere, that of American foreign policy, American objectives remained constant. America's OECD partners, many also members of NATO or otherwise linked to the USA in military pacts, evidenced a willingness to alter attitudes and policies toward the Soviet bloc and the Arab states. The USA held staunchly to its own truths. From the Nixon Doctrine to the Carter Doctrine, America clung tenaciously to the conviction that the Soviet Union threatened the stability of the Middle East. Nixon's reliance on surrogate powers to stave off the Soviets disintegrated in 1979 when the Shah's power crumbled, while Carter's promise to intervene unilaterally to protect the Persian Gulf was meaningless.[16] American military power and diplomacy proved impotent against implacable Arab hatred of Israel, strident nationalism, and such manifestations of violence and chaos as the Lebanese imbroglio, the Iran–Iraq War, and the West Bank Palestinian rebellion of early 1988. Western oil ventures faced multiple risks in the Middle Eastern tinderbox. It behooved the importing states and their oil companies to reassess the costs of maintaining production in the region.

According to Luciani's calculations, the 10 largest MNOCs (the Seven Sisters plus Amoco, CFP, and Elf) controlled 73 percent of Middle Eastern/North African production in 1972. By 1980, they had direct access to but 47 percent, the bulk of which they received under contract from producing state oil companies. Concomitantly, MNOC ownership of non-Communist world production fell from almost 70 percent in 1973

to under 50 percent by 1980. National firms handled a rising share of production, processing, and marketing. Given the risks inherent in Middle Eastern operations, BP, Gulf, and Elf virtually abandoned the region while RDS cut back sharply the scale of its operations (Table 8.6). The Aramco partners, all US firms, continued to invest in Saudi Arabia, believing it relatively secure and unlikely to proceed arbitrarily against them.[17]

The advanced importing states, after 1973, extended their authority over the domestic oil industry. Italy's ENI and France's CFP antedated the energy crisis. In addition, France, in 1976, formed Elf-Acquitaine through an amalgamation of firms. New state companies, Norway's Statoil (1973) and the British National Oil Company (1976) were created to protect national security and assure the state a fair share of the proceeds from North Sea oil production. Both firms were endowed with offshore oil properties, engaged in joint ventures with private firms, and refined and marketed oil. Germany, too, experimented in 1974 with an amorphous sort of national oil company but when it failed to advance German interests it was terminated in 1979. Britain also turned away from state control when the government of Prime Minister Thatcher succeeded in privatizing both BNOC and the British Gas Corporation.[18]

To assess the performance of the state owned firms requires identification of their official objectives. Three goals seem paramount: to strengthen the security of oil supply, to gain preferential treatment from producing states, and to reduce substantially MNOC shares of domestic markets. ENI dominated the Italian market only because RDS, BP, and Exxon withdrew. ENI consistently operated at a loss and was dependent upon the MNOCs and the USSR for a large portion of its crude. ENI did not win particular favor from the producing states. French oil companies lost direct access to Middle Eastern oil during the 1970s while dependence upon that region for oil continued unabated. After 1978, revolution and war virtually dried up the flow of oil from Iran and Iraq, forcing French companies to search for supplies in less chaotic areas. The goal of a 50 percent share of the domestic market for state firms was abandoned in 1978. Statoil and BNOC owned safe oil. By most accounts they performed satisfactorily. But did they better serve the national interest than the private firms would have, functioning under a regulatory agency with no hands-on role? Labour created BNOC; Socialists, Statoil. Evaluations of both depend upon the ideological eye of the beholder.[19] French, Italian, and German vulnerability to sudden supply disruptions in the late 1980s remained acute. Britain and Norway enjoy energy self-sufficiency for some finite period of time only because of the North Sea.

For a steady flow of crude, America relied upon its special relationship with Iran and Saudi Arabia and the private firms operating there and in such other producing areas as Latin America, Canada, and Nigeria. European efforts to improve oil security by initiating government to government contacts with Saudi Arabia and Iran yielded little oil above that covered by existing contracts with the Iranian National Oil Company and Saudi Arabia's Petromin. While Aramco in Saudi Arabia, the Iranian Consortium, and the BP–Gulf partnership in Kuwait experienced severe contraction in controlled liftings, these firms continued to receive most of the oil that the Gulf states did not process or market themselves.[20]

Changes in the location of world energy reserves and centers of world production into the 1980s were insufficiently remarkable to augur a more secure energy future for the industrialized states. The TPER of the USA, Japan, and OECD-Europe declined by 5 percent between 1979 and 1985; global TPER climbed 7 percent. Oil as a proportion of global TPER fell from 46 percent in 1975 to 38 percent in 1985, a reduction reflected in the energy use patterns of the industrialized states (Table 7.1). A commensurate increase in the use of coal, natural gas, nuclear, and hydropower accompanied oil's decline. But this modest alteration hardly justified complacency regarding future fuel supplies in the economically advanced states.

Oil remained the premier fuel. Production in 1985 matched that of 1973. Virtually the same countries in 1985 produced a portion of world oil similar to that of 1973 and earlier (Tables 7.4 and 4.4). New producing areas in the North Sea and Alaska offered but temporary relief. North Sea reserves of 3 billion metric tons (bmt) were a mere seven times greater than annual oil consumption in OECD-Europe. Alaska added 1.4 bmt to US reserves, the equivalent of two years of domestic consumption. Moreover, the declining volume of Middle Eastern and North African production after 1979 reflected conscious policy rather than depleted reserves. OPEC's members sat on more than 60 percent of world reserves in the late 1980s. Middle Eastern states controlled over 50 percent of reserves. This oil is far cheaper to produce than offshore oil or oil from other fields in the western hemisphere.[21]

The oil price advances of 1973–4 and 1979–80 induced a flurry of oil exploration and development ventures in areas other than the Middle East. New oil from the North Sea or Alaska cost anywhere from 15 to 30 times more to produce than Middle Eastern oil, but with prices 60 to 80 times greater than the cost of production, the new oil reaped large profits. Global reserves, however, remained quite stable, rising but 2 or 3 percent from 1973 to 1979 and not at all during the 1980s.

Substantial oil discoveries in Latin America after 1975 added over 7 bmt to regional reserves by 1985. Mexico owned 6 bmt of this increase

and Venezuela, 1 bmt. Mexico elected to accelerate production, lifting 47 mmt more in 1979 than in 1973; Venezuela's production fell by 52 mmt (Table 7.4). Latin American output rose by only 11 mmt over those years and its share of world oil exports remained at about 10 percent.

