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**“REVISITING ARAB-U.S. STRATEGIC RELATIONS:
GEO-POLITICAL, ENERGY, DEFENSE COOPERATION,
AND DEVELOPMENTAL DYNAMICS”**

3:30-5:15: “ENERGY”

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DR. JOHN DUKE ANTHONY: We're lucky to have Frank Verrastro from CSIS involved intimately with this energy studies program to be the chair for this session and to help set some of the conceptual parameters. Frank.

FRANK VERRASTRO: Well, good afternoon. I must tell you right from the get-go that I have been around these for quite a while now and seen John Duke. He never shies away from controversy. But I thought putting Iran, Iraq, and energy together in one afternoon really kind of moved the bar up.

The theme of this year's conference revolves around the strategic U.S.-Arab relationship in a variety of areas, and that includes geopolitics and energy. And we have asked this panel to look at some of the challenges and opportunities going forward because when you look at the forecasts of demand between now and 2030, it looks like global demand is set to increase by between 40 and 50 percent, but the demand that developed – the developing and emerging world increases by – it doubles in fact.

We just completed part of the National Petroleum Council study. We chaired geopolitics and policy, that task group. We need every possible molecule of energy that we can get. And the investment challenges, the security challenges, are going to be enormous. When you look at the resource endowment of the world in terms of conventional, non-conventional supplies, the ability to convert coal and natural gas to liquids, the endowment out there is enormous, but it's the above-ground issues; its governance, geopolitics, investment security, transportation, environment. These are the issues that are going to cut you out or have the ability to cut you out.

[EDITOR: The National Petroleum Council is “an Oil and Natural Gas Advisory Committee to the Secretary of Energy.” It was established following World War II by President Harry S. Truman and is intended to represent the views of the oil and natural gas industry to the appropriate government authorities. Today the Secretary of Energy is charged to assure a well-balanced membership representing all segments of the industry, all sections of the country, as well as large and small companies. The report referred to throughout this session is ***HARD TRUTHS: Facing the Hard Truths About Energy***. It is available for purchase in printed form, on CD, or as an electronic download from the NPC. (See <http://www.npc.org>)]

The bios of our speakers on this panel, and an august group it is, are included in your packet, so let me introduce the panel. They include the Honorable Clay Sell, who is Deputy Secretary of the U.S. Department of Energy; Dr. Mohammed Al-Qahtani, who is

the President and CEO of Aramco Services Company, and he is speaking today on behalf of Aramco; Michael Dolan, president of ExxonMobil Chemical Company and Executive VP of ExxonMobil Corporation; John Hofmeister, President of Shell Oil Company; Gary Heminger, President of Marathon Petroleum Company and Executive VP of Marathon Oil; and Sigmund Cornelius, Senior VP of ConocoPhillips.

The order on today's panel will proceed as shown in your program with one small change, and this is due to a scheduling conflict. Gary has to leave to catch a plane, actually very shortly, so we will move him first, with Clay's okay. We will move him first on the panel followed by Secretary Sell, and then we will proceed in the normal order.

This will be a great time, out of courtesy both to the panelists and the folks next to you to turn off your cell phones if you haven't already done so. If you'll hold your questions to the end, that would be great. And I understand that there are index cards for you to write those questions on. The only guidance I would have on that is write large and legibly because if I can't read them, I can't ask them. Okay, and with that, we'll go forward. Gary, the podium is yours.

GARY R. HEMINGER: Thank you, Frank, and, again, I apologize for needing to leave. And Honorable Deputy Secretary, Mr. Sell, I apologize to you as well. But I'd like to take a moment to recognize our friends and partners here from Saudi Arabia, Kuwait and Libya, for helping us to meet the world energy needs. These are relationships that have been cultivated over many years, and I look forward to continuing them well into the future.

To understand the dynamics of the petroleum industry today and consumer expectations, you need to look at the future need for petroleum products. According to a recent study, world refining capacity will have to grow 32 million barrels per day over the next 25 years to be able to meet that projected demand. To meet this need, energy companies have announced new record-setting capital-spending plans, and these investments are required just to stay in the game, addressing the need for capacity expansion to meet their growing demand.

The total amount of the industry spending will be huge, and according to some estimates, American refiners have spent roughly \$50 billion over the last decade and a half, and worldwide, the IEA [International Energy Agency] estimates that it will require more than \$4.3 trillion to deliver the portion of energy needed by 2030. That means every dollar must be spent wisely across the entire spectrum of exploration, production, refining, marketing, and transportation.

And Marathon takes this need very seriously. We expanded our Detroit refinery just a short time ago to bring approximately one million gallons per day of additional refined products to the marketplace. And we aren't stopping with that expansion. We recognize the need for even more capacity within our own network, and this year finds us in the midst of building the first new refinery in the United States since 1976, which at

that time was the Marathon Garyville refinery. So we built the last refinery in 1976 and we're here to build the new refinery which we expect to have complete by the end of 2009 at a size of around 180,000 barrels per day that will deliver 7.5 million gallons of additional refined product every day.

This project, one of the largest in the private sector – and I know John Hofmeister will talk about their new project after me. But this will take our refining complex in the Garyville, Louisiana, market to 425,000 barrels per day. But expanding capacity is difficult – particularly in the United States, we are faced with many hurdles before we can even consider investment. Some recent legislative initiatives have encouraged the view that the United States could significantly shift away from reliance on hydrocarbons. I think that is difficult to conclude based on the fact that the U.S. expects to continue to grow GDP by between 2.5 to 3 percent annually.

For example, Congress is proposing to change - through the tax code section 199 - to remove tax incentives passed just a few years ago that encourage much needed expansion. And the energy bill currently before Congress is attempting to roll back certain incentives to enhance domestic production that were enacted into the 2005 energy act. The uncertainty of the legislative landscape makes it difficult to assess political risk and the impact on political risk and the impact on political investments – excuse me, on potential investments.

I am also concerned with the NOPEC legislation. That would permit legal action against the Organization of Petroleum Exporting Countries [OPEC] for antitrust violations. As you all know, the No-Oil Producing and Exporting Cartels Act of 2007 passed overwhelmingly by the House and Senate, if enacted into law will place the U.S. at risk of increasing international tensions. [EDITOR: The NOPEC legislation makes it illegal for countries to collude to artificially set high prices and limit the production of oil, natural gas, or any other petroleum products. The effect is to make OPEC or any other oil cartel subject to U.S. government anti-trust scrutiny by eliminating the “sovereign immunity” these governments are currently granted by the courts and allow the Department of Justice to pursue lawsuits against oil producing cartels in U.S. federal courts. While the popular appeal of such legislation is apparent, critics worry that these provisions would invite retaliatory actions from the governments of oil-producing and marketing countries, particularly against American investments in their countries.]

However, instead of threatening those who help supply the energy needs of our nation, I believe we should continue to find ways to manage the nation's dependence on imported oil by pursuing constructive solutions and common interests. While Marathon is pursuing many of these solutions, we also continue to look to our allies in the Arabian Gulf who continue to supply nearly 20 percent of the U.S. crude oil needs.

Fortunately, President Bush has suggested he will veto the omnibus energy bill if NOPEC legislation is included. With a global focus on the industry and the uncertainty of key legislation, our industry is at a crossroads today. It is best understood as a choice between two futures, between wishful thinking and tough-minded reality. The reality is

that hydrocarbons represent the most available, cost-effective means of meeting the needs of future generations, and that well-meaning but flawed initiatives that frustrate investment in hydrocarbon development essentially hold the future hostage to unproven, non-commercial technologies.

