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GASOLINE PRICES

HEARING

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

ONE HUNDRED TWELFTH CONGRESS

SECOND SESSION

TO

RECEIVE TESTIMONY ON CURRENT AND NEAR-TERM FUTURE PRICE EXPECTATIONS AND TRENDS FOR MOTOR GASOLINE AND OTHER REFINED PETROLEUM FUELS

MARCH 29, 2012

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THURSDAY, MARCH 29, 2012

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC.

The committee met, pursuant to notice, at 9:35 a.m. in room SD–366, Dirksen Senate Office Building, Hon. Jeff Bingaman, chairman, presiding.

OPENING STATEMENT OF HON. JEFF BINGAMAN, U.S. SENATOR FROM NEW MEXICO

The CHAIRMAN. OK. Why don't we get started?

Thank you all for coming today. This is an oversight hearing of the Senate Energy and Natural Resources Committee on the current and near-term future price expectations and trends for gasoline at the pump.

As we all know, Americans are facing high prices when they go to fuel up their cars and trucks at the pump. They're struggling with the impact of those prices. The high prices are also a significant drag on our entire economy as we work to increase growth and job creation. We've organized this hearing to learn more about what is contributing to these higher prices, and what we can expect in the coming months as we approach the summer driving season.

I've said on several occasions in recent days that I believe it's important for us to use accurate facts when we work on these important energy policy issues. That's a major reason why we asked the panel of experts to come speak to us today. To provide us with their views on what those facts are.

Let me just note a few key points that I think are beyond dispute. If they are subject to dispute, maybe our witnesses can correct me on that. But I think they're accurate.

We know that the price of oil is set on a world market and that changes in our own domestic oil production do not have a major impact on the price of oil on that market, that world market.

We do not face cycles of high gasoline prices in the United States because of a lack of domestic production or a lack of access to Federal resources or because of environmental regulations getting in the way of us obtaining cheap gasoline.

We also know that there are many factors that can impact world oil markets. We hope to hear more about those factors today from all of our witnesses. We look forward to hearing from them about the dynamics of these various factors and what we can expect in coming months.

I also hope we can take what we learn and use it to focus on policies that can actually lead to more stable gasoline prices over time. This committee did good work on those issues in 2007 in developing the bipartisan energy bill we passed that year. That bill has delivered more biofuels for transportation and more efficient vehicles on our roads.

It already has helped to significantly reduce our dependence on foreign oil. We need to continue our work to find ways to use less oil and to be less vulnerable to the volatility, of the world oil market. I hope today's discussion will give us useful information on how we can do that.

Before we hear from our witnesses, before I introduce them, let me turn to Senator Murkowski for any comments she wants to make.

STATEMENT OF HON. LISA MURKOWSKI, U.S. SENATOR FROM ALASKA

Senator MURKOWSKI. Thank you, Mr. Chairman.

Welcome to our distinguished panel. We're all anxious to hear your comments this morning. I think we're all looking for the quick and easy answer, but I think realistically we know that there are no quick and easy answers to the fact that we are seeing significantly high prices at the pump.

In this morning's Washington Post the headline is, as area gas prices top $4 a gallon, I do a little independent survey of my communities back home. Just do a week by week assessment here.

Unleaded in Barrow is going for $5.75 a gallon.

Juno, our State Capital, is $4.15.

Nome is $5.98.

Kotzebue, just above it, is $7 and 31 cents.

So they're looking at what the national average is now and saying, boy, in the rear view mirror that looks pretty good because we're getting nailed with the high prices. They're looking for answers. So when there has been suggestion either in political commentary or in the news that somehow or other this is a political opportunity for us, I don't think most who are really feeling the pain at the pain, feeling the pain in their wallets and their pocketbooks, they don't view this as a political opportunity.

They expect us to do something here. They want to know what it is that can be done. So this exchange this morning, I think, is important.

We recognize that there are a lot of different factors that are driving up the fuel costs. Some are clearly beyond the control of this President, clearly beyond the control of this Congress. We recognize that.

But there are some things that I think that we can influence. We've heard about how we've got limited ability to control the instability in the Middle East or with the growing demand in China and other emergent countries and economies. Of course, our influence there is limited. That is clearly contributing to higher oil prices. We recognize that.

But there are a number of areas where the U.S. and particularly, our own Federal Government can have an impact.

We can influence pipeline capacity by improving them on a timely basis.

We can influence whether refineries stay in business by virtue of the regulations that we apply to them.

We can influence the value of the dollar and tax rates on the production, delivery and use of fuel.

I think, very importantly, the Federal Government controls access to millions of acres of Federal land with oil potential and of all the factors that I have listed, I think access is really the only area here where this committee has direct jurisdiction over. Our decisions help determine whether companies have access to the outer Continental Shelf, to the non-wilderness portion of ANWAR, much of the Rocky Mountain West. So if I seem somewhat eager to focus on access to Federal lands and waters it's because I think this is one of the areas and perhaps the most significant area that we can have the direct authority or that we do have the direct authority to help.

I believe, quite strongly, supply and demand absolutely matter. It's not just one or the other. We are the world's number 3 producer of oil. We're the world's No. 1 consumer of oil.

Our production is rising on state and private lands. The question that nobody seems to be asking, though, is what the price of oil would be if that weren't happening. If we weren't seeing this increase that the President keeps pointing to. In my mind there's no doubt that it would be higher, that the pain at the pump would, in fact, be worse.

I think most of us are using the terminology around here now that we should pursue an "All of the Above" energy policy. I think that that means increased or higher efficiency standards for vehicles of all sizes. It means investments in R and D for alternatives. It certainly means a concerted effort to bring more of America's oil to market.

With that, I look forward to the testimony and the questions and answers from those of us here on the committee.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you very much.

Let me just briefly introduce our witnesses. We very much appreciate them being here.

Dr. Howard Gruenspecht is the Acting Administrator and Deputy Administrator with the Energy Information Administration in the Department of Energy.

Dr. Daniel Yergin is Chairman of IHS Cambridge Energy Research Associates here in Washington.

Mr. Frank Verrastro is the Senior Vice President and Director of Energy and National Security Program for the Center for Strategic and International Studies here in Washington.

Dr. Paul Horsnell is the Managing Director and Head of Commodities Research with Barclays Capital in London.

Thank you all very much for being here. If you could each take whatever time you think is necessary to make the points that you think we need to understand. Your full statements will be included in the record as if read.

Dr. Gruenspecht.

STATEMENT OF HOWARD GRUENSPECHT, ACTING ADMINISTRATOR, ENERGY INFORMATION ADMINISTRATION, DEPARTMENT OF ENERGY

Mr. GRUENSPECHT. Thank you, Mr. Chairman, Ranking Member Murkowski and members of the committee. I appreciate the opportunity to appear before you.

The Energy Information Administration is the statistical and analytical agency within the Department of Energy. Because EIA does not promote or take positions on policy issues and has independence with respect to the information it provides, our views should not be construed as representing those of the Department or other Federal agencies.

Prices for all petroleum products have risen in recent months but gasoline prices are of particular concern to most consumers. The national average price of regular gasoline averaged $3.58 per gallon in February 2012, 37 cents higher than in February 2011. It's certainly risen since over the past month as well. The February price was at a historic high for any February. There is, however, significant regional variation in prices as illustrated in Figure 1 of my testimony.

Crude oil price increases, I think, have eclipsed other drivers of motor fueled prices as shown in Figure 2 and 3 of my testimony. While both gasoline and diesel prices rose by 37 cents per gallon from February 2011 to February 2012, the cost of crude oil to refiners rose by about $20 per barrel, about 48 cents per gallon over the same period. The increases in crude oil prices since the start of 2011 appear to be related to a tightening world supply/demand balance and concerns over geopolitical issues that have impacted or have potential to impact supply flows from the Middle East and North Africa, a region that is critical to global oil supply.

Demand growth in developing countries drove an 800,000 barrel per day rise in world demand in 2011. Non-OPEC supply, mostly from outside of the Middle East, has had some recent setbacks, as described in my testimony. In addition both the United States and the European Union have acted to tighten sanctions against Iran including measures with both immediate and future effective dates.

Current prices reflect expectations, as well as today's conditions, and many analysts see continuing demand growth with possible tightening in supply over the coming months—a combination that's affecting the market. For the first time since 1949 in 2011, EIA data show that the United States became a net exporter of petroleum products. That's not including crude oil, just the products that come out the other end of the refinery.

However, we don't think that higher gasoline prices are being caused by higher product exports. U.S. gasoline exports have grown mainly as a result of refiners having excess capacity as U.S. consumption of petroleum based, liquid fuels has declined. Between 2007 and 2011 U.S. consumption of liquid fuels fell by 1.85 million barrels per day. Over the same period domestic production of ethanol and biodiesel, which displaces petroleum in motor fuels, increased by roughly half a million barrels per day.

While the domestic demand for petroleum fuels has declined, many U.S. refiners had a competitive advantage in markets in Latin America and other regions that need gasoline imports to

meet growing demand. U.S. refiners are taking advantage of these export opportunities. Accordingly, they reduced crude oil inputs to their refineries by only a little more than 300,000 barrels per day between 2007 and 2011, despite the much larger decrease in liquid fuels consumption in the United States and the increase of the non-petroleum liquid fuels to meet that consumption.

Without product exports domestic refiners would have reduced their runs by a much larger amount. In EIA's March short term outlook, the cost of crude oil to refiners continues to be the major factor affecting gasoline and diesel prices. The average refiner's acquisition cost of crude oil is forecast to increase from $102 a barrel in 2011 to almost $115 per barrel in 2012, but falls back in 2013.

EIA recognizes that significant uncertainties could push oil prices higher or lower than our forecast. Based on options in futures prices for the 5 day period ending last Friday, market participants apparently believe that there's a 14 percent chance that the June 2012 WTI futures contract will expire above $120 per barrel, $14 higher than the WTI spot price on March 23rd. For Brent, which trades at a significant premium over WTI, and is generally more representative of water borne crude prices in today's market, the probabilities of exceeding particular dollar thresholds are correspondingly higher.

EIA's March outlook expects the average retail price of regular gasoline in the United States to average $3 and 79 cents per gallon in 2012 compared with $3 and 53 cents per gallon in 2011. More recent information points toward a somewhat higher gasoline price forecast in the next outlook. Again, based on options in futures prices over the 5 days ending March 23rd, the probability of the June 2012 futures contract for reformulated blendstock expiring above $3 and 35 cents per gallon, which would be comparable to a $4 per gallon national average retail price for regular gasoline, is approximately 44 percent.

EIA expects diesel prices to average 36 cents per gallon above gasoline prices in 2012. Diesel prices are affected by world demand growth for diesel and other distillate fuels, particularly in the emerging economies. That growth has significantly outpaced gasoline demand growth in recent years.

In conclusion, while EIA does not take policy positions, it has often responded to requests from this committee and from others for data and special analyses. I want to assure you that we stand ready to respond to such requests over the coming weeks and months.

Mr. Chairman, Ranking Member Murkowski and distinguished members, I would be happy to answer any questions that you may have.

[The prepared statement of Mr. Gruenspecht follows:]

PREPARED STATEMENT OF HOWARD GRUENSPECHT, ACTING ADMINISTRATOR, ENERGY INFORMATION ADMINISTRATION, DEPARTMENT OF ENERGY

Mr. Chairman and Members of the Committee, I appreciate the opportunity to appear before you today to discuss current and near-term future price expectations and trends for motor gasoline and other refined petroleum products.

The U.S. Energy Information Administration (EIA) is the statistical and analytical agency within the U.S. Department of Energy. EIA collects, analyzes, and disseminates independent and impartial energy information to promote sound policy-

making, efficient markets, and public understanding regarding energy and its interaction with the economy and the environment. EIA is the Nation's premier source of energy information and, by law, its data, analyses, and forecasts are independent of approval by any other officer or employee of the United States Government. Therefore, our views should not be construed as representing those of the Department of Energy or other federal agencies.

RECENT GASOLINE AND DIESEL PRICES

Prices for all petroleum products have risen in recent months, but gasoline prices are of particular concern to most consumers. The national average price of regular grade gasoline averaged $3.58 per gallon in February 2012, 37 cents (11.5%) higher than in February 2011 and an historic high for any February in both real and nominal terms. Diesel fuel prices have moved higher along a parallel path, averaging $3.95 in February 2012, also 37 cents per gallon (10.3%) higher than in the comparable year-ago period and an historic high for any February. As illustrated in the color-coded map in Figure 1*, there is significant regional variation in gasoline prices. During 2012, retail gasoline prices in the Rocky Mountain region have been well below the national average due to lower crude oil input cost for refiners in that region. On March 26, the average price in the Rocky Mountain region was $3.69 per gallon. That was 56 cents per gallon lower than the average price on the West Coast, which was $4.24 per gallon on the same day. The West Coast has recently experienced several refinery outages that pushed up retail prices in that region. The national average price for regular grade gasoline on March 26, 2012 was $3.92 per gallon.

Key factors that drive petroleum product prices are the cost of crude oil to refiners, the costs of refining and marketing petroleum products, the balance between demand and available product supplies, and taxes applied to gasoline and other motor fuels. In the short term, changes in the cost of crude oil tend to be the single most important factor driving changes in product prices. But product prices are also affected by demand, which varies seasonally. Generally, gasoline prices peak during the summer driving season. Furthermore, imbalances between product demand and available supply affect prices. In extreme cases, local supply disruptions such as from unplanned refinery or delivery outages can push up product prices beyond any changes in crude oil prices. These types of imbalances are usually short-lived and tend to impact prices in specific local areas or regions.

Recently crude oil price increases have eclipsed other impacts on petroleum product prices, including any downward effect stemming from recent weakness in U.S. gasoline and diesel demand. While both gasoline and diesel prices rose 37 cents per gallon from February 2011 to February 2012, the cost of crude oil to refiners rose by about $20 per barrel (48 cents per gallon) over the same period. Figures 2 and 3 show U.S. retail prices for gasoline and diesel fuel along with refiners' average crude oil costs, illustrating the significant impact of crude oil prices on product prices.

CRUDE OIL PRICE INCREASES

Crude oil prices reflect both current market conditions and market participants' assessments of developments that could affect the future balance between supply and demand. The economic outlook is a key driver of demand expectations. Assessments of the decline rate for existing production, prospects for projects that can add liquids production at new and existing fields both inside and outside of member countries of the Organization of the Petroleum Exporting Countries (OPEC), and geopolitical developments that have the prospect to disrupt production and/or the flow of crude oil into the marketplace are key factors that enter into views of the future supply situation.