The most significant long-term trend in world oil production occurred after 1979. Middle Eastern producers substantially reduced output while Britain, Norway, and Mexico raised the volume of their liftings (Table 7.4). OPEC producers husbanded their reserves. Saudi Arabia, with 24 percent of global reserves in 1986, contained 141 years of production at 1986 levels; Britain's North Sea fields, contributing less than 1 percent to world reserves, would last for less than a decade at current withdrawal rates, as would US reserves.[22]

Regions considered secure by OECD states yielded only marginal additions to natural gas reserves. US gas reserves continued to fall while no large finds augmented western Europe's reserves. During the 1970s, the USSR and Iran discovered new fields which gave the Soviets some

Table 7.4 World crude oil production, 1973–87 (million metric tons)

	1973	1978	1979	1980	1985	1987
World	2829	3078	3156	3049	2828	2767
USSR	430	568	593	612	607	590
USA	467	441	433	436	455	415
Saudi Arabia*	372	409	488	490	165	231
UK and Norway	2	73	97	108	165	123[1]
Mexico	27	62	74	98	137	127
China	51	102	108	107	127	134
Iran*	297	264	154	84	114	122
Brunei[†]	15	21	27	25	93	
Venezuela*	171	110	119	110	86	86
Canada	90	67	76	72	79	75
Nigeria*	104	97	117	105	75	64
Iraq*	102	127	176	84	73	102
Indonesia*	68	83	82	80	67	66
United Arab Emirates*	77	93	77	87	59	75
Libya*	110	100	105	93	53	49
Algeria*	56	56	61	58	50	32
Kuwait*	140	96	112	71	48	61
Egypt	8	23	27	30	45	
Above % of World production	91	91	93	90	88	83

* OPEC states
† Includes Malaysia
[1] UK only

Sources: De Golyer and MacNaughton, *Twentieth Century Petroleum Statistics 1986*, Dallas, Tex.: De Golyer and MacNaughton (1986), pp. 4–11; Energy Information Administration, *Monthly Energy Review November 1987*, Washington, D.C.: USDOE (1988), pp. 112–13.

35 to 40 percent of global reserves and Iran 20 to 25 percent. Iran contains more natural gas than all of North America, as do the Arab Persian Gulf states. But Middle Eastern gas is of little use to Europe or the USA. Indeed, flaring wastes over 60 percent of the gas produced. Earlier expectations of a large liquefied natural gas trade did not materialize, except to Japan where LNG imports substituted for oil in electric generation. Soviet gas exports to western Europe filled a rising demand.[23]

The security of OECD's future supply of oil and natural gas remains problematic, in spite of the reduced rate of energy use achieved since 1979. Since the mid-1970s, OECD states have rapidly depleted their safest sources of oil. Adequate reserves of natural gas exist, particularly in western Europe, but that fuel cannot substitute for oil in road transportation. Coal use has not contributed to a diminution in gas or oil use while nuclear, even under the most favorable conditions imaginable, will not displace fossil fuels in the production of electricity. This suggests that the West did not use to advantage the time gained by its temporary access to secure oil and gas by reducing its reliance on those potentially scarce fuels. As the 1980s ended, the West's energy position remained fragile.

During the 1960s, the dominant position of western MNOCs in the oil fields of the non-Communist world assured, or so the West believed, an uninterruptible supply of energy to the cheapest price. But even while the oil spigot ran freely, not every nation hewed undeviatingly to the cheapness standard. France opened its doors to cheap oil, at the expense of the coal industry, but neither Britain nor Germany could afford simply to abandon coal, their sole domestic source of energy. Various forms of subsidization buffered those large coal industries against the full effects of oil and gas competition, a protection persisting in Britain even as North Sea oil and gas penetrated the domestic market. Simultaneously, the West committed substantial funds to develop nuclear power, despite the absence of accurate cost data and reliable safety procedures. The incongruities characteristic of pre-embargo fuel policies extended into the post-embargo years.

The supply side reaction of the West

Western European nations and the USA (Japan will be treated separately) responded to the price and supply shock of 1973 with policies that I would label as minimally incremental. Each state operated within parameters set by a particular energy endowment and a unique political structure and style. Each aimed to diversify its internal energy mix by

reducing oil imports through the substitution of indigenous forms of energy and/or fuels obtained from producers more reliable than the Arab states. Simultaneously, several European states launched diplomatic initiatives to placate Arab producers and, hopefully, to foster with them a special state-to-state relationship through the medium of national oil companies. The USA relied upon its Persian Gulf security role to maintain the flow of oil from Iran and Saudi Arabia. Soaring oil prices aggravated inflation and worsened trade imbalances. The pricing of energy products posed a complex dilemma: allowing an uninhibited market driven rise in domestic prices risked a political backlash; artificially restricting prices might obstruct energy exploration while encouraging habitual use.

Supply considerations dominated the energy strategies of the USA and western Europe, and Japan as well, from 1973 through 1979. In addition, the governments of the USA, Britain, Italy, and France employed price controls to moderate inflation while Germany permitted oil prices to rise to market levels, necessitating concomitant increases in regulated electricity and natural gas prices. US price regulations prevented product prices from increasing as sharply as they did in western Europe. Most commentators agree that controlled prices in the USA retarded the discovery of new oil and gas, stimulated energy consumption, thereby serving the purposes of OPEC, and excited the hostility of America's OECD partners.[24]

Of the major OECD members, France acted most directly to curb oil imports. Impelled by security considerations as well as by a high current accounts deficit in 1974, which could not be alleviated by larger exports, France imposed, in 1975, a ceiling on the value of allowable oil imports. Germany, on the other hand, while offering some incentives to improve the efficiency of energy use, essentially allowed home demand to determine the level of oil imports. In contrast to France, Britain, Italy, and the USA, Germany's comprehensive industrial policies encouraged a rapid acceleration of exports, the earnings of which paid the higher cost of oil imports. In Germany, as Ikenberry explains it, energy policy formed an integral part of industrial policy. In America, the crisis produced, in November 1973, the misleading rhetoric of President Nixon's "Project Independence," an impossible scheme to "meet America's energy needs from America's own energy resources" by 1980.[25] Thereafter, a hotchpotch of energy legislation achieved little. Most significantly, Presidents Nixon and Ford failed to win legislation to decontrol oil and gas prices and to tax imported oil.[26]

The volume of oil imports after 1973, displayed in Table 7.5, attests to the success or failure of each nation's effort to reduce oil imports. Note, however, that a reduction of oil imports was not synonymous

Table 7.5 Net national crude oil and product imports, 1973–85 (million metric tons)

	1973	1977	1978	1979	1980	1984	1985
USA	305	432	409	420	337		248
Japan	292	279	270	284	253	217	
OECD-Europe	776	657	648	647	589		413
West Germany*	151	143	144	151	138		95
Britain	117	53	42	26	7	−37	
Italy	131	115	118	123	109	92	
France	130	117	116	126	109	68	

* Gross imports

Sources: De Golyer and MacNaughton, *Twentieth Century Petroleum Statistics, 1986*, Dallas, Tex.: De Golyer and MacNaughton (1986), pp. 60–1; *BP Statistical review of the world oil industry*, issues, 1970–85, *passim*; IEA, *Energy Statistics, 1971–1981*, Paris: OECD/IEA (1983), pp. 311–31, 343–53, 626–38, *1983–1984* (1984), pp. 51–3; IEA, *Energy Balances of OECD Countries, 1970/1982*, Paris: OECD/IEA (1984), pp. 387–9, 404.

with resolution of the energy crisis. Over the period, 1973–7, net American oil imports rose by 38 percent, French imports declined by 13 percent, and German imports fell by 5 percent. Britain's import dependence was dramatically reduced after 1975 when North Sea oil arrived. By 1978, domestic oil filled in excess of one-half of British demand while oil consumption had dropped by 11 percent. Britain achieved self-sufficiency in 1981. TPER dropped more rapidly than in other industrialized nations, not as a consequence of a programmed effort but due rather to a stagnant economy. Both TPER and net import dependence in the USA steadily advanced from 1973 to 1979 (Table 7.1). In Germany, net import dependence remained unchanged through the 1970s while TPER rose modestly, both trends reflecting Germany's willingness to pay for more expensive energy. French TPER also grew, but at a much slower rate than during the 1960s. Import dependence was essentially unchanged because of rising coal and natural gas imports.[27] In short, TPER trends reveal no purposeful campaign among the above states to reduce energy use; instead they sought to substitute other fuels for oil. Conservation, from 1973 to 1978, was not identified as an essential new source of energy.

