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MANAGING ENERGY MARKETS

BIJAN MOSSAVAR-RAHMANI
EDITOR
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The XIV Repsol YPF–Harvard Seminar, Managing Energy Markets, was held in June 2004 in A Coruña, Spain. Like previous sessions, this gathering brought together an outstanding group of senior representatives of governments, international organizations, industry, and academia from more than a dozen countries for two days of lively discussion of developments in global energy markets and their implications for public policy and corporate strategies.

The meeting was kicked off with an introductory presentation by Repsol YPF’s Alfonso Cortina and a keynote presentation by Harvard University’s Joseph S. Nye. The rest of the Seminar was fashioned around three panels, each initiated by several invited papers and then opened to discussion by all the participants.

Irwin M. Stelzer of the Hudson Institute was prevailed upon again to serve as Seminar rapporteur—to prepare, in real time, a summary and conclusion of both presentations and the ensuing debate. His was
a broad mandate: note agreements and disagreements, make sense of what was said, point out what was missing, and draw conclusions.

Another long-time Seminar participant, Bijan Mossavar-Rahmani of Mondoil Corporation, was, also once again, recruited as Guest Editor, to help edit and supervise the publication of these proceedings. Constance Burns, John F. Kennedy School of Government, is the Repsol YPF–Harvard Seminar Series Editorial Director.

Needless to say, the presentations made to the Seminar and edited versions reproduced here reflect the views of the speakers and not necessarily those of the entities with which they are associated, nor the organizers of the Seminars.

The participants are indebted to the Fundacion Repsol YPF’s José Luis Díaz Fernández, Harvard University's William W. Hogan, and Repsol YPF’s Alfonso Cortina, and their respective colleagues and staffs, for assembling another distinguished group to debate issues of pressing importance to global energy markets. Alfonso Cortina stepped down as Chairman and CEO of Repsol YPF in the fall of 2004 as this volume was prepared for publication. His institutional support for—and substantive contributions to—these Seminars have been invaluable.

Finally, for the first time, participants included three Repsol YPF–Harvard KSG Fellows—participants in a multi-year program set up at the John F. Kennedy School of Government and sponsored by the Fundacion Repsol YPF to encourage and support advanced graduate students, academics, and other professionals who wish to pursue research on energy-related issues.
MANAGING ENERGY MARKETS
It is a great pleasure to welcome you to this XIV Repsol YPF–Harvard Seminar on Energy Policy. Our XIII Seminar, held in Salamanca in May 2003, was entitled *Thinking the Unthinkable*. On that occasion, the debates analyzed the post–September 11 global reality and challenged us to stretch our imaginations and ponder such previously unpredictable scenarios as the destruction of the World Trade Center, the collapse of certain giant corporations, and the war in Iraq. Sadly, the unthinkable happened again in Madrid on March 11, 2004, when Spain was attacked by terrorists and plunged into great desolation. We extend our deepest condolences to the hundreds of victims and their relatives. The Madrid attack was not an isolated event, but just one of the many violent episodes that have not only taken lives, but also greatly disturbed world markets, particularly the energy market. The political uncertainty created by the threat of terrorism weighs heavily on the world economy. Calculations show that in 2003, political risks reduced world gross domestic product (GDP) by 0.25 percent, or some $800 billion. If the situation does not improve, this cost could surge to $1 trillion in 2004, in terms of economic growth and corporate investments alone.
Now let me turn to another recent event, more predictable and encouraging: the enlargement of the European Union to 25 members on May 1, 2004. Both economically and socially, this event was enormously important for our continent and the entire world. In the long term, the enlargement signifies a European commitment to creating a great economic power consolidated in stability and prosperity. The European Council’s recent decision to approve the treaty for a European constitution, now awaiting ratification by the citizens of the 25 member states, provides a ray of hope in this troubled and divided world. I contemplate with great satisfaction an image of Europe firmly pressing forward toward unity, continuing the journey it began in 1951. The constitution’s preamble declares the European peoples’ vigorous determination to forge a common destiny, to build a continent that is open to culture, learning, and social progress, to deepen the democratic nature of its public life, and to strive for peace, justice, and solidarity throughout the world. The new Europe of 25 has been created at a relatively favorable time.

At last year’s Seminar, I joined with those predicting the end of a low economic cycle and the beginning of a global recovery. Happily, those expectations were realized. Since the last quarter of 2003, the global economic recovery has grown stronger and more widespread. As a result, the International Monetary Fund (IMF) predicts 4.5 percent world growth in both 2004 and 2005. Due to global recovery, an upsurge in international trade, and sound financial conditions, the risk factor in the 2004 forecast has declined.

The forecast for 2005 predicts particularly strong growth in developing countries. In emerging Asian economies, commodity policies and competitive exchange rates are sustaining robust growth. The positive outlook for Latin American countries is especially important. After four years of slow growth, a sharp increase in global trade and commodity prices should bring regional GDP growth close to its potential. Higher GDP growth is expected in sub-Saharan African countries, supported by the combination of greater political stability and higher international commodity prices.

Among industrialized nations, the United States leads the growth recovery. Japan is also growing, powered by strong external
demand and the recovery of investment. The “Euro Zone” is finally experiencing recovery as well, albeit at a slower pace. We can expect that growth to accelerate in 2004 as the global cyclical recovery, driven by improvement in the rest of the world, takes hold in the Euro Zone. The enhanced economic scenario, which emerged at the end of 2003, gathered strength during the first quarter of 2004. Despite the strong euro, increased private consumption and business investment, coupled with the surge in world trade, have contributed to an increase in European exports.

In the first five months of 2004, economic growth was roughly based across sectors. Recent short-term indicators, including industrial production confidence indicators, suggest that this recovery will probably continue for the rest of the year, supported by sustained growth in services and industrial production. Only a significant appreciation of the euro would jeopardize this prediction. Nevertheless, certain problems linger that may prevent sustained high growth rates in the long run. Persistent rigidities in product and labor markets will limit potential GDP growth rates. As a result, structural reforms are a key issue in considering how to deal with reduced long-term growth potential.

Despite the generally positive economic outlook, several risk factors threaten to cloud the forecast. First, the imbalance of payment between regions and countries could lead to exchange rate volatility. Second, some Organization for Economic Cooperation and Development (OECD) countries lack the political thrust to undertake structural reforms. Third, persistent barriers still hinder progress toward freer world trade, especially in agricultural products. Finally, there are fears that higher oil prices could significantly reduce world economic growth.

This last concern, the issue of oil prices, merits special attention. Let us first consider the oil market and then discuss the economic effects of the price changes. Since last year’s Seminar, the long-term price of oil has changed substantially. Five-year Brent swaps fluctuated in a band from $21 to $22 per barrel in June 2003. Today, this band ranges from $31 to $33, reflecting the largest increase in the past 20 years.
This year’s Seminar, Managing Energy Markets, could not be more timely, as our debates will highlight varying perspectives on the issues behind the change in the price outlook. Some of the basic forces that have driven long-term oil prices to the current level should be briefly explained. One of the important factors is precisely the positive scenario for the global economy outlined above. Currently, the main force driving robust global demand is the forecast for a strong GDP growth rate this year and next. In this respect, higher growth rates in the United States and emerging economies such as China and India merit special attention.

Oil demand in 2004 is expected to grow at its highest rate in the past decade, reaching 81.1 million barrels per day (mmb/d). Forecasts indicate that consumption growth may slow in 2005, but will remain strong over the next several years. In fact, one of the factors boosting oil prices is that demand in countries such as China and India leaves further margins for growth. These countries are immersed in the early stages of industrialization. As a result, their current consumption per person per year, 1.5 and 0.65 barrels respectively—lower than that of the industrialized European average of ten barrels per person annually—is expected to increase in the future.

The leading role China has played in this demand is remarkable. In 1992, China was self-sufficient in oil, even exporting small volumes; by 2003, it was a net importer of 2.85 mmb/d. In 2003, Chinese consumption grew approximately 11 percent, while average world consumption increased 2.1 percent. The Chinese share in annual world consumption growth has increased so intensely in recent years that between 1998 and 2002, China was responsible for 50 percent of the increase in world oil consumption. At the end of 2002, Chinese oil reserves amounted to some 18.3 billion barrels, which represent only nine years of consumption at the 2003 rate, or 15 years of present domestic production. China will unquestionably remain the main driver for all market demand during the next few years.

The apparent lack of response to price increases is another factor behind the strength of demand. Although gasoline prices in the United States are at an historically high level, 38 percent higher at the
pump in June 2004 than six months earlier, demand continues to grow. One explanation for increasing demand growth is that the share of transportation in final oil consumption is much higher now than it was in the 1970s or 1980s. Demand for private transport seems much less elastic than for industrial use or electricity generation.

Demand, however, is not the only element in the equation. Several supply-side concerns are among the fundamental factors driving the market, owing to a capacity constraint caused by a number of significant factors. First, a reduction in production capacity has been deepened by an apparently permanent loss of capacity in Iraq and Venezuela. In addition, Organization of the Petroleum Exporting Countries (OPEC) policy seems to have shifted. Faced with demographic changes due to high birth rates, key producers are attempting to achieve higher average long-term oil prices. The technological advances made in increasing oil production during the 1990s have begun to lose momentum. Production rates have recently matured in OPEC producing areas, and cost curves have moved upward.

The list of critical factors should also include the lack of spare capacity caused by lack of investment in several energy industries, including oil refining, natural gas production, and power distribution and transmission. As a result, the surplus energy capacity of the 1990s has vanished. Lack of investment in non-OPEC countries and the resulting low levels of production will give OPEC countries a prominent role in balancing global oil supply and demand.

Geopolitics is also a key driver of energy prices. While the situation in the Middle East may not be the worst the region has seen, the crisis has directly affected Saudi Arabia, which is the leading exporter and the country with the world’s largest oil reserves. Because Saudi Arabia is the only country with enough spare oil capacity to respond rapidly to market requirements, the oil market is especially sensitive to the political situation in that country. In the coming years, oil market players will closely monitor geopolitical events, particularly diplomatic relationships between Saudi Arabia and the United States.

In short, the recent increase in long-run oil prices is being driven by the combination of unexpectedly higher oil demand
growth coupled with oil supply bottlenecks from lack of investments, an increasing depletion of oil fields, and uncertainty about the security of the Middle East’s oil supply. The structural change toward higher prices, therefore, is based on both demand and supply considerations and on a potentially disruptive geopolitical situation.

How will these higher prices, real and projected, affect the global economy? If prices continue to rise, this question will probably return to the forefront of economic discussions. To echo Rodrigo de Rato, Managing Director of the IMF, increases in economic strength and rising demand are likely to compensate for oil prices that are now $5 per barrel higher than predicted in the IMF’s April 2004 World Economic Outlook. The short-term economic outlook does not, therefore, appear to be in danger. Nevertheless, oil prices are a key variable in economic growth, and there are several transmission channels for oil price increases. The effect of a change in oil prices depends on the channels in play, the positions in the economic cycle, and the economic structure of each particular country. In the case of net importing countries, an increase in oil prices means a reduction in income available for other goods. The heavier a country’s dependence on oil imports, the greater the loss of income. For exporting countries, higher oil prices increase national revenue, although some of those earnings are offset by losses due to lower demand for other export goods in net importing countries.

Nonetheless, increases in the price of oil will have an important impact on economic policy regarding inflation, world trade, and alternate energy sources. In the past, high oil prices have been accompanied by high inflation and significant increases in global interest rates. Tightening financial conditions have caused a decline in the consumption of goods and services as well as in investment in importing countries. Structural rigidities in the labor market have prevented the reduction of nominal salaries, while losses in purchasing power and lower demand have led to higher unemployment. The Impact of Higher Oil Prices on the World Economy (2003), a study by the International Energy Agency, suggests that the cost of a $10 per barrel increase in the price of oil is a 0.5 percent reduction of GDP in
industrialized countries and a 0.75 percent reduction in developing countries. Indeed, non-oil exporting, developing countries often suffer most from oil price increases, particularly because their output is generally more energy-intensive and less energy-efficient. In addition, spillover effects such as interest rate increases in the developed world have a higher indirect impact on the economies of developing nations.

With respect to the current oil price increases, however, several conditions suggest a more optimistic outlook.

- Higher oil prices have been accompanied by an increase in other non-energy commodity prices. This indicates that not all developing countries—those most deeply affected by past oil price increases—are suffering a decline in trade. This time, non-oil exports have increased both in price and volume, allowing developing countries to compensate for the higher price of imported oil.

- Global nominal interest rates remain at historically low levels. We should expect a change in the interest rate cycle in the very short term, at least in the United States, but low inflation will prevent interest rates from rising to dangerous levels.

- The economic situation in developing countries has improved significantly. In most such countries, inflation remains under control, and fiscal policy has improved dramatically. In addition, many developing economies have adopted floating exchange rates, which provide a higher degree of flexibility for absorbing price shocks.

To summarize, we are currently in a period of economic expansion, and the United States and Asia have emerged as the main players. Although some economists have pointed out that rising oil prices may put a brake on growth, the current price of oil suggests that such a risk is low. The three sessions of this Seminar will discuss the possibilities and implications of more and less optimistic scenarios for energy markets. These debates will be especially stimulating and the conclusions we reach will give us a deeper understanding of the world economy and the energy outlook for the near future.
To understand the relationship between oil policy and political transformation in the Middle East, one must first examine the role American power plays in the world. Thus, my remarks will focus on American power, and I will allow this knowledgeable audience to draw their own conclusions regarding implications for oil markets and the Middle East.

Certainly a contentious and ongoing debate surrounds this linkage of oil, the Middle East, and U.S. power. At the 2003 meeting of this Seminar, for example, the keynote speaker speculated that the absence of U.S. military power from the Middle East would not affect long-term oil prices because any regime there would need to exploit its oil revenues. I disagree strongly with that prediction. Assuming that any Middle East government will be eager to export oil to earn revenues, while logical, also assumes that the leaders of those governments are rational actors. This is not an assumption that one can afford to make. The political reality would depend on the type of regime that emerged from a power vacuum. If a radical fundamentalist regime,
uninterested in maximizing domestic income or supporting world oil markets, gained control of an oil-rich country, a prolonged disruption of oil from the region could quite possibly result. Even a regime that desired to export oil might, if immersed in a chaotic coup or civil war, be incapable of doing so for an extended period of time.

While the potential effects of decreased American power in the Middle East may be debatable, considerable consensus surrounds another of last year’s predictions—the possibility of another large terrorist attack. With this prediction I must, unhappily, agree. The world will see further large-scale terrorist acts, and energy supply systems are among the most likely targets, due both to the vulnerability of energy supplies and to the broad global economic repercussions of such attacks.

The role of American power is highly relevant to a discussion of the future of oil markets because all markets depend upon a framework of political power and security. In well-ordered systems, security is taken for granted. To cite a common analogy, security is a lot like oxygen: you do not even think about it until you miss it, but once you begin to miss it you cannot think about anything else. In discussing markets, then, one must consider the larger context in which markets breathe.

However, in assessing that larger context—including notably, American power—in which oil markets breathe, one must be wary of making predictions based on linear projections from current conditions. These typical models, while easy to create, often fail to predict the most significant events. When chairing the National Intelligence Council, which prepares intelligence estimates for the president, this author frequently told his analysts to take 99 percent of the variance for a particular problem and break down the most likely scenarios by percentage—for example, a 40 percent chance, a 20 percent chance, a 30 percent, and a 9 percent chance. Then, once they had given their best scenarios and assigned probabilities to each, they were told to identify conditions under which all the scenarios would be wrong and they would see something completely different from what they had projected. The analysts hated that process and claimed they had
thought everything through, based on a lifetime of experience, and had given their best scenarios. The comment back to them was, “Yes, but you can still all be wrong. What would it take to make you wrong?”

Looking at far-fetched assumptions was necessary to sensitize those analysts to the value of their future predictions. Considering the future of American power likewise requires focusing on the assumptions that underlie general projections of the security situation and its effect on oil markets.

The prevailing consensus about American power today is quite different from that of the very recent past. Perhaps 15 years ago, in the late 1980s, conventional wisdom claimed that the United States was declining, or even that the era of the “American Empire” was over. Paul M. Kennedy, the noted British historian who now teaches at Yale, wrote a best-selling book called *The Rise and Fall of the Great Powers*, arguing that the United States was following Imperial Britain and Philip II’s Spain into decline. In the 1980s, many people felt that American industry was likewise finished. In a book I wrote in 1990, *Bound to Lead*, it was argued, to the contrary, that the United States would be the leading country of the twenty-first century. While my answer may have been right, Paul Kennedy’s book earned all the royalties.

However, the collapse of the Soviet Union in the early 1990s produced a revised view of American power. This new view pronounced that the world is unipolar; there is only one superpower. With no counterweight to American power, some argue, Americans can do whatever they wish. This view, what columnist Charles Krauthammer calls “the new unilateralism,” is only half right. It is certainly true that, for at least the next few decades, neither China nor the European Union is likely to provide a real counterbalance to American power, and the United States will remain the world’s only superpower. Nevertheless, the new unilateralism theory is quite wrong because it fails to consider changes in world politics that render such a perspective irrelevant.

The terrorist attacks on September 11, 2001 vividly illuminated two changes that had taken place in the late twentieth century. One
was the rapid increase in globalization, by which is simply meant interdependence at intercontinental distances. While globalization in a broad sense is as old as human history, it has become much quicker and thicker in recent decades. For example, most Americans in the 1990s believed conditions in Afghanistan were dreadful but relatively unimportant to their daily lives. On September 11, Americans discovered that the state of a poor, weak country on the other side of the world could indeed matter very much.

The other late-twentieth century trend that the terrorist attacks illuminated was the dramatic change in technology. The tremendous decrease in costs, particularly of computing and communications, led to what one might call the “democratization of technology.” To cite one example, the price of computing power declined about a thousand fold between 1970 and 2000. If the price of an automobile had declined as rapidly, a car would currently cost $5. Whenever the price of a technology drops dramatically, barriers to entering the market fall. In terms of world politics, this development empowered non-state groups, permitting them to engage in activities previously restricted to large organizations with large budgets. In 1970, it was possible to communicate instantaneously and simultaneously from A Coruña to Rome, Ulan Bator, Brasilia, and Moscow, but it required the budget of a large organization such as Repsol YPF or the Spanish government. Today, anyone can accomplish the same communication in an Internet café, and pay almost nothing. To consider another example, one of the American government’s most closely guarded secrets during the Cold War was the existence of satellites that could photograph anywhere on Earth with one-meter resolution. Today, anyone can buy a one-meter resolution photograph online for approximately $79.

This is the democratization of technology. Non-governmental groups and non-state actors have been empowered, and it is not surprising that their numbers have increased tremendously. As a simple illustration, non-governmental organizations (NGOs) increased in number, according to one estimate, from 6,000 to 26,000 in the 1990s alone. Another kind of non-state actor that has burst into great strength, however, is the terrorist groups.
Terrorism has existed for centuries, but the recent democratization of technology has empowered terrorists in a new way. Organizations like al-Qaeda have a new ability to maintain loose cells but to coordinate them across 50 or 60 countries, leading to the unprecedented lethality of modern terrorists. Many terrorist attacks occurred during the twentieth century, but the most lethal of them—an Air India flight bombed by Sikh extremists—killed 329 people. By comparison, almost 3,000 people died on September 11. It is not far-fetched to imagine terrorists acquiring nuclear materials or biochemical agents like anthrax and killing hundreds of thousands or millions of people. The deliberate murder of millions of people is not new, but was an all-too-common twentieth-century occurrence under rulers such as Adolph Hitler, Joseph Stalin, and Mao Zedong. In those cases, however, mass murder required the apparatus of a totalitarian government. Governments are still relevant, of course, but the stage is much more crowded. The new reality brought by changes in technology and globalization have transformed world politics to such a degree that the question of how strong the United States is compared to China or the European Union is partly irrelevant. The key question is, can the United States, or any government, deal with the new nature of this threat?

It is important to contextualize the notion of power. Power is the ability to influence others toward a desired outcome, not a fixed absolute granted by certain resources. For example, we assume that oil is a power resource, but it has only become so since the industrial age. Uranium is a power resource today, but was not before the nuclear age. Whether specific resources yield power depends on context. In the twenty-first century, there are three different contexts of power. Consider the metaphor of a three-dimensional chess game, where one plays not only horizontally, but vertically as well. If one plays only the top board—in this metaphor, the board of military relations among countries—all the clichés about unipolarity and American hegemony apply. At that level, the United States does not face any challenge. By contrast, on the middle board—economic relations among countries—there is a balance of power. The United States cannot pass an international trade agreement without Europe,
China, or Japan signing on as well. The bottom board in this three-
dimensional game represents transnational relations, crossing bor-
ders beyond governmental control and ranging from infectious
diseases such as SARS and HIV to transfers of massive funds to the
drug trade and, of course, to terrorism. At this level, it is senseless to
speak of “the world’s only superpower,” unipolarity, or an American
empire. Power is distributed chaotically, and issues can only be
addressed through cooperation among governments.

The new conventional wisdom regarding American power—the
new unilateralism—is a dangerous form of one-dimensional thinking
that concentrates only on the top board. Playing on only one board
in a three-dimensional game guarantees that, in the long run, you
will lose the entire game. Iraq is a perfect illustration. American mili-
tary capacity guaranteed a brilliant, sharp, short campaign that
achieved military victory in a few weeks and with a very small num-
ber of troops. When it came to winning the peace, however, the sit-
uation became much more complex. With a shortage of troops and
international support, the United States is currently paying a very
high price for its one-dimensional thinking.

This new conventional wisdom regarding power focuses very
heavily on “hard power,” which is easy to measure by the size and
resources of the military. It fails, however, to consider adequately what
is described as “soft power.” To understand soft power, consider the
three ways one can exercise power, that is, influence others to achieve
a desired result. First, there is threat by coercion, commonly called
“sticks.” Alternatively, one can induce with payments, or “carrots.” A
third option, however, is to attract and co-opt, and that option is soft
power. In the past, people have also referred to this tactic as “winning
hearts and minds.” Some people say such thinking is irrelevant to the
new types of threat we face from terrorists, because you can never
attract an Osama bin Laden or al-Qaeda. While that is certainly true,
you can prevent them from recruiting effectively. The greatest threats
that we face come from the bottom, transnational, board. We must
lure people away from radical extremists.

