



**Testimony before the
Committee on Energy and Natural Resources
United States Senate**

**“Emerging Global Energy Trends and
Their Implications for U.S. Energy Needs,
Security and Policy Choices”**

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A Statement by

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Mr. Chairman, Members of the Committee, I appreciate the opportunity to appear before you today to discuss emerging global energy trends and their implications for U.S. energy needs, security and policy choices. I currently serve as Energy Program Director and Senior Fellow at the Center for Strategic and International Studies (CSIS). My remarks this morning are the result of analysis conducted at CSIS as well as from impressions and personal experience gleaned from my prior government service in a variety of energy policy positions and over twenty years experience in the private sector as an executive for domestic and international oil and gas companies.

Our Evolving Energy World

Mr. Chairman, the events of the past year have once again focused attention on the critical role which energy plays in our global economy. Rising global oil demand, concern over the adequacy, reliability, and pricing of energy supplies, the environmental implications of increased use of fossil fuels, the cost of those supplies for developed and developing economies alike, global geopolitics, trade and capital flows are issues that preoccupy business and governments around the globe. Consequently, I commend you and the committee for convening this hearing.

Given the critical importance of energy as a strategic commodity, a pivotal question is raised as to whether or not we should be managing its production, delivery and use differently as part of a larger effort to return to the consumer more acceptable control of his energy future. I would submit that as a consequence of having worked off the surpluses of spare global oil production and United States and worldwide refining capacity, witnessing the emergence of aggressive new players in the market, increased concentration of supply sources that are not co-located with future demand centers, and taking into account the environmental, security and foreign policy implications of these changes, a new global energy map may well be emerging and a new geopolitical game afoot.

U.S. consumers have come to both enjoy and expect a healthy domestic economy, which is underpinned by an energy supply that is at once available, affordable, secure, and environmentally benign. In this new world are those criteria unattainable or just beyond reach of current energy paradigms and policies?

While the focus of my remarks here today necessarily highlight the importance of oil and natural gas, it is important to note that coal continues to play a significant role for many countries, particularly with respect to power generation. In addition, continuing energy supply concerns and high prices will encourage increased coal production as a reliable, diverse, and cost competitive fuel source. Coal gasification, coal liquefaction, and clean coal technologies, all currently available, if applied on a sufficiently broad scale offer coal-rich countries such as the United States, India, and China an opportunity to minimize those concerns deriving from an increasing reliance on imported liquid fuels.

In addition, while not minimizing the contribution made by alternative energy forms, including nuclear and renewables, in the global picture for at least the next several decades these alternatives will remain cast in the roles of significant but clearly supporting actors.

I should also note that CSIS has not constructed a model of its own for forecasting future energy supply and demand. Consequently, my comments today draw heavily on forecasts and data from

a number of private sector and governmental sources, most notably those produced by the International Energy Agency (IEA) and the U.S. Energy Information Administration (EIA).¹

After analyzing the various factors that could affect global and regional supply and demand as well as policy issues that could alter the direction and timing of the various projections, it is our contention that sustained high prices, environmental challenges, foreign policy developments, and technological advancements invariably will produce an oil future different from that portrayed by either the EIA or IEA. We believe, for example, that the demand growth and production required to meet the forecasted demand of 120-126 million barrels of oil per day (mmb/d) in the next few decades are unrealistic, in part owing to the belief that production and delivery of 50 percent more oil than currently done today will strain existing resources, infrastructure, delivery systems, and the environment so as to be unsustainable.

Putting the Future in Context – Energy Consumption Trends

The world of energy is changing and moving in directions that further complicate the tasks that lie ahead. If the world does not respond appropriately to these challenges, we risk confronting a future that is increasingly uncertain and defined by factors beyond our control or influence. At its present pace, the world population is growing by almost 10,000 an hour – almost a quarter million per day. These people will need food, housing and other products and services which invariably require energy to produce and deliver.²

For the next twenty years, most forecasts predict that the world will continue to rely on the same energy forms that fueled the past century - oil, natural gas, coal, nuclear and a broad grouping of renewables, including solar, hydro, biomass and wind energy forms. Indeed, although global energy demand is forecast to double between 2001 and 2025, little change is expected in the relative shares of the major fuel sources (Figure 1).

In 2001, 85 percent of global fuel needs were met with fossil fuels, with oil (39 percent) being king, and renewables (8 percent) and nuclear (6 percent) playing supporting, but nonetheless important, roles. This global energy makeup, as expressed in percentage terms, was remarkably consistent even within disparate regions. Energy usage in North America, which currently comprises about 30 percent of worldwide consumption, essentially mirrored larger global trends. Increased reliance on nuclear energy in Europe, in contrast, slightly altered the total energy mix by reducing demand for coal and natural gas. In the developing countries, those often least able to afford or employ best available technology, the use of fossil fuels exceeded 90 percent.

Given the long lead times necessary to develop and introduce new conventional supplies and alternative energy forms, absent an economic, foreign policy, or environmental crisis or a major technological breakthrough, demand for fossil fuels (oil, natural gas, and coal) is expected to continue to dominate the global energy mix for at least the next two decades.

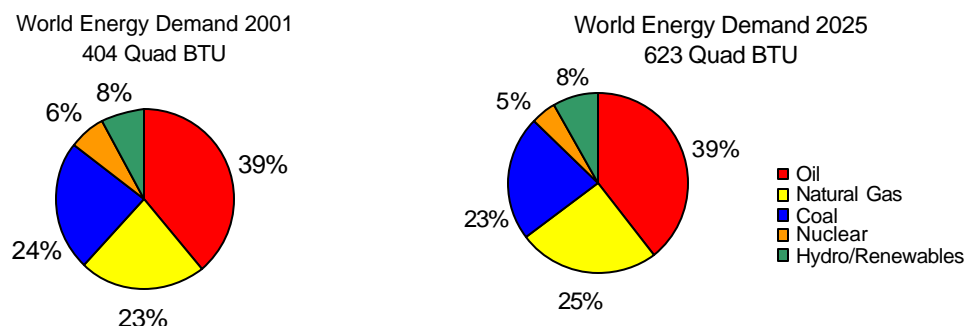
¹ *International Energy Outlook 2004 (IEO 2004)*, Energy Information Administration, U.S. Department of Energy, Washington, D.C. April 2004; *World Energy Outlook 2004 (WEO 2004)*, International Energy Agency/Organization for Economic Cooperation and Development, Paris, November 2004.

² “*The Outlook for the World Oil Market*,” Lord John Browne, Group Chief Executive, BP, Speech given at the Empire Club of Canada, Toronto, December 10, 2004.

In the case of the developing world, this trend is particularly dramatic. The IEA projection calls for developing Asia, including China and India, to continue its current economic expansion with GDP growth (5 percent annually over the forecast period), several percentage points greater than global growth as a whole.³ As a consequence, the energy demand accompanying such robust economic growth is expected to double over the next 2 decades (Figure 2), accounting for 40 percent of the total increase in projected world energy consumption over that period.