The supply side policies implemented by the industrial states aimed at increasing the use of coal and/or natural gas and expanding nuclear power, objectives not easily accomplished. Resource constraints, institutional structures, environmental concerns, interest group politics, and domestic energy use habits frustrated the fulfillment of energy supply goals, particularly in nations that lacked access to new and plentiful sources of energy.

The role of coal

The large coal industries of Britain and Germany suffered severely from oil competition during the 1960s (Table 6.6). Production in America reached its nadir during the early 1960s and then rebounded. But, the industry was burdened by large overcapacity and, by the early 1970s, was constrained by stiff environmental laws (Table 6.11).

Theoretically, high oil prices enhanced the value of coal as an available and lower cost substitute for oil, and of gas in America, as a boiler fuel in power plants and industry. In the coal producing nations, post-embargo energy plans were partly predicated upon a resurgent coal industry. Projections of electricity consumption through the 1970s optimistically employed as their guide the 6 to 8 percent annual growth rates of the 1960s which, if accurate, would create a demand requiring additional coal and nuclear generation.

In America, the Nixon and Ford administrations counted on vastly increased coal production to reduce oil imports swiftly. Ford called for 250 new coal mines that would add 125 mmt to US coal production which equaled 655 mmt in 1975, already 55 mmt higher than output in 1973. President Carter, in 1977, established the goal of 1 bmt by the 1980s. Not to be outdone, the Economic Commission for Europe, in 1978, anticipated a doubling of US coal production to 1.2 bmt by 1985. Even more incredibly, the World Coal Study (1980) predicted 2 billion short tons by the year 2000.

Somewhat less wild projections for production in Germany and the UK assumed a production in 1980 at least equal to 1973. However, in both countries and in EC as a whole, coal production declined through 1978, rose from 1979 to 1981, and commenced to slip again. Of the numerous factors that precluded achievement of coal production objectives, environmental opposition, infrastructure deterioration of the coal industry, a rash of nuclear plant openings, and falling rates of growth in electricity consumption were telling.[28]

In Europe and the USA during the 1970s, a body of environmental protection and health and safety laws added substantially to the costs of coal mining and coal use. Federal legislation in Germany regulated coal-burning emissions and water quality. German environmental groups concentrated on nuclear power rather than on coal mining and burning. In contrast, bitter political fights ensued in the USA over legislation designed to prevent and correct abuses of land and water by underground and surface mining. Proposals to regulate strip mining precipitated a battle royal. When finally passed in 1977, despite two previous presidential vetoes, the Surface Mining Control and Reclamation Act

increased the cost of producing the low sulfur coals of America's western mines. Similar struggles erupted over efforts to reduce the emission of various solid and gaseous pollutants during coal combustion. Emission control laws doubled the time consumed in siting and constructing a coal-fired power plant. Other laws mandated the application of state-of-the-art anti-pollution equipment. This legislation added to the cost of construction. Environmental objections, including heightened concern over acid rain, clashed with the equally compelling need to prohibit or strictly limit the production of electricity by natural gas and oil.

Necessary environmental laws were constantly subjected to the oblique assault of governments committed to increased energy production as the solution to the energy crisis. The German government and the Nixon and Ford administrations in America resisted the imposition of stricter environmental standards and sought to dilute existing rules. President Reagan undermined environmental defenses, virtually nullifying, for instance, the effectiveness of the strip mining law. The Reagan, Thatcher, and Kohl governments denied responsibility for the export of and damage caused by acid rain. Also, those leaders ardently supported nuclear power.[29]

The coal industry of Great Britain declined precipitously after 1955

Table 7.6 Coal production in world and selected nations, 1973–86 (million metric tons)

	1973	1977	1980	1982	1984	1985	1986
World	3029		3733	3903	4113	4359	4399
USA	599	697	753	838	896	886	807
UK	130	106	130	125	51	105	104
West Germany	222	215	225	224	212	210	201
USSR	615	665[1]	653	647	642	647	670
East Germany*	246		258	276	296	312	315
Poland	195	234	230	210	243	250	255
China†	398	550	620	641	789	845	873
Australia	88		105	128	138	156	169
India	81		114	136	153	158	168
South Africa	62		116	144	163	174	181

* Brown coal only
† Hard coal only
[1] 1978

Sources: W.A. Rosenbaum, *Energy, Politics, and Public Policy*, 2nd edn, Washington, D.C.: CQ Press (1987), pp. 166–7; *BP Statistical Review of World Energy*, issues, 1970–86; IEA, *Energy Statistics, 1971–1981*, Paris: OECD/IEA (1983), pp. 332–52, 643–8, *1983–1984* (1984), pp. 54–6; IEA, *Coal Information 1985*, Paris: OECD/IEA (1985), pp. 48, 432–3 and *1987* (1987), pp. 53–4.

(Tables 4.4 and 7.6). In Germany, a steeper fall was prevented by increased coal use in electric generation. Rising electric generation in America fostered a revival of the coal industry. The coal industries of Britain and Germany, however, were plagued by great overcapacity and only maintained by government subventions.

Electric power plants in Europe consumed about two-thirds of total coal production, and in the USA above 80 percent. Coal industries had received niggardly capital inputs during the 1960s. Archaic plant, hostile miner unions, deteriorating transport and, in the USA, outdated deep sea coal ports obstructed coal industry exploitation of the tantalizing market opportunities created by the energy crisis. Britain, in 1974, announced a £600 million investment plan for coal, but by 1982, coal output fell short of the 1973 figure and slid again in 1985. In Britain especially, but in Germany and France as well, the coal industry suffered from decisions made in the 1960s to shift from coal to oil and gas as power plant boiler fuels and to nuclear plants. Apparently shut off from power markets, coal companies and coal governing boards laid no plans to expand or modernize during the 1970s. Reversing this proved impossible. German coal production exceeded 210 mmt only because electric rate payers helped pay for utility coal use and because the utilities earned subsidies when they agreed to burn a stipulated tonnage over a number of years. Increased imports, not greater local production, satisfied expanded coal demand in Europe.[30]

