



## CHAPTER 4

# MIDDLE EASTERN OIL AND GAS

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The modern history of the Middle East is inextricably intertwined with petroleum. Oil and gas resources are the economic lifeblood of a number of nations in the region. In 1971 oil-importing nations paid about \$2 per barrel for petroleum produced by the eleven-member Organization of the Petroleum Exporting Countries (OPEC), an intergovernmental organization created in September 1960 by Iran, Iraq, Kuwait, Saudi Arabia, and Venezuela to coordinate and unify their national petroleum policies.

By 1981 the price of OPEC oil had jumped to about \$35 per barrel, largely as a result of oil-price shocks in 1973–1974 and 1979–1980. This 1,650 percent increase fundamentally changed the rules that governed international economic and political relationships. The effects of that change were still being felt worldwide at the beginning of the twenty-first century. Although the late 1990s witnessed a precipitous drop in oil prices, by late 2004 prices had risen again, holding steady above \$50 per barrel for an extended period of time. Past experience with such fluctuations made the international community more accustomed to such changes, but price volatility nonetheless remains a rallying cry for U.S. politicians who advocate for less dependence on foreign oil sources. As prices in 2006 peaked at more than \$70 per barrel, many analysts speculated that prices might remain at elevated levels for years.

The role of natural gas in the Middle Eastern economies is growing exponentially. The vast gas reserves of Qatar and Iran, improvements in technology that make getting gas to consuming mar-

kets feasible and more economical, and the burgeoning demand for natural gas in Asia, Europe, and the United States point toward the potential for substantial increases in revenues for gas-exporting nations.

The oil markets are intensely government-controlled. In terms of proven reserves, for example, state-owned Saudi Aramco and the National Iranian Oil Company each have ten times the supply of the portfolios of the largest private firms, ExxonMobil and Lukoil. As a result, oil and gas play a preeminent role in the political economy of the Middle East.

Since 2004, China has accounted for almost half of the increase in world oil demand, and its continued economic growth is expected to continue to raise its energy consumption. In the United States and Europe, demand for natural gas as a cleaner burning fuel for generating electricity is steadily increasing. The current state of Middle Eastern natural resources and the outlook concerning global supply and demand will remain critically important worldwide.

## History

During the first half of the twentieth century, the Middle Eastern oil-producing nations played a role subservient to the major international oil companies contracted to develop their oil fields. Concessions granted by Arab rulers gave foreign oil companies a free hand in exploiting their oil reserves. Such agreements required that the companies pay only a nominal royalty, an average of

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twenty-one cents per barrel, to the oil-producing country. In return, the oil companies were exempted from taxes in the producing nations and independently set production and pricing policy.

The oil-producing countries found these arrangements satisfying prior to World War II, when demand was low, prices were fluctuating or dropping, and prospects for discovering large quantities of oil were uncertain. During and after World War II, however, inflation reduced the purchasing power of the fixed royalties paid to the producing nations. In other words, their share of the value of the oil produced declined.

Venezuela became one of the first countries to challenge these arrangements, when in 1945 the government demanded and received an even split in oil profits with the companies. In subsequent years, Middle Eastern oil-producing nations, which had been receiving royalties of 12.5 percent of profits, adopted the Venezuelan model. By the early 1950s, all of the oil producers had negotiated 50–50 agreements. Between 1948 and 1960, these contracts increased the revenues of Middle East producers almost tenfold, to nearly \$1.4 billion.

The entry into the oil-production business of a number of new, independent companies in the 1950s put downward pressure on prices. The American firms of Esso (now Exxon), Gulf, Mobil, Socal (the predecessor to Chevron), and Texaco along with Royal Dutch Shell and British Petroleum—the corporations that controlled the world oil market—found themselves confronted by smaller, more aggressive companies eager to produce at high levels. These so-called Seven Sisters had in the past reduced overseas production when the world oil market became saturated, thus preventing a drop in price.

The independents, among them Amoco, Getty, and Occidental, made it more difficult for the major companies to control prices. The smaller businesses set their prices lower than the major companies' for gasoline and other oil products, upsetting the established market structure. Their actions forced the larger companies to cut posted prices (the asking price) in addition to matching the lower market prices (the price at which the oil

sells). As a result, producing nations experienced reductions in their royalty and tax incomes. The lower prices for foreign oil also led to an increased U.S. dependence on it and to a direct negative impact on domestic U.S. oil production. In an effort to protect U.S. oil companies, President Dwight Eisenhower imposed mandatory oil import quotas in 1959.

Concerned about these developments, Iraq called a meeting of oil-producing governments to discuss the situation. Iran, Kuwait, Saudi Arabia, and Venezuela responded quickly and agreed that action should be taken. The participants at the Baghdad Conference, held September 10–14, 1959, agreed to establish OPEC, with the initial goal of returning oil prices to their earlier levels and obtaining the right to consult with oil companies on future pricing decisions.

The oil companies made no further cuts in posted prices. Instead, the U.S. government helped ensure that producer-nation revenues increased without forcing companies to raise their price. It did so using an expansive interpretation of the foreign tax credit that lowered the taxes oil companies paid to the U.S. government, thereby offsetting the extra taxes they paid to producer governments. Some critics charged that such treatment amounted to a subsidy for foreign oil production.

### *A Unified OPEC*

During the 1960s, Abu Dhabi (whose membership later was transferred to the United Arab Emirates), Algeria, Indonesia, Libya, and Qatar joined OPEC. In 1975 the roster again expanded with the addition of Ecuador, Gabon, and Nigeria (the first two of which dropped out in the 1990s). This last expansion brought OPEC's membership to thirteen.

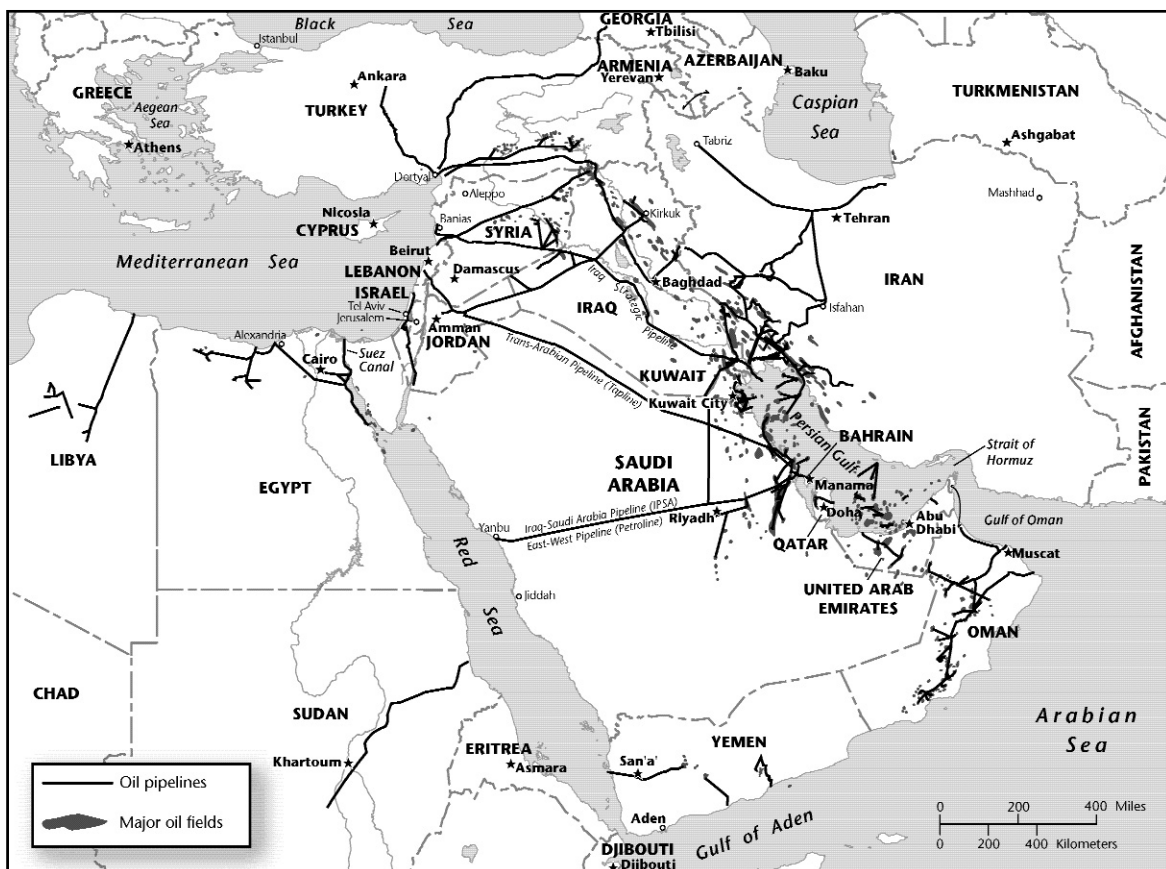
OPEC proved successful in preventing further cuts in posted prices for oil, but it failed during the early 1960s to restore prices to their earlier levels or to agree on a formula to limit output among its members. Moreover, throughout the 1960s, the producing states increasingly criticized the 50–50 split on oil profits that had become standard. In the