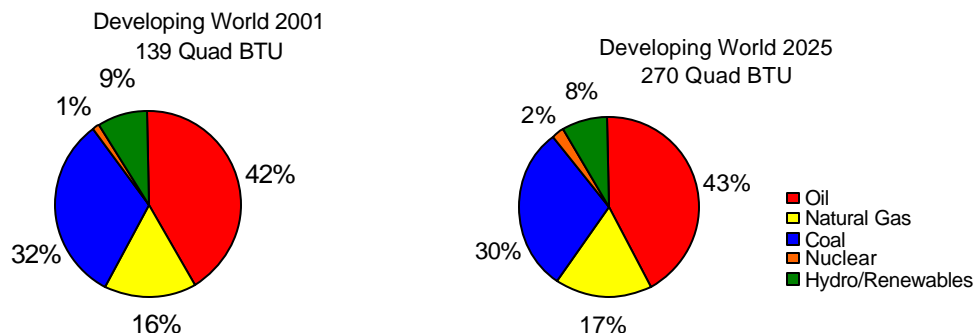
Although sustained high oil prices may ultimately moderate energy growth in Asia, the pace and level of the region's energy consumption could place serious strains on global oil markets and consequently raises significant concerns for both capital flows and emissions growth. Between now and 2025, over 60 percent of new growth in CO₂ emissions is projected to result from energy use in the developing world (Figure 3). The problem only gets worse with hyper-urbanization. By 2025, CO₂ emissions from the developing world will exceed those of the industrialized world, and by 2015 will achieve parity with the developed nations.

Figure 1 – World Energy Demand, 2001 and 2025



Source: *International Energy Outlook 2004*, EIA

Figure 2 – Developing Countries Energy Demand, 2001 and 2025

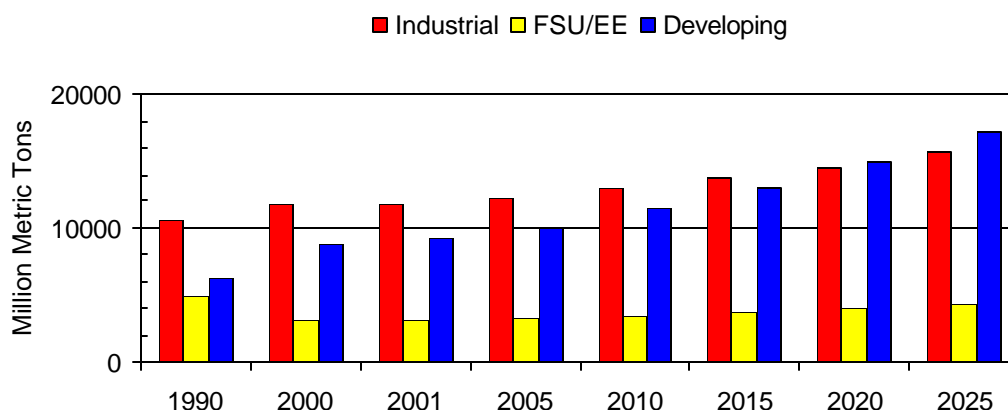


Source: *International Energy Outlook 2004*, EIA

³ See IEA forecast for developing Asia, "Chapter 8-Regional Outlooks," *WEO 2004*, IEA.

Figure 3

Carbon Dioxide Emissions 1990-2025



Source: "Environmental Issues & World Energy Use" *International Energy Outlook 2004*, EIA, pp.137-160

Of the total energy consumed worldwide, approximately 40 percent serves power generation needs and another 20 percent goes to transportation. Half the world's oil – half of an 82 million barrel-a-day market – is dedicated to transportation. In the absence of a substitute liquid fuel or changes to the gasoline combustion engine, this demand is becoming increasingly inelastic, especially in the United States, the world's largest oil consumer. Without improved efficiency and fuel capability changes made to the power and transportation sectors, energy demand cannot materially be reduced.

The Role of the United States

The United States is currently the world's largest producer, consumer, and importer of energy. The United States has roughly 5 percent of the world's population and produces 17 percent of the total energy supplied. Yet in the process of generating almost a third of global GDP, the United States consumes nearly a quarter of the world's energy.

The 2004 EIA forecast projects that overall energy usage in the United States will continue to increase at an annual growth rate of 1.5 percent for the next 20 years. Total U.S. demand for oil is projected to increase by 40 percent from current levels (slightly in excess of 20 mmb/d) to almost 28 mmb/d in 2025. Demand for all forms of petroleum fuels except for the bottom of the barrel increase, but total gasoline demand increases dramatically—after growing slowly for the past 15 years, largely as a result of fuel efficiency standards adopted in the 1970s.

Assuming a continued decline in domestic crude oil production, and with U.S. refineries running at or near capacity, absent substantial new investment, increased domestic demand means expanding reliance on imported oil, both crude and, increasingly, refined products. U.S. oil import reliance is expected to grow from the current level of 58 percent to between 65 and 75 percent of demand by 2025, depending on assumptions about price and economic growth.

The rise in oil import levels, both in absolute and relative terms, carries important infrastructure, logistical, environmental, financial, trade, security, and foreign policy implications. In particular,

the projected rise in refined petroleum product imports increases U.S. vulnerability to supply disruptions and potentially undermines the value of the Strategic Petroleum Reserve (SPR), assuming investment continues to lag in the creation of additional refining capacity.

A similar picture emerges for domestic natural gas. After an era in which gas was undervalued and in surplus supply, domestic production has plateaued and now begun to decline. As demand continues to grow – and the EIA projects increased use of gas domestically primarily for power generation – the United States will rely increasingly on nonconventional domestic production (e.g., tight sands and coal seam gas), gas from Alaska, on increased imports of pipeline gas from Canada (to the extent they are available), and on LNG from sources in Latin America, the Caribbean, Africa, the Middle East, Australia, and Russia.

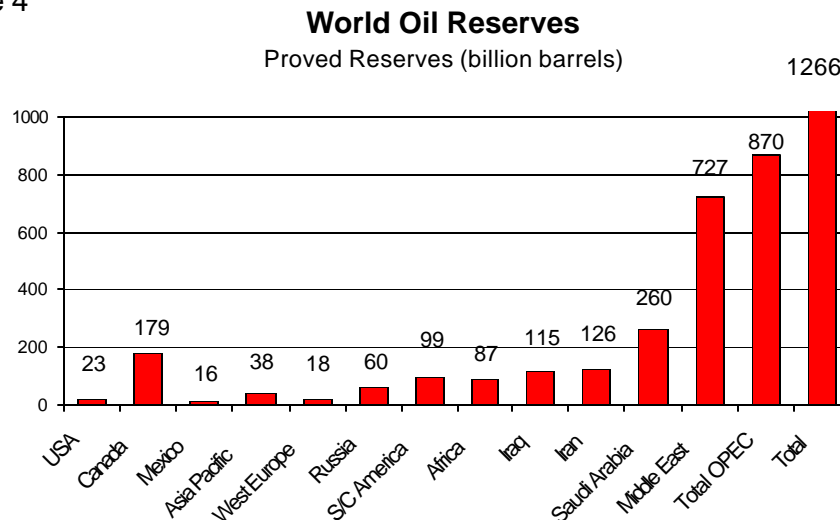
Projected supplies of LNG imports assume that additional regasification capacity will be permitted and constructed either within the United States or in areas proximate to U.S. borders – an uncertain assumption. In addition to environmental, safety, competition, and siting issues, opponents of additional LNG regas projects increasingly name security and foreign policy concerns about exposing the U.S. electric grid system to reliance on imports from countries, many of whom are oil exporters found in troubled regions of the world.