The great coal bonanza anticipated in 1973 never materialized in Europe and appeared to have run its course in America by 1984. Sharply falling oil prices after 1985 and heightened concern about the environmental impact of coal burning dimmed the economic luster of coal. Rising production in the USA was solely the consequence of the electric industry shift from oil and gas to coal, a process beginning during the 1950s and accelerating after 1973 — by 1985, electric plants consumed 85 percent of US coal output. The inability of Europe's coal industries to fill demand encouraged a modestly expanded international coal trade after 1973. But World Coal Study projections for substantial increases in the coal trade during the 1980s were very inaccurate. America hardly needed a 2 bmt output to fill foreign orders that peaked in 1981 at over 100 mmt and dropped to 80 mmt by 1986. Total world coal exports accounted for but 9 percent of world production. Ten nations, led by the USA, Australia, Poland, Russia, and South Africa provided more than 95 percent of all exports. Japan purchased the largest share of imported coal. Coal imports of EC countries amounted to over 70 mmt annually during the early 1980s, a small volume but reflecting the failure of European coal industries to satisfy demand. American and South African coal undersold British coal in Europe, and in Britain as well.[31]

Turning toward natural gas

Natural gas offered OECD-Europe an efficient replacement for coal and oil in such uses as space heating and cooking and industrial heat processes. From 1970 through 1985, natural gas provided a rising proportion of TPER (Table 7.1). Growth in France, Germany, and Italy matched that of OECD-Europe. For the Netherlands, with its domestic gas fields, the share of gas in TPER fluctuated around 50 percent from 1975 into the mid-1980s. North Sea gas permitted the UK to expand gas use from 5 percent of TPER in 1970 to 24 percent in 1985. While gas use rose in Europe, it declined in the USA (Table 7.1). Natural gas reserves depleted during the late 1970s were not restored thereafter. Supply problems intensified after 1969, reaching crisis proportions in some areas by 1979 and necessitating the curtailment of gas supply to some users and the prohibition of new gas hookups.

Natural gas exports from Holland's Groningen field commenced during the 1960s. With the discovery of North Sea gas, new supplies became available to Europeans. Such was the rise in gas consumption in western Europe — 74 billion cubic meters (bcm) in 1970 and 230 bcm* in 1985 — that imports from the USSR and Algeria grew in importance after the mid-1970s. The international gas trade centered in western Europe which received 52 percent of world imports. Japan and the USA, each receiving a comparable volume, accounted for another 30 percent. The USSR, Netherlands, and Norway shared 68 percent of world exports.[32]

During the 1970s and early 1980s, natural gas prices lagged behind oil prices so that gas competed favorably against a range of energy alternatives. Because of price controls, this held true in the USA as well, but scarcity ruled out an augmented role for natural gas. Each western European nation sought to increase the share of natural gas in its energy mix. Ideological preferences determined the structures that evolved to produce, transmit, and distribute the fuel. The North Sea producers delegated authority to administer gas production and transmission to national firms which operated through contracts with MNOCs. Phillips Petroleum operated oil and gas terminals for Statoil while a joint venture between RDS, Esso, and the Dutch government performed those functions. Gaz de France and Italy's ENI controlled their domestic markets. MNOCs dominated the German gas industry. RDS and Esso owned large shares in Ruhrgas, the giant gas utility which distributed 67 percent of domestic gas requirements. Ruhrgas, Thysingas, and other German utilities negotiated directly with Gasunie of

* Roughly 200 million metric tons oil equivalent.

Holland and Statoil regarding volume, prices, and duration of contract.

In the early 1970s, the British decision to prohibit exports of natural gas and the Dutch decision to conserve its gas fields and not to renew old contracts or let new ones diminished potential supply. Importers such as Germany, France, and Italy seeking gas as a substitute for oil, increasingly turned to the USSR and to North Africa. Only in 1981, in response to falling government revenues, did the Dutch reverse their export policy and initiate a search for new North Sea gas. By 1981, Soviet and North African gas provided about 30 percent of French imports. Soviet natural gas composed 30 percent of German natural gas imports and, by 1990, might exceed 50 percent. Russian gas provided one-third of total Italian gas consumption and may rise to 40 percent by 1990. By the mid-1980s, Soviet gas was a better bargain than Dutch or Norwegian gas.[33]

Soviet gas rode a rising tide and North African an ebb tide in western Europe.[34] Europeans considered the Soviets a reliable supplier of reasonably priced gas. Algeria's persistent efforts to reopen negotiations on the price of committed gas and even to unilaterally abrogate contracts earned for it a reputation of unreliability. With Soviet gas available and Holland once again an active gas merchant, Europeans turned away from LNG, a very expensive fuel and dangerous to transport and handle.[35]

US natural gas production and reserves each declined by about 25 percent from 1972 to 1985. Vietor and the contributors to the Goodwin volume identify federal and state price controls as the culprit. But fears of monopolistic pricing by gas producers, often subsidiaries of the major oil companies, and the large pipeline companies thwarted full federal deregulation until the 1980s. Obtaining gas from Canada, Mexico, and Algeria proved difficult. Each producer demanded the most lucrative deal. Negotiations with Algeria were abrogated between 1979 and 1981 because of Algeria's price demands. Similarly, in 1978 and 1979, disagreements over price prompted the USA to break off talks with Mexico. Under the best of circumstances, those sources could fill but an infinitesimal portion of domestic gas demand. Adjustments in gas use, however, did augment the gas available to residential and commercial users and to certain industries. Federal laws promoted nuclear power and conversion of electric plants from oil and gas to coal while prohibiting, in 1978, the use of gas as a boiler fuel in industry. As a result, power plant consumption of natural gas remained stable at 17 percent of gas production after 1973. In contrast, electric power in Japan took 57 percent of supply in 1985. American industries reduced their gas use, consuming 43 percent in 1985, compared with one-half in 1973, amounting to a 4 billion cubic feet cutback.[36]

From 1973 through 1979, US gas use declined by 8 percent; from 1979 through 1985, as deregulation took effect and prices rose, gas use declined by 6 percent. This diminution seemed more the consequence of economic slowdown, doubts regarding adequate supplies, and, after 1985, cheaper oil than a product of federal policies. Since 1979, savings have been no more substantial than before 1979. Estimated reserves continued to decline despite higher prices.

Significant relief from reliance upon foreign oil, the centerpiece of post-embargo energy policy, required: the discovery of large domestic oil and/or gas reserves; a vast expansion of coal use; significant additions of nuclear power; the commercial development of renewable forms of energy; conservation. Domestically owned oil and gas carried Britain to energy self-sufficiency by 1975. Substituting gas for oil reduced Holland's net energy imports from 78 percent of TPER in 1968 to under 10 after 1975.[37] Germany, France, Italy, and the USA lacked the domestic fossil fuels necessary for massive fuel substitution. In Germany and the USA, strong environmental interest groups slowed the rush to coal. Among available domestic resources, nuclear power beckoned in 1973 as the fastest way to reduce fossil fuel use in the power industry.

Nuclear power, a Faustian bargain?

The ebullient mood of nuclear power adherents turned sour during the 1970s while the role projected for the technology in 1973 fell far short of expectations. In 1973, OECD predicted an installed nuclear capacity for all members of 500 GW* by 1985 and 1,000 GW by 1990. In 1983, the capacity of operating plants within OECD equaled 142 GW with 169 GW ordered or under construction. Although well below OECD projections, a total capacity of 311 GW, if those in process came on line, represented a significant productive capacity (see Table 6.5). However, only part of the 169 GW in process materialized.

