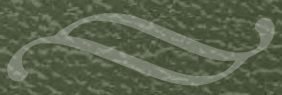
The Changing Dynamics of Energy in the Middle East



Anthony H. Cordesman
and Khalid R. Al-Rodhan

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The Changing Dynamics of Energy in the Middle East

Volume 1

Anthony H. Cordesman
and Khalid R. Al-Rodhan

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The analysis in this book relied on many sources, including reports by the Energy Information Administration (EIA), the International Energy Agency (IEA), OPEC (Organization of the Petroleum Exporting Countries), United States Geological Survey (USGS), Aramco, British Petroleum (BP), and the analysis of other energy analysts. Data for oil supply and demand were adapted from reports such as the EIA's *International Energy Outlook 2005* and the IEA's *World Energy Outlook 2005*. Reserves data were adapted from three main sources: the BP's *Statistical Review of World Energy 2005,* the IEA's *World Energy Outlook 2002,* and the *U.S. Geological Survey 2000*.

Data provided by the UN Department of Economic and Social Affairs, the World Bank, the International Monetary Fund (IMF), the Saudi American Bank (SAMBA), and other regional agencies on the economic, social, and demographic trends were also of great value in writing this book. Chapter 2 relied on the data provided by the International Institute of Strategic Studies (IISS) *Military Balance,* and the online version of the *CIA World Fact Book 2005*. While the analysis relied heavily on the work of the agencies outlined above, press reports and news articles were used extensively in researching this book.

1

The Importance of MENA Energy

Middle Eastern and North African (MENA) energy exports have become steadily more critical to the global economy and international security. Their importance has risen in recent years as rising Asian demand and a healthy global economy increase demand for oil exports near the limits of global production capacity. Current demand consumes virtually all of the oil that MENA states can produce, in spite of major price increases.

There may well be periods in the future where economic conditions worsen and energy demand and prices drop. The history of energy economics is highly cyclical and filled with periods of boom and bust. Over time, however, it seems likely that growing demand will continue to approach the limits of oil and gas export capacity and keep average prices high. China's and India's growing thirst for oil will be key factors in shaping such demand. However, virtually all energy forecasts project that the energy demand will also continue to grow at high rates in developing countries such as Asia, Africa, and the Middle East. Growth will probably continue at lower rates throughout the industrialized world, particularly in the United States.

This growth will probably push MENA oil and gas exports to the limits of the capacity that MENA countries can reach for several decades. For all the talk of new U.S. energy policies, and energy discoveries in other areas of the world, there is little prospect that the global economy can find any near- to midterm sources of energy that can prevent a growing reliance on MENA energy exports. Proven MENA oil and gas reserves remain too high a percentage of the world's total supply and are much cheaper to produce than most alternative sources of supply, and virtually all major energy forecasts call for a sharp increase in global dependence on MENA exports between 2005 and 2030.

The rise in global demand for energy has illustrated just how important MENA exports will be in the future, and how critical increases in MENA production

capacity and exports will be to keeping prices moderate. The MENA region has more than 60 percent of the world's proven conventional oil reserves and is the only region that can be counted upon to increase its production and export capacities in the midterm and the long-term. It has 40 percent of the world's proven gas reserves, and the demand for gas imports is rising sharply. There is no obvious substitute to a rising global dependence on MENA energy for at least the next quarter century.

These trends are forcing energy analysts to rethink the way in which they analyze MENA energy developments. In the past, many analysts and modelers have simply assumed that MENA countries would increase their export capacity to meet world demand at moderate prices. They have not analyzed what MENA countries actually planned to do or the real-world limits to how much and how rapidly they can actually increase production capacity.

Such analysis may have been acceptable as long as there was a significant surplus in existing production capacity relative to demand, although it always creates false expectations on the part of those who confused the projections of models with reality. Today, the issue is what will actually happen: what individual MENA countries plan to do and whether they can do it.

This has led some to talk about an energy crisis in the Middle East. It has led to growing speculation about whether MENA states can really provide the kind of energy exports that current models call for. It has also led others to conspiracy theories about the role MENA states and OPEC (Organization of the Petroleum Exporting Countries) play in world energy markets, fears of U.S. invasions or efforts to control MENA resources, or similar fears of Chinese and Indian efforts to secure energy supplies in ways that bypass global markets.

This book lays out the current facts that shape both MENA capacity to supply energy exports and the possible causes of major interruptions in supply and failures to maintain and expand export capacity at the level the world can really expect. It does not predict a major energy crisis, but it does describe a range of factors that could produce one.

At the same time, it finds that much of the talk about an energy crisis is based more on unrealistic forecasts and expectations than problems in the Middle East. The world needs to adapt to the true nature of the increases in supply that MENA states can be expected to make. The following chapters show that there may be much more of a crisis in unrealistic expectations about energy prices, and unrealistic projections of future export levels, than one in MENA export capacity.

In any case, it is unrealistic to talk about an energy crisis in the Middle East. If an energy crisis exists, it is a global crisis in adjusting to limits on global oil and gas export capacity, higher prices, and the need to find alternatives in the form of different forms of energy, increased efficiency in energy use, and better efforts to conserve energy resources.

REAL-WORLD EXPECTATIONS AND REAL-WORLD VULNERABILITIES

If the world is to develop real-world energy policies, it must set real-world expectations. It must accept the fact that MENA states do face limits on their future energy export capacity and will act according to their perceptions of their own economy interests and not some theoretic model of global need. Energy importers cannot afford to go on living in a climate of illusion about how much energy the MENA region will export in the future, or view limits to actual export capacity in terms of conspiracies by OPEC or MENA states. Living in a paranoid fantasy land is not going to solve anyone's problems.

More is involved than determining what levels of MENA and other global energy production and export capacity are technically feasible and will be provided at future market prices. Virtually all exporting states have some vulnerability to interruptions in their exports and face uncertainties over how much they can maintain and expand export capacity. The geostrategic stability of the MENA region does remain tenuous.

The rise of Islamist extremism and terrorism poses some degree of threat to virtually every nation in the region. Terrorist violence or low-level insurgency is taking place in such key MENA states as Algeria, Egypt, and Saudi Arabia. The Iraq War has not decreased the importance of the Gulf region or the West's reliance on MENA's energy sources. On the contrary, the insurgency in Iraq has highlighted the uncertainty consumers of energy must deal with in the short-, medium, and long-terms. Iranian and other efforts to acquire weapons of mass destruction threaten to destabilize the region and pose a particular threat to the Gulf. Religious extremism, the Iraq War, the Israeli-Palestinian conflict, and tensions in Lebanon and Syria threaten to divide Islam and create new tensions among Muslim, Christian, and Jew.

Virtually all of the oil-exporting nations in the MENA region face major internal problems with population growth, in creating jobs for a steadily expanding young labor force, in economic reform, in dealing with social changes, and in political modernization. Moreover, the last few years have made it all too clear that the strategic uncertainty in the MENA region can interact with equal levels of uncertainty in Africa, Russia, and Latin America. The MENA region may have the largest proven petroleum and gas reserves, but the risks involved are global.

ORGANIZATION OF THE ANALYSIS AND KEY SOURCES OF DATA AND ESTIMATES

Chapter 1 highlights the importance of the region to the energy market, analyzes trends in global oil and gas supply and demand, and studies the changing nature of global energy dependence. The following chapters analyze each of the key areas impacting the dynamics of energy developments in the MENA region:

- Chapter 2 analyzes key areas of internal risks in the region and general security trends. No energy analysis can be credible without taking into account the security and geopolitical uncertainty faced by countries in the MENA region.
- Chapter 3 analyzes the all too important link between regional stability and economic and political dimensions in the region. It outlines important developments in the MENA countries and the general long-term trends that must be addressed and taken into account in the Middle Eastern and North African energy sector.
- Chapter 4 analyzes energy development in the Gulf. It provides country-by-country analysis, national oil and gas production capacity trends, future plans, and energy risk assessment by country. It covers Bahrain, Iran, Iraq, Qatar, Oman, Saudi Arabia, and Yemen.
- Chapter 5 analyzes development in the Levant countries of Jordan, Lebanon, Palestine, Israel, Egypt, and Syria. It covers the national plans and provides country-by-country assessment of energy risks and development in their oil and gas industries
- Chapter 6 analyzes national oil and gas production capacity trends, future production expansion plans, and the overall energy risk for the North African nations of Algeria and Libya. It also provides a general overview of developments in North Africa.
- Chapter 7 focuses on methods of energy analyses, the importance of transparency, and of developing credible forecasting models. It compares different methods and energy reports by agencies such as the IEA (International Energy Agency), EIA (Energy Information Administration), and OPEC. The chapter also studies how the lack of robust modeling is contributing to the aura of uncertainty in the energy market, and it examines important issues in Middle Eastern energy.
- Chapter 8 studies the future of MENA energy supply and demand, the importance of foreign and domestic investment, and the potential impact technological and best practices can have on the global and Middle Eastern energy balance.
- Chapter 9 focuses its analyses on broad scenarios affecting the future of the region and the energy market. It puts current energy developments, announced country plans, and key geopolitical forces in perspective and examines their impact on policy and strategic planning.