Global Energy Reserves

Government owned or controlled companies control 72 percent of the world's oil reserves, 55 percent of the gas reserves, and more than half of the current world production.⁴ While two-thirds of the world's proven oil resources belong to OPEC members and 60 percent are found in the Middle East (Figure 4), non-OPEC producers, including the United States, Russia, Mexico, and Norway, currently provide significant global volumes, and will likely continue to do so for decades to come. As these resources are depleted, however, the world increasingly will come to rely on OPEC sources, in part as a function of their substantial reserves bases and partly the result of more favorable economics. Yet, these are sources where transparency issues and reserve numbers have been questioned and where production is generally controlled by national ministries or national oil companies (NOCs). Except under limited circumstances, these resources are currently inaccessible to international oil companies (IOCs).

⁴ James Boxell and Kevin Morrison, "Oil Majors Find New Rivals Snapping at Their Heels," *Financial Times*, December 8, 2004.

Figure 4

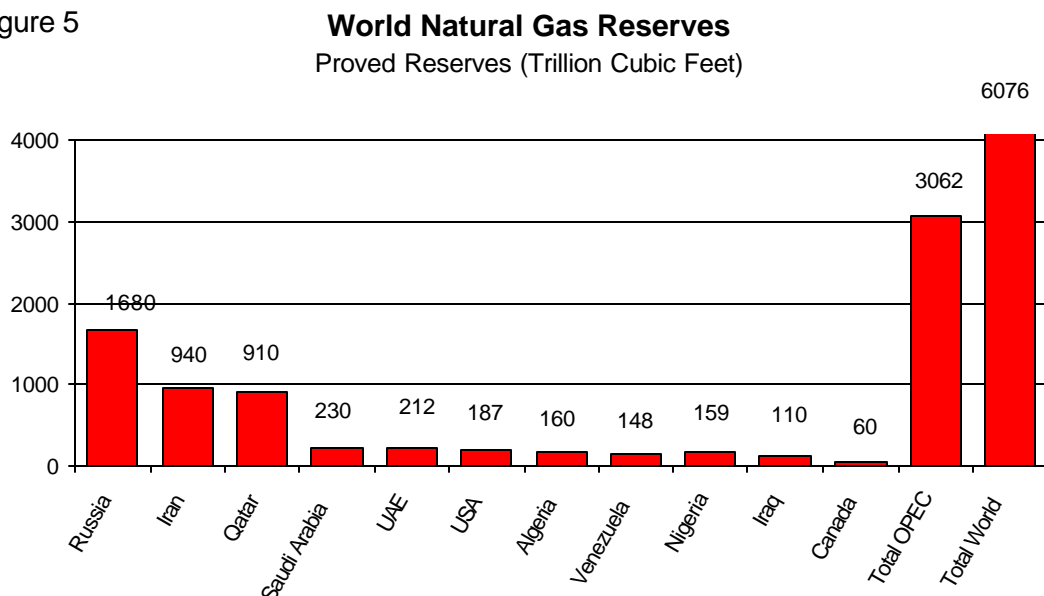


Oil and Gas Journal, Volume 101.49, December 22, 2003, pp.43-47⁵

Russia, Iran, and Qatar, the three top countries for natural gas reserves, contain almost 60 percent of the world's total (Figure 5). By contrast, the United States, Canada, and Venezuela account for just over 6 percent. OPEC member countries contain about half of global gas resources.

Examining the list of major gas reserve holders highlights two facts: first, natural gas reserves throughout the world are ample; and second, much of this supply is "stranded," that is, far removed from major consumption centers. As a consequence, gas transportation becomes a prime consideration – one that is accomplished either through overland pipeline routing or by cooling and liquefying the gas to move it in sea-borne tankers.

Figure 5

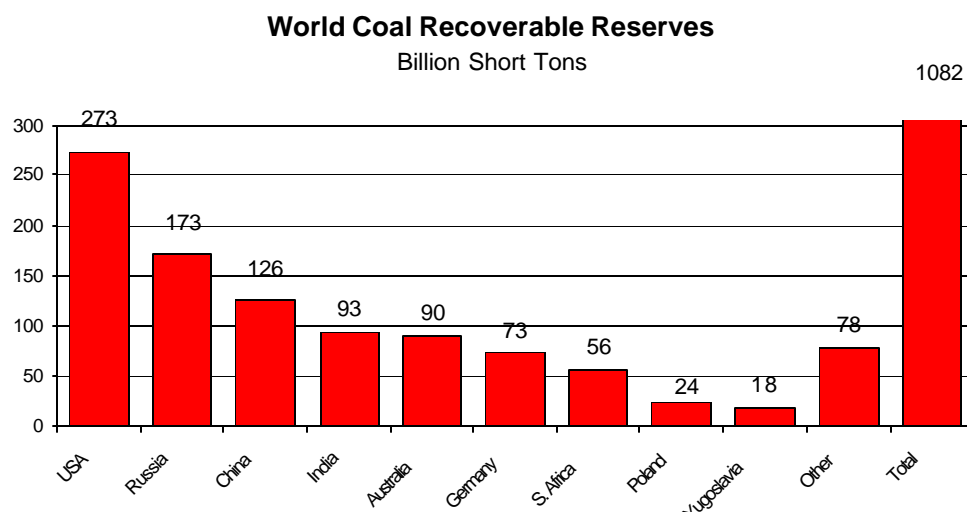


Oil and Gas Journal, Volume 101.49, December 22, 2003, pp.43-47

⁵ Note for Figure 4: The *Oil and Gas Journal* figures for Canadian oil reserves include heavy oil and tar sands resources, while the South American reserves total does not reflect Venezuelan heavy oil. In addition, while this data identifies Russian reserves at 60 billion barrels, certain company estimates put the figure much higher.

The United States, Russia, and China hold over half of the world's proven coal reserves. (Figure 6) The advent of truly “clean coal” technology and the world's ability to deal effectively with the environmental concerns related to mining and mining waste, could substantially improve coal's role in power generation, reduce natural gas demand (possibly freeing up supplies for transport uses), and improve efficiency.

Figure 6



International Energy Outlook 2004, EIA

Reconfiguring the Global Energy Map – A New Game for Oil

In the future, technology advancements and policy choices which re-rank security, environmental impacts, and foreign policy considerations could substantially alter the global energy mix and promote different fuel choices over traditional forms. That possibility may also have the impact of reconfiguring the global energy map, creating new regional and international commercial and strategic alliances, altering the environment, and changing the way in which the world generates, transmits, transports, and consumes its energy resources.

The emergence of new regional and international commercial and strategic alliances may similarly mark the beginning of a “new game” in the geopolitics of oil. Although the implications for IOCs and especially for U.S. oil companies are not yet fully evident, this change comes at a time when access to new opportunities is a principal driver behind most corporate plans. That coincidence presents an unwelcome complication.