In the USA, the utilities canceled 116 nuclear plants with a capacity of 130 GW between 1970 and 1984 while no new orders were announced after 1979. Between 1975 and 1987, Germany ordered only two nuclear plants and suspended construction on eight others. From 1967 to 1978, Britain ordered no new reactors but then ordered five in 1980. Between 1978 and 1987, Austria, Sweden, Denmark, Italy, and Holland abandoned the nuclear alternative. In 1970, Italy laid plans for 100 plants; in 1988, two of the three plants built were shut down. Switzerland, in

*GW = Gigawatt = 10,000,000,000 watts.

1988, elected to phase out the technology. Of the industrialized powers, only France and the Soviet Union (even after the Chernobyl disaster of April 26, 1986) evinced an unswerving dedication to nuclear energy.

As of 1986, nuclear power provided some 11 percent of TPER in OECD and generated 28 percent of electricity. In the USA, those figures were, respectively, 6 and 16 percent. France, by 1988, derived over 70 percent of electricity from some fifty nuclear power plants, and Belgium over 60 percent. Switzerland and Germany depended upon nuclear for about one-third of electric output, the UK about one-fifth. With the exception of France, these 1986 figures reflect very slow growth since the late 1970s.[38]

Within a decade, then, nuclear power ceased to be a viable option in America and much of western Europe. The extravagant promises of the nuclear industry and its powerful government supporters were buried under the realities of cost inflation and justifiable uncertainty regarding the safety of the technology.

"Two, four, six, eight, we don't want to radiate," chanted the anti-nuclear throng gathered on the Mall in Washington, DC, in 1978. One hundred thousand demonstrators crowded into Bonn in 1980 to protest against nuclear technology. Much had gone awry for the nuclear industry. Prior to the embargo, the cost of nuclear plants escalated to mind-boggling heights. Electric utilities, especially in the USA, risked their financial health by encumbering themselves with such capital obligations. In the USA, as Table 7.7 indicates, final costs greatly exceeded initial cost estimates. Plants finished during the late 1980s will be burdened by cost overruns of 500 to 1,000 percent. If these plants generate, ratepayers will shoulder the final costs.

A recent mass mailing by the US Council for Energy Awareness, a nuclear advocacy organization, alleged that "*. . . right now, extremists are working in over a dozen states and in Congress to shut down all the nuclear power plants in America.*" The nuclear industry in America blames cost overruns on the regulatory stranglehold of the federal government and on uninformed and ideologically driven radicals who dominate the environmental movement and command a broad constituency within a general public ignorant of the true facts. This self-justifying stance contains a mite of truth. In the USA, Germany, and elsewhere some of the more vociferous opponents of nuclear energy are simply anti-technology and/or dedicated to restructuring thoroughly the social order. But, it seems fair to say, most Americans and western Europeans are comfortable with and receptive to advanced technologies. Nuclear technology, however, makes their gorge rise. While experts endlessly debate the cost competitiveness of nuclear versus coal generated electricity and arrive at diametrically opposed conclusions,

Table 7.7 Nuclear plant cost inflation in USA ($ million)

	Projected cost	Actual cost
Diablo Canyon, Calif.	450	4400
Shoreham, N.Y.*	241	4000
Marble Hill, Ind.*	1400	7000
Midland, Mich.	267	4400
Seabrook, N.H.	973	5800
Trojan, Ore.	235	4600
Grand Gulf, Miss.	300	2800

* Abandoned or non-operative

Source: Time, February 13, 1984, pp. 34–42.

a large segment of the general public deems the technology too risky and associates it with the proliferation of nuclear weapons.[39]

That such negative attitudes, as measured in numerous public opinion polls, attained their current political effectiveness can be partially attributed to the disingenuousness of industry and government spokespersons since the birth of the industry. Despite a history of frequent plant accidents and shutdowns, including the near reactor meltdown at Three Mile Island in America in March 1979 and the fearsome reactor explosion at Chernobyl in the Soviet Ukraine in April 1986, reactor manufacturers and governments deny the dangers implicit in this technology. The US Council for Energy Awareness, in 1988, insisted that "nuclear energy is a safe, clean way to generate electricity." The Council assured Americans that nuclear plants "have a whole series of multiple backup safety systems to prevent accidents." Yet studies in America, Sweden, and Germany in 1987 estimated at 70 percent the probability of an accident such as Chernobyl occurring within the next five or six years.[40]

Equally erosive of the nuclear cause are the unresolved problems of nuclear waste disposal and the decommissioning of aged plants. The cost of burying an abandoned plant could equal the original cost. What will be done with irradiated material that remains lethal for thousands of years? The states of the federal republics of Germany and the USA have forcefully resisted the deposit of nuclear wastes within their territories. States, communities, and private groups have rendered ineffective national laws designed to locate waste disposal sites. "Put it somewhere else, not in my backyard" expressed the attitude of those dwelling in proximity to possible nuclear waste dumps. Faced with cost escalation, public fears of nuclear accidents, irresolution regarding waste disposal, and lower than predicted rates of growth in electricity demand, it is not surprising that nations in Europe and the utilities in America withdrew from the market for nuclear plants. A General

Electric official conceded in 1988 "that the domestic nuclear market for new plants has disappeared, with no hope of return in the foreseeable future."[41]

France persists as a world leader in nuclear technology, particularly the fast breeder reactor. Anti-nuclear opposition in France is ineffectual due to a highly centralized governmental structure comfortably insulated from such dissent. The Conservative Party in Britain and the Christian Democratic Union in Germany, victorious in elections in 1987, reaffirmed their commitment to nuclear power. In both nations, the opposition advocated the abandonment of the technology. Prime Minister Thatcher's government announced a twenty-five-year program of nuclear and coal-fired power plant construction estimated to cost £70 to £100 billion. Thatcher and Chancellor Kohl regard nuclear as indispensable to future economic growth, and both hope to capitalize on this revival through overseas sales of reactors.[42]

Central to the success of these programs are the development of reliable waste disposal methods and the safety of a new generation of reactors. Britain, Germany, and France are gambling on a future technological quick-fix.

In spring 1987, British newspapers reported a much higher incidence of leukemia among children living near nuclear reactors than among children living at a distance. If the causal nexus is corroborated, does the need for power outweigh such a clear and present danger? Some argue that achieving the greater good of the many justifies the occasional suffering of the few. They embrace the "Faustian bargain." Many people had, by 1988, rejected a Faustian bargain with the technology. Chernobyl warned that a nuclear mishap spread suffering among more than a few and among people far removed from the site.[43]

Nuclear power has not emerged as the dominant source of energy in the western world. Those nations now retreating from the technology cannot be applauded for a wise choice. While rejecting nuclear for the moment, few nations have made provisions for alternatives to fossil fuels.