There is a perception that the United States can achieve energy independence. That is wishful thinking and it is unrealistic. More importantly, it can distract us from focusing on the need to deal with our interdependence in the global energy market. We need energy from every available source to meet the world's growing demand, and this includes the use of biofuels. Some may assume that as an oil company, we have simply ignored the potential for energy alternatives, but that is not the case. We are eager to partner with the auto industry and others to develop a workable model for fuels of all kinds.

As many of you know, Marathon is probably the preeminent ethanol blender in the Midwest and one of the largest nationwide. We are blenders and distributors of biodiesel. We are currently constructing a new ground up on a 110 million gallon per year ethanol plant in Greenville, Ohio. We are active in gas to fuels, compressed natural gas technology, and exploring the potential of natural gas hydrates. We know something about alternative fuels, their strengths, and their shortcomings.

We project a substantial increase in renewables stimulated largely by legislation. Biofuels usage may grow 10 fold between 2000 and 2020, and using DOE numbers, ethanol alone grows from 4 billion gallons in 2005 to 14.6 billion gallons in 2030, representing about eight to 10 percent of the total gasoline consumption by volume.

Consumption of biodiesel, also supported by legislative action is expected to grow to 400 million gallons in 2030, and distillate fuel oil produced from coal to liquids reaches 5.7 billion gallons, again, using those government numbers. Together, that is a 7 percent increase in the distillate pool. However, neither alternative fuels nor brownfield refinery expansion will relieve the need for gasoline imports. [EDITOR: "Brownfield" expansion refers to expanding refineries onto previously used sites that are presumed to be contaminated by low concentrations of hazardous waste or pollution but that may be reused after appropriate environmental clean-up.] U.S. gasoline production, including alternatives, will continue to fall our domestic demand.

To meet the 35 billion gallon renewable fuels target included in the Senate legislation, we will need to see breakthroughs in fuel science and engineering that are today only speculative. However, the goal of a national E-10 blending [E-10 is a blend of 10% ethanol with 90% gasoline] is much more feasible. We fear that in the case of heavy ethanol blends like E-85 [a blend of 85% ethanol and 15% gasoline], consumers will just choose not to buy the product, and industry investment will go unrecovered. In addition, in many areas, ethanol blends impinge upon local air quality standards because ethanol increases the RVP of fuel, resulting in higher volatile organic compound emissions. [Editor: RVP is a reference to Reid Vapor Pressure, measure of gasoline's volatility. A lower RVP indicates a reduced amount of Volatile Organic Compounds that are a major

contributor to ground-level ozone, or smog. The U.S. Environmental Protection Agency makes special RVP allowances for 9-10% ethanol mixes thus allowing a reduction in air quality standards.]

The risk now is that legislative efforts will create mandates that far exceed reasonable production efforts, distort the market, and create legacy problems of food versus fuel, as well as environmental considerations.

Before closing, I would like to say a word about the public discourse and the ongoing work in Congress on climate change. This is important work, but my view is that progress should proceed carefully and incrementally. I have made a case that argues that more oil and gas will be needed to ensure the well-being of future generations. Climate change initiatives should examine the cost of alternative resources and the implications for the economy and our international competitiveness.

Sound policy also should be mindful of the huge emission impact of the developing world. Sound policy should encourage investment in fuels, in technology, and technology deployment, and favor market-based solutions over mandates. Sound policies should be transparent and understandable, and if fair and market-based, climate change policy will be understood, embraced, and applauded by the American people.

What is needed to determine the mix of fuels for the future? The rational choice of optimum solutions that are based upon sound principles and a true understanding of potential impact, it's with the industry and the economy. Ours is the responsibility to provide energy for the world's people today and in the future. It's a big job and a costly job. Let me reiterate: the world needs all new forms of energy that can stand on sound economic basis. Although we face a crossroads today, I believe we will find our way to a sound and beneficial future, through very substantial investment, through reason, and through free-market choices. Thank you very much.

(Applause.)

MR. VERRASTRO: Clay.

THE HONORABLE CLAY SELL: I often complain about the length of the introductions that I get. That was the best one I've gotten in a long time. And, Gary, thank you for your very nice speech, opening speech. I was happy to give up the time, give up the spot. In fact, Gary's speech was so good I have decided to shorten substantial parts of mine.

Ladies and gentlemen, friends, colleagues, it is a pleasure for me to join this very distinguished panel and give you some thoughts on the energy issues facing us today. And it's a pleasure to be with this particular group, which I understand is unique in Washington for your breadth of participants and for the depth of your focus and interest. Forums like this, that give people like me opportunity to visit with opinion leaders like you are very important as we talk about and grapple with this new energy reality that we

are collectively facing in the world. The United States, the Middle East, the rest of the world are facing a very new and a very different energy reality, I posit, than we have ever faced at any point in our history.

Now, why do I say that? I say it really for three reasons. We are seeing this incredible high-price environment, as we have seen demand outstrip supply and as we have seen suppliers effectively lose control of the market for the first time in our life. Over the next 25 years, energy consumption is projected to increase 60 percent. But a few facts tell that story even better.

Let's talk about China. China is a nation of just over a billion people. Today they have 31 million highway vehicles, but by 2030, the number is expected to be 200 million. Now, compare that to the United States. We are just a nation of 300 million, and we have 240 some-odd highway vehicles. But China will go from 30 million to 200 million in the next 25 years.

Here is another fact that speaks to demand: there are over 1.6 billion people in the world today that don't have basic access to electricity. We want the world to develop; we want the world to grow; we want people to have access to electricity; we want them to enjoy the conveniences of a modern economy, but as that happens, some predict that world electricity demand in the next 25 years will double, a doubling of world electricity demand possibly in the next 25 years.

Meeting all of these challenges will require an investment in infrastructure of over \$20 trillion in the next 25 years. Gary in his remarks talked about \$4.3 trillion investment for the downstream of oil-and-gas sector alone. But there is a second reason. We have seen similar conditions. We have seen high-price environments before, but there is a second reason that makes this a new and different energy reality. The world energy infrastructure today is bigger, it's more expansive, and it's more vulnerable to destruction and terrorism than it has ever been, but we are also seeing changing world conditions, and a distinct trend towards resource nationalism.

Here is a fact: two-thirds of the world's oil and gas reserves are in countries that substantially limit or prohibit U.S. or any foreign companies from investing there. But we have even seen similar situations to that before, that as we try to meet the demand under these new and different world conditions, we are also facing something that we have never seen before, and that is the reality of global climate change and the very real prospect that we will have to meet all of these new conditions in a carbon-constrained environment, and that truly makes this a very difficult and a very different energy reality.

Now, this view that I'm proposing was recently bolstered, and the similar points were made by the National Petroleum Council's report facing the hard truths on energy. I have been in this town 13 years, largely in the energy policy business, and I have read a lot of reports, and I can tell you this is one of the best reports I have ever had the pleasure to read.

Senior policymakers and opinion leaders in this town need to read this report, they need to understand it. We have to raise the level of understanding, particularly with the Congress as we seek to grapple with this new energy reality. The NPC study is notable for its depth of analysis, for the diversity of the participants, and for its comprehensive look across all industries and technologies. It was not just focused on the petroleum sector.

If you look back at the history of the National Petroleum Council – this is somewhat of an overstatement, but it makes my point nonetheless – most of the reports have reached conclusions that basically say if certain hurdles can be removed, the world oil-and-gas sector can meet all of the energy demands, and this is notable. This notable, this report is notable, and it takes a very different path, and it says that we will need – it embraces efficiency in a way the National Petroleum Council has never embraced efficiency before. It embraces biofuels in a way that it never has before. And it also recognizes the need for a global approach on carbon emissions in order to meet the new energy reality that we are facing.