To believe that the current terrorist threat is a clash of civilizations
is to mistake the nature of the problem. The real problem is a clash
within Islamic civilization. A small group of radical extremists who use force to impose their religious view on others is engaged in a civil war against a much larger group who mostly want the same things Westerners want: a higher standard of living, better education, opportunities for their children, health care, and a sense of dignity. Unless the hearts and minds of that larger group are won, a war on terrorism will never be won. U.S. Secretary of Defense Donald Rumsfeld has recently said that it cannot be known if the war on terrorism is being won. In his words, the question is whether more terrorists can be killed or deterred than the numbers that the madrassas produce and al-Qaeda recruits. Or, to use other terms, the question is whether those killed with hard power outnumber those we helped al-Qaeda recruit by the crude ways in which we use that hard power. Judging by public opinion polls, we are not faring well at all.

The United States has lost a great deal of its soft power during the last several years. For example, Indonesia, the world’s largest Islamic country, is desperately needed to defeat the Jama’a Islamia, a local offshoot of al-Qaeda. Polls in 2000 showed that three-quarters of Indonesians held a positive view to the United States. After the Iraq War, only 15 percent did. That’s quite a drop. Jordan and Pakistan are frontline states in the war on terrorism and are often described as friendly. Polls taken in April 2004, however, show that more Jordanians and Pakistanis admire Osama bin Laden than George W. Bush. Pakistani President Pervez Musharraf must balance America’s request for help with the risk of antagonizing public opinion at home. When the domestic opinion of the United States falls so low, leaders will obviously be less helpful than they might have been if Americans used soft power more wisely.

America’s inability to think three-dimensionally about power and its fixation on linear projections has led to a dangerous decline in American power in the last two years. The United States went to war in Iraq for three major reasons. The first was to prevent Saddam Hussein from developing weapons of mass destruction. If I had believed he actually had that capacity, I would have supported the war. The second reason was the belief that Saddam was supporting al-Qaeda, and this point is still disputed. The intelligence agencies say
any connections were likely not collaborative, meaning that while there may have been some contacts, it is unlikely the Iraqi regime supported the terrorist attacks on September 11. More importantly, the intelligence agencies now say that the net effect of the war in Iraq has been to strengthen whatever relationship existed before the war. Indeed, the war has proven to be a major source of recruitment for al-Qaeda, not only in Iraq, but throughout the Islamic world. The third reason for the war was the United States’ plan to transform the Middle East. A headline in The Wall Street Journal expressed the common view that “The Road To Jerusalem Goes Through Baghdad.” Spearheaded by the United States, regime change and democracy in Iraq would solve the Middle East’s larger problems.

Such a contention involved tremendous hubris about the ability to bring democracy to a region and the effectiveness of hard power alone. In fact, that hubris led to a series of mistakes. The first was inadequate troop strength; while winning the war was easy, there were not enough soldiers to win the peace. Second, American hubris prevented the United States from developing the sort of broad coalition President George H.W. Bush created in 1991. Third, when the war ended, the American leadership refused to internationalize the situation immediately and allow the United Nations to handle Iraq’s reconstruction; within six months, however, the United States had to ask the United Nations to help. This hubris has been tremendously costly. The United States failed to use soft power when it could have and did not create a broader international consensus to legitimize American power. Its presence in Iraq thus appeared to be an imperial occupation. This, in turn, carried great costs in hard power—American lives and American treasure. In the end, it has left the country greatly diminished.

If power has three components, military, economic, and soft power, then the weakening of American soft power in the last two years has been costly. Without attempting to predict the outcome in Iraq, it is certain that the loss of American power is a bad thing. It is not chauvinistic to say that most of the world actually needs American power to deal with the new types of threats that are
faced. If the United States learns the wrong lessons from Iraq, turns inward, and declines to be adventurous and willing to take risks, the world will be less secure—not only for oil markets, but for every other reason. America will likely remain the world’s largest military power for decades to come. Nevertheless, security should be considered a collective good, good for the United States but good for others as well. If the United States does not fill the leadership role, no other country will.

The key question is not whether this loss of American power is good or bad—it is bad. The more important question is whether and how it can be reversed. What must be considered are ways to use American power more effectively than has been done in the last few years. A combination of hard and soft power will make the United States once again a “smart power.” The success—or failure—of this task is the great unknown that will have more profound effects on oil markets than any increases in Chinese demand or moves for energy conservation at home.
At the heart of our first session, Managing the Tension Between Oil Producers and Consumers, are subjects that were mentioned in part in the XIII Seminar held in Salamanca in 2003:

- The possibility of a rapid and massive response to a momentary oil shortage by the consumer countries through their strategic stockpiles. At the beginning of the Iraq War in 2003, this response was not necessary because the producer countries supplied the market adequately.

- The need to intensify the dialogue between the producer and consumer countries, with the common objective of obtaining reasonable market stability.

- The well known fact that the oil reserves of Organization of the Petroleum Exporting Countries (OPEC), the former Soviet Union, and Mexico amount to 85 percent of world reserves, while in Organization for Economic Cooperation and Development (OECD) countries, which consume 62 percent of world production, reserves represent only 7 percent of total reserves. And that in the next three decades, 95 percent of increased energy production will occur in the non-OECD countries, as compared to 60 percent in the last three decades.
For natural gas, the situation is similar: 84 percent of the reserves are located in OPEC countries and the former Soviet Union, while in the OECD countries, reserves represent only 10 percent, yet these countries consume more than half of the world’s natural gas production.

Such statistics reflect the importance of the collaboration between producer and consumer countries, not only to put the market in order, but also to face up to the enormous investments that must be carried out to avoid long-term imbalances between supply and demand. Many producer countries will require massive international financing that could be hindered by restrictions on direct investment.

From all of the above, we can agree on the importance of this session on how to manage the tension between consumers and producers. Bijan Mossavar-Rahmani will speak to us about oil in turmoil, Claude Mandil about the IEA-producer dialogue, Guy F. Caruso on revisiting strategic stockpile analysis, and Nader H. Sultan about the role of national oil companies. That is, they will deal with the turmoil that has affected, and can again affect, the oil market; the contribution of strategic stockpiles to alleviate momentary crises; the need for dialogue between producers and consumers to put the market in order and to promote new investments necessary to achieve future increases in production; and the position of the national oil companies that control the greatest part of the world’s oil and natural gas reserves.
We need no reminding that the world oil market is in some considerable turmoil, what with higher than expected growth in demand for oil, notably in the United States and China on the one hand, and tight supplies with little cushion in the form of unused production capacity or inventories, on the other. All this at a time of tremendous political tension, acts of violence and terror, plus uncertainty about the future stability and direction of key exporting countries, including Iraq and Saudi Arabia, Nigeria and Venezuela.

Couple this difficult picture in the physical markets with intense trading in futures contracts by speculators betting on higher prices and you have the elements of a so-called “Perfect Storm” caused, just like a storm in nature, when two fronts collide.

And a “Perfect Storm” we have had, at least insofar as prices are concerned. Several weeks ago, oil prices hit the highest levels seen in two decades, at least in nominal terms, and while somewhat lower
this week, prices remain stubbornly high—certainly well above the $25 a barrel or so we were forecasting when we last met here in Spain a year ago.

Such high prices are of course good for the oil industry. This time, for the first time in recent memory, few are blaming the international oil companies for somehow manipulating the market to raise prices. No angry consumer action, no calls for windfall profit taxes. Instead, an estimated $10 component of current oil prices is attributed to a so-called market “fear factor” and blamed on everything from Washington’s adventurism in Iraq, to acts of terror by extremists in the Middle East, to Wall Street hedge funds, and finally, by the usual commentators, to Organization of the Petroleum Exporting Countries (OPEC) machinations.

But, whatever the cause or causes, the industry is pleased with the results. And the benefits of high prices are being felt across the board—we are seeing high margins and high profits everywhere from the upstream exploration and production sector, to the midstream transportation and trading sector, to the downstream refining and marketing sector.

Still, not all is well for the international oil industry. Far from it. Indeed, the industry is facing unprecedented challenges on several fronts, and how we respond will shape the future character of the business and dictate the role of the companies as a critical link between consumers and producers worldwide.

I will briefly describe three sets of challenges.

First, over the past several years, the largest companies have only replaced about three-quarters of the oil they have produced through drilling, notwithstanding high prices and significant advances in the same period in oil exploration and production technology. Granted, one can point to some companies that continue to grow their reserves base and size, but importantly, this is through acquisition of other companies, or acquisition of previously discovered or even developed fields, or from drilling extensions to existing fields. New giant or so-called elephant fields are being found periodically through pure exploration, but not nearly enough.
You could miss this trend if you reviewed national and aggregated global reserves and reserves replacement statistics, which paint a far rosier picture. The problem is that a large part of global reported reserves additions in recent years have been in the category of “political reserves.” That is to say, increases in official reserves figures for such countries as Saudi Arabia, Iran, and Iraq, designed to enhance strategic stature or to support demands for higher OPEC quotas and so on.

Thus, in the 1980s, with less effort than it takes to say “published proven reserves,” the Saudis increased their official reserves by a staggering 100 billion barrels to 270 billion barrels, the Iraqis increased theirs from 50 billion to 115 billion barrels, and the Iranians, not to be outdone, from about 60 billion to over 100 billion barrels. To put this effort into perspective, these three countries combined probably drilled fewer wells in the period leading up to the reserves reassessment than are drilled in a week in the United States. There is a lot of oil in the Middle East but you still have to drill to prove it up.

Sometimes other facts on the ground help put official reserves statistics in perspective. Take the example of Indonesia: starting in March of this year, Indonesia switched from being a net exporter of oil to a net importer of oil, a result of sluggish exploration activity triggered by lack of clear guidelines for investing in the petroleum sector, tax and bureaucratic barriers, and messy demands by provincial governments for a slice of revenues.

This role reversal comes at an awkward time because Indonesia currently holds the rotating position of the presidency of OPEC. So OPEC, the Organization of the Petroleum Exporting Countries, is currently led by Indonesia, a net oil importing country. This awkwardness is compounded by the fact that another OPEC member, Iraq, officially through the end of this month, and unofficially for some time to come, is under the rule and occupation of the Mother of All Oil Importers, the United States. OPEC is some all-powerful oil-exporting cartel, indeed. Irwin Stelzer, please take note.

Of course, Saudi Arabia, Iran, and Iraq have tremendous remaining potential, but this potential is not going to be tapped quickly,
cheaply, or painlessly. And certainly not without bringing in the international oil companies to do it for them.

And without such Middle Eastern countries in which to explore, the international oil companies, for their part, will not be in a position to keep up with the world’s growing appetite for black gold. Far from it, notwithstanding drumbeating about the potential of West Africa or the Central Asian Republics or other regions.

The recent crisis at one of the companies, Royal Dutch Shell, underscores the challenges ahead. This once proud, and still arrogant, company has been forced to take four downgrades of corporate proven reserves in one year—wiping off its books some 4.5 billion barrels of reserves—or about 25 percent of its total.

This problem is not limited to Shell; BP has had to write down reserves by a so-far modest 2.5 percent though more may be coming, and El Paso of the United States has had to write down reserves by a whopping 41 percent of its total. But the case of Shell has been the most spectacular, coming as it has amidst larger corporate problems triggered by poor governance, management overreach, and careless email traffic.

The second crisis facing the industry is political risk. More and more, political risk has become less about frontal attacks on companies by governments seeking to nationalize or expropriate assets or even change fiscal terms. If anything, governments throughout the world are scrambling to attract oil companies, large and small, to their oil and gas sectors. Never before have so many countries on so many continents been open for business.

Rather, the political challenges to the industry—the political risks—come from the threat to infrastructure security, and more importantly, from the unprecedented threat to employee safety. It is one thing to face the catch-ransom-release risks facing expatriates in places like Colombia, and quite another to encounter the kidnap and behead tactics of extremists in places like Saudi Arabia and Iraq.

And the risks are spreading. Just this month, an outside consultancy, brought in by Shell to assess the political and security risks of
its operations in Nigeria, reported back that this multinational could be forced to pull out of the country within five years because of violence in the oil-producing Niger Delta region. The report said that Shell had fuelled conflict in this region through its policies on community relations, access to land, and contract awards. Nigeria represents about 10 percent of Shell’s global operations.

Theft of Shell and other companies’ oil from pipelines and wellheads is widespread in Nigeria; by some estimates, such theft amounts to well over 100 million barrels a year worth in the billions of dollars. What is worrisome is that some of this cash has allowed community-based militias to buy weapons, ranging from small arms to rocket launchers. It is a disturbing prospect: local activists in impoverished regions that have seen virtually no development despite decades of oil production taking up arms, not against their own governments, but against the international oil companies.

The third challenge facing the companies is the call for greater transparency in their international operations and a halt to corrupt practices in dealings with foreign governments. Two of the latest comprehensive efforts to combat corruption are the Publish What You Pay Coalition, led by Global Witness, a London-based non-governmental organization (NGO), and the Extractive Industries Transparency Initiative, set up by the British government. These are good ideas.

Payoffs not only to African governments but also to political parties in Europe itself were contributing factors in the demise of Elf, France’s state oil champion. Former senior executives of the once mighty Mobil, since consumed by Exxon, are still under investigation for payoffs made in Kazakhstan before the company sold itself, perhaps in the hope that its legal problems would fade away with the rest of the corporation.

Meanwhile, one reads in the press stories of past payoffs by Halliburton, then under Dick Cheney, in places like Nigeria, side by side with stories of more recent Halliburton rip-offs of the U.S. government, now under Dick Cheney, in places like Iraq.

Write-offs of reserves, coupled with payoffs to governments
and rip-offs of customers, have led not only to layoffs of some of the offending executives but to a crisis of confidence and to soul searching not seen in the industry in decades.

Where will this lead, and what does it mean for producer-consumer relations and the role of the international oil industry as a connecting line between the two?

The three challenges I have described, namely the difficulty in replacing reserves in the old-fashioned way through drilling, the political risks faced in operating in hostile environments even when host governments are supportive, and new pressures not to buy official support with unofficial payments are of course inter-related. You cannot add to reserves if angry and increasingly assertive citizens of countries whose corrupt leaders you have bought off are shooting at you at in the field.

How can we create the right political and security conditions for Western oil companies to place tens of thousands of their experts and hundreds of billions of dollars of their funds to work in increasingly violent and unstable producing countries in the Middle East and also in other hostile spots in Africa, Latin America, and Asia? And to do so in ethical and transparent, and thus, sustainable fashion?

As an aside, I should add that even before the latest flare up of violence, spending on exploration and production had not kept up with higher prices or higher consumption requirements. Capital expenditures by the world’s top oil companies have been lower in each of the past three years than in the year 2000. How does one explain this? In two words: risk aversion.

Understandably, the companies cannot be certain how long high oil prices will hold, and new, larger projects have long lead times, sometimes as long as seven or eight years. The price threshold oil companies are using today to evaluate and approve projects is around $20 a barrel, up from about $15 a barrel a year or two ago but far shy of today’s $35 a barrel price. So new spending is growing only moderately and cautiously.

Instead, the largest companies are using cash to pay down debt,
buy back shares, pay dividends, and hoard what is left to be used to buy rivals when the opportunities arise. Such a strategy may make short-term financial sense and delight institutional investors, but it does nothing to help find oil longer term. This, too, needs to change.

A year or two ago it was hoped that by chasing out Saddam Hussein, the United States would sow the seeds of stability and civil society in Iraq and that a pro-Western government would somehow be democratically elected and serve as a model for other troublesome countries in the Middle East. And, importantly, open up Iraq’s prolific oil potential to international, and mostly American and British, oil companies. This, needless to say, has not come to pass. And many in this room cannot be faulted for having then, and now, considered that vision too ambitious, even naïve, and its execution severely flawed.

But without concerted effort, the problems of violence and extremism are not likely to disappear. Nor volatility and uncertainty in the world oil market.

Urgent steps need to be taken to renew the United States-Saudi relationship—with this regime or the next. If Washington’s Iraq strategy appears, at least in Spanish eyes, a spectacular failure, Washington’s rapprochement with Libya is universally expected to bear fruit. The current U.S. posture towards Iran and Venezuela needs re-examination, too, and by that I am not necessarily proposing that Washington embrace those regimes; it is just that a policy of sitting in the White House and hurling insults and invectives has not seemed to have worked.

I will leave it to others to debate the appropriate mix of political, diplomatic, and military actions, the right mix of soft and hard power, necessary to bring about the safe and secure and sustainable conditions for investment in oil exploration and production to meet global requirements. All I can do here is to emphasize, again, that without such conditions, the future of oil is less than assured.

Let me end on a somewhat positive note. Our industry is nothing if not resilient—having weathered crisis after crisis after crisis over the...
course of its more than 100 year history. Under the right conditions, with enough carrots and sticks, the industry can harness huge resources, whether financial, technological, or managerial.

At the height of the embarrassing Shell reserves measurement scandal, I happened to fill up the tank of my car at one of that company’s gas stations in the United States. There, at the bottom of my printed receipt was the following, not-altogether ludicrous, message: You can count on Shell.
There is good news: the producer-consumer dialogue is working. For years, the Executive Director of the International Energy Agency (IEA) and the Secretary General of the Organization of the Petroleum Exporting Countries (OPEC) would not even sit at the same table, but those times have changed. Much progress has been made in the past few years, particularly in those areas in which consumers and producers have shared interests and concerns.

The IEA and OPEC share many views on several significant topics, including the importance of ensuring adequate energy sector investment, market stability, and supply and demand security. Both groups also favor continued support for technology research and development, and increased data transparency. The IEA and OPEC agree that it is not acceptable that 1.5 billion people in the world have no access to modern forms of energy. Furthermore, there have been a number of tangible successes. During the supply disruption in Venezuela and the build-up to the Iraq conflict in 2003, the IEA and OPEC worked together to avoid a market crisis by sharing information and putting
adequate supplies of oil on the market. The common effort of the IEA and OPEC and their member countries resulted in the establishment of the International Energy Forum Secretariat in Riyadh, Saudi Arabia, which has conducted several seminars and issued a joint IEA-OPEC Investment Strategy. Through the IEA-OPEC Joint Oil Data Initiative, the two organizations work closely together to decrease vulnerability to oil price swings both in consumer and producer countries.

Nevertheless, the two sides still disagree on many ideas, such as the role of the market compared to that of government and a proper price band mechanism. The IEA strongly disagrees with OPEC’s apparently deliberate policy of maintaining low production and low commercial stocks. Additionally, the IEA and OPEC strongly disagree on issues of access to reserves. This dispute is especially ironic considering that most of the world’s reserves are not fully accessible to international oil companies.

The IEA and OPEC also differ on policy approaches to environmental concerns. While most consuming countries agree that environmental issues, including global warming, are very serious, many producing countries continue to regard such concerns as excessive “petrophobia.” Furthermore, producing and consuming countries disagree significantly on consumer taxation policies. Oil ministers in producing countries frequently joke that they should tell consuming countries, “We will give you oil for free if you will give us back half of the taxes you levy.”

In addition to the differences between the blocs, there are serious problems resulting from contradictions within each bloc’s own policies. Within producing countries, for example, there are contradictions concerning a “right” price band. OPEC countries officially support a price band and claim to be satisfied with the current mechanism for maintaining the desired $22–$28 per barrel price band. As is commonly understood, however, those countries do not regularly enforce the band, and indeed have not done so for almost a year, as Figure 1 shows. Consuming countries and organizations like the IEA quite understandably believe this contradiction effectively renders meaningless producer support for the band.
A second contradiction within producing countries concerns the response to volatility of oil prices. It is generally agreed that when stocks in consuming countries are high, prices are relatively stable. However producers claim to dislike volatility; they frequently pursue low stock policies and thus create a puzzling contradiction. Finally, while producers express concern with a lack of future investment, that concern is contradicted by the fact that they offer the international oil companies very limited access to the two-thirds of the world’s oil they control. Producers maintain quotas to support prices, but historically this policy has not proved to be sustainable. The excessively high prices generated by the quota system reduce market share for producing countries and are thus ultimately detrimental to them.

Consumers also display internal contradictory policies. For example, all consuming countries complain about high oil prices and their detrimental effect on the world economy. When prices are high, however, consumers fail to reduce their demand, the market signals are not well received, and consumption remains extremely high. The policy is self-defeating; consuming countries should relaunch strong
energy efficiency and energy saving policies. Such policies might not be advisable in an election year, but their absence nonetheless highlights an important contradiction.

A second consumer contradiction is the repeated call for surplus production capacity. This is a serious issue in the light of OPEC’s declining spare capacity, as shown in Figure 2. For example, consumers become anxious when Saudi Arabia’s surplus capacity falls to only 1 or 1.5 million barrels per day (mmb/d). At the same time, they fail to recognize that spare capacity can only be attained in countries with a nationalized oil company, strong governmental leadership, and no market forces. Consuming countries must recognize that when market forces work, there is no spare capacity. Furthermore, consumers claim they want low prices, but seem unconcerned about encouraging adequate future investment.

Joseph Nye earlier said that security is like oxygen—you do not think about it until you do not have it, and then you think of nothing else. For many producing and consuming countries, oil could replace oxygen in this metaphor. When a national economy is too
dependent on oil, the nation runs a huge risk; when it lacks oil, or oil exports, it thinks only of that. While the risk for producing and consuming countries is not symmetrical, the fact that the transportation sector in consuming countries is 95 percent oil-dependent is nonetheless disconcerting. Consumers want a secure oil supply, but they do not want refineries or pipelines in their neighborhoods. Thus the “not in my backyard”—or NIMBY—attitude among consuming countries is another important internal contradiction.

Producers criticize tax policies in consuming countries, but believe their own governments’ policies are domestic affairs in which other countries should not be involved. Consumers worry that the global supply of oil will run out, but take few steps to reduce consumption by switching to alternative fuels or improving efficiency, as previously noted. Producers dislike consumer questions about the adequacy of their reserves, but restrict access to data. The list of contradictions goes on and on.

What do all those contradictions mean for the producer-consumer dialogue? Dialogue has helped identify many areas of common interest, but producer-consumer disagreements clearly remain. Whether further dialogue can resolve these differences is unclear.