This analysis draws upon both national data and two key official efforts at energy analysis and modeling. There are many sources of global energy estimates, they use many different models, and their results differ in detail. There are also many major uncertainties as to the size of the oil and gas reserves in any given country, the cost of extracting them, future energy demand, future energy costs, and virtually every other aspect of energy analysis and forecasting.

Most energy experts do, however, make use of the data and modeling produced by the EIA of the U.S. Department of Energy (DOE) and the IEA. The forecasts and estimates of the EIA and the IEA also represent one of the few modeling efforts that receive public review and which are supported by large analytic resources and a reasonable level of transparency. The EIA also annually recalibrates its forecasts and estimates based on its past degree of accuracy.

As Chapter 7 shows, there are serious limits to these forecasts. In effect, they estimate the amount of energy the global economy would like and then find ways to

show how energy supplies could increase to meet market needs without becoming unaffordable. Estimates by the EIA and IEA are, however, key benchmarks most analysts use to analyze the global energy market. They also are probably all too realistic in showing just how critical a role future demand for oil and gas will play in the world's overall use of energy, in spite of the impact of other sources of energy, advances in technology, advances in energy efficiency, and the impact of conservation.

There is never any certainty to estimates of the future role of given sources of energy. It is always possible that some massive technological breakthrough will occur that will sharply reduce the need for oil or some massive new source of energy resources will be found outside the Middle East. However, ever since the United States first sought to reduce its dependence on foreign oil—which took place as part of Project Independence, beginning in the early 1970s—various experts have promised the solution could come from offshore oil reserves outside the MENA region or from other sources of energy like fuel cells, tar sands, shale oil, nuclear power, fusion, geothermal energy, biomass, wind, conservation, and a host of other means.

None of these promises has succeeded in altering the fundamental balance of world energy supplies or in reducing global economic dependence on exports from the MENA region. In fact, despite 30 years of efforts to find substitutes for MENA energy resources and exports, estimates of the percentage of the world's proven oil reserves located in the MENA area have increased, as have the projections of global dependence on MENA exports.

OIL AND GAS VS. OTHER SOURCES OF ENERGY

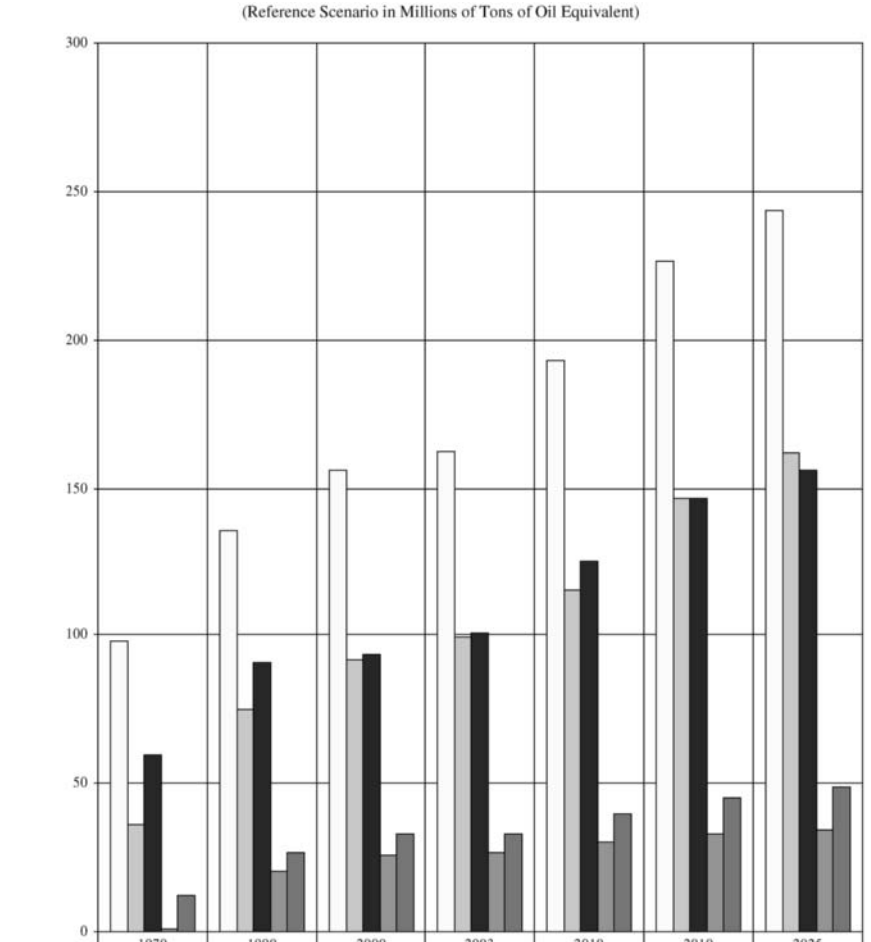
No analysis of the present and the future impact of MENA oil and gas exports can be decoupled from an assessment of the overall trends in global energy balances. Any such analysis can only be illustrative, given the uncertainties involved, and recent EIA and IEA projections present the problem that they have not comprehensively examined the impact of sustained high oil prices. Nevertheless, such projections are probably broadly correct in showing how demand for petroleum interacts with other forces of energy supply.

Such trends also become clear only when they are both quantified and portrayed in graphic form. They are too complex to describe in prose alone, and the interactions between the trends involved can be understood only by taking the time to compare the numbers and trends developed in different estimates and projections. Like many areas of economics, this may make energy analysis a "dismal science" for those who dislike numbers. However, there is no other way to approach energy analysis and to properly illustrate both what estimates predict and the major uncertainties in such estimates.

Global Energy Trends and the Future Role of Oil and Gas

The following charts and tables provide an overview of the possible trends in world energy supplies and consumption.

- Figure 1.1 shows an estimate by the EIA of world energy consumption by type of fuel between 1970 and 2025. It projects major increases in the use of hydroelectric and renewable energy (shown as "other") by 116 percent from 1970 to 1990, 24 percent from 1990 to 2000, and 49 percent from 2003 to 2025. It also projects 108 percent from 1970 to 1990 and 64 percent from 2003 to 2025 in the use of natural gas. In addition, the world's use of coal will increase by 52 percent from 1970 to 1990, 11 percent from 1990



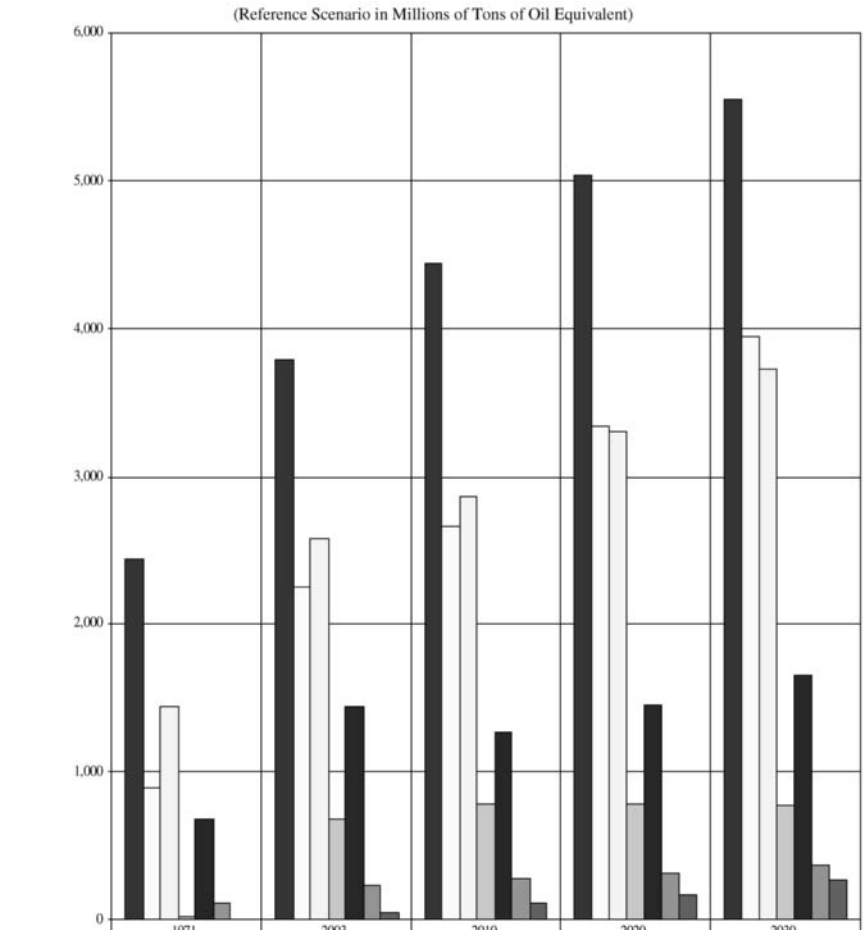
	1970	1990	2000	2003	2010	2010	2025
Oil	97.8	136	155.9	162.2	193.1	226.6	243.4
Natural Gas	36.1	75	91.4	99.1	115.2	146.6	162.1
-Coal	59.7	90.5	93.6	100.7	125.2	146.8	156.1
Nuclear	0.9	20.3	25.5	26.5	30.2	32.9	34.1
Other	12.2	26.4	32.8	32.9	39.8	45.2	48.9

Source: EIA, International Energy Outlook, various editions.