The report identified six hard truths, which I'm going to read here because I think they are very important to opinion leaders and policymakers in this town. If we could make the case, if we could stipulate a broad understanding of these six hard truths, the kinds of policies that we are seeing in the Congress, the kinds of policies that are coming out of the administration I think would be much better, at better than what is coming from the Congress.

Here are the six hard truths.

- **Number One: Coal, oil, and natural gas will remain indispensable to meeting total projected energy demand growth – indispensable.**
- **Number Two: The world is not running out of energy resources.** The world is not running out of energy resources, but above ground risk, like resource nationalism, limited access, people and infrastructure constraints may effectively limit production to something far less than what is required.
- **Number Three: To mitigate these risks, expansion of all economic energy sources will be required including coal, nuclear, renewables, and unconventional oil and natural gas.** Each of these sources faces significant challenges including safety, environmental, political, or economic hurdles and imposes infrastructure requirements for development and delivery.
- **Number Four – this is one of my particular favorites: Energy independence – one of the oft-used phrases in America – energy independence should not be confused with strengthening energy security.** The concept of energy independence is not realistic in the

foreseeable future but U.S. energy security can be enhanced by moderating demand, expanding and diversifying domestic energy supplies, and strengthening global energy trade and investment. The report says there can be no U.S. energy security without global energy security. Gary made the point about NOPEC. It's for this reason that the president has promised to veto energy legislation with the NOPEC law in there.

- **Number five: A majority of the U.S. energy sector workforce including skilled scientists and engineers is eligible to retire within the next decade.** As we seek to face and address this new energy reality, the workforce must be replenished and trained. This is a very real and a very daunting issue.
- **And the sixth hard truth: Policies aimed at curbing CO2 emissions will alter the energy mix, increase energy-related costs, and require reductions in demand growth.**

Now, the United States is acting on these hard truths. I mean, quite frankly, they have underpinned the Bush administration policy for six years. We are working to ensure traditional energy supplies from a greater diversity of sources. We are coordinating broader use of advanced technology to give us more energy options. We are promoting great energy efficiency, and we are encouraging the construction of more infrastructure. We have to build it, and we have to better secure it.

Now, with the proven oil and gas reserves in the Middle East, the Middle East is and will remain a critical region, a critical region in terms of meeting increased global energy demand. Significant investment will be required to ensure that energy supplies keep pace with growing demand and robust economic growth. It is in the interest of both producing and consuming nations to keep the market well-supplied, and to seek to reduce volatility. Investment is needed throughout the energy supply chain, from exploration and production, to refining and distribution.

And in all of these areas, we are encouraged by very real signs of progress that are underway. We applaud Saudi Arabia's recent expansion announcement to invest \$18 billion to increase oil production capacity to an estimated 12.5 million barrels per day by 2009. On refining, planned capacity expansions in the Middle East are welcome, as well as new investment in the United States. Earlier this fall, Saudi Aramco and Shell Oil Company announced their plans to expand the Motiva refinery in Port Arthur, Texas, which, when complete, will make that the largest refinery in the United States.

In the growing area of natural gas, Qatar is the lead investor, partnering with Exxon Mobil and ConocoPhillips in the development of the \$2 billion Golden Pass LNG terminal and pipeline project in Sabine, Texas. We commend Qatar for their work to invest in the infrastructure necessary to keep pace with market demand. Countries and companies represented in this room have had first-hand experience in expansion

programs that are providing additional supplies to the world market. History has shown that international energy companies offer unmatched technological expertise, which leads to increased production and development.

However, as I noted earlier, access to new reserves is an enormous obstacle. Companies require a clear rule of law, respect for the sanctity of contracts, and a positive and transparent climate for investment. Over time, the need for new supply and new investment should strengthen and expand partnerships between the countries of the Middle East, the United States, and United States oil and gas companies.

With the backdrop of this new energy reality and the challenges that we face, the United States and nations of the Middle East have a growing and strengthening energy future. I'm confident in our joint efforts to further strengthen cooperation and to encourage transparency and greater openness for direct foreign investment. Together, we are helping to ensure reliable, affordable energy supplies for the growing global economy.

Once again, I want to thank the National Council on U.S.-Arab Relations for convening this conference. I look forward to hearing from my colleagues, and to your questions as they follow. Thank you.

(Applause.)

MR. VERRASTRO: I should tell you that I've decided that with six people on the panel that I would necessarily keep the introductions brief. Clay, I was going to – your mom had sent me some information but I decided to just go with Clay. (Laughter.)

So Dr. Qahtani, you're up next. So thank you for your remarks.

MOHAMMED Y. AL QAHTANI: Well, thank you, Frank, for this very efficient introduction. (Laughter.) And a special thank to Dr. Anthony and to the National Council on U.S.-Arab Relations for inviting me to speak at this very prestigious and very important policymakers' conference.

Good afternoon, ladies and gentlemen. I am really honored to share the stage with such a distinguished group of panelists, and to talk to about Saudi Aramco's role in helping meet future energy demands. I would like also to thank Secretary Sell for his kind remarks towards Saudi Arabia and Saudi Aramco. Thank you very much.

It's also a pleasure to be back in Washington and to be around so many people who recognize the importance of strong U.S.-Arab relations. I believe the timing of this conference is especially appropriate because it offers the opportunity to address some of the issues raised in the National Petroleum Council report. The NPC's study correctly concludes that the world is going to need more energy, a lot more energy in the years to come. Experts predict that global energy demand will grow by about 50 percent over the next 25 years. While there is no quick and easy way to meet this growing appetite for

energy, I believe we can successfully address our global energy supply challenges through a four-point approach.

- First, add new production capacity and additional reserves to keep pace with the growing demand for oil.
- Second, build new refineries and reconfigure existing plans to process a wider range of crude grades.
- And third, increase energy conservation and improve efficiency.
- And fourth, invest in technology that will help us find and produce more energy, use it more efficiently, and reduce the environmental impact.

Today, I will discuss Saudi Aramco's contributions to each of these areas. But first, I think it would be useful to look at oil's role in meeting future global energy demands. The U.S. Energy Information Administration forecasts that hydrocarbons will provide about 85 percent to the world's energy needs for at least the next 25 years, with alternative sources providing the rest. The world will continue to rely on hydrocarbons, and oil in particular, with alternatives complementing oil, not replacing it.

So the question is: Where will the oil come from? Widely accepted estimates put proven conventional reserves at approximately 1.2 trillion barrels, while recoverable non-conventional reserves, heavy oil and tar sands, are at least one-and-a-half trillion barrels. In addition, experts believe that ongoing exploration activities and advances in technology will enable us to find an additional two trillion barrels from new fields and increase recovery rates in existing fields. Added together, we are looking at more than four-and-a-half trillion barrels of potentially recoverable oil.

When you consider that the world's total production of oil to date totals about one trillion barrels, this means we have tapped less than 20 percent of the estimated global crude oil resources. Let's put it in other words. **There is enough oil in the ground to meet the world's needs for at least the next 140 years at current consumption levels.**

So what is Saudi Aramco's role in all of this? Saudi Aramco conservatively estimates its proven crude oil reserves at 260 billion barrels, which equals to about 25 percent of the world's total. The company also manages the world fourth largest natural gas reserves. In addition, Saudi Aramco delivers more than 10 percent of all the oil used throughout the world every day. And I can assure you that the company is firmly committed to maintaining this leadership role as a reliable and a responsible supplier.

