

U.S. ENERGY AND MINERAL NEEDS, SECURITY AND POLICY

OVERSIGHT HEARING

BEFORE THE

SUBCOMMITTEE ON ENERGY AND
MINERAL RESOURCES

OF THE

COMMITTEE ON RESOURCES
U.S. HOUSE OF REPRESENTATIVES

ONE HUNDRED NINTH CONGRESS

FIRST SESSION

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**OVERSIGHT HEARING ON “U.S. ENERGY AND
MINERAL NEEDS, SECURITY AND POLICY:
IMPACTS OF SUSTAINED INCREASES IN
GLOBAL ENERGY AND MINERAL CONSUMP-
TION BY EMERGING ECONOMIES SUCH AS
CHINA AND INDIA.”**

**Wednesday, March 16, 2005
U.S. House of Representatives
Subcommittee on Energy and Mineral Resources
Committee on Resources
Washington, D.C.**

The Subcommittee met, pursuant to call, at 10:00 a.m., in Room 1324, Longworth House Office Building, Hon. Jim Gibbons, Chairman of the Subcommittee] presiding.

Present: Representatives Gibbons, Peterson, Pombo (ex officio), Grijalva, Faleomavaega, and Costa.

**STATEMENT OF THE HON. JIM GIBBONS, A REPRESENTATIVE
IN CONGRESS FROM THE STATE OF NEVADA**

Mr. GIBBONS. Good morning. The Subcommittee on Energy and Mineral Resources will come to order. The Subcommittee today is going to hear testimony on U.S. energy and mineral needs, security and policy: impacts of sustained increases in global energy and mineral consumption in emerging economies such as China and India. Under Committee Rule 4(g), the Chairman and Ranking Minority Member can have opening statements. And any Member other than that who wishes to make a statement can have it included in the record under unanimous consent.

Let me begin with my remarks this morning before we start.

First of all, I want to welcome all of our witnesses today. It is a pleasure to have you here before us. We may be interrupted by a series of votes, which are usually something we have to deal with. That is what you hired us to come here to do is to vote on the Floor. So we will try to do it as expeditiously as possible and make sure the impact on your presence and the time you have to spend here is minimal.

But the Subcommittee today meets to hear testimony on global energy and mineral transactions and the potential impacts on U.S. energy and mineral needs and the impact on security and policy as well. My opening remarks are not laden with a bunch of statistics,

because I am certain that our witnesses who are here with us today will have that aspect of this debate fully covered. My intent is to set the tone of this important oversight hearing and encourage an open discussion on the future of U.S. energy and mineral policies in light of sustained increases in resource demand by emerging economies such as China and India.

This hearing should not be viewed as an attempt to do China or India-bashing. These countries simply are learning that economic success is directly linked to energy consumption. It just so happens that economic growth in these countries is not only outpacing the rest of the world, but is also exceeding their own growth expectations. Last Friday, for example, the International Energy Agency, IEA, revised upward by 25 percent China's demand for oil for the year 2005. And in order to sustain this economic growth, emerging economies such as China and India will need more and more supplies of energy and minerals. This is an issue which has garnered a great deal of attention in the mainstream media. And I would demonstrate to the audience, this package here, what I am holding in my hand, is a small sample of recent media coverage given to this meteoric economic growth, and thus the energy and mineral consumption in India and China is at issue today.

Many of these articles that I have just pointed to, along with information from numerous reports covering a range of issues and topics related to U.S. energy and mineral security, can now be found on our Subcommittee's website. I encourage my colleagues and their staffs to utilize this information in going forward in reviewing our domestic energy and mineral strategy for the future.

So where does this fit into the U.S. and to the U.S. picture? Well, the U.S. has been at the top of the food chain for most of recent history. One of the major reasons we are in the U.S. and have been so successful is that we recognized early that the foundation for economic growth is built with energy and minerals, but continued success tends to foster apathy and disinterest in that which has created this success and the U.S. is no exception to that rule. Our domestic energy and mineral policies have languished over the years driving investment overseas, increasing our reliance on foreign sources of energy and mineral resources. Last year, the U.S. imported more than 63 percent of its oil, placing our energy needs increasingly at the mercy of foreign governments. Yet, we continue the cycle of tolerating irresponsible energy and mineral policies and thereby continuing to discourage investment in domestic energy and mineral production and subsequently becoming more dependent on foreign sources.

Yesterday, crude oil prices closed at \$54.85 a barrel. Natural gas closed at \$7.16 per million BTU. The U.S. trade deficit in energy is more than 25 percent of our total balance of payment and continues to increase at a rapid rate. The U.S. must take a serious look at its energy and mineral supply strategy for the long-term. And we must start by enacting a comprehensive national energy policy that encourages diversity of fuel use, increases domestic production and self-sufficiency.

I welcome our witnesses, as I said earlier. I look forward to their testimony. But before I turn to our witnesses, I would like to turn

to our Ranking Member, Mr. Grijalva. And I would like to welcome him at this time for any remarks he may have.

[The prepared statement of Mr. Gibbons follows:]

**Statement of The Honorable Jim Gibbons, Chairman,
Subcommittee on Energy and Mineral Resources**

The Subcommittee meets today to hear testimony on global energy and mineral trends and their potential impacts on U.S. energy and mineral needs, security and policy. My opening remarks are not laden with endless statistics because I'm certain our witnesses who are in the "statistics business" will have that aspect of this debate fully covered. Rather, my intent is to set the tone of this important oversight hearing and encourage an open discussion on the future of U.S. energy and mineral policies in light of sustained increases in resource demands by emerging economies such as China and India. This hearing should not be viewed as an attempt to do China or India-bashing. These countries simply are learning that economic success is directly linked to energy consumption. And it just so happens that economic growth in these countries is not only outpacing the rest of the world, but is also exceeding their own growth expectations.

Last Friday, for example, the International Energy Agency (IEA) revised upward by 25 percent its estimates of China's demand for oil for the year 2005. And in order to sustain this economic growth, emerging economies such as China and India will need more and more supplies of energy and minerals. This is an issue that has garnered a great deal of attention in the mainstream media. I hold in my hand a small sampling of the recent media coverage given to the meteoric economic growth—and thus energy and minerals consumption—in China and India. Many of these articles, along with information from numerous reports covering a range of issues and topics related to U.S. energy and mineral security can now be found on our Subcommittee website. I encourage my colleagues and their staffs to utilize this information as we go forward in reviewing our domestic energy and minerals strategy for the future.

So, where does the U.S. fit into this picture? The U.S. has been at the top of the food chain for most of recent history. One of the major reasons we in the U.S. have been so successful is that we recognized early-on that the foundation for economic growth is built with energy and minerals. But continued success tends to foster apathy and disinterest in that which has created the success, and the U.S. is no exception.

Our domestic energy and minerals policies have languished over the years, driving investment overseas and increasing our reliance on foreign sources of energy and mineral resources. Last year, the U.S. imported more than 63% of its oil, placing our energy needs increasingly at the mercy of foreign governments. Yet we continue the cycle of tolerating irresponsible energy and mineral policies, thereby continuing to discourage investment in domestic energy and mineral production, and subsequently becoming more dependent on foreign sources. Yesterday, crude oil prices closed at \$54.85 per barrel. Natural gas closed at \$7.16 per million Btu. U.S. trade deficit in energy is more than 25 percent of our total balance of payments, and continues to increase at a rapid rate. The U.S. must take a serious look at its energy and mineral supply strategy for the long-term. We must start by enacting a comprehensive national energy policy that encourages diversity of fuel use, increased domestic production, and self-sufficiency.

I welcome our witnesses today and look forward to their testimony. Before turning to our Ranking member I would like to welcome my friend and Full Committee Chairman from California, Mr. Pombo, and recognize him for any opening remarks he may wish to give at this time.

**STATEMENT OF THE HON. RAUL GRIJALVA, A REPRESENTATIVE
IN CONGRESS FROM THE STATE OF ARIZONA**

Mr. GRIJALVA. Thank you very much, Chairman Gibbons, and I join you in welcoming our guests and look forward to the information in the hearing. Global energy supply and demand are becoming an increasingly important issue with the potential to adversely affect the United States as global demand for energy increases particularly in the emerging powerhouse economies of China and India. While a number of supply side and supply chain factors have contributed to the situation, the most significant long-term factor

contributing to rising oil prices is an increase in Asian demand, most notably from China. China's unprecedented growth not only makes it a driver of long-term increase in energy prices, but also the most vulnerable to rising oil prices.

In the United States, a key domestic fossil fuel that we have become so dependent on—oil—is diminishing, though our appetite for it continues to grow. We have only 3 percent of the world's oil reserves, yet we consume 25 percent of the world's yearly supply. While we have known for years that conservation, energy efficiencies, alternative energy technologies are feasible and available, the U.S. has remained an economy overwhelmingly dependent on fossil fuels. As a Nation, we have resisted options to raise fuel mileage standards or to increase renewable portfolio standards, but instead harp on the need to open protected areas to new oil and gas development. Overseas, emerging countries such as China and India, appear to be less resistant to new options. For example, China and its Asian neighbors are responding to high global oil prices by accelerating their search for alternative power sources and encouraging energy conservation. Speaking at the annual Asian power conference in Singapore two weeks ago, Asian energy officials said their governments are increasingly diversifying their fuel mix to cut dependence on imported oil by developing other power sources such as natural gas, geothermal, hydro, liquefied, hydro liquefied natural gas and renewable fuels.

In closing, let me say as we prepare to consider national energy legislation when we return from the Easter recess, we must recognize that there is no single solution to meeting the Nation's energy needs. We cannot simply drill our way out of high oil and gas prices nor can we drill our way to energy security. Ultimately, we as policymakers must develop a national energy plan that takes full advantage of both conventional and unconventional resources and encourages energy efficiency and new technologies. Thank you, Mr. Chairman.

[The prepared statement of Mr. Grijalva follows:]

**Statement of The Honorable Raul M. Grijalva, Ranking Democrat,
Subcommittee on Energy and Mineral Resources**

Thank you, Chairman Gibbons. I join you in welcoming our distinguished guests and look forward to an enlightening and informative hearing.

Global energy supply and demand are becoming an increasingly important issue with the potential to adversely affect the United States as global demand for energy increases, particularly in the emerging powerhouse economies of China and India.

As reported this month in *The Asian Times*, "A notable feature of 2004 was the volatility in oil prices—New York light sweet crude prices reached a peak of US\$55.67 on October 25, ending the year up 33.6% at \$43.45 per barrel. While a number of supply-side and supply-chain factors have contributed to this situation, the most significant long-term factor contributing to rising oil prices is an increase in Asian demand, most notably from China. China's unprecedented growth not only makes it a driver of a long-term increase in energy prices, but also the most vulnerable to rising oil prices."

In the United States, a key domestic fossil fuel that we have become so dependent upon—oil—is diminishing, though our appetite for it continues to grow. We have only 3% of the world's oil reserves, yet we consume 25% of the world's yearly production of oil.

While we have known for years that conservation, energy efficiencies, alternative energy technologies are feasible and available, the U.S. has remained an economy overwhelmingly dependent on fossil fuels.

As a Nation, we have resisted options to raise fuel mileage standards or to increase renewable portfolio standards, and instead harp on the need to open

protected areas to new oil and gas development. Overseas, emerging countries, such as China and India, appear to be less resistant to new options.

For example, China and its Asian neighbors are responding to high global oil prices by accelerating their search for alternative power sources and encouraging energy conservation. Speaking at the annual Asia Power Conference in Singapore 2 weeks ago, Asian energy officials said that their governments are increasingly diversifying their "fuel mix" to cut dependence on imported oil by developing other power sources such as natural gas, geothermal, hydro, liquefied natural gas and renewable fuels.

In closing, let me say that as we prepare to consider national energy legislation when we return from the Easter recess, we must recognize that there is no single solution to meeting the Nation's energy needs. We cannot simply drill our way out high oil and gas prices. Nor can we drill our way to energy security. Ultimately, we, as policymakers, must develop a national energy plan that takes full advantage of both conventional and unconventional resources and encourages energy efficiency and new technologies.

Mr. GIBBONS. Thank you very much. I would like to welcome to the Committee, the Chairman of the full Committee, Mr. Richard Pombo of California. And if he has any remarks, he is welcome to give them. And I would like to welcome Mr. Peterson of Pennsylvania, who is very interested in the issues of energy from his home State. There are no opening remarks other than those, so with that, we will turn to our witnesses today. I will introduce them. The Honorable Guy F. Caruso, who is the administrator of the—energy information administrator. Jeffrey Logan, China program manager, International Energy Agency. Dave Menzie, chief of the international minerals section of the USGS.

Mr. GIBBONS. Gentlemen, if you would please rise and raise your right hand, we swear in our witnesses.

[Witnesses sworn.]

Mr. GIBBONS. Let the record reflect that each of the witnesses answered in the affirmative. We will begin by hearing from the honorable Guy Caruso. Mr. Caruso, welcome, the floor is yours.

**STATEMENT OF HON. GUY F. CARUSO, ADMINISTRATOR,
ENERGY INFORMATION ADMINISTRATION**

Mr. CARUSO. Thank you, Mr. Chairman. And Chairman of the full Committee, Mr. Pombo, and members of the Subcommittee. It is a pleasure to be here to present the Energy Information Administration's outlook for energy markets. As we meet this morning, global oil markets remain extremely tightly balanced. Strong economic growth and particularly the energy growth of 2004, which put upward pressure on crude oil and natural gas prices continues in 2005 and we see a very strong growth again this year led by not only China, but the other developing Asian countries, as you mentioned, India. And the United States as well continues to have strong growth, particularly in the transportation fuels. What this has done is stretched the capacity to produce, store, refine and transport oil on a global basis, nearly to the limit, which means that there is little or no cushion to deal with unexpected changes in either supply or demand so that whenever one occurs, whether it be small or large, the only pressure relief valve is prices. And what we are seeing today with nearly \$55 of WTI, West Texas Intermediate, and the high prices of natural gas is a manifestation of that tightness globally and in particularly north America.

Over the long run, IEA does a long-term forecast based on existing policies and rules and regulations. And what it means is if we keep on the path we are on, we are going to see very strong growth in energy demand in this country, about a third increase in our demand over the next 20 years. But our domestic supply won't keep up with that demand, which means we'll become more increasingly dependent on imports of energy, both oil and natural gas. We see our import dependency going from 27 percent in 2003 to 38 percent in 2025. But we are using energy more efficiently. It's not all a negative story. Our economic growth has been averaging about 3 percent over the last 20 years, and we see that—we project forward about that level of growth.

And our energy demand has been growing at 1.5 percent, so we are actually producing more GDP per unit of energy used, but we are becoming less flexible in dealing with this situation as we depend on oil more for transportation—about 70 percent of our oil is used in transportation. Our oil import dependency, you have several figures before you. The second one shows that oil import dependency will rise from about 57 percent on a net basis in 2003 to 68 percent in 2025. Most of that growth will be in the transportation sector, and therefore, there is little flexibility in terms of changing our demand and supply patterns with respect to transportation.

Turning to natural gas, we see that import dependency growing as well from 15 percent to 28 percent over the next 20 years because it has been the fuel of choice in the electric power sector and continues to be used heavily in the industrial sector. Our domestic supplies will not keep up with that demand, therefore we see imports from Canada and more particularly from LNG, liquefied natural gas, growing very sharply to over 6 trillion cubic feet by 2025. So we will become dependent not only on oil imports from foreign sources but as well, natural gas from outside of North America.

On a global basis, world economic energy growth will increase by more than 50 percent over the next 20 years and that will be led by growth in developing countries. China and India will grow very fast, not only for oil, but natural gas. And coal will dominate in the electric power sector, which has implications of course for greenhouse gases. We expect about 120 million barrels of day of oil demand by 2025. And we believe the resources are adequate to meet that kind of demand.

Nevertheless, it will represent a significant investment challenge for our international oil companies, national oil companies. And as we have seen, political instability often inhibits the proper path of investment in many of these countries in the upstream.

So in conclusion, the economic growth in populous countries of the world such as China, India and the United States will certainly increase energy demand sharply. Fossil fuels will remain a dominant source of energy. And the dependence on foreign sources of oil will increase significantly for not only the United States, but particularly those countries in developing Asia. Mr. Chairman, thank you very much again for this opportunity to present the IEA's outlook.

[Charts used in Mr. Caruso's oral presentation follow:]

Figure 1. U.S. Energy Production, Consumption, and Net Imports, 1960-2025 (quadrillion Btu)

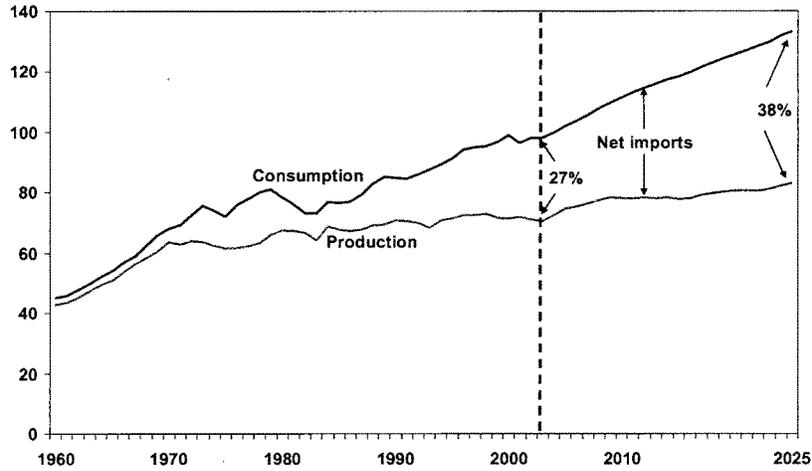


Figure 2. U.S. Petroleum Supply, Consumption, and Imports, 1970-2025 (million barrels per day)

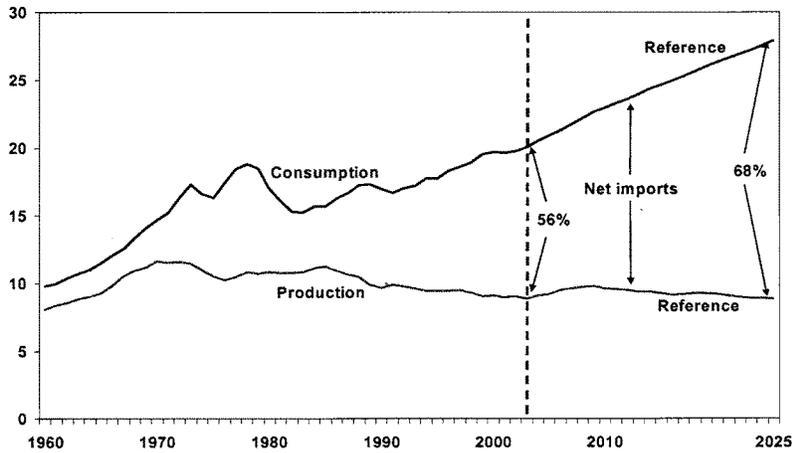


Figure 3. U.S. Natural Gas Production, Consumption, and Net Imports, 1970-2025 (trillion cubic feet)

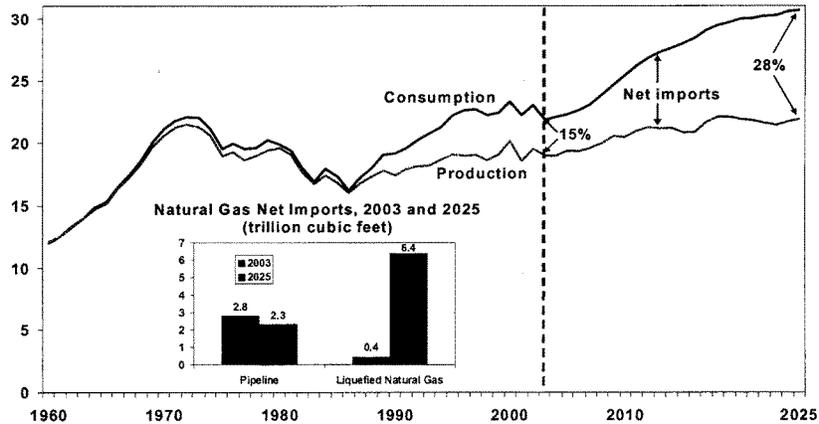
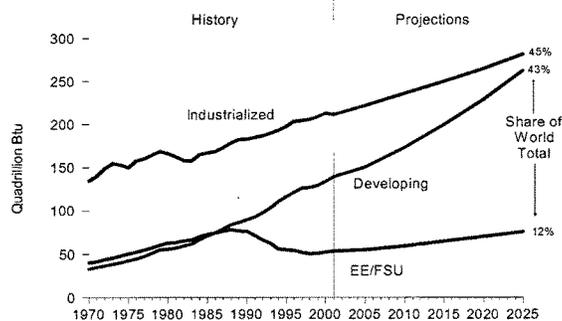


Figure 4. World Marketed Energy Consumption by Region, 1970-2025



[The prepared statement of Mr. Caruso follows:]

Statement of Guy Caruso, Administrator, Energy Information Administration, U.S. Department of Energy

Mr. Chairman and Members of the Committee:

I appreciate the opportunity to appear before you today to discuss the impact of increases in global energy demand on U.S. energy needs, security, and policy, particularly the impact of sustained increases in emerging economies such as China and India.

The Energy Information Administration (EIA) is an independent statistical and analytical agency within the Department of Energy. We are charged with providing objective, timely, and relevant data, analysis, and projections for the use of Congress, the Administration, and the public. We do not take positions on policy issues, but we do produce data, analysis, and forecasts that are meant to assist policy makers in their energy policy deliberations. Because we have an element of statutory independence with respect to the analyses, our views are strictly those of EIA and should not be construed as representing those of the Department of Energy or the

Administration. However, EIA's baseline projections on energy trends are widely used by government agencies, the private sector, and academia for their own energy analyses.

The Annual Energy Outlook provides projections and analysis of domestic energy consumption, supply, prices, and energy-related carbon dioxide emissions through 2025. Annual Energy Outlook 2005 (AEO2005) is based on Federal and State laws and regulations in effect on October 31, 2004. The potential impacts of pending or proposed legislation, regulations, and standards—or of sections of legislation that have been enacted but that require funds or implementing regulations that have not been provided or specified—are not reflected in the projections.