Figure 1.1 EIA Projection of World Primary Energy Consumption by Type of Fuel

to 2003, and 55 percent from 2003 to 2025. The world still, however, nearly doubles its use of oil and will see an increase in oil by 50 percent from 2003 to 2025.

- Figure 1.2 shows a similar projection to 2030 by the IEA. From 2003 to 2030, hydro increases by nearly 62 percent, coal by 44 percent, gas by 76 percent, nuclear by 12 percent, biomass by 15 percent, and renewables by 404 percent. Despite the growth in other sources of energy, the demand for oil will grow by 47 percent.



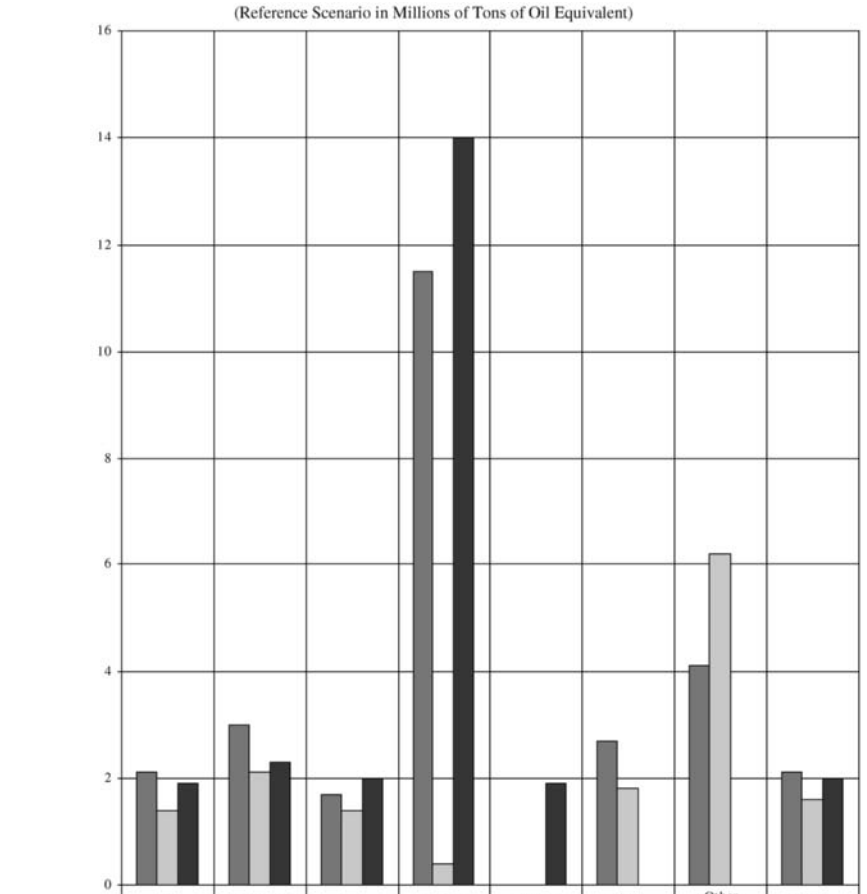
	1971	2003	2010	2020	2030
Oil	2,446	3,785	4,431	5,036	5,546
Gas	895	2,244	2,660	3,338	3,942
Coal	1,439	2,582	2,860	3,301	3,724
Nuclear	29	687	779	778	767
Biomass & Waste	683	1,443	1,273	1,454	1,653
Hydro	104	227	278	323	368
Other Renewable	4	54	107	172	272

Source: IEA, World Energy Outlook 2005.

Figure 1.2 IEA Projection of World Primary Energy Consumption by Type of Fuel

- Figure 1.3 shows that the EIA and the IEA both model a significant drop in the future rate of increase in oil consumption relative to the past, but that both estimate there will still be a 1.7–1.8 percent annual increase in oil use over the next 22–27 years.

The actual future will, of course, be different. A quick glance at the details of Figures 1.1 and 1.2, or the comparison in Figure 1.3, shows that the EIA and the IEA project strikingly different futures for renewables and nuclear energy, and significant differences in the relative growth of gas and coal. These estimates also understate the



	Oil	Natural Gas	Coal	Nuclear	Other	Hydro	Other Renewables	Total
IEA: 1971-2000	2.10	3.00	1.70	11.50	-	2.70	4.10	2.10
IEA 2003-2030	1.40	2.10	1.40	0.40	-	1.80	6.20	1.60
EIA: 2002-2025	1.90	2.30	2.00	14.00	1.90	-	-	2.00

Source: IEA, World Energy Outlook 2002; EIA, International Energy Outlook 2005.

Figure 1.3 Comparative EIA and IEA Estimates of Average Annual Percentage of Future Growth of World Energy Consumption by Type of Fuel: 1971–2030

uncertainties involved. As has been touched upon earlier, these estimates are based on demand-driven modeling techniques that tend to assume incremental supply is available at moderate prices. Even if they were more realistic in estimating how quickly supply will increase, real-world historical trends are never smooth or consistent. No one can predict a technological breakthrough. No one can predict economic growth or environmental developments with any precision, and extrapolating existing trends in known sources of energy over more than two decades is certain to produce substantial errors.

Oil and Gas Dependence vs. Dependence on Other Forms of Energy

At the same time, these projections do help illustrate the fact that energy risk goes far beyond oil and gas and the MENA region. The highest risks in terms of the gains in the various projections of future sources of energy do not seem to be in oil and gas supply, but rather in nuclear energy (because of the perceived safety risk), and in the use of coal (environmental problems). While renewables are often seen as desirable in terms of emissions, virtually all of the projected gain in these projections comes from large hydroelectric plants, which are increasingly seen as posing major environmental risks of a different kind.

Put differently, if any shortfall occurs in the other areas of global energy supply, the demand for petroleum will actually be much higher than models presently estimate, particularly because oil remains by far the most efficient way of transporting energy flexibly over long distances. Similarly, the higher the rate of global economic growth and the more developing nations actually develop, the higher the demand for oil and oil imports.

The world's economy does, however, have tremendous momentum. Drastic shifts in the global balance of different types of energy supply involve massive investments in production, transportation, and end-use equipment that are expensive and difficult to accomplish. The world is hard to change in broad structural terms, and most shifts in energy are costly; availability, export methods, and technology are incremental and take decades to have a major global impact.

In practice, this means that fossil fuel will be the single most important energy source of meeting the global energy needs for the next three decades. Recent studies by the EIA and the IEA assert that fossil fuel will continue to dominate the world energy market at least to 2030. The IEA estimates the following:[1]

> Fossil fuels will continue to dominate energy supplies, meeting more than 80% of the projected increase in primary energy demand. Oil remains the single most important fuel, with two-thirds of the increase in oil use coming from the transport sector. Demand reaches 92 mb/d in 2010 and 115 mb/d in 2030. The lack of cost-effective substitutes for oil-based automotive fuels will make oil demand more rigid. Natural gas demand grows faster, driven mainly by power generation. It overtakes coal as the world's second-largest primary energy source around 2015. The share of coal in world primary demand falls a little, with demand growth concentrated in China and India. The share of nuclear power declines marginally, while that of hydropower remains broadly

constant. The share of biomass declines slightly, as it is replaced with modern commercial fuels in developing countries. Other renewables, including geothermal, solar and wind energy, grow faster than any other energy source, but still account for only 2% of primary energy demand in 2030.