Producers and consumers will be most successful if they try to resolve the contradictions together. Investment needs to be mobilized to generate spare capacity and restore confidence in market stability. There must be a commitment to data transparency, and engaged technical meetings and collaborative studies must be conducted to that end. While there is agreement in principle on the need to step up research and development and promote technology, work should be done together to achieve those goals. Most importantly, the market must be supplied, building the integrity of the dialogue process. Furthermore, even if “hard power” is sometimes needed, the IEA favors the “soft power” of dialogue.

Indeed, the IEA-producer dialogue is based on soft power. Successful dialogue can improve the current situation, although it will not solve many important issues of the oil sector today.
Given the risk-intensive nature of the international oil industry, the idea of a reserve supply of oil for emergency use is a logical one. The Arab oil embargo of 1973–1974 showed in stark relief that the United States and other Organization for Economic Cooperation and Development (OECD) nations had no adequate mechanism to handle such a crisis. Henry Kissinger, then U.S. Secretary of State, believed in the importance of an institutional response to such a crisis, and led an international movement that culminated in the formation of the International Energy Agency (IEA) in November 1974. Shortly thereafter, the International Energy Program (IEP) was signed, requiring IEA member countries to maintain strategic inventories, controlled either by government or industry. In 1975, the U.S. Congress passed the Energy Policy and Conservation Act (EPCA), with the security of the United States in mind and also in response to the IEA requirements. The original authorization for a strategic petroleum reserve (SPR) specified a capacity of one billion barrels of crude oil.
The U.S. SPR never reached a billion-barrel capacity. After a slow start, inventory had reached 100 million barrels and capacity was at 250 million barrels by 1979 when another supply disruption followed the overthrow of the Shah of Iran and the Islamic Revolution. After that shock, stocks rose more steadily throughout the 1980s and the early 1990s, reaching almost 600 million barrels. Then, in 1994, the reserve fill was suspended for budgetary reasons. Nevertheless, capacity has since grown to over 700 million barrels, and inventory is rising to fill that capacity.

The IEA requires its members to hold emergency stocks of oil equal to 90 days of net imports under governmental control. In some countries, such as Japan, governments have chosen to own and operate the stocks directly. In most European Union countries, however, private companies maintain the reserves under the guidelines of and—in emergencies—the control of the governments. The United States relies on both the SPR and the private sector to meet the 90-day requirement, although the government does not have control over private sector stocks. The U.S. president has the authority to draw down the SPR under the EPCA but has no legal authority to order companies to utilize their own inventories. The value of these private holdings for emergency use is uncertain; studies have shown that most commercial inventory in the United States is for operational purposes only and very little would be readily available in an emergency. Whether the existence of a government reserve influences companies’ inventory policy remains a matter of debate.

The SPR was formed as an insurance policy against the potential economic, political, and military consequences of an oil supply disruption. It benefits not only the United States, but contributes to worldwide market stability, particularly through America’s obligation under the IEP, signed by all of the members of the IEA. To determine the value of this insurance policy, we must consider the changes that have occurred over the last 30 years. American dependency on imported oil has grown steadily since the early 1970s, when the United States imported 30 percent of its oil. Today, foreign oil meets nearly 60 percent of American needs. In the early 1980s, U.S. oil
reserves represented a high point of more than 100 days’ worth of oil; today’s 661 million barrels represent only 55 days of supply.

Volatility of oil prices has contributed to, if not led to, the recent recessions the United States has experienced. As Figure 1 illustrates, these include the effects of the embargo in 1974, the Iranian Revolution in 1980, and the Iraqi invasion of Kuwait in 1990. Most recently, the rise in prices in 2000 and 2001 was followed by a small recession. These experiences are one of the reasons why some policy-makers suggest using the SPR as a commodity hedge to lessen the effect of price spikes.

But government policy has always backed off from using the SPR as a market-leveling buffer stock fund. It was authorized only once in an emergency, on January 17, 1991, and in collaboration with other IEA partners, as air strikes began over Baghdad during the Persian Gulf War. At that time, the IEA Governing Board approved the coordinated release of national inventories at up to 2.5 million barrels per day (mmb/d) if the market required. In fact, due to the

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**Figure 1**

*Past Oil Price Spikes Have Created Periods of Recession*
small amount of damage to oil facilities outside of Iraq, less than half of that oil was actually taken up.

A relatively small number of non-emergency sales have occurred for various reasons over the years. There have been a number of test sales to ensure that the system worked. The deficit of the 1990s led to sales for budgetary purposes; and reserve oil has been exchanged in response to short-term problems such as hurricanes. In all, a total of 96 million barrels has been drawn down, but only 17 million during an emergency.

Are there any circumstances that would clearly mandate the government use of the SPR? Recent events in Venezuela provide an excellent example of the ambiguities that surround the use of the SPR. Supply disruptions of Venezuelan oil exports began in early December 2002 and ultimately led to a complete cessation of Venezuelan exports, almost 2.5 mmb/d. By January 2003, oil prices had spiked to the high $30s per barrel. There was a sharp call for using the SPR: oil from Venezuela, a short-haul supplier, could not be replaced quickly. While it takes five to seven days to get Venezuelan oil to the United States, its most likely replacements would come from the Persian Gulf, which is 40 to 45 days away. The SPR seemed ideal to fill that gap. Further, inventories in the winter of 2003 were relatively low and needed to be replenished; using the SPR would reduce the upward pressure on price.

On the other hand, many policy-makers believed market intervention was a less-than-optimal strategy, arguing that it was best to wait and see what would actually happen next in Venezuela. They believed, wrongly it turned out, that the strikers would not carry through with their threats to shut down oil exports. Further, they wanted time to allow other Organization of the Petroleum Exporting Countries (OPEC) countries to fulfill the promises by Saudi Oil Minister Ali Naimi and others to make up any supply loss from Venezuela. In the aftermath, the media reported a supposedly unofficial agreement between Minister Naimi and Robert Priddle, then Executive Director of the IEA, to allow the Saudis to increase their production if the IEA did not draw down the reserves.
The Bush Administration did not authorize an SPR drawdown to offset the Venezuelan crisis. Official policy in January and February 2003, with a war in Iraq imminent, was to keep the SPR as high as possible: there was no drawdown, but there was a halt to the approximately 100,000 barrels per day that were being added to the SPR. Many OPEC countries increased production to partially offset the Venezuelan loss; the Saudis ramped up production to over 9 mmb/d, and others produced at full capacity. However, several months later the war broke out in Iraq, and the stock loss persisted.

In retrospect, people on both sides of the issue still believe they were right. By May 2004, the world market had made up all that lost oil but OECD inventories of crude are only now returning to normal. As for prices, at the first disruption in Venezuela, the price per barrel spiked from $25 to over $35 per barrel, yet it fell again when it became clear that the Iraq War would not disrupt supply. Although oil prices have steadily risen, this rise is not closely related to the SPR issue. As Figure 2 shows, the industry operates so close to the margin that between 98 and 99 percent of world productive capacity is currently utilized. Given demand growth, this trend will likely continue for the next several years and maintain pressure on price.

*Figure 2*

*World Excess Oil Production Capacity*
The disruptions of the last 30 years and those that will surely come in the future testify to our continued need for the safety valve the SPR provides in the United States and for a strategic reserve commitment in the IEA. This same history also demonstrates the inability of the U.S. government to determine a policy regarding the best use of the SPR. Whether the reserves should be saved for extreme emergencies or whether they should be used in other, less extreme, situations, such as in the Venezuelan shutdown, is still undecided. The only consensus, a bipartisan consensus, is that SPR use is ultimately a political decision: no specific trigger is linked to a price, the number of barrels disrupted, or its percentage relative to overall supply.
The Role of National Oil Companies

Nader H. Sultan
Kuwait Petroleum Corporation

The war in Iraq has created a new oil landscape, especially concerning the future of national oil companies (NOCs), the role of international oil companies (IOCs), and the ongoing relationship between the two.

One of the primary features of this new landscape is the increasing cost of oil. Prices are currently between $35 and $40 per barrel and will likely rise. First, a note of perspective regarding that familiar term “high oil prices.” Prices are higher, true, but we must ask, higher compared to what? For example, once adjusted for inflation, the price of gasoline in 1920 was twice today’s price. To match adjusted prices in 1980, a barrel of crude oil would have to cost $80. While prices are higher in a fixed sense, they are not exorbitantly so. When one considers that a deep water well in the Gulf of Mexico costs $150 million, a cost that includes the sophisticated high technology for developing those wells as well as for the offshore platforms, $2 a gallon for gasoline does not seem that expensive.

Nevertheless, I certainly agree that higher prices bring concerns over security, reserves, and transparency. According to a single-line
projection, the demand for oil will increase from 80 million to 120 million barrels per day (mmb/d) in the next 20 years. While the bulk of the demand increase will come from China, its impact on the NOC-IOC relationship will be most profound in the Middle East. With half the world’s oil reserves, the Middle East will meet two-thirds of the demand increase and vastly strengthen its position as the world’s largest exporter. In addition, the demand increase will dramatically increase interregional trade because, as the International Energy Agency (IEA) has shown, future areas of demand will not match future areas of supply. According to the IEA, this demand will require an annual investment of $200 billion. Finally, the Middle East’s economic concerns—rising population and declining real gross domestic product (GDP) per capita due to fairly stagnant oil prices until recently—also speak to the importance of the future of the NOC-IOC relationship in a part of the world where oil plays such an important role in national economies.

Lord Browne, the Group Chief Executive of BP, recently said that super majors compete for just two things: access to resources and access to customers. This highlights a major difference between NOCs and IOCs. National companies do not compete for resources. Rather, they control access to them; this is the basis of our competitive edge. On the other hand, IOCs control “above-ground resources”—technology, markets, and access to capital, which are the basis of the IOC competitive edge. Some have suggested that NOCs are essentially privileged instruments of global supply management because, as government-owned entities, NOCs not only control resources but also can retain spare capacity and are thus “strategic suppliers.” It is important to differentiate between strategic suppliers and commercial suppliers. Strategic oil suppliers are those countries or areas with spare capacity; spare capacity thus defines a strategic supplier. IOCs, of course, are never strategic suppliers; for economic reasons, companies will not or cannot maintain spare capacity, but governments can.

It is important to realize that not all NOCs are strategic suppliers. Russia, the Caspian region, and Angola, for example, have NOCs that are important commercial oil suppliers, but not strategic suppliers.
Another important difference among NOCs is the cost of exploiting the national reserves. In the Middle East, NOC reserves are low-cost. Exploration and production in the Middle East run around $2 a barrel. This is in contrast to a per barrel cost of $10 in North America and $6 in Russia (not counting rail transportation costs for export).

In this new landscape that marks the twenty-first century, NOCs face a series of challenges: attaining clarity of corporate vision; defining their role vis-à-vis their ministries and their governments in operations in general, particularly their fiscal relationship; and rethinking their relationships with the IOCs.

A NOC must have a clear corporate vision of where it wants to go and must involve its government in that vision. This is not an easy task. While it is true that the company has only one shareholder, it has the daunting obligation to align national social objectives and company commercial objectives. The Indian Oil Company provides one example of how this process can work. Every year, that organization signs a memorandum of understanding—a kind of performance scorecard—with its government in which it makes commitments about employment and investment. At the end of the year, the Oil Bureau reviews the record, thus allowing the NOC to maintain a clear vision, past and future. In addition, some NOCs are trying to adopt commercial best practices in their operations. Here, however, one must differentiate between achieving commercial standards and becoming privatized. For example, in Kuwait, where 50 percent of GDP comes from oil, one could not even consider privatizing the industry. Just how commercial a NOC endeavors to become is a major part of the clarity of its corporate vision.

A second major challenge is corporate governance, including an operating plan and a clear definition of the relationship with the energy ministry. When I was in Norway with Kuwait’s Energy Minister, Sheikh Ahmad Fahd al-Sabah, he asked a group of Norwegians from Statoil, the Norwegian NOC, how often the Norwegian Energy Minister interfered in Statoil affairs. They replied, “Three times in 30 years.” The Minister then turned to me and asked, “Nader, how many times do I interfere?” I said, “Three times
a day.” That is the reality of the comparative situations in Norway and Kuwait. In Kuwait, can our Minister be permitted not to interfere? No. In Kuwait, Parliament compels the Minister to interfere because it wishes to influence oil policies and because the Minister is politically responsible.

In the best regimes, efficient management of a national oil and gas sector depends on three elements: policy, regulation, and operation. Policy is usually enacted by energy ministries, regulation by an independent regulatory body, and operations by the NOC. When these demarcations are clear, the national oil company is most efficient. Where does the national fiscal regime fit into this plan? The national fiscal regime poses a particular challenge. A fiscal regime in which the government grants the NOC independence and budgetary autonomy is critical. And the temptations facing both government and NOC to back away from this ideal standard are large. For example, currently the government and the oil sector in Iraq are having difficulty with this, and in Venezuela, the government is starving its national oil sector from its revenues.

The final challenge is the new relationship NOCs must develop with IOCs. Relations between the IOCs and the NOC host countries are mutually beneficial because both groups need one another. For example, the IOCs, with their worldwide investment portfolios, can take “frontier risks,” which national companies may not be prepared to take. The IOCs’ wide global reach and risk-taking ability, therefore, can help national companies. Sonangol in Angola could not risk exploring in 6,000 feet of water by itself—it needed the aid of a private international company. But there are potentials for conflict as well. For example, an IOC must appreciate, and defer to, a national company’s knowledge of its own country, systems, and reservoirs. The policies and investments that are proposed must be aligned to this national situation. Kuwait, for example, currently invites IOCs to invest in the country. However, Kuwait’s economic vision is premised on a reservoir that will last 30 to 35 years. When IOCs sign a 15- or 20-year agreement, they want to maximize production during that period. Kuwait, however, wants to maximize production over the life of the
reservoir, which may be much longer. Aligning these conflicting goals is not always easy, but room for cooperation must be found.

In conclusion, let me note several areas where there is room for increased cooperation and new alliance among IOCs and NOCs. I am thinking about relationships that transcend commercial projects and extend to partnerships that address the larger challenges in the energy world. These challenges need to be faced, not only at the producer-consumer government level, but also at the commercial level, between international and national companies. Energy bottlenecks need to be identified, and strategies need to be constructed to eliminate them. Issues of supply security also need to be discussed. In the last few years, for example, the Chinese have become increasingly anxious about acquiring control of supply from the Middle East.

If a partnership that has a focus beyond that of commercial relationships can be constructed, a true alliance may result. Working with common objectives, each side can bring something unique to the table. One may bring reservoirs; the other, access to technology and secure markets.

I believe ensuring a stable energy future for the world is a joint responsibility, not that of a single side. A new relationship between the NOCs and IOCs holds considerable promise toward that goal.
As we all know, the energy industry faces serious challenges to worldwide energy production, including security threats from terrorist groups, corruption fueled by rising energy prices, and the weakness of governments in producing countries. Falling reserves, lessened capital expenditures by major oil companies, and a shift in control of supply to national oil companies all compound the industry’s problems. Yet, although these issues are depressing, they must be addressed if the industry is to continue to supply the world’s energy needs.

Before turning to our distinguished panelists for their perspectives on Managing Energy Investments in Challenging Environments, I would like to focus briefly on one particular area of the energy world that is much involved with investment and investment risk. I refer to liquefied natural gas (LNG)—and its growing international markets.

A major change is occurring with respect to the supply and demand for natural gas, and by extension to LNG, especially in the
United States. When price controls were removed from natural gas in the 1980s, prices fell and demand increased. In addition, new technologies made natural gas a favored fuel for electricity generation, itself a dramatically expanding market. These developments have produced a situation much like that at the end of World War II, when demand for oil exceeded what the United States was able to produce domestically, and the nation turned increasingly to imported oil. Today we are witnessing the same phenomenon with natural gas.

What are the consequences of this widening gap between natural gas supply and demand? North America uses about 28 trillion cubic feet (tcf) of natural gas per year. Even at $6 per million British thermal units (mmbtu), which is the current price of natural gas in North America, there is still a 2 to 3 percent supply deficit. Demand, fired by the growing market for electricity generation, is not significantly declining. The result will be a return to importing LNG.

The quantities of LNG that will eventually reach North America will dominate the world markets. Such quantities will require a significant expansion in infrastructure, notably in import terminals, and projects are already underway to meet this demand. For example, my company, Sempra Energy, plans to build three LNG plants in North America. One, in Baja California, just south of the Mexican-American border, will import in a year as much LNG as all of South Korea. Overall, when the first new terminals begin production in 2008, the U.S. market will sustain natural gas prices at the level of $3.50–$4.00 per mmbtu. The ten new terminals that will probably be built, largely on the Gulf Coast and in the Caribbean, will have the capacity to bring from 4–7 tcf into the U.S. market. This quantity should be sufficient to compensate for the domestic shortfall.

For the natural gas producing countries, the increase in demand will affect them just as rising demand for oil has done in oil producing countries, and political and economic concerns over the management of this resource will inevitably emerge. For example, Bolivia, although it has no oil, has significant proven reserves of natural gas that South America needs and the United States could use. Political and historical considerations in Bolivia have prevented the
export of that natural gas until now, but pressures are rising to change that policy.

But whether the focus is on producing nations or on consuming nations, on oil or on natural gas, the issue of investment—its magnitude and its risks—is always a dominating issue as we will hear from our panelists in this session. They are all notably well qualified to discuss their topics.

Our first speaker, Luis Mañas, will discuss how energy companies evaluate investment risk in turbulent markets and countries, and the unintended consequences of such evaluation. Ricardo Hausmann, our second speaker, will speak on the linkages among trade, oil, and currency fluctuations in developing countries and the economic consequences of such links. Our third speaker, Tony Meggs, will address the technology and infrastructure expansion in the energy industries motivated by concerns about global climate change and other environmental issues.
Despite widespread concern with investment risk throughout the oil industry, the underlying nature of risk and its implications for investment have been neither sufficiently researched nor properly understood. The failure to correctly understand the nature of investment risk in turbulent countries is due in large measure to flaws in the standard approach to risk assessment and asset valuation. When applied in emerging markets, such an approach unfortunately has led to significant under-investment both in oil (and perhaps other resources) and in long-term projects.

This provocative and possibly unconventional assertion is based on economic common sense and industry experience, not simply on theory. While I may sound more like an academic than a practitioner, I assure you that my theorizing has a very practical basis.

Countries in turbulent areas, fraught with political and economic risk, produce a large share of the world’s oil. The Middle East and North Africa provide classic examples of this phenomenon, but now the turmoil has spread. Latin America, for example, which used to be
a stable part of the oil world, now poses political problems in Venezuela, economic problems in Argentina, and major governmental problems in Bolivia and Colombia—and all with implications for the oil industry. Nevertheless, while most oil countries are risky places for investment, they also tend to be economically solvent. They do not carry low credit ratings, and they tend to pay their debts. These countries retain an important basic source of wealth with which they can back themselves.

Repsol YPF is particularly concerned with this topic because the company relies on non-Organization for Economic Cooperation and Development (OECD) countries for most of its production. Indeed, the largest concentration of Repsol YPF’s oil production is in Latin America, particularly in Argentina. In 2003, 57 percent of Repsol YPF earnings before interest and debt (EBIT) derived from Argentina and 71 percent derived from Latin America more broadly. That year, the company invested 62 percent of money available for new investment in Latin America.

Given Repsol YPF’s extensive involvement in Latin America, it is important to know whether the region represents a high-risk area as a whole or whether it is the individual countries that carry specific risk characteristics. Distinguishing country risk from area risk is an essential task for corporate investors. Whether Latin America is a risk category in itself determines whether investing in additional Latin American countries means putting more eggs into the same or into different baskets. In this case, the answer is that the only significant commonality among Latin American countries is their status as emerging countries, which tend to move in concert with one another due to financial contagion and the need to access world capital markets. Thus, in the event of an oil crisis in Argentina, for instance, Repsol YPF can choose to diversify away from that risk by investing in Bolivia, Mexico, Trinidad, or Venezuela. Such action makes sense if it is believed that country risk events in those countries are not correlated with Argentina any more than with other emerging countries, such as Algeria, Libya, or a Middle Eastern country.

Another important distinction that companies must make is between diversifiable and non-diversifiable country risks. Are country
risk events correlated among oil-producing countries? For example, is a risk in Argentina correlated with a risk in Libya or Iran? Evidence appears to indicate that there is little correlation among such countries, indicating that the country risk involved is quite diversifiable. This scenario plays out in the portfolios of the big multinationals like Exxon Mobil or Royal Dutch Shell, whose presence in many countries allows them to diversify away the specific risk of a given country.

Turning now to the place of country risk in asset valuation, let me address the issue of questionable economic formulas used in asset valuation. To assess the value of an asset, economists rely on several widely-used formulas, of which Figure 1 is a typical example. The basic ingredient of the formula is the estimate of the free cash flow (FCF) that would result from a base case, or most likely scenario. The FCF is then discounted at the cost of capital, which is usually based on the capital asset pricing model (CAPM). The calculation must also include a country risk premium for investments in emerging countries. This premium is based on the seemingly reasonable assumption that a company will ask for greater returns from an emerging country than from an OECD or other less risky country.

Although such reasoning seems to follow common sense, it is completely wrong. The standard practice is, in fact, inconsistent with

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**Figure 1**

*Country Risk in Asset Valuation: Usual Practice*

\[
NPV = \sum_t \frac{E[FCF_t]}{(1 + K)^t}
\]

- Base case or most likely scenario
- Cost of Capital: CAPM-based with “ad-hoc” country risk premium

\[
K = r_f + \beta(\Delta R_m) + \Delta R_c
\]
the basic tenets of the financial theory underlying the formula. Furthermore, it creates an important bias against investment in emerging countries and against long-term investments more broadly. This bias affects how risk is perceived, and leads to why we believe it is riskier to invest in an oil well in Argentina or Bolivia than in the United States.

Typically, we assume that the nature of country risk in emerging countries will produce lower cash flows than the contract and current government laws specify. The real cash flows one actually receives may well be lower than the “statutory cash flows” one may expect if legal rights are respected. The nature of risk in these countries is that the rules of the game can change to the investors’ detriment, after the investment is made. Other factors contribute to risk as well. For example, one would not expect the security problems Saudi Arabia currently faces to develop in most OECD countries. The result of this is that, in economic jargon, cash flows in emerging countries bear a highly asymmetric risk. While the statutory case is typically the best case, a great deal of downside risk develops from country risk events.