The U.S. projections in this testimony are based on the AEO2005, which was released on the EIA website on February 11, 2005. In addition to the long-term U.S. forecast of energy markets, EIA also prepares a long-term outlook for world energy markets, which is published annually in the International Energy Outlook (IEO). The latest edition of this report, the IEO2004, was published in April 2004. The projections in the AEO2005 and the IEO2004 are not meant to be exact predictions of the future but represent likely energy futures, given technological and demographic trends, current laws and regulations, and consumer behavior as derived from known data. EIA recognizes that projections of energy markets are highly uncertain and subject to many random events that cannot be foreseen such as weather, political disruptions, and technological breakthroughs. In addition to these phenomena, long-term trends in technology development, demographics, economic growth, and energy resources may evolve along a different path than expected in the projections. Both the AEO2005 and the IEO2004 include a large number of alternative cases intended to examine these uncertainties. The AEO2005 and IEO2004 provide integrated projections of U.S. and world energy market trends for roughly the next two decades. The following discussion briefly summarizes the highlights from AEO2005 for U.S. energy demand and supply. It is followed by a discussion of the key trends in world energy markets projected in the IEO2004, with a focus on China and India.

U.S. Energy Outlook

U.S. Energy Prices

In the AEO2005 reference case, the annual average world oil price¹ increases from \$27.73 per barrel (2003 dollars) in 2003 (\$4.64 per million Btu) to \$35.00 per barrel in 2004 (\$5.86 per million Btu) and then declines to \$25.00 per barrel in 2010 (\$4.18 per million Btu) as new supplies enter the market. It then rises slowly to \$30.31 per barrel in 2025 (\$5.07 per million Btu) (Figure 1). In nominal dollars, the average world oil price is about \$52 per barrel in 2025 (\$8.70 per million Btu).

There is a great deal of uncertainty about the size and availability of crude oil resources, particularly conventional resources, the adequacy of investment capital, and geopolitical trends. For example, the AEO2005 reference case assumes that world crude oil prices will decline as growth in consumption slows and producers increase their productive capacity and output in response to current high prices; however, the October 2004 oil futures prices case for West Texas Intermediate crude oil (WTI) on the New York Mercantile Exchange (NYMEX) implies that the average annual oil price in 2005 will exceed its 2004 level before declining to levels that still would be above those projected in the reference case. While not discussed here, the AEO2005 includes other cases based on alternative world crude oil price paths to evaluate this uncertainty.

In the AEO2005, average wellhead prices for natural gas in the United States are projected to decrease from \$4.98 per thousand cubic feet (2003 dollars) in 2003 (\$4.84 per million Btu) to \$3.64 per thousand cubic feet in 2010 (\$3.54 per million Btu) as the availability of new import sources and increased drilling expand available supply. After 2010, wellhead prices are projected to increase gradually, reaching \$4.79 per thousand cubic feet in 2025 (\$4.67 per million Btu) (about \$8.20 per thousand cubic feet or \$7.95 per million Btu in nominal dollars). Growth in liquefied natural gas (LNG) imports, Alaska production, and lower-48 production from non-conventional sources is not expected to increase sufficiently to offset the impacts of resource depletion and increased demand in the lower-48 States.

¹World oil prices in AEO2005 are defined based on the average refiner acquisition cost of imported oil to the United States (IRAC). The IRAC price tends to be a few dollars less than the widely-cited West Texas Intermediate (WTI) spot price and has been as much as six dollars per barrel lower than the WTI in recent months. For the first 11 months of 2004, WTI averaged \$41.31 per barrel (\$7.12 per million Btu), while IRAC averaged \$36.94 per barrel (nominal dollars) (\$6.26 per million Btu).

In AEO2005, the combination of more moderate increases in coal production, expected improvements in mine productivity, and a continuing shift to low-cost coal from the Powder River Basin in Wyoming leads to a gradual decline in the average mine-mouth price, to approximately \$17 per ton (2003 dollars) (\$0.86 per million Btu) shortly after 2010. The price is projected to remain nearly constant between 2010 and 2020, increasing after 2020 as rising natural gas prices and the need for baseload generating capacity lead to the construction of many new coal-fired generating plants. By 2025, the average mine-mouth price is projected to be \$18.26 per ton (\$0.91 per million Btu). The AEO2005 projection is equivalent to an average mine-mouth coal price of \$31.25 per ton in nominal dollars (\$1.56 per million Btu) in 2025.

Average delivered electricity prices are projected to decline from 7.4 cents per kilowatthour (2003 dollars) (\$21.68 per million Btu) in 2003 to a low of 6.6 cents per kilowatthour (\$19.34 per million Btu) in 2011 as a result of an increasingly competitive generation market and a decline in natural gas prices. After 2011, average real electricity prices are projected to increase, reaching 7.3 cents per kilowatthour (2003 dollars) (\$21.38 per million Btu) in 2025 (equivalent to 12.5 cents per kilowatthour or \$36.61 per million Btu in nominal dollars).

U.S. Energy Consumption and Supply

Total energy consumption is projected to grow at about one-half the rate (1.4 percent per year) of gross domestic product (GDP), with the strongest growth in energy consumption for electricity generation and commercial and transportation uses (Figure 2). Total energy consumption is expected to increase more rapidly than domestic energy supply through 2025. As a result, net imports of energy are projected to meet a growing share of energy demand. Net imports are expected to constitute 38 percent of total U.S. energy consumption in 2025, up from 27 percent in 2003 (Figure 3).

Total petroleum demand is projected to grow at an average annual rate of 1.5 percent in the AEO2005 reference case forecast, from 20.0 million barrels per day in 2003 to 27.9 million barrels per day in 2025 (Figure 4) led by growth in transportation uses, which account for 67 percent of total petroleum demand in 2003, increasing to 71 percent in 2025. Improvements in the efficiency of vehicles, planes, and ships are more than offset by growth in travel. In 2025, net petroleum imports, including both crude oil and refined products (on the basis of barrels per day), are expected to account for 68 percent of demand, up from 56 percent in 2003.

In the U.S. energy markets, the transportation sector consumes about two-thirds of all petroleum products and the industrial sector about one-quarter. The remaining 10 percent is divided among the residential, commercial, and electric power sectors. With limited opportunities for fuel switching in the transportation and industrial sectors, large price-induced changes in U.S. petroleum consumption are unlikely, unless changes in petroleum prices are very large or there are significant changes in the efficiencies of petroleum-using equipment.

Total demand for natural gas is also projected to increase at an average annual rate of 1.5 percent from 2003 to 2025 (Figure 5). About 75 percent of the growth in gas demand from 2003 to 2025 results from increased use in power generation and in industrial applications. Growth in U.S. natural gas supplies will depend on unconventional domestic production, natural gas from Alaska, and imports of LNG. Total nonassociated unconventional natural gas production is projected to grow from 6.6 trillion cubic feet in 2003 to 8.6 trillion cubic feet in 2025. With completion of an Alaskan natural gas pipeline projected for 2016, total Alaskan production is forecast to increase from 0.4 trillion cubic feet in 2003 to 2.2 trillion cubic feet in 2025. Total net LNG imports in the United States and the Bahamas are projected to increase from 0.4 trillion cubic feet in 2003 to 6.4 trillion cubic feet in 2025.

Total coal consumption is projected to increase from 1,095 million short tons in 2003 to 1,508 million short tons in 2025, growing by 1.5 percent per year. About 90 percent of the coal is currently used for electricity generation. Coal remains the primary fuel for generation and its share of generation is expected to remain about 50 percent between 2003 and 2025. Total coal consumption for electricity generation is projected to increase by an average of 1.6 percent per year, from 1,004 million short tons in 2003 to 1,425 million short tons in 2025.

Total electricity consumption, including both purchases from electric power producers and on-site generation, is projected to grow from 3,657 billion kilowatthours in 2003 to 5,467 billion kilowatthours in 2025, increasing at an average rate of 1.8 percent per year. Rapid growth in electricity use for computers, office equipment, and a variety of electrical appliances in the end-use sectors is partially offset in the AEO2005 forecast by improved efficiency in these and other, more traditional

electrical applications and by slower growth in electricity demand in the industrial sector.

Total marketed renewable fuel consumption, including ethanol for gasoline blending, is projected to grow by 1.5 percent per year in AEO2005, from 6.1 quadrillion Btu in 2003 to 8.5 quadrillion Btu in 2025, largely as a result of State mandates for renewable electricity generation and the effect of production tax credits. About 60 percent of the projected demand for renewables in 2025 is for grid-related electricity generation (including combined heat and power), and the rest is for dispersed heating and cooling, industrial uses, and fuel blending.

International Energy Outlook

The IEO2004 includes projections of regional energy consumption, energy consumption by primary fuel, electricity consumption, carbon dioxide emissions, nuclear generating capacity, and international coal trade flows. World oil production and natural gas production forecasts are also included in the report. The IEO2004 projects strong growth for worldwide energy demand through 2025. Total world consumption of marketed energy is expected to increase by 54 percent, from 404 quadrillion Btu in 2001 to 623 quadrillion Btu in 2025.

World Energy Consumption by Region

The IEO2004 reference case outlook shows the strongest growth in energy consumption in the developing nations of the world (Figure 6). The fastest growth is projected for the nations of developing Asia, including China and India, where robust economic growth accompanies the increase in energy consumption over the forecast period. GDP in developing Asia is expected to grow at an average annual rate of 5.1 percent, compared with 3.0 percent per year for the world as a whole. With such strong growth in GDP, demand for energy in developing Asia is projected to double over the forecast period, accounting for 40 percent of the total projected increment in world energy consumption and 70 percent of the increment for the developing world alone. Energy demand increases by 3.0 percent per year in developing Asia as a whole and by 3.5 percent per year in China and 3.2 percent per year in India.

Developing world energy demand is projected to rise strongly outside of Asia, as well. In the Middle East, energy use increases by an average of 2.1 percent per year between 2001 and 2025, 2.3 percent per year in Africa, and 2.4 percent per year in Central and South America.

In contrast to the developing world, slower growth in energy demand is projected for the industrialized world, averaging 1.2 percent per year over the forecast period. Generally, the nations of the industrialized world can be characterized as mature energy consumers with comparatively slow population growth. Gains in energy efficiency and movement away from energy-intensive manufacturing to service industries result in the lower growth in energy consumption. In the transitional economies of Eastern Europe and the former Soviet Union (EE/FSU) energy demand is projected to grow by 1.5 percent per year in the IEO2004 reference case. Slow or declining population growth in this region, combined with strong projected gains in energy efficiency as old, inefficient equipment is replaced, leads to the projection of more modest growth in energy use than in the developing world.

World Energy Consumption by Energy Source

Oil will continue to be the world's dominant energy source. Oil's share of world energy remains unchanged at 39 percent over the forecast period. China, India, and the other countries of developing Asia account for much of the increase in oil use in the developing world and, indeed, in the world as a whole (Figure 7). Developing Asia oil consumption is expected to grow from 14.8 million barrels per day in 2001 to 31.6 million barrels per day in 2025, an increase of 16.9 million barrels per day. The developing Asian increase in oil use accounts for 39 percent of the total world increment in oil use over the forecast period. China and India alone account for one-fourth of the world oil increment between 2001 and 2025. In the industrialized world, increases in oil use are projected primarily in the transportation sector. In the developing world, demand for oil increases for all end uses, as countries replace non-marketed fuels used for home heating and cooking with diesel generators and for industrial petroleum feedstocks.

The IEO2004 reference case shows supply able to keep up with demand over the next 20 years, with world oil consumption in the range of 120 million barrels per day by 2025. EIA's view, which is based on information from the latest United States Geological Survey (USGS) World Petroleum Assessment on oil resources and reserves, is that potential supply concerns to 2025 arise primarily from obstacles to investment in capacity growth rather than resource adequacy. Our view in this

regard is shared by many analysts, but differs from some analysts who are concerned about an imminent “peak oil” problem. In EIA’s view, the ultimate size of an oil field is rarely known when it is discovered. Rather, with drilling and improved technology, the full extent of the recoverable resource typically increases over time. This process is demonstrated at the national level by the increase in U.S. proved reserves of oil in 5 of the last 7 years notwithstanding significant production and limited discoveries. Global proved reserves are also higher today than they were 30 years ago, despite substantially increased production.

While we believe that sufficient oil resources are available to meet the projected growth in demand to 2025, substantial investment will be required to bring these resources into production. Although the IEO2004 reference case forecast assumes that the necessary investments will be made based on economic criteria, there are several important barriers to investment that could impede realization of this scenario. Some of the main challenges are: 1) international major producers lack access to resources in some key countries; 2) national oil companies are guided by governments and are not always motivated to expand capacity based on economic criteria; 3) political instability limits development in some regions; and 4) poor economic terms that slow investment.

Natural gas demand is projected to show an average annual growth of 2.2 percent over the forecast period. Gas is seen as a desirable option for electricity, given its efficiency relative to other energy sources and the fact that it burns more cleanly than either coal or oil. The most robust growth in gas demand is expected among the nations of the developing world, where overall demand is expected to grow by 2.9 percent per year from 2001 to 2025 in the reference case (Figure 8). In the industrialized world, where natural gas markets are more mature, consumption of natural gas is expected to increase by an average of 1.8 percent per year over that same time period, with the largest increment projected for North America at 12.9 trillion cubic feet. China, India, and the other nations of developing Asia are expected to experience among the fastest growth in gas use worldwide, increasing by 3.5 percent per year between 2001 and 2025.

Coal remains an important fuel in the world’s electricity markets and is expected to continue to dominate fuel markets in developing Asia. Worldwide, coal use is expected to grow slowly, averaging 1.5 percent per year between 2001 and 2025. In the developing world, coal increases by 2.5 percent per year and will surpass coal use in the rest of the world (the industrialized world and the EE/FSU combined) by 2015. Coal continues to dominate energy markets in China and India, owing to those countries’ large coal reserves and limited access to other sources of energy. China and India account for 67 percent of the total expected increase in coal use worldwide (on a Btu basis) (Figure 9). Coal use is projected to increase in all regions of the world except for Western Europe and the EE/FSU (excluding Russia), where coal is projected to be displaced by natural gas and, in the case of France, by nuclear power for electric power generation.

The largest increase in nuclear generation is expected for the developing world, where consumption of electricity from nuclear power is projected to increase by 4.1 percent per year between 2001 and 2025. Developing Asia, in particular, is expected to see the largest increment in installed nuclear generating capacity over the forecast, accounting for 96 percent of the total increase in nuclear power capacity for the developing world as a whole. Of the 44 gigawatts of additional installed nuclear generating capacity projected for developing Asia, 19 gigawatts are projected for China, 15 for South Korea, and 6 for India.

Consumption of electricity from hydropower and other renewable energy sources is expected to grow by 1.9 percent per year over the projection period. Much of the growth in renewable energy use is expected to result from large-scale hydroelectric power facilities in the developing world, particularly among the nations of developing Asia. China, India, and other developing Asian countries are constructing or planning many new, large-scale hydroelectric projects over the forecast period, including China’s 18.2-gigawatt Three Gorges Dam project which is scheduled to be fully operational by 2009. The Indian government has plans to add 50 gigawatts of hydroelectric generating capacity by 2012.

Alternative International Forecasts

As noted earlier, there is considerable uncertainty associated with any long-term forecast. Changes in key assumptions about economic growth and energy intensity lead to substantial differences in the projections for 2025. To quantify this uncertainty, IEO2004 includes high and low economic growth cases. The IEO2004 reference case shows total world energy consumption reaching 623 quadrillion Btu in 2025, but this varies substantially under different assumptions about economic growth, ranging from 542 quadrillion Btu (in the low economic growth case) to 710

quadrillion Btu (in the high economic growth case). Thus, there is a substantial range of 168 quadrillion Btu, or about one-fourth of the total consumption projected for 2025 in the reference case, between the projections in the high and low economic growth cases.

While it is true that there is a great deal of uncertainty in long-term forecasts, it is equally true that EIA's forecast of worldwide energy use is largely in agreement with projections from other organizations that provide comparable forecasts. The International Energy Agency's (IEA) World Energy Outlook 2004 (October 2004), Petroleum Economics, Ltd's (PEL) World Long Term Oil and Energy Outlook (March 2004), and PIRA Energy Group's (PIRA) Retainer Client Seminar (October 2004) all produce forecasts that are comparable to the IEO2004. Three of the four forecasts expect worldwide energy use to expand by about 1.8 to 1.9 percent per year (IEO2004, IEA, and PEL) between 2000 and 2020 (Figure 10). PIRA proffers a more robust forecast, expecting energy use to expand by 2.4 percent per year, but the PIRA forecast only extends to 2015.

The forecasts show some variation in expectations for the world's future fuel mix. The forecasts do have similar expectations about the growth of oil over the 2000 to 2020 time period (except for PIRA, which forecasts only to 2015), projecting average annual increases of between 1.6 percent (PEL) and 1.9 percent (PIRA). They also generally agree that natural gas will be among the fastest growing energy sources in the forecast, although the increase in world natural gas demand in the IEO2004 at 2.1 percent per year is somewhat lower than the other forecasts, where the growth in natural gas use ranges from 2.6 percent per year to 2.8 percent per year. However, the PIRA forecast sees a much higher increase in coal use than do any of the other forecasts. IEO2004 expects higher growth for nuclear power than the other forecasts, and the IEA projects higher expected growth in renewables than the other forecasts.

Conclusion

Continuing economic growth in populous countries of the world, such as China, India, and the United States, is expected to stimulate more energy demand, with fossil fuels remaining the dominant source of energy. While our analysis suggests that world fossil energy resources are adequate to meet demand requirements, it also suggests that the countries accounting for most of the growth in fossil energy consumption will increasingly rely on imports. Dependence on foreign sources of oil is expected to increase significantly for China, India, and the United States. These three countries alone account for 45 percent of the world increase in projected oil demand over the 2001 to 2025 time frame. A key source of this oil is expected to be the Middle East.

Furthermore, although natural gas production is expected to increase in all of these countries, natural gas imports are expected to grow faster. In 2001, India and China produced sufficient natural gas to meet domestic demand, but, by 2025, natural gas production in these two countries will only account for about 60 percent of demand. In the United States, reliance on domestic gas supply to meet demand falls from 86 percent to 72 percent over the projection period. The growing dependence on imports in these three countries occurs despite efficiency improvements in both the consumption and the production of natural gas.

In this environment, the level of energy prices, particularly oil prices, is highly uncertain. It depends on the adequacy of investment in exploration and production efforts, technology, and infrastructure. It also depends on the actual rate of growth in demand, political stability around the world, and improvement in end-use technologies. Higher energy price trends can lead to major changes in the energy supply slate and, if energy prices are high enough, the level of demand. For example, in a high oil price case completed as part of AEO2005, gas-to-liquids and coal-to-liquids became important parts of total U.S. energy supply by 2025. Unconventional oil and natural gas resources can also play a much larger role.

This concludes my testimony, Mr. Chairman and members of the Committee. I will be happy to answer any questions you may have.