The EIA reference case estimated total world oil consumption increased from 66.5 million barrels per day (MMBD) in 1990, and 78.0 MMBD in 2001, to 78.2 MMBD in 2002. This case projected total consumption to reach 94.6 MMBD in 2010, 103.2 MMBD in 2015, 111.0 MMBD in 2020, and 119.2 MMBD in 2025. While this is only an average annual increase of 1.9 percent per year from 2002 to 2025, it would amount to a total increase of 41.0 MMBD during the forecast period—a cumulative increase of 52 percent.[2]

It seems doubtful that any of the forces now at work could produce major short-term (2006–2010) changes in the broad structure of global energy balances, and there are many reasons why the Middle East will probably continue to dominate the world oil market for the next two decades even if substantial changes were to take place in global demand.

The MENA area has been, and will continue to be, a critical factor in meeting global demand and in providing oil exports for simple and straightforward reasons. It has more oil, its oil is cheaper to produce, and it has the infrastructure to export energy cheaply and in large amounts. Its cost for additional production is low by comparative standards, and domestic demand for oil in the MENA region is low relative to total production capacity. In fact, if some major breakthrough in other sources of energy or conservation should reduce global demand for oil, higher cost producers in other areas would probably have to cease producing or reduce production first, meaning that the MENA region would retain its importance in the world market.

THE IMPORTANCE OF MENA OIL TO THE GLOBAL MARKET

The MENA region dominates world oil exports today and will almost certainly do so for decades to come. This is true even if one assumes steady progress in conservation, major improvements in the supply of renewables, and major increases in energy supplies from gas, coal, nuclear power, and renewables.

Recent estimates indicate that the region has well over 60 percent of the total world oil proven reserves (733.9 billion barrels), and it produced 24.57 MMBD or 24 percent of the world's total oil production. Even if Canadian tar sands are included, which are estimated to contain 175 billion barrels, the MENA region still has 53 percent of the world total oil reserves. In addition, the Middle East contains over 40 percent of the world gas reserves or 2,570 trillion cubic feet (Tcf).[3]

Current Estimates of Proven MENA Oil Reserves vs. the World Total

One can argue the validity of the way that proven oil reserves are estimated. Some producers have inflated their "proven" reserves to project strategic importance, which

has added to the uncertainty and the lack of transparency. Limited hard data are available to validate many current national claims.

Nevertheless, most sources estimate that most of the world's proven oil and gas reserves are in the Middle East and North Africa. For example, the IEA summarized the importance of MENA energy in its *World Energy Outlook 2005* as follows:[4]

> The greater part of the world's remaining reserves lie in that region [the MENA]. They are relatively under-exploited and are sufficient to meet rising global demand for the next quarter century and beyond. The export revenues they would generate would help sustain the region's economic development. But there is considerable uncertainty about the pace at which investment in the region's upstream industry will occur, how quickly production capacity will expand and, given rising domestic energy needs, how much of the expected increase in supply will be available for export. The implications for both MENA producers and consuming countries are profound.

British Petroleum (BP) is widely quoted as a credible source of global oil and gas reserves, and its estimates of world's oil resources, and MENA's share, reflect the following trends:[5]

- In 1980, the world had a total of 667.1 billion barrels of proven oil reserves, and the Middle East and North Africa accounted for 396.0 billion barrels of this total (59.3 percent).
- In 1988, the world had a total of 996.2 billion barrels of proven oil reserves, and the MENA area accounted for 689.5 billion barrels of this total (69.2 percent).
- In 1998, the world had a total of 1,069.5 billion barrels of proven oil reserves, and the MENA area accounted for 719 billion barrels of this total (67.2 percent).
- In 2002, the world had a total of 1,047.7 billion barrels of proven oil reserves, and the MENA area accounted for 783.8 billion barrels of this total (66.5 percent).
- In 2004, the world had a total of 1,188.6 billion barrels of proven oil reserves, and the MENA area accounted for 795.3 billion barrels of this total (67 percent).

As is the case with many areas of energy analysis, estimates do not always agree on fundamental issues of production, reserves, and export capacity. What virtually all sources do agree upon, however, is the importance of oil and natural gas and oil in the MENA region to the global energy market.

It is also important to understand that the vast majority of these reserves are held in the Gulf. If one uses the BP estimates, the Gulf and Yemen have 61.4 percent of the world's reserves, the Levant has 0.6 percent, and North Africa has 4.5 percent.[6] Moreover, if one uses the conventional method of estimating proven oil reserves, the broad patterns in the distribution of the world's oil reserves by country have not changed in more than a decade. In fact, unless one counts recent efforts to reclassify Canadian tar sands as part of proven oil reserves, the end result of more than 30 years of exploration since the oil embargo of 1973 has been to increase the Middle East's percentage of proven total world oil reserves.

The Future Impact of MENA Oil Reserves

There are a number of different ways to estimate oil reserves, and there are many debates over the size of probable oil reserves and future discoveries, over how to count heavy oil and tar sands, and over the impact the rate of future advances in recovery technology will have on estimates of exploitable reserves. The IEA currently defines the types of reserves as follows:[7]

- Proven reserves: the hydrocarbons that have been discovered and for which there is reasonable certainty that they can be extracted profitably.
- Probable reserves: the volumes that are thought to exist in accumulations that have been discovered and that are expected to be commercial, but with less certainty than proven reserves.
- Possible reserves: the volumes in discovered fields that are less likely to be recoverable than probable reserves.

The U.S. Geological Survey has two more types of reserves and defines them as follows:

- Known reserves: discovered crude oil accumulations that are considered economically viable to produce.
- Undiscovered reserves: quantities of crude oil that geological data and engineering information indicate exist outside known oil fields.

Uncertainty and Risk in Reserve Estimates

As has been discussed earlier, estimates of the share of the world's total oil reserves that are in the MENA area have increased steadily for a quarter of a century, but some experts question how realistic current estimates of proven and potential reserves really are, and how long the gains from new exploration, drilling, and production technologies can be sustained. There are serious debates over how given countries are characterizing and managing their oil reserves, and these involve such key MENA countries as Iraq, Kuwait, Saudi Arabia, and the United Arab Emirates (UAE). Matthew R. Simmons, for example, has challenged current calculations of Saudi oil reserves, especially in the Kingdom's ability to manage reservoirs and replace aging giant and supergiant oil fields.[8]

Chapter 4 examines the Simmons challenge and the Saudi Aramco response in detail, but it is worth noting that oil is a strategic commodity, and many oil-producing nations have used their estimates of reserves to stress their strategic importance. There was a race among Gulf States to increase their claims to proven reserves during the Iran-Iraq War, both to obtain outside aid and to gain political status. Kuwait, for example, claimed its reserves suddenly jumped from estimates of around 65.4 billion barrels in the early 1980s (1982), to around 90.0 billion in 1985. Iran claimed an increase from 58.0 billion barrels in 1982 to 100.0 billion in 1987.

Abu Dhabi increased its claims from 58.0 billion to 92.9 billion during this same period. Iraq responded with claims that its reserves increased from 31.0 billion in 1982 to 100.0 billion in 1988, and Saudi Arabia increased its claims from 163.4 billion in 1982 to 257.5 billion in 1989.

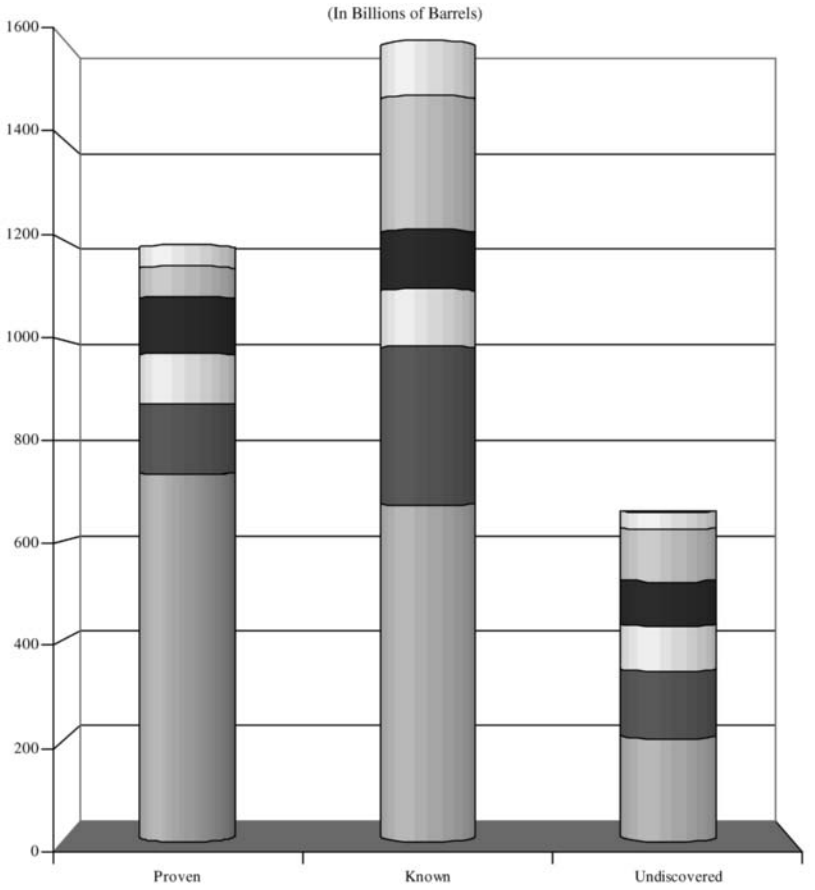
Even when politics are not an issue, there are enough inevitable uncertainties in the data and methodology, resulting in many different estimates of proven, probable, known, discovered, and undiscovered oil reserves. The most notable open source estimates are the *Oil and Gas Journal,* the BP annual *Statistical Review of World Energy,* the *U.S. Geological Survey,* and the *OPEC Annual Review.*