The increases in crude oil prices since the beginning of 2011 appear to be related to a tightening world supply-demand balance and concerns over geopolitical issues that have impacted, or have the potential to impact, supply flows from the Middle East and North Africa, a region that is critical to overall global supply of crude oil. While demand growth in the United States and especially in Europe has been weak, demand growth in developing countries has been relatively strong, resulting in world demand growth in 2011 of 0.8 million barrels per day (bbl/d) over 2010. At the same time, non-OPEC supply has had some setbacks recently, including production drops in South Sudan, Syria, Yemen, and the North Sea. In addition, both the United States and the European Union have acted to tighten sanctions against Iran, including measures with both immediate and future effective dates. Current prices

* Figures 1–3 have been retained in committee files.

reflect expectations as well as current conditions, and many analysts see continued demand growth with possible tightening in supply over the coming months.

CHANGES IN PETROLEUM PRODUCT TRADE FLOWS

EIA data indicates a significant shift in petroleum product trade flows, as the United States became a net exporter of petroleum products in 2011 for the first time since 1949. EIA has been asked whether this development has contributed to rising gasoline prices. We do not believe that there is any significant causal linkage between these two phenomena. U.S. gasoline exports have grown mainly as a result of refineries having excess capacity as U.S. consumption of petroleum-based liquid fuels has declined. Between 2007 and 2011, U.S. consumption of liquid fuels fell by 1.85 million bbl/d (8.9%). Over this same period, domestic production of ethanol and biodiesel, which displaces petroleum-based components of motor fuels, increased by 0.51 million bbl/d (112%). Imports fell in both absolute terms and as a share of U.S. petroleum product demand over this period.

At the same time as domestic demand for petroleum-based liquid fuels declined, many U.S. refiners had a competitive advantage in some world markets that need to import gasoline. Most gasoline exports leave from Gulf Coast refineries to serve markets in Latin America where demand has been growing rapidly. U.S. refiners were able to take advantage of these export opportunities, and, accordingly, they only reduced crude oil inputs by 0.32 million bbl/d (2.1%) between 2007 and 2011. Without those product exports, refiners would likely have reduced crude inputs and refinery output much more than what actually occurred.

While the United States has been exporting gasoline from the Gulf Coast, we still import gasoline into the East Coast, which receives about 85 percent of U.S. gasoline imports. Both pipeline capacity and domestic waterborne shipping constraints currently discourage increased product volumes from traveling from the Gulf Coast to the East Coast. As long as European and other foreign gasoline supplies remain competitive, the East Coast is likely to continue to draw on these supplies. Also, if Gulf Coast refiners were not exporting to Mexico and other Latin American countries, Europe would likely be sending more supplies to those areas, potentially increasing the cost of gasoline imports to the Northeast.

THE NEAR-TERM OUTLOOK FOR MOTOR FUEL PRICES

In EIA's Short-Term Energy Outlook, the cost of crude oil to refiners continues to be the major factor affecting gasoline and diesel prices through the end of 2013. The average refiners' acquisition cost of crude oil is forecast to increase from $102 in 2011 to almost $115 in 2012, but falls back a bit in 2013 to $110.

Significant uncertainties could push oil prices higher or lower than projected. A number of non-OPEC countries are currently undergoing supply disruptions. Oil prices could be higher than projected if current disruptions intensify, new non-OPEC projects come online more slowly than expected, or OPEC members do not increase production. On the demand side, if the pace of global economic growth fails to recover in OECD countries, or if economic growth slows in non-OECD countries, prices could be lower.

The value of options on futures contracts is one key indicator of forward-looking market sentiment. Call options provide the holder with the right to buy a commodity at a specified price up to a specified future date, while put options provide the right to sell at a specified price up to a specified future date. Given strike prices and the time to expiration, the value of options contracts can be used to calculate the market's current assessment of the uncertainty range for future prices and/or the market's view that prices for future delivery at specified dates will exceed or fall below any particular level. Application of this approach to market prices for the 5-day period ending March 23 suggests that market participants believe there is a 14 percent probability that the June 2012 West Texas Intermediate (WTI) futures contract will expire above $120 per barrel, $14 higher than the WTI spot price on March 23. Given the higher absolute level of Brent crude prices, which are generally more representative of waterborne crude prices in today's market, the probabilities that the June Brent contract will exceed specified dollar thresholds are much higher.

EIA expects to see continued constraints in transporting crude oil from the U.S. midcontinent region, and thus a continued price discount for landlocked crude oils, including WTI, relative to other world crude oil prices. The projected WTI price discount to the average U.S. refiner acquisition cost of crude oil narrows over the forecast from about $10 per barrel in the second quarter of 2012 to $4 per barrel by the fourth quarter of 2013, as physical pipeline capacity constraints diminish. EIA expects WTI prices to remain relatively flat in 2013, averaging about $106 per bar-

rel, while the U.S. average refiner acquisition cost of crude oil declines to $110 per barrel, narrowing the gap.

Given its forecast for crude oil prices, EIA is expecting an increase in gasoline and diesel prices in 2012 of almost 30 cents per gallon over their average prices in 2011. Product prices decrease along with crude oil prices in 2013. EIA expects regular-grade motor gasoline retail prices to average $3.79 per gallon in 2012, compared with $3.53 per gallon in 2011. During the April-through-September summer driving season this year, prices are forecast to average about $3.92 per gallon, with a peak monthly average price of $3.96 per gallon in May. Based on implied volatilities calculated from options and futures prices over the 5 days ending March 23, the probability of the June 2012 futures contract for reformulated blendstock for oxygenate blending (RBOB) expiring above $3.35 per gallon (comparable to a $4.00 per gallon national monthly average retail price for regular grade gasoline) is approximately 44 percent. The corresponding market-based probability that the June 2012 RBOB contract will expire at a level that would imply a national monthly average retail price for regular grade gasoline of $5.00 per gallon or more is less than 1 percent.

Diesel prices are projected to average $4.15 per gallon in 2012, which is 31 cents higher than in 2011. Prices are forecast to decline slightly to $4.11 in 2013. Throughout this forecast, diesel prices are expected to remain above gasoline prices. World demand growth for diesel fuel, primarily in the emerging economies, has significantly outpaced gasoline demand growth in recent years. EIA expects retail gasoline prices to average 36 cents per gallon below diesel in 2012 and 40 cents per gallon lower in 2013.

One of the major uncertainties that could impact gasoline and diesel prices in the Northeast this summer is the possible closure of the Sunoco Philadelphia refinery. If Sunoco is unable to find a buyer for its Philadelphia refinery, it plans on shutting the facility, which could create some local supply disruptions as the transition occurs. This issue was discussed in a recent EIA report, Potential Impacts of Reductions in Refinery Activity on Northeast Petroleum Product Markets, and we continue to monitor that situation.

Given the near-term focus of this hearing, this testimony does not address longer-term projections related to the supply and demand for crude oil and petroleum products that are considered in EIA's Annual Energy Outlook and International Energy Outlook, which provide domestic and international energy projections through 2035 for a variety of cases reflecting alternative assumptions about economic growth, supply conditions, and policies. These longer-term projections may be relevant to policymakers' consideration of possible proposals that could significantly impact demand or supply trends for crude oil and petroleum products over an extended time period.

CONCLUSION

As I noted at the outset, while EIA does not take policy positions, its data, analyses, and projections are meant to assist policymakers in their energy deliberations. EIA has often responded to requests from this Committee and others for data and special analyses, and I want to assure you that we stand ready to do so over the coming weeks and months.

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

The CHAIRMAN. Thank you very much.

Dr. Yergin, go right ahead.

STATEMENT OF DANIEL YERGIN, CHAIRMAN, IHS CAMBRIDGE ENERGY RESEARCH ASSOCIATES

Mr. YERGIN. Mr. Chairman, Ranking Member Murkowski, members of the committee, it's an honor to be here. It's, obviously, this is a very timely hearing. I'm very pleased to be part of this distinguished panel in terms of trying to sort out the questions of what's happening with gasoline prices.

Senator Bingaman and Senator Murkowski have really outlined the problem that is on the table to be addressed in terms of where gasoline prices are now and the pain that they're causing for motorists and consumers. It's also the larger question is we're looking at an economic recovery here. Europe is in a bad situation. What happens with oil prices will be very important.

Gasoline prices, where they are now, is where they were 4 years ago when we last—this committee was very concerned with what was happening. If we look at the prices, Howard gave us the latest prices through February. If we look at the prices at the end of March 2012 they are more or less the same place prices were in May, at the end of May 2008.

So what's the same? Then the market was really being driven by what we might call demand shock from the emerging markets and this kind of aggregate disruption with a lot of supply being out in different parts of the world. Some of those same factors are at work today.

The emerging markets are virtually the only source of growth in demand, although not as strong as it was half a decade ago.

Disruptions and I think the number that's used now is that about 750,000 barrels a day are disrupted when you add up what's happening in different parts of the world.

We also have just a basically, a tight market in terms of supply. It's tighter than it was last year. Spare capacity of, we estimate, 1.8 to 2.5 million barrels a day. That would create upward price pressure in any case.

Two things are different. One is of grave concern and the other is one of some reassurance.

One difference is geopolitics. Geopolitics was not a strong factor last time when we saw the prices that we're seeing today. It certainly is today.

It began with the Libyan disruption, the Arab spring. But it's clearly focused right now on the Iran's nuclear program. A sense that a clock is ticking between now and the end of June when various sanctions go into place.

I think you could say that it really a new phase, not only on Iran. But Iran's impact on the oil market began at the end of November when the United Nations came out with its report on Iran's nuclear program saying that it was putting together the capabilities for a nuclear device. Then you look what's happened to price since then. Since mid December world oil prices are up about 20 percent. U.S. gasoline prices are up about 20 percent.

It is a unique situation because basically the Europeans and the United States have focused in now on targeting, very directly, Iranian oil revenues. Those revenues provide over 50 percent of the Iranian government's total operating revenues. So between the EU's embargo and the U.S. sanctions, which imminently we presume will be put into place so that they'll start to play out in June, this is a wholly new situation to actually seek to reduce Iranian exports.

Iran has responded with threats with military exercises. The oil market has jumped when they threaten to close the Strait of Hormuz. It's worth reflecting on that for a moment because of all the oil exporters the country that would be most punished by that is Iran, which does not have the same financial wherewithal of the other exporters.

The other thing about that threat, it's kind of a classic threat to threaten the United States, to threaten Western Europe. But they didn't look quite closely at their numbers because actually China depends more on the Strait of Hormuz, over two million barrels a

day, than we do. It was the Chinese Premier who reminded Tehran to avoid what he called, extreme action, involving the Strait.

So the question is how to move the market into balance as this effort to reduce some significant share of Iranian oil exports now takes place without driving up the price of oil.

Saudi Arabia plays a very key role. There's an article today by the Saudi Oil Minister. I think it's in today's Financial Times. Describing what they're doing and they have the extra spare capacity. What was noteworthy was this paragraph about how their inventories all around the world are full. That is actually good news.

But what has to happen is to replace those Iranian barrels either with supplies from elsewhere or on the demand side. Both are necessary. I think that over the next few months we may see demand having a bigger impact in balancing than might be expected now. One thing we should keep our eye on is what happens with inventories.

I said one thing is different that is of concern which is Iran. The other thing that is of difference is very positive news. It's what's happening with U.S. energy production.

You know, 4 years ago when this committee assembled when oil prices were going up, there was a general mood of pessimism that the U.S. was finished as a producer. We were on the road to be a major importer of natural gas. We would be spending upwards of $100 million a year to import natural gas. That's completely turned around now as we are now in a position of abundant natural gas.

The other thing that has happened is what has happened to U.S. oil production. U.S. oil production is up 20 percent since 2008, over 1.1 million barrels a day. Senator Murkowski, the point you made, that has a big impact.

If that 1.1 million barrels a day was not there, we would be looking at much higher prices than we're looking at today. This year we think U.S. oil production might increase by at least another 300,000 barrels a day. That's an important offset.

The other important offset is what's happening with Canadian Oil Sands which have tripled, have actually tripled, since 2000. If you look at Canadian Oil Sands currently, that output is greater than Libya was producing before the Civil War. So it's a big number.

So those are positives. So between what we might call peak demand in the United States, the production increase, the biofuels that Senator Bingaman referred to. This has changed our position. Our oil imports have declined from 60 percent in 2005 to the latest number I've seen in your numbers, Howard, 44 percent.

What to do in the near term to mitigate prices at the pump? Obviously, you know, there are no silver bullets, magic buttons to push. What's key is additional supplies and rising inventories.

I think the experience of the disruptions during hurricanes Katrina and Rita drive home the fact of the importance of the flexibility, flexibility in the movement of crude and products as a very important offset. That refers to the need we have for pipelines in this country for logistics addressing, of course, the Jones Act, the ability to move supplies.

We need to build confidence about new supplies both North America and internationally.

We, the United States, might look in the concert with the G-8 countries and the other IEA countries of what kind of coordinated measures, relatively modest measures, that individuals and companies can take that collectively, add up to modulate demand. Because what will happen here demand will be very important.

Of course, any relaxation or realism on the part of Iran would be taken as very welcome by the market. So I think we should expect, kind of, ebbs and flows in responding to what happens.

But if events remain on the, kind of, course described above and the calendar that's going to unfold between now and the end of June, we should expect that oil prices will be a register of those tensions and what unfolds in the months ahead. Certainly will be calibrated in the gauge at the gasoline pump.

So there's the importance, to focus on those forces of supply and demand to offset the risk that we'll be seeing in the months ahead.

Thank you.

[The prepared statement of Mr. Yergin follows:]

PREPARED STATEMENT OF DANIEL YERGIN, CHAIRMAN, IHS CAMBRIDGE ENERGY RESEARCH ASSOCIATES

It is an honor to address the U.S. Senate Committee on Energy and Natural Resources. I appreciate the invitation to participate in this important hearing. It is timely—and indeed urgent—to discuss the current state of the oil and gasoline markets.

Gasoline prices are going up again, as they did four years ago, once again creating pain for American motorists and for the overall economy—and this time looming as a major risk for economic recovery. It does seem to be back to the future. At the end of March, 2012, the average gasoline price was about $4.00 a gallon—the same level as at the end of May, 2008.

Yet much has changed in terms of the causes. This is also true for the circumstances. One decisive change is that America's energy position is much more resilient and its resources understood to be more abundant than four years ago.

The 2008 price increase was generated by a number of factors. The "Demand Shock" was the most important—arising from surging consumption in emerging markets countries. Just a decade ago, at the beginning of the 21st century, almost two out of every three barrels of oil were consumed by developed countries. As the decade progressed, demand from emerging markets—especially China—surged, most notably in 2004-2005. The emerging markets nations are on their way to using more oil than the developed world. Their share will continue to rise as their consumption of oil continues to surge, while demand in the developed world peaks.[1]

In the price run-up last decade, the impact of this "Demand Shock" was augmented by what we have called the "Aggregate Disruption"—the loss of supply from Venezuela, Nigeria, Iraq, and the US Gulf of Mexico due to Hurricanes Rita and Katrina. The result was an inordinately tight oil market, especially in 2005. On top of these fundamental factors of supply and demand, the "financialization" of oil became more pronounced as commodities emerged as a distinct asset class for a wide range of investors. Persisting weakness in the dollar also seemed to boost the oil price—and thus gasoline prices. On top of all of this was a pervasive pessimism about the adequacy of future supplies, both in the United States and in the world—in other words, a belief that the world was "running out" of oil and the United States was "running out" of natural gas.