Figure 1. U.S. Energy Prices, 1970-2025

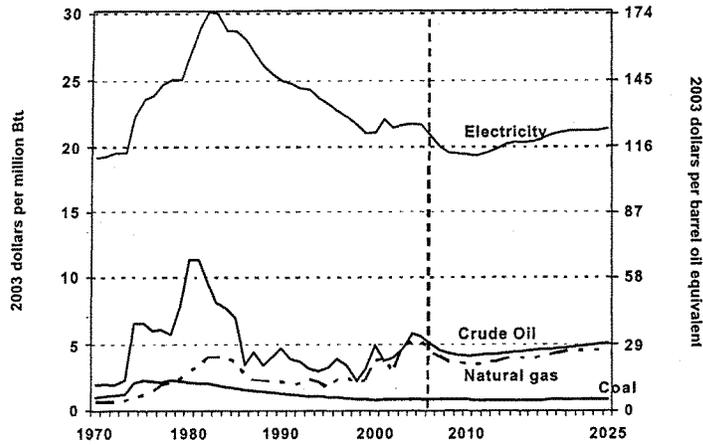


Figure 2. U.S. Delivered Energy Consumption by Sector, 2003 and 2025 (quadrillion Btu)

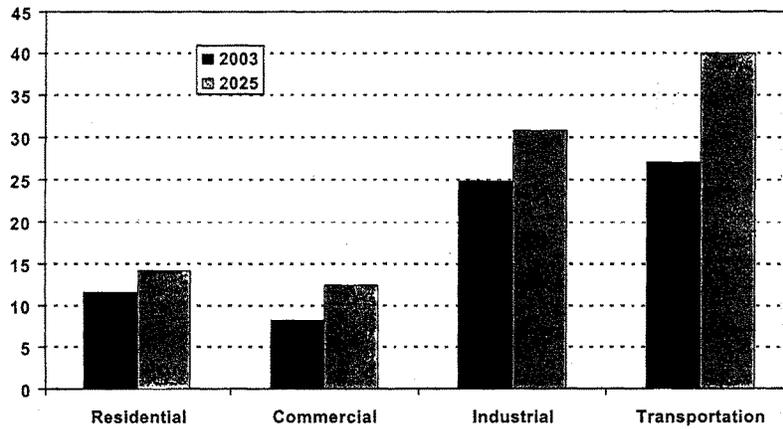


Figure 3. U.S. Energy Production, Consumption, and Net Imports, 1960-2025 (quadrillion Btu)

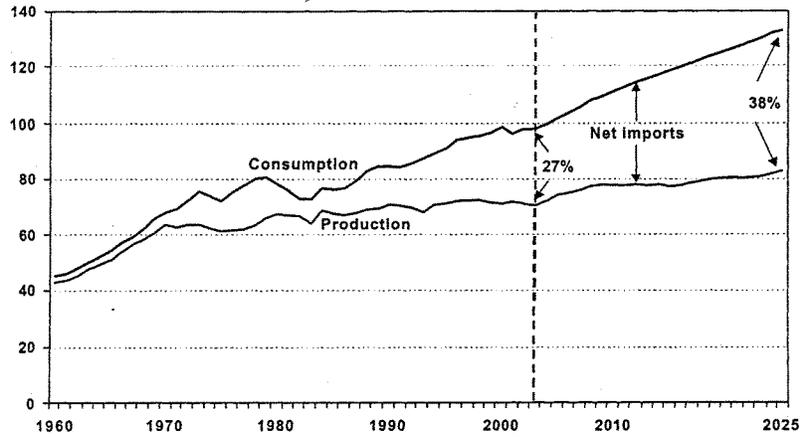


Figure 4. U.S. Petroleum Supply, Consumption, and Imports, 1970-2025 (million barrels per day)

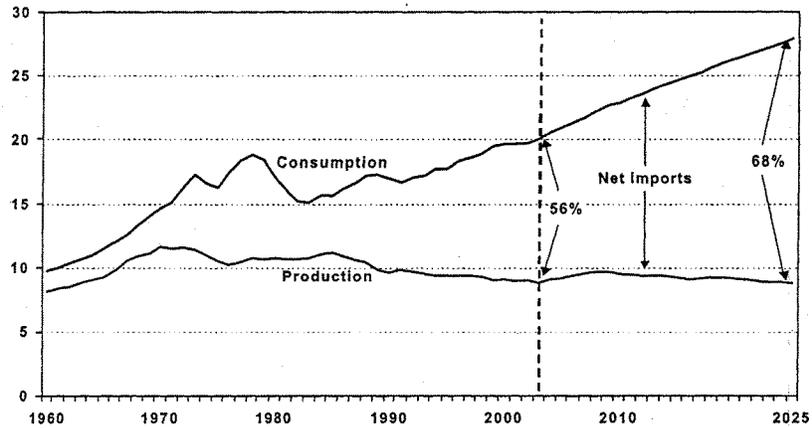


Figure 5. U.S. Natural Gas Production, Consumption, and Imports, 1970-2025 (trillion cubic feet)

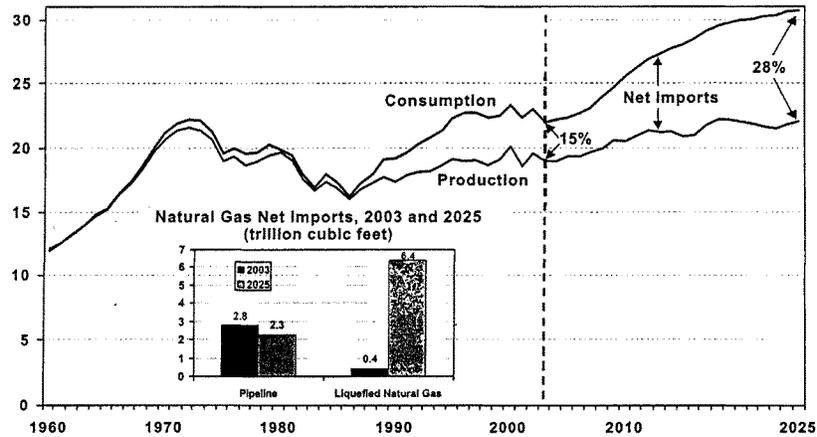


Figure 6. World Marketed Energy Consumption by Region, 1970-2025 (quadrillion Btu)

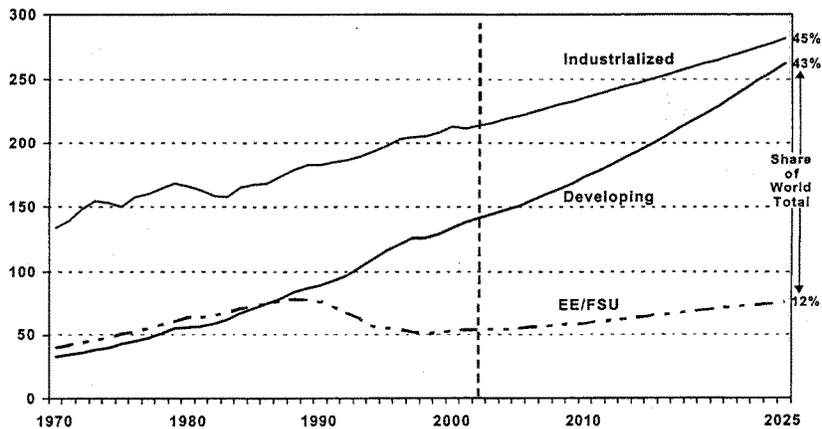


Figure 7. World Oil Consumption by Region, 2001, 2010, and 2025 (million barrels per day)

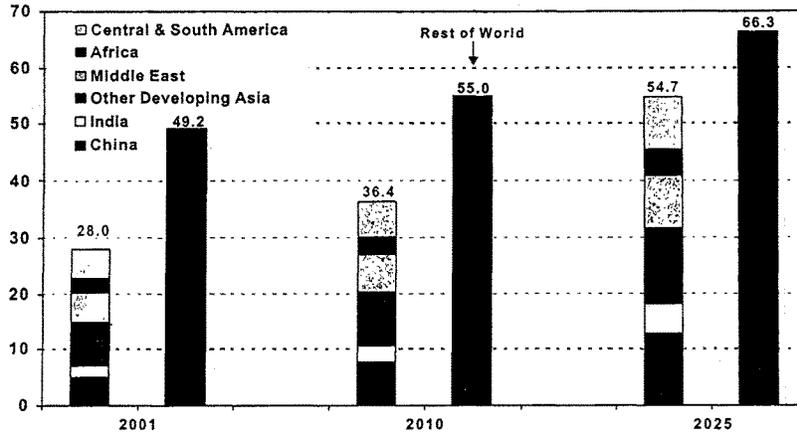


Figure 8. Natural Gas Consumption by Region, 2001, 2010, and 2025 (trillion cubic feet)

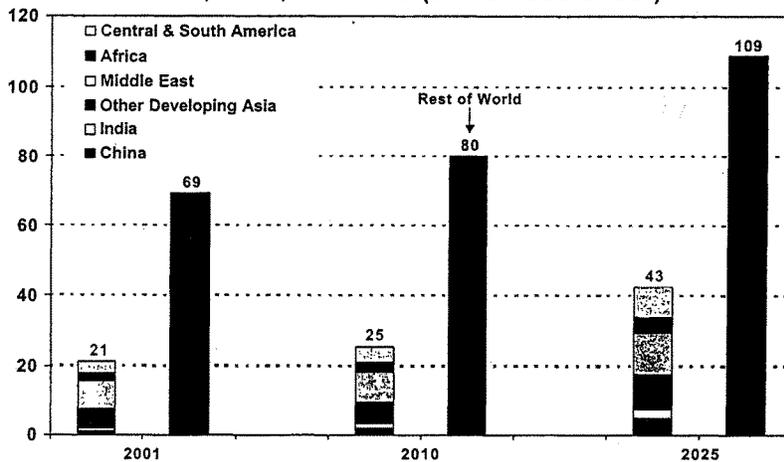


Figure 9. Coal Consumption by Region, 2001, 2010, and 2025 (million short tons)

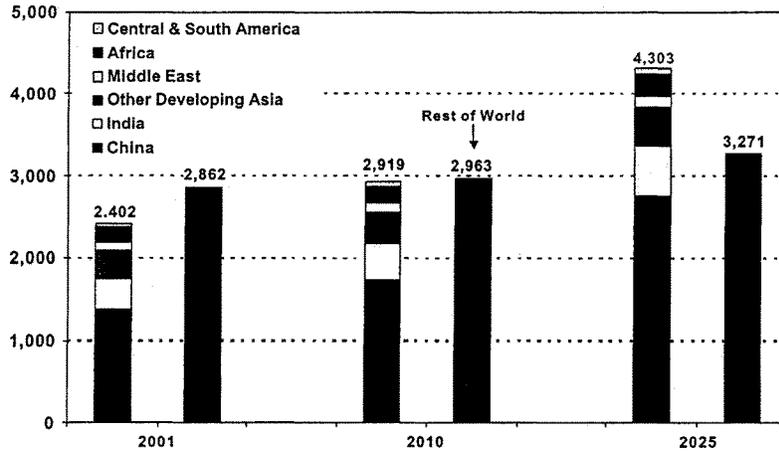
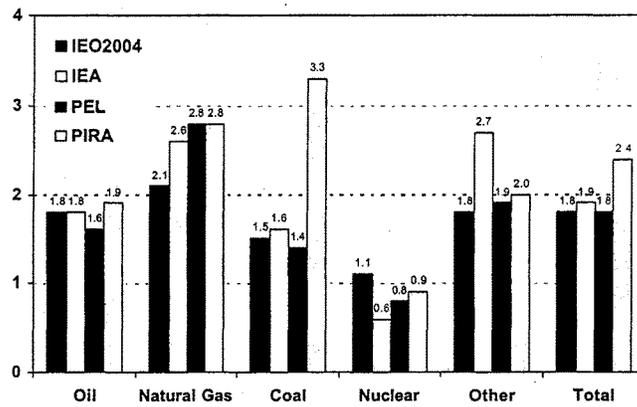


Figure 10. Projected Worldwide Increases in Energy Use by Fuel and Forecast, 2000-2020 (percent per year)



Mr. GIBBONS. Thank you very much, Mr. Caruso. We appreciate your insight. And your testimony is always very helpful to us as we go forward in this discussion. And we turn now to Mr. Jeffrey Logan, who is the China program manager for the International Energy Agency. Mr. Logan, the floor is yours. And by the way, for each of our witnesses, we will, by unanimous consent, enter into the record your full and complete written statement. And of course, you're free to summarize, within a 5-minute timeframe, your remarks, if you wish.

**STATEMENT OF JEFFREY LOGAN, CHINA PROGRAM
MANAGER, INTERNATIONAL ENERGY AGENCY**

Mr. LOGAN. Mr. Chairman, thank you very much, members of the Subcommittee and ladies and gentlemen. I'm very happy to be here this morning on behalf of the International Energy Agency to talk about China's energy sector. Although China is not a member of the International Energy Agency, we have clearly been engaging the country much more seriously to better understand its surging energy demand and take appropriate steps where possible. I'm here primarily to discuss the oil and gas sector in China, although I would like to start with a few general words about a trend in China in the energy sector that could have very important long-term implications and that trend has to do with the energy economic relationship in China.

Until the late 1990s, China's average reported energy consumption grew only half as quickly as the economy. In other words, its energy elasticity was surprisingly low, 0.5. There are serious and well-known questions about the validity of official Chinese statistics, but energy use still grew more slowly than gross domestic product, even with these data problems in account. This was a remarkable achievement for a developing country and it resulted in significant savings in energy use and greenhouse gas emissions. But since the new millennium, energy consumption in China has surged.

In 2004, the energy elasticity rose to over 1.5, meaning there is a 1.5 percent growth in energy use for every 1 percent growth in GDP. Energy experts in China and abroad have provided very little information that accurately describes why the economy has been using so much more energy over the past 5 years. Indeed, the changing economic relationship caught Chinese planners themselves off guard and is largely responsible for the serious energy shortages that exist in China right now, especially in the electricity sector.

Historically, China's economic growth has gone through cycles of rapid expansion followed by periods of slower growth. We believe that China is currently in the peak of one of its expansionary periods and is likely to grow less rapidly in the near future. But we need to understand more fully the apparent changes in China's economic and energy relationship as the impact of such a change over even just a few years can have a lasting impact on global markets, energy security and greenhouse gas emissions.

Now on to the oil sector. China's opaque oil sector has attracted immense attention over the past few years. Oil demand in China grew by over 27 percent in the past 2 years, while domestic produc-

tion has been largely stagnant. As a result, crude imports have climbed by 75 percent between 2002 and 2004. And China now relies on imported crude for 4 of every 10 barrels that it consumes. Perhaps surprisingly, though, Chinese oil demand in 2004 equaled only one-third the level of the United States. IEA forecasts envision Chinese demand continuing to grow to the year of 2030 when it reaches nearly 14 million barrels per day. At that time, Chinese crude imports would roughly equal those of the United States today.

Still, total Chinese demand then will be one-third less than what the United States consumes right now. Three drivers account for the most recent growth surge in China's oil demand. Increasing vehicle ownership, growing industrial demand for petrochemical feed stocks and perhaps most unusually the surging need for oil-fired backup power generation due to the severe electricity shortages there. The vehicle and petrochemical sectors are likely to continue to grow steadily in the future, but we anticipate a fall-off in the amount of oil that is used for backup power generation in the near future as more coal and hydroelectric plants come on-line. The timing of this falloff, however, is difficult to predict, but we anticipate it will start in the second half of 2005.

Rising crude imports in China have alarmed government policymakers. They have developed a multi-pronged approach to help address the country's looming energy insecurity. The measures include promoting State-owned oil companies to purchase overseas equity oil, diversifying sources of oil supply, launching construction of strategic petroleum reserves, developing alternatives to oil and enacting demand side efficiency measures. I have outlined each of these measures in my written testimony.

The IEA continues to believe that global oil reserves are sufficient to accommodate global demand through 2030 and beyond. More important uncertainties however, relate to maintaining stable output among major producers, dealing with environmental issues like climate change, and marshalling the necessary investment in each link of the oil supply chain. China has taken major steps to boost the use of natural gas primarily as a way to improve urban air quality.

But China's natural gas policy is fragmentary and development occurs on a project-by-project basis rather than by focusing on the needs of the entire gas chain. Developments in China's gas sector have surprised many critics, though. The first gas pipeline to Beijing in the late 1990s was widely predicted to be an economic failure, the main criticism being that the government focused only on a supplied push strategy and seemed to ignore the needs of consumers. But gas demand has developed fairly quickly however, and a second pipeline to Beijing is now under development.

The new cross country West-East Pipeline faces similar criticism. Potential users have little incentive to switch from coal. The pipeline started commercial operation in late 2004, a year ahead of schedule, and will slowly ramp up to a design capacity in the year 2007. The pipeline faces potential competition from imported LNG from Shanghai where several import terminals are under consideration. Promoting natural gas use in China as a substitute for coal and oil serves global interests in energy security, climate change

and trade. Global gas supply for LNG production is expanding rapidly and rising Chinese imports are not likely to stress the international gas markets as they have in the oil sector. Although Chinese energy companies will face increasing challenges in global energy markets, they have demonstrated a growing capacity to compete. More than ever, U.S. policy should be focused on engaging China on energy issues because the security, commercial and environmental implications are too great to ignore. Thank you very much for your attention and I would be happy to answer any questions you might have.

[The prepared statement of Mr. Logan follows:]

**Statement of Jeffrey Logan, Senior Energy Analyst and
China Program Manager, International Energy Agency**

Summary

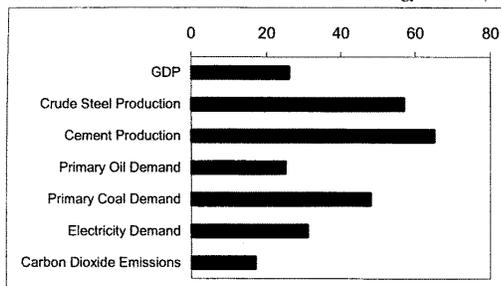
Chinese energy demand has grown robustly over the past three years and is likely to remain intimately tied to future economic performance. The average Chinese citizen consumed only one-fourteenth as much oil as the average American in 2004, but China will play an increasingly important role in all aspects of the global petroleum market. The current frenzy to purchase overseas oil assets by Chinese state-owned oil companies is likely to slow in the near term as policymakers realize more effective ways to boost energy security. China does not currently import natural gas, but that will change by next year and 5-10 LNG terminals are possible by 2015. Global economic, environmental, and security interests related to China's energy sector are best served through an active program of collaboration to promote energy efficiency, natural gas utilization, and coordinated use of strategic petroleum reserves.

Overview

China has charted a bold course of economic reforms over the past 25 years, achieving mixed, but often remarkable results given the development challenges it faces. Reported average annual GDP growth of over nine percent has improved living standards for hundreds of millions of Chinese people to a level unmatched in any point of Chinese history. China now plays a key role in the supply and demand of many global commodity markets including steel, cement, and oil. (See Figure 1.) If sustained, China's development will likely create the world's largest economy, as measured in purchasing power parity, in about two or three decades. Per capita wealth, however, will remain far below OECD levels. Enormous opportunities and challenges await commercial, governmental and social interests across the globe in parallel with China's development.

This document provides an update on current oil and natural gas trends in China, and looks at future growth projections. Where possible, it describes potential impacts on U.S. interests and recommends ways for U.S. policy to help overcome negative impacts. It is based largely on the International Energy Agency's dialogue and collaboration with China as a Non-Member Country participant. It begins with an overview of recent changes in the Chinese energy-economy relationship.

Figure 1 – China's Share of Incremental World Production and Energy Demand, 1998-2003.

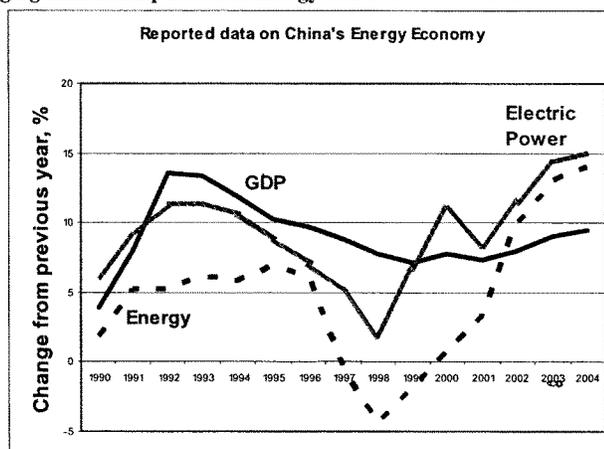


Source: World Energy Outlook 2004, IEA.

A Changing Energy-Economic Relationship

Chinese energy demand has surged since the arrival of the new millennium, when a new round of investment-driven economic growth began. Preliminary Chinese data indicate that the energy elasticity of demand (the growth rate of energy consumption divided by that of GDP) surpassed 1.5 in 2004. In other words, for every one percent increase in GDP, energy demand grew by over 1.5 percent. The shift reverses China's recent historical trend of maintaining energy elasticity below 1.0. (See Figure 2.) For most developing countries, including India, Brazil, and Indonesia, energy elasticities greater than 1.0 are normal, but for China it is a groundbreaking change.

Figure 2 – Changing Relationship between Energy Use and Economic Growth in China.



Source: China Statistical Yearbook 2004. Data from 2003 and 2004 are IEA estimates based on widely-circulated press reports.

Many analysts rightly question the validity of Chinese economic and energy statistics; GDP is likely underreported right now, although from the late 1970s until the end of the 1990s, it was considered overstated. Likewise, Chinese energy consumption, coal in particular, is tracked poorly. Coal use from 1996-1999 is now regarded as massively underestimated by analysts both inside and outside of China due to untracked output from small coal mines. One of the contributing factors behind China's current energy crunch is indeed these poorly tracked energy statistics: good energy policy and energy planning require accurate data.

Despite the problems with data quality, the general trend raises concern. Is this new energy-economy relationship in China temporary or does it indicate a deeper structural change within the economy? The difference could have a profound impact on future global energy markets, energy security, and environmental quality. Almost no authoritative research has been published to explain the surging elasticity. A clearer understanding of what is happening in Chinese energy markets may never be uncovered, but more research into the new energy-economic relationship would benefit the international community and China. More importantly, greater Sino-international collaboration on energy efficiency would serve global trade, environmental, and security interests.

Oil Sector: The Search for Security

China surpassed Japan in late 2003 to become the world's second largest petroleum consumer.¹ In 2004, Chinese demand expanded nearly 16 percent to 6.38 million barrels per day (b/d), about one-third the level in the United States. (See Table 1.) Domestic crude output in China has grown only very slowly over the past five years. At the same time, oil demand has surged, fueled by rapid industrialization. Imports of crude oil grew alarmingly in 2003 and 2004 to meet demand, increasing nearly 75 percent from 1.38 million barrels per day (b/d) in 2002 to 2.42 million b/d in 2004. Imports now account for 40 percent of Chinese oil demand.

¹ Contrary to many press reports, China is not the second largest importer of crude oil. That distinction still belongs to Japan, which imported more than twice as much oil as China in 2004.

Table 1 – Global Oil Demand by Region (in millions of barrels per day)

| | Demand | Annual Change | | | Annual Change (%) | | |
|---------------|--------|---------------|------|------|-------------------|------|------|
| | 2004 | 2003 | 2004 | 2005 | 2003 | 2004 | 2005 |
| North America | 25.18 | 0.47 | 0.61 | 0.36 | 2.0 | 2.5 | 1.4 |
| Europe | 16.47 | 0.20 | 0.26 | 0.10 | 1.2 | 1.6 | 0.6 |
| China | 6.38 | 0.55 | 0.86 | 0.50 | 11.0 | 15.6 | 7.9 |
| Other Asia | 8.55 | 0.22 | 0.45 | 0.24 | 2.8 | 5.6 | 2.8 |
| FSU | 3.71 | 0.12 | 0.14 | 0.12 | 3.5 | 3.8 | 3.1 |
| Middle East | 5.88 | 0.20 | 0.32 | 0.29 | 3.7 | 5.7 | 4.9 |
| Africa | 2.81 | 0.04 | 0.07 | 0.09 | 1.7 | 2.4 | 3.3 |
| Latin America | 4.91 | -0.09 | 0.18 | 0.13 | -2.0 | 3.8 | 2.6 |
| World | 82.51 | 1.85 | 2.73 | 1.81 | 2.4 | 3.4 | 1.7 |

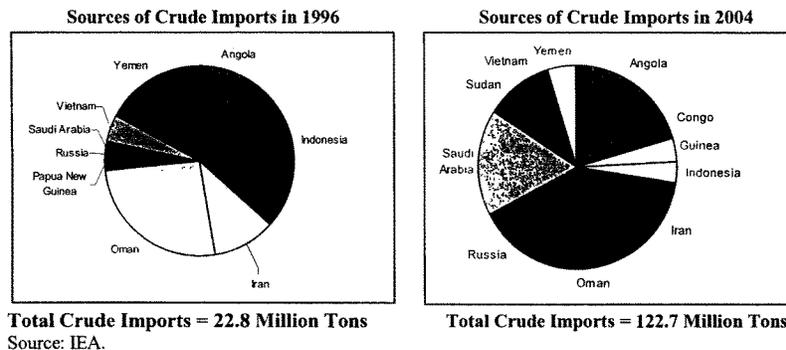
Source: *Oil Market Report*, March 2005, IEA.