The most quoted type of reserves is proven, and the IEA has described the different attempts to estimate proven oil reserves as follows:[9]

> The most widely-quoted primary sources of global reserves data—the Oil and Gas Journal (O&GJ), World Oil, Cedigaz (for gas), and the US Geological Survey (USGS)—compile data from national and company sources. In addition, OPEC compiles and publishes data for its member countries. IHS Energy (formerly Petroconsultants) also compiles data but for "proven plus probable" reserves only. Other organizations, including BP, publish their own global estimates based mainly on data from the main primary sources. Despite the differences in approaches among these organizations, current estimates of remaining proven reserves worldwide do not vary greatly. BP puts global oil reserves at the end of 2003 at 1148 billion barrels. Other estimates for the same year range from World Oil's 1051 billion to IHS Energy and O&GJ's 1266 billion barrels. Both BP and O&GJ include Canadian oil sands which increases their estimates substantially, although differences in their approaches produce very different results: BP includes 11billion barrels of oil-sands reserves under active development. O&GJ includes all proven oil-sands reserves, which they estimate at 174 billion barrels. World Oil excludes natural gas liquids and Canadian oil sands. Differences among all the main sources are small in terms of the number of years of remaining reserves: 36 according to World Oil and 44 according to O&GJ.

Most estimates are close to each other. The differences tend to stem more from the definition of what is proven, probable, known, and undiscovered than from major differences in the input data. As the following figures show, estimates tend to agree more often than not:

- Figure 1.4 compares the BP estimates of proven oil reserves by region to that of the USGS 2000 of unknown and discovered oil reserves. It shows that the Middle East reserves (excluding North Africa) have 62 percent of the world's proven oil reserves, 42 percent of the known oil reserves, and 31 percent of the undiscovered oil reserves. In each case, it is greater than any other region in the world.
- Figure 1.5 shows a BP estimate of the trends in Middle Eastern reserves over the last two decades and shows an upward trend in each country. It also shows how Middle Eastern nations rank relative to other leading oil producers in terms of total proven reserves. From 1984 to 2004, the BP estimates of proven oil reserve in Iran increased by 125 percent, Iraq by 77 percent, Kuwait by 7 percent, Qatar by 338 percent, Saudi Arabia by 53 percent, Syria by 129 percent, the United Arab Emirates by 201 percent, Yemen by 2,800 percent, Algeria by 31 percent, and Libya by 83 percent. Egypt and



	Proven	Known	Undiscovered
Asia Pacific	41.1	107.7	32.1
North America	61.0	268.0	106.3
Africa	112.2	116.5	89.7
S & C America	101.2	113.5	91.1
Europe & Eurasia	139.2	315.7	132.8
Middle East	733.9	672.6	204.8

Sources: BP, Statistical Review of World Energy 2005, and the USGS 2000.

Figure 1.4 BP and USGS 2000 Estimates of World Oil Resources in 2004

Tunisia's proven reserves estimates decreased by 10 percent and 67 percent, respectively. Total MENA proven oil reserves increased by approximately 69 percent during the last two decades.

- Figure 1.6 compares the trend in the Middle Eastern proven oil reserves to that of the rest of world. The largest growth was seen in South and Central America, which increased its proven oil reserves by 179 percent. Africa follows with a 94-percent increase, the Middle

Figure 1.5 BP Estimates of MENA and Other Regional Proven Oil Reserves 1984–2004 (in Billions of Barrels)

Nation	1984	1994	2004	% Change 1984–2004	% of World Total
Bahrain	N/A	N/A	N/A	N/A	N/A
Iran	58.90	94.30	132.50	125%	11.10
Iraq	65.00	100.00	115.00	77%	9.70
Kuwait	92.70	96.50	99.00	7%	8.30
Oman	3.90	5.10	5.60	44%	0.50
Qatar	4.50	3.50	15.20	238%	1.30
Saudi Arabia	171.70	261.40	262.70	53%	22.10
Syria	1.40	2.70	3.20	129%	0.30
UAE	32.50	98.10	97.80	201%	8.20
Yemen	0.10	0.10	2.90	2,800%	0.20
Other	0.20	0.10	0.10	–50%	less than 0.050
Total Middle East	**430.80**	**661.70**	**733.90**	**70%**	**61.70**
Algeria	9.00	10.00	11.80	31%	1.00
Egypt	4.00	3.90	3.60	–10%	0.30
Libya	21.40	22.80	39.10	83%	3.30
Tunisia	1.80	0.30	0.60	–67%	0.10
Total MENA	**467.00**	**698.70**	**789.00**	**69%**	**66.40**
Other Africa	21.60	28.00	57.10	164%	4.70
Asia Pacific	38.10	39.20	41.10	8%	3.50
Europe/Eurasia	96.70	80.30	139.20	44%	11.70
North America	101.90	89.80	61.00	–40%	5.10
S. & C. America	36.30	81.50	101.20	179%	8.50
World Total	**761.60**	**1017.50**	**1188.60**	**56%**	**100.00**

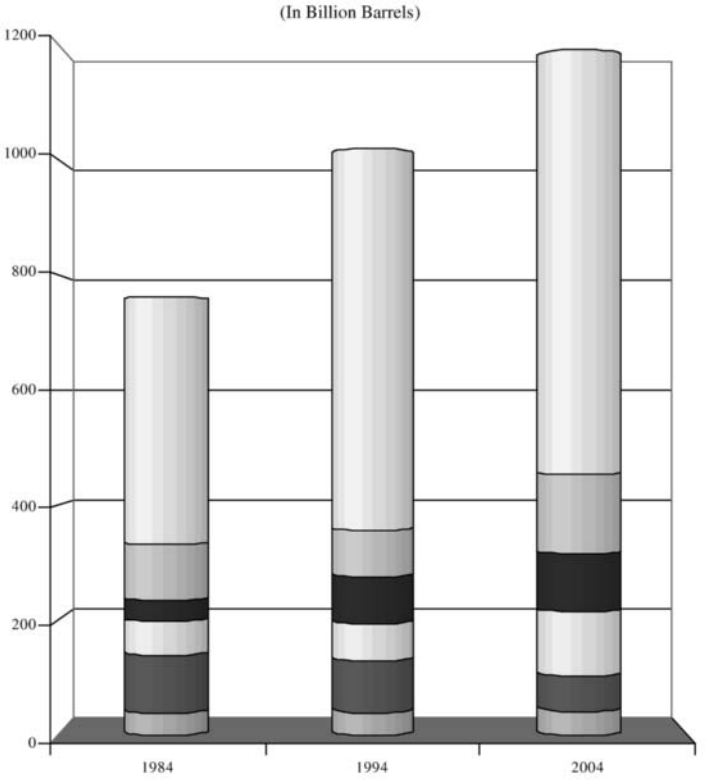
Source: BP, *Statistical Review of World Energy 2005*. N/A = not available.

East with a 70-percent increase, and Europe and Eurasia increased by 40 percent. The only decrease occurred in North America, which saw a 40-percent decline in its proven oil reserves.

The Canadian Tar Sands Debate

Most significant departures from the conclusions reached in the BP estimate reflect the decision to include Canadian tar sands in estimates of world reserves. Canada estimates that such tar sands total 175 billion barrels of oil and has proposed they be included in the estimate of proven oil reserves on the grounds that they can be produced at a cost of $16 to $26 per barrel, less transportation.

The USGS indicated in 2000 that recoverable tar sands could be only 20 to 33 percent of what the Canadian Energy Board claims.[10] The EIA estimates that if such tar sands are included in the pool of proven reserves, the MENA share of world reserves would be reduced from some 65 percent to around 57 percent. The EIA analysis also



	1984	1994	2004
Middle East	430.80	661.70	733.90
Europe & Eurasia	96.70	80.30	139.20
S&C America	36.30	81.50	101.20
Africa	57.80	65.00	112.20
N. America	101.90	89.80	61.00
Asia Pacific	38.10	39.20	41.10

Note: the Middle East excludes North Africa. If one includes North Africa, the proven oil reserves will be 467.0, 698.7, and 789.0 in 1984, 1994, and 2004 respectively.
Source: BP, Statistical Review of World Energy 2005.