Evidence of this new game may be found in the activities of the national oil companies of China and India, exploring the globe in search of equity oil. Deals are struck on a bilateral basis, often secured through the granting of considerable foreign aid to host governments. Moreover, political commitments between the representative governments, sometimes hidden, sometimes not, add a worrisome element.

China currently receives 6 percent of its oil imports from Sudan and 15 percent from Iran. It is

entirely conceivable that as a consequence of this oil dependence China could be expected to use its Security Council veto should the United States or other UN members attempt to impose oil-related sanctions on either nation.

Similarly, in Russia where it is widely believed that oil and gas development will serve as the engine for broader economic growth, President Putin appears committed to ensuring that control over those resources rests in state hands. While Russia, in the past, has declined to play politics with the export of oil and gas to the West, it is not implausible to assume that those resources may now be used in a manner that advances the country's national interests, sometimes discreetly, sometimes not.

The viability of OPEC is questioned from time to time. While cooperation is easy to achieve during times of high oil prices, declining prices have member-countries concerned over their continued ability to meet internal budgetary requirements, taking actions that serve their own national interests rather than that of OPEC as a whole.

Three factors may shape the future of OPEC. First is the conventional wisdom that oil prices have moved to a new level, above the \$22-28 target; and that, absent any precipitous drop in demand, they are likely to stay high for some time.

Second, the disappearance of OPEC spare producing capacity (currently at its lowest level in 30 years), and the unwillingness or inability of member-countries other than Saudi Arabia to expand measurably producing capacity beyond expected market requirements, supports continued oil price volatility.

Third, in the coming decade, Libya, Iran, and Iraq are expected to be in a position to substantially ramp up production volumes and consequently seek higher OPEC export quotas. If global demand is insufficient to accommodate those incremental volumes without disturbing other member quotas, how will OPEC as an institution react?

EIA forecasts global oil supply in 2025 to exceed current production by some 46 percent or over 38 mmb/d. To achieve this level, production increases are required from both OPEC and non-OPEC sources. In the near to mid-term, increases in non-OPEC volumes will likely come from Canada, Mexico, Angola, Azerbaijan and Kazakhstan. Meeting this target will also require OPEC volumes to substantially increase. While there is a high level of confidence that the region contains reserves adequate to meet these targets, the strain on resources, supporting infrastructure and political governance should not be underestimated.

In forecasting future OPEC output, considerable attention must be paid to the pace and success of expansion efforts in Iraq, Iran, and Libya – three countries in which the oil sector has largely been neglected for decades as a consequence of political upheaval, war, nationalization, and sanctions. In 1979, combined OPEC production capacity exceeded 38 mmb/d. Twenty-five years later capacity had declined to around 31 mmb/d (Figure 7). Two-thirds of that capacity loss can be traced directly to declines in those three countries. At the same time, Saudi capacity is roughly the same today as it was 25 years ago.

Figure 7

OPEC Production Capacity, 1979 – 2004 (mmb/d)			
Member Country	1979	1990	2004
Saudi Arabia	10.84	8.00	10.50
Iran	7.00	3.10	3.9
Iraq	4.00	3.60	2.6
Kuwait	3.34	2.40	2.5
UAE	2.50	2.20	2.5
Qatar	0.65	0.40	0.8
Venezuela	2.40	2.60	2.55
Nigeria	2.50	1.80	2.35
Indonesia	1.80	1.25	1.0
Libya	2.50	1.50	1.5
Algeria	1.23	0.75	1.20
Total	38.76	27.60	31.60

CSIS, PIW Estimates

The growth in oil production from non-OPEC sources has significantly contributed to the marked erosion in OPEC market share since the late 1970s, as have gains in energy efficiency. That trend may be changing. Despite the emergence of a wider variety of producer nations, including new production from Latin America, the Caspian, Australia, West Africa, and nonconventional oil from Venezuela and Canada, plus the sharp rebound in Russian oil production, future growth, especially by 2020 and beyond, is likely to be overshadowed by production gains from the resource-rich Middle East.

It is here that the question of sustained demand looms particularly large. In 2003, both OPEC⁶ and the IEA projected that the average growth in global demand for oil over the next several years would approximate 1.6 percent per year. If true, worldwide incremental demand for oil would increase by almost 10 mmb/d by 2010. At that pace, virtually all new production – from both OPEC and non-OPEC sources – would be needed to keep pace with demand.

Assuming, however, that sustained higher prices may reduce that growth to 1.1-1.2 percent annually over the same period, additional worldwide production of only about half that much would be required.⁷

Under those conditions, non-OPEC oil production, including output from Russia, the Caspian, West Africa, and others, coupled with renewed efforts in Iraq and Libya, for example, would undoubtedly produce downward price pressure on other OPEC members and OPEC as an

⁶ *Monthly Oil Market Report*, December 2003, OPEC.

⁷ Extracted data from IEA and EIA reference and low economic/high price cases.

institution (in terms of quota enforcement). This could result in a particularly difficult time for Saudi Arabia during a period in which the Kingdom is expected to face substantial challenges in terms of population growth, governance, and political succession issues - a time during which sustained high revenues generated by oil exports will likely be needed.

Major Global Oil Players

We can identify six key players in today's world oil market: Saudi Arabia, Russia and Iraq as "Givers" to the market, and the U.S, China and India as major consumers or "Takers."

Saudi Arabia

Saudi Arabia is likely to continue as world's largest oil exporter for at least the next few years, though Russia could pose a challenge in terms of gross production. Saudi Arabia is one of the few countries which possesses additional spare production capacity and is capable of expanding that capacity (at least on a temporary "surge" basis) in the near term.

Notwithstanding this enviable position, or possibly because of it, concerns surrounding Saudi output continue to abound. Terrorist threats to Saudi production and export facilities have increased upward pressure on crude oil prices and the Kingdom's aging leadership with no clear succession beyond the current Crown Prince, who is 80 years old, remain cause for concern.

In addition, the Kingdom's growing and youthful population, the tension between religious conservatives and more reform minded factions, high unemployment, and the increasing need for ever higher earnings to pay for health care, education, and infrastructure will require all the skills of the royal family to maintain social order.

Even with its then substantial oil export revenues, the Kingdom ran budget deficits until as recently as 2002. Notwithstanding current high production and prices, Saudi officials remain concerned that with the rise of Russian and Iraqi oil production and the re-emergence of Libya, in the absence of continued robust oil demand, OPEC producers and Saudi Arabia in particular could face reduced output and/or lower prices in the next several years.

Terrorism is the most public and immediate threat to the Kingdom and the royal family, not to mention the world oil market. Asset and personal security have improved over the year, in part due to collaboration and assistance from the government's foreign partners. While public support for terrorism is low and improved security may have reduced the chances of a successful attack, the threat has not been removed.

Political reform, despite its seemingly glacial pace, is also underway. The government is pursuing an announced process with specific markers, although it is not prepared to offer the ultimate democratic objectives sought by some in the West. In many ways, the U.S. declaration of bringing a wave of democracy to the Middle East may have exactly the opposite effect in terms of the pace and direction of reform in the Kingdom.