WHAT HAS CHANGED

Today some of the same factors remain at work. The emerging markets continue to dominate world demand growth. To be sure, the rate of this growth is lower than in some previous years. Nonetheless, world oil demand is expected to reach a record high of 89.5 million barrels per day this year, due primarily to emerging markets growth. Also, commodities remain a distinct asset class.

[1] Daniel Yergin, The Quest: Energy, Security, and the Remaking of the Modern World (New York: Penguin, 2011), Chapter 8 "The Demand Shock", Chapter 6 "Aggregate Disruption."

Meanwhile, the oil market is again experiencing a number of supply disruptions. The loss of supply from Libya last year—about equivalent to the volumes lost due to Hurricanes Katrina and Rita—contributed to a tight oil market. That loss helped to push up world oil prices in 2011 , on an average annual basis, to their highest level on an inflation-adjusted basis since the 1860s. The market has tightened further in recent months, and prices so far this year are higher than last year's average. Today, supply is disrupted from Sudan, Yemen, Syria, among other locations. At this point, disruptions have taken at least 750,000 barrels per day off the market.

A key indicator of the current relatively tight market balance now is the thin cushion of spare production capacity—the difference between world oil production and production capacity. Spare capacity is expected to range between 1.8 and 2.5 million barrels per day in 2012, low compared with recent years. Such a tight balance would, in any circumstances, create upward pressures on price.

This year, the dominant factor in pushing up world oil prices—and thus gasoline prices in the United States—is geopolitics—specifically, rising tension over Iran. The report of the United Nations International Atomic Energy Agency at the end of November 2011 introduced a new phase in the contention over Iran's nuclear program. In its report the IAEA warned of "serious concerns regarding the possible military dimensions to Iran's nuclear programme." These concerns were based on its view that Iran "has carried out activities relevant to the development of a nuclear explosive device."[2]

SANCTIONS AND IRAN'S THREATS

Since mid-December, both world oil and U.S. gasoline prices have increased about 20 percent.The European Union has agreed to place an embargo on the importation of Iranian oil and has restricted Iran's access to its financial markets. The United States is expected to make a determination imminently as to whether the world oil price and supply of non-Iranian oil are sufficient to implement new, tighter sanctions on oil transactions three months from now. These sanctions will deny access to the U.S. financial system to entities undertaking oil transactions with Iran's central bank, unless countries are certified to have made "significant" reductions in imports of Iranian oil. (Japan and some European countries were recently exempted.)

The purpose of tighter US and EU sanctions and restrictions is to constrain the ability of Iran to sell its oil—and ultimately reduce the amount of oil revenues flowing into Tehran's coffers. Iranian oil exports, which have been running at about 2.2-2.5 million barrels per day , provide over half of Iran's total government revenues.[3] This is the first major effort by the West to restrict directly Iran's oil exports. The stricter sanctions are driven by the conclusion that such severity is required by the seriousness of the risk that Iran is approaching and will cross what has been described as the "red line" in the development of nuclear weapons.

Iran has stoked the tensions since November by threatening to "close" the Strait of Hormuz, through which passes 35 percent of world oil exports, along with a substantial part of world liquefied natural gas (LNG) shipments and significant volumes of refined products. It has also held highly-visible naval exercises and weapons tests; refused access for IAEA inspectors to Iranian enrichment facilities; and, implicitly, threatened other responses.

Iran's threat to close to the Strait of Hormuz would first and foremost punish Iran itself, which depends on the Strait for virtually all of its oil exports. Moreover, the threat looks toward the "West", aimed at intimidating Europe and the United States. But times have changed. China depends on transport through the Strait for more than two million barrels a day of supply, and China's Premier Wen Jiabao recently warned Tehran against "extreme acts across the Strait of Hormuz".

BALANCE IN THE MARKET

It is the prospect of Iranian barrels dropping out of relatively tight market—and not being replaced—that is affecting crude oil prices. This in turn, is affecting the prices that Americans pay at the pump.

Will tighter Iranian sanctions lead to a shortfall that makes the world oil market tighter still, and prices yet higher?

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[2] Implementation of the NPT Safeguards Agreement and relevant provisions of the Security Council resolutions in the Islamic Republic of Iran, report dated November 18, 2011 by the Director General of the International Atomic Energy Agency.

[3] IHS Global Insight, "Iran's Economy", March 2012

The answer will be determined by one of two things: either "replacement" barrels come into the market, or fewer barrels being needed because world demand is lower than anticipated.

Saudi Arabia, holding almost all of the world's spare capacity, has the ability to fill a two million barrel a day gap in supply. However, that would virtually exhaust the world's spare capacity, a situation that would alarm the market. Additional supplies could come in over the course of the year from a number of countries—Iraq, Libya, Angola, Colombia—and the United States and Canada. Yet, such supplies cannot be called on immediately to address a major supply disruption.

Oil demand may be modulated by the weakness of Europe's economy, an economic slowdown in China, increased efficiency in energy use, and the effects of higher oil prices.

THE GREAT REVIVAL IN NORTH AMERICA

Looking ahead, new sources of oil supply are coming into the market. While new oil production capacity cannot come to the market overnight, there is much greater confidence in oil supplies than in 2008. East Arica is emerging as a major new oil and gas play. Ghana is joining the ranks of exporters. Major new discoveries have been found off the coast of French Guyana in Latin America.

But nowhere is the change in perspective more striking than in the United States—and North America more broadly. In 2008, the dominant view was that the United States was a region of declining oil and gas production, and that the decline was irreversible. It was expected that the United States was on course to be a major importer of LNG—and would end up spending upwards of $100 billion a year to do so. Since then, however, the unconventional natural gas revolution—the surge in shale gas production—has transformed the U.S. gas position. At current prices, there is a growing interest in having some natural gas will go into the transportation sector, particularly large trucks and fleets.

The technology that underlies shale gas is also changing the outlook for oil supply in the U.S., which is now experiencing a "great revival" in production. North Dakota has recently overtaken California as the third-largest oil producing state in the country. Altogether, U.S. petroleum production is up almost 20 percent since 2008—some 1.1 milllion barrels per day. It is expected that U.S. production could increase by another 300,000 barrels per day this year.

The change in North America is not limited to the United States. The production of Canadian oil sands has almost tripled since the beginning of the 21st century. Today the output from the oil sands—1.7 million barrels per day—is greater than Libya was producing before its civil war.

While U.S. oil production has gone up, oil consumption in the United States is down—almost 10 percent since 2007—a decline of two million barrels per day. In fact, United States oil consumption in 2011 was back to where it was 14 years before—in 1997. The result is that net U.S. oil imports have declined from 60 percent in 2005 to 44 percent at the beginning of this year and are likely to continue to decline, as supply increases and more efficient cars come into the fleet.

"ENERGY LESS-DEPENDENCE"

All this does not add up to energy independence for North America, but it does add up to "energy less-dependence". Continuing to facilitate these trends would be very helpful.

There are some more immediate things that can be done to help mitigate high prices at the pump. Additional supplies and rising inventories are the starting point. The experience during Hurricanes Katrina and Rita demonstrates that promoting flexibility in the movement of crude and products can help offset upward price pressures. Building confidence about future supplies, both in the United States and internationally, is another measure. The G-8 and IEA nations can coordinate to focus on the relatively modest measures that individuals and companies can take that collectively add up to help modulate demand. If for any reason there is some relaxation in tensions over Iran's nuclear program, then that will reduce the evident security premium in the price. But, if events remain on the course described above, then oil prices will be a barometer of those tensions and of what unfolds in the months ahead.

The CHAIRMAN. Thank you very much.

Mr. Verrastro.

STATEMENT OF FRANK A. VERRASTRO, SENIOR VICE PRESIDENT AND DIRECTOR, ENERGY AND NATIONAL SECURITY PROGRAM, CENTER FOR STRATEGIC AND INTERNATIONAL STUDIES

Mr. VERRASTRO. Thank you, Chairman Bingaman, Senator Murkowski, members of the committee, I, too, thank you for the opportunity to appear today.

The rapid rise in gas prices has become a staple on the evening news, as you're all too well aware. It's understandably painful for the American consumers and it's actually a threat to the economic recovery. So I commend the committee for holding this hearing at this time.

Given the expertise of this panel I won't repeat what Dan and Howard have just said because I agree with the forecast and what has actually occurred. I will instead highlight a few points. I've actually brought some slides to my testimony. If you'll refer to those, especially the first 3 and the last one, I think we can walk through this pretty quickly.

The first slide actually shows crude oil prices. We did it registered in terms of Brent rather than WTI because WTI is no longer a world class marker. After last year's Arab spring crude oil prices essentially settled into a narrow band for the last half of the year. You can see that from July through December. This was largely as a consequence of what we feel were counterbalancing signals of fears of weaker economic growth and the Euro crisis on the one hand and perceived stress on the supply side on the other.

At the beginning of the year, however, this all began to change. Between January 1 and March 9th, as both Dan and Howard have said, Brent prices rose by about $20 a barrel. For the past 2 weeks, prices have been bouncing around at a new, albeit higher band and yesterday closed at about $124. The price this morning at 8 o'clock was $125.04

Economic improvement in the U.S. and elsewhere as well as weather related events certainly contribute to this bullish sediment. But concerns about supply stability were also readily apparent. Iranian threats to close the Strait of Hormuz drove much of that increase.

When you look at Figure 2, and I know this has been an issue that Senator Franken has looked at. Given the upside potential of commodity—given the upside potential, commodity investments in oil have also increased. This is not unlike what occurred in 2008 and 2007.

The bottom line here is at least for the near term the current psychology of the market is supportive of keeping prices at a higher level. I think the psychology is important because when you look at prices the old fundamentals used to be supply, demand and inventory. Now we're looking at current prices, future prices, weather, crude oil quality and this idea of breaking market momentum is really important when you see ups and downs in the market.

Demand growth is still forecasted as we move through the year. The potential for real disruption threats are on in ongoing supply disruptions in South Sudan, Russia, Yemen, Canada, China, Syria, the North Sea and Nigeria. Potential dislocations as well in places like Brazil and Iraq. These will all continue to push upward pres-

sure, even as we see increases coming out of the Saudi Arabia and the United States.

In addition in the aftermath of Fukushima, Japan's inability to restart their nuclear reactors and 53 of the 54 reactors are currently shut down. This has resulted in increased demand for oil as well as for LNG. Even without the closure of the Strait of Hormuz, the projected removal of several hundred thousand barrel a day of Iranian production as a consequence of sanctions, will put added stress on the market as we move further into the spring.

In such a market even good news like Saudi Arabia's offer last week to increase production has been tempered by the notion that additional output will effectively deplete the world's available spare capacity because we're so close to that edge. That would leave price, near term increases in Libya and the use of strategic stocks as the only weapons available to dampen, even on a temporary basis, further upward movements in the event of additional and unanticipated disruptions. This is not a comforting thought.

There's been a lot of discussion about the closing of refineries on the East Coast of the United States. What contributed—and what contribution that has made, the Trainer Refinery, Marcus Hook Refinery and maybe Philadelphia. As raw material feed stock is the largest component of gasoline prices the increase in crude prices, as Dan and Howard have already said, is necessarily reflected in the price we pay at the pump.

But concerns about deliverability given the refinery closures on the East Coast and elsewhere were also factors. Given time, I believe that product imports from Europe, the Middle East and Asia, our shipments from the Gulf Coast will eventually close that gap. But prices, given transportation costs, are likely to be higher until we find lower cost logistical alternatives. They actually become readily available. Shipments from the Gulf, which is Pad Three, are an option, but deliverability will be influenced by the availability of Jones Act vessels or possibly waivers to the Jones Act, docking and storage facilities and regional and local pipeline capacity.

The good news and this is Figure 3, is that absent a massive global disruption or market tightening beyond what we foresee today, if history is any guide, so this is just history. It's always easier to predict history than the future. The U.S. gasoline prices generally decline or tend to decline after July.

Unfortunately for consumers and I think we're all of the same mind here, there is little that can be done in the near term. In a free market system price is always the final allocator of scarce resources. members of this committee have already offered a number of measures to help mitigate these impacts. I'm happy to discuss any and all of these.

While I don't have time to elaborate on the oil price myths section of my testimony, I hope you will find these points both informative and entertaining. I welcome any questions or comments on those as we go forward.

Final points. The remainder of my charts really relate to the changing energy landscape which Dan has so artfully already described. Raises the question of whether and how we want to use

our vast unconventional resources along with an array of new technologies, efficiency and renewables to build a new energy future.

Dr. Don Paul, who is a colleague of ours at CSIS, has characterized this as the great dilemma. It's an issue this committee will be dealing with in the next several months as well as the next several years.

For the last 40 years U.S. Energy Policy has been predicated on the dual notions of growing demand and resource scarcity, especially in relation to oil and natural gas. We are now potentially looking at demand reduction and resource abundance. The landscape is being transformed even as we sit here today.

Higher prices in technology, applications to scale are driving an unconventional resource revolution. This phenomenon has the potential for creating a new energy reality. One in which the United States, once again, becomes a global leader in oil and gas production coupled with efficiency, as you mentioned Senator Murkowski, improvements in alternative supplements.

This revolution can substantially lessen oil imports achieving a significant reduction in our balance of payments. It will also simultaneously create an engine for growth, a platform for technology and innovation, new job creation, new tax and royalty revenues and the revitalization of domestic industries. But that development must be managed prudently and responsibly in line with balancing our environmental, economic and foreign policy goals.

The policy motto which is on my last slide, is what we would advance in terms of discussing and balancing those tradeoffs. It's actually a policy model we developed for the 2007 NPC study. It basically says that efficiency is the sweet spot, but at any given point of time, if you look at it as a dial, economic concerns or foreign policy concerns or environmental concerns can subordinate your energy policy. The trick is to make sure that you balance all the way through.

If we are able to do this, the successful development of these resources, will give us, I believe, breathing space. To develop and dispatch the next generation of cleaner burning or lower carbon fuels that currently do not exist at scale.

At this writing, as Senator Bingaman has said, U.S. oil production is at its highest level since 2003. Natural gas has eclipsed the previous output records set back in the 1970s. Oil imports comprise less than 45 percent of total consumption. Refined product exports are averaging almost 3 million barrels a day. This gives the domestic refining sector an enormous "value add."

As development continues at scale, new issues will undoubtedly arise including the build out of new supporting infrastructure, the role of exports, the timing and sequencing of development initiatives, including, Senator Murkowski, in Alaska with respect to TAPS which we need to get on, the right mix of Federal and state regulation. This new energy reality will require a serious policy rethink when it comes to mapping out the decades coming. With the ability to access these new unconventional resources we may very well be on the verge of an American energy renaissance. While the indications are quite positive with respect to resource abundance, we are in the very early stages of this narrative.