Figure 1.6 World Proven Oil Reserves Trends by Region: 1984–2004

indicates that the commercialization of Canadian tar sands at this price spread may prove to be commercial over time, but that this will take years to fully conform and requires a massive new production and transportation infrastructure.

Near- to midterm production capacity is also an issue in evaluating the importance of tar sands. The U.S. DOE estimates that even if affordable production of this volume of reserves of tar sands does prove valid in real-world economic terms, it will lead to only 2.2 MMBD worth of actual production by 2025, and 1.0 MMBD of

exports to the United States.[11] This makes tar sands an interesting possibility, but one with limited short- to midterm impact.

USGS Estimates of Potential and Probable Reserves

The U.S. Geological Survey provides another way of considering how estimates of world reserves might change in the future. It not only estimates proven reserves—which are recoverable with today's technology and today's costs—but the potential growth in reserves in known fields and the probable size of undiscovered fields. According to the USGS, the present total size of proven reserves is 1,212.9 billion barrels compared to 1,188.6 billion barrels of oil. The Middle East has 685.64 billion barrels, or 58 percent of the total.[12]

If one looks at potential discoveries through 2025, the USGS estimates that known reserves and fields will be found to have another 730.5 billion barrels by 2025 and that the Middle East will then have 252.5 billion barrels, or 34.6 percent of these new discoveries. If one combines proven reserves and reserve growth, the Middle East would have a total of 938.1 billion barrels, or 48 percent of 1,943 billion barrels. This indicates that the Middle East could shrink as a percent of future world production after 2025.

This would be even truer if one considers the USGS estimate of undiscovered fields and reserves. The USGS estimates that undiscovered fields and reserves could amount to another 939.9 billion barrels and that the Middle East could have 269.2 billion barrels, or 28.7 percent of this total. If one combines proven reserves, reserve growth, and undiscovered reserves, the Middle East would have 1,207.3 billion barrels, or 42 percent of a global total of 2,882.9 billion barrels.

In short, the Middle East would remain of critical strategic importance, but could lose its present level of dominance at some point between 2020 and 2030. This is an important long-term possibility, but one with little practical importance for current and midterm energy policy.

The IEA Estimate of Reserves

Figure 1.7 compares the 2002 International Energy Agency estimates of remaining, undiscovered, and total oil production of major oil production nations. It compares how much each country has produced to date to that of its remaining reserves in billion barrels of oil. The IEA uses a mixture of its own databases and the USGS estimates and calculates total world oil production up to 2002 at 718.0 billion barrels and annual production in 2001 at 75.8 MMBD. It projects 959.0 billion barrels of remaining reserves and 939 billion barrels of undiscovered reserves.

Saudi Arabia is estimated to have an estimated 221 billion barrels in remaining reserves and 136 billion barrels in undiscovered reserves. Russia ranks second with 137 billion barrels in remaining reserves and 115 billion barrels in undiscovered reserves. Other Middle East states dominate the rest of the picture.[13] According to the EIA, the world oil production averaged 80.9 MMBD from 2001 to the end of

Figure 1.7 IEA Estimates of Remaining Oil Reserves, Undiscovered Resources, and Total Production in 2002 (in Billions of Barrels)*

Rank	Country	Remaining Reserves	Undiscovered Resources	Total Production
1	Saudi Arabia	221.0	136.0	73.0
2	Russia	137.0	115.0	97.0
3	Iraq	78.0	51.0	22.0
4	Iran	76.0	67.0	34.0
5	United Arab Emirates	59.0	10.0	16.0
6	Kuwait	55.0	4.0	26.0
7	United States	32.0	83.0	171.0
8	Venezuela	30.0	24.0	46.0
9	Libya	25.0	9.0	14.0
10	China	25.0	17.0	24.0
11	Mexico	22.0	23.0	22.0
12	Nigeria	20.0	25.0	4.0
13	Kazakhstan	20.0	25.0	4.0
14	Norway	16.0	23.0	9.0
15	Algeria	15.0	10.0	10.0
16	Qatar	15.0	5.0	5.0
17	United Kingdom	13.0	7.0	14.0
18	Indonesia	10.0	10.0	15.0
19	Brazil	9.0	55.0	2.0
20	Neutral Zone	8.0	0.0	5.0
21	Others	73.0	220.0	91.0
Total		**959.0**	**939.0**	**728.0**

*Note: Estimates include crude oil and NGLs; estimates are taken from the IEA and USGS databases.

2005, which means that the world oil reserves are declining on average by that level.

If one looks at the IEA estimate of the reserves of other major MENA oil producers, they have the following resources:

- Iraq is estimated to have 78 billion barrels in remaining reserves and 61 billion barrels in undiscovered reserves. (Estimates of Iraq's oil reserves and resources vary widely since only 10 percent of the country's resources have been explored. Various reports—The Baker Institute, Center for Global Energy Studies, the Federation of American Scientists—indicated that the main deep oil-bearing formations of Iraq located in the Western Desert region could contribute additional resources up to 100 million barrels. These resources, however, have not been explored.)
- Iran is estimated to have 78 billion barrels in remaining reserves and 67 billion barrels in undiscovered reserves.
- The United Arab Emirates is estimated to have 59 billion barrels in remaining reserves and 10 billion barrels in undiscovered reserves.

- Kuwait is estimated to have 55 billion barrels in remaining reserves and 4 billion barrels in undiscovered reserves.
- Libya is estimated to have 25 billion barrels in remaining reserves and 9 billion barrels in undiscovered reserves.
- Algeria is estimated to have 15 billion barrels in remaining reserves and 10 billion barrels in undiscovered reserves.
- Qatar is estimated to have 15 billion barrels in remaining reserves and 5 billion barrels in undiscovered reserves.
- The Kuwaiti-Saudi Neutral Zone is estimated to have 8 billion barrels in remaining reserves and 0 billion barrels in undiscovered reserves.
- The United States is estimated to have 32 billion barrels in remaining reserves and 83 billion barrels in undiscovered reserves.

Cost Factors and Estimates of Reserves

Other factors need to be considered in evaluating such estimates of near- and mid-term impact of new discoveries on the world oil market. The cost of production from outside the MENA region varies sharply from region to region once one considers reserve growth and undiscovered reserves. Much of the production would have to come from the former Soviet Union, and from Latin American and African states, where production costs are often at least twice those in the Middle East. The estimates of reserve growth require major advances in enhanced oil recovery to make production economically viable outside the Middle East, and it can take decades to create the production and export infrastructure necessary to exploit undiscovered reserves.

MENA Oil Production and Production Capacity

Given these factors, it is hardly surprising that most estimates indicate that the MENA region will steadily expand its oil production, increase its share of world production, and increase its impact on the global economy through 2025–2030. There are major uncertainties in such estimates, and it must again be stressed that they are based upon demand-driven models that can exaggerate the ease with which major long-term increases can be made in supply at moderate prices. Despite these uncertainties, projections by the EIA and the IEA remain the best benchmarks for analysts and policy makers.

Production Levels vs. Sustainable Production Capacity

Given the tightness of the global oil market, production capacity is what matters most in determining market prices. It represents the oil-producing nations' abilities to meet sudden demand surges or supply disruptions, or, put differently, it represents the market supply ability to meet demand at a given price.