Figure 2 illustrates simply how such reasoning is compatible with economic theory. Because the expected FCFs are in the numerator, any adjustment due to country risk should also be in the numerator. The actual numerator, in this case, should be lower than it would be under the best case scenario, the statutory scenario where all contracts and legal rules are respected.

The cost of capital is placed in the denominator, as Figure 3 illustrates. Since country risk events are diversifiable, the weighted average cost of capital should be the same whether an oil well was being evaluated in an OECD country or in a developing country. While decreasing the numerator leads us to expect less, the cost of the discount factor is maintained. In the end, we can see intuitively that the value of an oil property in an emerging country is discounted when compared to the value of a geologically similar property in an OECD country.
Figure 2

**Being Consistent with Theory: Numerator**

\[ \text{NPV} = \sum_t \frac{E[FCF_t]}{(1 + K)^t} \]

Country risk should lead to adjustments in the numerator:

\[ E(FCF_t) < E(FCF_t^*) \]

i.e., what you expect to receive on average is less than what you expect to receive on paper (if all contracts and legal rules are respected)

Figure 3

**Being Consistent with Theory: Denominator**

\[ \text{NPV} = \sum_t \frac{E[FCF_t]}{(1 + K)^t} \]

If country risk is fully diversifiable, cost of capital (K) should be OECD weighted average cost of capital (WACC), without any “ad hoc” adjustment.
Having established this sequence, we must now consider how that discount is calculated. Consider a hypothetical country with a 20 percent probability $p$ of a country risk event on any given year, in which case cash flows are halved. That is, once every five years, this country’s risk problem will result in the 50 percent loss of the money investors expect according to the law and the contract. A simple model indicates that property in the country should be valued at 90 percent, which is a 10 percent discount, compared to an OECD property. While 10 percent does not appear to be very significant, losing 50 percent every five years does. Imagine, however, that the situation is even worse. If, instead of every five years, investors lose 50 percent of expected returns every two years, the value of an emerging country property should be 75 percent of the initial value of an analogous property in an OECD country.

According to the top matrix in Table 1, requiring a 7 percent higher return from a project in an emerging country is equivalent to assuming that the company will lose half its expected return half the time. Since projects in the oil industry tend to be quite long term, it makes sense to consider the indefinite life investment in the bottom matrix. In this case, assuming a country will expropriate 50 percent of the time and 50 percent of the money investors expect is equivalent to putting a risk premium in the denominator and asking for a 2.7 percent higher return than for the same project in an OECD country.

Such calculations clearly conflict with the standard belief in the necessity of a higher return on investments in emerging countries. Asking for a higher return on an investment in an emerging country is in fact equivalent to assuming that there is a constant probability of expropriation every year. A risk premium of 5 percent, well within the range of usual estimates, would imply that investors expect a 40 percent probability of expropriation with no compensation during the next 10 years. In 20 years, such calculations would anticipate a 64 percent probability of expropriation without compensation.

In the last 10 or 20 years, however, we have not witnessed such expropriation without compensation. This experience suggests that
the oil industry’s investment decisions are in conflict with both common sense and historical evidence. Again, we must ask whether this flawed methodology is causing the industry to invest too little in long-term projects in emerging markets.

Ultimately, the validity of different approaches to assessing valuation can be proved empirically; information is available from independent sources. The market value of oil and gas assets can be inferred by the transactions of comparable assets and by equity prices of public companies. And the discount probabilities and shortfall amounts of the model parameters can be estimated directly from

<table>
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<th>Equivalent Country Risk Premium</th>
<th>Probability of Country Risk (p)</th>
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<tr>
<td></td>
<td>25%</td>
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<td>Shortfall (z)</td>
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<td>25%</td>
<td>1.5%</td>
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<td>50%</td>
<td>3.1%</td>
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<tr>
<td>100%</td>
<td>6.9%</td>
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**Table 1**
Comparing to Usual Practice

10-Year Investment Project with Constant Free Cash Flow (FCF):

<table>
<thead>
<tr>
<th>Equivalent Country Risk Premium</th>
<th>Probability of Country Risk (p)</th>
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<tr>
<td></td>
<td>25%</td>
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<td>25%</td>
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<td>50%</td>
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<td>100%</td>
<td>2.7%</td>
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the empirical record of country risk events in comparable economic situations.

To summarize and conclude by returning to the original question: is the oil industry investing too little in emerging markets? And is the oil industry perhaps under-investing in long-term projects? A standard investment analysis would lead to different conclusions from those I have presented, and would make us evaluate the risk in emerging countries in a very different way. A standard investment analysis could lead us to penalize longer-term projects by the usual practice of introducing a risk surcharge taken from the bond market, which has nothing to do with the real commodities market or real investment. Including this surcharge in the denominator causes it to grow at an exponential rate. Therefore, there is a strong presumption that investment in turbulent countries might have been lower than it should have been, with even a stronger bias against investment in long-term projects in those countries. We need more research to answer these questions.
Despite their natural wealth, many oil producing countries are risky, unstable places unfriendly for investment. That resource-rich countries should suffer such economic difficulties creates a paradox often called the “resource curse.” While there are many explanations for this phenomenon, none is wholly satisfactory. The present discussion will introduce an alternative explanation of the resource curse in developing countries. This argument, “the trap of inefficient specialization,” is based on a paper Professor Roberto Rigobón and I have written, *An Alternative Theory of the Resource Curse: Fiscal Policy Formulation and Implementation in Oil-Producing Countries*.

To set the context: a comparison of growth rates of oil-exporting developing countries and other developing countries highlights the poor performance of oil exporters in the last several decades. In the past 20 years, the 15 oil-exporting developing nations experienced negative growth at minus 2.1 percent per year, while non-oil-exporting developing countries grew 0.5 percent per year. This 2.5 percent growth differential reflects the resource curse.
Yet, while oil appears to be a problem in the present, it has not always been so. Between 1960 and 1980, oil-exporting nations fared much better than other developing nations, growing approximately 2.5 percent per year faster. The idea that the “resource curse” is not a permanent phenomenon is shown by the fact that between 1920 and 1980 Venezuela saw the fastest increase in income of any country in the dataset compiled by Angus Maddison. By contrast, for the same set of countries in the period between 1980 and 2000, Venezuela ranks last.

Observers have offered many explanations for this resource curse. One explanation, known as the “Dutch disease” theory, argues that an expanded oil industry leads not only to greater income, but that this increase in income takes mainly the form of greater availability of foreign exchange. With higher income, people feel empowered to buy all kinds of goods—those that can only be imported (importables), those that can be either imported or produced domestically (tradables), and those that can only be produced domestically (non-tradables). Oil generates the foreign exchange to buy the tradables abroad rather than producing them domestically, but the non-tradables still need to be produced domestically. This shift in purchasing will tend to focus the economy away from tradables (agriculture and manufacturing) and into non-tradables (construction, commerce, and services), stifling this part of the domestic economy. This happens through a real appreciation of the currency, which makes non-tradables relatively more expensive than tradables. If for some reason manufacturing has larger long-run increases in productivity (a big if), then the economy will be moving away from the dynamic sectors and into activities with more stagnant productivity. The problem with Dutch disease theory, however, is that it should predict poor performance when oil income increases, as between 1960 and 1980, not when it declines. Decreasing oil income should lead to economic growth particularly in the tradable sector, as the country finally rids itself of its overwhelming dependence on oil income. This has certainly not been the case in the long period of low prices since the early 1980s.
A second explanation, what economists call “rent seeking,” argues that in resource-rich countries, individuals and groups lobby the government for fiscal benefits and subsidies instead of working or investing. This theory, too, does not explain why things get worse when there are fewer reasons to engage in rent seeking, as when oil income is low as in the past 20 years. This theory also assumes that a government, with its oil income, fosters corruption and even civil turmoil as various factions vie for control of the nation’s riches. Yet, this theory does not accord with history over the long term. For example, Venezuela experienced much civil turmoil before its oil industry blossomed, but once the government was sufficiently enriched by oil revenue to impose order over the country, those civil wars came to an end. In short, the notion that oil is naturally linked to corrupt and chaotic politics is incompatible with experience.

A third explanation for the resource curse places the onus on oil price volatility and its malign effects on the economies of producer countries. In terms of the real exchange rate, which measures the stability of a nation’s international competitive position, economies of developing countries are on average about 2.5 times more volatile than those of industrial countries. This exchange rate volatility is exaggerated in oil-exporting, developing countries. For example, between 1980 and 2000, the economies of oil-rich Bolivia, Ecuador, Nigeria, and Venezuela experienced the highest levels of real exchange rate volatility in a sample of 75 countries.

In theory, this volatility in the real exchange rate might be related to the fact that oil prices are remarkably volatile, making national oil income also quite unstable. To explain how oil income volatility might affect real exchange rate volatility and the resource curse, Professor Rigobón and I constructed a simplified model of an oil-exporting economy. We assume that there are three sectors to the economy: oil, which we take as an enclave activity; tradables; and non-tradables. We assume that labor is perfectly mobile within the country and that capital can move internationally at the international interest rate. As oil income rises and falls in such a country, the non-oil economy should adjust by shifting resources between tradables and non-tradables.
without any movement in the real exchange rate. The real exchange rate should exhibit no volatility in spite of the volatility in oil income. Clearly, however, this does not match the recent experiences of oil exporting countries. More than simple oil income volatility must be involved to create the resource curse.

Having rejected the usual theories, let me propose an alternative explanation for the resource curse: I suggest that it results from the “inefficient specialization” in oil by those developing nations with potentially diversified economies. The curse is caused by the interaction of three factors in a national economy:

- economic specialization in oil and non-tradables and away from tradables;
- volatile domestic spending of oil income;
- financial frictions—such as inefficient bankruptcy procedures, poor contract enforcement, and so on. We assume that financial frictions will make people behave as if they were more risk averse.

These elements create a vicious circle. Assume an economy has a small sector of tradables. In that case, the economy will not be able to adjust to an increase in oil income by shedding jobs and capital in the tradable sector so as to use these resources to increase the supply of non-tradables. The tradable sector is already using very few resources. The increased demand for non-tradables will not lead to an increased supply but rather to a rise in their price relative to tradables: the real exchange rate appreciates. The opposite happens when oil income declines. So specialization and volatile spending of oil income combine to produce a volatile real exchange rate. Financial frictions make people fear this volatility, especially in the tradable sector, and this causes the sector to only attract investments if returns are very high. The tradable sector will only attract capital if investments are compensated handsomely. But this makes it even more difficult to attract capital to tradables. As the tradable sector becomes smaller, the real exchange rate becomes more volatile and the real cost of capital goes up, making the sector shrink further until it completely disappears.
Here it is useful to divide the oil-producing, developing countries into three broad categories: efficiently specialized, diversified, and inefficiently specialized.

- “Efficiently specialized” countries are those with a very high oil wealth relative to their population. Given such resources, it does not make sense for this economy to try to produce tradables. There will be high demand for non-tradables and few people to supply them, while foreign exchange, i.e., that which a tradable sector would allow the economy to save, is in ample supply because of the high oil exports. Under these circumstances, trying to diversify these economies into producing more tradables would be futile. The Persian Gulf countries immediately come to mind as examples of this category.

- “Diversified” nations are those that have low oil wealth relative to their population and hence have an active non-oil sector of tradables. These diversified countries are a varied group, ranging from Indonesia, Kazakhstan, Ecuador, and Mexico.

- “Inefficiently specialized” countries also have relatively low oil wealth relative to their population so that they, too, should produce other tradables. However, they do not. Although their economic endowment should allow a more diversified export sector, inefficiently specialized countries export oil exclusively. This does not happen because it is economically efficient but instead because the environment for every other tradable activity becomes too volatile.

In other words, these economies become trapped in a vicious cycle that keeps the non-oil tradable sector small and encourages further specialization away from non-oil tradables. Inefficient specialization also significantly affects the non-tradable sector. As the real exchange rate becomes more sensitive to oil income volatility, interest rates in the non-tradable sector rise substantially. Investment in that sector collapses, and the country suffers a further decline in welfare.

To apply this explanation to real-world events, consider the plight of Venezuela in the last 20 years. Figure 1 compares the changes in
Figure 1
Venezuela: A Rise in Real Exchange Rate Volatility, 1950–2000

Volatility is measured as the standard deviation of the rate of growth of the indicated variable.

Figure 2
Venezuela: The Collapse in Capital per Worker, 1950–2000

Capital per worker is the stock of accumulated capital per worker in the non-oil economy in millions of Bolivars at 1984 prices.

Output per worker in the non-oil sector in millions of 1984 Bolivars is the non-oil gross domestic product (GDP) at constant prices divided by non-oil employment.
the volatility of oil revenues and of real exchange rates, 1950–2000. While the volatility in oil income was similar in the periods 1950–1982 and 1982–2000, the volatility of the real exchange rate soared in the latter period. Venezuelans might have expected that in this period lower oil revenues and a weaker real exchange rate would allow the country to become more diversified. Not so. The high volatility in the real exchange rate prevented new activities from developing or surviving. From this came a predictable result: the collapse of capital investment in the non-oil sector. Figure 2 illustrates this collapse in the Venezuelan non-oil sector beginning in approximately 1980.

What are the policy implications for each of these groups of nations?

Countries with diversified economies are well advised to retain their diversified economies and resist the temptation to over-specialize in oil. To achieve this goal, governments should commit to stabilizing their spending. Unfortunately, it is always easy for nations to slip from diversification to inefficient specialization. For example, countries that currently are diversified but face the risk of losing that diversification include Ecuador, Kazakhstan, and Indonesia. In the first two countries, oil expansion threatens to lead to the disappearance of non-oil exports. And in the third, being tagged with “heightened country risk” by the international investment community as a consequence of the 1997 financial crisis, as well as larger oil and gas revenues, could do the same.

By contrast, efficiently specialized countries should maintain their oil-dominated tradable sector. They should not attempt to forcibly diversify their economies. The classic example of that mistaken policy was the attempt by Saudi Arabia to grow wheat through subsidies. Rather, their policy should focus on managing the large but volatile stream of oil income that comes to the state. Volatile, uncertain government spending is harmful to welfare; to counteract that, governments should commit to expenditure stabilization policies.

And for the most challenged group of all, those “inefficiently specialized” nations, what policies can help them out of the resource trap? Here too, stabilizing government spending in the face of
volatile oil income is a critical step. In addition, these countries should try to improve their credit rating to make capital cheaper for the non-oil enterprises. Prudent fiscal policies that deliver stable spending will help. Also, better debt management and financial contract enforcement will reduce the perception of risk and thus make capital cheaper for investment in non-oil tradables.

Such recommendations are quite uncontroversial: working to improve a country's political and financial institutions is always and everywhere important. However, the difficulties involved in attempting such policies must be recognized. These are not easy tasks, and progress may be too slow to make a difference in the policy-relevant horizon.

If these conventional policies cannot be implemented and inefficient specialization remains, a case can be made for turning to less conventional, “second-best” policies. For example, the economy may be pushed toward diversification if the government can encourage investing in non-oil tradables by giving investors in this sector insurance on the real exchange rate. Such insurance might be provided through contingent export subsidies, although the World Trade Organization would probably disallow that course. Alternatively, the country could provide new activities in the non-oil tradable sector with a put-option on the real exchange rate: i.e., such enterprises would be guaranteed a minimum relative price at which they could sell their output.

Of course, such policies may fall prey to rent-seeking interest groups, who may misallocate the resources and thwart the diversification objective. The question is whether the government can address the market failure of inefficient specialization without creating an even more ominous government failure.

Getting countries out of the resource curse requires finding ways for their non-oil export sectors to survive and grow. It is a very difficult task. And the international oil industry has a great interest in ensuring that its activities in a country do not generate so much risk to the rest of the economy as to limit its growth.
THE TECHNOLOGY, INFRASTRUCTURE EXPANSION, AND CLIMATE CONCERNS

TONY MEGGS
BP, P.L.C.

The perceived threat of global warming has the potential to create the most challenging investment environment of all—impacting policy and investment decisions in the decades ahead. This is due to the extraordinary scale of the challenge and the high levels of uncertainty that will surround this topic for years to come. These remarks will focus on some of the infrastructure challenges that will be faced if technology is deployed to meet growing climate concerns. I should also say at the outset that these are my own views; most of them reflect BP thinking, but not all.

Energy is the foundation of modern societies. There is a clear correlation between energy use and prosperity. The provision of energy enables continued global economic growth and with it the opportunity to improve the quality of life for many millions in underdeveloped countries.

Some forecasts of energy demand and supply need to be examined. But before this is done, it should be understood that predictions about the future are invariably wrong—often spectacularly so. This is
particularly true when looking at the intersection of energy and technology. To take just one example, there was a strongly held view in the 1950s that nuclear energy would provide the world with electricity “too cheap to meter.” Of course, such widely held beliefs turned out to be completely wrong. Nuclear energy now provides only 7 percent of primary energy supply, and it faces a very uncertain future. Having provided that caution, what follows are some of the factors that will influence energy choices looking out to 2030 and beyond.

- Most forecasts indicate energy demand will grow rapidly worldwide and with it the need for substantial investment in infrastructure.
- Carbon constraints will probably become an increasingly important consideration.
- Therefore, the world will need to transition to lower carbon fuels: lighter hydrocarbons, renewables, and possibly hydrogen.
- This trend will heighten the infrastructure challenge; in short, the lighter the fuel, the greater the infrastructure challenge.

Take these factors one by one. First, rising energy demand. Energy consumption today is concentrated in the industrialized world. About 20 percent of the world's population consumes 65 percent of total primary energy supply. But as more countries industrialize, so global energy demand increases. The International Energy Agency (IEA) predicts an overall increase in energy demand of two-thirds by 2030. Of this growth, 70 percent will occur in developing or transition economies, with China alone accounting for 20 percent of the global increase. The cost of funding the infrastructure expansion to meet this new demand will be huge—at least $16 trillion at today's prices. This figure is large in absolute terms although it only represents 1 percent of projected global gross domestic product (GDP) over this period. The challenge is the uneven distribution of the investment requirement. And given the increased reliance on the private sector to fund infrastructure development, the challenge will be sizeable. Raising the capital and achieving competitive returns will be major issues, especially in some developing countries.
A second piece of context is that the world will probably need to lower carbon dioxide (CO₂) emissions as a precautionary measure to mitigate possible climate change. While the science is still provisional, the BP view, based on an emerging scientific consensus, is that the world ought to act collectively to stabilize atmospheric CO₂ concentrations at 500–550 parts per million (ppm) by 2050. That is double the pre-industrial level and considerably higher than current levels of 370 ppm. Simplistically speaking, this will require that carbon emissions are kept flat at current levels. But business-as-usual projections indicate emissions doubling from today’s level of around 7 billion tons per year of carbon to 14 billion tons by 2050. This represents a real technological, economic, and political challenge.

These are, of course, only predictions. But assuming they are true, and applying the precautionary principle, what are the options to reduce emissions in a world where energy demand continues to grow? Energy efficiency could be improved, renewables or nuclear technology could be deployed, or there could be a move toward lower carbon fossil fuel options. There is no silver bullet. It is likely that all of these technologies will need to be deployed to a greater or lesser extent. But we must be realistic about where we are starting from. Fossil fuels currently account for 88 percent of primary energy supply, and they will remain the dominant energy source for a long time to come. Questions are often asked about the world’s fossil fuel resource base, given the level of demand growth projected over the next 50 years. In fact, there is a great deal of fossil fuel left. The latest data indicate reserve-to-production ratios have risen over the last 20 years, and the trend is stable. In other words, new reserves are still found as fast as the older ones are produced. This is before the vast amounts of unconventional resources are even taken into account. So, reserves are not the central issue. Rather, it is whether the world’s reliance on fossil fuels is compatible with the challenge of reducing emissions.

If the reliance on fossil fuels is continued, then ways of reducing the emission intensity must be considered. This can be viewed in two parts. The first and more obvious step is to increase the share of
natural gas in the primary energy mix; natural gas is abundant and creates half as much CO$_2$ per unit of energy produced as coal does. A second, far more radical, step is to decouple fossil fuels from carbon altogether—use fossil fuels to manufacture hydrogen, strip out CO$_2$, and store it geologically. This method is called carbon capture and storage, or sequestration. Both of these options present large infrastructure challenges and, it can be argued, the lower the carbon content, the greater the challenge.

Let’s look briefly at the infrastructure challenges associated with natural gas. This fuel has an energy density three orders of magnitude lower than that of oil. This increases the cost and complexity of transporting natural gas to market over long distances, compared to oil. Natural gas pipelines represent massive investments, and transportation costs represent on average 45 percent of the total cost of natural gas. Perhaps even more important are the political complexities associated with building infrastructure that crosses national boundaries. This is something BP, Repsol YPF, and other firms know first-hand from the continued efforts to monetize natural gas from Bolivia. However, in the past decade, a global natural gas market has started to take shape, based predominantly on technological breakthroughs with liquefied natural gas (LNG), which have brought dramatic cost reductions. But technology will not always be decisive where infrastructure investment is concerned.

Societal acceptance is becoming an increasingly important consideration in all infrastructure decisions. The current opposition to the siting of LNG regasification terminals in the United States is one example of the many challenges of this type that will have to be faced. Another critical factor is the risk-reward balance set by market, policy, and fiscal frameworks. The global trend toward liberalization in natural gas (and electricity) markets has brought many benefits to customers, and BP has strongly supported this transition. However, liberalization has also created uncertainty and price volatility. There are fewer long-term contracts today, and this makes it difficult to get some of the largest projects off the ground. The risk-reward balance has tilted against infrastructure development.
Hydrogen is often mentioned as a likely alternative fuel. It is important to recognize that hydrogen, despite being the most abundant element in the universe, is not a primary energy source. It is an energy carrier. Like electricity, it must be manufactured. The only economic method of manufacture today is from hydrocarbons, and indeed it is already manufactured extensively for industrial use.