latter half of the decade, OPEC began consequently to agitate for higher revenues.

In June 1968, OPEC issued a declaration of principles asserting the right of member nations to control world oil production and prices. It also agreed on a minimum taxation rate of 55 percent of profits, more uniform pricing practices, a general increase in posted prices in all member countries, elimination of excessively high earnings for the operators, and the renegotiation of contract provisions that granted the oil companies excessive earnings. In the same year, a dozen Middle Eastern nations established the Organization of Arab Petroleum Exporting Countries (OAPEC). Established to promote distinctly Arab oil inter-

ests, OAPEC included the non-OPEC nations of Bahrain, Egypt, and Syria as well as OPEC Arab states. In time, OAPEC's mandate shifted, and now it focuses on the development of the petroleum industry through member cooperation, as opposed to dealing with pricing and supply and demand issues.

Price fluctuations resulting from political events in producer nations and the devaluation of the U.S. dollar produced continuing uncertainty and ceaseless demands from producer nations for increases to the posted price of crude oil. The international oil companies largely conceded, increasing prices by nearly 12 percent over the course of a few years.



*Major Middle Eastern Oil Fields and Pipelines*

The OPEC countries also were increasing their power at the expense of the oil companies on another front. Algeria, Iraq, Iran, and Libya nationalized their petroleum sectors in the early 1970s. In December 1972, Kuwait, Qatar, Saudi Arabia, and the United Arab Emirates established a participation agreement with various oil companies that gradually increased state control over the oil industry from an initial 25 percent in 1972 to 51 percent in 1982. By the mid-1970s, however, producing countries had gained either full control or majority state participation in the oil companies' operations in the Middle East, although management for the most part remained in the hands of westerners. Thus the share of Middle Eastern oil owned and controlled by the international oil companies declined sharply. In 1972 the companies had an equity interest in 92 percent of the oil leaving the Middle East. By 1982 their portion was less than 7 percent.

In October 1973, OPEC convened a meeting with the oil companies to discuss a substantial price increase. At the same time, Egypt and Syria attacked Israel. The ensuing war served to strengthen the OPEC representatives' resolve to raise prices. When OPEC and the oil companies proved unable to reach agreement on an increase, OPEC unilaterally set the posted oil price at \$5.12 a barrel, up from \$3 per barrel. At the same time, OAPEC decided to cut production by 5 percent each month until Israel withdrew from the Arab territories that it had occupied since the 1967 war and agreed to respect the rights of Palestinians. Saudi Arabia stiffened the sanction, announcing that it would cut oil production by 10 percent and end all shipments to the United States if it failed to modify its pro-Israel policy.

On October 19, U.S. president Richard Nixon asked Congress for \$2.2 billion in emergency military aid for Israel. Libya announced an embargo that same day. The next day Saudi Arabia reduced its oil production by 25 percent and halted supplies to the United States. Within days, most other Arab oil producing nations had joined in cutting production and boycotting sales to the United States.

Fears of inadequate oil supplies caused prices to skyrocket, making the once-shocking OPEC price of \$5.12 per barrel seem reasonable. With renewed

confidence, OPEC met again in December and announced a new posted price of \$11.65 per barrel. The industrialized world, by now painfully aware of its dependence on a dozen once-obscure countries, paid the cartel's price. The quadrupling of world oil prices led to a worldwide recession in 1974–1975 that most economists at the time labeled the worst since the Great Depression of the 1930s.

### *Effects of the Arab Oil Embargo*

The Arab states implemented their boycott systematically, dividing countries into categories. These included nations considered to be friends of Israel, namely, the United States and the Netherlands. They exempted certain other nations, including France and Spain. The countries designated as nonexempt could purchase what oil remained after the exempt nations had met their needs. With the 1973 embargo, Arab nations asserted a new role in the global market, emerging as a significant power in the international economy. They produced 37 percent of the oil consumed by the noncommunist world. In contrast, U.S. production had been falling since about 1970. The United States had no excess oil capacity.

Consuming nations quickly felt the effects of the Arab nations' cut in monthly petroleum production. To cope with the shortage, they introduced various measures, including rationing, restricting gasoline purchases to odd or even days, banning driving on Sundays, lowering speed limits, implementing prudent climate control in public buildings, and using alternative fuels.

Estimates vary, but the oil embargo is thought to have shorted the United States about 2 million barrels a day over the five months in which it was in effect. A 1974 Federal Energy Administration report estimates that the embargo cost half a million U.S. jobs and led to a decrease in the gross national product of between \$10 billion and \$20 billion. Some Arab oil, reportedly from Iraq and Libya, leaked through the embargo. The United States began withholding data on its oil imports in October 1974 to prevent these leaks from being plugged.

The embargo proved to be immensely effective as a political tool. European and Japanese leaders

expressed concern over the Israeli occupation and urged a settlement based on earlier cease-fire lines. Both were rewarded with OAPEC exemptions from the 5 percent cut in oil production for December 1973 and January 1974 and benefited from a 10 percent oil production increase.

U.S. secretary of state Henry Kissinger engaged in extensive shuttle diplomacy to mediate a settlement between Israel and Egypt. His efforts did not go unrecognized, as Egyptian president Anwar al-Sadat noted the “evolution” in U.S. policy toward the Middle East in January 1974. OAPEC announced the end of the embargo against the United States on March 18, 1974. Libya and Syria, however, refused to formally end the boycott until later that year.

### *Post-Embargo Prices*

After the embargo ended, oil-consuming nations hoped and even expected that OPEC would disintegrate. The oil producers moved cautiously, however, displaying considerable acumen. Saudi Arabia exerted significant influence over the organization through the mid- to late 1970s, using its large productive capacity unilaterally to shape the world oil market. Although some OPEC nations—namely, Algeria, Iraq, and Libya—were eager to increase prices and their revenues, the influence of Saudi Arabia and the inability of the nations actually to implement required changes made such a move impractical at the time.