As described in the IEA's March 2005 Oil Market Report, a significant driver of recent oil demand growth in China—perhaps on the order of 250-350 thousand barrels per day—has been the need for oil-fired back-up power generation in the face of serious electricity shortages. Other contributing factors are the rise in personal car ownership and growing industrial petrochemical needs, which are likely to continue growing fairly steadily. However, the amount of fuel oil and diesel used for back-up power generation will likely decline, as China closes the generation shortage by installing new coal, natural gas, hydro, and nuclear power plants. It has also promised to institute tougher new demand-side efficiency measures.

Chinese policymakers and state-owned oil companies have embarked on a multi-pronged approach to improve oil security by diversifying suppliers, building strategic oil reserves, purchasing equity oil stakes abroad, and enacting new policies to lower demand.

Diversifying Global Oil Purchases

Over the past decade, Chinese crude imports have come from a much wider and more diverse set of suppliers. In 1996, most of China's crude imports came from Indonesia, Oman, and Yemen. By 2004, Saudi Arabia was China's largest supplier accounting for 14 percent of imports, with Oman, Angola, Iran, Russia, Vietnam, and Yemen together supplying another 60 percent, and the remainder which came from a long list of other suppliers. (See Figure 3.) By diversifying crude suppliers, China has lowered the risk of a damaging supply disruption.

Figure 3 – Diversification of Crude Oil Supply Sources for China, 1996-2004.

Establishing Strategic Oil Reserves

China's 10th Five-Year Plan (2001-2005) called for the construction and use of strategic petroleum reserves by 2005. Construction has begun at one of four sites slated to store government-owned supplies. Chinese officials plan to gradually fill up to 100 million barrels of storage by 2008 (equivalent to 35 days of imports then). Original plans called for boosting stocks to 50 days of imports in 2010, but this may be slightly delayed. On the other hand, the recent surge in imports has led Chinese

policymakers to consider an even more aggressive long-term plan for 90 days of stocks, perhaps by 2020.

The IEA has shared experiences with China on member country stockpiling practices since 2001. Chinese officials have stated their intent to slowly fill their new stocks depending on global conditions. They have demonstrated less concern, however, in coordinating release of their future stocks as part of a larger global system. In other words, China may be more inclined to use strategic stocks to influence prices even without the threat of severe supply disruptions. We are exploring this.

Overseas Equity Oil

Chinese national oil companies (NOCs) have been active abroad for over a decade, but their hunt for overseas oil assets has accelerated in the past few years. This drive to buy overseas assets is a policymaking reaction to the rapidly growing need to import crude oil, and is an attempt to boost energy security. Most outside analysts question the efficiency and effectiveness of this policy; the act of owning resources, especially ones purchased recently at relatively high prices, does not significantly improve oil security because the risk of supply disruptions is largely ignored.

Chinese oil companies are not alone in overseas investment. The country's "going out" strategy is an attempt to create stronger Chinese companies, effectively use surplus foreign exchange reserves, and deal with over-invested domestic sectors. While a significant number of oil-related announcements have been made in the press since 2001, much of this activity is still waiting to be finalized. The lack of transparency over investment amounts, production sharing contract details, and proven petroleum reserves may create a more successful image of Chinese companies than is actually the case.

Until recently, Chinese companies seemed most comfortable operating in locations not dominated by the oil majors. This meant countries like Sudan, Angola, and Iran. For example, over half of Chinese overseas oil production currently comes from Sudan. Activity has picked up in other areas recently, however, including Russia, Kazakhstan, Ecuador, Australia, Indonesia, and Saudi Arabia to name just a few. Chinese companies appear to be improving their ability to purchase assets without overpaying, as earlier reports suggested, but this conclusion is only supported with anecdotal information. (See Text Box 1.)

Text Box 1 – Strengths and Weaknesses of Chinese National Oil Companies Operating Overseas

| <u>Strengths</u> | <u>Weaknesses</u> |
|---|---|
| <ul style="list-style-type: none"> • Ability to package comprehensive deals • High economic and political risk tolerance • Access to low-cost capital • Lure of China's future status | <ul style="list-style-type: none"> • Reputation for over-paying on assets • Limited technological excellence • Lack of "brand" recognition • Questionable standards on governance, safety, and transparency |

A key strength of Chinese NOC activity abroad is their ability to package complete investment deals in producing countries. In exchange for ownership of oil resources there, they can offer associated economic development projects (hospital and school construction, for example), investment opportunities in the lucrative Chinese market, and potential military transactions. International oil companies often complain that they cannot compete against these packaged Chinese deals. But Chinese NOCs are also limited in what they can accomplish due to technology shortcomings and lack of experience.

In 2003, Chinese state-owned oil companies pumped about 0.4 million b/d of equity oil. The figure is projected to rise by 8 percent annually thru 2020 when it hits 1.4 million b/d. At that time, this would amount to approximately 1.5 percent of global petroleum output, indicating that Chinese companies would have little influence on overall market trends.

Leading the drive among Chinese state-owned companies, China National Petroleum and Gas Company (CNPC) claims to have petroleum assets in 30 countries. It plans to spend \$18 billion in overseas oil and gas development between now and 2020. Most of CNPC's overseas production currently comes from Sudan, Kazakhstan, and Indonesia. Many speculated that CNPC would take a share in the restructured assets of Yukos, but a \$6 billion "loan" to Rosneft was used only for long-term oil purchases.

A disappointment for China during the year included the Russian decision to build an oil pipeline to Nakhodka with Japanese contributions, rather than to Daqing in northeast China with CNPC's participation. Discussions are still ongoing

regarding a potential spur line that would feed China's northeast. Russian oil sales from Siberia to China would serve U.S. interests in general as they would offset long-distance demand from the Middle East. China and Kazakhstan have made rapid progress in negotiating and starting construction on a cross-border pipeline that will initially deliver 0.2 million b/d of crude and products to Xinjiang province, and possibly later doubling to 0.4 million b/d. China appears to have made a geopolitical decision to secure its oil supplies with this line as costs would probably not pass a commercial test. Initial petroleum for this pipeline will likely be supplied by Russia and not Kazakhstan. Generally, more pipelines evacuating landlocked resources is a good thing.

China Petroleum Company (SINOPEC) is newer to the international game than CNPC and hopes to start pumping smaller quantities of equity oil in 2005 from activities in Yemen, Iran, and Azerbaijan. Perhaps the largest story in 2004 was SINOPEC's agreement in Iran to spend \$70 billion over 25 years to purchase LNG cargoes and participate in upstream oil activities there. The vast majority of this investment will be used to purchase long-term LNG supplies; the depth of the economic ties linking Iran and China in this deal should not be overstated.

China National Overseas Oil Company (CNOOC), the most progressive and outwardly-oriented of the Chinese state-owned oil companies, has been very active in Australia and Indonesia. In 2004, it succeeded in securing significant natural gas stakes in both countries. CNOOC surprised the global community in early 2005 when it was rumored to want to purchase Unocal for roughly \$13 billion. Many analysts believe that CNOOC would ultimately be only interested in keeping the Asian oil and gas assets of Unocal.

In summary, Chinese companies are increasingly active abroad and appear to be improving their business skills. They are unlikely to be able to purchase enough assets through over the coming decades to greatly influence the availability or pricing of global oil supplies. Furthermore, owning overseas assets does little to improve physical energy security without the capability to project strong military power. Anecdotal reports already indicate that some Chinese policymakers are beginning to question the wisdom of trying to boost energy security by purchasing overseas equity assets. Other Asian countries have realized it is more efficient to rely on global markets, strategic reserves, and demand-side efficiency measures. It seems likely, therefore, that the overseas purchasing binge will soon slow.

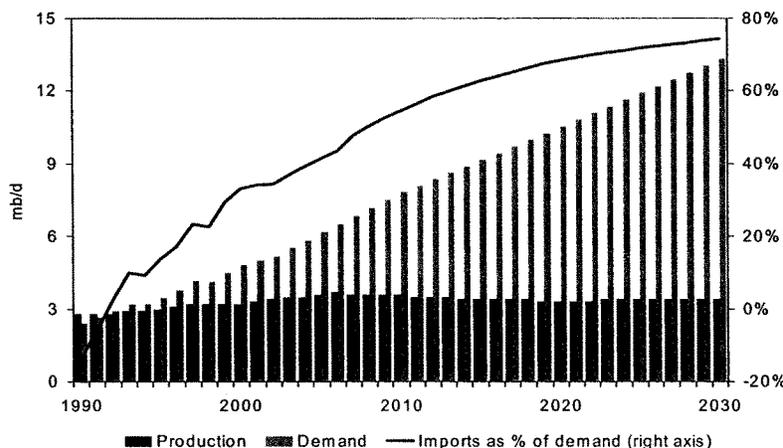
Demand-Side Measures

Per capita oil consumption in China is only one-fourteenth the level in the United States, indicating that strong growth could continue for many years. The transport sector in China will likely experience the strongest demand for oil over the mid- to long-term. Currently, there are roughly 24 million vehicles in China, with projections anticipating 90-140 million by 2020. This would push transport demand from 33 percent of total Chinese petroleum demand to about 57 percent (from 1.6 million b/d in 2004 to roughly 5.0 million b/d in 2020).

To partially address this problem, China enacted new automobile efficiency standards in late 2004. In Phase I, running from mid-2005 until January 2008, no increase in fleet fuel consumption will be allowed without penalties. Phase II would then begin and require a 10 percent reduction in fleet fuel consumption.

Another measure that has gained renewed attention is the imposition of a vehicle fuel tax. This policy would ban all road use fees instituted at the local level and replace them with a nationwide tax ranging from 30-100 percent of the current price of vehicle fuel. Gasoline prices in most Chinese cities, for example, are currently the equivalent of about \$1.60 per gallon. The fuel tax, if enacted, would raise gasoline prices to \$2-\$3 per gallon. The initiative has been discussed for years but lacked uniform support from policymakers. It has gained new steam over the past year with the surge in imported crude volumes.

Figure 3 – China’s Oil Demand Forecast thru 2030.



Source: World Energy Outlook 2004, IEA.

The Long-Term View

Without measures to limit demand or create alternative fuels, Chinese oil consumption appears set to grow rapidly for the foreseeable future. The World Energy Outlook 2004 forecasts Chinese petroleum demand in 2030 at just under 14 million bpd, about one-third less than current demand in the United States. (See Figure 3.) China’s import dependency will continue to grow, however, reaching 75 percent. In 2030, China would be importing as much oil as the United States did in 2004.

The IEA believes there are enough worldwide petroleum reserves to meet global demand through 2030 and beyond. More important uncertainty relates to marshaling the necessary upstream investments, maintaining stable petroleum output in major producer countries, building mid- and downstream infrastructure in consuming countries, and dealing with environmental issues like climate change. Furthermore, competition between China and India to purchase overseas oil assets is raising the stakes in upstream oil markets, but it is premature to say how this will evolve and impact long-term U.S. interests.

The Promise of Natural Gas in China: Whither Policy?

China has taken major steps since 1997 to boost natural gas use, mainly as a way to improve urban air quality. But gas was largely ignored for most of China’s modern history and new market-oriented measures are needed to fully encourage natural gas use.

Domestic gas production currently stands at 40 billion cubic meters (BCM) and accounts for roughly 3 percent of the country’s total energy demand. Chinese policymakers envision gas use rising substantially through 2020, when demand would reach 200 BCM and account for 10 percent of total energy demand. Baseline IEA estimates are currently less optimistic of future gas markets in China², but the potential for dramatic change cannot be discounted. With the right policy framework, gas use could be significantly higher than even Chinese government forecasts.

Chinese policymakers increasingly view natural gas as the fuel of choice for its environmental, security, and industrial advantages. But the gas industry is in its infancy and many barriers must be overcome before this relatively clean energy source can make a significant impact. The International Energy Agency recently completed a detailed study of China’s gas sector and delivered important recommendations to the Chinese government.³ Provided below is a summary of why

²The World Energy Outlook 2004 forecasts natural gas accounting for 6 percent of China’s total final energy consumption in 2030.

³Interested readers should consult this IEA publication for more complete information: “Developing China’s Natural Gas Market: Policy Framework and Investment Conditions,” International Energy Agency, Paris, 2002.

China is promoting development of the gas sector, the challenges it faces, and how some of these barriers could be addressed.

Drivers for Natural Gas

China is taking new measures to promote the use of natural gas for three reasons. First, natural gas used in place of coal can help China address environmental problems that have become urgent economic and social issues. Replacing coal with natural gas basically eliminates emissions of sulphur oxides and particulates, the two most serious local and regional pollutants. Gas also offers steep reductions in nitrogen oxide and greenhouse gas emissions.

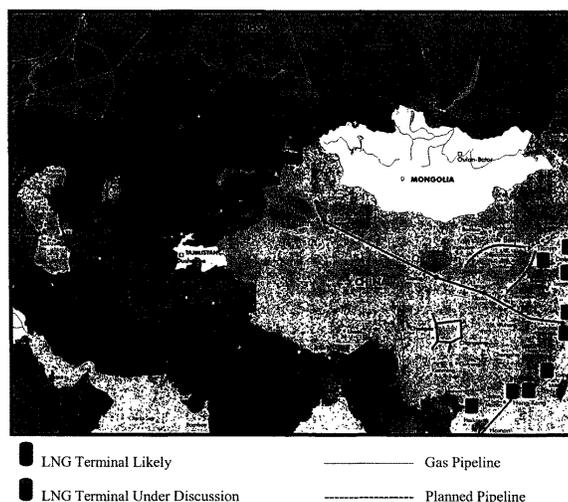
Second, natural gas can help China diversify its energy resources and address growing concerns over energy security. Imported crude oil now accounts for 40 percent of annual demand and will likely continue to grow rapidly. Additionally, coal demand has soared since 2002, resulting in localized transportation bottlenecks. China could help alleviate these energy security concerns by increasing reliance on natural gas. International gas markets are better able to supply China over the coming decades without jeopardizing overall energy security compared to oil because many new producers are ramping up their output.

Finally, natural gas has the potential to accelerate modernization of the country's industrial facilities. Most of China's industry is based on coal-burning technology, which is inherently less efficient than gas-fired equipment. Modern natural gas boilers, for example, convert about 92 percent of the energy contained in natural gas to useable heat. Coal boilers on the other hand, waste 20 percent or more of the input energy in the process. Similarly, advanced combined-cycle gas turbines used to generate electricity are nearly 60 percent efficient, while coal-fired steam turbines convert only about 40 percent of the energy in coal into useful electricity. Greater use of natural gas would also free up China's rail system to transport higher-value goods.

Developments and Hurdles

Important gas projects have been launched to support China's ambitious development targets for natural gas. A 3,900 kilometre, \$24 billion West-East Pipeline started commercial operation in late 2004. (See Figure 4.) Throughput will slowly ramp up to 12 BCM in 2007 as downstream projects and distribution networks are completed. The fact that CNPC completed the pipeline one year ahead of schedule, and without participation from its planned investment partners (Shell, Exxon-Mobil, and Gazprom), is testament to the drive and ability of Chinese energy companies. Although many outside observers question the economics of the pipeline, similar doubts were raised when China built its first gas pipeline to Beijing. The economics were shaky at the time, but that line is now oversubscribed and a second line will begin delivering gas to the capital in 2006.

Figure 4 – China's Natural Gas Infrastructure.



Two LNG terminals are also under construction in southeastern China, with perhaps a dozen more under discussion and consideration. LNG imports in China became an extremely hot topic in 2004 as coal prices rose substantially, along with incomes and air pollution. If even half of the LNG terminals currently under discussion are built, China could be importing 15-30 BCM of natural gas by 2015.

Talks continue on international natural gas pipelines with Russia and Kazakhstan as well, but progress has been slow. A joint feasibility study funded by Russia, China, and South Korea that would deliver 20 BCM of Russian gas to China and 10 BCM to South Korea is currently under evaluation. This pipeline may also have been ahead of its time, but Russia's Gazprom blocked any further discussion of the deal.

Important hurdles exist for natural gas market development, including:

- Natural gas is expensive compared to coal if environmental costs are not included;
- China is not believed to be endowed with abundant and cheap gas reserves, and known supplies are often located far from the main centers of demand;
- Gas supply infrastructure is fragmented and huge investment is needed to finance its expansion;
- China lacks a legal and policy framework to encourage investment in the gas sector; and
- There is a lack of knowledge over how to best develop natural gas technology and markets.

Perhaps the weakest link in China's current natural gas chain is the perception of high costs that results in weak demand for gas. Without stronger market pull for gas, the entire natural gas chain will remain weak, no matter how much the government tries to develop the market by administrative dictate.

To realize the ambitious target for gas market development in China, there is a need for the government to go beyond the "project-by-project" approach by publishing a comprehensive national natural gas policy. Such a policy could address issues of gas exploration, development, distribution, pricing, marketing as well as imports. It should be part of a coherent national energy policy, as China's gas industry is intertwined with the coal and the electrical power industry, and with environmental policy.

Preparation of a national natural gas law is also an urgent priority. Such a framework would provide a clear legal expression of the government's policy and strategy for gas industry development and the ground rules for operation of the gas industry. Almost every country where a natural gas industry has been established, whether based on indigenous resources or imports, has adopted a gas law in the early stages of market development. Adopting such a law would help create a more stable environment for investment and operation, reduce uncertainty and investment risk, and consequently lower the cost of capital.

Theoretically, environmental protection, in particular the reduction of local atmospheric pollution, is the key driving force for increased gas use in China. However, important challenges remain in turning this theoretical driver into a real market mover. China has put in place a whole set of environmental laws and regulations on air pollution, but a lack of adequate means for enforcing implementation makes most of them ineffective.

China lacks a central body to address coordination the country's overall energy strategy. Although an "Energy Bureau" was established several years ago, it does not have the capacity to implement effective and sufficient policy measures. There are roughly 30 employees at the Energy Bureau in China, while most OECD countries would have hundreds, if not thousands, of employees to create the policy framework and oversight needed to steer a modern energy industry. Given the current shortages of electricity and coal, Chinese planners announced the formation of an Energy Task Force in early March 2005 to further strengthen overall energy policy development. This step, however, is a disappointment to some who called for the creation of an energy ministry.

Synopsis

China's rapid economic growth has had a mixed impact on global markets. While China must take some of the blame for rising global commodity prices recently, it rarely receives recognition for helping keep the price of manufactured products low. China's rapid growth over the past few years should also be kept in perspective: China's 1.3 billion people currently consume only one-half the energy as the 290 million citizens in the United States, and Chinese oil demand is only one-third as large. Chinese policymakers have done a laudable job of steering economic reform, but a huge number of challenges—from population imbalances and environmental

pollution to political reform and AIDS—await solutions before the country can raise individual standards of living to anywhere near current OECD levels. The international community must engage China in order to minimize the challenges and maximize the opportunities that lie ahead.

Chinese NOCs have become much more active abroad, especially in regions not dominated by the major international oil companies. They have strategic advantages that can help them open doors in some producing countries, but their standards for safety, governance, and transparency remain an issue for all stakeholders. Most importantly, the purchase of overseas assets by Chinese NOCs is not likely to boost the country's energy security in a cost-effective manner since this act does not address potential supply and transit disruptions. The dash for overseas assets is likely to begin slowing in the near-term as policymakers digest this reality and weigh the high prices that NOCs are paying for sometimes questionable assets. Current estimates do not foresee Chinese companies playing a big enough role abroad to skew overall long-term oil market pricing or security, although rising domestic demand is clearly one reason for the current high global oil price. Chinese companies may also catalyze the development of more global resources than would have been case without their presence.

Mr. GIBBONS. Thank you very much, Mr. Logan. Again, this panel certainly appreciates your insight on these issues and your testimony has been helpful to us. We will turn now to Dave Menzie, chief of International Minerals Section from the USGS. Mr. Menzie, welcome, the floor is yours. We look forward to your testimony.

**STATEMENT OF DAVE MENZIE, CHIEF, INTERNATIONAL
MINERALS SECTION, U.S. GEOLOGICAL SURVEY**

Mr. MENZIE. Good morning, Mr. Chairman. Thank you for the opportunity to discuss the effects of rapid economic growth in developing countries on global mineral markets and on the U.S. economy, national security and global environment. This statement describes the link between mineral consumption and economic development, outlines how China's development is affecting mineral markets and examines some implications of this development.

Since the late 1980s, economic growth in China has been between 7 and 9 percent per year, doubling the economy every 8 to 10 years. China has been undergoing industrialization moving through a series of stages that include development of infrastructure, followed by development of light manufacture, followed by development of heavy manufacture, with increased—and then increased consumption of consumer goods and finally development of a service economy. Changes in these stages come roughly at 5-year intervals, with each stage taking about 20 years to complete and with the stages overlapping. During each stage of the economic development, consumption of particular mineral commodities rises dramatically by an order of magnitude.

How is China's economy affecting growth in the mineral markets? First of all, China's rising consumption of mineral commodities has resulted in higher prices, lower stock levels of mineral commodities such as aluminum, copper, gold, iron ore, nickel platinum group metals and tin. And another result has been high levels of use of world productive capacity. As a result, this has left little excess capacity to handle supply disruptions, and there have been shortages of mineral commodities that have caused manufacturers to limit production of finished goods. USGS has received numerous contacts recently from companies trying to find sources of

iron ore and steel including the types of steel used in the manufacture of automobile axles and in defense applications.

China is the leading producer of a number of minerals, including aluminum, antimony, cement, fluorspar, coking coal, magnesium, rare earths, steel, tin, tungsten and zinc. However, because of the demand of its economy Chinese exports for mineral commodities such as rare earths, silver, tin and tungsten are declining. China controls export of some of its mineral commodities by requiring export permits and it has export duties on other commodities. There are a significant source of a number of mineral commodities for which the U.S. is dependent for imports of its supplies, and these include things like antimony, barite, fluorspar, magnesium and there are things that are used in batteries, ceramics, electronic components, flame retardants, metallurgical processing and petroleum drilling.

In order to meet the needs of its growing economy, China has had to increase both its production and import of mineral commodities. China's large aluminum, copper and steel industries are dependent upon imports of raw materials, and there has been increasing interest by China in owning the sources of the raw materials for these industries and in purchasing companies overseas.