I'd say Chapter one, page 10. We will collectively and that's industry and government need to make the right choices. Operationally, in terms of safer, smarter and cleaner as well as with respect to investments, policy and regulation that will enable this potential to become a reality.

I appreciate the opportunity to elaborate on these issues. Look forward to answering your questions.

Thank you.

[The prepared statement of Mr. Verrastro follows:]

PREPARED STATEMENT OF FRANK A. VERRASTRO, SENIOR VICE PRESIDENT AND DIRECTOR, ENERGY AND NATIONAL SECURITY PROGRAM, CENTER FOR STRATEGIC AND INTERNATIONAL STUDIES

Chairman Bingaman, Senator Murkowski, Members of the Committee, thank you for the opportunity to appear before this Committee to discuss changes in the crude oil market and the outlook for gasoline and other refined petroleum products. The rapid rise in gas prices has become a staple on the evening news, is understandably painful for American consumers and adds another challenge to the economic recovery. So I commend the committee for holding today's hearing.

I currently serve as Senior Vice President and Director of the Energy & National Security Program at CSIS. The Center is a bipartisan/non-partisan think tank here in Washington that focuses on clarifying issues and developing solutions. I have been affiliated with the Center since 2003, but my energy roots go much deeper. In the 1970's I served briefly in the Oil and Gas Office of the U.S. Department of the Interior as well as in the Federal Energy Administration. In the Carter Administration, I was privileged to serve in the White House Office of Policy and Planning under Dr. James Schlesinger and later at the newly created U.S. Department of Energy, where I held a variety of policy positions, including serving as Deputy Assistant Secretary for International Energy Resources. The bulk of my career, however, was spent in the private sector, first with TOSCO Corporation as Director of Refinery Policy and Crude Oil Planning, and later for a 20 year run with Pennzoil Company as a Senior Vice President.

I also had the pleasure of working with my fellow panelist this morning, Dan Yergin, on the 2007 National Petroleum Council (NPC) "Hard Truths" report, where I chaired the Geopolitics and Policy Task Group. I would point out that the NPC effort, which, recognizing the expected growth in global energy demand, called for an "all of the above" approach to energy policy. I also served on the recently completed (2011) NPC report on the Prudent Development of North America's Oil and Gas Resources.

So I come at this issue from a decidedly industry perspective cognizant of the economic, environmental, and policy implications of what I would characterize as a changing energy landscape—even as we sit here today.

Given the expertise on this panel, instead of repeating what I expect many of my colleagues will describe in today's gasoline market, let me instead highlight a few major themes, and in the process dispel some myths. I have attached a series of charts to my testimony and will refer to them during this presentation to illustrate some key points.

CRUDE OIL MARKET ACTIVITY—DEMAND GROWTH, SUPPLY UNCERTAINTY, IRAN SANCTIONS AND FUKUSHIMA SUPPORT A BULLISH VIEW

With respect to the current oil market, it is instructive to roll back several months to get some perspective on the near term future (Figure 1).

After last year's Arab Spring (though the situation remains quite fluid from country to country)—the riots in Egypt, clashes in Bahrain, Syria and Iran, and the unrest and conflict in Libya, crude oil prices essentially settled into a narrow band for the last half of 2011—largely as a consequence of counterbalancing signals of fears of weaker economic growth and the Euro crisis (impacting demand) on one hand and real and perceived stress on the supply side.

At the beginning of the year, however, this all began to change. On December 30, 2011 the price for Brent Crude was a few cents above $108/barrel; by the middle of February, it had risen to $118/barrel, topping out (at least for now) at $128.08 on March 9. Economic improvement in the U.S. and elsewhere as well as weather related events contributed to this bullish sentiment. But concerns about supply stability were also readily apparent, and Iranian threats to close the Strait of Hormuz

added to that mix. Given the upside potential, commodity investments in oil also increased, not unlike what occurred in the price run up we saw in 2007-08 (Figure 2).

Bottom line is that, at least for the near term, the current "psychology" of the market is supportive of keeping oil prices elevated. Demand growth is still forecasted as we move through the year. And potential and real disruption threats abound with ongoing supply reductions in South Sudan, Yemen, Canada, China, Syria, the North Sea, and Nigeria (collectively removing almost 800,000 barrels per day from the market) and potential shortfalls in such places as Brazil and Iraq even as we see increased output from the U.S. and Saudi Arabia.

In addition, in the aftermath of Fukushima, Japan's inability to restart their nuclear reactors (53 of the country's 54 reactors are currently shut down) has resulted in increased demand for oil as well as for liquefied natural gas (LNG). And the projected removal of several hundred thousand barrels per day of Iranian output as a consequence of sanctions activity will put added stress on available global supplies. Iran is reported to have 5-6 VLCCs currently being utilized as floating storage facilities. But at some point, a reduction in sales will effectively force a scale back in production as there will be simply no place to put the excess oil.

In such a market, even "good news," like Saudi Arabia's offer to increase output to ensure that the market is balanced, has been met with either skepticism concerning the country's ability to deliver those barrels or the recognition that additional Saudi production will effectively remove the bulk of the world's available spare capacity "cushion", leaving price, near term increases by Libya and use of strategic stocks as the only weapons available to dampen (even temporarily) further upward movements in the event of an additional, unanticipated disruptions. Not a comforting thought.

One glimmer of hope here is that if the Iranian confrontation can be peacefully diffused, we could find ourselves with (at least temporarily) an oversupply of oil in the market—possibly, enough to temper the current bullish sentiment before doing economic damage.

GASOLINE AND U.S. REFINERY CLOSURES—MORE AN ISSUE OF DELIVERY LOGISTICS AND TIMING

Gasoline prices also began a similar but not identical ascent early in the year, rising from $3.25/gallon at the end of 2011 to $3.35/gallon by mid-January; then beginning a steeper climb, rising to $3.70 by the end of February and $3.87 as of Tuesday of this week.

As the raw material feedstock is the largest component of gasoline prices, the increase in crude prices is reflected in the run up, but concerns about availability given the refinery closures on the east coast and elsewhere were also factors.

Memorial Day is traditionally viewed as the onset of the "driving season" in the U.S. and in anticipation of increased demand, refineries begin gearing up for increased gasoline output in the spring as they come out of seasonal turnaround. The closure of Conoco's Trainer refinery and the Sunoco plant at Marcus Hook, PA means that come this summer, operational refining capacity in PADD I will have been reduced from 1.5 to roughly 1.1mmb/d (this is on top of the closure of Sunoco's 140,000b/d Eagle Point Refinery in New Jersey and Western Refining's 128,000b/d facility in Yorktown, Virginia last year). If/when Sunoco's Philadelphia refinery is closed, the capacity in PADD I will be reduced to around 700mb/d (half its former capacity). Add to that the surprise announcement to shutter the Hovensa refinery in St. Croix, and the availability of gasoline to parts of the east coast, from Florida to Ohio, will undoubtedly be impacted.

Given time, imports (product imports from Europe, the Middle East and Asia) or shipments from the U.S. Gulf coast will eventually close the gap, but prices (given transport costs) are likely to be higher until logistical alternatives (e.g., expansion of Colonial and regional pipeline systems) become available. Sunoco is likely to continue to keep its regional contract customers supplied with alternative volumes, but some spot purchasers may not have the same coverage. Shipments from the Gulf (PADD 3) are an option, but delivery will be influenced by the availability of Jones Act vessels (or waivers of the Jones Act), docking and storage facilities and regional/local pipeline capacity. Trucking deliveries from New York Harbor or other areas is also a near term, albeit higher cost option, and may require waivers on driver hours. Logistical delivery shifts from crude to refined product shipments will require cleaning crude tanks and pipes in Philadelphia and elsewhere.

The "good news" is that, absent a massive global disruption or market tightening beyond what we foresee today, if history is any guide, U.S. gasoline prices also tend to decline after July (Figure 3).

SO WHAT CAN BE DONE?

Unfortunately for consumers, little can be done in the near term. In a free market system, price is the final allocator of scarce resources.

There are, however, measures that can be taken to mitigate some of these impacts—several of which Members of this committee have already offered.

Accelerating the permitting and construction of storage and pipeline connectors or water borne infrastructure would be helpful as would looking at EPA and state waivers on fuel specifications to allow for greater substitutability of available gasoline in the system. To the extent that waivers of Jones Act requirements would facilitate more timely and larger volume movement of gasoline supplies between states and PADD districts, efforts should be made to eliminate such barriers. Department of Transportation (DOT) waivers on the hours driven by tank truck drivers could also be helpful to ensure the timely delivery of supplies to selected regional markets. The use of the Strategic Petroleum Reserve has also been suggested, but this too requires movement of refined product from PADD 3 refineries to east coast consumers.

In the long term, the President's goal of doubling fuel economy standards and increasing fuel choices makes eminent good sense. Doubling CAFE standards makes $4 gasoline feel like $2 gasoline to consumers. In addition, prudently developing America's vast energy resources (addressed in greater detail later in this statement) as well as the processing and delivery infrastructure needed to move it to market is also imperative.

The Commodity Futures Trading Commission (CFTC) and the Energy Information Administration (EIA) are currently evaluating the role of investors in market movements and an examination/explanation of the difference between gasoline costs (crude oil, refining, transport costs plus federal, state and local taxes) and retail pump prices (which reflect local competition, station lease costs and advertising, fill up days and discount policies, branded or unbranded supplies and profits, etc.) could also be instructive.

But, all that said, there is no immediate silver bullet here.

OIL PRICE MYTHOLOGY

Claims by certain advocacy groups and political factions that merely announcing the intention to increase access or production of oil as a way of driving down prices are unproven at best, as they have never produced, on their own, any meaningful price impact. Claims that oil prices plunged simply because President Bush on July 14, 2008 announced removing the moratorium on offshore development are, at best, half-truths without proper context. In point of fact, oil prices began their free fall well before the President's announcement (and continued long afterward) as a consequence of economic collapse and oversupply. 2008 oil prices peaked above at $145 on July 4th and continued their decline through the summer and fall, reaching $ 37.04/barrel on December 5, 2008.

In a similar vein, arguments that gas prices would be lower today if only the offshore moratorium had not been imposed after the Macondo accident, are also not persuasive. The addition of an incremental 250,000 or 300,000b/d, while helpful, is of little consequence in an 89 million barrel a day world. This is not to say that additional production volumes (from anywhere in the world) are not welcomed supplements as they add to global supply, but merely to suggest that volumes and context matter. Only last week, Saudi Minister Ali al-Naimi offered to increase the Kingdom's output by 2 million barrels per day over the next several months. Prices dropped by $2.48/barrel the next day, but then recovered before the week was out.

A recent statistical analysis conducted by the Associated Press covering 36 years found no statistical correlation between marginally higher U.S. domestic oil output and (monthly inflation adjusted) gasoline prices. The fact is that oil is a global commodity and U.S. production has only a limited impact on worldwide supply/demand balances.

"Excessive" regulation is often cited as a cause of reduced E&P activity, yet a recent report by PFC Energy points out that industry is coming back to America to invest. Partly due, no doubt, to the attractive resource prospects, but also as a result of America's legal and regulatory structure, improved economics, clean air and water, good schools, safe food, and quality of life. Moderation may be a useful concept here as both lax regulation and strangling overregulation have associated risks and costs.

For most Americans the focus of energy policy right now is all about gasoline prices. Critics of the administration are quick to point out that when President Obama took office in January of 2009, gas prices were around $1.90/gallon. They conveniently fail to mention that the U.S. economy was in a virtual depression. For

purposes of comparison, when President Bush took office in January of 2001, gasoline sold for an average of $1.55/gallon. In the summer of 2008, his last year in office, prices exceeded $4.25. The reality is that presidents have very little to do with near term fluctuations in gasoline prices.

THE CHANGING LANDSCAPE—OPPORTUNITIES AND CHALLENGES; USING THE UNCONVENTIONALS TO BUILD A NEW ENERGY FUTURE

The energy landscape continues to change. As the world's population grows, so too will the demand for energy. Oil demand growth earlier this century (2002-2007) had effectively eroded existing spare capacity, creating persistently tighter markets in which any geopolitical or weather related supply disruptions often resulted in exaggerated spikes in commodity prices. This picture was further complicated by infrastructure and capability limitations, heightened geopolitical and investment risks, volatile costs and prices and a growing concern about the environmental and security implications of the continued use of fossil fuels. At the same time, the emergence of new global players with increasingly larger energy and geopolitical footprints posed new threats to the ability of the U.S. to shape the global energy system of the future. In short, a new consensus was emerging that the time had come to fundamentally reform the system and develop new technologies, policies and strategies to simultaneously address the economic, environmental and foreign policy /security challenges related to the ways in which nations produce, transport and consume energy.

Most analyst agree that for a variety of reasons (e.g., growing global demand, concentration of resources, limited access and governance challenges, infrastructure needs, balance of payments outflows, changing geopolitical alliances, environmental and security considerations, etc.) the current energy system is simply unsustainable. A transformation is already underway. But make no mistake—it will take decades to complete.

For the last forty years, U.S. energy policy has been predicated on the dual notions of growing demand and resource scarcity, especially in relation to oil and natural gas—which are responsible for roughly two-thirds of U.S. energy consumption. As a consequence, we have looked to imports to balance our supply-demand needs, and in the process, have experienced periods of significant price volatility. But that trajectory is changing.

Fossil fuels (coal, oil and natural gas) account for more than 80 percent of global energy consumption. Renewables and nuclear make up the rest. And while the growth in solar and wind has been enormous, the base is small, and intermittency and infrastructure challenges remain a significant hurdle to widespread adoption. In the wake of the Macondo oil spill in 2010, the Fukushima nuclear incident in 2011, and the shale gas "revolution," the energy landscape is being transformed. Higher prices and technology applications at scale are driving an unconventional resource revolution as there are enormous unconventional oil and gas resources both here and abroad.

This phenomenon has the potential for creating a new energy reality, one in which the United States once again becomes a global leader in oil and gas production. Coupled with efficiency improvements and alternative supplements, this revolution can substantially reduce U.S. oil imports, achieving a significant reduction in our balance of payments. It can also simultaneously create an engine for economic growth, a platform for technology and innovation, job creation, new tax and royalty revenues, and the revitalization of domestic industries. But the development must be managed prudently and responsibly, in line with balancing our environmental, economic, foreign policy and energy security goals..

If properly and prudently managed, the successful development of these resources will give us the "breathing space" to develop and dispatch the next generation of cleaner burning/lower carbon fuels that currently do not exist at scale.

THE SHALE GAS EXPERIENCE

The growth of shale gas production in the U.S over the past decade has been truly remarkable. As a consequence of access (mostly on private lands), higher prices (2007-8) and the application of hydraulic fracturing (fracking) technology and extended reach lateral wells, the ability to economically unlock this vast "source rock" resource has elevated the United States to the position of the world's largest natural gas producer. This is an astounding accomplishment, as only a few years ago it was projected that the U.S would become increasingly dependent on pipeline gas from Canada and imports of LNG from around the world.