Conservation, a low priority

The leading industrial states have cavalierly ignored the most obvious new source of non-polluting, reliable, and safe energy, that derived from using less—conservation. A second source, equally untapped, is renewable energy: solar, water, biomass, the wind. Writing of West Germany, Lucas opines that "to say that support for renewable energy . . . is lukewarm would be something of an exaggeration."[44] Considered

exotic, few nations supported the research and development necessary to derive even marginal value from conservation or renewables.[45]

Between 1973 and 1979, western Europe and the USA focused attention on increasing the supply of energy and on substituting other fuels for oil. TPER in the USA rose uninhibitedly. Americans used an additional 174 million metric tons oil equivalent (mmtoe) during those years, or just under half of total Japanese TPER in 1979 (Table 7.1). Equally damaging, the USA became even more dependent upon foreign oil. OECD-Europe compiled an only slightly better record. Europeans used more energy in 1979 than in 1973, but did reduce net oil imports by 16 percent (Table 7.5). More effective conservation occurred after the second price shock in 1979. Thereafter, prices, aided by policies, worked to reduce energy use and improve efficiency of use, at least until 1984 when tumbling oil prices sparked a renewed upward march of energy consumption. In 1985, US and OECD-Europe TPER surpassed that of 1973.

Shifting to indigenous energy reserves reduced western European net energy import dependence after 1973 and, in America, after 1979 (Table 7.1). In Europe, natural gas and nuclear power, and in America, coal and nuclear power, substituted for oil. Europe's conversion to natural gas entailed risks even if local resources were well-husbanded. Switching from oil to gas, both purchased from foreign suppliers, at best temporarily alleviated the supply problem.[46]

Laws in the USA mandating slower driving speeds (changed to a higher speed in 1987) and improved gas mileage for automobiles (made less effective by President Reagan) provide some evidence for those who claim success for energy conservation. Proof abounds that industry adopted energy saving techniques. In the USA—and in western Europe and Japan—one unit of GDP required less energy to produce in 1980 than in 1973 (Table 7.8). The improved gasoline efficiency of new cars after 1973 moderated American oil consumption into the 1980s. But, in both Europe and America, bigger and more powerful cars reappeared after 1986. Automobile advertisements no longer emphasized better gas mileage.[47]

Economic stagnation reduced energy use in Britain. Investment in conservation fell far short of investment in the North Sea, nuclear power, and coal mines. Investment in R&D for conservation and renewables totaled £9 million in 1980–1 compared with at least £346 million in all other energy industries. The German Ministry of Economics proposed a conservation program in 1974 but it was rejected as detrimental to economic growth. Rising prices served as the sole conservationist weapon. The federal and state governments offered limited financial incentives to improve the energy efficiency of buildings, but

Table 7.8 US dollars of GDP produced per energy input, 1970–86*

	1970	1973	1980	1984	1985	1986[1]
USA	1227	1266	1418	1602	1693	1747
Japan	2386	2391	2902	3272	3440	3455
Germany	2618	2610	2980	3196	3243	3285
UK	2136	2261	2653	2924	2905	2922
France	3038	2998	3378	3582	3572	3499
Italy	2528	2472	2805	2960	2937	3010
OECD-Europe	2581	2552	2849	3038	3059	3088

* GDP divided by TPER (mtoe)
[1] Estimated

Sources: IEA, *Energy Balances of OECD Countries, 1983–84*, Paris: OECD/IEA, *passim*; IEA, *Coal Information 1987*, Paris: OECD/IEA (1987), *passim*.

reducing speed limits and increasing the fuel performance of autos were unachievable due to opposition from drivers and auto manufacturers. Increased supplies remained the central objective of the government. In 1980–1, the German coal industry received DM15 billion in federal subsidies; conservation schemes received about DM1 billion in each year, 1978–82. In 1977 and 1978, the French government rejected a series of broad conservation proposals, but the Iranian Revolution compelled some rethinking and the acceptance of some measures. Still, French subsidies to an uneconomic coal industry exceeded investments in conservation by four times. In the absence of broad and effective conservation measures, it is no wonder that energy use in western Europe climbed as energy prices fell after 1984.[48]

Price regulation in the USA held energy prices below world market levels, thus encouraging energy use and partly negating the effects of conservation measures applied to private transportation. Rising prices in Europe inhibited increased energy use but were unaccompanied by government incentives to save energy. Consumers in America and Europe adjusted rapidly to the higher prices and failed to discard old energy use habits. Energy intensive industries responded more permanently to higher prices, learning to produce more without added energy inputs. Industry led the way as the price crunch of 1979 catalyzed a more dynamic conservationist thrust. But, prior to that watershed event, neither Americans nor Europeans imbibed a conservationist élan.

Japan and the first energy shock

Japan, with the poorest energy endowment and the highest import dependence of the industrialized states, responded quickly and pointedly

Table 7.9 Total energy import bill, 1970–87 ($ billion)

	USA	Japan	EEC
1970	3	3	10
1973	8		
1975	27	24	56
1976	33	29	67
1977	44	29	71
1978	44	41	112
1979	65	64	162
1980	87	65	153
1985	56	43	124
1986	40	37	94
1987	44		

Sources: UN, *1983 International Trade Statistics Yearbook, vol. 1. Trade by Country*, New York: UN (1985), pp. 1086–7; OECD, *Foreign Trade by Commodities. Imports. vol. 2. 1985* and *1986*, Paris: OECD (1986), p. 146; Energy Information Administration, *Monthly Energy Review November 1987*, Washington, D.C.: USDOE (1988), p. 13.

to the price increases and supply disruptions of 1973–4. Even before that crisis, the Japanese government devised strategies to improve energy security. Mentioned earlier were efforts to bring more oil and other natural resources under Japanese control, reduce dependence upon MNOCs, and diversify the sources of oil imports by investing in non-Middle Eastern oil fields. Tables 6.2, 6.3, and 7.2 suggest only limited success in achieving those goals both before and after 1973.

The oil price increases terminated more than a decade of export-led economic growth and exacerbated prior inflationary trends. To pay for energy imports, Japan gave up some 6 percent of GDP during both the first and second energy crises, compared with about 2 percent for the USA and 3 percent for West Germany. Table 7.9 presents the cost of energy imports in current dollars. As a proportion of the entire import bill, energy imports in Japan reached 46 percent in 1980 and 34 percent in the USA. For the latter, an energy import bill of $87 billion produced a trade deficit of $24 billion; for Japan, energy imports caused a deficit of $11 billion.[49]

To combat this debilitating trend, the USA did little until 1979. Japan acted first to contain inflation and, then, to address the energy dilemma by improving energy use efficiency, de-emphasizing energy intensive industries, diversifying the sources of oil, and reducing the role of oil in the energy mix. While unmitigated success escaped them, the Japanese had something to show for their efforts by 1979.[50]

Inflation, already approaching 15 percent before the oil crisis, jumped to about 30 percent in 1974 and 1975. Targeting inflation as the most pressing threat, the government curtailed monetary growth, reduced spending, imposed lower wage settlements on labor, and inveighed

against high interest rates. Inflation fell to under 10 percent by 1977 at the cost of slower rates of economic growth. Industrial policies paralleled fiscal policies. Like Germany, Japanese economic growth was export-led. The energy crisis weakened such heavy industries as iron and steel and petrochemicals, currently facing stiff competition from such places as South Korea. Rather swiftly, Japan shifted its industrial focus from high energy intensive industries to less resource intensive and higher technology intensive industries. Along with Germany, Japan re-energized its quest for international markets, counting on larger earnings from exports of electrical equipment and lightweight, fuel efficient cars, as examples, to pay the added cost of imported fuels. Favored industries benefited from government research support; the nuclear industry was most favored.[51]