What are some of the implications of these trends? First of all, China and other developing countries are likely to continue to follow a general pattern of growth. For example, if Chinese consumers follow the example of their Japanese, Korean, Malaysian and Taiwanese neighbors, their auto ownership could rise from about 10 per thousand to 100 cars per 1,000 in about 10 years. Increased environmental residuals from developing countries will become a major source of both domestic and international issues, especially looking at transnational flows. Increased competition could take place among countries seeking sources of mineral commodities to supply their industrial production.

National policies regarding both the domestic and international resource ownership and policies concerning mineral exports are examples of ways that governments could attempt to secure advantage for domestic industries. As developing countries increase their per capita income consumption, several changes are likely. Higher national incomes are likely to lead to increased consumption of mineral commodities, but at the same time, the higher incomes lead to increased resistance to mineral production. This could create difficulties for companies that are seeking to increase exploration for new mineral deposits. Increased volatility in mineral prices could result from slowdowns in developing economies. During a downturn, developing economies could turn up their new production capacity to produce mineral commodities to an export toward developed countries and resulting in significant trade disputes.

An example of this was the cement exports to the United States that took place from Asia in 1997. In developing countries, high prices and increased competition for mineral commodities could bring additional economic pressure on our manufacturers. New strategies could be developed that would use information technology to increase recycling, reuse and remanufacture and would help to alleviate this trend. There has been increasing calls from

reliable information on both energy and mineral consumption in the press in recent months. And finally, the continued growth in the economies of China and other large developing countries could result in a period of real rising prices for mineral commodities such as occurred following World War II. Thank you, Mr. Chairman.

[The prepared statement of Mr. Menzie follows:]

Statement of W. David Menzie, Geologist, U.S. Geological Survey

Good morning, Mr. Chairman. Thank you for the opportunity to discuss the effects of rapid economic growth in developing countries on global mineral markets and on the United States economy, national security, and the global environment. This statement describes the link between mineral consumption and economic development; outlines, in particular, how China's development is affecting mineral markets; and, examines some implications of this development. This information is based upon a recently released U.S. Geological Survey (USGS) Open-File Report 2004-1374, "China's growing appetite for minerals."

The USGS, through its Mineral Resources Program, is the primary Federal provider of scientific and economic information for objective resource assessments and unbiased research results on national and international mineral potential, production, trade, consumption, and environmental effects. This USGS role is clearly defined and unique from other Federal, State, local or private entities. These USGS activities provide information ranging from that required for land planning decisions on specific management units to that required for national and international economic, foreign policy and national security decisions.

One of the major international news stories of 2004 was the rapid growth of the Chinese economy. China's growth earned headline status because China is consuming large amounts of raw materials and is becoming a more important factor in global trade and economic growth in other countries. Development on the scale that is now occurring is greatly increasing world consumption of minerals and will affect patterns of mineral production, trade, and consumption.

The Connection Between Minerals and Economic Development

For many developing countries, economic growth has just begun; however, China's economic growth is not new. Since the late 1980s, economic growth in China has been between 7 and 9 percent annually, doubling the economy every 8 to 10 years. China has been undergoing industrialization, moving through a series of stages that include development of infrastructure, followed by development of light manufacture, development of heavy manufacture, increased consumption of consumer goods, and finally, by the development of a service economy. Based upon the experiences of the Federal Republic of Germany and Japan during the post-World War II period, and of the Republic of Korea in the period 1970-95, changes begin at roughly 5-year intervals and each of the stages takes about 20 years to complete— with stages overlapping. During each stage of economic development, consumption of particular mineral commodities rises dramatically.

For example, the first or infrastructure stage is characterized by large increases in consumption of cement, crushed stone, and sand and gravel; cement consumption may rise from a few tens of kilograms per person per year to 0.5 to 1 ton of cement per person per year. During the second or light manufacturing stage, consumption of copper may increase from less than a kilogram per person per year to around 10 kilograms per person per year. In the third or heavy manufacturing stage, consumption of aluminum, iron ore, and steel rises. For example, aluminum consumption typically increases from less than a kilogram per person per year to 10 to 30 kilograms per person per year. The consumer goods stage of development is characterized by increased consumption of durable goods such as automobiles. Increases in the consumption of metals with specialty applications such as nickel, which is used in stainless steel, industrial minerals, and fuels are characteristic of the fourth or consumer goods stage. Finally, high but static rates of per capita consumption of minerals in finished goods are characteristic of the ultimate services stage.

China's per capita consumption of copper (about 2.5 kg in 2004) suggests that it is about 20 to 30 percent of the way through the light manufacturing stage of development.

How Chinese Economic Growth is Affecting World Mineral Markets

USGS analysis indicates that China's rising consumption of mineral commodities has resulted in higher prices and lower stocks of mineral commodities such as aluminum, copper, gold, iron ore, nickel, platinum-group metals, and tin. Another

result has been high levels of use of world production capacity for many commodities. This has left little excess capacity to handle supply disruptions. In some cases, shortages of mineral commodities have caused manufacturers to limit their production of goods. World demand for iron ore, iron and steel scrap, blast furnace coke and steel has been especially strong. This contrasts strongly with the situation of 2001 when analysts argued that 10 to 20 percent of steel capacity was unneeded. As with other mineral commodities, most of the increase in steel demand has come from China. The USGS has received numerous contacts recently from companies trying to find sources of iron ore and steel, including those used in the manufacture of automobile axles and in defense applications.

China is the leading producer of a number of minerals including aluminum, antimony, cement, fluorspar, coking coal, magnesium, rare earths, steel, tin, tungsten, and zinc. However, because of the demands of its economy, Chinese exports of mineral commodities such as rare-earth elements, silver, tin, and tungsten, are declining. China controls exports of some mineral commodities such as antimony, coking coal, and tungsten by requiring an export permit. China also maintains duties on exports of some mineral commodities. China is a significant source for a number of mineral commodities for which the United States is dependent upon imports for most of its supply. These include antimony (79 percent of imports), barite (90 percent), fluorspar (65 percent), indium (49 percent), magnesium compounds (68 percent), rare earths (67 percent), tungsten (47 percent), and yttrium (88 percent). These mineral commodities have important uses in applications such as batteries, ceramics, electronic equipment, flame resistant materials, metallurgical processing, and petroleum drilling.

In order to meet the needs of its rapidly growing economy, China has had to increase both its production and imports of minerals commodities. China's large aluminum, copper, and steel industries are dependent upon imports of raw materials. As a result, China has made significant foreign investment in bauxite and alumina, copper, iron ore, and nickel production facilities. Last fall, state-owned China Minmetals Corporation entered into discussions to purchase the Canadian company Noranda, Inc. Although those negotiations have not resulted in an agreement to date, they are indicative of interest by China in owning sources of the mineral commodities that its industries rely upon. China's rapid economic development and increased consumption of mineral commodities are also increasing environmental residuals released into the environment.

Some Possible Implications of the Rapid Economic Growth in Developing Countries

USGS analysis of mineral consumption patterns shows that continued strong economic growth in China and other developing countries with large populations has some important implications.

1. China and other developing countries are likely to follow general patterns of development. China is now well along in its light manufacturing stage and has begun to develop its heavy industry and even to consume durable goods such as automobiles. If Chinese consumers follow the example of their Japanese, Korean, Malaysian, and Taiwanese neighbors, Chinese auto ownership could rise from about 10 to 100 autos per thousand people within the next 7 to 10 years. Unless there is a significant improvement in automobile engines, this could create a significant increase in environmental residuals.
2. Increased environmental residuals from developing countries will become a major issue both domestically in the developing countries and internationally. Transnational flows of environmental residuals could increase disputes between nations.
3. Increased competition could take place among countries seeking sources of mineral commodities to supply industrial production. National policies regarding domestic and international resource ownership and policies concerning mineral exports are examples of ways that governments could attempt to secure advantages for domestic industries.
4. As the developing countries increase their per capita income, several changes are likely. Higher national incomes are likely to lead to increased consumption of mineral commodities. At the same time, higher national incomes are likely to increase resistance to mineral production because preferences for environmental goods and services increase with income. This could create difficulties for companies seeking to increase exploration for new mineral deposits and to extend lives for some deposits that were thought to be reaching the end of their production.
5. Increased volatility in mineral prices could result from slowdowns in developing economies, which are producing and consuming very large quantities of mineral commodities. If during such a downturn, developing countries turn

their growing capacity to produce mineral commodities to exports to developed countries, significant trade disputes could take place. The rapid increase in imports of cement from Asia into the United States following the downturn of Asian economies in 1997 is a small example of what could happen.

6. In developed countries, high prices and increased competition for mineral commodities could bring additional economic pressure on manufacturers. New strategies could be developed that would use information technologies together with innovations in product design to reduce the costs of disassembling durable goods at the end of life of products and of sorting materials. This could increase reuse, remanufacture, and recycling of components and help manufacturers to avoid high cost new materials.
7. Rapid changes in mineral consumption are creating conditions where reliable information for economic and national security planning and developing public policies will be increasingly important.
8. Continued growth of the economies of China and other large developing countries could result in a period of rising real prices for mineral commodities. This would be in contrast to the last 30 years, during which real prices of many minerals have declined. Over the next 20 years, mineral commodity price trends may more closely resemble the period from 1950 to 1970 than the last 30 years because of the proportion of the world's economies undergoing development.

The rapid economic growth in developing countries is greatly increasing global mineral consumption, changing global patterns of mineral production, trade, and increasing releases to the environment. These changes have important implications for the economy and national security of the United States.

Thank you, Mr. Chairman, for the opportunity to discuss this important matter, and in so doing, to showcase the significant information gathering and analytical capabilities resident in the USGS.

Mr. GIBBONS. Thank you very much, Mr. Menzie, you have added a perspective on the mineral picture here that is very important and critical to this panel's understanding. We appreciate your testimony. To each of our witnesses now, I want to explain that we will be going into a 5-minute questioning period where members will have an opportunity to address specific questions to you. We will try to limit those to 5 minutes each depending upon the schedule here.

Let me begin by asking, perhaps, Mr. Caruso, when we look at oil today at \$55 a barrel, what is driving up the price of oil? Is it something other than demand, which doesn't seem to be rising as quickly as the price of a per barrel cost? What is driving oil to \$55?

Mr. CARUSO. Mr. Chairman, the main factor driving up the price of oil is the not only the increase in demand, which was very robust in 2004, 2.7 million barrels a day, but the fact that it used up almost all of the productive capacity in the world. So that we have an extremely tight situation, not only in the production side, but in the refining industry and in transportation. And so that any small change, whether it be a strike of workers in Nigeria or a problem in Iraq, the only safety relief valve is price. So the price in economic terms has become very inelastic in the short run, goes up much faster than the percentage increase in demand.

Mr. GIBBONS. You raise the issue of productive capacity. Is that at the well that we are talking about or is that in the refined product productive capacity?

Mr. CARUSO. Currently, it's in both. During October of 2004 when Hurricane Ivan shut in about 500,000 barrels a day of U.S. capacity in the Gulf of Mexico, the world was essentially operating at 100 percent of capacity. With that capacity being back on stream, maybe we are up to about 98 utilization on a global basis

out of 84.5 million barrels a day. Any industry operating that close to the margin spread out over many thousands of miles means this enormous inflexibility to deal with problems.

And second, because of the increase in demand for transportation fuels, gasoline and diesel, the ability of refiners not only in the U.S. but in Europe and even in Asia is now also being stretched very thin. It is not only productive capacity at the wellhead, but the ability to convert that crude oil into that mix of products that is currently being demanded. And China is a big part of that, because as Jeff pointed out, a big part of their incremental demand is in increased use of passenger cars and trucks.

Mr. GIBBONS. Are we increasing our capacity to refine fuels in this country?

Mr. CARUSO. We are, but only at existing facilities. We have not built a new refinery since the late 1980s. All of the incremental capacity to refine has been added at the bottlenecks at existing refineries or some additional capacity, but at existing sites. So we have had added capacity, but relatively slowly. And we are increasingly dependent on imports of products, particularly from Europe and the Caribbean export refineries, which we expect to continue over the next 2 decades.

Mr. GIBBONS. Very briefly for my education and those of members of the Committee, can you tell me exactly where the United States imports its oil from?

Mr. CARUSO. Sure. The main suppliers are Canada, number one.

Mr. GIBBONS. How much do they provide us?

Mr. CARUSO. They are providing about 1.8 million barrels a day out of 12, so about one-sixth of our imports in 2004. Saudi Arabia is slightly behind, a couple hundred thousand barrels a day less, maybe at 15 percent. And then Mexico, maybe just a little bit less than that, 14 percent. And then fourthly Venezuela. So those top four, Canada, Saudi Arabia, Mexico and Venezuela account for almost 70 percent of our imports. The rest come from a large number of countries like Nigeria and others from—much less from Norway, UK. But the others are much smaller. The key, the other key to that question is in the future, we expect most of the incremental supplies—I mentioned we are going to need 8 million barrels a day of more demand and it will be in the form of imports. Most of that will be coming from, we believe, Persian Gulf OPEC countries.

Mr. GIBBONS. My time has expired.

Mr. Grijalva.

Mr. GRIJALVA. Thank you, Mr. Chairman. Let me begin, Mr. Menzie, if I may, and I appreciate the data you have given on behalf of USGS with regard to the global mineral market and China's effect on it. Let me ask you a question. The Administration has proposed that program be reduced by 28.5 million in the 2006 budget. So how will the international minerals program accommodate this loss? And will you be able to produce and present to Congress the kind of data and information that you have to date?

Mr. MENZIE. Sir, the cuts, as I understand them, would eliminate international mineral reporting and the work on minerals internationally through our global assessment program. So those would not be available in the future.

Mr. GRIJALVA. The primary focus then for USGS then will be to look at domestic minerals, Federal lands primarily?

Mr. MENZIE. As I understand it, that's correct, sir.

Mr. GRIJALVA. Mr. Logan, in your discussion with the Committee, as you were talking, you said that—let me see if I'm quoting you correctly, the environmental issues are too great to ignore. Can you outline some of the environmental implications of the situation in China as a consequence of the statement you made that those issues are too hard to ignore?

Mr. LOGAN. China currently consumes about 2 billion tons of coal each year and a lot of that consumption happens in outdated and very inefficient technologies, old boilers or furnaces. Power plants, emit huge quantities of sulfur dioxide and other harmful pollutants. We see increasing amounts of air pollution from China traveling across the Pacific ocean and even reaching U.S. territory. But from a global perspective, probably more important is the rise in greenhouse gas emissions in China. And since coal is by far the most carbon intensive fuel, the intensity of the carbon emissions in China are very high. They have taken a lot of steps to try to rationalize energy use in China. But as I mentioned, the last few years, we have seen a very disturbing trend where the economy is using much more energy to produce a unit of economic growth than it had in the past. So we believe that China's energy development plans are intimately tied to global and environmental quality and global and environmental issues. And that's why we believe it is too important to ignore.

Mr. GRIJALVA. And my last question, Mr. Chairman, Mr. Caruso, the Asian Times reported that China has joined the United States and Japan in developing strategic petroleum reserves and the 75-day period of emergency reserves in four locations. I want to ask how is that development—how will that affect the energy prices both in the long-term and the short-term, the development of both reserves?

Mr. CARUSO. Yes, indeed that's correct. China has started a program to develop strategic petroleum reserves at a relatively low level of fill for 2005. Jeff might have more detail, but I think it's less than 100,000 barrels a day for 2005. And so I don't think it will have a large impact, but certainly as I mentioned, when the market is tight as it is, it certainly will—there will be some small impact, I believe, this year in the short term. In the long term, I think it is probably a net benefit to have China in the position where it has strategic reserves so that we will be able to rely on those in the case of some sort of a disruption. To the extent that other countries develop this kind of a cushion in terms of strategic reserves as we have done in this country and in other IEA countries, I think it is a net plus for global market stability.

Mr. GRIJALVA. In that same equation, how would our reserve, given the competition for fossil fuels between the United States, China and India—and I can only describe it as competition—how does the Nation's strategic petroleum reserve factor into that competitive equation?

Mr. CARUSO. Well, our fill rate is also relatively low at roughly 100,000 barrels a day this year. And we are approaching the full capacity, design capacity of 700 million barrels. So I would not

expect there to be much of a market impact in terms of competition for oil to fill China's reserve compared with filling ours. I think it's such a small part of the 84.5 million barrel a day global market that I don't think that will be a major factor in the oil market.

Mr. GIBBONS. Thank you, Mr. Grijalva. We will turn to Mr. Peterson now.

Mr. PETERSON. Thank you, Mr. Chairman, I want to thank the panel for very interesting testimony. Mr. Caruso, I was reading from some information that was a part of your—it said total demand for natural gas is also projected to increase at an average annual rate of 1.5 percent from 2003 to 25.75 percent of the growth in gas demand from 2003 to 2005 results from increased use of power generation and industrial applications. Is the bulk of that power generation?

Mr. CARUSO. Yes, Congressman Peterson. The amount of increment in gas will be about 50 percent of our growth. I will make sure that's accurate for the record, but that's my recollection. But by far, the largest increment of growth will be in electric power.

Mr. PETERSON. I don't think it was wise when we went there, but that's another issue, because what we are not talking about is the homeowner. I mean today, gas—the price, the continued price increase of gas and the projected price increase of gas is going to put the American homeowner in a very difficult strait, especially older people with large homes. Much of America depends on natural gas to heat their homes and commercial application, the cost to heat commercial establishments and those who use natural gas as a heavy use to make, bake or cook, to make their product. I have my dry kilns that in my district that dry wood and use natural gas. They have shut down. They no longer can dry wood competitively with natural gas. I don't think we have any idea how much of this is going on around the country if people are moving away from natural gas, which they ought to be moving toward in my view.

I guess what scares me about your testimony or stuns me is we are saying we're going to double the importation of gas in the next 15 years. And it's almost all through LNG, from your charts. You're going to increase LNG use in this country by 16 times. Do you really think that is doable? You have to build the most expensive ships the most controversial ports and you buy from unstable countries who will double or triple the price when we increase the volume. And can we even get there? Can we increase LNG by 16 times?

Mr. CARUSO. I think we can. The investment patterns that we see going on overseas to develop liquefaction capacity are moving forward at a reasonably good pace. And the regasification proposals currently at FERC are more than 20 to build regasification terminals. We don't think that 20 will be built, but that's how many are being proposed or have been submitted to FERC, the Federal Energy Regulatory Commission.

So we think the gas is there. There appears to be investment willingness to build the liquefaction capacity. And based on our projections, we certainly believe the demand will be there.

Mr. PETERSON. I know the gas is there. I mean, that's not the issue. But is it wise for us to become importers of natural gas? Now what you didn't mention is can you build a port, but now you have to build a pipeline to connect it to the current system. I don't know

of only one gas company that is even talking about that. Is there much of that going on?

Mr. CARUSO. There is some going on, but there is more to the story than just the liquefaction and regasification. There is hooking up with the existing distribution system. And that will also represent significant investments as well. Certainly, I know there is debate going on in this Chamber as well as the Senate as we speak on the wisdom of our energy policy, but clearly, you know, what can I say from the IEA point of view, our projections indicate that the demand will be there largely in electric power and industrial applications. And as you point out, 60 percent plus of our homes in this country are heated by natural gas. So I think the wisdom—I, of course, rely on the decisionmakers and policymakers to debate that.

Mr. PETERSON. Well, you are the agency that reports the data. So I am not picking on you. You are not the policymaker. But your data you are giving us assumes that is the only option we have is LNG.

Mr. CARUSO. In fact, Chairman Pombo and others have asked what would happen if this—we did not indeed meet this type of demand, whether it be for reasons of the inability to site the regasification terminals or the investment wasn't made. And clearly what our studies have shown is that if supply is not available or the infrastructure is not built, as I mentioned with oil, there's only one pressure relief valve. If the demand is there and supply is not forthcoming, that means higher prices.

Mr. PETERSON. And I think we are at the busting—we are at the wall already. I don't think homeowners, commercial and industrial in this country continue to pay the highest natural gas prices in the world, which we have. Oil prices, everybody pays the same. But the natural gas prices, they go from \$0.80 to \$7 and something. You can't compete with 80 cent gas, which many countries have. A lot of countries have gas for less than a buck. We are really putting ourselves in a terrible competitive—but the assumption that we have to double our importation and it's all on the back of LNG is a dangerous, flawed strategy, because—and I know my time is up, but be prepared for the next round, because I am not done. I am just getting started.

Mr. CARUSO. I am well aware of it.

Mr. GIBBONS. We will turn to someone who understands the importation of energy in this part of America that is unique to most others, Mr. Faleomavaega from American Samoa.

Mr. FALEOMAVAEGA. Thank you, Mr. Chairman. Just on a follow-up question that Mr. Peterson is trying to pursue here. Maybe gentlemen, you can help me. It is my understanding that the state of Qatar currently largest reserves of natural gas in the world. Am I correct in this?

Mr. CARUSO. They are in the top three. There is Russia, Iran and Qatar. They are all very close. The three of them together have about 70 percent of the world's natural gas reserves.

Mr. FALEOMAVAEGA. My understanding, Bolivia has made findings of natural gas and very pretty much in abundance. How does this compare then to us as to what Mr. Peterson is trying to pursue here? Over the years—and I will follow up with a question. This

has always been the issue for how many years now we keep talking about more and more our country has to input our fuel resources, especially oil and fossil fuel. And somehow we seem to be spinning our wheels. Every year we go through this round talking about limited energy resources and what are we doing about it and bringing up this issue as Mr. Peterson reiterated about the supply of gas alone, what is the option there available because of our dependence on this resource from other countries? Are we doing enough R&D?.

This is another point of my question. It has always been a touch and go when we talk about alternative energy resources but it always comes back to fossil fuel. Doesn't seem to be any real seriousness maybe perhaps in part of our government and maybe the energy companies. What are some of the alternative resources that we could really do serious R&D so we don't have to be so dependent on these other countries for these resources? I am asking all three of you gentlemen.

Mr. CARUSO. You are absolutely right. Certainly technology and R&D are the answer for the long term, and I think there has been a significant amount and continues to be. There can always be more. And one cannot overlook technology that has been done over the last several decades that has led to substantial improvements in the way we use—as I mentioned, we are using about half the amount of energy per unit of GDP than we were using 30 years ago.