Less than a decade ago, shale gas comprised less than 2 % of domestic output. Today it accounts for almost a third. The enormous success in shale development

has resulted in significantly lower prices, reduced consumers' electric bills and stimulated discussion about exports and the revival of a competitive domestic petrochemical industry (Figure 4: Map of Shale Gas Resources).

The 2011 report by the NPC projects a possible resource base of several thousand trillion cubic feet (TCF), suggesting more than a hundred years supply at current consumption rates. As we continue to learn more about the shale resource plays, more recent supply forecasts have become even more bullish.

That said, as with all energy sources, there continue to be operational risks and consequences. The practice of fracking is not without controversy. Environmental concerns about water contamination, water use at scale, recycling and proper disposal, land use, property values, noise, haze, methane and GHG emissions, seismicity concerns around wastewater disposal, congestion and other local issues will have to be responsibly addressed. However, technology, well integrity, operational "best practices" and community engagement, coupled with proper regulation and enforcement should make realization of the benefits of this resource achievable.

TIGHT OIL

The application of lateral wells and fracking technology has had a similar impact on tight oil and shale oil development. Development of the Bakken has catapulted North Dakota past California as the nation's third largest oil producing state, and similar development is also taking place in the Niobrara, the Monterey, the Utica, Eagle Ford and other basins around the country (Figure 5: Domestic Unconventional Oil Resources).

At the turn of the century, U.S. tight oil production was around 150,000 barrels per day (b/d). Last year it approached nearly 1 million b/d. Current projections estimate that it could approach 2.5-3 million b/d (or more) by 2020. When coupled with increased production from the offshore, including the ultradeep water and lower tertiary formations, oil sands (yes, the U.S. has oil sands), shale oil, oil shale, natural gas liquids, conventional onshore production and the Arctic—U.S. liquids production could exceed 12 million b/d, exceeding the current output of Russia and Saudi Arabia (Figure 6: North American Oil Supply Potential).

When alternative fuels and reduced demand due to efficiency improvements (CAFE standards) are factored in, U.S. imports (and our oil imports bill) can and will inevitably decline.

Not surprisingly, many of the concerns related to shale gas development are also associated with accessing unconventional oil. As is the case with unconventional gas, industry has committed to step up its game with respect to responsible management of both "above" and "below ground" issues, greater transparency, education and community engagement. Smarter, safer, cleaner is now an operational necessity.

At this writing, U.S oil production is at its highest level since 2003. Natural gas has eclipsed the previous output record set back in 1973. Oil imports comprise less than 49%of total consumption, and refined product exports are averaging almost 3 million barrels per day, giving the domestic refining sector an enormous "value add."

As development continues at scale, new issues will undoubtedly arise—including the build-out of new supporting infrastructure, the role of exports, the timing and sequencing of development initiatives (including in Alaska with respect to the TAPS pipeline), the right mix of federal and state regulation, etc. (Figures 7 & 8:, U.S. Refineries and Infrastructure Issues). However, the prospect of sizable new production opportunities in the U.S. and North America necessitates a re-assessment of our decades old tool kit and a serious policy "rethink" when it comes to mapping out the coming decades.

In formulating the final recommendations for the 2007 NPC "Hard Truths" report, we developed a policy model (Figure 9) that sought to balance and capture the trade offs often found between conflicting/competing foreign policy/security, economic and environmental objectives. The essence of the approach was that we needed to balance rather than subordinate competing interests in order to achieve sustainable growth—as all of these issues and considerations are likely to be with us for decades to come. With the ability to access these new unconventional resources, we may very well be on the verge of an American energy renaissance. And while the indicators are quite positive with respect to resource abundance, we are in the very early stages of the narrative and will collectively (industry and government alike) need to make prudent choices with respect to both policy/regulation and investment to enable this potential to become a reality.

I appreciate the opportunity to elaborate on these issues and look forward to answering any questions.

The CHAIRMAN. Thank you very much.
Dr. Horsnell.

STATEMENT OF PAUL HORSNELL, HEAD OF COMMODITIES RESEARCH, BARCLAYS

Mr. HORSNELL. Thank you. Chairman Bingaman, Ranking Member Murkowski, members of the committee, I'm very grateful for the opportunity to appear for you today. My written testimony details 6 salient points about the current gasoline and global crude oil markets. I'd like to use my time today to just briefly raise all 6 of those.

The first of those points concerns some specifics of the U.S. gasoline market. As other panelists noted, prices have risen faster than other product prices and crude oil prices. That clearly does appear to be a fairly strong effect from the closures and potential further closures of capacity along the East Coast, in the Caribbean and some other refinery closures in Europe.

Those concerns really appear to markets worried about the transition from domestic supply of gasoline in the Northeast market through to imported supplies. I think the points we would like to make is that there is no global deficit of gasoline. There's a lot of additional refinery capacity that's coming on, primarily in China and India and at the global level, even with a large amount, some two million barrels a day of U.S. and European refining capacity likely to have come off stream between last year and this year.

There is no overall shortage. The problems then are very much these deliverability issues, transitional issues. That's very much where the market is now at a rather delicate stage as the peak of the driving season starts to come forward. I think our view is a fair degree of some of the rises in U.S. gasoline prices are down to some of these deliverability concerns. It's clearly an issue that our colleagues at the EIA are clearly following very closely.

Turning more to the global crude oil market the point I'd like to make is on spare capacity. It is remarkably limited at the moment. We estimate around about 1.7 million barrels a day of sustainable spare capacity.

By that I mean capacity that can be brought on market fairly timely within 30 days. Can be kept on stream for 90 days. If you allow more time, then more capacity can come on, but on that strict definition it appears to be less than 2 percent of the market.

More worryingly with that level of spare, the market does appear to be balanced. As Saudi Minister Al-Naimi mentioned in his oped in the Financial Times today, the market does appear to be balanced. Why that's of some concern is we're coming off a period of 2 years where demand has tended to run a bit ahead of supply. Global inventories, implied inventories, have fallen for 8 straight quarters which is unprecedented. So to get prices up to this level and to have spare capacity down to that level and only have a reasonably balanced market is a matter of concern.

I think our further concern is that there comes a cusp where the market will start to worry more about the loss of further spare capacity will no be relieved by seeing extra supply. I think we're very close to that point at this relatively thin level. The spare capacity perhaps is the dominant point because it is literally in all of the

above item and that it picks up all the variations in supply and demand.

But just to go through those I think our third feature is this very strong change which the previous panelists have already referred to in the geography of non-OPEC oil supply, a surge in production from North America, 550,000 additional from North America as a whole last year. We expect another half a million from North America this year which 80 percent will come from the U.S. Again to go back to Senator Murkowski's point about what things would have been like without it, I think the reflection of that is what's happening in the rest of non-OPEC areas.

Non-OPEC production outside North America fell last year by some 580,000 barrels a day. So perhaps surprisingly non-OPEC production actually fell in 2011 simply because the dead weights coming from production losses particularly in the North Sea, but also in other areas. So again, without that contribution from the change in North American patterns, the fall in non-OPEC supply really would have been quite serious last year.

The—federator that on to the very current market circumstances and this is our fourth salient point. There is currently a rather high rate of supply losses, in particularly non-OPEC areas, unusually high rate. Just to detail some of them the situation in Sudan and South Sudan has taken 400,000 barrels a day of oil off the market and looks set to for an extended period given some of the recent deterioration in relationships and the border incidents.

Production is down in Yemen. It's down from Syria. There have been some accidents in Canada.

Just this week some further accidents in the North Sea have taken off another portion. In total, as of today, we estimate just over one million barrels a day of non-OPEC production is out unexpectedly. That's more than we would normally expect.

It's part of the reason why the market is still balanced despite the very high rates of OPEC production that we're seeing at the moment. So again, it's very hard to factor in on it by definition as unexpected factors. But I think they are a significant feature of the current market.

The fifth point is just on demand. Demand growth is continuing. It's modest at the global level. It's very heavily concentrated.

If you take Brazil, India, China, Saudi Arabia, that's—those 4 countries alone just as they have for over the past 5 years constitute virtually all of the net global demand growth. Outside those four, demand has been falling for a fairly long period. This actually has some very specific features that draw attention to the impacts of Fukushima on Japanese demand.

Japanese demand will not be expected to be falling as it has done for a while. But very strong Japanese demand last year, primarily for LNG, but also for oil. For this year we think some of that increase is the nuclear plants continue to stay down is going to be biased toward oil.

As of now of the 54 Japanese nuclear units, there's only one currently operating. Even that one it's very likely to come off stream for maintenance during May. Again, that's a factor which has tightened up on the demand side. Method OECD demand has not fallen quite as much as we might have expected given those high prices.

A final current feature and again, I don't want to repeat what previous panelists have said. There is an unusually high degree of geopolitical risk at this time. This really, again goes, back to spare capacity.

We worry about geopolitical risk when spare capacity is low. If we're in the world 3 years ago and a lot of global spare capacity than the number of potential political issues that might impact on the oil market would be relatively limited. The response then would be relatively muted. As spare capacity gets less, the number of things that can affect prices increases and the sensitivity increases.

So just to mention some other ones beyond those panelists have already done. There are concerns about Nigeria in the wake of the situation, politically, there over the course of the last few months. There are also some geopolitical concerns about sustainability of Iraqi production and in particular the continuing disputes between Baghdad and the regions of the oil law and getting the full potential of Iraqi productions to go forward. So it's not just Iran. There are a series of other geopolitical issues which I think do just play across the market radar occasionally.

I'll still there in terms of describing those 6 but I do look forward to answering any questions you have. Thank you.

[The prepared statement of Mr. Horsnell follows:]

PREPARED STATEMENT OF PAUL HORSNELL, HEAD OF COMMODITIES RESEARCH, BARCLAYS

Chairman Bingaman, Ranking Member Murkowski, and members of the committee, it is a pleasure to appear before you today and I thank you for your invitation to do so.

In background, I am the Head of Commodities Research at Barclays. I lead a team of analysts in New York and London who research supply and demand conditions and other fundamental drivers across a wide range of traded commodity markets. My own particular focus is on oil markets which I have covered over a couple of decades, first as an academic working in the Oxford Institute for Energy Studies and then latterly as an analyst within the banking sector.

The current oil market situation is one of high crude oil and gasoline prices. The US national average for the retail price of regular unleaded gasoline stands, as of 26 March, at $3.92 per gallon, which is 9% higher than a year ago and which is within 20 cents of its all-time high. In a few areas of the country the all-time high has been surpassed, for example in the EIA gasoline price survey the average of regular unleaded in Chicago stands at $4.47 per gallon, higher than the peaks reached in 2008 and then exceeded in 2011. Elsewhere in the world, retail gasoline prices are also at record levels, for example in the UK the national average for unleaded gasoline currently stands at the equivalent of $8.40 per US gallon. Indeed, across Europe both crude oil and retail prices are at record highs in domestic currency terms due to the combined effect of a stronger dollar and higher international commodity prices. Figure 1* below shows the value of the OPEC basket of crude oils in euro terms, which has reached new all-time highs after a sustained rise that has now lasted for more than three years.

My focus here is on the fundamentals of the international oil market at this time. There are six salient characteristics of the current market that I will address in more depth below. First, there are some specific factors bearing on US gasoline prices that relate to East Coast refinery closures and the associated uncertainty. Second, the buffer of sustainable spare crude oil production capacity is currently thin at the global level. Third, a surge in North American supplies has coincided with a weak output profile elsewhere, leaving non-OPEC output as a whole rather stagnant. Fourth, so far 2012 has seen an unusually high level of production outages. Fifth, global demand growth is continuing albeit at a modest level, dominated by four countries in particular, taking global oil demand close to 90 mb/ d for the

*Figures 1 and 2 have been retained in committee files.

first time despite a continuing fall in OECD demand. Sixth, and finally, that there is a heightened level of geopolitical risk and geopolitical awareness in the oil market. I will now turn to each of these defining characteristics in turn.

1. US gasoline and the effect of refinery closures

Some of the rise in gasoline prices is not due to global issues or to changes in the price of crude oil. Indeed, a large part of this year's rise in US retail gasoline prices has been due to the specifics of the US physical gasoline market. US wholesale gasoline prices have increased more this year than either crude oil prices or other oil product prices. From the last trading day of 2011 through to 26 March, the price of May gasoline increased by 23%. By contrast, over the same period US West Texas Intermediate crude oil for May delivery rose by just 8.1%, May Brent rose by 18.2% and May heating oil rose by 13.4%. As is shown in Figure 2, the May gasoline crack has risen by more than $20 per barrel since December, ie wholesale gasoline prices have risen by over $20 per barrel more than WTI crude prices.

The higher rate of increase of wholesale gasoline prices relative to crude and other products reflects market concerns as to the impact of a series of closure announcements for oil refineries on the US East Coast and in the Caribbean. The closure of refineries with high gasoline yields (and with other closures possible) means that the a large tranche of the North East gasoline market is transitioning from being supplied within the region to, in future, being met by imports or by increased flows from the Gulf Coast. In terms of the latter, there are a variety of market views as to how binding pipeline and shipping constraints are likely to be, and the concern among physical traders is that regional inventories might fall fairly sharply when the driving season begins. Market price dynamics appear to be attempting to incentivise imports to meet any potential gap over the next three months in particular, as well as reflecting concerns as to a potential abrupt tightening of the physical gasoline market in the NY Harbor area in the wake of the refinery closures.

The element of the gasoline price rises that is due to the uncertainties in the wake of the East Coast closures is localised and does not reflect the global availability of refinery capacity and gasoline. There is no global shortage of gasoline, and sufficient supplies can ultimately be obtained, albeit at a cost. Those supplies can only be obtained at higher import costs, and that is what US wholesale prices are beginning to reflect. At a global level, we still expect the net addition of refinery capacity to outpace global oil demand growth in 2012, just as it did in 2011. That is despite substantial closures in North America and Europe, estimated at almost 2 mb/d across 2011 and 2012 combined, with further closures possible. In particular, there has been a rapid build up in Chinese refinery capacity. Between 2010 and 2013 we expect Chinese capacity to have risen by 3.4 mb/d, Indian capacity to rise by 1.8 mb/d, other Asian capacity to rise by 1.7 mb/d and Middle East capacity to rise by 1.3 mb/d. We do not expect there to be refinery constraints at a global level, nor do we expect any lasting global issues in the deliverability of gasoline. However, the abrupt closure of so much North American capacity has clearly unsettled the market, and led to concerns that the physical markets in the regional might remain tight and dislocated, at least in the early part of the driving season. Ultimately imports and the tweaking of any logistical issues and bottlenecks will solve the problem, however that may well come at the cost of a higher equilibrium price in order to keep imports flowing in to the required extent.