But this is of limited value in reducing emissions unless the resultant CO$_2$ can be captured and stored. BP is heavily engaged in capture and storage technology and will shortly begin, along with its partners Sonatrach and Statoil, one of the world’s largest CO$_2$ storage projects at the In-Salah natural gas field in Algeria. While there are still many issues—technical and societal—to be resolved before capture and storage can become a large-scale option, the technologies are available for deployment today on a limited basis.

So, what would be the most effective use of carbon-free hydrogen? Once again, infrastructure issues may determine the best outcome. Because of its low molecular weight, hydrogen is even more difficult and costly to transport and store than natural gas. Most of the current media attention around hydrogen focuses on its use as a transportation fuel of the future. However, the infrastructure implications of widespread hydrogen distribution are enormous, as much of the existing oil-based infrastructure would need to be replaced. To put this in perspective, there are 135,000 service stations across Europe alone.

It will most likely be many decades before oil could be supplanted as the fuel of choice for transportation. Even after 100 years of development, the internal combustion engine still has enormous opportunity for technical improvement. Vehicle efficiencies could easily be doubled using available technology over a period of years. Consider the alternative of introducing hydrogen-rich fuel into the power sector. There are real attractions to this option. Hydrogen can be used today in combined cycle natural gas turbines to deliver very low emissions—at an estimated 50 percent premium on the cost of electricity. A large new vehicle-refuelling infrastructure would not be required; manufacturing facilities could be expanded or new ones
could be added. Meanwhile, research on fuel cells and hydrogen storage technologies could continue. The cost per ton of CO₂ avoided is an order of magnitude lower for introducing hydrogen into the power sector than into the transportation sector. There are undoubtedly issues that would need to be overcome, but this is an option that must be considered more seriously.

What of renewables? While it has been argued that fossil fuels will dominate energy supply for many decades to come, it is also likely that renewables’ share of energy supply will grow. However, the power density of renewables is 5 to 6 orders of magnitude lower than that of fossil fuels. Yet, modern cities and industrial complexes rely on high-power densities provided by fossil fuels. A greater move toward renewables will require that these lower-density, often intermittent, supplies are matched with high concentrations of demand. This will pose complex infrastructure challenges. Technological breakthroughs in electricity storage and transmission will be required to enable viable long-term solutions.

In conclusion, energy demand will continue to grow—albeit in an unknown and disorderly manner—and fossil fuels will almost certainly provide much of that growth for the foreseeable future. Meeting the likely constraints imposed by climate considerations will pose enormous challenges. As reductions to the carbon content of fuels are attempted, infrastructure issues will be critical in determining optimal solutions. Outcomes will be determined by a complex blend of science and technology, economics and, perhaps most importantly, politics. And all of this will take place against a background of continuing uncertainty, thus requiring an extraordinary amount of wisdom and cooperation between policy-makers, energy providers, and energy consumers around the world.
SESSION III
MANAGING THE TRANSITION TO GLOBALIZATION

CHAIRMAN’S INTRODUCTION

WILLIAM W. HOGAN
JOHN F. KENNEDY SCHOOL OF GOVERNMENT
HARVARD UNIVERSITY

The final panel of the 2004 Repsol YPF–Harvard Seminar will address Managing the Transition to Globalization of several vital non-petroleum energy sources: nuclear power, natural gas and liquefied natural gas (LNG), and electricity. The panel might have been titled Managing the Transition to Regionalization to reflect the increasing regional integration of markets that is occurring in parallel with global integration. “Globalization” is the more apt term, however, because of the worldwide scale that is present in all of these industries. Nuclear issues are clearly global, and LNG expansion is on an international scale. And in the other industries, the regional developments are being experienced everywhere, on a global scale.

In all of these energy sectors, the transition process highlights the importance of establishing a viable relationship between business and government to address market problems. Yet in these industries, as in all infrastructure industries, the task of defining the precise roles of government and business, of determining how they best work
together, or separately, to achieve an efficient market, is both complicated and necessary. The relationship is crucial to establishing the institutions that allow markets to function, such as a judicial system that protects property rights, or a regulatory system that deals with monopoly and market power. A second important element of the business-government relationship deals with what economists call “externalities”—problems that markets simply cannot solve, a form of market failure. An economic side effect, externalities are costs or benefits arising from an economic activity that affects people other than those engaged in the economic activity. They are not reflected fully in prices. Because these externalities do not form part of the calculations of those who make economic decisions, they are a form of market failure. Particularly in energy industries, many issues are related to serious security concerns and thus affect people outside of the industry. And that common impact renders those problems much more difficult to resolve.

Our panel consists of four distinguished speakers, each an expert in his field. Each panelist will survey the current developments in his area to see the effects of widespread expansion. Charles B. Curtis, the first speaker, will address energy policy, nuclear power, and nuclear proliferation. Jonathan Stern, our second speaker, will reflect on the regional expansion of natural gas in Europe in the wake of a decade of liberalization. David H. Nissen, the next speaker, will follow with a review of the evolution of LNG into a vital fuel that has become competitive worldwide. Our final speaker, Pedro Mielgo, will address electricity policy and cross-border trade in the European Union.
The prospects for the development of nuclear energy and the dangers of nuclear proliferation have always been interrelated. Half a century ago, in December 1953, U.S. President Dwight D. Eisenhower spoke to the United Nations about the “fearful atomic dilemma.” This problem, as Eisenhower described it, was “how to find a way by which the miraculous inventiveness of man shall not be dedicated to his death, but consecrated to his life.” That speech, quickly dubbed “Atoms for Peace” by the press, laid out a grand bargain. The United States would share nuclear technology for beneficial use with any state that promised to forever forego the possession of nuclear weapons. Eisenhower challenged the Soviet Union to do the same under an internationally enforced system of safeguards.

His vision led to a non-proliferation consensus and later to the Non-Proliferation Treaty (NPT), the regime on which we rely today to constrain nuclear weapons capabilities while sharing the fruits of nuclear learning. More nation states adhere to the NPT than to any
other international treaty. Its administrative authority, the International Atomic Energy Agency (IAEA), has overseen a truly world-changing spread of nuclear technology in the form of nuclear energy production, nuclear medicine, and agricultural and industrial applications. This technology has even fueled space travel, the last frontier of human ambition.

Looking back on these last 50 years, there is much to feel satisfied about, especially given the forecasts of doom prevalent at the time. There has been neither nuclear war nor even nuclear explosions, except for test purposes. While many predicted there would be 16 to 20 nuclear weapon states by the end of the twentieth century, there are only eight, or perhaps now nine. Nuclear power, though far short of its promise, accounts for 17 percent of the world's electricity needs. Virtually everyone in this room has benefited from advances in nuclear medicine. The glass is clearly more than half full.

Nevertheless, we continue to wrestle with the challenge posed by the dual nature of the atom. We still do not know whether nuclear technology can be reliably harnessed for the welfare of humanity, or whether its more dangerous and destructive potential will dominate the nuclear future. Throughout the Cold War, the Soviet Union and the United States generally collaborated in the IAEA and restrained their allies and others who sought nuclear capabilities. As former U.S. Defense and Energy Secretary James Schlesinger has observed, however, with the end of the Cold War and its disciplines, such restraint has broken down. Knowledge of the fuel cycle has grown, and increasingly nations have sought nuclear capabilities. The present actions of Libya, North Korea, and Iran (and Iraq in the past) illustrate this point.

It is now obvious that the non-proliferation strategy has developed serious shortcomings. The very broad distribution of technical expertise in the world today enables an only moderately sophisticated state—or a well-financed terrorist organization—to acquire the capacity to make a weapon if it acquires fissile nuclear material. This is clearly so for highly-enriched uranium, and a number of us fear it is also true for plutonium. More than 40 nations are considered to
have the expertise to develop nuclear weapons if they have acquired fissile materials, and we must presume that al-Qaeda can acquire this capacity. We now know that plutonium produced in civilian nuclear power programs is suitable for making nuclear weapons, and that highly-enriched uranium at research reactors throughout the world is at risk. The world does not yet admit universally the first fact about reactor-grade plutonium, and is entirely too slow to address the dangers associated with highly-enriched uranium at research facilities.

Some data may help to illustrate the point. There are over 200 metric tons of separated plutonium derivative from the civilian nuclear power program. Over 20 tons of highly-enriched uranium have been distributed in 100 research facilities and critical assemblies in 40 countries throughout the world. We should remember that only a handful of kilograms is needed to make a nuclear weapon. It is now clear that the current physical security arrangements for nuclear materials are inadequate in the post–September 11 world. Furthermore, recent efforts to strengthen security requirements through international agreement have not been successful. It is equally apparent that the current voluntary system of export controls is insufficient to keep dangerous technologies and dual-use equipment out of the hands of proliferate states. The disclosures of activities by rogue Pakistani nuclear scientists in Iran, Libya, and North Korea demonstrate that commerce in enrichment technologies increases states’ abilities to fabricate highly-enriched uranium, the most easily weaponized material.

Indeed, many officials, including the Director General of the IAEA, now readily acknowledge that the current safeguards designed to keep material from being diverted by a state to military use are inadequate to the task. The treaty’s terms do not bind all nations, the regime lacks reliable and effective enforcement, additional protocols are necessary to supplement the verification regime, and even these may not be sufficient when it comes to enrichment reprocessing and related fuel-cycle facilities. Lastly, we must acknowledge that, 50 years into the nuclear age, we still have no solution for the management of the nuclear waste byproduct of civilian nuclear energy applications.
Why continue this sad litany of shortcomings? Unless we recognize and solve these problems and deal more effectively with the legacy of the last 50 years, we can never have a promising nuclear future. Such a belief does not render me anti-nuclear. My concerns are broader. The world needs to preserve a nuclear option to meet twenty-first century energy requirements. For more than 30 years, I have been at the center of U.S. energy policy formation and concerns about primary fuels balances. This experience influences my thinking, as do growing concerns about global warming and the consequences of ever-increasing volumes of greenhouse gases released by fossil fuel combustion. This latter concern may be sufficient to propel national energy policies to favor nuclear energy and to accept some of the proliferation risk associated with an expanding reliance on nuclear power in the developing world, where it will be most employed. Importantly, however, this will not occur unless more effective solutions are developed to address the most serious of the nuclear non-proliferation regime’s flaws.

Even if those flaws are addressed, such change will require substantial government intervention, subsidies, advances in technology, and improved public understanding of energy policy choices. In liberalized power sector markets, investors, developers, and boards of directors will hesitate to choose the nuclear option because of its vulnerability to the next terrorist attack, the next environmental event, or public fears that are too easily aroused with respect to anything radiological. These vulnerabilities combine with economic disadvantages—high front-end capital costs and long construction and licensing periods—to severely handicap the nuclear option.

Advancing nuclear energy prospects will thus require some kind of state action. Even so, states—at least democratic states—will be reluctant to favor nuclear power because we have not yet developed a solution to the management of nuclear waste. As waste product continues to expand, this makes for increasingly difficult politics. Such difficulties persist in the United States, and increasingly in the pro-nuclear states of Japan, South Korea, and Taiwan. The political choice is further complicated because inducing states to develop sufficient nuclear power to make a meaningful difference in climate
change will almost certainly require significant government subsidies to compensate for the relative cost disadvantage of nuclear energy versus competitor fuels.

Part of the difficulty lies in determining the location of the large numbers of plants required to really make a difference. A recent Massachusetts Institute of Technology (MIT) study on the future of nuclear power, *The Future of Nuclear Power: An Interdisciplinary MIT Study*, sheds light on this issue. MIT’s global growth scenario postulates that by 2050, after adjusting for projected increases in world population and trends in urbanization, nuclear energy might contribute 19 percent of the world’s electricity, a market share increase of just 2 percent. Yet this scenario, if realized, would require between 1,000 and 1,500 new nuclear plants of 1,000-megawatt size, an

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<th>Table 1</th>
<th>The Future of Nuclear Power</th>
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<td><strong>Global Growth Scenario</strong></td>
<td><strong>Nuclear Electricity Market Share</strong></td>
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<tr>
<td><strong>Region</strong></td>
<td><strong>Projected 2050 Gwe Capacity</strong></td>
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<tr>
<td>Total World</td>
<td>1,000</td>
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<tr>
<td>Developed world</td>
<td>625</td>
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<tr>
<td>U.S.</td>
<td>300</td>
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<tr>
<td>Europe &amp; Canada</td>
<td>210</td>
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<tr>
<td>Developed East Asia</td>
<td>115</td>
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<td>FSU</td>
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<tr>
<td>Developing world</td>
<td>325</td>
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<tr>
<td>China, India, Pakistan</td>
<td>200</td>
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<td>Indonesia, Brazil, Mexico</td>
<td>75</td>
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<tr>
<td>Other developing countries</td>
<td>50</td>
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Projected capacity comes from the global electricity demand scenario in Appendix 2, which entails growth in global electricity consumption from 13.6 to 38.7 trillion kWhrs from 2000 to 2050 (2.1% annual growth). The market share in 2050 is predicated on 85% capacity factor for nuclear power reactors. Note that China, India, and Pakistan are nuclear weapons capable states. Other developing countries include as leading contributors Iran, South Africa, Egypt, Philippines, and Vietnam.

investment of well over $1 trillion. This would represent an almost threefold increase from today’s 366 plants, as Figure 1 shows.

If this were accomplished, the MIT study estimates, 1,000 gigawatts of energy capacity from nuclear power could displace 800 million tons of carbon, if it replaced natural gas-fired generation, and 1,800 million tons if it replaced coal. Certainly, those numbers represent a high value in any global climate change strategy. Achieving that projection, however, would require starting very soon, in the next five to 15 years. Furthermore, it would also require significant cost subsidization or other market intervention. Even the optimistic MIT study acknowledges that making nuclear energy cost-competitive with coal and natural gas, at least in the near future, would require a 25 percent reduction in construction costs, a 20 percent reduction in construction time, and reduced operation and maintenance and capital costs. Alternatively, a carbon tax of $50–$100 per ton would be required. Both options create supremely difficult political choices. Indeed, natural gas as a liquefied product could be delivered worldwide at $3.50–$4.00 per million British thermal units (mmbtu). If that is the case, making nuclear power competitive would require a carbon tax of well over $100 per ton.

Changing the nuclear future for the better requires three things:

- We need to enhance and universalize existing safeguards, enhance the physical protection of nuclear materials, and enforce breaches of the NPT.

- We need to advance research and more proliferation-resistant power production technologies, drive down front-end costs of new plants, and advance our understanding of waste management options.

- We need to improve public understanding of the vital role energy plays in our economies, our environmental health, and our security. Only by doing so will we be able to develop long-term strategies of sustaining political value that might improve nuclear energy’s prospects in the future.
Fifty years ago, President Eisenhower established a hopeful vision for a nuclear future. It was not, as his granddaughter Susan Eisenhower recently remarked, a blueprint, and certainly not for all time. Today we need a new vision for this new century, one that deals more effectively with nuclear danger in order to preserve the opportunity to fulfill the nuclear promise. At present, we lack the vision to see the future. Nuclear danger is apparent and pressing, while the prospects for nuclear energy remain opaque and uncertain.
Discussing the broad topic of natural gas in Europe in a brief space presents a considerable challenge. Europe includes 33 countries, so generalizations require some fairly heroic assumptions. It is important to note, especially in light of the location of the Seminar, that many of the generalizations do not apply to Spain. Unlike many European natural gas markets, Spain has demonstrated an impressive commitment to liberalization and competition in the natural gas sector over the past decade.

This presentation focuses on three major agenda issues that will affect natural gas in the years—or perhaps even the decades—ahead:

• liberalization, regulation, and competition;
• the closely related issue of corporate restructuring that has changed the structure of the utility sector;
• possible scenarios for supply, demand, and price.
The last ten years have laid the groundwork for the legal and regulatory fundamentals that, over the next few years, are intended to lead to a liberalized and competitive European natural gas market. After years of discussion and legislation, two major European Union Directives (and another that is projected to be passed in 2004) have established the legal and regulatory fundamentals, and the schedule for implementation has been accelerated. The European gas market will be completely open to competition by July 2007. Separate independent distribution and transmission networks will be created for transmission in 2004 and distribution by 2007. A greater degree of transparent and non-discriminatory access to transmission networks—firm and interruptible, long-term or short-term—is being implemented with an attempt to develop a uniform approach to charges, which avoids cross subsidies and discrimination.

Despite such groundwork, however, significant obstacles to a liberalized and competitive market remain. Competition remains at a low level throughout Europe, and there are very few true new market entrants. Natural gas prices remain linked to oil, testifying to the lack of any serious gas-on-gas competition. Furthermore, production of natural gas imports is concentrated in very few hands. High transportation tariffs, serious transparency problems, and stringent balancing regimes work against liberalization.

The principal obstacle has been the corporate players who, supported by their governments, have restructured and consolidated into “multi-energy” or “multi-utility” pan-European national champions. These companies include E.ON-Ruhrgas, RWE, and others in Germany; Electricité de France (EdF) and Gaz de France (GdF) in France; and ENI Gas and Power and Enel in Italy. These consolidations are significant developments, particularly because they were supported by their governments, in some cases against the advice of national competition authorities. French and German national champions have taken significant shares of the natural gas and electricity market in Britain, and virtually taken over the markets in many important central and eastern European countries. That such developments frequently received direct governmental support bodes poorly
for the rapid development of competition and liberalization in European natural gas markets. With the notable exception of Spain, where attempts to merge natural gas and electricity companies have been stopped by the competition authorities, most European governments have supported—or at least not opposed—mergers that have created national utility champions.

These national champion companies seek to maintain their dominant oligopolistic status. By paying prices for equity that cannot be justified by any conventional mergers and acquisitions analysis, they have gained entry into many other European markets. Several months after E.ON took over Powergen in the United Kingdom (UK) in 2002, for example, it accepted a more than one billion euro write down of Powergen’s asset value. The fact that national champions are willing to spend massive amounts on asset acquisition has the effect of preventing new entrants from entering the market. At the same time, these national champions tolerate their counterparts in other European countries and a few niche players who do not threaten their position. They have had relative success managing competition with the other major suppliers, including Norwegian and Dutch suppliers, Gazprom of Russia, Sonatrach of Algeria, and various liquefied natural gas (LNG) suppliers. They have also been extremely successful in controlling the development of natural gas trading to ensure that liquidity never develops to the point where spot prices could upset the long-term contractual framework.

The domination of markets by national champion companies places producers in a difficult situation in relation to their future strategies. They wonder whether they should simply sell the natural gas to national champions or seek vertical integration themselves. Many producers are trying to develop downstream businesses with power plants as their main entry point, as well as trying to use LNG projects to vertically integrate from wellhead to power plant. Producers are hindered by their general lack of knowledge of sales, marketing, and the power sector. Furthermore, their electricity investments threaten oil-linked pricing, the industry’s “Holy Grail.” If—or as many believe, when—the market moves away from oil-linked pricing,
competition will increase, and no one in the upstream sector wants that to happen.

The third agenda issue is how the fundamentals of supply, demand, and price will evolve. Figure 1, the consensus projection of Organization for Economic Cooperation and Development (OECD) Europe natural gas demand through 2020, shows that power generation represents between two-thirds and three-quarters of the incremental natural gas demand in the next 20 years. Growth in demand outside of power generation will average 1 percent per year. In the “conventional wisdom” projection, today’s small surplus will become a deficit within five years and a very significant deficit within 20 to 30 years.

However, as we have seen, natural gas demand projections depend greatly on power generation. Looking around Europe, apart
from Italy, Spain, and a few smaller, peripheral countries, little natural gas-fired power generation is being constructed. This current power generation reality contradicts conventional wisdom projections. Further, even when a company decides to build a natural gas-fired power plant, it will take three to six years before that plant is operational. As a result, even if many companies decide on natural gas-fired power generation today, those plants will not generate power until approximately 2010. To adjust for this, a “lower power generation” case has been constructed by reducing the demand data in Figure 1. The projection in Figure 2 thus shows the line for power as relatively flat until around 2010, when it begins to increase modestly. Indeed, one could even argue that power will increase even more after 2010 due to decisions made today. This projection flattens the potential supply gap. It predicts a natural gas surplus in OECD Europe.

Figure 2
OECD Europe Natural Gas Demand 2000–2030
(lower power generation scenario)
until 2010, which suggests that there is no need to contract for more natural gas until then.

The problem with this projection, however, is that while this is a total OECD Europe picture, one country—the UK—will experience a very dramatic change in its natural gas supply. The UK will shift from exporter to substantial importer within five or six years. Removing the UK data from consideration reveals a different picture, shown in Figure 3. The UK import takes up virtually the entire requirement until approximately 2015, when continental Europe will again be in deficit. Suppliers now are clearly so desperate to export to the UK that the UK has already contracted for much more natural gas than it could possibly use before 2012. As a result, although the UK could have a natural gas shortage during the next two or three winters,
after 2007 it will have a significant surplus, in spite of its transition from exporter to importer.

To summarize, the introduction of liberalization and competition into natural gas markets has made slow progress in the majority of European countries. The restructuring of the utility sector, and the creation of national champions with a tight grip on continental European natural gas markets, render future progress in these areas uncertain. Those companies have strategies to increase vertical integration, further limit the potential for competition, and continue to support oil-linked pricing. Further liberalization will occur, but competition is unlikely to challenge the position of these companies, which so far have retained control of the market.

On the other hand, the growing natural gas surplus presents a problem for the national champions. The surplus appears to be growing, and high oil-linked prices will make it increasingly difficult to manage. Two possible scenarios can be advanced:

- If demand remains constrained and new natural gas-fired generation is smaller than anticipated, Europe will not need large additional supply for some time and will divert some of its contracted LNG to the United States.
- If gas-to-gas competition develops, prices will fall, power plants will be built, and more LNG will move to the United States, the surplus will dissipate much more quickly. In this scenario, the timing of the arrival of gas-to-gas competition is crucial.