So there has been improvement and certainly some of the oil and gas that's being produced today wouldn't have been produced under the technology of 30 years ago. There are developments, deep water drilling. There is a lot that has been happening.

But in terms of alternative energy supplies, there is a long lead time when it comes to thing like hydrogen, fuel cell development and others. So until then, what we have been doing is importing oil and now more and more natural gas, because that's the available supplies at a reasonable cost.

And indeed, you mentioned Qatar, our estimates is that Qatar LNG, when it's up and running and deliverable to the U.S. would probably come into the east coast at about \$3.60 a thousand cubic feet which is about half of today's spot price. So economics will drive this. Very pertinent question that Congressman Peterson raised about strategic and whether this is the path we should be on or not. This is worth anticipating.

Mr. FALEOMAVAEGA. The three most populous countries in the world, China, India and the United States, even though we consume over 30 percent of the world's energy resources with a population of only 486 million people, do you get the impression that there is such an evil thing on the part on China and India that they have to look for energy resources. I mean 2 billion people combined population, the demand for the consumption is there. I notice that India wanted to do a \$4 billion pipeline contract with Iran going through Pakistan, and we are placing very serious objections to this. What is your take on this?

I notice that China is going to central and South America shopping for more oil supplies because of this demand. Is it bad for these two nations to be seeking other oil resources, just like we are trying to do in other parts of the world?

Mr. LOGAN. I can try to say a few words about that. I think when we look at the development of China's economy and we see that how immensely people's lives have changed in the last 30 or 40 years, it is truly remarkable. Literally hundreds of millions of people have been lifted out of dire poverty and a lot of that has been associated with rising energy consumption. So, no, I don't think we can consider that China and India and other large developing economies don't have a right to improve their standards of living by using more energy. It's inevitable, it's going to happen and I think we have to prepare for it.

In terms of Chinese and Indian and some other large state-owned companies, energy companies investing abroad, there's a mixed picture, I think. We see some benefit when state-owned companies from China and India invest in resources that other international energy companies ignore for political or economic reasons. They are making it possible to bring on some incremental supply to the global market, because no one else will touch those resources.

Mr. FALEOMAVAEGA. I know my time is up. Just a quick observation, my understanding, Kazakhstan has the third largest oil reserves potentially in the world. Something also to consider. But one thing I wanted to note as a matter of observation, if we have really been serious about refinement. My understanding is we have enough coal supply. And Mr. Peterson probably knows more about coal more than I do. And how much R&D is going into refining coal as an energy resource and I'm curious about that. Every time I hear about coal, it is an environmentally dangerous resource for fuel. My question is how much R&D have we put in there, if this is good for the next 1,000 years, to provide the energy needs for country? Why aren't we doing enough research to make coal as a better resource, environmentally safe? And just a matter of observation. Mr. Chairman, I know my time is up.

Mr. GIBBONS. Thank you very much.

Let me just say that each year we do add money into a Clean Coal Technology Program in this country that helps with that research and development.

One of the observations I want to make before turning it over to Mr. Peterson is a concern that some of us have is a monopolization of the oil production and the products that come from that by a country with its demand tying up those international sources, so whether it be the United States, whether it be China, whether it be India, whether it be any other country going out there and acquiring the only or remaining productive capacity, that monopolizes that whole issue, which then puts a tremendous variability and instability into the whole program for what we do in terms of our growth. And I will come back to my question.

I want to go to Mr. Peterson. We probably each have time for one more additional question before we go to go do two votes, at which time we will come back and hear our second panel.

Mr. Peterson.

Mr. PETERSON. Yes. I wanted to mention the coal thing, but I guess I don't have time.

We do have a clean coal technology fluidized bed boiler; we use it for our dirtiest lowest BTU that's on top of the ground that was

put there as waist coal years ago. We're burning it cleanly, but we have chosen not to use it in this country, even though, in my view, it takes the particulate out of the air and puts it in the fuel waste that does not go in there, but we just closed the door on coal, unfortunately. But I am going to go back to natural gas.

I think natural gas is the one fuel that can bridge us through these difficult times, but I guess I'm stunned that we're listening to Greenspan—who I don't think knows crap about energy—because he said we should do LNG. He's the guy who has raised the LNG issue in every hearing in the last year and a half. He's the one that put natural gas in the hearing process when he asked to come to the Commerce Committee and talk about it. And he has given the LNG solution, which, in my view, is the worst potential solution we have.

This country has adequate reserves to drill its way out of the natural gas problem and be competitive with the rest of the world. We have huge reserves in natural gas. But if the government-imposed moratoriums on all the areas where gas is readily available continue, and have been supported by three presidents—I think erroneously, including this one—I think that's a mistake in this country.

Natural gas is going to be the bridge to hydrogen. All the hydrogen makers tell you we're going to make hydrogen out of natural gas before we make it out of water and other things because that's the easiest, simplest way to do it.

I have an all natural gas bus company at State College that's going to start enhancing with hydrogen with the hopes down the road on running them on hydrogen, but it will be hydrogen made from natural gas.

Now we're using natural gas unlimitedly for power generation, which I think is a waste. What we ought to have is a no-growth-in-oil-use policy in this country. We have three percent of the world's oil, we have almost unlimited natural gas in this country that we can drill for. And I guess I would like to make the statement for the press and everybody else, a gas well is not an oil well, and nobody wants to talk about that. I think it's time for this country to decouple oil and gas leasing. A gas well is a 6-inch hole in the ground with a steel casing, cement at the bottom, cement at the top, and we let gas out. That's not a huge environmental hazard, but we have been conditioned as a public to think it is.

Many of our gas fields are dry gas, you don't even have fluids hardly. So I think, I mean, I think it's ludicrous that we don't have a policy about opening up our rich fields to drill for natural gas in lots of very safe places. I'm told there's—I forgot how many trillion feet off of the shore of New Jersey 80 miles out.

This summer my staff visited Canadian drilling rigs on the Great Lakes—I didn't go, I wished I had have. And Canada drills in our Great Lakes, sells us the gas. And I have never heard a complaint on the shores of Lake Erie about that drilling. If they hit an oil well, the cement truck is ready and it plugs it, they don't use it. But the natural gas is piped underground, undershore, nobody even knows it's there, it lets gas out.

I mean, natural gas is not an environmental hazard. You have a two-acre lot, if you're doing it on land, that you have to clear to

produce the well, and once it's over, there's a tank and a couple of pipes there. I mean, it's not an environmental—why this country thinks drilling for natural gas is a hazard, it's the clean burning fuel. We should be fueling all public transportation with natural gas, taking relief of oil. We should be fueling taxicabs, delivery trucks, service trucks that go short distances. They have a new engine that uses natural gas for diesel where you can go back to 15 percent diesel and 85 percent natural gas. Think how much cleaner that would be with diesel trucks on the highways. There is an engine being worked on, and it's pretty close to being available. I mean, I think for us to have a natural gas policy that our only answer is to import LNG—and there is no way, in my view, that you can increase the LNG into this country by 16 times in the period of time this mentioned, I think that's a very flawed policy.

Mr. GIBBONS. Mr. Peterson, thank you very much for the discussion on natural gas. And you can tell he's not sitting on the fence on this issue.

We did have a signal, as you heard from the buzzers, there are 2 votes going to take place. We anticipate that this will take about 30 minutes for the next 2 votes, so we're going to adjourn this hearing for 30 minutes.

Before I do, and before I release this panel, I want to thank all of you three for coming here today. We will call up our next panel at the beginning when we return. But there are going to be a number of written questions that we will submit to the members of the panels; we would like those to be answered and submitted back to us within a week, if we could possibly do that, no longer than 10 days, of course, after that.

With that in mind, I will tell the members that we have about 5 minutes to run vote, and we're going to adjourn this hearing—or recess this hearing, not adjourn, we will recess for about 30 minutes.

[Recess.]

Mr. GIBBONS. The Subcommittee on Energy and Mineral Resources will come back to order. We will call up our second panel now, and before I make those names known, I want to apologize to everybody. You've just now experienced Congressional time, what we call 30 minutes turns into an hour, of course. So with that, I want to call up our second panel, which will be Milt Copulos, President National Defense Council Foundation, and Alan S. Hegburg, Senior Fellow, CSIS Energy Program, the Scowcroft Group.

Mr. GIBBONS. Gentlemen, welcome. We will turn now to Mr. Copulos. Welcome, the floor is yours. We look forward to your testimony.

**STATEMENT OF MILTON COPULOS, PRESIDENT,
NATIONAL DEFENSE COUNCIL FOUNDATION**

Mr. COPULOS. Thank you, Mr. Chairman. I would like to thank you for the opportunity to testify.

Mr. Chairman, America is heading headlong into disaster, a disaster of our own making. Three decades ago, the Arab Oil Embargo made clear that our Nation's dependence on import oil was reaching dangerous levels and threatened to jeopardize our military and

economic security, but that warning went unheeded. Today, despite all of the rhetoric and posturing and lamentations about energy, our security situation is far worse than it was in 1973. In fact, on a volumetric basis, oil imports today are more than double the level they were then.

We are also becoming increasingly dependent on imports of important non-fuel minerals. We are 100 percent dependent on imports for 17 important non-fuel minerals ranging from graphite to gallium, and 80 or more percent dependent on another dozen.

Under any circumstances, our reliance on transoceanic imports for key commodities would be a cause for concern, but a confluence of factors has heightened the threat that they pose to a critical level. These factors have a growing competition for resources from emerging economies, particularly that of China, and to a lesser degree India, and the inherent instability of the nations that constitute our most important sources of transoceanic supplies.

For two decades, China's economy has grown between 7 and 9 percent annually, the highest rate of any nation on earth. To fuel this growth the PRC has developed a ravenous appetite for natural resources. Indeed, China counts for 40 percent of the total growth of oil demand in the past 4 years. Similarly, China's frenetic economic expansion is also credited as being a major factor driving the recent increases in nonfuel mineral prices. India, too, while not equalling China, still has an economy growing at around 6-1/2 percent a year, with the accompanying increases in the need for both energy and nonfuel minerals.

But the stunning economic growth of emerging Asian economies is not the only concern in regard to transoceanic imports. Six nations, Canada, Mexico, Saudi Arabia, Venezuela, Nigeria and Iraq, provided 66.9 percent of U.S. Oil imports last year, accounting for 42 percent of our total supply. Of these 4, Saudi Arabia, Venezuela, Nigeria and Iraq furnished 37.7 percent of our imports, equalling 23.7 percent of total supply. And that's where the danger lies.

In December of last year, al-Qaeda issued a statement that said, in part, we call on Mujahadin in the Arabian Peninsula to unify their ranks and target the oil supplies that do not serve the Islamic nation, but the enemies of that nation. There is little doubt that terrorists are trying to make good on the threat. Since May of 2003, 90 people have died in terrorist incidents in Saudi Arabia, and there have been dozens of attacks on oil-related facilities in Iraq. Although these incidents have not seriously disrupted supplies as yet, sooner or later they will.

Even without a major supply disruption, however, they have been a principle factor in the huge oil price increases since in the past year. Nigeria is plagued with ethnic violence and banditry in its oil-producing regions, losing an estimated 145,000 barrels a day to theft.

In Venezuela, President Chavez, a close confidant of Fidel Castro, with suspected ties to insurgents in Colombia and al-Qaeda, has threatened to cutoff oil shipments to the United States. In short, we face a new reality of increased competition from emerging nations of Asia, and critical instability among our principle transoceanic sources of supply. It is a reality that makes our

continued dependence on imports an unacceptable risk, but it's a risk we need not take.

The simple truth is that our Nation does not have an energy shortage. All we need to do is find the political will to take advantage of our incredible energy endowment. Consider this, there are 104 trillion cubic feet of so-called stranded gas in Alaska. Utilizing well-proven gas-to-liquids technologies would permit us to convert the stranded resource into clean burning fuels that could be shipped to the lower 48 States by the trans-Alaska Pipeline System. And that's just the tip of the iceberg.

The U.S. holds 62.5 percent of the world's oil shale deposits, the equivalent of 530 billion barrels of oil. That's more than twice the proved reserves of Saudi Arabia. The U.S. Also holds 25 percent of the world's coal reserves, 275.1 billion tons, or enough to maintain current production levels for 2 centuries.

There also remain huge untapped resources of conventional oil and gas resources in areas offshore that are currently closed to development.

One of the most exciting prospects is methane hydrates, known as the water that burns. U.S. methane hydrate resources are estimated to hold 320,222 trillion cubic feet of natural gas; that is the equivalent of 51.1 trillion barrels of oil. One, just one, onshore methane hydrate deposit in Alaska is estimated to hold 519 trillion cubic feet of natural gas, the equivalent of 82.9 billion barrels of oil.

We also have emerging technologies that can help us use the energy resources we have more efficiently, and provide alternative sources of fuel. Hybrid electric vehicles, for example, can substantially improve automotive mileage.

The choice is really very simple; we can act now to do something to use our domestic resources, or stand idly by and allow us to be overwhelmed by events. If we fail to act, we will have no one to blame but ourselves.

[The prepared statement of Mr. Copulos follows:]

**Statement of Milton R. Copulos, President,
National Defense Council Foundation**

My name is Milton R. Copulos and I am President of the National Defense Council Foundation.

I would like to thank Chairman Gibbons and the Members of the Subcommittee for the opportunity to testify today.

America is rushing headlong into disaster. What is worse, however, is that it is a disaster of our own design.

Three decades ago, the Arab Oil Embargo made it clear that the nation's growing dependence on imported oil was reaching dangerous levels and threatened to jeopardize our economic and military security. Despite that dramatic demonstration of our vulnerability nothing has been done to address the problem.

At the time of the Arab Oil Embargo in 1973, we imported 34.8% of our oil. In 2004, imports averaged 62.9%, and on a volumetric basis were more than twice the level they were 30 years ago.

We may soon come to regret our complacency.

A confluence of factors has occurred that heightens the jeopardy we face from our profligate import dependence.

THE FIRST FACTOR: EMERGING ECONOMIES

On one front, we have skyrocketing demand, driven in large part by the frenetic pace of economic growth in nations such as China and India. Indeed, for the past decade China has experienced a growth rate of between 7% and 9%, with a phenomenal rate of 9.5% in 2004. India's GDP has grown at an average of 6% for

the same period, hitting 8.2% in the first quarter of 2004. In contrast, U.S. GDP grew at 5.6% for the same period, and Japan at 5%.

Fueling this economic growth will require oil in increasing amounts. So much oil in fact, that the ability of current suppliers to produce it may be stretched to the breaking point.

To illustrate, oil consumption in developing countries is expected to rise by 3% annually over the next 20 years. This means it will increase from 14.5 million barrels per day in 2000 to 29.8 million barrels per day by 2025. Within this total Chinese oil consumption, which accounted for fully 40% of the growth in world oil demand over the past four years, is expected to rise from the 5.56 million barrels per day recorded in 2003 to 12.8 million barrels in 2025. Of this total, 9.4 million barrels per day are expected to be accounted for by imports.

India, too, is expected to see a dramatic rise in its oil consumption with a 28% increase projected for just the next five years.

Under the best circumstances, the competition for oil generated by the explosive economic growth of Asia will serve to put a tremendous upward pressure on prices, driving them well above the current \$50 plus per barrel average. OPEC officials have said oil prices could rise to as much as \$80 a barrel and they may well be correct. In fact, under the right circumstances the price could be even higher.

Under the worst circumstances, as our organization warned in a Los Angeles Times article five years ago, the competition for oil could lead to armed conflict—particularly with China. Lest this statement seem alarmist or far-fetched, I would note that the Chinese are, for the first time in their history, developing a “blue water” navy capable of operating beyond their shores, and their naval doctrine has been revised to provide for the projection of force in an arc running roughly 800 miles from their shoreline.

But, I said there was a confluence of factors, and the growth of global demand is just one of them. The other, equally important factor is the growing instability of the nations on which we rely for the bulk of our imports.

THE SECOND ELEMENT: UNSTABLE SUPPLIERS

Six nations, Canada, Mexico, Saudi Arabia, Venezuela, Nigeria and Iraq, contribute 66.9% of all U.S. oil imports, equaling 42% of our total consumption. Of these, four, Saudi Arabia, Venezuela, Nigeria and Iraq account for 37.7% of our imports or 23.7% of the oil we use.

And that’s where the danger lies.

September 11th 2001 changed forever the way we must view resource dependency. We must never allow ourselves to forget that one of al-Qaeda’s principal objectives is to destroy the U.S. economy. Indeed, that is the reason the World Trade Center was selected as a target—it was a symbol of America’s remarkable economic strength.

More important, al-Qaeda and its affiliates understand all too well that one way to bring about their goal of economic disruption is to disrupt our supplies of imported oil. If anyone harbors doubts that this is true, they need only look to al-Qaeda’s December 11th 2004 statement which made the threat explicit stating:

“We call on the mujahideen in the Arabian Peninsula to unify their ranks and target the oil supplies that do not serve the Islamic nation but the enemies of this nation.”

Continuing the statement also urged that al-Qaeda followers:

“Be active and prevent them from getting hold of our oil and concentrate on it in particular in Iraq and the Gulf.”

As dramatic as the December 18th statement was, however, what it actually did was to officially sanction what was already going on.

For the past several years, America’s transoceanic oil supplies have been under growing assault.

In October of 2001, Sri Lankan Tamil Tiger terrorists conducted a coordinated suicide attack on an oil tanker involving five small boats. Seven people were killed.

Eleven months later, al-Qaeda affiliated suicide bombers attacked and holed the French oil tanker Limberg in Yemen killing one crewman and causing a 90,000 barrel oil spill.

In the summer of 2002, Saudi Interior Ministry forces thwarted an al-Qaeda plot to attack and cripple the loading dock at Ras Tanura which handles 10% of the world’s oil supplies.

A report by the Institute for the Analysis of Global Security documented over 100 attacks on oil pipelines between April of 2003 and April of 2004.

Last July gunmen stormed an oil tanker at anchor in Indonesia.

The list goes on and on, but the point is simple: if oil must cross an ocean to get here, it is not secure.

But external terrorists are not the only threat.

The facts show that three of our most important sources of oil imports are so insecure that relying on them is tantamount to playing Russian Roulette with all the chambers in the gun loaded. Together these nations account for over one-quarter of our transoceanic oil imports.

Let's take them in order of importance.

PLAYING RUSSIAN ROULETTE WITH OIL SUPPLIES

Saudi Arabia, the world's largest oil producer and location of one-fourth of the world's proved conventional oil supplies accounts for 12.1% of U.S. oil imports or roughly 7.6% of the oil we use.

With almost 40% of its population under the age of 15 and declining fortunes that have seen Saudi Arabia's per capita income drop by 80% adjusted for inflation since its peak a quarter century ago, the Desert Kingdom is rife with unrest—much of it directed at the West. Indeed, since May of 2003 90 people have been killed in terrorist incidents and foreign nationals have been urged to leave. It is true that the Saudi Interior Ministry is attempting to combat the terrorist threat to their country, and has arrested hundreds of al-Qaeda suspects, but the threat continues to grow. Moreover, over the past year, al-Qaeda cells operating in Saudi Arabia have increasingly targeted oil-related facilities for attack.

But even if terrorists do not disrupt the flow of Saudi oil, another concern has recently surfaced: the ability of the Desert Kingdom to maintain its production levels. Matthew Simmons of the Houston-based Simmons Company International set off a firestorm of controversy in petroleum industry circles with his analysis of Saudi Arabia's oil production capability. It is his contention that the failure of the Saudis to invest in maintaining its huge Ghawar oil field has undermined that nation's ability to "surge" production in response to market needs. The Saudis have always been viewed the supplier of last resort. If Simmons is correct, the prospect of global shortage is far greater than previously believed.

Venezuela provides 12.1% of U.S. oil imports equaling 7.4% of domestic consumption. With the election of Hugo Rafael Chavez Frias as President, relations between the U.S. and its fourth largest oil supplier entered a new era of hostility. A self-styled populist with close ties to Fidel Castro and terrorist groups operating both in Latin America and around the globe, he recently threatened to cut off oil shipments to the United States. Chavez is openly sympathetic to al-Qaeda. Moreover, he is cited in the latest edition of the State Department's "Patterns of Global Terrorism" report as having "an ideological affinity" with Colombia's FARC and ELN terrorist groups. The State Department also says that weapons and ammunition captured from FARC rebels have been traced to official Venezuelan stocks and facilities. The situation in Venezuela is further complicated by internal strife that was manifest in a general strike that shut down that nation's oil industry for several months beginning in December of 2002.

Nigeria, which supplies 8.7% of U.S. oil imports accounting for 5.5% of our consumption, has been plagued with ethnic and political turmoil in the Niger Delta, its principal oil producing region. In 2004, an average of 145,000 barrels of oil per day was lost to theft and vandalism. Moreover, foreign oil workers and facilities have been a frequent target of violence. For example, in April of 2004 two Americans working for Chevron were attacked and killed, and in January of 2005, 300 armed villagers from the village of Owaza attacked two Royal Dutch Shell flow stations forcing the evacuation of 18 staff members.

In addition to security issues, serious questions have also been raised concerning Nigeria's reserve estimates with Royal Dutch Shell recently reducing the reserve estimates of its holdings there by 67%, or almost 1.5 billion barrels. Moreover, even if reserve estimates are accurate, Nigeria suffers from a lack of investment funds to maintain and expand its oil and gas production. This fact raises further question about Nigeria's ability to maintain current production levels in the years ahead.

OTHER OIL SUPPLY ISSUES

While terrorism and political instability are major sources of concern regarding transoceanic U.S. oil imports, they are not the only factors threats to transoceanic oil imports. Another important concern are the efforts by the emerging Asian economies to become major participants in the development of global oil resources, and especially such efforts directed at traditional U.S. suppliers.

On January 20th, the Chinese government signed agreements with Canada to help develop Canadian uranium mines and oil reserves. Among the areas of greatest interest to the Chinese are the Canadian tar sands deposits in Alberta province. The 175 billion barrels of recoverable oil trapped in Canadian tar sands represent a resource base two-thirds the size of Saudi Arabia's. In addition, China has expressed

interest in investing \$2 billion to purchase a 49% interest in a pipeline to carry oil 720 miles from Alberta to the northwest coast of British Columbia.