With inflation shrinking national revenues, however, prices had to be increased by the end of the 1970s to reflect the reduced value of the dollar, the currency in which oil transactions are generally conducted. The position of those OPEC members pushing for higher prices was enhanced in late 1978, when oil field work stoppages and other political disruptions in Iran led to production cuts, and Western economies continued to grow vigorously.

### *The Market Takes Over*

In December 1978, OPEC agreed to end the eighteen-month freeze on prices. Oil ministers established a schedule for price increases, but by

March 1979 the market had superseded their schedule. Prices reached \$14.54 per barrel, an increase of 14.5 percent in three months, largely because of the substantial drop in Iranian production resulting from the overthrow of the shah and the imposition of an Islamic republic under Ayatollah Ruhollah Khomeini.

Strong demand produced a tight global oil market and exposed again the vulnerability of importers, including the United States. The outbreak of the Iran-Iraq War in 1980 exacerbated importing nations’ fears over Middle Eastern oil supplies. OPEC oil ministers ratified the market price of oil in June 1979. Saudi Arabia, along with the United Arab Emirates (UAE) and Qatar, increased prices to \$18 per barrel, but other members raised their prices to \$20 per barrel.

Increasing prices and concerns over supply led many industrial nations to pursue alternative energy supplies and to promote conservation. By the early 1980s, efforts in industrial nations to reduce their dependence on OPEC oil showed significant results. The amount of electricity generated by nuclear energy increased by 33 percent between 1982 and 1984. Some nations, including Japan, tried to diversify their energy supply by importing liquefied natural gas. Japan increased its natural gas usage by 31 percent between 1983 and 1984. Most nations, though not the United States, increased gasoline taxes to cut petroleum consumption. At the same time, support continued for already extensive mass transportation networks. In addition, a number of nations began to exploit newly discovered oil-production areas. Britain and Norway, for example, began to reap the benefits of oil discovered in the North Sea before the embargo.

During the next three years, prices continued to climb, reaching \$41 per barrel in 1981, as OPEC members openly and often bitterly disagreed over pricing structures and production levels. Saudi Arabia repeatedly urged restraint on the upward march of prices. When they remained high, U.S. demand decreased, and Saudi Arabia was forced to decrease its production to help prop up the price.

At the same time, world oil production continued to decline. From a peak of 62.5 million barrels per day (bpd) in 1979, it dropped in each of

the following four years: to 59.5 million bpd in 1980; 55.9 million in 1981; 53.5 million in 1982; and 53 million in 1983. By 1984, with the world beginning to recover from the effects of recession, it increased to an average of 54.1 million bpd. Further recovery was slow in coming, with production reaching only about 56.1 million bpd by 1987.

Weak demand compelled OPEC to agree for the first time on production quotas, in March 1983, introducing a collective production ceiling of 17.5 million barrels per day and sharply reducing prices. The key grade of OPEC crude, Saudi light, fell from \$34 per barrel to \$29 per barrel.

For about fifteen months these arrangements helped maintain a rough balance in the world market. As economic activity picked up in oil-importing countries, energy consumption increased in the first half of 1984. Economic growth slipped in the second half, however, and oil consumption again fell. Some OPEC members exceeded their quotas and secretly engaged in price discounting, resulting in further downward pressure on prices.

Since the quotas in effect were too loose, in October 1984 the oil ministers of six OPEC members, along with Mexico and Egypt, agreed in principle to restrict production by a further 1.5 million bpd to defend the \$29 per barrel price of Saudi light. The official price of Saudi light remained at \$29 per barrel until the beginning of 1985, when Saudi Arabia dropped it to \$28.

By early 1985, OPEC production had fallen 57 percent from pre-embargo levels. OPEC was producing only about 46 percent of its maximum sustainable capacity, and of this amount the greatest declines had been absorbed by its Middle Eastern members. They produced only 41 percent of the amount they otherwise could, while allowing non-Arab members to produce at 65 percent of their capacity. In 1985 Kuwait also set off a sudden rise in reserve estimates in the Persian Gulf when it increased its estimated reserves from 64 to 90 billion barrels overnight.

## Prices Plummet

By May 1985, Saudi production fell to a twenty-year low of 2.5 million bpd and continued

to decline. Meanwhile, the Saudi government ran a budget deficit of at least 46 billion rials, or more than 27 percent of revenues. An ambitious domestic development program depended on the use of gas produced with oil. With oil production so low, gas production became inadequate to meet the development program's requirements. Tired of bearing the burden of holding down production while other OPEC members cheated on their quotas, Saudi Arabia in late 1985 announced that it would no longer adjust for the disparities between supply and demand by producing well below its quota. From that point on, it sold the additional quantities up to its quota limit at market rather than official prices.

The results of the Saudi initiative were dramatic. The world's largest oil producer increased sales by underpricing oil in an already glutted market. Demand was flat. After peaking at around \$35 per barrel in 1981, world crude prices eased toward \$28 over the next five years. By January 1986, prices had fallen below the psychological threshold of \$20 per barrel—a ten-year low.

Although Saudi Arabia intended its policy to garner a larger market share for OPEC as well as for itself, it was not an OPEC policy. Some OPEC nations, such as Kuwait and the UAE, still holding cash reserves and feeling the same pressures as Saudi Arabia, seemed to support the market-share strategy. Meanwhile, some of the poorer OPEC nations—Algeria, Indonesia, Iran, Libya, Nigeria, and Venezuela—starved for cash or burdened with debt, resisted it.

OPEC's inability to reach consensus caused oil markets to continue their downward pricing slide through the spring and summer of 1986, finally settling in the \$10–\$12 range. Action by OPEC finally halted the long price slide when, at a meeting in early August 1986, members reached an agreement to cut combined output to 16.8 million bpd, about 4 million barrels less than they had been pumping earlier in the summer.

The price drop brought serious revenue losses in the near term for most OPEC producers. They lost an estimated \$50 billion in 1986 in their efforts to reassert market influence. The inability to further endure such revenue losses forced

OPEC to stop its market-share offensive. At the same time, in response to lower prices, consumption started to inch up for the first time since 1979.

As oil prices and sales volumes declined, OPEC members reduced their imports of goods and services, but not fast enough to prevent a \$15 billion collective trade deficit. Although members' deficits represented relatively minor offsets against the cumulative surplus of nearly \$400 billion earned over the previous decade, they continued to grow. After prices hit bottom in August 1986, they gradually began to recover. OPEC members renewed their production control agreement in December, and shortly after the beginning of 1987, the world price leveled off near \$18 per barrel.

A suspension in political antagonisms between Saudi Arabia and Iran helped to alleviate overproduction, but despite this shift toward production quotas, in August 1987 OPEC was still producing 20 percent more oil than the quotas allowed. This cheating affected, albeit less significantly, the stability of prices, which additionally was offset by a drop of about 15 percent in the value of the dollar in the same year.

### *Petroleum Industry Investments*

OPEC nations adapted to the emergence of an increasingly open and volatile oil market in the 1980s in a number of ways beyond competing for sales. Multibillion-dollar barter deals, usually oil-for-arms swaps, became common. OPEC producers also increasingly worked to acquire new positions "downstream," in the refining and distribution sectors of the petroleum industry. While low prices for crude hurt the producers who pumped it from the ground, they helped refiners by widening their profit margins. It was a lesson not lost on OPEC that during and after the price crash of 1986, earnings stayed healthy and even grew for the oil companies. The major corporations profited because they were "vertically integrated," meaning that they were involved in every step of the supply process, from exploration and production to petrochemicals to retail gasoline stations.