Production capacity is harder to measure than actual production, and sustainable production capacity is even harder. The ongoing debates about surplus capacity and future capacity make it all too clear that the global energy market depends on the ability of producers to sustain a given level of capacity for a given period of time. It is important, therefore, to start with some general definitions of these metrics:

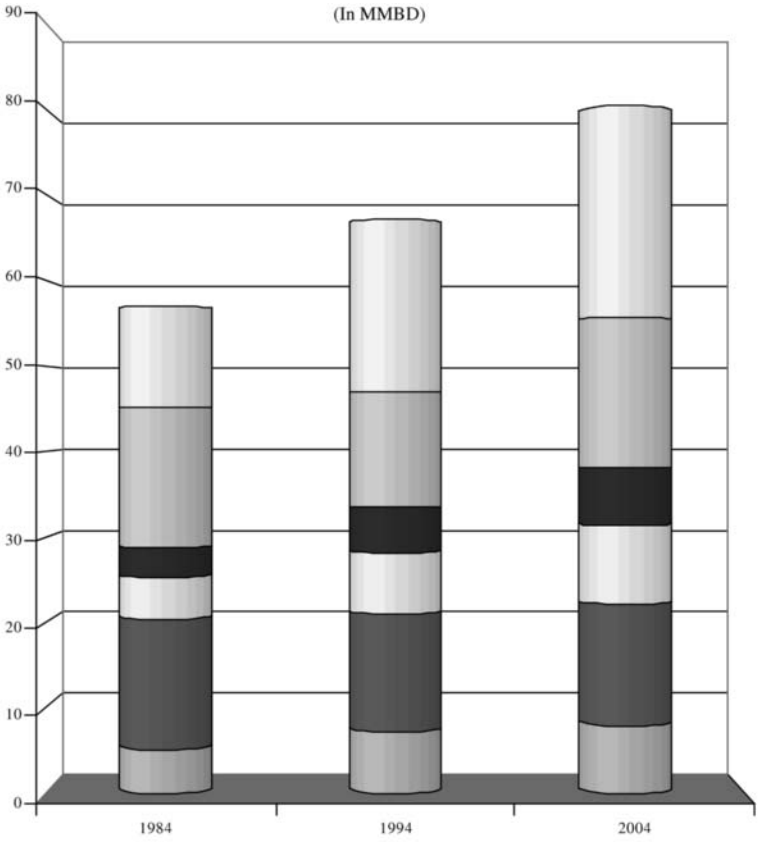
- Production level: represents the actual amount of oil being pumped by a given country or region. It is the easiest metric to measure because it measures how much countries export plus how much they consume locally and store in their strategic reserves. While it measures actual levels of oil, it does require a level of transparency from the producing nation that is lacking in most instances. Agencies such as the IEA, the EIA, and OPEC provide credible estimates.
- Production capacity: measures the actual production level plus the ability of the producing nation to instantly increase its oil production level. The problem with measuring capacity levels is that it depends on more than actual levels. Agencies have to rely on the world of the producing nations. In addition, when forecasting future production capacity, modelers have to take into account present and future geopolitical risks, the global economic environment, the impact of technological breakthroughs, and the actual level of resources.
- Sustainable production capacity: represents the level of production capacity that a producing nation can sustain for a certain time. This is hard to estimate and is equally uncertain as a metric because it depends on the definition of "certain time" and "sustainable."

The other important measure, which is derived from the three preceding metrics, is the level or sustainable surplus capacity, which measures how much more a producer can increase and sustain a certain production level. Currently the level of surplus capacity is getting a lot of attention, especially given high oil prices and the ongoing fear of supply disruptions.

Historical Regional Production Patterns: Upward Trends

Historically, OPEC has dominated the production capacity and level of oil-exporting states, and the Gulf-OPEC countries, Saudi Arabia, Kuwait, Iran, Iraq, and Qatar, have dominated OPEC's total production level, capacity, and sustainable capacity. Between 1970 and 2004, the MENA share of total world production ranged from nearly 25 percent to as high as 42 percent.

Figure 1.8 shows the trend of world oil production levels from 1984 to 2004 by region. It shows that the MENA region production doubled between 1984 and 2004. It produced 14.3 MMBD or 24.9 percent of the world's total in 1984, 23.8 MMBD or 35.6 percent in 1994, and 28.8 MMBD or 36 percent in 2004. Other regions' oil production levels increased in a similar manner. Africa's oil production also doubled during the same period. In 1984, it produced 4.87 MMBD and 9.26 MMBD in 2004. North America's production level decreased during the same period from 15.2 MMBD in 1984 to 14.1 MMBD in 2004.

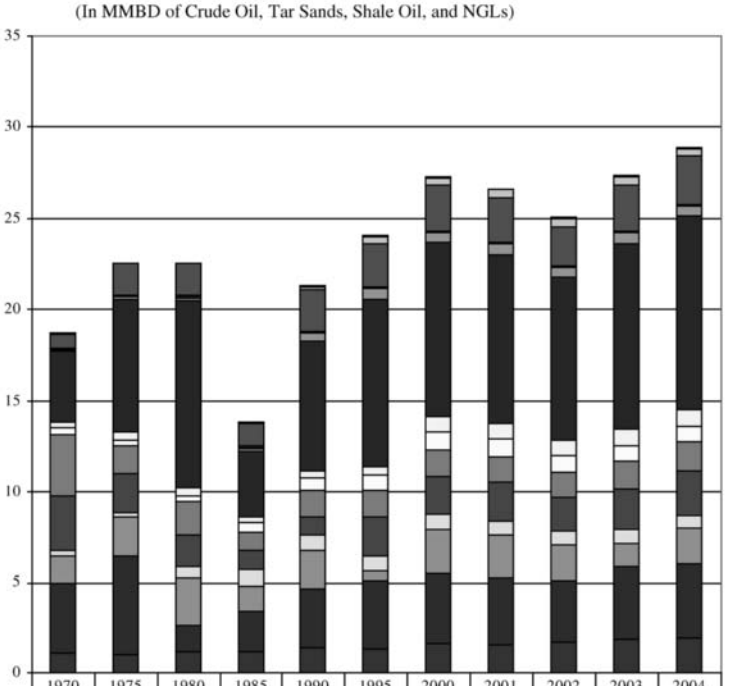


	1984	1994	2004
Middle East	11.84	20.12	24.57
Europe & Eurasia	16.34	13.66	17.58
S&C America	3.54	5.35	6.76
Africa	4.87	7.00	9.26
N. America	15.20	13.81	14.15
Asia Pacific	5.17	7.18	7.93

Source: BP, Statistical Review of World Energy 2005.

Figure 1.8 World Oil Production Trends 1984–2004

The country-by-country oil production levels in the Middle East show somewhat similar patterns, although important differences exist from country to country. From 1975 to 2004, the production levels of all the MENA countries' except Tunisia, Iraq, and Iran increased, as is shown in Figure 1.9. This pattern of increases somewhat understates the trend in production capacity, however, because of the impact of OPEC quotas, the ongoing requirements imposed on each member, and the impact of fluctuations in oil prices. Saudi Arabia, for example, experienced high levels of production fluctuations between 1970 and 1990. It produced 3.58 MMBD in



	1970	1975	1980	1985	1990	1995	2000	2001	2002	2003	2004
Other Middle East	0.08	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Yemen	-	-	-	-	0.18	0.35	0.45	0.47	0.46	0.45	0.43
United Arab Emirates	0.76	1.70	1.75	1.26	2.28	2.41	2.50	2.43	2.13	2.55	2.67
Tunisia	0.09	0.10	0.12	0.11	0.10	0.09	0.08	0.07	0.07	0.07	0.07
Syria	0.09	0.19	0.16	0.16	0.41	0.60	0.55	0.58	0.55	0.56	0.54
Saudi Arabia	3.85	7.22	10.27	3.60	7.11	9.13	9.51	9.26	8.97	10.22	10.58
Qatar	0.36	0.44	0.48	0.32	0.43	0.46	0.86	0.85	0.78	0.92	0.99
Oman	0.33	0.34	0.29	0.50	0.70	0.87	0.96	0.96	0.90	0.82	0.79
Libya	3.36	1.51	1.86	1.03	1.42	1.44	1.48	1.43	1.38	1.49	1.61
Kuwait	3.04	2.13	1.76	1.13	0.96	2.13	2.10	2.09	1.86	2.24	2.42
Egypt	0.32	0.23	0.58	0.88	0.90	0.92	0.78	0.76	0.75	0.75	0.71
Iraq	1.55	2.27	2.66	1.43	2.15	0.53	2.58	2.38	2.04	1.35	2.03
Iran	3.85	5.39	1.48	2.21	3.27	3.74	3.82	3.73	3.41	4.00	4.08
Algeria	1.05	1.00	1.14	1.15	1.35	1.33	1.58	1.56	1.68	1.86	1.93

Source: BP, Statistical Review of World Energy 2005.

Figure 1.9 Middle Eastern Petroleum Production by Country: BP Estimate for 1970–2004

1970, its production level jumped to 10.27 MMBD in 1980, then dropped back to 3.60 MMBD in 1985, and then jumped to 7.11 MMBD in 1990.

The same is true for many of the other MENA countries from 1970 to 2004:

- Algeria produced 1.05 MMBD in 1970, 1.14 MMBD in 1980, 1.35 MMBD in 1990, 1.58 MMBD in 2000, and 1.93 MMBD in 2004.

- Libya produced 3.36 MMBD in 1970, 1.86 MMBD in 1980, 1.42 MMBD in 1990, 1.48 MMBD in 2000, and 1.61 MMBD in 2004.
- Iran produced 3.85 MMBD in 1970, 1.48 MMBD in 1980, 3.27 MMBD in 1990, 3.82 MMBD in 2000, and 4.08 MMBD in 2004.
- Saudi Arabia produced 3.85 MMBD in 1970, 10.27 MMBD in 1980, 7.11 MMBD in 1990, 9.51 MMBD in 2000, and 10.58 MMBD in 2004.