China's move to enter into oil production and development agreements with traditional U.S. suppliers is not limited to Canada. China already operates two oil fields in Venezuela and has signed an agreement to develop 15 declining fields in Zumano in eastern Venezuela. The Venezuelan government has also invited China to participate in exploration projects in the Orinoco belt, one of the world's richest oil deposits. China has also made overtures concerning oil exports to Mexico's national oil company, PEMEX.

It is not just the Chinese, however, that are fishing for oil in traditional U.S. waters. India recently signed an oil cooperation agreement with Venezuela. The agreement is the most recent in a series of overseas oil development projects initiated by India's state-owned Oil and Natural Gas Corporation (ONGC). They also have projects underway in Russia, Vietnam, Sudan, Myanmar and Australia.

Clearly, competition for the world's oil resources will become increasingly strong in the years ahead. But oil is not the only natural resource which poses an import vulnerability danger to the United States. Nonfuel mineral imports, too, create an unacceptable economic and military vulnerability.

THE IMPORTANCE OF NONFUEL MINERALS

Few Americans give much thought to the important role nonfuel minerals play in our nation's economy. Yet, while it is not commonly understood, they are as essential to a modern industrial state as energy. In fact, 16.8% of U.S. GDP is a direct product of minerals and materials mining and processing.

To illustrate, in 2004, the value of nonfuel minerals produced in the United States totaled \$44 billion. But that was just the tip of the iceberg. These raw minerals, along with minerals imports generated \$418 billion in processed mineral materials. These processed minerals, in turn, added \$1.97 Trillion in value to U.S. manufactured goods. All told, some 16.8% of U.S. GDP is directly linked to minerals and materials processing. As a result, one out of every six jobs in our economy is directly or indirectly tied to mineral production.

Yet as important as these commodities are to America's economic success, their supply is not assured.

TENUOUS SUPPLIES

We currently rely on foreign sources for 100% of seventeen important minerals. These range from gallium, which is used in such critical applications as the manufacture of semiconductors, computer chips and transistors to graphite, which is used for such high-tech products as fuel cells, and so-called "nano-flakes," 20 micron thick graphite particles that have a broad range of applications from advanced computer technology to aerospace.

We are also dependent on foreign sources for 80% or more of another dozen key nonfuel minerals including titanium sponge, which has a wide range of important defense applications, including providing upgraded armor for the Abrams M1A2 tank; palladium, which is essential to catalytic chemistry, and tantalum which is essential to the manufacture of corrosion-resistant chemical equipment and micro-circuitry.

Overall, the value of U.S. imports of raw and processed materials increased 30% between 2003 and 2004. More important, though, this increase occurred even though the tonnage of materials imported declined. The reason for the price increase in the face of decreasing imports was simple: market competition.

As with oil, the competition for nonfuel minerals is intensifying, and as with oil, the primary reason for this intensification is the stunning increase in China's appetite for these commodities.

THE ROLE OF CHINA

As noted, China's GDP has been growing at an accelerated pace for two decades—in fact doubling in size every eight to ten years. An important aspect of this growth is that it has been largely the result of spending on capital goods and construction projects which are by their nature both energy and mineral intensive. The effect of the demand created by this spending has been to spark skyrocketing demand for nonfuel minerals and strain production and processing capabilities to the limit.

The extent of the current global shortage of some nonfuel minerals and materials is illustrated by the situation in regard to steel. In 2001, it was estimated that there was somewhere between 10% and 20% excess steel processing capacity around the globe. But in 2004, demand for steel was so strong that France petitioned the European Mining Commission to suspend antidumping duties.

Although Chinese officials indicate they plan to restrict their country's growth rate to around 8%, even that level of expansion will place a strain on world mineral

markets. Therefore, as with oil, competition for nonfuel minerals between China and the industrialized nations of the world will remain a permanent fixture of the global economy.

ADDRESSING THE OIL IMPORT PROBLEM

Given that the perils of America's import dependence are a reality, the question is, how can the nation's vulnerability be reduced?

Perhaps the greatest irony arising from our current energy and minerals dilemma is that the answer has been at hand all along: make better use of what we have.

In saying this, I am not advocating some draconian plan that relies on effectively hamstringing the economy in the name of reduced energy use. Rather, I am saying that America does not suffer from a shortage of energy. The simple truth is that America's energy endowment is more than sufficient to provide for all of our needs, both today and in the future. The only real shortfall that we have is a shortfall of the political will to find innovative ways to fully utilize the resources we are blessed with.

For example, there currently are some 104 Trillion cubic feet of "stranded" natural gas resources in Alaska—gas that currently cannot reach market due to an inability to transport it. Alaska's natural gas could help reduce our dependence on imported oil, if only we were able to find a way to get it where it is needed. In the long run, a gas pipeline could provide the means for transporting Alaskan gas to market, but it will take time to accomplish its construction, and time is a luxury we do not have.

Fortunately, there is another way to take advantage of this resource.

GAS TO LIQUIDS

The Fischer-Tropsch technology to convert natural gas to liquid fuels has existed since the 1920s. It is currently in use in South Africa to produce approximately 200,000 barrels of liquid fuel per day. It would be possible to build a mobile Fischer-Tropsch processing plant on Alaska's North Slope near Prudhoe Bay to convert the stranded gas to liquid fuels that could be transported by the Trans-Alaska Pipeline System.

In addition to helping reduce oil imports the project would have several added benefits.

First, the fuel produced in this manner would be extremely clean, and would thereby benefit the environment.

Secondly, as oil production at Prudhoe Bay continues to decline, it will, in the near future, fall to a level insufficient to sustain flow through the TAPS system. Therefore, a substantial amount of recoverable oil might be left behind because it could not be transported. The added volume of throughput generated by a gas-to-liquids plant would help sustain the levels needed to maintain TAPS operations and thereby significantly extend ultimate recovery from the Prudhoe Bay field.

A third benefit would be the ability to demonstrate the practicality of building mobile gas-to-liquids plants for use by the Armed Forces as a means of providing fuel in the field.

Perhaps the most important benefit, however, would be that in demonstrating the practicality of converting natural gas to liquids in the harsh Alaskan climate, the project would open the door to exploiting the vast methane hydrate resources that exist in Alaska.

METHANE HYDRATES

Methane Hydrates provide another potentially huge source of energy. They were discovered in the 1960s. They consist of methane gas trapped in a lattice-like ice and are found largely in ocean bottom sediments lying below 450 meters and in permafrost. The Energy Information Administration estimates that the United States methane hydrate resources in place hold 320,222 Trillion cubic feet of natural gas. This is the equivalent of 51.1 Trillion barrels of oil. More important, onshore methane hydrate deposits in Alaska are estimated to hold 519 Trillion cubic feet of natural gas, the equivalent of 82.9 billion barrels of oil.

What makes methane hydrates so promising is the fact that in December of 2003, a joint U.S., Japanese and Canadian research program to determine if methane hydrates could be produced reported their results. The answer was affirmative. According to officials involved in the project, it will be possible to produce these resources economically within a few years. Alaska's onshore methane hydrates, by themselves, would be sufficient to eliminate the need to import oil entirely.

But methane hydrates are not the only option.

OIL SHALE

The United States also holds 62.5% of the world's oil shale deposits. The oil shale reserves found in the Green River formation that extends through Wyoming, Colorado and Utah is estimated to hold some 130 billion barrels of recoverable oil. The Eastern Marine formation may hold as much as 400 billion barrels.

The earliest recorded production of oil shale occurred in Autun, France in 1929. Even as the first oil well was being drilled in the United States in 1859, the first commercial oil shale industry was beginning in Scotland. Production there ranged between 1 million and 4 million tons annually between 1881 and 1955. After 1955, competition from cheap oil imports caused production to gradually decline until 1962 when it ceased.

While interest in producing U.S. oil shale resources has surfaced whenever oil prices rose sharply in response to tight supplies, new oil discoveries would drive prices down and make oil shale an uneconomic alternative. Oil shale was in effect always a bridesmaid but never a bride. The need to be concerned over energy security coupled with rising prices may finally provide an incentive to take advantage of this prolific resource.

COAL

The United States is also richly endowed with coal resources. In fact, the U.S. is the "Saudi Arabia" of coal holding 25% of the world's recoverable coal reserves. Totalling 275.1 billion tons, U.S. coal resources are sufficient to meet current production levels for 200 years. Like natural gas, the technology to convert coal to liquid fuels has been long known. Also, new advances in Clean Coal Technology have addressed many of the environmental concerns that previously caused objections to coal liquefaction and gasification. Moreover, as with oil shale, the concern over energy security coupled with the anticipated sustained high prices for oil may combine to make synthetic fuels produced from coal an economically viable alternative.

While alternatives like methane hydrates, oil shale and synthetic fuels from coal all provide options that could and should be pursued, there is another source of fuel to offset oil imports that warrants consideration: making full use of our domestic oil and gas resources.

CONVENTIONAL RESOURCES

Vast, undeveloped deposits of oil and natural gas lie in areas foreclosed to exploration. The Arctic National Wildlife Refuge, for example, holds what may be the last onshore "Super Giant" oilfield in North America. Further, the experience of developing the vast Prudhoe Bay oilfield has demonstrated that oil and gas exploration and production can be conducted in sensitive environments without causing irreparable harm.

Similarly, there are huge potential deposits of both oil and natural gas in offshore areas currently foreclosed to exploitation. As with the Arctic, much experience has been gained in developing offshore hydrocarbon deposits that shows such resources can be produced in an environmentally sound manner.

NEW TECHNOLOGIES AND ALTERNATIVE FUELS

In addition to developing our rich domestic energy endowment, it also makes sense to encourage both efficiency and non-hydrocarbon alternatives. One of the most promising new technologies is the hybrid electric vehicle. Although automobile manufacturers may well have initially introduced hybrids as a response to pressure from environmental interest groups, their public acceptance has far exceeded anything that could have been anticipated. As a consequence all of the major auto manufactures are seeking to expand their hybrid lines. A particularly interesting new development is the so-called "plug-in" hybrid electric which can achieve a fuel efficiency level of several hundred miles per gallon.

Alcohol fuels and other bio-based fuels also can help to offset some portion of oil imports. But in the end, it is also important to recognize that there are roughly 220 million privately owned cars and light trucks in the United States that will continue to require conventional fuels to operate. Since their average lifespan is 16.8 years, the need for conventional fuels will remain with us for decades to come. Therefore, options like gas-to-liquids, methane hydrates, oil shale and synthetic fuels as well as expanded production of conventional oil and gas resources will be necessary if import levels are to be reduced.

What is perhaps most critical in developing a plan to reduce America's oil import burden is to recognize that there is no single solution. Rather the answer is to do everything. We must take full advantage of both conventional and unconventional resources and encourage efficiency and new technologies.

ADDRESSING THE NONFUEL MINERALS PROBLEM

The problem of nonfuel minerals imports is somewhat more difficult to address than that of oil import dependence. The reason for this is that there are some mineral commodities that are not found within our borders. Therefore, any program to address nonfuel mineral imports must take a two-part approach.

As with domestic energy resources, our dependence on imports for some nonfuel minerals is the product of government restrictions. While it was the policy of the U.S. government to encourage domestic mineral development through the middle of the 20th century, a variety of laws and regulations were imposed beginning in 1964 that increasingly discouraged domestic mineral development.

Over the succeeding decades, more and more restrictive regulations have been added to the mix with the end result being the decline of our extractive industries. The impact of these rules is most dramatically illustrated by the fact that North American mineral firms only allocate between 7% and 10% of their exploration budgets to the search for domestic minerals.

Clearly, removing unreasonable or excessively restrictive regulations will go a long way towards reviving the domestic mineral industry and reducing the need to import those minerals that can be produced from domestic sources. There still remains, however, the problem of meeting the need for minerals that cannot be found at home. There are three ways in which this problem can be addressed.

The first step is to ensure that the government maintains adequate stockpiles of those strategic and critical materials we cannot produce for ourselves. History has demonstrated that no matter what the cost of maintaining a strategic stockpile may be, it is still cheaper than attempting to acquire critical materials in a time of crisis through the marketplace.

A second step is to encourage the recycling of those minerals that can be retrieved from abandoned equipment. For example, millions of automobiles are scrapped each year, and all of them have catalysts that contain platinum group metals. Many of these catalysts are retrieved so that the platinum group metals they contain can be recovered. We should ensure that they all are.

A third step is to aggressively research alternatives to those nonfuel mineral commodities we cannot produce for ourselves. In this way the need for imports can be permanently ended.

CONCLUSION

I began my testimony by saying that America was rushing headlong into disaster. I stand by that statement. Our transoceanic energy resources are already under assault and it is just a matter of time before forces hostile to our nation and what it stands for succeed in causing a major disruption of supplies. Whether it is the result of a terrorist act or an intentional embargo as occurred in 1973 is of little consequence. What is important is to understand that it is coming and coming soon—probably within the next two years. When it does happen we should not again find ourselves asking why nothing was done to prevent it.

Even if there is no supply disruption, however, there remains the fact that increasing competition for energy resources will continue to exert an upwards pressure on prices. This holds out the prospect of high energy prices reducing economic growth, fueling inflation and further aggravating our balance of trade.

Most important, it also means that we will continue to export jobs abroad.

And also bear in mind that some portion of every dollar we spend to purchase transoceanic oil finds its way into the hands of people who intend to do us harm.

I also repeat that the disaster we are facing is of our own making. The United States is endowed with a resource base more than adequate to meet its needs—only we are able to make full use of it.

The choice we face is simple. We can either find the political will to do those things necessary to break the shackles of oil and nonfuel mineral imports, or we can continue to stand idly by and allow events to overwhelm us. If we fail to find the courage to do what is right, we will have no one to blame but ourselves when the next crisis wreaks havoc throughout our economy.

Mr. GIBBONS. Thank you very much. We appreciate, certainly, your testimony. It's very helpful, as I said about the other testimony before the Committee as well. And we will turn now to Mr. Hegburg for your comments. Welcome, the floor is yours, and I look forward to your testimony as well.

**STATEMENT OF ALAN S. HEGBURG, SENIOR FELLOW,
CSIS ENERGY PROGRAM, THE SCOWCROFT GROUP**

Mr. HEGBURG. Thank you, Mr. Chairman. And thank you very much for the invitation to appear before you.

If I could, I would just like the record to show that I'm here on behalf of the CSIS Energy Program, and solely on their behalf, and I don't speak for anyone else.

Mr. GIBBONS. Certainly.

Mr. HEGBURG. I would like to just pick up on something that was mentioned this morning, which is the nature of the oil market as it is, and how you look at it, and what that means going forward for the United States.

There are several interpretations as to what's going on in the market, but two of them are quite important for the next round of investment in the oil and gas business, particularly in the oil business. One is that this is a bubble market, this is a very high-priced market, and it's an analysis that's held mostly by energy economists that because it's an energy market, it will decline rapidly, and then we will come back again. And the cycle of going up and coming down is very short.

Now, if you're an investor as an oil company, that means that you're looking at a very short term where you're going to be at high prices, and then all of a sudden very quickly, you are at low prices. So I think there is a logical explanation for why companies are not investing.

Not investing anywhere in the oil sector—although investment is taking place, but not at the rates that are needed—comes at a time when the entire surplus of this sector has been worked off. Earlier we discussed the surplus on the oil-producing side and surge capacity and how that has come down to essentially a million barrels a day for an 80-million-barrel-a-day demand. The surplus in refining capacity. The surplus in the service sector and probably in pipelines too, not just in the United States, but worldwide; pipelines are being built elsewhere, but, in fact, a lot of investment needs to come into this infrastructure to meet the demand numbers that are out there.

The second interpretation, which is a longer interpretation, is that we are at a structural change in the oil market in that we're at higher price levels, and we're going to see these levels for some amount of time. So the investment cycle is longer, it's not shorter, it's not 3 years, it may be 10 years; it may be longer than that, which means you should invest because you can get your money back relatively quickly, and then if the prices are going to stay high, you can generally make money, as a private investor, over a fair amount of years.

Those are really two fundamentally different views of what the future holds, but they have obviously severe implications for the structure and the ability to supply the demand which we see in the short term. And I think Guy Caruso talked a bit about that in terms of the period after 2025, but, in fact, the period of 2010 to 2015 actually is quite important. And I think in the short term, as was mentioned, it's particularly important in the refining sector since the capacity in the refining sector is very high and it's being used very much. That means unless there is investment in the

refining sector of the United States, we will see a fair amount of product imports.

Now product imports have historically come from the Caribbean and from the Atlantic basin. The Atlantic basin product import supply is coming down, and that suggests that we're going to have to rely more and more on the Caribbean. And there is very few refinery positions left in the Caribbean, which means you have to import product from a longer distance, which means they're more expensive. So the refining sector, given the nature of it on a world-wide basis, is an equally important need in this society, as the producing sector is.

And it seems to me for Congress, in its deliberations and looking forward, one of the issues—and I don't do policy issues for Congress, I'm not a lobbyist, but one of the issues is how do you encourage the financial markets and the capital markets to invest at a time when they're hesitant to invest because their market outlook is too short?

Thank you very much, Mr. Chairman.

[The prepared statement of Mr. Hegburg follows:]

**Statement of Alan Hegburg, Senior Fellow, Energy Program,
Center for Strategic and International Studies, Washington, D.C.**

Mr. Chairman, Members of the committee, I appreciate the opportunity to appear before you today to discuss recent global oil developments and their implications for U.S. energy requirements and commercial markets.

I am appearing on behalf of the Center for Strategic and International Studies where I am a Senior Fellow with the Energy Program. The remarks are drawn from some recent CSIS analysis as well as from my own personal observations and experience, including policy positions in the U.S. government and almost 20 years in the energy industry.

Recent Developments.

Over the past 18 months there have been three significant developments which have prompted serious assessment of the implications for U.S. energy supply for the immediate period as well as for the long term.

They are:

- Forecasts from the EIA predict a 50 percent increase in worldwide oil demand over the next two decades. These demand forecasts take place at a time when the surplus in oil surge capacity is at its lowest level in 30 years.
- Unexpected high oil prices in 2004. Prices increased rapidly, similar to the increases in the 1970s, suggesting a structural shift in oil prices to a higher level. Surprisingly, this occurred without prompting a major public outcry and with little impact on short-term world economic growth.
- The emergence of new competitors in the international market place determined to secure short term oil imports as well as longer term oil investments.

These and related developments have prompted a reassessment of the implication for U.S. energy policy as it seeks to adjust and manage a changed international energy market.

Demand forecasts.

EIA's long-term forecast for oil demand is similar to that of the International Energy Agency. Behind the 50 percent increase in oil demand to 2025 is a short-term demand forecast reflecting a continuing dramatic increase in the growth of oil demand.

Historically, short-term demand has grown only slowly. For example, it took 18 years for oil demand to grow from 60 to 70 mmb/d. However the increase from 70 to 80 mmb/d took only 8 years. Now, the IEA forecasts oil demand to exceed 90 mmb/d in 2010, only five years from now.

This pace of increase will require dramatic increases in investment and infrastructure all along the oil supply chain.

Even if continued high prices reduce this rate of growth, and absent a major economic or financial change, oil demand is expected to remain on an upward trajectory for the foreseeable future.

Given the long lead times in the oil investment cycle, the increased supply to meet this demand will have to come from areas with some surplus capacity, primarily the Middle East, as well as from new production in the Caspian, Latin America, Africa, West Africa, and the U.S. offshore Gulf of Mexico.

Beyond 2010-2015, production from the Arabian Gulf will account for the major share of incremental supply to the world market.

With U.S. oil production flattening increases in U.S. domestic consumption will be met increasingly from imports. This increased dependency will include both crude oil and, absent significant investment in domestic refining capacity, refined petroleum products.

Oil Prices

The period 2003-2004 witnessed a wide variety of supply developments contributing to the rapid increase in prices. These included: declines in Venezuelan production; domestic strife in Nigeria leading to reduced crude exports; strikes in Norway; concern over Russia's ability to sustain production and exports as a result of the Yukos affair and pipeline capacity concerns; sabotage and security concerns in Iraq; and, the sustained loss of U.S. production in the Gulf of Mexico resulting from Hurricane Ivan.

Oil prices remained high in spite of increases in production from OPEC member countries. The quality of the OPEC crudes being offered to the market was less attractive to refiners who were competing for the higher quality crude oil leading to price discounting for the surge capacity offered to the markets.

The most significant cause of higher oil prices was higher demand, however. Growth in Chinese and U.S. oil demand accounted for the majority of the worldwide increase.

With supply continuing to be stretched and demand forecasts continuing to be bullish, most analysts expect oil prices to remain at or near current levels for the next year or two. Whether these prices demonstrate a cyclical or a structural change in oil prices is a major question.

For many of us the change appears structural as industry and consumers adjust to the higher price levels. At the same time, there is also likely to be a correction in response to market developments.

New Competitors in the Market Place

The emergence of China in both the trading and investment markets has prompted speculation if not concern. In the trading market, China has emerged as a new competitor for worldwide crude oil in response to its increasing demand and short term peaking of domestic production.

Of equal importance is the emergence of Chinese investment in both OPEC and non-OPEC countries. Chinese companies have aggressively pursued oil investment opportunities in, inter alia, Kazakhstan, Sudan and Australia, and is considering deals in Venezuela, Canada, Russia and Iran. China, as a matter of strategic importance, appears determined to lock up long-term supplies in expectation of continuing tight markets.

Private companies complain that the ability of the Chinese to outbid them for attractive prospects reflects their lower cost of capital and ability to offer political sweeteners and perhaps guarantee better prices. At the same time, there is at least one example of China winning a closed auction indicating that the record of Chinese investment practices is mixed.

The practice of tying commercial investment to politics and finance to acquire oil supplies is not new. The French government pursued a similar strategy in the late 1970s rather than join the International Energy Agency with its reliance on multi-lateral cooperation and market-based strategies.

Whatever the nature of the deals, Chinese oil trading and investment strategies carry the potential to lock up attractive additional opportunities at the expense of private investors and, of equal importance, reduce the liquidity in the trading market as the crude it obtains is likely to be dedicated solely for use in the Chinese market.