OPEC members began to hedge against price uncertainty by moving downstream as well. The most prominent example of downstream reintegration was Saudi Arabia's June 1988 acquisition for \$1.2 billion of 50 percent ownership of three Texaco refineries in the United States as well as marketing access to 11,420 gasoline stations in twenty-three states. Some Americans and Europeans felt uneasy about such investments by Middle Eastern oil states, but at the same time the deals appeared to promise greater security for consuming nations.

### *The OPEC Roller Coaster*

Although many observers expected the resolution of the Iran-Iraq War in July 1988 to boost oil prices, disputes between the two nations over appropriate production quotas hindered any increase. Instead, Saudi Arabia continued to produce well above its quota, once again pushing prices down around \$10. After Iran and Iraq reached an agreement in November 1988, oil prices rose immediately and stayed in the \$18-\$22 range for the first six months of 1989. Prices rose again in late 1989 as a result of unexpectedly cold weather and falling output from oil fields in the collapsing Soviet Union, the fall of which created an Eastern European market for OPEC oil. Prices jumped so fast in late 1989 that OPEC raised its production quota by about 3 million bpd, to 22 million bpd.

In April 1990, crude prices went into a nose-dive following reports that OPEC's production continued to climb, reaching its highest level since 1981. Prices had fallen about \$3 by late March and were threatening to sink below \$18. As a result of overproduction above quota levels to keep prices below \$18 per barrel by Kuwait, Saudi Arabia, and the UAE, OPEC output exceeded 24 million bpd in March, well above the ceiling of 22.1 million barrels it had set for itself in November 1989.

In May 1990, OPEC announced commitments from major producers to cut production a further 1.445 million barrels, the bulk of which was to be borne by Kuwait, Saudi Arabia, and the UAE. The

announced cuts were not enough to persuade the market that supply and demand would be brought back into balance, and prices continued to slip.

## The Persian Gulf Crisis and War

By the end of June 1990, the price of oil hovered around \$14 per barrel. On June 26, Iraq issued a chilling warning to Kuwait to curtail its overproduction. On July 12, two weeks in advance of the regular mid-year OPEC meeting, Saudi Arabia boosted sagging oil markets by announcing that it would temporarily and unilaterally cut production. A few days later, on July 17, Iraqi president Saddam Hussein publicly threatened to use force against other Arab OPEC nations unless they curbed overproduction. Hussein charged that the policies of the over-producing nations were “inspired by America to undermine Arab interests and security.” Shortly thereafter, Iraq accused Kuwait of several transgressions unrelated to oil pricing, in particular that Kuwait had been drilling for oil and deploying troops on Iraqi territory. By July 23, Western intelligence sources reported Iraq massing tens of thousands of troops near its border with Kuwait.

The troop deployments and diplomatic friction offered an inauspicious backdrop for the opening of the July OPEC meeting. Despite significant doubt that Iraq would carry out its threats, it nonetheless got virtually everything it wanted at

the meeting: The thirteen oil ministers signed an agreement raising their target price from \$18 to \$21 a barrel, and to achieve that price they agreed to a new production ceiling of 22.5 million bpd, which was higher than the previous ceiling but below the amount members actually pumped.

### *Oil and Aggression*

Despite meeting apparent success at the OPEC summit, Iraq invaded Kuwait on August 2, 1990. The geopolitics of Middle Eastern oil played a major part in Iraq’s motivation. At the same time, it is possible to overemphasize the role of oil, which is important primarily because of the economic, political, and military power it represents. Hussein may have seen oil simply as a means to an end.

The price-versus-production dispute of 1990 was, if not a pretext for the invasion, a surface manifestation of much deeper tensions. The issue of price-versus-production had provoked dissension among OPEC nations throughout most of OPEC’s three-decade history. Even in 1990 the issue was a legitimate question of strategic philosophy. The positions of various OPEC nations tended to reflect their particular circumstances as well as market conditions. During much of the 1980s, Saudi Arabia and other nations argued against pushing the price of oil too far. Too high of a price encouraged conservation by consuming

U.S. Energy Consumption by Source, 1997–2005 (in Trillion Btu)

Year	Coal	Natural Gas	Petroleum <sup>a</sup>	Nuclear Electric Power	Hydroelectric Power	Geothermal	Solar and Wind	Biomass <sup>a</sup>	Total Consumption
1997	21,445	23,329	36,266	6,597	3,640	325	104	3,307	94,800
1998	21,656	22,936	36,934	7,068	3,297	328	101	2,843	95,200
1999	21,623	23,010	37,960	7,610	3,268	331	115	2,886	96,837
2000	22,580	23,916	38,404	7,862	2,811	317	123	2,922	98,976
2001	21,914	22,906	38,333	8,033	2,242	311	135	2,666	96,498
2002	21,904	23,628	38,401	8,143	2,689	328	169	2,746	97,967
2003	22,321	22,967	39,047	7,959	2,825	331	179	2,812	98,273
2004	22,446	23,036	40,594	8,222	2,690	341	207	2,982	100,414
2005	22,830	22,640	40,441	8,133	2,715	352	213	2,781	99,894

Notes: Sums of components may not equal totals because of rounding and net imports of coke and electricity.

a. The Energy Information Administration counts ethanol used in gasoline in both petroleum and biomass, but only counts it once in total consumption.

Source: Energy Information Administration, *Annual Energy Review 2005*, July 2006, [www.eia.doe.gov/emeu/aer/overview.html](http://www.eia.doe.gov/emeu/aer/overview.html).

nations, brought more non-OPEC production on line, reduced OPEC's market share and economic leverage, raised supply, and eventually drove prices down again. Hard lessons of the previous two decades indicated that price stability was in the best interest of producers as well as consumers.

Iraq's treasury suffered from far more than the price of oil. Iraq owed Kuwait and other Gulf states some \$30 billion that it had borrowed to support its war against Iran. Before invading Kuwait, Hussein demanded that Kuwait forgive these debts, in part arguing that Iraq had fought Iran in the interest of protecting not only itself, but other Arab states from the export of Iran's Islamic revolution. Iraq also needed money to finance an expensive arms buildup underway since 1988.

The Rumaila oil field represented another point of contention between Iraq and Kuwait. This crescent-shaped reservoir, nearly two miles deep and fifty miles long, was thought to be one of the world's biggest fields, possibly several times larger than that at Prudhoe Bay, Alaska. The Iraq-Kuwait border bisected it, with the majority of it believed to be under Iraq. When Iraq refused to negotiate a deal for sharing the oil, Kuwait began pumping without an agreement. Before the Iran-Iraq War, Iraq pumped intensively from its side of the reservoir. During the war, however, Iraq mined the field to keep it out of Iranian hands and was not able to match the rate at which Kuwait depleted the pool. Iraq considered Kuwait to be "stealing" its oil.

The broader geopolitical context ultimately made oil important to Iraq, as Hussein attempted to use oil prices as a club in his bid for leadership and power in the Arab world. Iraq's invasion brought a jump in the price of oil, as commodity markets reacted to expected decreases in production and heightened uncertainty, which were confirmed when the United Nations imposed a trade embargo on Iraq, effectively removing Iraq's 3 million bpd from the market. Kuwait's production, almost 2 million bpd, also was lost. By mid-August, the price of oil had reached around \$27 per barrel and was rising. Increased production by other OPEC members helped to temporarily decrease prices.

Despite the belief of many analysts that supplies were adequate for the immediate future, war speculation pushed the price to \$31 by mid-September. Price volatility continued through the fall, with prices reaching as high as \$40 on rumors of war. The high prices of 1990 naturally produced increased revenue for OPEC members. OPEC nations exported about \$160 billion worth of oil, bringing in some 42 percent more revenue than in 1989.