As part of this long-term strategy, Saudi Aramco is pursuing an unprecedented expansion program to increase total capacity from about 10 million barrels per day in 2004 to maximum sustained capacity of 12 million barrels by 2009. And if you look at the entire Saudi Arabia, it is 12.5; that includes the Northern Area Oil Operations. Importantly, this increase in capacity, which has already reached 10.8 million barrels per

day will enable the company to continue to maintain a spare production capacity in the range of one-and-a-half to two million barrels per day. Although expensive to the company, the maintenance of this reserve capacity is crucial to helping ensure market stability in the event of disruptions in the supply from other producers. This extra capacity has helped moderate volatility in world oil markets during major supply interruptions caused by political turmoil in producing countries and natural disasters like Hurricane Katrina and Hurricane Rita.

Two major components of Saudi Aramco's crude oil production capacity expansion program are the Khurais oilfield, which represents the largest incremental increase in the history of the oil industry with 1.2 million barrels per day, and Manifa oilfield, which represents the oil industry's largest ever offshore increment with 900,000 barrels per day. Saudi Aramco is also pursuing an aggressive expansion of its exploration activities in frontier areas like Rub' al Khali desert and the Red Sea. The company has tremendous potential for discovering additional reserves of oil and natural gas resources.

In addition to conducting exploration on its own, Saudi Aramco is participating in a number of joint ventures with international oil companies to explore for natural gas in Saudi Arabia. In the downstream sector, Saudi Aramco is planning to increase its worldwide refining capacity by nearly 50 percent to almost six million barrels per day during the next four to five years. Some of this capacity will be in the U.S. and much of it will be capable of processing heavy sour crude, thereby helping correct the worldwide mismatch between crude quality and existing refining configurations. [Editor: The quality of crude oil is measured by its viscosity (thickness) and its sulfur content. Thus, "heavy sour crude" is more viscous and has higher sulfur content making it more difficult and more expensive to refine into usable petroleum products.] Saudi Aramco is also developing a number of integrated refining and petrochemical facilities in the Kingdom, which will help meet the growing global demand for petrochemicals and their derivatives.

Throughout all of these projects and programs, the company has strong commitment to environmental stewardship and energy conservation. For example, Saudi Aramco has developed a carbon management technology roadmap to help reduce CO2 emissions. The company is also implementing energy conservation measures to reduce the amount of energy required to produce a barrel of oil.

Now, I would like to talk about the vital role that technology plays in all of this. Saudi Aramco has achieved a strong record of developing and deploying advanced technologies. Cutting-edge innovations, like seismic processing, intelligence fields, and sophisticated reservoir simulation, have enabled the company to make great strides in exploration and producing. For example, the company's earth scientists and engineers are meeting the challenge of boosting oil productivity through dramatic innovations and multilateral well drilling. Their use of advanced down well technologies allows the number of laterals to increase several-fold and maximum reservoir contact wells can boost recovery rates tenfold or even higher.

Looking to the future, major technology opportunities include the use of nanotechnology in subsurface and engineering and the development and deployment of new tools to better manage the reservoirs. New technologies also hold great promise for improving energy efficiency and reducing the environmental footprint of global energy use. As part of Saudi Aramco's commitment to this objective, the company is a major sponsor of the Weyburn-Midale CO2 Storage and Monitoring Initiative, an international effort to study the viability of long-term carbon storage in conjunction with enhanced oil recovery. [EDITOR: The Weyburn-Midale CO2 Storage and Monitoring Initiative is a project of the non-profit Petroleum Technology Research Centre (PTRC) based in Regina, Saskatchewan, CANADA. This \$80 million project is studying CO2 injection and storage underground in depleted oil fields where volumes of CO2 gas are captured from industrial sources and injected in an effort to revive oil production from the depleted fields. The goal is to establish the framework necessary to encourage CO2 geological storage worldwide.]

Now that I have covered Saudi Aramco's projects and technology, I want to talk about cooperation as a critical factor in the global energy equation. While the prospects of energy independence might seem appealing, the bottom line is that no company or country can go it alone in a global energy market. Therefore, we must approach issues like energy security, economic impacts, infrastructure, and environmental and policy matters in an integrated and cooperative manner.

I certainly believe that working together we can accomplish this. Saudi Aramco, for example, is involved in numerous mutually beneficial partnerships. In addition to the natural gas exploration joint ventures I have previously mentioned, the company participates in joint technology development with oil fields service companies and collaborative research with academic institutions. The company also has a number of productive partnerships with IOCs [International Oil Companies] and refining and marketing activities throughout the world, including here in the U.S.

The strong bond between Saudi Aramco and American oil began in the 1930s when Dammam Well No. 7 literally became the first successful discovery in the oil business for Saudi Arabia. Since then, thousands of Americans have spent their careers working for Saudi Aramco, helping build the world's leading oil company.

Saudi Aramco currently delivers 1.4 million barrels of crude oil to the United States every day. This represents about 15 percent of the total U.S. oil efforts. In addition, Saudi Aramco has purchased billions worth of goods and services from American suppliers during the last decade alone. And it now has hundreds of contracts with U.S.-based companies.

Saudi Aramco is also a partner through a wholly-owned subsidiary with Shell and Marathon in Motiva Enterprises. We just last month announced a 325,000 barrels per day capacity expansion at its Port Arthur, Texas refinery. The expansion will increase the refinery's crude oil throughput capacity to a total of 600,000 barrels per day. This

will make it the largest refinery in the U.S. and one of the largest in the world. It will also enhance the refinery's ability to handle more diverse grades of crude oil. It also will strengthen America's supply of gasoline, diesel, and aviation fuel. And it will provide about 4,500 construction jobs and 300 new permanent jobs upon completion.

There is also mutual benefit resulting from America's working for Saudi Aramco. The company appreciates the skills and talents of the American members of its workforce and maintains an aggressive recruiting program to attract experienced geologists, engineers, and other specialties from across North America. Higher education is another example of the company's close ties with the U.S. Over the past 40 years, thousands of Saudi Aramco-sponsored students, myself included, have benefited from the U.S. university experience. Nearly 700 of the company's students are currently enrolled in universities and advanced professional programs here in the U.S. Many of Saudi Aramco's executives have benefited from the exceptional education and training they received here in the United States and the contacts they made while in the U.S. universities have helped set the stage for productive business relationships going forward.

So I'd like here to summarize my remarks by reemphasizing three key points. First, Saudi Aramco is bullish on the role of petroleum and helping meet the world's future energy supply challenges. The company is committed to increasing its sustainable production capacity to 12 million barrels per day by 2009. In addition, Saudi Aramco has begun an aggressive exploration program to find additional oil and gas reserves. The company is also increasing its worldwide refining capacity by nearly 50 percent in the next four to five years.

Second, Saudi Aramco, recognizes that innovation and innovative technologies will provide more energy, improve efficiency, and result in a cleaner environment. And third, Saudi Aramco believes that increased cooperation through joint ventures, partnerships and alliances will be crucial to dealing effectively with the world's energy challenges. I'd like to conclude my remarks by applauding this conference, not only for addressing energy and other key issues, but also for emphasizing the importance and value of nations and people working together. Thank you very much. (Applause.)

MICHAEL DOLAN: Thank you, Frank, for that very short introduction. (Laughter.) It's certainly my pleasure to be with you all today and to be part of this distinguished panel. I'm sure there's at least a few of you sitting there wondering what a chemical guy is doing on the panel today. And I have to confess that I've asked myself that several times as I've listened to my energy colleagues here. Let me see if I can make a case for that.

As background, ExxonMobil has operated in the Middle East for more than six decades. And about half that time, we've been in the chemical business in the Middle East as well. And from a chemicals perspective, the region clearly enjoys an unparalleled advantage to energy and chemical field stock position. By integrating chemicals into the bigger resource management strategy, we see equally unparalleled opportunity for the region to benefit from proximity to the growing markets in Asia.