2. Global spare oil production capacity

Beyond the factors specific to the US gasoline market, there are also pressures coming through from crude oil markets. While there is significant global spare capacity in the refining of oil, there is currently little spare capacity in crude oil production. If we define sustainable capacity as being that which can be brought into production within 30 days and which can be kept on stream for at least 90 days, then we estimate that global spare capacity today stands at no more than 1.7 mb/d, with virtually of that being held by Saudi Arabia. This is a little less than 2% of global oil demand, i.e. the global crude oil industry is currently producing at 98% of its sustainable maximum. Loosening that definition and allowing for capacity that takes as long as 90 days to come on stream may take the total to a shade above 2.5 mb/d. However in our view the stricter definition is the more useful one when it comes to the consideration of filling supply gaps in a crisis. Such high rates of capacity utilisation normally involve higher and more volatile prices, producing a far greater reaction to potential supply shocks than during periods when spare capacity is more ample.

The current level of total OPEC production (i.e. crude oil plus natural gas liquids and other oil liquids) is running at an all-time high of 37.5 mb/d. Thus far, this extremely high output level has not resulted in any significant or sustained observable

market surplus or inventory build, although in our view it has removed a long-lived imbalance. Global oil demand has exceed global oil supply for an unprecedented eight quarters in a row, which has whittled away at the significant level of surplus inventories built up during the 2008-9 downturn. To return the global system to a more even footing, there would be a case for the desirability of a few quarters of inventory builds to start to rebuild cover. With OPEC producing at the current elevated levels, we are projecting a modest global inventory build for both Q1 and Q2, breaking that long run of inventory draws. The scale of those projected builds is perhaps not enough to restore an optimal cushion, but it should help stall the increase in crude prices as long as there are no further significant supply shocks.

Thus far in 2012 the physical global crude market is reflecting tightness, with participants prepared to pay a premium to accelerate their deliveries of crude oil. This situation, known as backwardation, has held in the Brent market for just over a year, and means that there is currently no prompt surplus of crude and that there is no market incentive or need to clear the market by holding more inventories. We would expect to see the erosion of prompt physical market differentials as being an early sign that the tightness was at least beginning to fade, but thus far the strong bid for prompter physical crude has been maintained.

3. Significant changes in the geography of non-OPEC supplies

Despite the strong increase in US oil supply and the prospects of significant further increases, non-OPEC supply as a whole has stagnated, indeed it fell in 2011. A sharp divergence in crude oil production growth has opened up between North America and the rest of non-OPEC output. In 2011 North American oil supply surged by 550 thousand b/d, of which growth two-thirds came from the US alone. Barclays expects a further 500 thousand b/d of growth in 2012, of which more than 80% is expected from the US. In contrast, non-OPEC supply outside North America fell by 580 thousand b/d in 2011, cancelling out all of the North American growth, with the UK and Norway being the major sources of decline. In 2012 we expect non-OPEC supply outside of North America to decline by 220 thousand b/d, and outside the Americas as a whole we expect it to decline by 410 thousand b/d.

Because of the weakness elsewhere, the increase in US production has served primarily to prevent the market from becoming even tighter, rather than creating any overall tendency towards surplus. It has, however, begun a significant remapping of the geography of global oil trade, made more obvious when the additional effect of lower regional oil demand is factored in. The gap between North American oil demand and supply narrowed by 870 thousand b/d in 2011, and we expect a further 750 thousand b/d narrowing in 2012. For the US alone, the implied trade gap narrowed by 720 thousand b/d in 2011 and is expected to narrow by a further 690 thousand b/d in 2012.

4. There is currently an unusually high rate of non-OPEC production outages

Beyond a more general malaise in the performance of non-OPEC production outside of North America, there is also currently an unusually high level of production outages. These are due to various factors including civil disturbances, civil and other wars, geological disappointments and accidents. As of this week, the tally of outages includes a loss of 0.4 mb/d from Sudan/South Sudan, 0.15 mb/d from Yemen, 0.15 mb/d from Syria, 0.2 mb/d from Canada (syncrude outages) and a tail of other outages including the latest problems in the North Sea Elgin/Franklin fields that together bring the total to just over 1 mb/d. While, with the exception of the Sudanese outage, none of these situations have been large enough in volume terms to garner much sustained attention, the combined effect has been enough to prevent any overall inventory and supply cushion from building up over the course of Q1.

5. Global demand growth continues, albeit modest and highly concentrated

The strong difference in recent years between weak OECD and strong non-OECD demand growth has continued into 2012, but with some new features. Within the OECD, the reshaping of Japan's energy sector following the Fukushima accident has produced strong Japanese demand for fuel oil and direct burning crudes, as well as sharp increase in LNG demand. As of now, of the 54 Japanese nuclear units there is only one that is operational. Even that single remaining plant is due to come offline for maintenance in a few weeks. With Japanese LNG regas capacity becoming a little stretched, and with the utilisation of gas-fired generation now high, oil looks likely to garner a significant slice of incremental Japanese power demand. The y/y increase in Japanese use of fuel oil and direct burning crudes stands at more than 350 thousand b/d and is likely to rise further, providing a significant offset to the weakness of OECD demand elsewhere. Overall, Barclays expects OECD demand to fall by 370 thousand b/d in 2012, less than the 660 thousand b/d fall seen in 2011

due to an improving US economy and the increased use of oil in Japanese power generation.

Overall, Barclays expects global demand growth of around 1 mb/d in 2012, with the OECD decline being offset by emerging market growth. The main sources of that net growth are expected to be the same countries that have dominated global demand growth in recent years. From 2008 to 2011, global oil demand grew by 2.6 mb/d. Over the same period, demand growth of 3.2 mb/d came from just four countries; namely Brazil, India, China and Saudi Arabia. We are not expecting any dramatic slowing in the pace of demand growth from these four countries in 2012, and their combined growth is, at just over 1 mb/d, expected to represent all of the net global demand growth.

6. An elevated degree of geopolitical risk

The impact of geopolitical risk on oil prices is a function of the level of spare sustainable capacity. At high levels of spare capacity, the potential for geopolitical tension to rattle markets and to become priced in is limited. As spare capacity falls, the impact of geopolitical developments is likely to increase, and at the current extremely limited level of spare capacity there is some danger that geopolitical concerns could begin to dominate. Currently the potential situations include, for example, the political tension and attacks in Nigeria, and the downside risks to Iraqi output in the face of tensions over oil policy and oil payments between central government and the regions. However, the tightening constraints on Iranian exports has perhaps been the main geopolitical issue for oil markets this year, with physical markets starting to consider the effects of the realignment of global trade flows in the face of the impending EU import ban. The Barclays base case scenario has a relatively benign outcome for oil prices, with some cooling from current levels to achieve an annual average of $115 per barrel for Brent. That base case involves no significant escalation or extended supply loss in any geopolitical situation.

Conclusion

Current retail gasoline prices are the result of the combined effect of specific gasoline market factors (namely East Coast and other refinery closures) and the feed through of higher crude oil prices. For prices to cool probably requires some improvement in the position in most of the six areas we note above. That would include avoiding the worst-case scenario in the market transition effects and the concerns on system flexibility caused by the refinery closures; the appearance of more slack within the global crude oil system be that through improved non-OPEC supply performance or by a more significant downturn in demand; and more limited oil market implications from the various geopolitical concerns currently at play. The key summary parameter is global spare sustainable capacity, and the tightness of that does appear to be a source for magnification of the market sensitivity to further supply-side or demand-side shocks.

The CHAIRMAN. Thank you. Thank all of you for your excellent testimony. Let me start with the 5 minutes of questions.

Let me ask on the issue of the refining capacity. The decision that companies have made to close some of their refining capacity and the effect that might be having on the price of gasoline, particularly in the East, East Coast. Maybe you, any of you, I don't know if Dr. Gruenspecht, do you have any more insights you can give us on that point as to what is causing them to shut down this refining capacity and if there is any clear indication as to how much of the price increase we're seeing results from that?

Mr. GRUENSPECHT. Thank you, Mr. Chairman.

As you know the EIA has put out a couple of pretty detailed reports on the Northeast evolving refining situation. We're not privy to company decisions to close or sell refineries which are made within the strategic plans of each company.

But, it's very likely that the reason refiners are closing, particularly refineries on the East Coast, is that they're not making money. They're not profitable operations.

East Coast refiners operate in a pretty competitive environment. They have higher crude acquisition costs than companies in other parts of the United States because they're bringing in water borne

crudes from Africa which are some of the most expensive light, sweet crude oil. The refiners in the Midcontinent are getting cheaper crude oil. The refiners on the Gulf can process lower quality crude oil because they have different refining capabilities.

At the same time Europe has an excess supply of gasoline available for export which tends to keep prices on the East Coast relatively moderate through competition with those refineries. We're really not seeing high prices on the East Coast relative to other parts of the country at this time. In fact the Chicago area has higher prices now than Philadelphia.

There are concerns. I agree with Paul Horsnell that it's more about the logistics than about the supply of gasoline. Looking forward there are some concerns particularly related to the one major refinery that's still operating in the area, Sunoco Philadelphia. If that refinery were to shut down there might be some areas in the Northeast that could potentially be subject to low supply, particularly of ultra low sulfur diesel.

Let me just leave it there because others may want to speak.

The CHAIRMAN. Dr. Yergin.

Mr. YERGIN. Yes. Just to add two points to that. I mean, what Howard says, one of the refining companies has publicly said that they have been losing a million dollars a day. You can't go on very long losing a million dollars a day.

I think we need to look at what's happening in refineries in the context of what's happening to overall U.S. energy demand. U.S. demand for oil is down two million barrels a day in since 2007. That's a 10-percent drop. In fact our demand levels now are back to what they were in 1997.

So that is part of the context in which it's kind of rebalancing that both Howard and Frank talked about is occurring.

The CHAIRMAN. Yes, Frank, go ahead.

Mr. VERRASTRO. Yes, Senator. So in a past life I was Director of Crude Supply and Refining Policy at TOSCO which at that time was the largest independent in the United States. I think Howard and Dan have summarized it absolutely correctly.

So the refining business has always been difficult. We're in a situation now where we have declining product demand. But if you're an East Coast refinery and you're dependent on light, sweet crude to make gasoline, your acquisition costs are higher, but you're pressured on the back end because there's a lot of competition.

Especially in the last 2 years while a lot of the East Coast refineries were dependent on Libyan crude. When Libya went down they were looking for substitutes. The crude quality substitutes for them were Algerian, Nigerian Angolan which is same oil that a lot of the Europeans were looking for at the time. So their acquisition costs necessarily rose.

Dan's absolutely right that they were losing a million dollars a day which is difficult to do. There's one offsetting factor. I know in the case of Sunoco they intend to keep a terminal facility, which means they intend to continue to supply customers.

So it won't be all of their customers. I suspect contract customers will probably continue to get product. They'll work out arrangements for that. Their spot customers, however, might be in a different situation.

Then the logistics and as Paul talked about the deliverability system is really important. Philadelphia has historically been a crude oil port. But if the refineries aren't there in order to bring in product you have to change out the tanks, change out the pipes and the pumps and the storage facilities to actually move product.

New York is typically a refining center or rather a product import center. But to get those supplies down to Western Pennsylvania or Ohio, probably in the near term means trucking. So this will all work out in time, but it's just over the summer driving season it might be a little difficult.

The CHAIRMAN. Dr. Horsnell, did you have anything more to add on this?

Mr. HORSNELL. Just briefly. I'll just point out that it's an issue really for refineries right the way across North America and Europe. Those are at a disadvantage either by position or by the nature of their inputs or their nature of their refinery equipment are all under pressure. So it's not just an East Coast specific factor.

I'd also just also say if I might this, the problems, potential problems they share and I would again stress these are transitional. These are to do with moving from a domestically supplied market through to a great reliance on imports.

The CHAIRMAN. Senator Murkowski.

Senator MURKOWSKI. Thank you, Mr. Chairman.

Gentlemen, thank you all for your testimony this morning. Very important. Very interesting.

I want to explore a little bit more on this issue on where we are with spare capacity. I think it was you, Dr. Horsnell, you used the term remarkably limited when we talk about the global spare capacity. I think in previous statements you've used the terminology ridiculously thin.

So anyway you cut it there's just not enough that is out there. It seems to me that when we're talking about the geopolitics, what's happening in Iran, Yemen, what we're seeing with the increased demand in developing countries. All of these things that we have no control over.

This issue of spare capacity is really a key one when we're talking about the impact on prices and the vulnerability that we have from an energy perspective and certainly from a security perspective. So let me ask the question. It goes back to where I was going in my opening comments. When we're talking about increased domestic production here, if we were to bring on two and a half million barrels a day here and OPEC then responded by holding back that same amount as the U.S. sources come online OPEC is going to hold back.

Would that not amount to greater spare capacity within the system and potentially a cheaper price of oil?

I throw that out to any of you.

Go ahead, Mr. Verrastro.

Mr. VERRASTRO. So all things being equal that would be correct. But the demand side of the ledger is also important, so if demand also goes up and absorbs that extra production. So you're right that if OPEC were to hold more spare capacity that's the cushion for when the flag goes up. But if demand also starts rising as a result

of lower prices or if it's non OECD demand expansion that we're seeing, it's good to stay ahead.

So I would welcome any and all production. It doesn't necessarily translate at any given time to lower prices.

Senator MURKOWSKI [presiding]. OK.

Dr. Yergin.

Mr. YERGIN. Senator Murkowski, I think your focus on spare capacity really goes to the heart of the matter. Before The Quest, the book, The Prize, when I was writing it I spent a fair amount of time reading Senate hearings from the early 19——

Senator MURKOWSKI. Sorry about that.

[Laughter.]

Mr. YERGIN. No, they were extremely interesting and lively. Very lively.

But spare capacity was the kind of the nub that things came down to. If you look back and when prices went up in the last decade you look back at 2005. It was a spare capacity issue. The market was as tight as it has been on the eve of the 1973 crisis.

When you adjust it for the fact that world demand is a lot higher it tells you it's a tight market. I noticed Paul's number on spare capacity was even a little tighter than ours. That, you know, it is worrying that we—it's a market without a lot of flexibility when you have that kind of very tight spare capacity.

So it is, along with inventories, it is one of the real things that we need to focus on.

Senator MURKOWSKI. Let me ask in another way then. Perhaps, Dr. Horsnell or Dr. Gruenspecht, you can weigh in as well.

So if the Saudis were to do what has been asked by some back here to put an additional two and a half million barrels a day out on the market. Doesn't that then remove some of the world's spare capacity? Could that not act to create a higher risk premium and impact the price of oil because you're now in a position where yes, they've done what we've asked.

They're theoretically trying to help out here. But by doing so you eliminate or certainly reduce that spare capacity that is then available so you don't have that safety net, if you will, and could that not have an unintended consequence in terms of a price increase?

Dr. Horsnell.