After an initial brief rise after the start of the allied bombing campaign on January 16, 1991, oil prices went into a steep decline. Energy traders reacted on the assumption that the rapid neutralization of the Iraqi air force had removed most of the danger to Saudi oil facilities. It appeared that overall stability in the oil market belied the predictions of some veteran oil traders

#### Share of U.S. Oil Consumption Supplied by Imports, 1997–2005 (Thousands of Barrels per Day)

Year	Total Consumption <sup>a</sup>	Total Imports	Percentage Imported	Imports from OPEC Countries	Percentage of Total Consumption Imported from OPEC
1997	17,815	10,162	57.0	4,569	25.6
1998	18,172	10,708	58.9	4,905	27.0
1999	18,673	10,852	58.1	4,953	26.5
2000	18,803	11,459	60.9	5,203	27.7
2001	18,770	11,871	63.2	5,528	29.9
2002	18,917	11,530	61.0	4,605	24.3
2003	19,177	12,264	64.0	5,162	26.9
2004	19,849	13,145	66.2	5,701	28.7
2005	19,787	13,527	68.4	5,508	27.8

a. Total of Energy Information Administration consumption data for residential, commercial, industrial, transportation, and electric use.

Source: Energy Information Administration, *Annual Energy Review, 2005* (Washington, D.C.: Department of Energy, July 2006), tables 5.4, 5.13a, 5.13b, 5.13c, 5.13d.

that war would cause oil prices to jump above \$50 a barrel.

With the start of the ground war later in January, U.S. president George H. W. Bush kept a promise to release one million barrels a day from the U.S. Strategic Petroleum Reserve. His commitment was originally intended to dampen the upward volatility of oil prices, but with the price having already declined, the move only added to the downward pressure on prices. They remained well below \$20 even after the February 28 cease-fire.

OPEC ministers held their first postwar meeting on March 11 in Geneva. The most pressing item on the agenda was bolstering the price of oil, which could only be achieved by reining in production. Worldwide, oil production in 1990 reached its highest level in eleven years, while consumption dropped for the first time in thirteen years. At the meeting, OPEC decided to cut production by around 1 million bpd, about 5 percent, to support a \$21 per barrel target price.

Oil from Kuwait was slow to return to the market. By early May, only 10 percent of Kuwait's burning oil wells had been extinguished. Not only was Kuwait's considerable output of refined product off the market, but the nation had to import gasoline and other fuels for domestic consumption. Kuwait finally announced in July that it would resume exporting crude oil. At the time, it could export only about 140,000 bpd, but that increased steadily to almost 600,000 bpd by the end of the year.

Worries about a shortage of oil on the world market receded after the war's end. Even with the absence of Iraqi and Kuwaiti oil, more than enough oil to meet world demand found its way onto the market. OPEC took no significant action to adjust supply or price. By the end of June, OPEC members collectively had pumped more than the official production ceiling of 22.6 million bpd. Their elevated production continued through the year, making 1991 production OPEC's highest in more than a decade.

### *The Post-Gulf War Era*

In the years after the Gulf War, debate continued within OPEC with regard to appropriate

production ceilings. Saudi Arabia repeatedly sought to raise its production quotas in an effort to increase its market share. Iran regularly argued the necessity of more drastic production cuts. The continued disagreements forced prices on a downward trend, as the international perception was that OPEC lacked self-discipline.

January 1993 brought new military tensions between Iraq and the United States and its allies over Iraq's failure to comply fully with United Nations (UN) Security Council resolutions. Oil prices remained almost unchanged, although war jitters normally raise prices. Price stagnation was a sign that the fundamental forces affecting the market tended to push prices downward.

Also in January, Saudi Arabia surprised the world petroleum market with a call for OPEC production cuts of at least one million barrels a day. The proposal seemed to be a reversal in basic Saudi policy; oil prices rose strongly on the news. The increased prices, however, did not last long, as Algeria, Iraq, and Kuwait dissented from the proposed plan. This disunity sent prices downward, as traders again doubted OPEC's ability to enforce discipline. By May 1993, OPEC nations were pumping 600,000 bpd more than the new ceiling of 23.6 million. Disagreement between OPEC members continued throughout 1994 and 1995 as world oil prices continued to slide. Attempts to impose additional production cuts proved unsuccessful, so OPEC retained its existing quotas through the summer of 1995.

Most of the 1990s went by with Iraq's oil production curtailed by economic sanctions imposed in the wake of the Gulf War. The volume of oil removed from production as well as the length of its absence significantly affected the Middle East's oil picture. In January 1996, after the United Nations offered to allow Iraq \$2 billion worth of oil exports rather than \$1.6 billion, Iraq signaled its willingness to begin negotiating over the terms of the proposed oil-for-food program. In May, the United States, United Nations, and Iraq reached an agreement for Iraq to sell \$2 billion worth of oil every 180 days at market price. After some delay, oil began flowing in an appreciable quantity in December 1996, and Iraq began exporting limited amounts of oil to generate

revenue to purchase food and medicines. The flow amounted to about 500,000 barrels per day, one-eighth of Iraq's estimated capacity of 4 million bpd. By late 1998, under United Nations restrictions, Iraq was producing about 2.4 million bpd, of which 1.8 million bpd was being exported.

As the 1990s came to a close, OPEC attempted to regain control of the market through occasional production cuts and increases. Nonetheless, the price of oil remained volatile, bottoming out under \$10 per barrel in late 1998. OPEC still had not reestablished an effective grip on world markets. At the same time, forces stronger than OPEC were at work on the market, including the Asian economic

crisis, which significantly lessened demand for oil and the ability of Asian nations to pay for it. Oil prices appeared to be in recovery in March 1999, when OPEC and non-OPEC countries agreed to production cuts of more than 2 million bpd.

## Twenty-First-Century Recovery

In the early 2000s, the world oil market entered a recovery. Increased global demand, cooperation between OPEC and non-OPEC producers, improved quota discipline on the part of OPEC members, and political developments in the Middle East all played a role in reinvigorating the petroleum

### World Crude Oil Production and Petroleum Consumption, as of August 2006

CRUDE OIL PRODUCTION		PETROLEUM CONSUMPTION	
Country	Thousands of Barrels per Day	Country	Thousands of Barrels per Day
Russia	9,330	United States	21,322
Saudi Arabia <sup>a</sup>	9,300	Other Non-OECD <sup>bc</sup>	14,470
United States	5,155	Other OECD Europe	9,151
Iran <sup>a</sup>	4,035	Other Asia <sup>c</sup>	8,810
North Sea	3,997	Other OECD Non-Europe	3,498
China	3,670		
Mexico	3,252	China <sup>c</sup>	7,340
United Arab Emirates <sup>a</sup>	2,702	Japan	4,850
Kuwait <sup>a</sup>	2,550	Former Soviet Union <sup>c</sup>	3,900
Venezuela <sup>a</sup>	2,490	Germany	2,692
Canada	2,438	Canada	2,372
Nigeria <sup>a</sup>	2,430	Korea, South	2,086
Norway	2,430	France	1,875
Iraq <sup>a</sup>	2,203	United Kingdom	1,814
Algeria <sup>a</sup>	1,805	Italy	1,556
Brazil	1,703		
Libya <sup>a</sup>	1,700	World Total <sup>c</sup>	83,150
Angola	1,468		
United Kingdom	1,198		
Indonesia <sup>a</sup>	1,015		
Qatar <sup>a</sup>	885		
Oman	727		
Argentina	701		
Malaysia	685		
India	650		
Egypt	630		
Ecuador	544		
Colombia	534		
World Total	73,628		

a. Member of the Organization of the Petroleum Exporting Countries (OPEC)

b. Organisation for Economic Co-operation and Development

c. Figures for the second quarter of 2006.