In part, I'm here today to share the perspective of a big energy consumer. The chemical industry relies on oil and natural gas to produce the things that make everyday life better. And this will be the case for many years to come. Today, 99 percent of chemicals depend on oil and natural gas. And in addition to sharing the perspective of an energy user, I'm also here today to share my views on the growth opportunities for the chemical industry in the Middle East and, more importantly, to discuss how chemical industry investment can help maximize the region's natural resources to promote long-term economic development.

These opportunities are, of course, contingent on a policy environment that welcomes international trade and investment and one that fosters global competition and free enterprise. Strategic alliances and international cooperation are great enablers that drive success in the global marketplace. ExxonMobil's long and mutually beneficial relationships in the region are prime examples of the value that can be derived from U.S. and Middle East cooperation.

I think it's important to anchor this discussion with the knowledge that oil, natural gas, and coal are expected to meet 80 percent of the world's energy demand over the next quarter century and beyond. This is no small feat given that the World Bank projects that the earth's population will increase from more than six billion today to eight billion by 2030, and most of that growth will come in developing nations. Over the same period, the global economy is expected to more than double in size to about \$70 trillion. Much of that increase will occur in large countries such as China and India.

As populations expand and living standards improve, the use of energy, chemicals, and related products will increase. As a result, we expect global energy demand to grow by 30 percent over today's levels by the year 2030. The growth in global liquids demand through 2030 will be led by the transportation sector, with the world's light duty vehicle fleet growing by 60 percent. Total transportation demand in 2030 will be about 45 percent higher than it is today.

Now, these projections are important to the chemical industry for several reasons. First, the industry will continue to compete directly with the transportation sector for liquids from crude needed as petrochemical feedstocks. Second, we will continue to be a significant supplier of raw materials to produce all those additional cars and light trucks, creating a large market opportunity. And finally, the quality of motor fuels will change in response to growing environmental concerns. This will have an impact on the molecules that are available to the chemical industry.

These factors add up to a critical question. Can there possibly be enough oil to meet growing energy and chemical needs. According to the U.S. Geological Survey, the earth is estimated to have more than three trillion barrels of recoverable conventional oil. This estimate has grown steadily as the oil industry has developed more advanced technologies to find and produce these resources. If we add estimated non-conventional resources such as heavy oil and shale oil, this recoverable volume rises to more than four

trillion barrels. Over history, mankind has used about 25 percent of that, or about one trillion barrels. That means ample resources are available to meet growing oil demand well into the future.

The energy outlook is positive, but it is challenging. Getting to those supplies and bringing them to market will continue to present us with technological, financial, and geopolitical challenges. These challenges are of interest to the chemical industry. Ninety-nine percent of chemical feedstocks come from oil and natural gas. In other words, the health of the chemical industry depends on the health of the petroleum industry.

Energy is required to fuel our manufacturing processes, but oil and natural gas are also important feedstocks that we use to make countless consumer products. Worldwide, demand for these consumer products continues to increase as a result of ongoing economic development in the pursuit of improved living standards. The chemicals business is based on maximizing resources, or more specifically, generating the most value for society from every molecule. Chemical manufacturing, though a couple of steps removed from oil and natural gas production, is an integral part of the bigger resource management picture.

It is also an exciting time to be in the chemical industry. World demand for chemicals is growing at a brisk pace, about two to three percent above world GDP. That's an average growth rate of five to six percent per year or about triple the expected growth rate for all forms of energy. This high demand growth reflects the continued penetration of chemicals and plastics into end-product markets such as automotive, packaging, construction, and health and personal care. These products are fundamental to everyday life.

Over the next 10 years, we expect some 60 percent of the world's petrochemical growth to occur in Asia. China alone will account for more than one-third of that growth. By 2015, Asia is expected to account for 50 percent of global demand for key commodity chemicals and China alone is expected to account for 25 percent.

With large oil and natural gas reserves, Middle East nations are uniquely positioned to help meet this rising demand and they are geographically situated to provide efficient access to the emerging markets of Asia Pacific. However, meeting future petrochemical demand requires more than access to advantaged feedstock and being in the right place at the right time. It also requires innovation, rooted in leading-edge technologies. As manufacturing processes have improved and become more efficient, industry can produce higher quality products that will serve new applications and markets.

For the Middle East, the goal is to get the highest value out of its natural resources while building a thriving economy. The growing chemical demand I've described presents major opportunities for the region to upgrade its natural resources into higher margin products and strengthen its economy. The Middle East enjoys an enviable and

unparalleled advantage by its access to energy and feedstock position and the revenue from oil and gas production supports further investment and development. Adding value to the gas at the crude oil well head became the cornerstone of the competitive and robust Middle East petrochemical industry.

ExxonMobil remains highly optimistic about prospects in the region. Currently, we already have a large asset base and we continue to pursue major projects to provide additional advantage capacity. Our joint ventures in Saudi Arabia are conducting a major study to examine the feasibility, building capacity to make synthetic, copolymerized rubber, elastomers, and carbon black for the first time in the region. These projects are essential for tire manufacturing.

The growth we're seeing in Asia translates directly into more cars on the road, underscoring the significance of this investment opportunity. In 2006, Qatar Petroleum and ExxonMobil agreed to begin studies for a world-scale petrochemical complex in Ras Laffan Industrial City, Qatar. The proposed project would include a steam cracker along with derivative units designed to provide premium products to the Middle East, Asia, and Europe.

In addition, we've also partnered with Sinopec [China Petroleum and Chemical Corporation] and Saudi Aramco on a project in China. The Fujian Complex in Quanguang, Fujian Province is a fully integrated joint project with a downstream in chemical derivatives and is the only fully integrated project with foreign investment in China. Synergies from these world-scale integrated businesses closely coupled with the strengths of the partners and a long-term crude supply feedstock agreement with Saudi Aramco significantly enhance the competitiveness of this project and help ensure its world-class performance.

Based on our overall growth plans, we anticipate our capacity in the Middle East and Asia will increase by nearly 50 percent over the next several years and we continue to look for more advantaged growth opportunities. Our investments bring with them well-paying long-term jobs and multiplier effects on local economies, thereby enhancing overall economic growth.

At ExxonMobil, our focus is on meeting today's needs while protecting the aspirations of future generations. Without a doubt, the chemical industry makes everyday life better by providing raw materials for more than 70,000 products that help keep us all safe, healthy, warm, cool, on time, in motion, and connected. But they also play a fundamental role in helping society be more energy efficient and environmentally responsible.

One example is plastics. We all know that plastics are used in almost everything: protective packaging, lightweight components for cars and aircrafts, mobile phones, toys for your children, medical devices, and even the pipes that carry our drinking water. And because these materials often allow us to do more with less, plastics actually contribute to more efficient use of resources. Even with all those end uses, plastics account for just

four percent of the annual consumption of oil and natural gas. No other material can compete with plastics when it comes to meeting technological demands while preserving our natural resources.

Across all industries and in all parts of the world, the drive to reduce human impacts on the environment has never been greater. For our part, ExxonMobil is taking action today to mitigate greenhouse gas emissions, and we support the development of advanced energy technologies to significantly mitigate emissions in the future. We're also implementing new technologies to make our products more environmentally friendly and energy efficient. By finding ways to reduce our environmental footprint, ExxonMobil is helping to lead the world in better environmental shape for future generations, all while providing products and energy the world needs today.