Russia

The Soviet Union entered the world market as a small net exporter in the late 1950s. During the next decade as production and export volumes grew, application was made for membership in

OPEC. That gesture, however, was rebuffed – although at OPEC’s invitation, Russia now attends the cartel’s official meetings with observer status.

Over 30 years, Soviet oil production increased from 2.3 in 1958 to more than 12 mmb/d in 1988, but export volumes remained relatively low, partly as a result of low domestic prices that encouraged wasteful consumption, and partly due to system loss. With the collapse of the oil sector in the late 1980s-early 1990s, Russian oil production declined rapidly from its 1988 peak to a low of some 6 mmb/d in 1996.⁸ This decline was unprecedented in world oil history, in that it was brought about not by developments in the market place, but rather by oilfield mismanagement and the lack of investment capital.

Following a decade of difficulty and turmoil, new investment has produced a marked increase in Russian oil output to about 9.2 mmb/d in 2004, allowing Russia to challenge Saudi Arabia as the world’s leading oil producer. Internal consumption of approximately 2.4 mmb/d limits current exports to 6.7 mmb/d.

More importantly, until the recent crackdown on Russian producers, especially the embattled company Yukos, and the reassertion of Kremlin control over energy policy, output and exports (via infrastructure), estimates for future Russian production indicated continued and substantial growth – possibly reaching as high as 12 mmb/d in 2025⁹ – assuming continued high prices and successful exploration and oilfield development in the intervening years.

Russia’s ability to continue to increase production rests on several considerations. Existing oil production, in part, reflects Soviet technology and practices. Production practices are suspect and the ability of the existing fields to sustain increased output is an open question.

The Putin government’s strategy of restoring state control if not ownership of the oil and gas producing and infrastructure sectors, including its effort to insert favored companies into existing joint ventures, reflects a restoration of greater centralized direction. Overall, there is a widespread perception in the industry that large Russian producers desire foreign partners for financial reasons but are unwilling to relinquish control or ownership. Smaller Russian companies, on the other hand, hope to attract foreign partners as they provide the only available option for growth and new capital.

These developments raise the prospect that Russian production from existing fields may be nearing a temporary peak. Without additional incentives or early development of additional prospects, the recent history of rapid increases may not be sustainable. Future increases in the export of oil and gas in large part will depend on the timely discovery and development of new deposits in Eastern Siberia and offshore, on the availability of supporting infrastructure, and on IOC involvement contributing funding, technical and managerial know-how. Moreover, and of equal importance, the investment climate must be attractive and the rule of law must be in place, and honored. Risk-averse management may look elsewhere, while other corporations may value access over what is normally viewed as acceptable risk.

⁸ “Russia Country Analysis Brief,” EIA, May 2004, www.eia.doe.gov/emeu/cabs/russia.html

⁹ Tables D5: World Oil Production Capacity by Region and Country, High Oil Price Case, 1990-2025,” *International Energy Outlook 2004*, EIA, pp. 217

Iraq

The timing and success in stabilizing Iraq may well be one of the largest wild card issues with respect to global oil supply and prices. Iraq currently holds the world's second largest proven reserves of oil (at 115 billion barrels) and most industry observers speculate that with renewed investment directed to oilfield exploration and development, plus access to advanced technology and infrastructure improvements, the country could become a major oil producer/exporter. Realizing that future, however, will require substantial improvements in infrastructure and security, rule of law, and a thorough examination of the state of the major producing reservoirs in both the north and south (soon to be undertaken as a result of recently awarded contracts to Shell and BP). In addition, while the country is saddled with significant external debt, including billions in compensation claims resulting from the invasion of Kuwait, these financial obstacles are not expected to prevent investment from going forward.

Infrastructure security is especially important. Pipelines in Iraq have been blown up over 170 times since the President Bush's declaration of the cessation of major hostilities in May 2003. These incidents disrupt oil production and export schedules and bring about considerable financial loss to the country. This week's elections, while a significant step forward in the march toward democracy and nation (re)building are not expected to bring an end to the violence and sabotage.

Other Suppliers

There are also other groups of emerging producers. Over the last ten years substantial new exploration has taken place in the Caspian region, where significant production and exports are about to become a reality. Kazakhstan and Azerbaijan possess substantial resources, but as domestic consumption is quite limited, the timely development of these resources has depended on the availability of export pipelines to move oil and natural gas to hard currency markets.

A pipeline to carry Kazakh oil to an export site on the Black Sea has been available for several years now and is key to production reaching the stated goal of 3.5 mmb/d by 2015.¹⁰ Later this year, the Baku-Tblisi-Ceyhan (BTC) export pipeline will become operational, allowing expansion of fields offshore Baku.

Libya has recently proposed terms for production sharing agreements (PSAs). While expansion plans out to 2010 are comparatively modest, the removal of sanctions in a tight global oil market has made the country more attractive to investors. Even facing difficult contract terms, companies are still anxious to re-enter Libya.

West African oil provinces, at first glance, seem well-positioned to respond to U.S. oil import needs. The relatively short, direct route across the Atlantic Ocean to East Coast ports combined with superior crude quality lead many to suggest that West African exports can help the United States reduce its dependence on Middle East oil. Investment in heavy oil processing globally, however, may change the dynamics of West African marketing. Wide spread corruption, a personalized political system, lack of reform, and the failure to equitably redistribute the

¹⁰ See official statement by Uzakbai Karabalin, President of Kazmunaigaz National Oil Company, October 2003, www.kazakhembus.com/100203.html, and *Kazakhstan Country Analysis Brief*, EIA, November 2004, www.eia.doe.gov/emeu/cabs/kazak.html.

financial benefits of oil export revenues have created conditions conducive to civil unrest that often interferes with oil production and export schedules.

Nonconventional Supplies

Nonconventional energy supplies (heavy oil and tar sands) in Canada and Venezuela hold considerable promise, but also face substantial obstacles. Development of the Canadian oil sands requires tremendous amounts of water and natural gas and is very labor intensive. Extraction is largely a mining operation and two tons of oil sands are needed to produce one barrel of oil. At present, these oil sands yield roughly 1 mmb/d.

The heavy oils of Venezuela face their own challenges. Yet given the enormity of the resource base, even in the face of the recent announcement of hefty royalty increases, investors still look favorably (albeit cautiously) on prospects for development.

Global Gas & LNG

Global gas reserves are abundant and given recognition of natural gas as an environmentally friendly fuel and the desire of resource holders to monetize their resource, it is not surprising that forecasts for gas supply and demand over the next decade are frequently described as robust.

Unfortunately, much of this gas is considered stranded as it is located in areas geographically distant from major consuming areas. In some cases, overland piping of gas is economic, but for transiting great distances, including across ocean expanses, liquefying the gas and shipping it in sea-borne tankers is becoming an increasingly attractive option. IEA projections for gas demand growth indicate that natural gas will overtake coal as the second leading energy fuel source sometime in the next decade. By 2030, more than 50 percent of all inter-regional gas trade will be comprised of LNG shipments.