Mr. HORSNELL. Yes, I think that's a very good point, Senator. I think we're very close to that point where the calming effect of bringing on more supply could very much be overwhelmed.

Senator MURKOWSKI. Bringing on more supply from OPEC? Yes.

Mr. HORSNELL. If Saudi Arabia did increase dramatically from this point, OK. There's more supply. That should be a depressing effect on prices.

But then spare capacity would, but if they brought on two and a half that's all global spare capacity. There will be nothing left at all. I think that would very much unnerve the market. So I think very much on that cusp where further increases may not bring prices down too much further.

I guess to illustrate in terms of how much could be brought on timely. The two and a half million I think on to Minister Al-Naimi's recent statements would probably take 90 days to bring it

on stream. What could be brought on in 30 days is probably 1.7, 1.8 million barrels a day.

But bringing all that on would then leave the system with no spare capacity at all. As Dr. Yergin said, that would be a very——

Senator MURKOWSKI. Let me just—my time has expired. But I just want to make sure that I understand this. In term—when we're talking about spare capacity, it's not only what you have out there as reserve, if you will, or additional supply. It's your ability to bring it on within a timely manner.

Is there anyone other than the Saudis that have that ability to provide for additional capacity?

Mr. YERGIN. Essentially no, I think. Just a little bit in a few other countries in the Middle East.

Mr. GRUENSPECHT. Yes, I think there is a little bit. But——

Senator MURKOWSKI. But limited.

Mr. GRUENSPECHT. There's no question that Saudi Arabia would be the major holder of spare capacity.

Senator MURKOWSKI. Thank you, Gentlemen.

The CHAIRMAN [presiding]. Senator Franken.

Senator FRANKEN. Thank you, Mr. Chairman.

Gentlemen, thank you for your testimony.

We're currently working to pass legislation to reduce tax loop holes that benefit the top 5 oil companies, to benefit them to the tune of $2 billion plus a year. These companies made $137 billion in profits last year. These are the top 5 companies.

Let me repeat that. In a time of budgetary constraints American taxpayers are subsidizing companies that make $137 billion in profits in 1 year. They made nearly a trillion dollars of profits over the last decade.

We're looking to move, again, $2 billion worth of these tax loop holes. You would think that these companies, who have the privilege to drill on oil rich lands that belong to the American people, would acknowledge that it is a little absurd to get a $2 billion subsidy from American taxpayers when you are making billions of profits off of government lands.

Now there are some in this body who claim that getting rid of these tax loop holes will cause gas prices to rise. They claim the oil companies will do less exploration as a result. But as it turns out last year they put $38 billion of their profits to just repurchasing their own stock while again, these subsidies are only $2 billion.

So let's go to Mr. Verrastro. What do you think of the, about the assertion that getting rid of $2 billion worth of subsidies will raise gas prices? Would it follow—just what do you think of that? Would that raise prices?

Mr. VERRASTRO. I have a couple thoughts on that, Senator.

I think the subsidies, I know subsidies have been thrown around the Senate and tax loop holes. There are provisions in the tax code that were put there for a reason. I think you can argue that some of those are price sensitive, right?

I think there's different baskets. The independents are a cash-flow operation. So taking away the expensing of geologic and geophysical costs would make a lot of sense cause they need that money to drill their next well.

The majors are in a different situation. My sense would be that the Foreign Tax Credit, for example, would be the big one for them. There's a number of other things. No one likes to get taxed, but I mean you make a fair point when you look at quarterly profits or annual profits verses the whole account.

Senator FRANKEN. These are essentially loop hole subsidies. Wouldn't it follow that if cutting these subsidies would increase the price of oil in one way to bring gas prices down would be to increase subsidies? Then why don't we just do that?

Why don't the taxpayers just pay more?

Mr. VERRASTRO. No. I think that the exploration and production budgets, right? The ENP budgets now are allocated on a certain basis.

Companies, I think, one of the big problems is that the government's role and stakeholder's are different from the private sector's role and stakeholder's, right? So you actually have a fiduciary obligation. I'm not defending the industry, but you have a fiduciary obligation to get the best response for your shareholders, right?

So some of that means reinvestment, some of that means repurchasing stock, some of that means putting money in research. I guess I would contest it on the grounds that there——

Senator FRANKEN. Listen. All of you are saying that among the factors driving the price of gasoline are demand in developing countries, non-OPEC supply setbacks and uncertainty vis-a-vis Iran. Wouldn't losing these subsidies to the top 5 oil companies have an essentially miniscule or nonexistent effect on the price at the pump?

Mr. VERRASTRO. Senator, if you put it that way, yes.

Senator FRANKEN. OK. That's not what I've heard from my colleagues on the other side.

Mr. VERRASTRO. I just think you have to put it in context, right? There's a lot more around—

Senator FRANKEN. That's the context I just put it in and you agreed with me.

Mr. VERRASTRO. it's——

Senator FRANKEN. So there.

Mr. VERRASTRO. It's $2 billion in the course of what it would mean to substantially raising or lowering gasoline prices now. Right, you're absolutely correct.

Senator FRANKEN. OK. Let me ask you another question. It's—I'll read from a letter from—to the Minneapolis Star Tribune from a Commissioner at the U.S. Commodities Futures Trading Commission.

He says. "The March 24th story in the strip, lawmakers say excessive speculation drives up gas prices seeks balance by giving the other side of the issues with regard to the impact of speculation in oil trading. Senators Al Franken and Amy Klobuchar of Minnesota are right, however, as speculation has caused unfair prices."

Even Goldman Sachs in a research report last year acknowledges the fact. Also data generated by the St. Louis Federal Reserve Petroleum Marketers Association and others indicate that one of the major factors in high prices is oil speculation. That's why Senators Klobuchar and Senator Sanders, myself, among others have introduced legislation to force the Commodities Futures Trading Com-

mission to place limits on speculators and Chilton, who is a Commissioner, has agreed.

What do you think about it? Can you tell me what has happened over the last decade with respect to the ratio of speculators and end users in the oil markets?

Mr. VERRASTRO. So I would suggest that maybe Paul or Howard might be better situated to answer this question.

I think there has been a change historically between commercial players and traders or money managers, market managers. It used to be that the commercial traders did a lot more of the exchange because they actually used the oil. That has reversed itself over the last decade. Clearly money managers play an increasing role.

In 2007 and 2008 we actually saw, in terms of dollars, a lot of money moving to commodities whether it was gold or silver or oil. So it's treated as a global commodity.

In terms of the impact of actual speculative activity whether it's before the fact driving prices up or it's after the fact supporting the price increases. CFTC's examination and EIA's examinations probably have better data.

Senator FRANKEN. OK. I know my time is up. So I don't want to ask Mr. Gruenspecht to speak to that unless it comes up from someone else's question.

The CHAIRMAN. Alright. OK.

Senator Barrasso is next.

Senator BARRASSO. Thank you, Mr. Chairman.

Mr. Yergin, I'd like to ask you about the Strategic Petroleum Reserve.

Yesterday the Financial Times reported that the Obama Administration is proposing that the U.S. and Japan and several European Nations tap their Strategic Oil Reserves to address gasoline prices. This would be the second time this Administration has tapped the Strategic Reserve. The Obama Administration tapped it last June and to my knowledge has not yet filled the Reserve back to capacity.

I understand that the International Energy Agency has not supported the Obama Administration's recent proposal. The Executive Director of the IEA has said no specific supply disruption is currently underway. Germany has also resisted the proposal. Germany's Economy Minister has insisted that Germany's oil reserves are for a "genuine physical shortage."

In your Wall Street Journal op-ed, you stated that, "There should be some caution about using our Strategic Reserves before it is absolutely necessary." So do you think that it is appropriate to tap the Strategic Petroleum Reserve at this time?

Mr. YERGIN. I think caution is still the word. I think the Strategic Petroleum Reserve and the whole system of the International Energy Agency emergency sharing was set up to deal with disruptions and major threats to GDP.

I think that we're heading, you know, if you listen to these numbers that have been used here today about spare capacity. Paul described the high degree of geopolitics. What's different about the geopolitics this time? That part of it is actually aimed at reducing an important source of oil supplies in the market.

But that hasn't happened yet. That's not going to happen til June. So I think that the SPR is a very important asset along with this whole thing. But it's really there to deal with a disruption. You know, there are a lot of uncertainties ahead.

Senator BARRASSO. Thank you.

I'd also want to talk about your—the interview you gave cause I read it from the U.S. Chamber of Commerce. You stated that Keystone, Keystone pipeline, is really a symbol for the oil sands. The major argument against it has to do with carbon emissions.

You also said that the numbers have been misconstrued. You explain that a barrel of petroleum made from oil sands oil, in terms of the CO_2. You went on to say that Americans use other oils that also add about that same amount of extra CO_2 to the atmosphere. You said you hope that the President's decision will be reversed I think by the beginning of 2013, if not before then.

Will you please elaborate on how critical you think the Canadian oil sands and the Keystone XL pipeline are to America's energy security?

Mr. YERGIN. I think that what's happened is that the United States and Canada become much more integrated in terms of energy. Canada is, by far, a larger source of imports. It happens to be our neighbor. I think, what is it, the longest undefended border in the world? That the growth of the oil sands has been really quite extraordinary going from being a fringe to being something really significant.

If you look on a well to wheels basis the carbon footprint is about 5 to 15 percent higher. There's a lot of work being done to bring down that, even that disparity. What strikes me about the Keystone in the discussion is that there has been less discussion about the security aspects of that.

If you look at the through put that would pass, the volumes that would pass through that pipeline, is equivalent to one-third of Iran's total exports. That's a big number. That's a world class number. So that side of it is, I think, has to be part of the equation and part of the discussion.

Senator BARRASSO. Thank you.

I'd also like to ask you about the EPA's pending Tier 3 regulations for American refiners. They're going to require further reductions in sulfur content in gasoline. There have been some ideas of how much that would impact. Apparently the cost of producing gasoline would be increased by 6 to 9 cents a gallon.

Do you think it's appropriate to move forward with these regulations?

Mr. YERGIN. I haven't studied that. So I can't answer that. I don't know if Frank can?

Senator BARRASSO. Let me ask you one other thing then. I'd like to ask you about oil futures markets. That's come up previously in the discussions.

You know, in January this committee held a hearing on U.S. and global energy outlook at the time. Ambassador Richard Jones, the Deputy Executive Director of International Energy Agency testified with Dr. Gruenspecht and others. Ambassador Jones said, "The invisible hand of market speculators is often referred to as having held oil prices artificially high. Yet detailed research," he said, "has

so far failed to identify a smoking gun in the commodities derivatives market."

He went on to explain that there is no clear link between futures market activity and oil price moves. That, "Evidence is slim surrounding so-called excessive speculation." Do you think that these are fair statements by Ambassador Jones?

Mr. YERGIN. I think from our understanding there is the oil has become, commodities, have become an asset class. Invested in that, that there is a—the role. Of course the word speculation, if you're an airline and you need to hedge your supply, you need a speculator on the other side who is going to hedge it and so that kind of how it actually works.

But that that's, you know, that's one factor. But it's not the overwhelming factor. All you have to do today is look at the factors that, if going back to Senator Murkowski's question about the spare capacity. The supply/demand balance and that is the policy the U.S. Government to reduce the flow of Iranian oil into the world market. That gives, you know, that's what the reaction is.

If you're an airline, you're going to hedge yourself against the uncertainties. I think I find that there's not a clear scenario about what happens. But there's a sense of the great seriousness, a somber seriousness, about these issues that are on the table.

Senator BARRASSO. Thank you very much, Mr. Chairman. My time is expired. Thank you.

The CHAIRMAN. Thank you.

Senator MANCHIN. Thank you very much, Mr. Chairman. Thank you all for your service.

The thing I was wondering though is that you were talking about oil prices and gasoline prices and what it means to the people at the pump. In West Virginia it's right at close to $4. It's very hard.

We have probably one of the states, the most rural states and commuting for jobs than most any other state. We always say you have to drive to survive in West Virginia. So you can only imagine the hardship it's putting on people.

With that being said, I'm hearing so much from all of you all as experts that there's very little we can do. You can imagine the frustrations when we go home and people say, well can't you help me? We feel frustrated.

We think we can help by alternative fuels, coal to liquids, natural gas, compressed natural gas, things of this sort. That's not going to be traded the way you're trading oil. Where we have a little bit more control over our own destiny which we know the technology is there.

Even Secretary Chu has said, coal to liquids with biomass really makes sense. It does not leave a carbon footprint. It basically can work and it has worked.

The Germans basically perfected Fischer-Tropsch in 1936. Senator Jennings Randolph flew a plane, an airplane, in 1942 from West Virginia to Washington, DC, on a coal to liquids that the Air Force has tested in. We couldn't even get a bill passed here to use alternative fuels for our military which makes no sense at all. Yet we are held captive by global markets that we have no control over.

I'd like to hear and Doctor, it might be hard for you because being in it, but if I could hear from all of you. Do you not believe

that we should be changing and we could change and the technology is there and it can make a difference in the price at the pump?

We'll just start right and go right down the line.

Mr. HORSNELL. Yes, and I don't want to misinterpret the other panelists. I don't think anybody was saying there's nothing you can do about it. I think what we were saying is that the problem is an all of the above problem.

Senator MANCHIN. I want to know about coal to liquids and I want to know about natural gas as a transportation fuel.

Mr. HORSNELL. Again, that's the reason why oil prices are now clearing at a higher level is to bring on new technologies, to create base through energies.

Senator MANCHIN. These are old technologies. 1936.

Mr. HORSNELL. They were old technologies but they at $20 crude they were not economic. We're now moving into levels where if somebody can get those technologies to work economically then clearly that's where the price signal is given. So I don't think there's anything that precludes those technologies that are——

Senator MANCHIN. Do you think we should be developing those technologies and trying to move forward so we have a little more control of our destiny as far as price at the pump?

Mr. HORSNELL. As part of the sort of, all of the above solution since——

Senator MANCHIN. Do you agree we're not going to though, right? Because of the EPA and because of all the different infringements we have on government?

Mr. HORSNELL. As a non-American I don't want to say precisely what——

Senator MANCHIN. OK. Let me go down to an American then.

Mr. HORSNELL. Yes, alright. I think it's fair to say that greatly at a global level progress in alternative fuels has been relatively slow. Some of that is to do due to economics and with—but it does take quite a long time to bring these things in.

So, again, that's back on to the all of the above. A start has to be made at some point.

Senator MANCHIN. Mr. Verrastro.

Mr. VERRASTRO. Thank you, Senator. So I'm again, going to enter into some dangerous territory here and follow Paul's comments that there are some benefits to be derived from higher oil prices. The first and foremost of that is that a lot of these unconventional wouldn't have been developed.

Shale gas wouldn't have been developed before the fact that we had private land access, this new technology and $12 gas price in 2007 and 2008. That's what spurred the development. Ultra deep water, oil sands, the unconventionals, a lot of this new production is higher cost production. One of the benefits of reaching a level, not $125, but a higher level means you can bring on more production and then moderate future prices.