Let me leave you with a few thoughts to sum up my remarks. As we in the energy and chemical industries go about our work, we must do so with detailed attention to the impact it will have on the world's wellbeing today and in the future. From the chemicals side, part of our contribution to that wellbeing is to provide affordable and reliable products that enhance quality of life in a manner that is economic, safe, and environmentally responsible.

The Middle East offers exciting new opportunities to expand industries' capacity to make those products efficiently and profitably. With the support of public policies that promote free trade, competition, innovation, investment, and access to resources, the chemical industry can bring long-term economic development to the region and much needed consumer products to the world's growing population. Thank you. (Applause.)

FRANK VERRASTRO: Thank you, Mike. I thought I would be applauded for my brief introductions; that obviously isn't the case. So let me tell you a little bit about my friend, John Hofmeister. John is the President of Shell Oil Company. He's a political scientist by training and has risen to this rank in the corporate world. He was also the star catcher on our high school baseball team. Ladies and gentlemen, John Hofmeister.

JOHN D. HOFMEISTER: That was just for one inning, Frank. (Laughter.) Ladies and gentlemen, I really do stand in awe of some of the messages that have been announced here in this forum today. As a relative newcomer to this industry, I deeply respect the incredible work that has gone on for over the past century in bringing us to where we are today. Think about a simple set of facts. From the period of post-World War II to the turn of the century, market forces – primarily market forces – brought the economies of the world to an incredible level of economic wellbeing with available and affordable energy. Through the technology and the innovation of an industry that has been developing its capabilities for nearly 100 years, the world has come to a level of economic wellbeing and economic aspiration to take that economic wellbeing around the world – not in selected countries, but around the world – on the back of available and affordable energy.

To the point that right at the turn of the century, we were dealing with – and we're only five months away from the anniversary of – a world that was so-called drowning in oil. If you recall the March edition of *The Economist* magazine in March of 1998 in which two oil workers were standing in the midst of an oil field with what looked like an unfortunate blowout as a well had gone out of control and oil was essentially raining upon them. It was a symbolism of what the world was experiencing in March of 1998, which was drowning in oil.

We're only six or seven months away from the anniversary of the infamous \$10 a barrel oil of just a decade ago. Today's oil price, I understand – I haven't seen the report – is pushing \$90. In 10 short years, we've moved from a world where we were allegedly drowning in oil because of the incredible impact of market forces through a 50-year run at successful development of natural resources with technology and innovation to reach a point now just 10 years later where the scarcity of oil, the energy insecurity that we are feeling around the world has pushed the crude oil price to the point that it has – not because there aren't enough resources.

We have heard from the National Petroleum Council; we've heard from the remarks prior to these remarks. We've heard about the availability of available resources. But what about the affordability of those resources? Whether it's oil and gas, whether it's coal, whether it's biofuels, whether it's hydrogen, whether it's wind, whether it's liquefied natural gas, whatever the source of fuel, will it be affordable? What is the basis on which that affordability is possible?

And there are those who are greatly concerned about our energy security future; not only because of scarcity of supply, but affordability of supply. There are some new and exciting innovative technologies, which, frankly, even at \$90 oil are not affordable, because of the high cost. Future technology, future development – for example, in biofuels, second-generation biofuels in particular may – may – deliver over the next couple of decades, serious quantities of biofuel as an alternative; but hardly overnight. We're already pushing the fuel/food price debate through the markets of many countries as food competes with fuel from products like corn ethanol or sugar-based ethanol. Cellulosic ethanol – a better, perhaps, long-term alternative, still requires continuing research and development for it to operate at a commercial level at today's prices – and today's prices are much higher than we knew 10 years ago, as I just said.

But the affordability issue, I think, is the issue that drives international cooperation. I agree with the point, energy independence in the short term is a naïve point of view that may have some political credence in the very short term, but simply lacks economic credence for any time in the imaginable future. And so, the world must work together – regions of the world must work together. And an American and Arab forum to come together on the subject of availability and affordability is essential as we deal with the energy requirements of the future.

A couple of additional points – today, you may have seen the report of the new Airbus A380 making its maiden flight from Singapore to Australia. I believe it was

either Sydney or – I'm not sure where it went; I didn't catch the whole story. Other examples – if you go up to the Capitol Hill today, you'll see a collection of new electric vehicles – very interesting exciting electric vehicles. As I walked by this afternoon, one of my colleagues walking with me said, I wouldn't want to be in that vehicle and be in traffic with an SUV coming the other direction. Issues that have to be dealt with in terms of the opportunity of travel the A380 represents where millions more people will get to travel who haven't traveled by air, because of the economic wellbeing of global economic growth. But exciting new innovation about alternative vehicles, which will have a future. Of course they will, but with time.

Where am I going with this, ladies and gentlemen, because this is not a technical – this is not a numeric discussion? There are three points that I want to make today that deal with international cooperation on matters of energy, that deal with economic affordability, so that we can sustain a world supply of energy of all sources from the hydrocarbons to the alternatives, with obvious emphasis on hydrocarbons over the next probably 50-plus years.

And those three points are the following: **number one, market forces alone will not get us there.** Market forces got us the last half of the 20th century, and weren't those years wonderful? Not for everybody; but for many, because we saw what economic wellbeing could do through those market forces. But in a period of natural resource nationalism, which is likely to continue, in a period of constrained supply, which is likely to continue for a variety of reasons, in a period of continued economic demand growth in a world of constrained supply, market forces alone will not suffice. We need government leadership in the continuous supply of available and affordable energy.

In the United States of America, for example, what that means – and Clay said it well – it means more access. More access to domestic production so that we can help ourselves in this country with available, affordable energy, with natural resources that exist aplenty. Only 15 percent of the outer continental shelf of this country is available for exploration and production. I don't think anyone is asking for 100 percent that I've talked to, but what about 20 percent, 25 percent? Think of what that could mean in terms of daily oil production in this country, which would take some of the enormous pressure off other national resource issues in other countries, which may need more time for development, for more technology, through partnerships.

So market forces alone are insufficient. Government leadership is required with sound public policy to enable the development of more hydrocarbons and the development of more alternative fuels, because all of the above will be essential as the National Petroleum Council report cites.

Point number two – energy efficiency needs strong global leadership by companies and by government and by entrepreneurs. What do I mean by energy efficiency? Let's just give three simple examples of what energy efficiency could mean.

Think of the lowly incandescent light bulb. Once a brilliant invention, still lighting our homes, our offices, our museums, our office buildings? Thomas Edison worked very hard on that in 1879. The technology has hardly changed. And yet we have production of tens of millions of incandescent light bulbs per week around the world. These incandescent light bulbs use 3 percent of the electricity they consume for light; 97 percent of the electricity consumed by an incandescent light bulb is wasted as heat - hardly an efficient use of energy. But yet, we continue to rely upon the incandescent light bulb, because it is the cheapest alternative for light in the home, and we have an air conditioner that can take the heat away, which raises another efficiency question. But technology – the LED, the fluorescent light – can move that efficient use of technology further down the path.

Another example is the internal combustion engine, which we all love – I presume we all love – 20 percent of the energy consumed provides mobility; 80 percent is wasted as heat. Thank goodness we have a big radiator on most of our vehicles to take the heat away. But when people complain about high gasoline prices, I think about the energy efficiency of how that gasoline is being utilized, realizing that \$4 out of 20 (dollars) is actually providing mobility, and \$16 goes for heat production.

Or the jet engine, the A380 is not a bad example. The jet engine, about 6 to 8 percent depending on the model produces push; 92 percent is exhaust, which is really heat and other gases. So in terms of efficiency, if we had the human energy put forward towards efficiency development by technology, we could actually extend our energy supply by an extraordinary factor.