The key to the change will be the movement of continental European natural gas markets away from oil-linked prices; when, or if, that happens, the nature and speed of the changes will become clear.
Global trade in liquefied natural gas (LNG) is growing in volume and strategic importance. In the last eight years, growth in LNG volume has been accompanied by an ongoing transformation in its business character. The traditional project-utility chain model supported the funding of facility chains for LNG trades on tight, bilateral long-term contractual relationships. These relationships were between the LNG export project as seller and the monopoly-franchised natural gas or electricity utility as buyer. Now, however, through a process that Joseph Schumpeter would have described as creative destruction, new projects are being formed by LNG merchants—major energy companies that control facilities and retain title to the LNG through the chain. This new business model, called commercial LNG, is still evolving. It is being driven by the confluence of three trends: growing size and scope of LNG trade, lower costs through the LNG facilities chain, and the erosion of utility monopoly franchises in more competitive inland natural gas markets.
This evolution is most advanced in the Atlantic Basin market. I will start by using developments here to illustrate the expansion of trade and facilities that has been so frequently discussed. Then I will step back and show how that economic expansion has been matched by an evolution of business structures, including who owns what and on what terms. This will show the transition from the traditional project-utility chain model to the current commercial model, and it will suggest some policy questions resulting from the evolution.

The dramatic growth in demand for LNG in Atlantic markets (and elsewhere) has been driven by several factors, most prominently, the increasing demand for natural gas in electricity generation. At a delivered price as high as $4–$5 per million British thermal units (mmbtu), natural gas is the preferred fuel for base load electricity generation in combined cycle facilities. Beyond straight economics, natural gas is preferred at even higher prices because of environmental considerations, the rapidity of plant construction, relatively low capital costs, and flexible dispatch over the daily load cycle. Natural gas is a wonderful fuel for producing electricity.

LNG is an increasingly important component of natural gas supply as growing continental markets reach out for new, more remote production. Capital costs throughout the LNG supply chain have been cut in half in the last 15 years. Production costs for both oil and natural gas have dropped sharply with new technologies for seismic, horizontal drilling, and sub-sea completions. Pipeline costs are down. Shipyard competition has driven ship costs down. And, driven by the need to enter inland natural gas markets, LNG supply projects are instituting more competitive facility procurements from construction contractors and LNG process vendors. This competition has cut export project costs through simpler design and project management and significant increases in scale. Indeed, the cost to supply LNG to inland natural gas markets is generally $3.50 per mmbtu or less.

The Atlantic LNG project in Trinidad, sponsored by Repsol YPF and others, originated contractor competition in front-end engineering design (FEED) for the LNG plant, and has set a new standard in reducing grassroots project costs. More generally, where in 1996, the
standard liquefaction train had the capacity of two million tons per year, today new LNG projects are installing four to five million tons per year trains, and Shell and ExxonMobil are talking about new projects with one or more trains of eight million tons per year capacity each. The result is that LNG can compete with coal for base load generation almost anywhere in the world, and notably in the growing continental natural gas markets of the Atlantic Basin.

To give a sense of the prospects for LNG expansion, Figure 1 shows the probable quadrupling of LNG demand in the Atlantic Basin, with volumes rising from 40 million tons per year in 2003 to

Figure 1
Atlantic Basin LNG Demand, 1980–2015
160 million tons per year a decade later. There will be major growth in demand in the Iberian Peninsula, significant growth in France despite her traditional focus on nuclear power, and the potential for massive LNG import growth in the United Kingdom (UK) as growing demand and declining production of natural gas move this country from exporter to importer status. In North America, maturing production of natural gas is failing to keep pace with demand, offering an entry point for LNG.

On the supply side, Figure 2 shows projected growth in LNG supply through 2015. The reserves are more than adequate, and there is
a great deal of new and expanded supply project activity. Out of the eight current export projects serving Atlantic markets, four are expanding in Nigeria, Oman, Qatar, and Trinidad. New projects are being built in Egypt and Norway, and others proposed in Angola, Equatorial Guinea, Iran, Nigeria, Venezuela, and Algeria (which is finally returning to the new project market after the debacles of the 1980s).

In short, the fundamental economics for LNG trade expansion are fine: there are ample supply resources, proliferating export project development efforts, and demand growth potential, which is very large. But the funding of new LNG supply projects still requires assured shipping and access to markets and sales revenue. Shipping is not a problem and is growing apace. More than 80 new ships are scheduled for delivery between 2002 and 2007. The changes in ownership are even more significant than the growth in numbers. In addition to shipping dedicated to long-term contracts, at least 15 vessels will be acquired by big players such as BG, BP, Shell, and Tractebel for trading.

The potential bottleneck is new LNG import capacity. In Europe, this is not a major issue; import capacity is expanding dramatically, with large LNG import terminal projects in the UK, France, Spain, and proposals for several in Italy. In North America, prospects for new LNG import capacity are more conflicted. Recent and welcome changes in U.S. federal laws and policy encourage the construction of LNG import terminals, by allowing privately controlled (“non-jurisdictional”) LNG import projects. But, as with other U.S. energy infrastructure proposals, there are federal and state jurisdictional conflicts over siting and permitting.

The four existing U.S. import terminals will expand annual capacity to 1.3 trillion cubic feet (tcf), or about 26 million tons, to accommodate new supplies from Egypt, Norway, Qatar, and Trinidad. However, a host of proposed projects on both the East and West Coasts face various degrees of resistance. LNG advocates on the coasts have not been successful in making the political case that LNG is safe—and that if these areas do not import LNG, the country may
see a great upsurge in coal-fired electricity generation. By contrast, plans in the Gulf of Mexico, where people are used to energy projects, are likely to fare better. ChevronTexaco, ConocoPhillips, ExxonMobil, and Shell are developing import projects in the Gulf to be supplied from new export projects in Africa, the Middle East, and Venezuela.

The recent growth in LNG volumes has been accompanied by a growth in short-term trading—arm’s length trades involving third-party buyers using existing capacity through the chain. The traditional project-utility chain structure always generated some spare capacity; but its production was typically traded within the long-term bilateral contract framework. True short-term spot trading emerged in the late 1990s, and such trades have expanded from two to about eight million tons per year, which is about 7 percent of the market. On the demand side, growing U.S. natural gas market liquidity offers both a market and a key support for such trading.

It is now possible to see arbitrage at play in the trading. The thing to keep in mind going forward is that LNG offers the only physical arbitrage between continental natural gas and electricity markets, and so the embedded optionality value of uncommitted capacity through the chain is very high. And the keys to exploiting that optionality are market liquidity and destination optionality within the contractual terms of the project business and commercial structures.

How have these changes taken place? It is useful to reflect for a moment on how business and commercial structures develop in any energy trade. All energy businesses share common structural features. They are capital intensive, with about 70 percent of value added by capital services. They require a facilities chain from production through transportation, distribution, and use. Early on in industry development, these chains are bilaterally committed. That is, a specific supply project is linked by design and commercial commitment to a specific market. The project-utility chain business structure consists of an export project, which is typically a joint venture between a supplier (an international or national oil company), and buyers, which are typically monopoly-franchised utilities or merchant
traders. And the deals are processed in facilities with bilaterally dedicated services. In these chains, suppliers and buyers must be connected by long-term contracts. For the supply side, such a model assures a creditworthy revenue stream; for the demand side, it assures a reliable, non-opportunistic supply.

Now, what went on in LNG under the project model? Remember that LNG is not a commodity; it is a means of transportation. Its economic function is to move natural gas from a low-cost, low-value resource to a distant, high-value market. The resource has to be low-cost to provide the margin to pay for the transportation, and it has to be low-value to favor export. Markets have to be distant because otherwise natural gas is moved by pipeline; markets have to be high-value to pay for the expensive LNG infrastructure. Early LNG supply project development was costly and technically challenging. Early trades offered little rent cushion; in fact, they came into the market at negotiated pricing premiums.

Import terminals and service facilities for electricity generation and citygas distribution cost several billion dollars, on the same order as the outlay for supply or export facilities. Distant markets imply international trade. As a consequence, the arrangement has to be contractual, and it has to start big because of the necessary scale in facilities. Unlike any other energy business, LNG cannot start incrementally in local markets, because its purpose is transportation.

Early projects on the demand side are therefore owned by monopoly utilities; the project is a separate business deal in an isolated market. And the whole logistical chain, costing perhaps $5 billion or more, must be created and financed simultaneously, with construction funding dedicated four or more years in advance. This requires a special kind of business structure and financing. The key is a creditworthy sales-and-purchase agreement (SPA). In the standard SPA, quantity risk is allocated to the buyer, who assumes a take-or-pay obligation to assure utilization of the chain. Price risk is taken by the seller. Pricing is oil-indexed, which requires a “social contract” in which regulators, customers, and politicians agree that the utility can charge end-use customers on that basis. This business structure is
very costly to buyers because the rigid delivery means no laying off or acquiring additional LNG to mitigate demand and supply mismatches. It is also costly to sellers because the rigid destination restrictions limit arbitrage.

In the project-utility chain structure, there is little scope for opportunistic trade in response to shifting competitive market conditions. But a competitive commercial market for an energy commodity requires at its base a competitive commercial market for transportation services. The starting point in the move to a commercial model is the unbundling of transportation assets and services. This was true in oil, later in natural gas, and currently in electricity. For example, the oil business started to open up after the 1956 Suez Crisis when Greek ship owners started to permit third-party free on board (FOB) purchases at terminals in the Persian Gulf. Ultimately, the entire oil business became unbundled. Natural gas unbundling was next. In the United States in 1985, the U.S. Federal Energy Regulatory Commission’s Order 436 mandated open access to pipelines, and now liberalization in the European markets includes a mandate for third-party access as well. Finally, in electricity, we are accepting that its transportation and congestion pricing requires unbundling with the use of financial transmission rights (FTRs).

Now consider the commercial LNG model, which accommodates opportunistic exchange to meet current market conditions. This requires a LNG merchant business structure to control production, liquefaction, shipping, and import capacity that can be used flexibly. In addition, with the replacement of the buyer monopoly utility, the merchant must take up or arrange for the marketing functions—demand aggregation, sales, and trade credit (replacing project credit in the old model). Neither LNG supply projects nor importing monopoly utilities are equipped to manage these cross-trade functions.

However, enabled by lower costs through the LNG chain, expanded LNG market scope, and accessible natural gas markets, major energy companies that are the natural gas producers in supply projects can move downstream. Also, major natural gas buyers can
move upstream to become LNG merchants with capacity control across multiple trades, in some combination of multiple supply projects, undedicated shipping, and multiple import location access.

This changes the role of the LNG export project, which takes on a different business structure and commercial function. In one version of this new model, the LNG export project becomes a tolling facility, selling liquefaction, storage, and loading services to the natural gas producer/LNG merchant. Natural gas producers rather than the projects become the sellers. And LNG merchant traders, who have control of facilities' assets through the chain, evolve as buyers. In the Atlantic Basin in the late 1990s, new trades were formed by BG, BP, Cabot LNG (later Tractebel LNG), Gas Natural, and Repsol YPF, which controlled their own shipping and moved the shipping among projects. The LNG plant is simply paid a processing fee, and the upstream producers such as BG, BP, Repsol YPF, and others are now selling—and they themselves often participate in buyer import projects. An alternative model is for LNG project partners to buy LNG from the project and then transport and sell to the import projects that they form. In Qatar, ExxonMobil with Qatar Petroleum and ConocoPhillips are developing such structures for export to the UK and North America.

Who are the players in this new world? As Table 1 shows, it is no longer the “projects-to-utilities” players. Rather, it is the majors such as BG, BP, ExxonMobil, Shell, and Sonatrach that start as suppliers and move downstream from project positions through their own shipping to define import positions. And at the same time, the buyers are moving upstream. Gaz de France has moved upstream and is taking equity LNG into its Atlantic ports. Repsol YPF moved upstream into the Trinidad project and manages its own ships. The pattern continues. In commercialization, “gas for sale” signs are not installed and customers do not simply line up. Rather, what does happen is that the major players are controlling capacity through the chain.

Under the commercial structure, most of the trade will continue as long-term contracts, but the character of those contracts will change. There is now discretionary trading, with many variables.
Negotiations are between principals who know where the ships, production gaps, and offloading gaps are. So this is still a principals’ business, and they all have the same Rolodex. Long-term contracts will evolve to permit and share arbitrage, which will loosen destination restrictions. There will be liquid markets that support some spot trading. Spot trading will remain, but within the context of a larger business. True swaps involve too many people.

**Table 1**

*Merchants Emerge from Both Ends of the LNG Chain*

<table>
<thead>
<tr>
<th>Merchant</th>
<th>Export Positions</th>
<th>Shipping</th>
<th>Import Positions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SUPPLIER SIDE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BG</td>
<td>Trinidad (Atlantic LNG), Egyptian LNG, Iran (prop.)</td>
<td>Yes</td>
<td>Lake Charles, LA, Brindisi, Italy (prop.)</td>
</tr>
<tr>
<td>BP</td>
<td>Trinidad (Atlantic LNG), Angola LNG (prop.), Abu Dhabi, Indonesia, Iran (prop.)</td>
<td>Yes</td>
<td>Bilbao, Spain, Cove Point, MD</td>
</tr>
<tr>
<td>ExxonMobil</td>
<td>Qatar, West Niger Delta LNG (prop.), Angola LNG (prop.), Indonesia</td>
<td>Yes</td>
<td>UK, France, and Gulf of Mexico (all prop.)</td>
</tr>
<tr>
<td>SONATRACH</td>
<td>Algeria</td>
<td>Yes</td>
<td>El Ferrol, Spain (prop.)</td>
</tr>
<tr>
<td>Shell</td>
<td>Nigéria LNG, Venezuela (prop.), Oman LNG, also Brunei, Australia, NSW, Malaysia, Sakhalin</td>
<td>Yes</td>
<td>Cove Point, MD, Elba Island, GA, Altamira, Mexico (prop.)</td>
</tr>
<tr>
<td><strong>BUYER SIDE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GdF</td>
<td>Snohvit, Egyptian LNG</td>
<td>Yes</td>
<td>France (2)</td>
</tr>
<tr>
<td>Repsol YPF</td>
<td>Trinidad (Atlantic LNG)</td>
<td>Yes</td>
<td>Bilbao, Spain, Altamira and Lazaro Cardenas, Mexico (prop.)</td>
</tr>
<tr>
<td>Tractebel</td>
<td>Trinidad (Atlantic LNG)</td>
<td>Yes</td>
<td>Zeebrugge, Bel., Everett, MA, Bahamas-FL (prop.)</td>
</tr>
<tr>
<td>Union Fenosa/ENI</td>
<td>SEGAS LNG (Egypt), and purchase from Oman LNG</td>
<td></td>
<td>Sagunto</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>El Ferrol, Spain (prop.)</td>
</tr>
</tbody>
</table>
The emergence of the LNG merchant structure raises new policy issues:

• In North America, import terminal siting is a key issue. The “not in my backyard” (NIMBY) problem for LNG (as well as for electricity transmission) highlights the gaps in the federal and local dimensions of the regulatory structure and will create increasingly acute problems in both of those markets, absent an aggressive rationalization of the jurisdiction policy.

• Project finance is replaced by trade finance, but with new characteristics. Commodity futures markets are always thin on the short side, and so the project structure’s vanishing creates new demands for finance. The disappearance of the asset-owning merchant traders after the Enron collapse has formed very thin futures markets in natural gas and made commercial trading harder.

• Demand aggregation, or market power, becomes a critical issue. For example, in Europe there is a fight among both natural gas pipeline suppliers and LNG suppliers over destination clauses. The suppliers—Sonatrach, the Russians, and the LNG projects—want to keep them, and the European Commission wants to abolish them. The question is who will share the rents from arbitrage.

• Transportation access remains a critical unresolved issue. Third-party access to import terminals is not the same as common carriage, and it provides an incentive to owners to fill up their own terminals with their own contractors’ supplies.

• At the base is the question of whether or not efficient competition is attained. Whether creative destruction will go that far remains to be seen. However, the trend in Europe, despite a decade of liberalization, shows the market power of emerging national champions.
When European nations began the drive to liberalize electricity markets in the 1990s, the principal focus was on individual national markets rather than on a common electricity market on a Europe-wide level. However, in the decade that has passed since the inception of electricity liberalization, the importance of international electric trade both in the development of viable competitive national markets and in the liberalization of the electricity industry has become clear. This shift in perception will be reviewed and then the issues that are currently facing cross-border electricity trade in Europe will be considered.

In 1996, a benchmark year on the path to electricity liberalization, the European Commission (EC) approved a key directive, Directive 96/92/CE, that fixed a series of common standards for internal electricity markets. The directive established rules regarding grid access for third parties, procedures for installing new plants, the unbundling of vertically-integrated corporate activities, the creation of a new structure for transmission system operators (TSOs), and it set a calendar for liberalization. It did not address questions of international exchanges or international trade.
However, in a sector like electricity—historically dominated by vertically integrated companies with national or regional monopoly status, and marked by regulatory, economic, and technological barriers to entrance—it should be no surprise that liberalization efforts have had less than complete success. There has not been marked success in such critical areas as bringing new players into the market or establishing true competition among companies. In the face of such developments, the importance of cross-border trade to aid in solving the problems of liberalization became evident. Certainly, international electricity exchanges make it possible to partially compensate for the lack of national competition and for the lack of investment resources that enable newcomers to participate in markets.

An emphasis on cross-border trade in the liberalization agenda was a feasible option because Europe had the infrastructure base for an international trading system. In the 1940s and 1950s, a series of international interconnections was created to provide emergency support between national systems as well as to manage seasonal exchanges of national electric production surpluses. Today, Europe—including nations both inside and outside of the Union for the Coordination of the Transmission of Electricity (UCTE)—boasts the largest interconnected electricity system in the world.

It became clear that the 1996 Directive did not have the effect of stimulating further cross-border trade. International trade increased by only 2 percent from 1996 to 2002. Indeed, even in 2004, it will constitute only 13 percent of total European electricity consumption. New efforts are clearly needed to redress this slow growth, and to move toward exploiting its potential effects on competitive markets.

Such efforts have been forthcoming, from both governmental and industry initiatives; these efforts focus on building more homogeneous national regulatory frameworks and on significantly increasing the available capacity of transmission interconnections. For example, in 2003, the EC approved a new directive, 2003/54, focused on international trade as well as on the traditional national market issues. For cross-border trade, the directive established a series of guidelines to manage congestion and available capacity in
international connections. According to these guidelines, short-term congestion must now be managed by competitive procedures that provide incentives to increase efficiency in investments and networks, as well as in new generation. The regulation also provides specific recommendations on auctions that may be conducted until the goal of an intra-daily horizon is reached.

In parallel efforts, transmission companies and system operators grouped together in the European Transmission System Operators (ETSO) have set non-governmental standards for the industry. Notable among these has been the elimination of pancaking. In 2002, there were only single tolls for international transactions, and by 2004, all tolls had been eliminated among the ETSO countries. In terms of infrastructure, the European Union’s Barcelona Council in 2002 mandated that each member state should, by 2005, achieve interconnection facilities with its neighbors equivalent to 10 percent of installed power. Furthermore, the Trans-European Networks Initiative was established to co-finance infrastructures for inter-European connection.

The ability of internal national markets to consolidate through cross-border trading, however, still faces four important barriers: different structures for access rates; lack of reciprocity in opening national markets; concentration of generation facilities; and differing procedures for handling regulated costs. In sum, the present level of interconnection between national markets is simply not sufficient. Deadlines for new transmission installations are often delayed by authorization permits and increasingly demanding environmental considerations, thus further impeding both the structure and degree of interconnection. While liberalization has made progress, the industry must establish a level of coverage in areas such as new generation, adequate interconnections, and reliability of supply.

Reliability, of course, is of paramount concern. Liberalization has meant the abandonment of traditional systems of centralized planning and of cost recovery for private investment in infrastructure. In this new framework, it is not surprising that the maintenance and expansion of peak load capacity, unused much of the time, should become
problematic. In fact, margins of reserve capacity have been reduced to the point that some countries, Italy and the Scandinavian ones for example, have very low margins under certain conditions. In such situations, to fall back on international connection capacity is risky, particularly when these transmission networks are being used more and more for commercial purposes.

As noted, the interconnections were originally built for system backup, but they are used increasingly for commercial purposes. This commercial use of interconnections, however, has outpaced actual capacities and raised risk levels. These risks were clearly demonstrated by events in Europe and North America during the summer of 2003. Within two months, three significant supply interruptions affected neighboring countries in those areas. Problems arose between the United States and Canada in August 2003, between Denmark and Sweden in September 2003, and finally between Italy and Switzerland. These experiences testify to the threat to reliability brought about by using interconnections beyond their capacities for commercial purposes.

Reliability is also threatened when problems are passed from one country to another by system operators who, although coordinated, are still independent. Countries that are highly dependent on interconnections and imports for supply run a significant risk. Returning to the summer of 2003, it is important to recall that Sweden’s interconnection capacity was equivalent to 29 percent of installed power; Denmark’s was 51 percent. This high interconnection capacity caused the Danish system to collapse when a Swedish operator near the border made a small error. The same problem developed in Italy where, in a country dependent on imports, reserve capacity was largely outside the nation’s own borders. Indeed, a very similar scenario played out in California in 2001 and 2002, and between the United States and Canada in 2003. These examples testify to the importance of economic and reliability regulations, as well as agreements between operators to prevent undesired effects.

The construction of interconnections that promote international trade must be accompanied by a clear understanding of the economic
considerations involved in addition to those affecting supply reliability. Cross-border pricing is one of those economic considerations. Cross-border trade does not tend to affect prices. Energy resources in Europe are such that marginal prices of electricity should tend to converge. Any structural price differences are therefore due to regulatory policies, which differ widely among European states. Some governments mandate the need for new generation, for example, while others allow the market to make the determination. In Norway, Sweden, and the United Kingdom, TSOs are required to buy reserve capacity. In other countries, TSOs are not allowed to buy electricity for the market. Some countries have regulations that promote short-term actions while others focus on longer-term planning. The price difference between Germany and Holland provides a good example of these differences. Although they are neighboring countries in the central European market, the price difference is between 10 and 13 euros per megawatt hour.

This highlights the question of whether the increase in interconnections would provide a long-term solution for market integration and price convergence, or whether regulatory restructuring would work more effectively.