Japan's energy-specific policies employed conservation, particularly after 1979, and technological change to reduce overall energy consumption and lower oil imports. The substitution of nuclear power and liquefied natural gas (LNG) for oil received high priority. As in the USA and Germany, Japan prohibited new orders for oil-fired electric plants. Fiscal incentives were employed to encourage industry to conserve energy. But, as with Germany, the Japanese government manifest reluctance to deal rigorously with consumption in the private transportation and residential–commercial sectors. As auto use increased, so, too, did gasoline consumption. Residential–commercial energy use marched ahead until 1980. Between 1973 and 1980, Japanese electricity production advanced by 23 percent while consumption in the residential–commercial sector rose by 50 percent, spurred on by the sale of air conditioners and domestic appliances. Shibata considers Japanese energy policies cautious and unimaginative.[52]

Greater attention was directed toward assuring supply than at conserving energy. Efforts to achieve greater control over oil through the medium of Japanese oil companies were no more rewarding than in earlier years. Table 7.2 indicates a somewhat diminished reliance upon Middle Eastern oil, but 64 percent from that region—40 percent from the Arab producers—confirms persisting vulnerability. Imports of Japanese developed crude never exceeded 10 percent from 1970 to 1985. Indeed, Japan's oil supply became less secure. In 1972, eight major oil companies delivered 75 percent of total imports. During the next decade, the MNOCs were replaced as the dominant suppliers, but by producing governments rather than by Japanese firms. By 1982, producing governments provided 47 percent of imports compared with 41 percent for the MNOCs.

A trade agreement with China in 1978 in which Japanese technology was exchanged for oil and coal provided little of either and resulted in the cancellation of contracts in 1981. In 1985, China provided about 7 percent of Japanese oil imports. Investments there, however, and in Malaysia as well, may bear fruit in the future, as does participation in Indonesian energy development.[53]

Greater quantitative success has been achieved in replacing coal- and oil-fired power plants with nuclear and LNG. Despite LNG's very high cost, Japan imports a large volume because it is environmentally acceptable. While the number of gas customers has expanded rapidly, power plants consume some 75 percent of LNG. Coal is environmentally unacceptable; oil can no longer be burned in power plants. Japan contains very little natural gas. Thus, Tokyo Electric Power has entered long-term contracts for LNG from Alaska, Brunei and Indonesia, Abu Dhabi, and Malaysia. LNG provided 5 percent of TPER in 1979 and 10 percent in 1985 (Table 7.1). It provides over 20 percent of electric power. Nuclear provides 21 percent (Table 6.5; see Table 7.1).

Indifference to conservation meant that only LNG and nuclear power were available to meet the demand for household energy and for electric power. As an earlier section emphasized, the costs of and risks attending nuclear power were substantial. Despite awareness of such disadvantages, Japan developed a fully self-sufficient nuclear complex, complete with the domestic manufacture of all components, fuel reprocessing, and a breeder reactor. Whereas ninety-seven contracts in the USA were canceled after 1975, thirty new Japanese reactors were planned or under construction at the end of 1986, with a total capacity larger than that on-line in 1986. By 1984, nuclear generation produced 63 percent more electricity than in 1980, meeting some five-sevenths of the increased electric demand over that period.

The industry and its government sponsors confront, however, ardent political opposition from both socialists and environmental groups, linked in a configuration similar to the anti-nuclear movement in Germany. Operating reactors, numbering thirty-four in 1986, concentrated in such densely populated areas as Tokyo–Yokohama and Osaka–Kyoto. Few Japanese were far removed from a reactor; few reactors were far removed from an earthquake fault. Stringent construction and safety regulations have prevented a Three Mile Island-type accident. Frequent shutdowns, however, plagued the industry. As in America and Europe, no long-term plans have been formulated for the secure storage of nuclear wastes. Information emanating from nuclear officialdom glibly overlooked the waste problem.[54]

Energy consumption in Japan rose from 1973 through 1979, fell from 1979 to 1982, and renewed its upward movement thereafter. However, oil consumption and oil imports fell (Table 7.5). Energy use efficiency in Japanese industry registered impressive advances. In 1980, the

petrochemical industry consumed 84 percent of the energy burned per unit of output in 1973; steel consumed 43 percent. Other industries ranged between those two marks.[55] The data in Table 7.8 attests to the superior performance of Japan.

Despite the progressive record, Japan remains highly dependent upon Middle Eastern oil. Diversifying the fuel mix by substituting LNG required the acceptance of high costs and acknowledged dangers in transporting and processing the volatile fuel. Nuclear plants produce electricity at lower costs than LNG and other fuels. But the long-term viability of nuclear power remains clouded. From the embargo through 1979, *per capita* consumption of energy in Japan rose slightly while TPER registered an 11 percent gain. The Iranian price shock induced a modest reduction of 9 percent through 1982. By 1985, TPER was again 10 percent above that of 1973 (Table 7.1).

Constraints on energy policy formulation

The energy crisis of 1973–4 only temporarily disrupted the flow of oil to the industrialized democracies. World crude output dipped by 5 percent from 1974 to 1975 and then rose by 11 percent between 1975 and 1980. Although OPEC's production stabilized after 1975, output from Saudi Arabia and the North Sea added 131 mmt to available supply between 1973 and 1980. Oil was available (Table 7.4).

Immediate and lasting consequences attended the oil price increases (Table 7.3). Throughout OECD, annual rates of economic growth slowed and even became negative in 1974 and 1975, the annual rate of inflation climbed, along with unemployment, and, with the exception of West Germany, balance of payments deficits accumulated. By 1978, none of the OECD states had recaptured the growth position of 1972–3. The Iranian price shock occasioned renewed disarray, but markedly less so in Japan and Germany than in the USA, Britain, Italy, or France.[56]

Not surprisingly, political constraints and ideological predilections shaped the policy responses of the industrialized democracies to the supply and price squeeze. Each of the governments, its leadership vulnerable to the ebb and flow of electoral results, marched to the tune of influential constituencies peculiar to each country.

Motorists and household consumers of electricity and gas cast many votes. The USA, Germany, Italy, France, Britain, and Japan cushioned those interests against the full force of surging oil prices. The posted price of crude advanced by 680 percent from 1973 to 1979; retail gasoline prices in Germany rose by 32 percent; in USA, by 115 percent; in France, by 138 percent; and in the UK, by 226 percent (Table 7.3). The tax portion of retail prices in the USA changed scarcely at all. French, British, and Italian gasoline taxes were raised but at a rate much below the rise in posted prices.[57] Treating drivers and householders tenderly undoubtedly salvaged votes but such expediential politics also dampened the conservationist effects of rising prices.