And thirdly, education – education of the populations around the world; not the least of which is in this country. I happened to be four cities away from the completion of a 50-city visit to countries around the United States, which I referred to a year ago in this forum – 46 cities down, four more to go. We'll finish by the middle of November. Having met tens of thousands of people across the country, having had hundreds of media interviews on television, on radio, and in print media, having had numerous conversations with more than 25 governors, more than 20 major city mayors, with elected officials from city councils, from county councils, from members of Congress, state legislatures, virtually every person I met referenced the lack of knowledge or understanding.

This whole pejorative notion of something called, quote, “big oil,” unquote, which conjures up all kinds of negative images, all kinds of misunderstandings, all kinds of suggestions of bad actions like price gouging and collusion and withholding supplies, all of which are nonsense – at least in the world that I know – this education around where energy comes from, how it's used, how it's applied, what it does and what it doesn't do, its implications for the environment.

As part of our preparation for this visit to so many American cities, we looked at school systems across the country to see what is taught about energy, where is it taught, how is it taught? We frankly were chasing a wild goose, because we could find almost

no education curricula on energy. Education on geology, education on physics, education on environmental science; but what about this whole field of energy? From our school children at elementary level to middle school to high school through university, all of these folks grow up; we were all there once. How much does the current generation of officialdom know about energy?

So energy efficiency, energy education, and government policy helping to enable markets to operate, I think, are critically important to the energy affordability and energy availability future, which will fuel economic growth in the decades ahead. Thank you.

(Applause.)

MR. VERRASTRO: Thank you. Our final speaker is Sigmund Cornelius. He's Senior VP for Planning, Strategy, and Corporate Affairs at ConocoPhillips. Let me just remind you, for those of you that have questions, if you fill out a card, raise your hand, we'll be by to pick them up; and we'd appreciate that.

SIGMUND CORNELIUS: Good afternoon. I thought you were going to introduce me to say that like John, I've also played baseball. This spring I had the honor of playing in the Boston Red Sox fantasy baseball camp. I did not get a contract there, so I'm – next year, yeah.

Thank you for the opportunity to discuss Arab-U.S. strategic relations and how we can work together to improve the reliability and environmental responsibility – acceptability of the world's energy supplies. As has been previously highlighted, the energy security challenges that confront the world were analyzed recently by the National Petroleum Council study. Being last on the panel, you've already heard the hard truth conclusions of this study. In the interest of time, I'll not bother to repeat them so we can move more rapidly to your questions.

But given these hard truths, you might ask what should we do about them? We believe that to meet the challenges of ensuring energy and carbon security, government and industry must work together in four major areas: expanding and diversifying our energy sources, lowering their carbon intensity, improving global energy efficiency, and investing in new technology. I'll go through each of these in more detail briefly.

The first step is expanding and diversifying our energy sources. This includes developing conventional and unconventional fossil fuels, as well as alternative sources. To do this, governments must remove barriers to resource access and provide incentives for the higher cost alternatives. The private sector can then make the necessary investments; the magnitude of those investments were previously discussed.

The world must encourage producing countries to expand their capacity and not send mixed messages about the long-term need for their production. For example, the U.S. should not threaten to cut oil imports from the Middle East or pass laws allowing lawsuits against producing nations. We should also allow energy producing nations to

invest in the United States. In fact, it is in our best interest to allow them to do so. Shared economic interest will ensure that needed supplies will come to this country.

Turning to the alternatives, governments must encourage the development of all energy sources. But it must not ignore the drawbacks associated with some of these alternative sources. They will cost more and require more infrastructure development than conventional sources. There are limits on how quickly they can ramp up. And some of them, the unconventional fossil fuels, are more energy and carbon intensive than conventional oil is today. In addition, biofuels development could impact the environment and raise world food prices unless we can develop second-generation technology that does not use as much water or fertilizer or use food sources as feedstock. The world will need the alternatives as well as oil from the Middle East and North African countries far in to the future.

While developing new energy supplies, our industry must also find sustainable ways to lower our carbon intensity. For example, our industry must reduce the fuel consumed by production and refining, and we must learn how to sequester carbon. Governments must help by providing a regulatory and legal framework that provides incentives for sequestration, and a method for valuing carbon avoidance. Nuclear and renewable power sources should also be encouraged as well. With respect to fuel efficiency, governments should also provide both the policy framework and the incentives for improving energy efficiency across the global economy. This is vital in order to reduce price pressures and carbon emissions.

And finally, technological innovation is required to accomplish all of these objectives. Government and industry both must increase spending on research and development into promising, efficient, and economically attractive new technologies. We also need to be investing more in the education of our workforce that will develop and sustain our energy future. Clearly, the world has a growing need for energy, which poses enormous economic and technological challenges for our industry.

Consequently, ConocoPhillips believes that opportunities for collaboration between national oil companies and the publicly held international companies have never been greater. Our world is much different than just a decade ago. The traditional methods for engagement assumed limitations of available local resources. That has changed. Our partners in producing nations have grown more self-sufficient in expertise, technology, and capital. So a new model of collaboration is emerging that allows each party to bring skills and competencies to the table.

NOCs [National Oil Companies] have deep knowledge of the host country's geology and markets. They have local technical expertise and a finely tuned sensitivity to the political and social environment. These insights can greatly reduce risk. IOCs [International Oil Companies] have technology solutions, drawn from global experience in a variety of geological settings and operating conditions. They are highly experienced in maximizing production from older reservoirs, which could be very valuable in the

more mature fields in the Middle East. They also have major project experience in procurement and in data management skills that are vital in this era of major projects.

Meanwhile, NOCs are broadening their investment horizons. This creates new opportunities for them to benefit from the expertise of the IOCs and downstream technology and access to high-value markets. Finally, the IOCs have the financial strength to help make the multi-billion dollar investments that are becoming the norm in the industry. This can enable producing nations to improve the efficiency of their energy developments and to direct more of their spending to other national priorities.

With these factors in mind, we suggest a new model of collaboration, one that enables NOC and IOC partners to share the cost, spread the risk, and find the most effective technical and commercial solutions to development challenges. We believe this model must incorporate five components: complementary business and technical strengths, material stakes for each partner, a common dedication to maintaining good relations through the companies starting with the CEOs and commitment to uphold the sensitivity of contracts, and lastly, a strong alignment of interest; not only of project goals, but also of the broader aspirations of each partner.

This requires a longer-term view than the joint venture or production sharing models of the past. It requires the partners to be open-minded, flexible, and innovative. For example, our work with Qatar Petroleum, developing the Qatargas 3 project [an integrated LNG – Liquefied Natural Gas production chain], shows such collaboration. We are now working with other participants to create a single integrated operation from upstream to liquefaction through the markets.

In conclusion, the most apparent hard truth of all of this is that satisfying the world's thirst for energy will require a combination of actions. These will include development of conventional supplies as well as alternative sources, improvements in energy efficiency, and measures to reduce the risk of human-caused climate change.

These actions will in turn require unprecedented levels of investment and collaboration. We need ongoing dialogue to ensure the timely expansion of production capacity that is needed from the Middle East and North Africa. And most importantly, we believe that by working together, national oil companies, and the international energy industry can meet the investment challenges before us. I want to thank the National Council on the U.S.-Arab Relations for sponsoring this event, and look forward to your questions. Thank you.

(Applause.)

MR. VERRASTRO: Okay, thank you. Those are excellent presentations. The questions are outstanding. In fact, I am taking them all back with me. But they fall into two broad categories: foreign policy and then climate carbon change kind of investment technology and the footprint. So let me start with the footprint.