Source: Energy Information Administration, *International Petroleum Monthly*, November 2006, tables 1.1a, 1.1b, 1.1c, and 1.7, [www.eia.doe.gov/ipm](http://www.eia.doe.gov/ipm).

## Estimated Crude Oil and Natural Gas Reserves of Select Countries, as of January 1, 2006

Region/Country	Crude Oil <sup>a</sup>		Natural Gas <sup>b</sup>	
	Reserves	Percentage	Reserves	Percentage
North America	213	16.5	265	4.3
Canada	178.8		57	
Mexico	12.9		—	
United States	21.4		193	
Central and South America	103	8.0	251	4.1
Brazil	11.2		—	
Venezuela	79.7		151	
Europe	15	1.2	201	3.3
Netherlands	—		62	
Norway	7.7		84	
Eurasia	79	6.1	1,953	32
Azerbaijan	7		—	
Kazakhstan	9		65	
Russia	60		1,680	
Turkmenistan	—		71	
Uzbekistan	—		66	
Middle East	743	57.5	2,565	42
Iran	132.5		971	
Iraq	115.00		112	
Kuwait	101.5		56	
Qatar	15.2		911	
Saudi Arabia	264.3		241	
United Arab Emirates	97.8		214	
Africa	103	8.0	486	8
Algeria	11.4		161	
Egypt	—		59	
Libya	39.1		—	
Nigeria	35.9		185	
Asia and Oceania	36	2.8	392	6.4
China	18.3		—	
India	5.8		—	
Indonesia	—		98	
Malaysia	—		75	
World Total	1,293		6,112	

Notes: A dash indicates that a nation is not among the top 20 in reserves.

a. Billions of barrels

b. Trillion cubic feet

Source: Adapted from Energy Information Administration, *International Energy Outlook, 2006*, [www.eia.doe.gov/oiaf/ieo](http://www.eia.doe.gov/oiaf/ieo). See the Web site for additional sources and notes on estimates.

sector. This recovery continued despite increasing calls for U.S. independence from Middle Eastern sources of energy in light of the September 11 al-Qaida attacks on the United States and the U.S.-led war in Iraq.

In October 2004, oil reached \$55.17 per barrel, the highest closing price then on record, only to be surpassed in March 2005 at \$56.10 per barrel. In the intervening months, oil prices remained above \$50 per barrel, with most analysts believing that

prices would remain at elevated levels for some time. In March 2005, the chief executive officer of the Kuwait Petroleum Corporation asserted that oil prices would never again dip below \$40 per barrel. OPEC again agreed to raise production in an effort to curb prices, despite strong disagreement by several members.

Prices peaked in August 2005 at more than \$70 per barrel, the result of an unforeseen surge in demand and speculative buying at a time when refining bottlenecks and geopolitical strife conspired to limit increases in production. At year's end prices had dropped to \$60 per barrel partly in response to OPEC opening 2 million barrels per day in spare capacity and promising "to stabilise the market." In May and August 2006, however, prices again exceeded \$70 per barrel as a result of several global geopolitical factors, including developments in North Korea's missile program, fighting between Hizballah and Israel, a report from the U.S. Department of Energy indicating a decline in domestic reserves, and politicians drawing comparisons to the 1979–1981 crisis. Prices steadily declined through the end of 2006, however, and by the third week in January 2007 dropped sharply to just below \$48 per barrel, a 14 percent decrease since the prior month, due to unusually mild weather. OPEC and many market commentators forecasted that crude oil prices would hover around \$50 for the first half of 2007 and recover slightly later in the year.

Global oil demand continued to rise, leading the International Energy Agency (IEA) to repeatedly modify its estimates upward. Its predictions for 2005 put demand at 84.3 million bpd, up from 80 million bpd in November 2003 and 77 million in 2002. The IEA estimated that global oil demand will rise to 92 million bpd by 2010 and to 110 million bpd by 2020. The U.S. Energy Information Administration's (EIA) 2006 long-term forecast, however, lowered projected oil demand by 2025 to 111 million bpd, as compared with a 119 million bpd estimate for 2025 in last year's projection, because of the expected dampening effects of higher long-term oil prices.

The United States and developing nations in Asia, primarily China and India, are expected to

experience the largest growth. In developing nations, oil consumption is expected to increase for all end uses, including residential, commercial, industrial, and electric power generation. Such increases will require incremental production of more than 44 million bpd above 2007 levels.

With their majority position in OPEC, Middle Eastern nations undoubtedly stand to gain a greater market share of increasing demand as a result of declining non-OPEC reserves. Indeed, in 2006 Middle Eastern producers represented eight of the top fourteen oil exporters, a trend that likely will continue given their proven reserves. Iraq holds significant potential in this regard. Since the 1990 Persian Gulf War, the country's production has been erratic and limited. By May 2006, Iraq was averaging a production rate of 1.9 million bpd, well below its potential capacity. Industry experts believe the earliest that additional capacity could be added to Iraqi production is 2007. Nonetheless, Iraq is considered to be a prime target for additional oil development given that less than 25 percent of its discovered fields have been developed.

In addition, the cost of producing a barrel of oil in the Persian Gulf (before royalties or taxes) is estimated at about \$2. Oil from most other regions is several times more expensive to extract because of higher production and exploration costs. Major declines in world oil prices are consequently more harmful to oil producers outside of the Middle East, and significant increases in oil prices benefit Middle Eastern producing nations the most. Middle Eastern oil nations enjoy another advantage in that their proven reserves are high in relation to their rate of production—roughly ten times higher in the Persian Gulf than in the United States. Their excess production capacity gives them market power.

On the supply side of the equation, the EIA put the Middle East's proven oil reserves, as of January 2006, at 743 billion barrels, which accounts for almost 60 percent of all reserves. The EIA had also predicted, under a normal pricing scenario, a steady increase in Middle Eastern production, from 21.2 million bpd in 2003 to 29 million bpd in 2025, which would account for approximately

32 percent of world consumption. Under a high-price scenario, Middle Eastern production would taper off to approximately 18.7 million bpd in 2025 because of decreased demand as a result of price.

## Peak Oil

For much of the history of Middle Eastern oil production there has been an underlying assumption by many that Middle Eastern oil reserves are so vast that exhausting them was not a possibility. The EIA's annual outlook, for example, does not include a declining-supply scenario in its 25-year projections, even though it estimates world reserves at only 43 times current annual consumption. In recent years, however, the concept of "peak oil" has been receiving significant industry attention.

Peak oil refers to the point at which the world's finite supply of oil begins to decline. M. King Hubbert, an American geophysicist, first coined the term in 1956, and the concept is appropriately called Hubbert's Peak. Hubbert accurately predicted 1970 as the point at which U.S. oil supplies would peak. Well-respected analysts and industry participants are in the mid-2000s questioning whether the world oil supply is approaching Hubbert's Peak or in fact may have already reached it. A 2005 study commissioned by the U.S. Department of Energy specifically focused on analyzing viable technologies to mitigate the expected oil shortages associated with the impending peaking of world oil production.

A May 2004 *New York Times* article heightened concerns about the peaking of global oil supplies in implying that Saudi oil fields were in decline and that the kingdom likely would be unable to expand its production capacity much beyond current production levels. Some analysts speculate that excessive, aggressive drilling by Saudi Arabia could have inflicted substantial damage to some of its most productive wells, thereby reducing their productivity. Although Saudi officials emphatically denied the article's assertions in a published rebuttal, more experts believe that Saudi fields may quickly decline. Other disappointing revela-

tions have followed elsewhere in the Persian Gulf, such as Kuwait's admission at the December 2005 OPEC meeting that it could not maintain its current pace of production.