Other countries, however, show the opposite trend. Tunisia, for example, produced 0.09 MMBD in 1970, 0.12 MMBD in 1980, 0.10 MMBD in 1990, 0.08 MMBD in 2000, and 0.07 MMBD in 2004. These trends tell important stories, especially of how well the MENA countries deal with the fluctuation in the global energy demand. It also tells the story of how OPEC managed the oil production level for its MENA countries. In addition, we can see clearly how much the Gulf States dominated the production level for the MENA region and hence OPEC and the world.

Despite the importance of these stories, it is present and future production capacities that make a difference in the global energy balance. More specifically, it is the sustainable production capacity of these countries that has the largest influence on the global energy market and the international economy.

EIA Projections of Future Increases in MENA Oil Production Capacity

Virtually all major modelers project an increase in the oil production capacity of the MENA countries. As mentioned earlier, with the projected increase in global demand for oil and other sources of energy, forecasters expect that the world demand will be mostly met by increases in Gulf-OPEC production.

The ability of countries in the region to meet these requirements is, of course, sensitive to oil prices and the flow of investment capital. More generally, it is critical to any debate over whether global oil production has begun to peak and whether increases in oil supply can meet major increases in demand and keep prices relatively moderate.

The EIA estimates of MENA's oil production capacity vary sharply according to the assumption made about the price of oil: $21/barrel for the low-price case, $35/barrel for the reference case, and $48/barrel for the high-price case. In 2004–2005, the MENA oil production capacity was approximately 29.0 MMBD, and the EIA 2005 estimates called for massive increases for the MENA region's future production capacity. The following show the various estimates and the projected percentage increases:[14]

- For the low-price case, the EIA estimates the MENA region's oil production capacity to be 39.4 MMBD in 2010 (36-percent increase), 45.5 MMBD in 2015 (57-percent increase), 52.5 MMBD in 2020 (81.8-percent increase), and 59.4 MMBD in 2025 (105-percent increase).

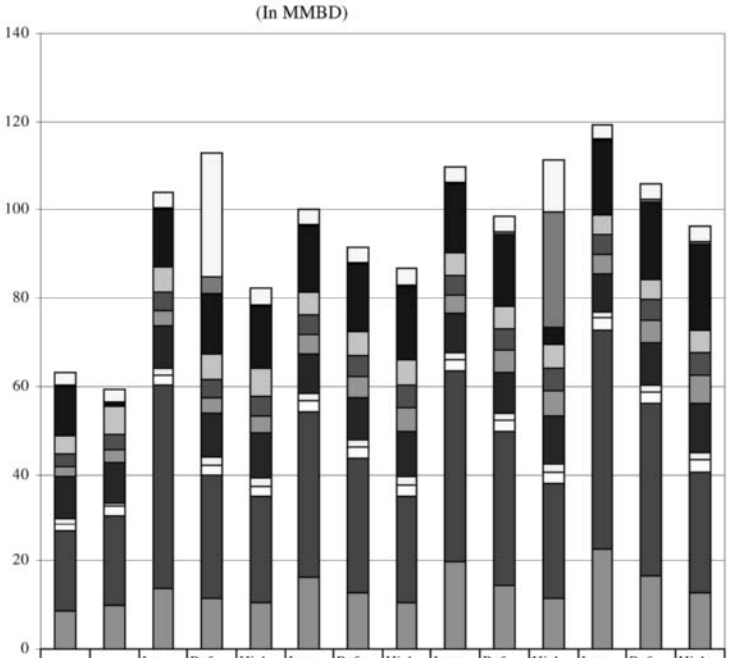
- For the reference case, the EIA estimates the MENA region's oil production capacity to be 34.6 MMBD in 2010 (19-percent increase), 37.6 MMBD in 2015 (30-percent increase), 42.7 MMBD in 2020 (47-percent increase), and 47.8 MMBD in 2025 (65-percent increase).
- For the high-price case, it estimates the MENA region's oil production capacity to be 30.4 MMBD in 2010 (5-percent increase), 30.7 MMBD in 2015 (6-percent increase), 33.0 MMBD in 2020 (14-percent increase), and 35.2 MMBD in 2025 (21-percent increase).

These figures show that the EIA projections call for large increases in OPEC production capacity and, more specifically, in Gulf and Saudi production capacity. In its reference-case forecast, the EIA calls for the OPEC states of the Gulf alone to increase their production capacity from 20.7 MMBD in 2002, to 28.3 MMBD in 2010, 30.8 MMBD in 2015, 35.2 MMBD in 2020, and 39.3 MMBD in 2025.[15] This would mean that Gulf OPEC oil production capacity would increase from 27 percent of total world capacity in 1990 and 26 percent of world capacity in 2001, to 26–32 percent of world capacity in 2010, 24–33 percent in 2015, 24–35 percent in 2020, and 24–36 percent of world capacity in 2025 depending on the price of oil.[16] These figures would be even higher if other non-OPEC "Gulf" oil producers like Oman and Yemen were included, but it is important to note that the range does not change drastically in this forecast.

While the Gulf dominates the EIA estimate of the increase in MENA oil production capacity, the EIA estimate also projects significant increases in oil production capacity in North Africa. Algeria and Libya are estimated to increase their production from 3.2 MMBD in 2002, 3.6–4.4 MMBD in 2010, 3.6–5.2 MMBD in 2015, 4.0–6.4 MMBD in 2020, and 4.4–7.6 MMBD in 2025. The North African share of the total world production capacity, however, will not change. It will remain between 4 and 5 percent of the total.[17]

Given recent developments in the global energy market, many experts believe that these EIA projections are based on unrealistically low oil prices. Nevertheless, they provide a valuable look at what the future might be if prices stayed moderate, and there were no drastic shifts in government policies, new resources, and security risks. The following figures show these EIA projections for the period between 1990 and 2025:

- Figure 1.10 compares the EIA estimates of the regional oil production capacity between 1990 and 2025. The forecasts are based on its 2005 estimates, which assumed oil prices to be $21/barrel for the low-price case, $35/barrel for the reference case, and $48/barrel for the high-price case. In all cases, OPEC members, and more specifically the Gulf-OPEC States, are projected to dominate the world oil production capacity.
- Figure 1.11 shows the EIA's 2005 projection of increases in Middle Eastern oil production capacity by country, illustrating the critical importance of Saudi Arabia, and the role of Iran, Iraq, Kuwait, and the United Arab Emirates. Relative to world



	1990	2002	Low	Ref	High	Low	Ref	High	Low	Ref	High	Low	Ref	High
			2010			2015			2020			2025		
China	2.80	3.00	3.60	28.30	3.70	3.40	3.60	3.70	3.40	3.60	11.60	3.30	3.50	3.70
E. Europe	0.30	0.20	0.30	3.70	0.40	0.40	0.40	0.40	0.40	0.40	26.20	0.40	0.50	0.50
FSU	11.40	0.80	13.10	13.60	14.10	14.90	15.30	16.60	15.80	16.50	3.80	16.90	17.60	19.60
North Sea	4.00	6.30	5.70	5.80	6.20	5.20	5.40	5.80	4.80	5.10	5.40	4.30	4.50	4.90
Mexico	3.00	3.60	4.20	4.30	4.50	4.50	4.60	4.90	4.50	4.70	5.10	4.70	4.90	5.30
Canada	2.00	2.90	3.40	3.50	4.00	4.30	4.80	5.40	4.40	4.90	5.90	4.40	5.10	6.40
US	9.70	9.30	9.50	9.90	10.20	9.10	9.70	10.50	8.90	9.50	10.90	8.40	9.30	11.00
Other Mature Markets	1.40	0.80	1.60	1.70	1.70	1.60	1.60	1.70	1.60	1.60	1.70	1.50	1.60	1.60
Other Middle East	1.40	1.90	2.20	2.30	2.40	2.40	2.50	2.60	2.50	2.50	2.80	2.70	2.80	3.00
OPEC Persian Gulf	18.70	20.70	46.60	28.30	24.40	37.90	30.80	24.50	43.60	35.20	26.20	50.00	39.30	27.80
Other OPEC	8.50	9.90	13.80	11.60	10.60	16.40	12.90	10.60	19.80	14.50	11.60	22.80	16.70	12.60

Source: EIA, International Energy Outlook 2005.

Figure 1.10 EIA Projection of World Production Capacity by Region: 1990–2025

production, the MENA region is estimated to play a major role in determining the world oil supply for the next 20 years.

- Figure 1.12 illustrates the impact and importance of high oil prices on the estimated rate of increase in Middle Eastern oil production capacity, illustrating that price is one of the key uncertainties. It also highlights sensitivity and elasticity analysis of the EIA estimates of MENA's supply trends.