Additional issues have only recently become evident, and action is being taken. The EC has prepared a strategy paper that aims to redefine wholesale markets, establish a link between short-term and long-term sales, and, especially, ensure that TSOs can reserve capacity for peak periods. A new directive has been proposed to address a series of issues concerning infrastructure and security of supply. Two types of institutions, regulators and transmission companies, play an important role in the Commission’s decisions. In an important step toward coordinating and harmonizing national regulations, a group of regulators has been created to provide advice on the Commission’s plans. This move should help solve many problems concerning supply and demand and consumer difficulties. On the other side, the UCTE is developing an operational handbook and establishing a firm, multilateral agreement among its members to achieve compulsory standards to respond to emergencies.
Several important issues are still pending.

- Investment in transmission networks within a market framework must be encouraged. Efforts to develop transmission networks based on economic signals have not been successful. The long-term decisions required to develop interconnections necessitate an increase in central planning, which uses the networks as a natural monopoly, and cannot be combined with free generation. The generation and transmission systems, while independent, need to be coordinated.

- Signals for the creation of new generating capacity must be established, particularly for peak capacity. This is not a decision that the market will make automatically, so there has to be an established authority with power to make such decisions.

- Benchmarks for the siting of such facilities must be developed. Creation of critically needed new infrastructure faces growing social opposition. Although the solution to this problem is not evident, we should recognize it as a major obstacle to promoting international trade.

- Reliability standards for transmission networks need to be established. The vast increase in trade requires increased attention to how transmission networks function in critical situations. In the United States, studies of the transmission grid and the work of research groups such as the Electric Power Research Institute have led to proposals for considerable upgrades of the data computing systems that support the transmission systems. In the future, this will be a key element for network reliability.

- Finally, environmental issues must be confronted on an ongoing basis. In particular, the extent to which the Kyoto Protocol will distort or redress the balances between countries must be considered, as does its impact on supply guarantees and trade and price convergence.
Alfonso Cortina treated us to one of the best reviews of the state of play in the world oil markets that I have heard in a long time. Given the extent of the nonsense written about this industry in the financial press, it was a pleasure to see a clear statement of the demand and supply conditions that are causing what Nader Sultan quite properly called “higher” rather than “high” oil prices.

In my view, Alfonso Cortina is correct to remind us that the near-term economic outlook is quite good, with a worldwide recovery being powered by growth in the United States, which in some months is adding 10,000 permanent, high-paying jobs every day; a boom in China, which we all hope can be converted into steady if slower growth—say 7 percent instead of 10 percent; and a recovery in Japan. Only in Europe, characterized by what Alfonso Cortina calls “a lack of thrust to undertake structural reforms,” is there the probability of continued stagnation and high unemployment in the core countries of France and Germany. All will depend on whether Spain
and like-minded countries can interpret the new European constitution—if it is ever adopted, which is unlikely—in a way that overrides France’s dirigiste view of what that document means.

From Joe Nye, we received a broadening of our view of the context within which we should be thinking about energy markets. Unfortunately, he comes off a period of serving as Dean of the John F. Kennedy School of Government at Harvard, a position in which he was dealing with tenured professors, and therefore had available to him only the “soft power” of persuasion. “Hard power” was not included in his arsenal. Whether even so eloquent an exponent of the soft power of persuasion could have persuaded Saddam Hussein to relinquish power, without relying on a modicum of hard power, is, to say the least, not certain.

Never mind: Professor Nye had valuable lessons for all of us who spend time at these Seminars peering into the future. Beware of linear projections; remember Hogan’s Rule that “The only surprise is no surprise”; markets depend on a well-ordered security system. Most important, do not count on being able to do business-as-usual with a radical fundamentalist regime should it take control of Saudi Arabia. The new regime’s desire to harm the West might well outweigh any desire for revenue from the sale of oil or, as I would put it, Osama bin Laden has proven his preference for caves over palaces. In the event of the threat of such a regime change, we would have little choice but to intervene—indeed, the countries that now rail at America’s muscular foreign policy would beg us to do so.

We have reached the point where thesis and antithesis have produced a synthesis. Joe Nye is quite right that there are limits to the reach of hard power, and that we should place more emphasis on soft power—the Voice of America, ambassadors who emerge from their bunkers to engage the local populace deployed in what he calls the “ability to influence others.” But in a recent book, An End to Evil: How to Win the War on Terror, Richard Perle, who has in the past graced these Seminars, says exactly the same thing—and no one has ever accused Richard of going wobbly on anything.
In sum, I think both sides in this dispute should claim victory. Joe Nye says that we did not use hard power sufficiently in the 1990s; few hard power advocates will contend that we got the mix of hard and soft right in Iraq. The soft power advocates should overcome their ingrained, elitist antipathy to President George W. Bush and Defense Secretary Donald Rumsfeld, the hard power advocates should overcome their macho objections to Secretary of State Colin Powell and former National Security Adviser Brent Scowcroft, and both should get on with the development of the foreign policy we so desperately need to meet the threats that Joe Nye so graphically described. In the process, we might hunt for the reforms in the United Nations that José Manuel Revuelta has urged us to devise.

And if Europe takes the advice of Luis Javier Navarro and invests more in hard power, while America takes the advice of Joe Nye and more visibly adds soft power to its arsenal and finds a middle way between preserving the status quo and attempting revolutionary changes—his policy of “dynamic stability”—we might all be better off. The worst outcome of the Iraq War would be for America to turn inward. Which America’s heavy dependence on imported oil makes an impossible policy.

Certainly, everything we have heard in these past two days tells us that all nations relying on imported oil are now competing for increasingly tight supplies. Alfonso Cortina reminded us of the fabulous growth in demand from China, which has gone from a net exporter to a net importer. Everyone seems agreed that the demand for oil will grow rapidly in the medium-term future—by 40 million barrels per day in the next 20 years, according to Nader Sultan.

But the oil ain’t where the demand is. Nader Sultan says that the Middle East will have to meet two-thirds of the increase in demand; José Luis Díaz Fernández points out that 95 percent of the increase in energy production in the next decade will occur in non-Organization for Economic Cooperation and Development (OECD) countries.

How much of this will have to come from Organization of the Petroleum Exporting Countries (OPEC) countries, wonders Vicky
Bailey. Claude Mandil expects non-OPEC supplies to increase by about one million barrels per day in the short run, while Guy Caruso thinks that in the longer run we might get an added three million barrels per day from non-OPEC sources. Bijan Mossavar-Rahmani tells us not to expect too much new oil from West Africa or the Central Asian Republics. Thus, much will depend on Russia. But here we must keep two facts in mind:

- Nader Sultan warns us that Russian oil costs about three times as much as oil from the Middle East, and that difference is widened by the higher transport costs which Russian oil must bear.

- Claude Mandil, in his typically French diplomatic way, warns us that the way the new Russian government is dealing with the oil sector “is a particular concern for oil exports.” The International Energy Agency (IEA), he points out, is having difficulty finding a discussion partner in Russia. Perhaps he should look up the old telephone number of the KGB.

All of this is part of what seems to be a general pessimism about the possibility of expanding supplies of oil in an industry that Adrián Lajous says is operating at 98 percent of capacity and has a long supply chain.

For some reason, and I am not sure what that reason is, there seems to be a widely held view among the participants that higher oil prices will not operate to increase exploration—in economic terms, a view that the supply curve is highly inelastic. Bijan Mossavar-Rahmani pointed out that the largest oil companies have replaced only three-fourths of their production, despite high oil prices and falling costs resulting from new technology. Indeed, he goes further, and warns us not to put faith in producing nations’ reports of reserve additions. These, he says, are “political reserves” from “such countries as Saudi Arabia, Iran and Iraq, designed to enhance strategic stature or to support demands for higher OPEC quotas.” Why we should need any warning that there is a large gap between Saudi statements and facts I am not certain, but it is always good to be reminded of that fact by an authority with the knowledge and stature of Bijan Mossavar-Rahmani.
The list of reasons given by so many of our participants for believing that the supply curve is so highly inelastic runs something like this:

1. Bijan Mossavar-Rahmani quite properly notes that terror threats have added an estimated $10 per barrel to the price of oil, and that oil companies do not like to plan investments when such a component of the current price might suddenly disappear. Also, terrorist threats make it difficult or impossible for international oil companies to deploy personnel in many parts of the world, and may force Shell to pull out of Nigeria.

2. Tony Meggs says that major oil companies are failing to raise investment levels because “they have learned from experience that it is bad business because prices go up, and prices come down.”

3. Juan Miguel Cayo and David Nissen say that there is a tendency for oil companies to under-invest, perhaps because they do not use tools of the quality described by Luis Mañas—sophisticated, but not quite sophisticated enough to satisfy Cynthia Lin, who prefers real options theory, which Luis Mañas does indeed use when elements such as waiting for revenue flows to develop have a significant effect on anticipated returns. I always get nervous when tenured academics accuse businessmen of not taking enough risks, and this nervousness increased when Professor Nissen—who informs us that he has been pointing out to all oil executives who would listen that they have badly measured risk and therefore have under-invested—compared the mistakes made by BP with the much wiser course chosen by Mobil—which is no longer with us—and by Shell, described by Bijan Mossavar-Rahmani as “This once proud, and still arrogant, company [which] has been forced to take four downgrades of corporate proven reserves in one year, wiping off its books some 4.5 billion barrels of reserves—or about 25 percent of its total.” With all respect for Professor Nissen, and that respect mounted rapidly as I listened to his wonderful presentation on the liquefied natural gas (LNG) industry, I cannot help wondering why he feels
that the experience of long-gone Mobil and disgraced Shell should inform the actions of BP.

4. But Nader Sultan does not agree that the constraint on new supply comes from an inability or unwillingness to finance new ventures. National oil companies can get financing. The problem, he feels, is that the countries that control the resources need the international oil companies to provide technical assistance and project management.

5. A fifth candidate for the role of contributor to supply inelasticity might be classified as “institutional arrangements.” Humberto Calderón Berti points out that we have no mechanism to induce private investors to invest in spare capacity; Nader Sultan says we have no mechanism to reconcile the different optimization strategies of host governments, which want to maximize revenues over the life of a reservoir, and international oil companies, which prefer the shorter 20-year time horizon; and Claude Mandil wants somehow to prevent oil companies from using their increased revenues to pay higher dividends, buy back shares or pay down debt, and bemoans the fact that investors “have better uses for their money” than to reinvest in the oil business. Why he rejects the signals from capital markets is unclear—except that he is in the great tradition of French preference for ministers over markets. Adrián Lajous says that we must view access “in a much wider dimension,” although Bijan Mossavar-Rahmani says that access is not a problem.

In short, there seem to be as many views as to why it is not likely that the needed investment will be forthcoming as there are people in this room. My own view is that if oil prices remain at anything like current levels for a while, and if we can assure physical security for workers, most of these impediments will evaporate. After all, if demand remains as strong as Alfonso Cortina is predicting, the need for capital by national oil companies as great as Nader Sultan is predicting, and access as available as Bijan Mossavar-Rahmani claims it is, all parties will have a strong incentive to create an institutional
framework that encourages new investment in exploration and development.

But there will be a lag, during which time the industry is pressing on its production capacity. Which would suggest that the level of inventories in private hands and under government control will play an important role. Claude Mandil, the designated ruler-over-Europe’s reserve, assures us that all is well—or almost so. The producer-consumer “dialogue,” he says, is working, and has produced broad areas of agreement concerning the need for adequate investment, market stability, and other such things. Disagreements over environmental, tax, inventory, and other policies remain, with both sides adopting often-contradictory positions. In a magnificent display of the even-handedness for which he is famous, Claude Mandil concludes, “It is not for me to say who is right, who is wrong.” That chore was left to Jose Sierra López, who argues that the IEA has not been successful in the past in creating a single European Union market, and in developing non-bureaucratic tools of crisis management.

Guy Caruso shared with us a brief history of the U.S. Strategic Petroleum Reserve (SPR), and contended that it is a valuable tool. But here he and Claude Mandil run into a problem. Pressed by Joseph Aldy—who several times reminded us of his service to the Clinton Administration, where I hasten to add he was involved in the administration’s arguably successful economic policy, but not in setting its moral standards—to define a supply interruption, the keepers of Europe’s and America’s strategic reserves were less than precise. Claude Mandil’s response will go down among the classics: “I cannot define a supply interruption, but if I meet one, I know what it is.” Americans in the audience will recognize the similarity of this answer to that of a judge who, when asked to define pornography, said, “I know it when I see it.” Claude Mandil went on to tell us that a disruption produces high prices, but not all high prices are the result of a disruption.

This must mean that the reserve can be used to cope with price spikes, but not new price plateaus. Which means that the keepers of the reserves must be able to predict the duration of new, higher price
levels, no easy chore. No matter: Guy Caruso does not need a precise definition of a supply interruption, since he sees the definitional problem as a political, not an economic, matter. The SPR is to be used, he tells us, when politicians can no longer “take the heat” generated by an oil price increase.

All of which means that Bill Hogan once again had it right when he said, “We do not know how to do this…. The SPR is a dead idea.” Instead of trying to resuscitate it, or to get the producing countries to hold more inventories, we should stop trying to do something we cannot do—target high or low prices—and get on with the job of solving security problems, which Mohamed Boutaleb emphasizes we must do, and improving the commercial arrangements between national oil companies and international oil companies, to create what José Luis Díaz Fernández called an “essential collaboration” between consumers and producers.

The discussion of the SPR highlights just one example of the problems created by an absence of rigorous economic analysis. Another problem is reflected in the discussion we had of the demand side of the oil market. Several speakers wonder why high gasoline prices have not caused a breakdown in America’s love affair with SUVs and other big, comfortable, and safe automobiles.

Fortunately, Paul Portney is with us to point out that it is naïve to expect the amount of gasoline demanded to fall immediately when prices rise. He quite properly noted that the oil price rise is relatively recent, consumers are not certain that the new high gasoline prices are permanent, the cost of gasoline is a small part of the cost of operating a vehicle, and people like their SUVs—they are, in his words, “utility-producing.” I would add another point, one that Paul pointed out to me some time ago: those who expect short-term reactions to higher gasoline prices should keep in mind that the average life of an automobile has increased from seven to fifteen years, meaning that the capital stock is rather long-lived. In the longer run, we do know that consumers respond to higher prices by cutting back on their use of gasoline—and of other energy products—but major short-run responses are simply not in the cards.
This may mean that Steve Baum is in for a surprise. He tells us that only petrochemical companies are cutting usage in response to $6 per million British thermal units (mmbtu) natural gas prices; other consumers seem impervious to these higher prices. That might, of course, be a short-run phenomenon, as with the response to higher gasoline prices. But his guess is that we will not have to worry about long-run responses to $6 natural gas since we are likely to build some ten (of 30 planned) new LNG terminals by 2008, adding four to seven trillion cubic feet to available supplies, and bringing the price down to somewhere between $3.50 to $4.00 per mmbtu.

As I understand it, David Nissen is less certain that all of these terminals can be built, although prospects for approval on the U.S. Gulf Coast seem bright.

If at least ten terminals are added, Steve Baum says, LNG usage in America will be so great that U.S. demand will set the world price of natural gas, which will be decoupled in good part from the oil price. But that is less likely to happen in Europe. Jonathan Stern tells us that in Europe excess supplies of natural gas might drive a wedge between natural gas and oil prices in three to four years. And, in response to a question from Willie Heller, David Nissen says that the link will not be broken until natural gas trading hubs develop.

Meanwhile, the cost of LNG facilities continues to fall. Tony Meggs pointed out that if auto manufacturers had cut costs as much as oil companies have reduced the cost of LNG terminals, cars would cost $5 each. Bill Gates once said that about computers—if auto manufacturers had cut costs as much as computer manufacturers, cars would cost less than $1,000. To which a General Motors executive, in an atypically astute response, said, “And they would crash every hour.”

That demand for LNG will exist because we are unlikely to see any new nuclear plants built in America, not least because, as Charlie Curtis pointed out, we have not solved the problem of vulnerability to terrorist and environmental events which, if they occur anywhere in the world, affect everywhere in the world. Needless to say, other environ-
mental pressures will encourage greater use of natural gas. These pressures are already producing a response by the oil industry, or at least by BP. Tony Meggs laid out a scenario for a transition to lighter fuels, which will require $16 billion in infrastructure investment between now and 2030—needed if we are to reduce carbon emissions and contain global warming. Which Claude Mandil agrees we must do.

But it will not be easy. Tony Meggs says that the technology for carbon dioxide (CO$_2$) capture and storage exists, but it will be many decades before oil is replaced in mobile transportation. And Claude Mandil says that renewables will not solve the problem, a view supported by Pedro Mielgo, who joined José Luis Díaz Fernández in pointing out some of the problems with wind energy, thereby rejecting Cynthia Lin’s charmingly utopian thought that renewables can somehow “discipline oil producers” to do more to improve the environment. Claude Mandil raises the possibility of a renewed interest in nuclear power—which Steve Baum says will not happen in the United States, and Charlie Curtis says will not happen in the absence of subsidies on the order of $200–$400 per installed megawatt, more generous treatment of construction work-in-progress (CWIP), and a board consisting of very brave men and women, or Finns. Claude Mandil also notes that if we are to solve environmental problems we must develop “mechanisms” different from those in the Kyoto Protocol—which realization we in America, who have always known that Kyoto is a sham, very much welcome.

Although Tony Meggs could not give Rob Stavins as precise an answer as Rob would have liked to his questions about the source of BP’s emission targets, the discussion of environmental issues was satisfactorily coherent. I am not sure the same can be said about the discussion of risk assessment.

Not that Luis Mañas was other than a model of clarity in his explanation of why we often tend to over-estimate the risk associated with investment in resource-rich countries. His was a lecture of which any academic would be proud, and from which any businessman can benefit. And it was enriched by Federico Sturzenegger’s observation that in managing expropriation risk, we must recognize
that deals cannot survive shocks such a major post-deal rise in oil
prices, an asymmetry of which Luis Mañas is well aware.

This lucid discussion was followed by a presentation by Ricardo
Hausmann that many here found difficult to grasp. He told us just
how terrible it can be for a country to become rich—if that wealth
stems from the discovery of oil, and if that wealth is badly managed.
He agrees with Nader Sultan that oil-exporting, developing countries
have generally done badly, due largely to the volatility of domestic
spending and exchange rates. Most interesting is his recommenda-
tion that if a country has lots of oil, it is more efficient for it to spe-
cialize rather than to diversify.

But that is only one policy that might be pursued to help
resource-rich countries to increase per capita gross domestic product
(GDP), which Nader Sultan points out has been declining in many
producing countries to the point where the GDP of Persian Gulf pro-
ducers merely equals that of Switzerland, which has one-fifth of their
population. Steve Baum asked the panelists to consider what the
obligations of energy companies are to host countries, beyond mere
revenue-sharing. Ricardo Hausmann responds that deals should be
structured so that volatility risk is transferred away from host coun-
tries, to oil companies. Tony Meggs adds that oil companies should
do four things: (1) support education; (2) support social programs; (3)
be transparent; and (4) engage in a dialogue with the host country
about diversification—informed, I would hope, by Ricardo
Hausmann’s insights. I should add that this solution—“dialogue”—
comes up often, and seems to me to be a word inserted when no
one has any idea how to solve a problem. In the context of oil mar-
kets, where—as Humberto Calderón Berti points out—we have a
genuine clash of opposing interests between consumers and pro-
ducers, and, within OPEC, between members with different reserve
positions, it is often best for dialogue to result in disagreement.
Markets are more efficient adjudicators of disputes than parties
prone to bilateral monopoly solutions. So, as Bill Hogan points out,
paraphrasing the famous book, Getting to Yes, it is often important
to get to “No.”
In the course of our discussions we have raised several issues that commend themselves to us for consideration at our next Seminar. Let me list those:

1. We have not adequately integrated Joe Nye’s several admonitions into specific problems in energy markets. He says that we need to deploy soft power in our efforts to help the majority of Muslims whom he says “want what we want” to defeat what he calls a “small radical group of Islamic fundamentalists.” I do not know if he is right about the balance of forces within Islam—I hope he is, but from what I know about Saudi Arabia I suspect he is not—but we must stop thinking linearly and ask this question: “What would the energy markets and the world economies look like if Saudi Arabia fell into the hands of people Joe Nye says would have no incentive to continue producing oil?”

2. If Alfonso Cortina is right about the increasing importance of China as an importer of oil, what are the geopolitical and economic consequences of that fact? If China sees its interests in the Middle East increasingly aligned with its suppliers, what effect will that have on United States–Chinese relations? On the Middle East? On relations with Russia? On oil markets themselves?

3. While thinking of geopolitical issues, we might want to consider the relative weight to attach to soft and hard power. It would be interesting to invite Joe Nye and, say, Richard Perle—both of whom say that we need to deploy both soft and hard power—to tell us what they would do with $1 billion. Would they spend it on the Voice of America? On preparing invasion plans for an incremental takeover of the Saudi oil industry? On alternatives to imported oil? As Luis Javier Navarro put it, “What mechanisms, institutions, and processes do we need to get the right balance between soft and hard power?”

4. What “mechanisms” can be developed that allow the development of a sensible alternative to the Kyoto Protocol?

5. What market mechanisms can be developed to solve the not-in-my-backyard attitudes that are preventing the construction of needed refineries (Claude Mandil), LNG terminals (David Nissen),
coal plants (Steve Baum), electric transmission lines, and drilling in certain areas of the United States?

6. How can we arrange for national oil companies and international oil companies to recognize and accommodate each other’s interests, in the mutual interest of both? What can be done to open Middle Eastern countries to foreign investment and technological expertise where needed? How can we encourage economic development in oil producing countries, now that we know the cost—terrorism—of the lack of job opportunities in those countries, always keeping in mind the issues raised by Luis Mañas and Ricardo Hausmann?

7. What incentives can we create to enable producing nations and private sector players to maintain spare capacity and adequate inventories—especially if we agree with Bill Hogan that strategic petroleum reserves programs are basically nonsense?

8. How can we get better balance between market advocates and those who see a large role for government? Joe Nye says that the Kennedy School unleashed some 300 bureaucrats on the world at the recent graduation—though that is not exactly the way he phrased it. This Seminar program included four speakers from the private sector, three from the academy (not counting chairs), and five from government and non-profits in a world in which increasing demands will be placed on risk-takers and where there is decreasing confidence in the ability of ministers to substitute for markets. How can we get a better balance? Bill Hogan has a working definition for the role of government—“Establishing institutions so that markets can function.” It would be interesting to put some flesh on those bones.