A number of energy analysts take the position that peak oil would be a critical, devastating event—potentially the largest energy crisis in history. What has made predictions remarkable since 2003, however, is the number and consistency of industry experts stating that the peak will occur in ten years or less. Such an event should spark widespread recognition that oil supplies are, in fact, limited, meaning that oil prices likely would remain quite high, perhaps near the \$72 per barrel high of August 2006. Although it is not immediately clear whether these predictions will play out in the near term, if they do, energy-importing nations will face severe economic crisis as their most important fuel source is drastically reduced.

## Growing Demand: China and India

In the past decade, the rapid pace of economic growth in the developing world has fueled a large portion of increased oil and gas consumption, and that portion should only grow in coming decades. Not only are developing economies growing at a much faster pace than in richer nations, but they also require more fuel per dollar of GDP growth. As a result, Asian economies are outbidding the West in order to divert oil and gas to their markets. The two largest developing nations, China and India, will therefore become increasingly important customers of Middle Eastern oil and gas.

China only used natural gas for 3 percent of its energy needs in 2003. With its booming economy expected to raise gas consumption by almost 7 percent per year, though, China opened its first liquefied natural gas (LNG) import terminal in 2006 and plans to finish nine more terminals by 2015. China's crude oil imports in November 2006 increased significantly from the previous month and by more than 31 percent from the previous year. Continued growth is expected, with analysts predicting China's petroleum imports quadrupling from 2003 to 2030, with a growing

share coming from the Middle East. In recognition of the key role that China is expected to play in the global market as a major importer of oil and gas, OPEC and China established a formal Energy Dialogue in December 2005.

India possesses promising deepwater petroleum reserves, but its economy is growing quickly enough that it will remain a net importer. India should also experience a rapid increase in imports of LNG and pipeline gas, with the EIA predicting 6 percent growth in consumption through 2030. Both India and China, however, have vast reserves of coal that should remain a much cheaper resource than natural gas and act as a brake on an otherwise rapidly-expanding import business.

## Caspian Sea Petroleum

Since the breakup of the Soviet Union in 1991, the abundant reserves of oil and gas in the Caspian Sea region have had significant, if indirect, influence on the economics and politics of Middle Eastern oil. Iran is among the oil nations bordering the Caspian Sea, along with Azerbaijan, Kazakhstan, Russia, Turkmenistan, and Uzbekistan. With proven reserves estimated to be as large as those of the United States or the North Sea, the Caspian region had been a major source of oil for the Soviet Union but had remained virtually closed to world markets. Moreover, Caspian oil and gas resources were comparatively undeveloped. Their distance from markets and the limited infrastructure for processing and transport restricted their availability. During the 1990s, multinational oil companies signed agreements worth tens of billions of dollars with Caspian nations to develop their oil and gas resources.

A key issue concerned where to route the pipelines that would bring Caspian oil and gas to world markets. The routes of existing lines carried oil and gas via Russia to other parts of the former Soviet Union, although some ended at the Russian Black Sea port of Novorossisk, from which tankers could carry it through the Bosphorus to the Mediterranean. That route, however, contained political and environmental problems. One of sev-

eral possible outlets for Caspian oil is through Iran to the Persian Gulf and Turkey, but sanctions instituted by the United States in 1995–1996 against companies doing business with Iran and a lack of political will made this alternative untenable. Instead, international efforts focused on the development and construction of the the Baku-Tbilisi-Ceyhan pipeline. It is the world's second longest pipeline and is named after the city where it starts on the Caspian in Azerbaijan, the Georgian capital through which it travels, and its terminus in southern Turkey. Oil began flowing in May 2006 and is expected to reach its capacity of 1 million barrels per day in 2008 or 2009. Another major development in 2006 was the opening of the Atasu pipeline, which travels east to supply China with oil and thus diversify the Caspian consumer base.

One of the most important effects of petroleum development in the Caspian region on Middle Eastern oil nations might ultimately be to depress the world price of oil by adding supply not balanced by demand. By 2015 the U.S. Department of Energy's Energy Information Administration expects overall Caspian output to reach 4.2 million barrels per day. Given the underdevelopment of economies throughout the region, as well as political turmoil such as the December 2006 leadership crisis in Turkmenistan, continuing tension between Russia and its southern neighbors, and separatist movements in the Caucasus and Kurdistan, analysts expect that development of Caspian resources will take decades to complete.

## Economic Diversification

Concerns over peak oil, combined with longer-standing concerns about being overly dependent on one or two commodities, have inspired many Middle Eastern nations to redouble their efforts to diversify their economies. The short-term economic wellbeing of top oil-producing nations is dangerously dependent on oil production. In Saudi Arabia, oil export revenues make up 90–95 percent of export earnings, 70–80 percent of government revenues, and 40 percent of gross domestic product, which means that a fall in prices would

quickly result in government deficits and economic depression. Rapid population growth means that the wealth brought by oil production has been spread increasingly thin—Saudi oil export revenues in 2004 were only \$4,564 per person, compared with \$22,589 in 1980. Across the Middle East, unemployment is double-digit largely because of a mismatch between employee skills and in-demand jobs. Part of the solution has been to move downstream, creating the refined, higher-value fuels actually used by consumers as well as by transporting the fuels to the consumer's shores. Qatar Petroleum has been particularly progressive, with investments such as a 70 percent stake in a planned LNG terminal in Texas.

Prospects for other energy sources, such as nuclear or solar, are cost-prohibitive, and in the case of the former, too closely associated with Iran's brinksmanship over nuclear weapons in the mid-2000s. Diversification, therefore, has focused on the transition to an economy more like Turkey's, which is relatively robust despite possessing very few natural resources.

Bahrain, which expects to exhaust its oil resources in 10 to 15 years, has implemented a well-planned transition to a more diversified economy. After decades of substantial investment in education, Bahrain is now considered an education hub for the Middle East. Heavy industry also has benefitted from investment plans: Bahrain has the largest aluminum smelter outside of eastern Europe and also exports refined petrochemicals such as ammonia and metals like steel. Advanced infrastructure has turned Bahrain's airport into the region's busiest and encouraged growth in information technology and health care. The most praised aspect of Bahrain's diversification has been in the finance industry, which has surpassed oil as the largest contributor to GDP. Bahrain's financial sector is playing a major role in introducing the concept of Islamic-law finance to the wider world.

Dubai, along with the rest of the United Arab Emirates, has become Bahrain's main competitor in the financial sector. It has drawn far more attention, however, for its lavish investment in the Middle East's other major growth industry—tourism.

Having already built the world's largest man-made port, tallest building, and most expensive hotel, Dubai businessmen are building the world's three largest artificial islands to expand the emirate's shoreline. The smallest, Palm Jumeirah, opened to its first residents in December 2006, but international investors have already snapped up high-priced locations that are years from completion.

## Natural Gas

Natural gas is increasingly used globally as a primary source of energy. The EIA predicts that from 2003 to 2030, natural gas consumption will rise by 92 percent, to 182 trillion cubic feet (Tcf) per year, which would increase its share of world energy consumption from 24 to 26 percent. The Middle East's natural gas reserves are estimated at slightly more than 2,500 Tcf, or roughly 42 percent of the world's reserves. Qatar alone holds approximately 900 Tcf. Importantly, and unlike oil, there remains significant room for new discoveries—the U.S. Geological Survey estimates that more than 4,000 Tcf of viable reserves remain undiscovered. Despite these significant reserves, natural gas has always been the lesser-favored commodity of Middle Eastern nations because of the sizeable capital investment required and the economic difficulty in getting the gas to consuming markets.