Bilateral oil deals involving consuming governments are a two edged sword for a producing country. On the one hand they appear to offer a guaranteed and growing market for incremental production, something producers have sought for years. However such access may come at the expense of price, as Chinese investors and buyers try to leverage guaranteed access to the market in exchange for lower prices.

Implications for U.S. policy

U.S. policy since the Carter Administration has been to rely on private investment, international commercial decisions on investment and trading activities, and access to a generally fungible international market to supply the United States. The

United States has been able to leverage access to an attractive domestic market in which to invest and sell under commercial terms to encourage sales and investment. This strategy has worked.

The question is whether this strategy can continue to assure supplies at the levels required and at acceptable prices.

Worldwide investment over the past year in the oil sector has reportedly been below levels needed to effectively meet increasing short-term demand. In addition, and in spite of higher prices, private companies appear to have had difficulty replacing oil reserves over the past year. The reasons appear to be numerous and involve a failure to obtain access to promising opportunities, delays in bringing new production on stream, and changes in investment terms.

Several producing governments have radically changed investment terms by increasing the government share of the investment, unilaterally changing investment laws, and increasing the government financial take.

These developments can have serious consequences. They can reduce the attractiveness of international investment particularly in those countries expected to provide incremental production. Abrupt government decisions to abrogate the financial terms of the investment contract can, at a minimum, reduce the reinvestment opportunities needed to continue to increase production. Such action also reduces the amount of money available to private investors for investment. And, most importantly, these practices tend to have a dampening affect on the addition of new short term oil production to meet the expected demand growth, helping to maintain high prices if not increase them while doing little to improve the supply demand balance over the mid to longer term.

It is in this context in which the debate over the future of U.S. energy policy is being framed.

Mr. GIBBONS. Thank you very much, Mr. Hegburg. And I appreciate your testimony, too, because yours is the economics of investment, which is very important.

I always want to ask a few questions, if I may, and beginning with you, Mr. Hegburg, because what I see is a difference between large national oil companies and small private oil companies and the way that they're able to—small companies aren't able, I should say, as readily or with the same economic efficiency as national oil companies—to attract capital. Why—how do you explain that? I mean, they're all dealing with the same commodity at the end, but we've got a lower rate or a lower or a better—or sweeter, I should say—capital infusion with national oil companies than with the smaller private oil companies. Why is that?

Mr. HEGBURG. Mr. Chairman, can I just make sure we're talking about the same thing?

Mr. GIBBONS. You must, because you're talking to a geologist here that doesn't know what he's saying. Go ahead.

Mr. HEGBURG. National oil companies, to my mind, is a State oil company, such as Saudi or Amoco or Kuwait Petroleum Company. Then there's the international majors, which are privately owned—ExxonMobil, BP, Shell. Then there are the smaller, independent companies which are the companies that vary greatly in size in the United States. Also, there are a number of independents overseas in other countries.

If the question is can the smaller companies attract capital? Some of the larger independent companies can, and they are in the international marketplace, and you will see them in Egypt and Algeria. Some of them are very interested in Libya and have actually obtained acreage. Their strategies vary in terms of investment. They will sometimes try to get a position and then farm out that position to a larger, better financed company to help them pay for it and take a smaller share, depending on what they've found.

Also, they may be in consortia. International companies, both the independents as well as the large international majors, normally bid in consortia, as opposed to individually. And that means smaller companies can come in and take in 5 or 10 percent, which reflects their position. And it happened in Azerbaijan; for example, there were a number of smaller companies that came into consortia in the early days of Azerbaijan.

The very small independents in the United States obviously have a problem making—having enough money to play in the big areas, so unless they consolidate or find something else, they are essentially excluded from the international marketplace. Now, they can go to Canada, which is relatively simple for them to invest, but getting into a larger play somewhere internationally is partly a function of capital, partly a function of human resources. And just from my own experience, at least one large company I'm aware of, when Russia opened up, decided not to go into Russia because it would have tied up its human resource capacity in the company, which meant it would have committed, its geologists and financial people and lawyers and production engineers would have been committed to Russia, and the payouts in Russia look very long.

So it was not an economic decision to go into Russia, in spite of the high degree of probability that they could find reserves.

Mr. GIBBONS. So really the difference between large international companies and the smaller private companies in terms of the cost of capital required to produce the same product or the same oil from the same oil field is basically due to, in terms of what I understood, the risk involved with a smaller company versus a larger company?

Mr. HEGBURG. I think that's it. There is a number of risk factors that a smaller company is not willing to take on. Large companies will take on a substantial amount of risk as long as their portfolio is diversified, and that they have some very high-risk properties and some very low-risk properties; so they're not all in one place and their risk is very high. And they have decided on their capital budgets that that's where they are going to put their investment.

And you will hear anecdotally in the industry now among the very large companies that they have a lot of cash, their capital budgets are large, but they're not being spent because they have decided to focus their efforts in 1, 2, or 3 countries. And this is a change because in the old days, if you look back since 1979, companies invested throughout the world in a variety of places and brought a number of new areas to the floor, Angola was one, Azerbaijan is one, Kazakhstan is one. These are all new producers in the marketplace. Azerbaijan was an old producer in the Russia system, but it's a new producer in the international marketplace. And that was largely because companies went out and invested in a wide range of places, in part because they did not find the U.S. Market attractive for investment for a variety of reasons, or in part because new areas were opened up, or in part because some of the OPEC countries did not allow them to invest, and of course that was Iran—because of U.S. sanctions—Saudi Arabia, Kuwait and the non-OPEC Mexico, which you couldn't invest.

So you went and looked at those places you think you could find oil. And of course that's what brought a huge amount of investment

to China, a lot of oil investment went into China. And they've had relatively good success, particularly in the Bohai and down in the South China Sea finding oil, but it was driven, in part, by opening up to foreign investment.

Mr. GIBBONS. Mr. Copulos, we heard testimony from the IEA representatives that were here talking about the 2020 timeframe for China and the increase of about 1.4-million-barrels-per-day consumption, which I was somewhat surprised, in reading through the testimony, that they say that that sort of change in the economic picture for China will have very little influence—or not very little influence on overall market trends. Do you agree with that or do you disagree with that?

Mr. COPULOS. No, I think it's utter nonsense. China and India together, particular—Asia in general, but China and India in particular are going to be driving the world oil market for decades to come. They said that you could see—for example, at the same time they said you could see China automobile ownership increase from one in 1,000 to one in 100. Well, if you do the math, that's 120 million automobiles that suddenly are on the road. Now that's going to be a major factor.

Also, at the same time that you're seeing this growth of Chinese and Indian and probably Philippine and Indonesian consumption, you're also going to see a decline in a lot of the world's older oil fields unless a lot more is found, and certainly in terms of the U.S. So it means, among other things, that we're going to be competing much more vigorously with the Chinese for overseas supplies if we don't do something more to develop what we have here at home.

Mr. GIBBONS. Well, can we make up our own energy shortfalls by depending upon increases in efficiency and renewal of energy sources in this country?

Mr. COPULOS. No. When people talk about, for example, the CAFE standard automobile mileage, if today you wanted to offset our imports using CAFE, you would have to average 420 miles to the gallon. Now, my car doesn't quite do that, but the trouble is that's a moving target, because as we add more automobiles and domestic production were to decline, you would have to be running ever faster to stay in place. So it's one of those things designed by the left.

Mr. GIBBONS. So if we do nothing, in other words, if we keep status quo on our domestic production in this country, we're going to ultimately end up with an enormous trade deficit by the imported energy alone. What do we need to do in this country, in the United States, to increase domestic production or domestic—from domestic supplies of oil and gas?

Mr. COPULOS. Well, let me begin by saying there is no need for us to be importing any oil whatsoever, we can do it domestically. And what we need to do first and foremost is to open up those areas to development that are most evident where we know we can do things. For example, if we went into Alaska, we've got 104 trillion cubic feet of stranded gas up in Alaska. If you were to build a gas-to-liquids plant up there, convert that, that's 16.6 billion barrels oil equivalent. If you went into ANWR next door, the U.S. Geological Survey estimates that at 10 billion barrels—of course they've never been right on an estimate, in my recollection, they

tend to be very low, but let's take their number, 10 billion barrels, then there's an onshore deposit of methane hydrates, which is equivalent to 519 trillion cubic feet of gas, or about 82.9 billion barrels of oil converted from gas to liquids to fuel. So right there you have 4 times our current proved reserves in just those 3 items.

Then we have our offshore oil and gas, which is an enormous resource we've barely tapped. We have 500—and I'm using the low USGS estimates on this by the way—530 billion barrels of oil equivalent in oil shales, that's twice Saudi Arabia's prove reserves. We've got 275.1 million tons of coal which can be converted using clean coal technology, and that doesn't even begin to get the real foreign burner, which is methane hydrate. So as I said, we've got 320,222 trillion cubic feet of natural gas, 51.1 trillion barrels of oil. So we can do it.

What has been lacking is not the resources, what has been lacking is not the technology—and I should also add, we do have a lot of alternatives that have value—what has been lacking is a political will, and until such time as we find the political will, we're going to stumble along.

I was telling one of the staff people here I ran across a piece I wrote in 1978 that said that by the year 2010, we would be importing 70 percent of our oil, and we would be paying \$65 a barrel if we did nothing to resolve the issue. Well, 5 years from now—I may have been a tad high on the percentage and a tad low on the price, but we're pretty much in that ballpark. And I didn't come to that conclusion because I'm some kind of a genius, it's because I could add and subtract and look at decline rates, and increases in consumption. It's not rocket science to figure it out. It's also not rocket science to figure out the solution, which is to use what we have, use it efficiently, use it cleanly, but use it.

Mr. GIBBONS. What will it take to move the political pendulum, in your opinion, in a direction which will allow for decisions to be made, policy decisions to be made in this country to promote, for example, the utilization of oil shale methane hydrates, additional oil fields that we now know are out there, ANWR, et cetera; what is it going to take?

Mr. COPULOS. Well, I have seen it twice in my lifetime—I've been doing this about 31 years—and the first time was the construction of the Trans-Alaska Pipeline System, which had enormous opposition until the 1973 embargo, and all of a sudden prices went through the roof, supplies were short. The second time was during the Iranian oil boycott war, about three things mixed in altogether there, when again, prices went up real high, supplies were short. And we made so much progress on that, few people know this, that by October of 1985, Saudi Arabian exports to the United States had fallen to 27,000 barrels a day. It panicked them. They entered into force measure provisions in their contract to cut oil prices in half. By April Fools Day, 1986, the spa price was actually \$9.99, but the result was they went from 27,000 barrels a day of exports to the U.S. To over 800,000 in a very short period of time. And in the process, by cutting the price, destroyed much of the U.S. Independent oil industry and caused a huge number of stripper wells to be shut in, losing an enormous amount of domestic production.

Had they not done that, I don't think we would be sitting here today talking about this issue.

So it's two things, it's price and supply; and frankly, supply more than price. People will find a way to pay for energy no matter what it costs, but when there are gasoline lines out there they start shooting each other.

Mr. GIBBONS. Mr. Hegburg, you wanted to make a statement.

Mr. HEGBURG. Thank you, Mr. Chairman.

Could I just make a couple of observations? I don't want to get into the debate about ANWR and CAFE standards, but it seems to me there's a couple of things to look for. One is, in the transportation fuels market today in this country, we're seeing alternative fuel penetrate the market, so the market may be driving us somewhere to reduce our reliance on pure gasoline; that is possible, and that will actually have an impact on our transportation fuel demand, which is the core of the import problem for the United States. I'm not saying it's going to be within a couple of years, but in fact it is happening.

And it may take a different form, but the fact that we do see alternative fuels emerging in the marketplace—and not just what CNG and others suggest, but there is an opportunity out there to reduce the demand that we have and the growth in demand for gasoline in this country.

Mr. GIBBONS. Let me follow that up because I think that leads to a very important part of this question, part of the equation, and that is that would require a dramatic increase, as you stated, in investment in infrastructure because alternative fuels are going to require, as Mr. Peterson said, construction of new highly complex, very technical shipping requirements, ports for LNG, but if you've got some of these alternative fuels, you're going to require a new infrastructure to replace current and existing infrastructure.

Where do we go to get that level of international or national investment that's going to be required for this?

Mr. HEGBURG. Thank you, Mr. Chairman. I was keeping metric gas outside the issue of transportation fuel and focusing on the oil alternatives to oil transportation and better use of transportation fuels in the oil sector. There is no question infrastructure investments will have to be made, we're going to have to make them anyway. I mean, the point is, as I was saying earlier, we need more infrastructure investment in the United States, whether it's in imports, whether it's in refining, and everything else. And it happens when returns attract the capital. And if you anecdotally talk to refiners today and ask them why are they not investing in refining capacity at adequate levels, you think, well, it's the environmental question, it's the permitting question, and it's generally the return question. They are very hesitant in refining sector to make huge amounts of investment which is what the refining sector requires because they are very uncertain, particularly if they have a 3-year time horizon, that they could actually end up with very high-cost investment and very, very low or negative returns. So the markets have to sort of pick up on that.

Mr. GIBBONS. Very briefly. What does the government need to do to ensure or to encourage that kind of investment at this point, then?

Mr. HEGBURG. I hate to speak for the industry, because I have no idea what they would like from the government. In some places they would like better depreciation rates, they would like—some companies would like, in the case of Alaska, as you know, guaranteed rates at the well head for natural gas, and I think that is to protect from the down price pressures on natural gas, because I think as we have discussed earlier, LNG is likely to drive prices down in the United States, not up, and if that's the case, then the Alaskan gas is going to be very much like long-hall Russian gas in the 1970s, it was very expensive, and the net backs at the well head were very, very low. So there will be pressures for that; obviously there would be pressures for some kinds of fiscal incentives. I'm sure that you've all heard this from companies, but those are the kinds of things I can imagine that would be on the table for them when they start going down this road before they go to the investment decision.

Mr. GIBBONS. Well, it seems to me, then, it's going to take almost a crisis of some sort before government reacts then to some pressure from an industry to get them to move; because normally government doesn't move voluntarily in any direction unless there is external pressure of a magnitude which would justify, you know, changes to our policy at this point in time. So are we going to have to reach a crisis before we get government to act to do these things that should be done in a long-term anticipation of where this country's energy needs are going to be?

Mr. HEGBURG. Thank you, Mr. Chairman. I agree with you. A number of us have been surprised when prices went up over the last year or so that there was no huge reaction of the public at large. It did have a demand impact, obviously, not very great, unlike 1979 when people were lined up around the block to get oil.

What will it take? It may take a crisis, that's historically how we actually do public policy often. It also may just take, as I mentioned earlier, market changes, fundamental market changes which sort of occur in the current situation without a great deal of crisis when companies decide there is something to this, this market has legs, we need to be in this market, we will be late to the market, but we need to be in the market.

And it's conceivable that in the industry itself—and I think over the past month or so I have noticed a couple of CEOs are talking about energy policy and the need for energy policy and the need for changes in energy policy. Now they're not specific, but when the industry participants start talking about the need for changes, that suggests to me that they are willing to be public and say things that they otherwise wouldn't say in a marketplace where they were perfectly satisfied with what was going on.

Mr. GIBBONS. Before I release you gentlemen from this panel, I want to go back to Mr. Copulos, who talked a little bit about the increase in our dependency on 17 commodities, commodities that I think we're 100 percent dependent upon in this country. And you know that the value of imported raw and processed mineral commodities has increased, even though the volume of imports has declined.

Do you believe that we have a sound policy today regarding this problem; or do we need to have a new policy, an Interior

Department policy for not only recognizing, but collecting the information for this, that we're now seeing being stripped from our inventory of information that we collect all this?

So I guess two parts of that question: One, the economics of 100 percent dependence on 17 commodities. And second, the removal of information from our ability to collect that data and know where that data is leading us.

Mr. COPULOS. Well, to answer your first part, I come at this from a perspective of having been the author of the one and only Strategic Minerals Report done by the National Strategic Minerals Council in the White House—it was abolished right after that—and one of the things we learned at that time—

Mr. GIBBONS. When was that produced?

Mr. COPULOS. 1988. I actually have a copy somewhere in my files.

What we saw then was there was a lot of pressure to get rid of stockpiles, strategic stockpiles for budgetary reasons, one would be to sell it to help alleviate the deficit. The only trouble with that strategy is, as we learned in World War II and during the Korean War and many other times in our history, was that no matter what the stockpile costs—and we're only talking about minerals we can't produce ourselves and don't have a substitute for—it's a fraction of what it's going to cost you to—stockpiling is going to be a fraction of what it's going to cost you if you have to buy it in times of crisis.

We allowed our World War II stockpiles to be sold off and decline immediately after—in the immediate post-war period, Korea came along and we paid 8 to 10 times their value to replace them in a very short period of time under crisis conditions, which caused all sorts of other problems. When the Korean War broke out and during the Vietnam War, we had been dumping some of our nickel stockpiles, there was a Canadian nickel strike, and all of a sudden we wound up short of nickels. These things happen.

And so we have to hold ourselves harmless against them, especially when you're talking about, for example, gallium; gallium arsenide is fundamental to the manufacture of computer chips. And I don't think there is anyone who would argue that today the computer is not an essential element of our society, it also happens to be an essential element of our national defense with the new electronic battlefield that we've seen operate so effectively.

Graphite, which we tend to think of as pencils, is also what is being used to manufacture microchips. So we need a stockpile. Where we can develop substitutes through R&D we should. And we should also look into recycling. There are a lot of things like millable metals, and so on that you can recover from through recycling. And a lot of that's done, perhaps we need to make sure it's done to the maximum degree possible.

Now in terms of information, one of the reasons we were able to do the report that we did in 1988 is we did have access to that information, We had good information. You can't make good decisions without good information. I'm always in favor of having as much information available to our legislators as possible because the decisions they make are far too important to be made in the absence.

And if I might, I do want to add one brief thing that gets us back to energy a little bit. Talking about alternatives, because I think

one thing we need to really get into the record and start understanding is to start being honest about what alternative energy is and is not doing in our economy.

On the transportation sector, if you factor out alcohol fuels that are used as an octane booster and inoxygenate an extender. There are about 175,000 alternative fuel vehicles on the road today, the bulk of which you're seeing is your natural gas. So let's not argue that they are making a lot of inroads, it's simply not true, and we're fooling ourselves if we say they are.

The other thing is, in many cases the alternative fuel vehicles that are out there are dual-fueled, and they're using gasoline instead, and I can give you a longer list of examples. That's not to say they can't be used, shouldn't be used, or we shouldn't encourage them, but I think one of the things we need to do is start making sure that when people do acquire an alternative fuel vehicle, they actually use the fuel.

The second thing is we have to bear in mind that there are 220 million cars and light trucks that are currently in the United States today; they need conventional fuels, you're not going to go back and retrofit them, they've got an average life span of 16.8 years. And as long as they're on the road we're going to need—we looked at this in our 2003 report, and it was our estimate that it would take 25 years to make a transition from our current fuel mix to alternatives. I think that figure is still valid. It can be done, but we need to first make a decision that we want to do it.

Mr. GIBBONS. Thank you both very much. We're, of course, running out of time here for our panels, and I just wanted to sum up—first of all, I would like to show a slide if I could, if we could bring it up on the screen there for not just the panel, but for the audience as well.

As you look at that graphic up there, it's pretty much of a statement of the balance between the economic and environmental progress we've made between 1970 and the year 2000. And as you can see, since 1970, there have been emissions of six criteria pollutants that have dropped between 28 and 98 percent. And while in America we saw 164 percent increase in the GDP, a 37 percent increase in population, a 42 percent increase in energy consumption, and a 140 percent increase in vehicle miles driven.

Now, what this says is that we have significantly increased our gross domestic product in this country by vehicle miles driven, while at the same time reducing pollutants in six important criteria for air pollution.

I don't think we could achieve the reduction in our pollutants or the increase in the economic standard of this country without the state-of-the-art pollution controls and energy efficiencies from our factories, from manufacturing, in vehicles, and offices in homes throughout. So I think what the point of this slide is that it's clear the United States has the technology to both improve its economic base, as well as address air quality standards and reduce the pollutants in the air as well. So to me it's a very important indicator of the American ingenuity, the entrepreneurial skills in this country in order to balance out the economy that we have in this country.

And if we can go to slide 2, I think this is what we're faced with now as we look over there. We're looking at the problem of having areas of this country which are known sources of—known areas where there are resources for this country to develop, but they are off limits. When you look at that area for California, the east coast, the Florida coast and the Gulf of Mexico, the center part of the Rockies, all of that's literally off limits to oil and gas exploration and development. And as this country moves forward with its economic expansion, the population expansion, the demand for energy in this country can only increase if we expect to maintain our economic advantage in the world, and I think it's very clear to everybody and anyone who looks at this photograph that we've got to address some of the problems we have with the restrictions on our exploration for oil and gas if we're going to be able to supply the demand, supply the needs of this country. Even in, as many of you have said, the face of alternative fuels which are out there—which are necessary, they're needed, they're a critical component to the energy and economic picture of this country, but we've got to start looking at where we can produce these fuels, and what are our restrictions and why are we restricting ourselves from that. That, I think, was the fact and the issue that Mr. Peterson was talking about.

We have created our own binding restriction on this country by ourselves by refusing to allow oil and gas exploration—for whatever reason, whether it's aesthetic purposes, NIMBY purposes, whatever you want to call it, the not-in-by-back-yard-issue, which I think hurts us, harms us economically tremendously in our ability to get over the importation of foreign sources of energy for this country.

With that said, let me wrap this up because many of you have been here longer than had anticipated for this hearing. I do want to thank you gentlemen, and as I said to the previous panel, we will submit written questions to you, we would ask that you look at those questions, and of course respond to us in writing for additional questions that me or members or staff of this Committee may have. With that, I want to thank both of you very much for sticking around that extra time, understanding the Congressional schedule being part of our Committee, giving us what I think is probably some of the most insightful testimony and interesting facts with regard to where this country is going regarding our energy portfolios, where we're going economically. Where we need to be going in the future is a very critical policy decision that we in Congress have to make. And your assistance, your help, your insight and guidance is a big part of that overall picture.

So with that I want to thank you both. I want to release the second panel, and with that, in addition, this Subcommittee hearing is adjourned.

[Whereupon, at 12:40 p.m., the Subcommittee was adjourned.]