9. How can we decide what role nuclear power should play, and develop “the vision to see the future” that Charlie Curtis says is lacking? Are we for subsidies? Carbon taxes, which Steve Baum says are a non-starter? How can safeguards be improved? How do externalities compare with other fuels? Or is the option so “brittle” as not to be worth considering?
10. How can we eliminate remaining barriers to competition in Europe’s natural gas and electric markets, barriers described in detail by Jonathan Stern and Pedro Mielgo?

11. How can we do more to express our appreciation to José Luis Díaz Fernández of the Fundación Repsol YPF, Alfonso Cortina of Repsol YPF, and Bill Hogan of Harvard University, and their staffs for their organization of this wonderful program?
Stephen L. Baum is Chairman and CEO of Sempra Energy, a San Diego-based Fortune 500 energy services holding company with subsidiaries, including San Diego Gas & Electric Company (SDG&E) and Southern California Gas Company, that provide electricity, natural gas, and value-added products and services. Other subsidiaries provide electric generation, commodity trading, and other energy products and services domestically and internationally. Baum directs the strategic operations of all Sempra Energy companies and is actively involved in leading the development of Sempra Energy’s liquefied natural gas business. Prior to Sempra Energy formation, Baum was Chairman and CEO of Enova Corporation and Executive Vice President of SDG&E, predecessor companies of Sempra Energy. Earlier, Baum practiced utility law as Senior Vice President and General Counsel of the New York Power Authority and in the private sector. He graduated from Harvard University and the University of Virginia Law School.
Guy F. Caruso is the Administrator of the Energy Information Administration (EIA), the agency within the U.S. Department of Energy (DOE) that provides policy-independent data, forecasts, and analyses regarding energy. His earlier posts at DOE included Senior Energy Economist in the Office of International Affairs and Director of the Office of Market Analysis. Before coming to DOE, Mr. Caruso worked at the Central Intelligence Agency as an International Energy Economist and in Paris at the International Energy Agency as Director of the Office of Non-Member Countries. Since 1998 Mr. Caruso has served as the Executive Director of the Strategic Energy Initiative project of the Center for Strategic and International Studies. He holds degrees from the University of Connecticut and from Harvard University.

Alfonso Cortina de Alcocer has been Chairman and CEO of Repsol YPF S.A. and Chairman and CEO of YPF S.A. (Argentina) since July 1999. Earlier, from 1996 to June 1999, he was Chairman and CEO of Repsol S.A. Mr. Cortina has an extensive background in the banking industry, including service with Banco de Vizcaya Group, Bancaya Inmobiliaria; Managing Director of Hispano Hipotecario, Sociedad de Crédito Hipotecario, S.A. (Hispano Americano Group); Chairman of Sociedad de Tasación, S.A.; Vice-Chairman and Managing Director and Chairman and Managing Director of Portland Valderribas, S.A. He is active in public sector activities as well, having served as President of the Spanish Energy Club; member of the Executive Committee of the Foundation for Technological Innovation (COTEC); member of the European Round Table of Industrialists (ERT); and member of the Trilateral Commission. Mr. Cortina holds degrees in Advanced Industrial Engineering from ETSII in Madrid and in Economics from Madrid University.

Charles B. Curtis is the President and Chief Operating Officer of the Nuclear Threat Initiative. A lawyer by training, Mr. Curtis has served extensively in the public, private and governmental sectors. His service with the U.S. government includes posts as Under Secretary and later Deputy Secretary of the U.S. Department of Energy, 1994–1997. As Chief Operating Officer of the DOE, his duties included direct programmatic responsibility for all the Department’s energy, science, technology, and national security programs. Further,
he served as Chairman of the Federal Energy Regulatory Commission and on the staffs of the U.S. House of Representatives, the U.S. Treasury Department, and the Securities and Exchange Commission. Mr. Curtis served as the Executive Vice President and Chief Operating Officer of the United Nations Foundation (UNF). He was a founding partner of the Washington law firm of Van Ness Feldman.

José Luis Díaz Fernández has been President of Fundación Repsol YPF in Madrid, Spain, since its creation in January 1996. The Fundación was established to coordinate Repsol YPF’s work in promoting educational, cultural, and research activities. And as Vice President of Fundación YPF in Buenos Aires, Argentina, Mr. Díaz Fernández also promotes educational and cultural activities in Latin America. During his long career in the energy world, he has served Repsol YPF in many roles, including Chairman and CEO of Repsol Petróleo and as Chairman and CEO of Campsa. Mr. Díaz Fernández has a Ph.D. in Mining Engineering from the Universidad Politécnica de Madrid and has served on the faculty of the School of Mines there. He is a member of the Spanish Engineering Academy.

Ricardo Hausmann is Professor of the Practice of Economic Development at the John F. Kennedy School of Government, Harvard University. His interests have long focused on issues of growth, macroeconomic stability, international finance, and the social dimensions of development. Prior to coming to Harvard, Professor Hausmann served as the first Chief Economist of the Inter-American Development Bank, 1992–2000, where he created the Research Department. Earlier, in his native Venezuela, he served as Minister of Planning of Venezuela, and as a member of the Board of the Central Bank of Venezuela. He also served as Chair of the IMF-World Bank Development Committee. He was Professor of Economics at the Instituto de Estudios Superiores de Administracion (IESA) in Caracas from 1985 to 1991, where he founded the Center for Public Policy. He holds a Ph.D. in Economics from Cornell University.

William W. Hogan is Lucius N. Littauer Professor of Public Policy and Administration at the John F. Kennedy School of Government at Harvard University where he is Director of the Repsol YPF–Harvard
KSG Fellows Program and Research Director of the Harvard Electricity Policy Group (HEPG). For more than a decade, Professor Hogan has been actively engaged in the design and improvement of competitive electricity markets in many regions of the United States and around the world. He has worked to design the market structures and market rules by which transmission system organizations coordinate bid-based markets for energy, ancillary services, and financial transmission rights (FTRs). In particular, Professor Hogan is the principal architect of pricing and financial transmission rights systems based on locational marginal cost pricing (LMP), to efficiently price the effects of transmission congestion. He has actively supported the Federal Energy Regulatory Commission’s decision regarding independent system / market operators, regional transmission organizations, and a standard market design, based on the experience of the New York and PJM markets. Professor Hogan received his undergraduate degree from the U.S. Air Force Academy and his Ph.D. from UCLA.

Claude Mandil is currently serving a four-year term as Executive Director of the International Energy Agency (IEA), based in Paris. This position highlights his commitment to international cooperation in energy affairs throughout his career as a distinguished French civil servant. While serving as Director General for Energy and Raw Materials at the Ministry of Industry, Post, and Telecommunications, Mr. Mandil was instrumental in arranging France’s membership in the IEA in 1991. He was France’s first representative on the IEA’s Governing Board and served as chairman of the board from 1997 to 1998. His long career with the French civil service has focused on energy issues. Most recently, he has been Chairman and CEO of the Institut Français du Pétrole and Managing Director of Gaz de France. He previously served as a member of the Nuclear Safety Working Group of the G7, Director General of Bureau of Mines and Geology (BGRM), and CEO of the Institute for Industrial Development (IDI). Mr. Mandil is a graduate of France’s École Polytechnique and École des Mines.

Luis Mañas is Chief Financial Officer of Repsol YPF, where he is also a member of the Executive Committee. Joining Repsol in 1987, he
has also held the posts of Corporate Director of Planning and Control and Director of the Chairman’s Office. Before coming to Repsol, he had served at the World Bank, the International Monetary Fund, and the Spanish Ministry of Economy. Mr. Mañas earned a Ph.D. in Economics at the University of Chicago and Licenciade degrees in Economics and in Law from the Autonomous University of Madrid. Mr. Mañas has taught at the University of Chicago, Complutense University of Madrid, and CEMFI (Bank of Spain) and has written widely on finance, international economics, econometrics, and monetary theory.

**Tony Meggs** is Group Vice President, Technology for BP, P.L.C. where he works with Managing Directors for Technology, Strategy, and Performance across all BP. After early assignments with Sohio and with Exxon, he joined BP as Reservoir Engineering Supervisor in Prudhoe Bay, Alaska. Other responsibilities included field work in the Bruce, Brae, and Miller fields in the UK North Sea and in the Gulf of Mexico. He then became Manager of Resource Development, a post that included development of BP’s European gas strategy. Mr. Meggs received graduate degrees from Cambridge University and from Imperial College, London, and has been a Graduate Fellow of the Sloan Program at the Stanford Business School.

**Pedro Mielgo** is President of Red Eléctrica de España (REE), the Spanish national grid company and transmission system operator. In this role he oversees the restructuring of Spain’s electricity industry and works closely with counterparts throughout the EU. Prior to joining REE, he held positions in several segments of the energy industry, including electricity, oil, petrochemical, engineering, and foreign trade. Among other activities, he has managed several joint ventures for the construction of power stations in Spain and in other countries. Mr. Mielgo is member of the Boards of Directors of several industry associations and organizations, both domestic and international. He holds degrees in Engineering from the Polytechnic University of Madrid and in Economics and Marketing from Stanford University.

**Bijan Mossavar-Rahmani** is Chairman of Mondoil Corporation, a privately held company active in international oil and gas operations,
with a focus in West Africa. Between 1988 and 1996, he was President of Apache International, Inc., prior to which he served as Assistant Director for International Energy Studies, Energy and Environmental Policy Center, Harvard University. A former delegate to OPEC Ministerial Conferences, Mr. Mossavar-Rahmani has published more than ten books and dozens of articles on global energy markets. His books include *OPEC and the World Oil Outlook*, *Natural Gas in Western Europe*, *Energy Security Revisited*, and *The OPEC Natural Gas Dilemma*. Mr. Mossavar-Rahmani is active in industry and international affairs, and serves as a member of the International Consultative Group on the Middle East, Chairman of the Board of Foxtrot International LDC, Director of The American-Iranian Council, member of the Corporate Advisory Board of the Eurasia Group, and Director of the Persepolis Foundation. He holds degrees from Princeton and Harvard Universities and is a Commandeur de l’Ordre National de la Côte d’Ivoire.

**David H. Nissen** is a Professor of Practice in International and Public Affairs at Columbia University and Director of the Program in International Energy Management and Policy. Earlier, in the private sector, Professor Nissen managed the LNG and natural gas strategic consulting practice at Poten and Partners, Inc., and has worked with Exxon’s Corporate Planning Department and Chase Manhattan’s Corporate Lending Group. Nissen also served in the U.S. Federal Energy Administration (precursor to the Department of Energy) where he directed the quantitative assessment of the Carter administration’s national energy plan. Professor Nissen has taught at Rutgers School of Business and Rice University Department of Economics. Nissen holds a B.S. from the California Institute of Technology as well as an M.A. in Statistics and a Ph.D. in Economics, both from the University of California at Berkeley.

**Joseph S. Nye** is Distinguished Service Professor at the John F. Kennedy School of Government, Harvard University after serving for a decade as Dean of that school. Nye joined the Harvard faculty in 1964, serving as Director of the Center for International Affairs and Associate Dean of Arts and Sciences. In 1977 he moved to Washington, D.C. where he served as deputy to the Undersecretary
of State for Security Assistance, Science, and Technology and chaired the National Security Council Group on Nonproliferation of Nuclear Weapons. Other posts included Assistant Secretary of Defense for International Security Affairs (a position in which he won two Distinguished Service medals) and Chair of the National Intelligence Council. He returned to Harvard in 1995. Nye’s most recent books are *Soft Power: The Means to Success in World Politics* (2004), and an anthology, *Power in the Global Information Age* (2004). Nye received his bachelor’s degree from Princeton University, was a Rhodes Scholar at Oxford University, and earned a Ph.D. in Political Science from Harvard University.

Irwin M. Stelzer is a Senior Fellow and Director of Hudson Institute’s Economic Policy Studies program. Prior to joining Hudson Institute in 1998, he also served on the Board of the Regulatory Policy Institute (Oxford). Stelzer was Resident Scholar and Director of Regulatory Policy Studies at the American Enterprise Institute. He is the U.S. economic and political columnist for *The Sunday Times* (London) and *The Courier Mail* (Australia), and a contributing editor to *The Weekly Standard*. Stelzer founded National Economic Research Associates, Inc. (NERA), in 1961 and served as its president until a few years after its sale in 1983. He has also served as a managing director of the investment banking firm of Rothschild, Inc., and as a director of the Energy and Environmental Policy Center at Harvard University. Stelzer received his undergraduate degree from New York University and his doctorate in Economics from Cornell University.

Jonathan Stern is Director of Gas Research at the Oxford Institute for Energy Studies where he is creating a Research Group to carry out independent research and commentary on international natural gas issues. He is also Honorary Professor at the Centre for Energy, Petroleum and Mineral Law and Policy, University of Dundee, Scotland, and holds fellowships at both the Royal Institute of International Affairs and the Department of Environmental Science and Technology at Imperial College, London. He is Chairman of the British Institute of Energy Economics and member of the Board of Advisors, Institute for Energy, Law and Enterprise, University of Houston. Over the past two decades Professor Stern has published
extensively on energy and natural gas issues in the UK, Europe (western and eastern), the former Soviet Union, and Asia. His current work is focusing on natural gas security issues in Europe and on the future development of Russian natural gas.

**Nader H. Sultan** is Deputy Chairman and CEO of Kuwait Petroleum Corporation. He began his career at the Kuwait Petroleum Company in 1971, and when the Kuwait Petroleum Corporation was formed in 1980, he was appointed Executive Assistant Manager for Worldwide Product Sales. Mr. Sultan later served as Executive Assistant Manager for planning and international downstream in the marketing division and, simultaneously, as president of Kuwait Petroleum International Limited (KPI), following KPI's formation in July 1993. Mr. Sultan received a B.S. in Economics from the University of London.
LIST OF PARTICIPANTS

Mr. Joseph Aldy  
Repsol YPF – Harvard KSG Fellow  
Department of Economics  
Harvard University  
1875 Cambridge Street  
Cambridge, MA 02138, USA

Mr. Juan Bachiller Araque  
Director, International Relations  
Repsol YPF  
Paseo de la Castellana, 278  
28046 Madrid, Spain

Mr. Juan Badosa  
President  
Compañía Española de Seguros de Crédito a la Exportación (CESCE) and Vice President  
Fundación Repsol YPF  
Juan Bravo, 3B  
28006 Madrid, Spain

Ms. Vicky Bailey  
Partner  
Johnston & Associates, LLC  
2099 Pennsylvania Avenue NW  
Washington DC 20006, USA

Mr. Stephen L. Baum  
Chairman and CEO  
Sempra Energy  
101 Ash Street  
San Diego, CA 92101, USA

Mr. Mustafa N. Belaid  
General Manager  
Companies Accounts Department  
Ministry of Energy  
Shara Bashir Sadawi, PO Box 2655  
Tripoli, Libya

Ms. Amina Benkhadra  
Director General  
Office National des Hydrocarbures et des Mines  
34, Charii Al Fadela  
8030 Rabat, Morocco
H.E. Mohammed Boutaleb  
Minister of Energy and Mines  
Ministry of Energy and Mines  
Rue Abou Marouane Essaadi  
Haut Agdal  
Rabat, Morocco

Mr. Alejandro Bulgheroni  
Chairman  
Pan American Energy  
Avenida Leandro N. Alem 1180  
1001 Buenos Aires, Argentina

Mr. Humberto H. Calderón Berti  
President  
Calderón Berti and Associates  
Avenida Circunvalación del Sol  
Centro Profesional Santa Paula  
1050 Caracas, Venezuela

Mr. Guy F. Caruso  
Administrator  
Energy Information Administration  
U.S. Department of Energy  
1000 Independence Avenue SW  
Washington, DC 20585, USA

H.E. Juan Miguel Cayo Mata  
Vice Minister of Energy  
Ministry of Energy and Mines  
Avenida Las Artes Sur 260  
San Borja, Lima 41, Peru

Mr. Nestor Cerveró  
International Director  
Petrobras  
Avenida República do Chilé, 65  
Rio de Janeiro 20035-900, Brazil

Mr. Alfonso Cortina de Alcocer  
Chairman and CEO  
Repsol YPF  
Paseo de la Castellana, 278  
28046 Madrid, Spain

Mr. Charles B. Curtis  
President  
Nuclear Threat Initiative  
1747 Pennsylvania Avenue NW  
Washington, DC 20006, USA

Mr. Hamid Dahmani  
Senior Advisor to the Minister  
Ministry of Energy and Mines  
80, Avenue Ghermoul  
Alger, Algeria

Mr. José Luis Díaz Fernández  
President  
Fundación Repsol YPF  
Juan Bravo, 3B  
28006 Madrid, Spain

Mr. Robert S. Duncan  
Head, International Market Communications  
Repsol YPF  
Paseo de la Castellana, 278  
28046 Madrid, Spain

Mr. Severo Eneme Obono  
Head of Production Operations  
GEPetrol  
Acacia Mañe 39  
Malabo 965, Equatorial Guinea

Ms. Carmen Fernández Rozado  
Commissioner  
Comisión Nacional de la Energía (CNE)  
Alcalá, 47  
28014 Madrid, Spain

Mr. José Felix García  
Executive Secretary  
ARPEL  
Javier de Viana, 2345  
Montevideo 11200, Uruguay
Mr. Eduardo García Moreno  
Deputy Manager, International Affairs  
Repsol YPF  
Paseo de la Castellana, 278  
28046 Madrid, Spain  

Prof. Ricardo Hausmann  
Professor of the Practice of Economic Development  
John F. Kennedy School of Government  
Harvard University  
79 John F. Kennedy Street  
Cambridge, MA 02138, USA  

Mr. William Heller  
Director  
Falck Renewables Ltd.  
109 Baker Street  
London W1U 6RP, UK  

Prof. William W. Hogan  
Lucius N. Littauer Professor of Public Policy and Administration  
John F. Kennedy School of Government  
Harvard University  
79 John F. Kennedy Street  
Cambridge, MA 02138, USA  

Mr. Darby Jack  
Repsol YPF – Harvard KSG Fellow  
John F. Kennedy School of Government  
Harvard University  
79 John F. Kennedy Street  
Cambridge, MA 02138, USA  

Mr. Malcolm Jones  
Executive Chairman  
Petroleum Company of Trinidad and Tobago Ltd.  
Pointe-à-Pierre, Trinidad  

Mr. Adrián Lajous  
Senior Fellow, Center for Business and Government  
John F. Kennedy School of Government  
Harvard University  
79 John F. Kennedy Street  
Cambridge, MA 02138, USA  

Ms. Cynthia Lin  
Repsol YPF – Harvard KSG Fellow  
Department of Economics  
Harvard University  
1875 Cambridge Street  
Cambridge, MA 02138, USA  

Mr. Luis Mañas  
Chief Financial Officer  
Repsol YPF  
Paseo de la Castellana, 278  
28046 Madrid, Spain  

Mr. Claude Mandil  
Executive Director  
International Energy Agency  
9, rue de la Fédération  
75739 Paris Cedex 15, France  

Mr. Fernando Maravall  
Herrero  
Senior Vice President  
Exploration & Production and Corporate Management  
Cepsa  
Campo de las Naciones-Avenida Partenón, 12  
28042 Madrid, Spain  

Mr. William Massey  
Partner  
Covington & Burling  
1201 Pennsylvania Avenue NW  
Washington, DC 20004, USA  

Mr. Mohamed Mazari-Boufares  
Director, Strategy and Prospective SONATRACH  
Djane El Malik  
Hydra, Alger, Algeria
Mr. Tony Meggs  
Group Vice President, Technology  
BP P.L.C.  
1 St. James’s Square  
London SW1Y 4PD, UK

Mr. Antonio Merino  
Chief Economist  
Repsol YPF  
Paseo de la Castellana, 278  
28046 Madrid, Spain

Mr. Pedro Mielgo  
President  
Red Eléctrica de España (REE)  
Paseo Conde de los Gaitanes, 177  
28109 Alcobendas, Madrid, Spain

Mr. Carlos Montaño Fernández  
General Director, Energy Planning  
Department of Energy  
Insurgentes Sur, 890  
Col. del Valle  
03100 Mexico DF, Mexico

Mr. Bijan Mossavar-Rahmani  
Chairman  
Mondoil Corporation  
Monte Aplanado  
Mora, NM 87732-1010, USA

Mr. Luis Javier Navarro Vigil  
President  
BP Spain  
Avenida de Bruselas, 36  
Arroyo de la Vega  
28108 Alcobendas, Madrid, Spain

Prof. David H. Nissen  
Professor of Practice in International and Public Affairs  
Center for Energy, Marine Transportation, and Public Policy  
Columbia University  
420 West 118th Street  
New York, NY 10027, USA

Prof. Joseph S. Nye  
Distinguished Service Professor  
John F. Kennedy School of Government  
Harvard University  
79 John F. Kennedy Street  
Cambridge, MA 02138, USA

Ms. Martina Onguene  
Documents and Information Director  
GEPetrol  
Acacia Mañe 39  
Malabo 965, Equatorial Guinea

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Repsol YPF  
Paseo de la Castellana, 278  
28046 Madrid, Spain

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15008 A Coruña, Spain
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Repsol YPF
Paseo de la Castellana, 278
28046 Madrid, Spain

Mr. José Sierra López
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Alcalá, 47
28014 Madrid, Spain

Prof. Robert N. Stavins
Albert Pratt Professor of Business and Government
John F. Kennedy School of Government
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79 John F. Kennedy Street
Cambridge, MA 02138, USA

Dr. Irwin M. Stelzer
Senior Fellow
Hudson Institute
1015 18th Street NW
Washington, DC 20036, USA

Prof. Jonathan Stern
Director of Gas Research
Oxford Institute for Energy Studies
57 Woodstock Road
Oxford OX2 6FA, UK

Prof. Federico Sturzenegger
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1428 Buenos Aires, Argentina

Mr. Antonio Suárez Torres
Director, New Ventures
Repsol YPF
Paseo de la Castellana, 280
28046 Madrid, Spain

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P.O. Box 26565
Safat 13126, Kuwait

Mr. Peter Tjan
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165, Boulevard du Souverain
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Member of the Board of Directors
Repsol YPF
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Dirección General de
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Repsol YPF
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