In 2002, twelve countries (Algeria, Libya, Qatar, Nigeria, United Arab Emirates, Oman, Australia, Brunei, Indonesia, Malaysia, the United States, and Trinidad and Tobago) shipped some 5.4 trillion cubic feet (tcf) of gas to about the same number of countries worldwide. Supplying markets in just three countries—Japan, South Korea, and Taiwan—accounted for two-thirds of the total LNG demand. Three additional exporters (Russia, Norway, and Egypt) are constructing liquefaction facilities and at least seven additional producer/exporters (Iran, Yemen, Equatorial Guinea, Angola, Venezuela, Bolivia, and Peru) are waiting in the wings.¹¹

Unlike oil investments, however, LNG financing and project success ultimately are tied to consumer markets. Siting and permitting approvals, especially in the United States, are not guaranteed. Environmental, safety, and security concerns remain largely unanswered and policy issues surrounding the prudence of exposing the domestic electric grid to the same or similar price and supply volatility recently experienced in the oil-based transportation sector may dampen enthusiasm for needed natural gas imports, possibly to the benefit of domestic coal.

Consumer Wild Cards

The United States

¹¹ "Natural Gas," *IEO 2004*, EIA. pp. 47-74.

The role of the United States as an energy producer, consumer, and importer has already been noted in some detail. The energy future of the country seems at once very clear but very worrisome: declining domestic production and rising domestic demand, with the gap to be covered by imports from suppliers whose national interests may not and historically have not coincided with U.S. interests.

This almost inevitable growth in reliance on foreign supplies would, to the casual observer, seem to be a call to action, to define and implement policies that would concomitantly expand domestic supplies while setting demand management efforts in motion. To do so, however, requires a certain political will on the part of both the U.S. consumer and the government. And, to date, despite higher energy prices, threats of shortage, environmental damage and blackouts, that critical ingredient remains lacking.

All energy producer/exporters and consumer/importers are bound together by a mutual interdependency. All are vulnerable to any event, anywhere, at any time, that impacts on supply or demand. This means that the U.S. energy future likely will be shaped, at least in part, by events outside of its control and beyond its influence. Calls for energy independence, absent major technological breakthroughs and a national commitment, ring hollow and in the near term are both unrealistic and unachievable. In the absence of decisive political will to undertake those steps necessary to improve efficiency, promote conservation, the increased use of domestic energy resources and renewable energy forms, learning to manage the risks accompanying import dependency may be the only reasonable course of action.

Further, it should be noted that while the United States currently imports roughly 23 percent of its crude oil needs from the Persian Gulf, if total reliance also took into account the indirect imports of manufactured goods from other nations that also purchase Middle East oil, the resulting figure might be 30-40 percent higher.¹²

China

The analytical community is in almost universal agreement regarding the size and nature of Chinese energy demand growth over the next three decades. It will lead the world with growth rates substantially above the world average. All sectors of the energy producing economy are predicted to grow between 2.3 and 9 percent while generally maintaining the current share of each within the total fuel mix. Coal would retain its dominant position in this scenario.

Growth rates of this magnitude would drive world oil and, to a lesser extent, natural gas markets as imports of both are projected to increase substantially. Foreign investors and suppliers are eager to exploit this potential and Chinese officials are taking advantage of this interest.

As demonstrated by almost 30 years of economic reform and growth, Chinese decisionmakers are likely to proceed incrementally in further reforming the energy sector. The result is an existing energy sector containing a mix of market signals and government direction. For example, power stations pay close to market prices for coal but are unable to pass on the full cost to consumers.

¹² Anthony Cordesman, *Saudi Petroleum Security: Challenges & Responses*, CSIS draft, Washington, D.C., November 2004, p. 7.

China's mixed economic system complicates introducing new market related policies for a variety of reasons. Any decision may worsen existing distortions. Equally important, any decision is guaranteed to diminish the authority of those directing the system as well as those who benefit from the status quo. This latter problem may prove particularly intractable if both producers and consumers benefit from the status quo.

China's current five-year plan ends in 2005. A group of senior advisors, comprised of academics, senior statesmen, and business leaders is considering a revised energy strategy to cover the period to 2020. There are undoubtedly differences within the group over how to meet the announced goals of energy supply security, environmental protection, economic efficiency, and rural development, not to mention the implied need to maintain domestic tranquility.

Energy investors have a vested interest in any decisions made. There is for example a need to rationalize and modernize the refining sector while ensuring the delivery of product to rural or underserved areas. Similarly, there is a need to rationalize the domestic energy pricing system not just for consumers but also to effect market competition for competing energy sources.

India

India contains 16 percent of the world's population, a growing thirst for energy in support of its expanding economic growth, but only a very limited resource base to call upon. Oil use rose by a bit more than 1 million b/d during the 10-year period 1993 to 2003, but domestic oil production was able to cover just one-third of that increment. The gap could only be filled by expanding the importation of foreign oil, which now accounts for some 70 percent of the country's current oil needs. There is little reason to believe that any import relief can be secured, and the IEA places India's oil import dependence at 80 percent as early as 2010.

This high degree of dependence on foreign oil troubles the Indian government. As a consequence, the country is seeking to diversify its energy base while undertaking a broad-ranging and aggressive search for equity oil around the world. Interestingly, this search has on several occasions put India in direct competition with China. Limited opportunities worldwide confirm that this competition likely will continue.

Competition for access to oil supplies typically occurs between private companies. When governments, through national oil companies, increase their involvement in competition, both the nature of the issues and transparency regarding the terms may be sacrificed.

The natural gas resource base of India is equally limited, and for both oil and natural gas, the ever-increasing gap between domestic supply and demand will have to be covered by imports. India must look abroad for incremental supplies—production currently determines how much natural gas can be made available, and these volumes fall well short of the country's realistic needs. In this effort to search out and find acceptable sources of natural gas outside India, pollution abatement is just as much a driver as is diversity among fuels consumed.

Geopolitical Concerns

Does this new oil "map," the emergence of China as a major competitor (the number 2 importer and consumer, behind the United States), and threat of realignment and bilateral arrangements threaten traditional global supply network? Should the U.S. government be concerned if China

and Russia or China and the Middle East form diplomatic alliances and bilateral relationships? How would such action affect U.S. foreign policy options, especially regarding Sudan and Iranian sanctions? How plausible? Is the recent Saudi decision to supply China and reduce exports to the United States purely economic (given demand, crude quality and price differentials) or something more political in nature? Can a change in U.S. policy toward the Middle East peace process improve the U.S. Saudi relationship? How will the upcoming elections in Iraq affect the region?