The resource endowment – and a lot of the speakers talked about the resource – the global resource endowment – when you consider non-conventional, conventional fuels, and the conversion ability to make coal-to-liquids, gas-to-liquids to deal with oil sands, heavy oil, and tar sands – oil shale in this country – when you look at the unconvensionals, the resource endowment is large, but the carbon footprint looks to be more problematic. Any of you care to comment on that?

MR. SELL: Yeah, I'm happy to comment on that. I agree. And it's why in everything we do at the Department of Energy from a technology development standpoint, we have a significant bias and established bias for low-carbon and no-carbon technologies. And so, when we look at the prospect of coal-to-liquids bringing transportation fuel diversity into the marketplace, we cannot consider that without thinking about the significantly higher carbon emissions that go with it, which is why we – (off mike) – which is why we have opted for lower-carbon transportation technologies like biofuels.

MR. VERRASTRO: Other comments from the panel?

MR. HOFMEISER: I think that the range of energy alternatives has to take everything into account. And I think one of the reasons that Shell joined the United States Climate Action Partnership was the expressed intention of the partnership in which a number of utility companies, a number of integrated oil and gas measures, a number of equipment companies have joined together to try to, in essence, recommend to the lawmakers of the United States a reasonable, coherent framework in which carbon emissions can be capped, and in which trading systems can operate in a reasonable way. [See <http://www.us-cap.org>] [EDITOR: The United States Climate Action Partnership (USCAP) is a group of businesses and leading environmental organizations that came together to call on the federal government to quickly enact strong national legislation to require significant reductions of greenhouse gas emissions. Its goal is to achieve a “mandatory economy-wide, market-driven approach to climate protection.”] I do think that carbon management starts at home. My own company has been on a journey of carbon management to reduce its own carbon footprint to below 1990 levels by 5 percent by 2010.

But again, as the questioner properly brings up, the carbon intensity of unconvensionals challenges that footprint. And therefore, I think there needs to be a larger source – I agree with what Clay said about the low carbon – which is why the alternatives become very important in the whole scheme of things. But I don't think anybody can approach this singlehandedly. I think it has to be a coherent, across-the-board approach in order to do it. The refinery system, which a colleague, Mohammed al-Qahtani, referred to in Port Arthur, Texas, will actually end up producing many more products, many more quantities of product, but on a lower carbon emission basis in terms of manufacturability. So it's really across the board. So the emissions per barrel content of what we produce when that project expansion is completed will actually be better than what we do today. So technology plays a role here as well.

MR. AL-QAHTANI: I'd like to add and underscore the importance of technology here. I realize there is a significant component of CO2 associated with unconventional oil. However, the solution is in technology, and the way you capture and store CO2 is going to be a very critical factor for this to be an affordable economic way of going forward in the future. So CO2 capturing and sequestration, use of CO2 to enhance our recovery of unconventional oil development will be a significant part of this undertaking in the future.

MR. VERRASTRO: Let's just augment that a little bit. Since the National Petroleum Council study has been referenced a number of times today, when we developed the policies for the Council's study, we basically put together a triangle. So we had economic needs on top, foreign policy and security in one corner, environmental considerations in the other. With the thought being that for promulgating new policies in this new world, you had to address all three. And frequently, you hear the security people and the environment people, or the foreign policy and the price people, talk about just dealing with one side of the triangle. That doesn't work for balanced policy. So that's really considerable going forward.

I'd also like to point out that energy independence has come up a few times here – 190-plus countries in the world, none are energy independent; not necessarily a bad thing, and it would probably contravene some of our trade obligations as well.

Second question, let me kind of send you in the direction of Mike and Sig, it talks about what and where are the main opportunities in the Middle East – and this is both regionally and sectorally – for refining gas, petrochemical, new investments. And then there is a second question – and I'll open this to the panel – how much of a concern are escalating costs for raw materials, equipment, and the need to find qualified people? How are they either stimulating or dampening the timeframe that's necessary to bring on new production?

So Mike, if you'd like to start with the first one?

MR. DOLAN: Yeah, I think, you know, the environment we find ourselves in today is a very interesting one. There's no shortage of capital; there's plenty of capital. You can see that with some of the transactions that have taken place for some of the world's formerly best chemical companies. So there's lots of capital available. Technology flows pretty freely. There's a new technology coming along. Our industry has a tradition of licensing that technology.

And so, feedstock becomes a bigger question for us. If you look today at what's going on around the region in the Middle East, there's a lot of focus on upgrading molecules to chemicals and moving downstream in the value chains. So that's happening; it's happening pretty much around the region in all the places that have the molecules. I think the countries have decided that they can invest downstream; they can create jobs; they can create more wealth.

It is a very difficult environment. I think the general economic condition of the world, there's a lot of activity going on around the world; not just in our industry; not just in the oil industry. You know, sometimes, we're competing to hire welders who could go work on building a casino on the other side of a particular country, so there's a lot of competition.

The mention was made of one of the conclusions of the NPC study about the age profile of folks in our industry and how many of them – and the most skilled ones – are approaching retirement. So these are real issues that we all have to deal with. There's a lot of work going into capacity building, especially in the areas where this work is going on, helping to train people, bring new welders in, bring new fitters, train more engineers. A lot of the countries themselves have tremendous initiatives in establishing new universities, having cooperations with the universities here. So capacity building is really the watchword that we have out there, especially in the Middle East, and especially in Asia as we go forward. It's probably our most critical issue in the short term.

MR. CORNELIUS: As far as where the opportunities are in the Middle East, really in every country there are many opportunities; not all of which are available to all companies, also depending on the nationality of those countries – and I'm referring to sanctions. So it really depends on if you're looking for opportunities around the resources base or to invest in the chemical companies or the downstream operations. But the opportunities really are unlimited and they're just held back by a lot of the issues we discussed today.

MR. VERRASTRO: Let me direct this one to Clay. It's a foreign policy question. It says foreign policy analysts worry that energy demand growth in Asia will realign relationships between the Middle East and China, for example, at the expense of U.S.-Arab relations. Is the competition for resources a real threat and how can competition be supplanted by cooperation? I gave you the softball.

MR. SELL: I don't think competition for resources is a real threat. The key is to properly shape the competitive playing field. That's the key. The competition is great. But from a government standpoint, from a foreign policy standpoint, we have to ensure the competitive playing field is fair and appropriate. And as to the future, as demand – as we see this increase in demand – the center of gravity moving to the East, that's an opportunity for the Arab states to increase their levels of cooperation and partnership. But I do not regard it as a zero-sum game where the West and the United States would lose.

MR. VERRASTRO: Let me address one question to Mohammed. The question is a World Bank study claims that the future demand in Saudi Arabia for desalinated water will consume a very large portion of the kingdom's production in oil and gas. And how would that affect export trends and production profiles?

MR. AL-QAHTANI: Well, I would respond to domestic demand in two ways. One is in the gas joint venture initiatives, finding and producing more gas, and also, a

part of the expansion program in the crude oil program is considered for that local consumption. But the majority of our expansion program in the oil is really towards supplying the refining and international demand in oil.

MR. VERRASTRO: Thank you. I've done enough of these to know that you never stand in the way of – or stand between the happy hour and the last presentation. We've had a lot of good substantive discussion. You've been a very patient audience and very attentive as well. I'd like to thank this distinguished panel. And if you could join me in thanking them as well. (Applause.) Thanks very much.

DR. ANTHONY: The reception here precedes the one from 6:30-8:00. For those who have never been to the UAE Embassy, if you're driving, they have valet parking there. The address is here in the program. If you're taking the Metro, it goes right straight to the Van Ness Metro stop, and it's just four to five-minute walk from there.

(END)