Political fragmentation in Italy and America precluded the formulation of a workable energy policy. Italy scrapped its ill-conceived nuclear program without devising a viable alternative. In Britain, Labour governments relied on state companies to manage North Sea energy development, but dealt irresolutely with nuclear power. Prime Minister Thatcher's regime privatized the state oil and gas companies and, while planning to sell the assets of the Central Electricity Generating Board by 1991 and British Coal by 1993, firmly committed Britain to a nuclear future. The ideological incantations of left, center, and right in France were suffused by nationalistic emotions. The abandonment of NATO, the articulation of a pro-Arab-anti-Zionist position, dialogues with the Arabs, the rejection of IEA membership, refusal to accept nuclear non-proliferation accords reflected a pervasive nationalism, personified in the memory of Charles de Gaulle. France's nuclear complex and her *force de frappe* of nuclear weapons are displayed as triumphs of autonomy. Thus, the Socialist government of 1981, owing some part of its electoral success to its anti-nuclear promises, adopted the essence of its opponent's nuclear program. The rhetoric of German center-right governments expressed an unabashed devotion to free enterprise and market driven solutions to the energy crisis. In fact, Germany relied heavily on the policies and cooperation of powerful cartel-like utility combines and the central commercial banks. Federal and state governments, in America as well, regulated, subsidized, and otherwise intruded in energy affairs. Lucas perceives the "great firms as the initiators of policy" in Germany.[58] Understandably, they focused on nuclear development and other supply side solutions.[59]

The USA lacks a center of power and never was this more true than during the 1970s. Powerful and diverse constituencies competed for political preference and economic gain. People and organizations blended into myriad interest groups. Their common refrain demanded government intervention on their behalf while opposing, in the name of free enterprise, government favoritism toward other groups. Presidents Nixon, Ford, and Carter, successively, occupied the White House between 1973 and 1980. None succeeded in wringing approval for their comprehensive energy plans from the thoroughly Balkanized Congress.

Prior to the Iranian crisis, the USA may well deserve the lowest

grade for its energy policy response, but the marks of its OECD partners were not much better. The USA proved unwilling to plug the dike against oil imports which, in 1979, were 100 mmt greater than in 1973. The non-producing OECD states maintained their imports at a stable level after 1973 (Table 7.5). Just as elements within the US government blamed OPEC, Germany, and Japan for American balance of payments difficulties, so did the larger OECD states attribute economic instability and high oil prices to American oil imports. The Iranian crisis impelled the USA to cooperate with Japan and the EC nations in jointly reducing oil imports. A scheme to that effect was announced at the Bonn and Tokyo summit meetings of 1978 and 1979 and reconfirmed at the Venice meeting in 1980. Even before those meetings, President Carter labored to win congressional approval for the deregulation of oil and natural gas prices.[60]

Assigning the scapegoat role to the USA was as unjustifiable as it was for the USA to reproach Germany and Japan for America's industrial weakness. Each industrial state applied supply side solutions to the crisis. Indeed, the USA adopted more diverse and stringent conservation measures than its critics. To be sure, other measures, particularly price controls, canceled out the full effects of the conservation laws. Guilty of indifference to conservation and the use of renewable energy, the USA and its allies pushed full steam ahead to discover new sources of oil and to expand nuclear power. But, America's pluralistic politics and the federal system permitted a robust anti-nuclear coalition to block expansion even as consumer interests obstructed the abandonment of controlled oil prices and defeated efforts to raise taxes on imported oil. Political fragmentation and executive weakness stifled efforts by Carter to pull together a broadly based constituency favoring conservation. The governments of western Europe fared no better.

European governments and IEA correctly chided the USA for irresponsibly neglecting to stem the flow of oil imports. America's critics were no less supply driven. The IEA, in the mid-1970s, displayed annoyance at Norway's decision to maintain moderate North Sea oil production and not produce immediately from new fields. The frustrated importers contended that this forced them to pay more for oil.[61] At that time, those importers had no conservation policies in place.

One half of the reduction in oil imports accomplished in OECD-Europe from 1973 to 1977 were attributable to Great Britain and her North Sea oil (Table 7.5). The remainder occurred because of stagnant economies. Thereafter, increased natural gas use and nuclear power made possible a diminution of oil imports. Conservation, arousing no enthusiasm, contributed but marginally to the slackening of European energy use. Politically influential utilities, whether private of state

owned, sought greater not lesser sales, more not fewer appliances in households. Convincing people to burn less energy yielded no political gain to politicians accustomed to promising the best of all possible worlds at half price. As Rosenbaum wisely observes, "President Carter's advocacy of energy conservation as duty, sacrifice, and discipline added the stigma of moral obligation to conservation's other unfortunate implications. Conservation should not seem to require for its success a nation of Calvinists."[62]

So, the leaders of market driven democracies acted predictably, scurrying after new, expensive, and, frequently, dangerous sources of energy and loath to confess the shortcomings of their policies. Diversifying the domestic energy mix resolved few problems. Each of the fuels substituted for oil harbored serious drawbacks. In 1979, Carter, embarrassed by the negative reception of fellow citizens to his call for energy conservation, quickly turned to an $88 billion scheme to produce synthetic fuel. Big money and giant technology legitimated such programs.[63]

Notes

1. For the above two paragraphs: H. Maull, *Energy, Minerals, and Western Security*, Baltimore: The Johns Hopkins University Press (1984), p. 108; De Golyer and MacNaughton, *Twentieth Century Petroleum Statistics 1986*, Dallas: De Golyer and MacNaughton (1986), p. 60; International Energy Agency, *Energy Policies and Programmes of the IEA Countries, 1985 Review*, Paris: OECD/IEA (1986), p. 38; P. Odell, *Oil and World Power*, 7th edn, Harmondsworth, Middlesex: Penguin (1983), pp. 112–13; C. Tugenhadt and A. Hamilton, *Oil, the biggest business*, London: Methuen (1975).
2. For the above two paragraphs: Congressional Quarterly, Inc., *Energy Policy*, Washington, DC: Congressional Quarterly, Inc. (1981), p. 15; C.P. Bradley, *Recent United States Policy in the Persian Gulf: (1971–1982)*, Grantham, N.H.: Tompson & Rutter (1982), pp. 47–51; E.W. Chester, *United States Oil Policy and Diplomacy: A Twentieth Century Overview*, Westport, Conn.: Greenwood Press (1983), pp. 246–8; USHR Committee on Foreign Affairs, Subcommittee on the Near East, *The United States and the Persian Gulf, September 29, 1972*, 92nd Congress, 2nd session, Washington, DC: USGPO (1972), pp. 7–9; A. Al-Sowayegh, *Arab Petropolitics*, London: Croom Helm (1984), pp. 71–80, 123–9.
3. For the above two paragraphs: A.D. Johany, *The Myth of the OPEC Cartel: The Role of Saudi Arabia*, New York: Wiley (1980), p. 48; De Golyer and MacNaughton, *1986*, p. 5; M.T. Hatch, *Politics and Nuclear Power: Energy Policy in Western Europe*, Lexington, Ky.: The University Press of Kentucky (1986), pp. 40–1; H. Mendershausen, *Coping with the Oil Crisis: French and German Experiences*, Baltimore: The Johns Hopkins University Press for Resources for the Future (1976), pp. 71,