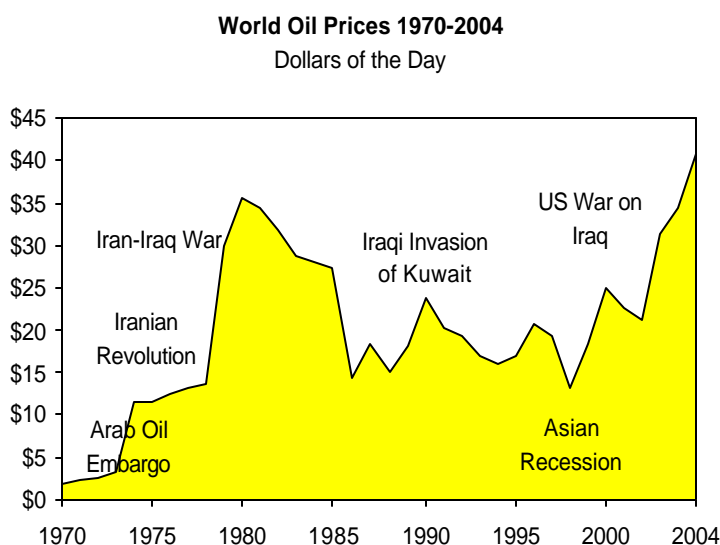
More importantly, under all forecasts, energy import dependence in Japan and China will increase. Part of this supply will come from Russia and part from Africa, but the bulk will come from the Middle East. Seeking security of supply through diversity of suppliers, in the past several months, the Chinese government has discussed commercial or diplomatic arrangements with Russia, Kazakhstan, Saudi Arabia, Iran, Venezuela, Canada and Argentina. Should this be a wake up call and cause for concern?

Price Volatility and the Current Oil Market

Crude oil prices have increased by over 60 percent since the beginning of 2004. As a consequence, the past few months have also seen near-record prices for refined petroleum products (gasoline and distillates) in the United States. While oil price volatility is seen often as a recent phenomenon, evidence over the past thirty years (Figure 8) suggests that price volatility has been the rule rather than the exception. Most of the upward price movements have been tied to oil supply disruptions and political upheaval. The 1973 spike was the result of a targeted embargo against the United States.

Conversely, when prices drop precipitously, it is usually the result of intentional or unintended oversupply. At times this has been caused by deliberate Saudi efforts to regain control of the market. Other price collapses were caused by demand reductions resulting from high prices (early 1980s) or economic recessions (Asian recession of the mid-1990s).

Figure 8



International Energy Outlook 2004, EIA

The current oil market, however, has been driven by a number of specific factors, including:

- Unexpected high demand growth in the United States and Asia, particularly in China;
- The marked absence of adequate commercial inventories (supplemental sources of supply);
- Limited spare production capacity on the part of the major producing nations;
- Uncertainty in the ability of producers to continue to deliver needed oil volumes to the market - a situation exacerbated by **actual** disruption in supply from Venezuela, Norway, Nigeria, the U.S. Gulf Coast, Iraq, and the concern over further losses from Venezuela as well as a **potential** loss of supply from Saudi Arabia and Russia; and
- The role of speculators.

A decided mismatch between the types of crude available for sale and those needed by refiners and buyers to produce consumer products has complicated the supply picture. This crude quality issue was most evident in the price spread between light sweet crudes and heavier, sour oil and in the request for light oil swaps or loans from the SPR that followed the loss of domestic production from the Gulf of Mexico as a result of Hurricane Ivan in September 2004.

Looking ahead into 2005, market fundamentals are likely to change very little. Sizable new (incremental) production is not expected until the latter half of this year at the earliest. Owing largely to the lag time between investment and output, additional production growth is not expected until 2007 and beyond. Consequently, if global demand continues to grow, albeit a bit more slowly than in 2004, partly as a result of weakened economic activity reflecting higher prices, supply/demand balances can be expected to remain tight but manageable for at least the near term. In this scenario, barring any significant and protracted loss of oil output, oil prices are likely to recede from current high levels but remain in the \$35-45/barrel range, while exhibiting continued volatility in reaction to specific events.

Alternatively, should sustained high prices result in a regional or global economic slowdown, demand reductions will have to be countered by OPEC production cuts to maintain price levels. Conversely, if prices moderate, we expect a corresponding increase in demand, continued tightness in supply availability and the prospects for substantial price increases if supply shortfalls become evident.

Increasingly, economic forecasters are projecting a reduction in U.S. and global GDP growth for 2005-06 as a result of sustained high oil prices. Regional economic impacts vary depending on the level of oil dependence of particular countries, their ability to substitute or reduce their oil consumption, and calculations based on achieved energy efficiency. At the very least, higher oil prices will have the effect of dampening the cyclical upturn in global economic activity.

Oil in the Financial Market, Inter-Regional Trade and Choke Points

There may be no clearer indicator of energy's role as a strategic commodity and the interdependency of participants in energy markets than an examination of oil's role in global trade and finances. In today's global oil market, after netting out volumes produced and consumed in the same country, somewhere on the order of 35-37 million barrels are actually transferred internationally on a daily basis. At an average price of \$45 per barrel, that adds up to slightly more than a billion and a half dollars a day. Daily U.S. crude oil imports cost more than \$450 million or over \$160 billion annually.

The transfer of wealth from the industrialized world to oil producer/exporters is without precedent. During the past 30 years OPEC's (net) export revenues have increased tenfold from under \$30 billion to almost \$340 billion (estimate for 2004). In the last ten years, oil export revenues have doubled for every OPEC member, and tripled in the case of Qatar.

More importantly, given rising global oil demand, the IEA's *World Energy Outlook 2004* projects that inter-regional trade in oil shipments will increase sharply by 2030, reaching 65 mmb/d, accounting for more than half of global oil production and roughly double current shipments. As a result of growing concentration in production and exports from the Middle East, increased tanker traffic to major consumption centers around the world will necessarily increase routing through recognized "choke points," major transport channels through which much of the world's oil (and LNG) currently flows. As these routes are highly trafficked and pose navigational challenges, they are also areas susceptible to piracy, terrorist attacks, or accidents.

EIA and IEA sources have identified six such strategic maritime choke points and several major pipeline systems. Those that affect oil and LNG tanker traffic are:

- The Straits of Hormuz, located at the mouth of the Persian Gulf, currently the world's most critical maritime oil-shipping route;
- The Straits of Malacca, located between Indonesia, Malaysia and Singapore, and the principal route for oil shipments to Asia;
- The Suez Canal, which connects the Red and Mediterranean Seas;
- The Bab el-Mandab passage, connecting the Red Sea and the Gulf of Aden;
- The Bosphorus and Turkish Straits, connecting the Mediterranean and Black Seas and a major waterborne shipping route for Caspian and Russian oil; and
- The Panama Canal.

Collectively, over 34 mmb/d of oil is shipped through these channels every day. Disruptions at any of these choke points would undoubtedly have a dramatic impact on crude deliverability and prices. More importantly, as global oil trade expands, these major arteries will become even more critical and heavily utilized. In fact, IEA projections forecast that tanker traffic through the Straits of Hormuz and Malacca and the Suez Canal alone will more than double by 2030.

Challenges for International Oil Companies (IOCs)

When confronted with the prospects of continued near-term tightness in conventional oil markets and corresponding high prices, instability in major oil producing areas, heightened sensitivity to national security concerns, the need to improve environmental conditions while continuing to offer reliable energy choices to developed and developing economies alike, IOCs are now faced with a spectrum of strategic investment choices. These include pursuing access to conventional energy resources and/or moving to develop nonconventional fuel forms, including LNG, GTL, renewables, and biofuels, in concert with traditional and emerging energy suppliers.