Major producing nations began to take on such investments by the mid-2000s. In January 2004, Saudi Arabia leased three of the nation's first major exploration projects for non-associated natural gas, or gas that is not found in association with petroleum. That summer, the Haradh processing plant opened, upping national production capability by 1.6 billion cubic feet (Bcf) per day, to 9.5 Bcf/day. In the meantime, however, the Middle East natural gas sector continued to suffer from underdevelopment—during a December 2006 cold snap, for example, gas-rich Iran had to shut off its pipeline to Turkey in order to have enough supply to keep its own citizens warm.

One of the critical factors leading to the increase in demand for natural gas is the growing importance of it to the electricity-generating

sector worldwide. As of 2003, energy consumption in the Middle East was roughly 42 percent gas, 55 percent oil, 3 percent other sources. By 2030, a dramatic switch will have taken place, with gas becoming the leading form of energy consumption in the region, at 54 percent to oil's 42. Using natural gas instead of petroleum for electricity frees up more petroleum, which can usually be exported more cost-effectively. For example, Saudi Arabia, which expects to almost double its electricity generation in the next fifteen years, plans to make the vast majority of new plants gas-fired. In the industrialized world, natural gas is the preferred option for new power generation because it is more efficient and environmentally friendly compared to other fossil fuels.

In the United States, domestic gas production remains relatively flat, while the marginal costs of domestic production continue to increase, causing a fundamental shift in long-term gas prices. The EIA estimates that high prices will cause U.S. consumption to grow more slowly than in the rest of the world, peaking at 25 Tcf in 2020 and plateauing thereafter.

The combination of higher natural gas prices, rising natural gas demand, and lower liquefied natural gas production and transportation costs is setting the stage for increased LNG trade in the years ahead. Estimates are that worldwide LNG trade will increase 35 percent by 2020. The EIA projects that in the United States LNG import capacity, long under-utilized, will almost quadruple over the next twenty-five years. With actual imports reaching an estimated 4.4 Tcf by 2030, the U.S. gas market increasingly will rely on Middle Eastern supplies, especially from Qatar and Egypt.

LNG is natural gas, primarily methane, that has been cooled to its liquid state, which is reached at  $-260^{\circ}\text{F}$  ( $162.2^{\circ}\text{C}$ ). Liquefying natural gas reduces the volume it occupies by more than 600 times, making it practical for storage and transportation via large ocean-going vessels. When liquid, LNG is too cold to be flammable or explosive.

As of 2007, the continental United States had five existing LNG receipt terminals, where LNG vessels discharge their cargo for storage, regasifi-

cation into natural gas, and ultimately transportation on the inter- and intrastate pipeline grid. With natural gas prices and U.S. industrial demand expected to continue to rise, dozens of new LNG terminals have been proposed for North America, with the majority of them concentrated in the Gulf of Mexico. Analysts in general agree that four to ten new terminals are likely to be constructed, coupled with expansions of the existing facilities. The first of the new terminals was scheduled to begin operation in 2007–2008.

LNG will play an even greater role in fueling the world's fastest-growing economies. While growth will be only around 1 to 2 percent per year in the developed world from 2003 to 2030, Asia outside Japan should see 5 percent annual growth.

Much of the world's LNG will come from Middle Eastern nations, including Algeria, Egypt, and Qatar. A number of international oil companies have agreements with Qatar to develop its massive gas reserves and operate liquefaction facilities. Because the LNG supply chain is so capital intensive—requiring upwards of \$4 billion for exploration, liquefaction, shipping, regasification at the import terminal, and transportation via pipelines—many of the major oil-producing nations are involved in all aspects of the LNG supply chain, from the exploration and production of gas fields all the way downstream to construction of proprietary regasification terminals.

Although still not as critically important as oil, natural gas represents an alternative source of revenue to petroleum for several Middle Eastern nations. Given the projected substantial increases in demand in the United States and abroad, it will be a profitable undertaking for LNG-exporting nations.

## Outlook

The 2003 U.S.-led war against Iraq reinforced the geopolitical importance of Middle Eastern oil reserves. Despite claims by President George W. Bush's administration justifying the war based on connections between Iraqi president Saddam Hussein and the extremist group al-Qaida

and on Iraq's weapons program, the invasion of Iraq was motivated at least partly by the fact that the United States considers Middle Eastern oil vital to its national security and economic interests. The large number of U.S. troops detailed to protecting the Iraqi oil infrastructure appear to confirm this.

As U.S. oil production continues to decline, the United States and many other nations sorely need access to Middle Eastern oil and gas. U.S. reliance on foreign oil imports, and now natural gas imports, likely will continue to increase despite repeated calls from U.S. politicians to reduce such dependence. Threats to energy security seem less identifiable, and perhaps less manageable, if indeed the forces of al-Qaida and other such organizations are targeting critical energy infrastructure as a means of inflicting economic harm.

Although Saudi Arabia has had a vested interest in helping to maintain the economic health of a good customer—the United States—hostility in some quarters toward the United States has made and in 2007 continues to make the relationship fraught with challenges and perils for Saudi Arabia. The presence of U.S. troops on Saudi soil—the birthplace of Islam—had become a rallying cry for Islamist opponents of the Saudi government. Al-Qaida and other groups attacked Saudi and U.S. targets in the kingdom, killing scores of people, and consistently railed against the government. Some saw in the U.S. invasion of Iraq acknowledgment of the need to tamp down the threat to the Saudis. Shortly after the invasion, in 2003 the United States withdrew its forces from Saudi Arabia and announced plans to build “enduring” bases—later changed to “contingency operating bases”—in Iraq.

Saudi Arabia's market-share offensives and the apparent eagerness of some OPEC members to increase their individual market shares at the expense of other members illustrate the fundamental and persistent debate spanning all four

decades of the organization's history. OPEC has long been divided into two competing camps: the price moderates, typified by Saudi Arabia, advocating for stable prices but often greater production, and the price hawks, such as Libya, pushing for a higher price regardless of market conditions. This division has often made it difficult for OPEC to operate as an effective cartel.

Fluctuating prices and repeated efforts to reign in or cheat on production quotas demonstrate a loss of some OPEC control over oil prices as market forces realign supply and demand. On occasion the cartel demonstrates market leverage, when its members summon the self-discipline and collective resolve to rein in production. Although Saudi Arabia consistently dominates OPEC and the world market, there is no guarantee that this situation will continue, especially if Saudi reserves enter a decline.

By the early 2000s, several events promised to significantly change the world energy markets: the more complete integration of countries like China, India, and Russia into the international economy as oil and gas exporters or importers, and the reintroduction of Libya and Iraq into the global market. The U.S. war in Iraq also appears to have caused many U.S. politicians from both the Republican and Democratic parties to question the United States' heavy reliance on Middle Eastern oil.

Nonetheless, the global importance of the Middle Eastern oil states remains unquestioned. As of 2006, the five Gulf countries with the largest reserves—Iran, Iraq, Kuwait, Saudi Arabia, and the UAE—held 55 percent of the world's potential oil supply. Record high oil prices in 2005 and 2006 greatly increased revenues for Middle Eastern producers. The enormous petroleum and gas reserves in Middle Eastern nations and the significant cost advantages these countries enjoy in extracting oil and gas leave little doubt that they will continue to influence the world's oil and gas supply and demand for many years to come.