Since the majority of today's proven oil reserves are located in a handful of countries with access controlled by national ministries or national oil companies, the ability of the IOCs to successfully pursue access opportunities is currently severely limited. This situation is exacerbated by current

high prices as these translate to high export revenues for major producer countries and undermine the need for outside assistance. Flush with the income from higher oil prices, host country producers are less likely to require or desire the assistance of foreign oil firms, except in the instance of acquiring technology-specific aid – enhanced oil recovery efforts, for example. Higher prices and profits generally also translate into tougher commercial terms for entrants as host governments look to extract additional concessions from bidders.

Assuming that companies are denied access to conventional oil reserves in OPEC nations, IOCs are left to choose among investment options in non-OPEC countries and frontier areas (e.g., ultra deep water and the Arctic), pursue nonconventional fuel choices, focus on research related projects to develop renewable sources and/or pursue technology and demand reduction initiatives that preserve the continuity or expansion of their product line. This alternative strategy is not without risk, however, and even large IOCs are expected to experience difficulty in replacing reserves in the coming years.

Political and Other Trends

International politics and the political environment within which companies operate are also undergoing fundamental change. For companies looking to invest or trade, an issue of paramount concern is the country's governing structure and the locus of political authority. And the predominant, emerging political ideology of this century has become autonomy, with its increasing emphasis on unique identities around shared ethnic, cultural, or religious values. This new ideology poses a challenge to the old system of nationalism and the traditional nation-state. As a consequence, investors are witnessing the growing power of non-state actors and the increasing likelihood of precipitating events leading to the overthrow/overhaul of ruling regimes. In energy producing countries, the importance of the energy sector invariably means that it is almost always in play politically.

Governments facing political threat or transformation respond in varying degrees with a combination of coercion, co-option and cooperation. Some resist claims for autonomy by reasserting central control and direction – often at the expense of market efficiency. States in which political authority and economic control is shared among a small group of individuals and interests resist threats to their control most vigorously. Consequences for investors are most severe in instances where the domestic confrontation results in an abrupt and violent political transition – as occurred in the past in Iran, Iraq, Libya, and Venezuela. Under those circumstances, oil production declines dramatically, usually failing to regain its pre-crisis levels for a decade or more. Further, in most cases, private assets are taken by the state.

On the economic front, market capitalism appears to be losing ground to economic ideology. The appeal of economic efficiency and reliance on the market, which resulted in the rapid spread of domestic market reforms and global financial, trade and investment integration in the 1980s and 1990s, has stalled. For the oil sector, domestic economic reforms were welcomed as they permitted foreign investment and even some limited privatization.

Citing justifications of security, jobs, environmental concerns, economic competition and the narrow need for securing energy supplies, certain nations have slowed reforms and are beginning

to pursue more centralized ideologically- justified, interventionist economic policies, often with widespread domestic public support.

The confluence of these political and economic changes holds several major implications for energy investors. First, to the extent that IOCs continue to be denied access to those few select resource-rich nations under competitive terms comparable to those offered elsewhere, their E&P investment opportunities are likely to become more complicated, causing investors to continually rebalance their portfolio risk, including the addition of less attractive opportunities, with potentially longer payout periods. Portfolios of the future will likely include fewer commercially attractive exploration opportunities in frontier areas, workover acreage offered by nations attempting to forestall production declines by offering more attractive terms to new entrants, and possibly a few lower return but highly prospective areas.

Coupled with the difficulty in obtaining access to proprietary reserves is the emergence of significant competitors pursuing investments in the most attractive exploration and production markets. As previously discussed, the most aggressive of these new competitors is China, and to a lesser extent, India. And this raises a third challenge, namely dealing with the reemergence of security inspired, politically driven foreign investment.

Over the past few years, Chinese state companies, in particular, have aggressively gained access to prime production opportunities using their lower cost of capital and the financial and political support of the Chinese financial institutions and government. These companies tend to make uneconomic bids, use Chinese state bilateral loans and financing, and spend wildly. Chinese investors pursue market and strategic objectives, rather than commercial ones.

In strategic terms, the Chinese government has artfully exploited the reduced U.S. political standing among oil producers (and its overuse of economic sanctions) to assert its strategic interest in the Middle East. Since China is unable to project significant military forces in the Gulf, it employs economic, commercial and political means instead. It is also seeking access to higher quality crudes that better match the configuration of its refining sector.

China also offers the attractiveness of its rapidly expanding energy consuming sector to leverage suppliers and investors to accept lower returns and to provide desired technology as the price for entry to both the downstream and LNG markets. In this way, China is redefining market competition.

The consequences of the Chinese strategy are to reduce investment opportunities for commercial entities and ultimately reduce the flexibility of the global crude trading market. While the implications of this strategy have not gone unnoticed, the United States has been slow to recognize the dynamics of this potentially changing market.

Implications for U.S. Policy

Over the past 50 years, U.S. energy policy has been faithfully diverse, often internally inconsistent, amazingly flexible in adjusting to public, market and commercial pressures, and incomprehensible to most observers. It is likely to retain many of these unique elements.

The 1970s provided the last clear articulation of an attempted national energy strategy – and this was largely in response to global energy events. The 1973 Arab Oil Embargo prompted the development of the SPR, the adoption of CAFÉ (Corporate Average Fuel Efficiency) standards, and the formation of the IEA. Domestic natural gas shortages and the prospects for declining oil supplies produced the Carter Administration's decision to lift oil price regulation and pursue energy sector transformation, ushering in a new era in U.S. policy driven by the market. The combined effect of these actions has produced the following results:

- Consumers pay market prices for oil and gas and market responses are favored to adjust to price distortions and to distribute oil;
- With some narrow exceptions, economic regulation is a policy of the past;
- The United States remains the largest and most attractive import market for suppliers of all types of oil and gas, ensuring oil supply diversity and relatively robust levels of natural gas imports. A policy inclination for regional or Western hemisphere oil supplies has been largely discredited, but nonetheless remains alive; and that policy may be revived in the face of global security threats;
- Refiners have successfully responded to environmental legislation by closing inefficient refineries and investing in increased capacity to produce new products, using lower quality crude oil;
- The SPR is nearing capacity and a heating oil reserve in New England now exists;
- All administrations have been committed to the multilateral political arrangements contained in the IEA. International cooperation in oil is enshrined, if not always practiced, in the face of world market shortages; and
- On a bipartisan basis, successive administrations have supported U.S. investors negotiating contracts, particularly in non-OPEC countries and with natural gas producers.

In short, economics has prevailed over the past 25 years. Oil prices have remained relatively low and U.S. energy efficiency has increased. However, changing market and political conditions may complicate America's policy agenda going forward, and these include:

- Energy security, broadly defined in terms of attacks on infrastructure, and greater vulnerability to imported oil supply threats, either physical or financial, due to growing production concentration;
- Market developments, particularly in alternative fuels and with respect to climate change. In the future, markets may drive policy more than policy drives markets;
- Less multilateral cooperation in the international oil trading and investment market places as governments pursue specific narrow interests;
- Increased vulnerability to supply disruptions due to growing natural gas import dependence in the power sector; and
- Political hostility to U.S. policy in specific regions as allies and friends abandon the United States to ensure their own political survival.

It is against this backdrop that future U.S. energy and security policies must be fashioned. But that is likely the topic for another day. Thank you.