I agree with you on expanding the use of alternative fuels. I think the problem, as Paul has said, has been that gasoline actually does very well in terms of energy content rich. The ability it's portable. It's fungible. It's storable.

Senator MANCHIN. But I know we're going to run out of time. Let me tell you what I'm saying. Coal to liquids.

Mr. VERRASTRO. Coal to liquids.

Senator MANCHIN. Secretary Chu says himself that liquids, using carbon capture and sequestration with biomass actually reduces the amount of carbon dioxide in the atmosphere. We know we can do it. We have the technology, but this agency, EPA, the Administration, will not help us move in that direction.

Mr. VERRASTRO. So I think part of the problem, Senator, with all due respect to West Virginia, is that on the coal side, CCS, at scale is an enormous lift. I agree with everything the Secretary said. With those conditions it's absolutely right.

But if we do fuel efficiency at 60 miles to the gallon it's going to be difficult for anything to compete with the gasoline hybrid engine.

Senator MANCHIN. Dr. Yergin.

Mr. YERGIN. If I could divide it into two. I think what Frank says that coal to liquids, the technology is doable. It's the cost.

I think the other side, natural gas. I think a difference that even from a year or two ago is the sense that natural gas is going to be part of the diversification of the transportation fleet in certain types of vehicles. We seem to be on the cusp of that.

But the other thing is I do think that it is incredibly important what's happening on the demand side. To go from 30 miles per gallon to 54 miles per gallon, that is worth many, many oil fields to make that happen. So I think the efficiency part of it is also a——

Senator MANCHIN. I'm just saying, just having control over our own destiny. We have no control over global pricing of oil.

Mr. GRUENSPECHT. There was an effort to develop light duty vehicles to run on natural gas. It has been tried, but didn't succeed very well in the marketplace.

I think there's a lot of interest in natural gas for heavy duty vehicles, for trucks, for liquefied natural gas as a fuel for trucks. We are going to include a sensitivity case in the upcoming Annual Energy Outlook that addresses that. There's also a lot of potential for methanol from natural gas either as an additive to gasoline, but not so much in the United States where we're using ethanol as an additive to gasoline.

If throughout the world the gasoline pool was supplemented with methanol the same way that we use ethanol in the United States there would be a lot of opportunity to displace oil. There's also probably some opportunity for straight methanol fueled vehicles. I agree with Dr. Yergin on the challenges in the costs of some of the coal to liquid technology especially with carbon capture and sequestration.

Senator MANCHIN. Thank you very much. I'm sorry.

The CHAIRMAN. Thank you.

Senator Risch.

Senator RISCH. Thank you, Mr. Chairman.

First of all, let me say thank you for your testimony. I think that probably for people who are watching this it's an eye opener. As far as how important the refining process is in all of this, I think Americans have a tendency to think about this as the price of a barrel of oil. They ignore the different kinds of oil that's out there.

But more importantly they ignore the fact that once a barrel of oil is produced there is a complex process by which it is turned into something they can put in their automobile. Actually use and transport in it to the place where it can be used. So your testimony in that regard is very welcome I think as far as helping clear up this picture.

Again, though it underscores the fact that the law of supply and demand is indeed a law. Here in this town with the politicians we find that the, a lot of people believe, that the law of supply and demand is merely a suggestion. Unfortunately we have to overcome that from time to time.

As you know we're debating a bill on the floor right now. I guess I come at it from a 180 from where Senator Franken comes at it. He talks about these awful loop holes and subsidies.

Language is an amazing thing in this town. When those were put into place they were called incentives in order to get the companies to produce more oil and gas so that we could have—this is so that the law of supply and demand would work in favor of the consumer. Now they're labeled as loop holes and subsidies as opposed to incentives.

So I appreciate your helping to clear that up. I guess I come from this from a relatively simple standpoint. I don't know how anyone who has even the slightest understanding of economics can believe that by increasing the cost, namely the taxes, that you will somehow lower the price to the consumer. I mean, that just, that absolutely boggles my mind.

Now you can go into a long theoretical discussion about oil in the long run it will bring in alternative fuels, etcetera, etcetera. But my constituents are looking for a price reduction today. You can't reduce the price by increasing the cost.

Finally let me say one thing. Appreciate your thoughts on the speculators. Again, you need market makers. I think everyone would agree that you need market makers.

Am I right or am I wrong on that?

I mean, if you're just going to buy from the producer there's always room for manipulation in that regard. But if you've got market makers, you get a free market that is very, very difficult to eliminate. The problem I have with what Senator Franken talks about and that is limiting the speculators.

How in the world, maybe you guys can answer this? How in the world if we absolutely prohibited speculation in America, put a 25 year sentence, mandatory, on anybody who engaged in speculation in the price. How would you stop that from happening in another country?

After all we make up only 330 million people on the planet that's got 7 billion. It seems to me they'd open up tomorrow in London or in Singapore or somewhere else. Do the exact same thing that they're doing here.

Am I right or am I wrong on that?

Dr. Yergin.

Mr. YERGIN. I think Paul should answer some of that. But I think that definitely, you know, we're just, we're part of a world oil market. We're not the world oil market. We're the North—U.S. oil market.

You know, if you re-look at these annual reports that Southwest Airlines, it's clear that without the ability for them to hedge their price risk, they would not have been able to stay in business is what their message is. To hedge you need somebody on the other side of that who—and that's what future markets do. So if we didn't have these kinds of markets in a situation, we'd be looking at today airlines would be taking their airplanes out of the skies and be putting them, parking them in the deserts because they were not able to hedge their financial risk.

That's what those markets do. Obviously the markets have to be regulated. They have to be understood very closely. When you have a big traded commodity, people need to manage their risk in order to stay in business.

Senator RISCH. Thank you, Dr. Yergin.

Mr. Horsnell, you seemed to be modestly familiar with Great Britain. Could we pass a law here in Washington, DC, that would regulate the speculators in London?

Mr. HORSNELL. I think I bring in one further country into this which is actually Switzerland. In what we've seen, noticed. I cover more the fiscal oil markets, but the trend we notice, particularly over the last couple of years, has been a very large movement of oil trading out of London and then into Switzerland.

Some of the most important traders now are not banks, they are Swiss based traders. You know, that may be again, part of the process you were talking about. It's much harder to get full visibility on an oil market where the balance has shifted away from more a regulated sense, should we say, and into other areas.

I think there are various shifts going on. Part of it is from banks into traders from New York and London into Switzerland. That might be an interesting development as the years go by in this particular area.

Senator RISCH. My time is up.

Mr. VERRASTRO. Senator.

Senator RISCH. Yes.

Mr. VERRASTRO. Can I add just one point on you talked about the tax incentives. I think that's absolutely right. I think time changes. I actually think the debate would be markedly different if there was a discussion of corporate tax rates overall.

Senator RISCH. Right.

Mr. VERRASTRO. That we wouldn't be in this position of subsidies and tax incentives.

Senator RISCH. Oh, I think you would.

Mr. VERRASTRO. There would be a balancing of the——

Senator RISCH. Here they'll call anything that has to do with a corporation, a loop hole or a subsidy. So I'd like to share your optimism, but I don't.

Thank you, Mr. Chairman. My time is up.

The CHAIRMAN. Senator Cantwell.

Senator CANTWELL. Thank you, Mr. Chairman. It's good to see all of you gentlemen here. Thank you.

I've enjoyed this discussion. I certainly believe in market fundamentals myself. Certainly believe in making sure that market fundamentals are policed.

But I can remember a time on this committee that we talked and talked and talked and talked about what was wrong with electricity when Enron was manipulating the market. There were a lot of people that thought it was 3,000 things other than manipulation until we proved that it was manipulation. Then everybody was like, oh, it's manipulation.

So I think the point here is what is the functionality of the markets that we really want to see? I was looking at your testimony, Dr. Yergin, about the financialization of oil in the commodities market. So I was curious as to your thoughts on this.

At what point does it really become a problem? Because it's quite clear the Commodities Exchange Act made it very clear that the Commodities Futures Market were created for two basic purposes.

One, to provide a revenue for producers and consumers of physical commodities to hedge their risk.

Two, to establish a fair price on supply and demand fundamentals.

So we had Mr. Tillerson come before the Finance Committee a year ago now. That was when oil was at $98 a barrel and I asked him what should that price be. He volunteered it really, if you're basing it on the next production price for a barrel of oil, it should be, he said, between $60 and $70.

So it's clear that this is the process and the cost of having both legitimate hedgers and speculators in the market. That there is a fear factor that's driving it up. There's a financial whistle.

But my question is really about these institutional investors that make the commodities like an asset class like securities. So these are people who are not in the market for any other reason than to make profit. They're not in the hedging for legitimate purposes or price discovery. They're there because it's a great financial play.

I'm curious as to at what point, at what price point, or what percentage point, do you think that that becomes a problem? I don't mean the price of oil. But if you, if Mr. Tillerson is right and here's what he says the production cost is. A lot of people think 15 to 20 percent is added on for the fear factors and then obviously there's all sorts of other things that happen on any given day.

But at what price do you think this asset class financialization really becomes a problem?

Mr. YERGIN. I think that the financialization certainly has to do with what you're talking about. Institutional investors or hedge funds, who are, you know, who are in there regarding this as an asset class. I think it's a little bit, when I use the term financialization I meant something even broader. Because you see like Calpers, the largest pension fund in the United States, regards commodities as an asset class and a way you invest in commodities is a way to play economic growth in China and so forth.

So it's, you know, it's not easy to separate it into segments. I understand that's the question you're asking. I think, you know——

Senator CANTWELL. I'm not even asking you to guess what it is. I'm just saying at what point, if I said, OK, they're affecting the price by 50 percent or they're affecting the price by 30 percent or 30 percent of the price above $60 to $70, which Mr. Tillerson says is the marginal cost for producing another barrel of oil. So if that's what it is, and we know there's all sorts of these other factors.

Mr. YERGIN. Right.

Senator CANTWELL. But at what point do you think that asset class investment changes the commodities market and becomes a problem? If it's affecting 30 percent of the price? If it affects 40 percent of the price? If it affects 50 percent?

Mr. YERGIN. You know, I don't know what the point is I would say, by the way that cost even since he's testified, the costs of developing the marginal barrel have gone up so much that that number would be raised somewhat. But I think, you know, I guess you're asking not in terms of the current circumstances, but at what point——

Senator CANTWELL. Would you worry about it, yes.

Mr. YERGIN. You know, I don't have an answer for that right now. I'm looking rather at the market and saying based upon, as you said, supply and, you know, the fundamentals are what's there. There's a fear factor or premium factor in it.

I don't know. Do you have a number in mind or?

Senator CANTWELL. I definitely believe that we should get these asset class investors out of this market. That's my personal opinion. When I look at Mr. Verrastro's chart here and I see this level of volatility at this end and this level of growth. I start asking myself is it worth $50 a week more to a Washington consumer driving to allow a bunch of commodity index fund investors to drive up this price when it hurts the U.S. economy?

I think the answer is no. Because commodities markets are about price and supply—you know, price and supply discovery. So they are to provide that marketplace for legitimate hedgers.

So saying that we're going to allow a bunch of investors to treat the commodities market like they want to treat the rest of Wall Street from a securities and investment perspective, I think is the wrong idea for commodities, something particularly as vital as gasoline.

Mr. YERGIN. Right. No, I understand.

One other thing I would kind of add is I think that point about if those markets were to lead the United States and not be—I'd rather see these markets in the United States regulated with the kind of scrutiny they have that incurring somewhere else where they're not under scrutiny. So part of the issue is it is a global marketplace.

Senator CANTWELL. I would add to that because I bet you, you could get the Europeans and the Chinese and everybody else to add in because I've heard from many of those people. They've been to my office. I think it's amazing that they come to my office, even elected people from Japan, saying what can you do to get these investors out of the commodities market because they're feeling the pinch around the globe.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Senator Portman.

Senator PORTMAN. Thank you, Mr. Chairman. I enjoyed the testimony earlier. I'm sorry I had to run to another of the 3 hearings going on at the same time.

One thing that I think struck me about your earlier testimony is the fact that is as hard as Congress tries we can't repeal one law

and that's the law of supply and demand. It's working right now. It's working to the detriment of folks at the level of the gas pump.

It's pain at the pump because, you know, we have a disconnect right now. We have a little bit increase in demand and we have some supply constrictions.

Looking at your testimony, Mr. Gruenspecht, you talked about prices being based on global supply concerns.

Mr. Yergin, you talked about in your op-ed recently I saw, but also in your testimony today, the geopolitics, sanctions on Iran. You talk about concerns over the Straits of Hormuz exacerbated by the fact that we don't have the spare production we should have, tight markets, Libya, other geopolitics, certainly again, the focus on Iran right now. The oil market is reading the front page of the paper I think is what you said.

I guess my question is that given that that's the situation if we were to increase production in this country, all things being equal don't you believe that would have an effect on price?

Mr. YERGIN. Yes. In a very simple answer, yes. I think the increase that we have had in the last 4 years has actually been very beneficial because we would be looking at much higher prices in a much tighter market without it.

So what's happening in the United States both on the demand side but on the supply side have a big influence on the global market.

Senator PORTMAN. So the statement that someone made which was surprising to me but even in the last few weeks as we've been talking about this on the floor and so on which is U.S. domestic production doesn't affect the price of gasoline. I don't see how that can be true if in fact there is this supply and demand reality out there.

Second is, as you all have talked about today, it matters as to where we're getting our source. So it's not just supply and demand. It's where the supply comes from and increasingly volatile and dangerous parts of the world are not a good place to rely on as we saw last year with Libya.

So I just think it's not only supply and demand, but tell me. Isn't it also the fact that if we had more domestic production and I would say even production from countries where there is more reliable source like Canada that that would have a positive impact on price? Do you all agree with that? Does anybody disagree with that?

That there's an issue here as to the quality of supply?

Mr. GRUENSPECHT. Yes, but I don't think that we're going to have a separate price from the rest of the world.

Senator PORTMAN. No, that's——

Mr. GRUENSPECHT. It is a world market, so——

Senator PORTMAN. That's not what I'm saying. It's set globally, but in terms of the U.S. price where we're getting our supply does that matter?

Mr. GRUENSPECHT. I think where we're getting our supply may matter, but matter less for the price than for other aspects, security aspects. Also production is an important part of the U.S. economy, jobs, economic activity. It's not just a matter of prices.

I think both supply and demand in the United States are part of a global picture. Policies influencing U.S. supply and demand affect world markets both directly and indirectly. So indirect effects can arise. For example, the technologies that we use to raise fuel economy in the United States go to the rest of the world and contribute to a lower demand globally. That has a big effect.

The same is true on the supply side. Our supply technologies are applied elsewhere. This is mostly about oil, but if you have something like shale gas which has had a very big effect on the United States, and those technologies are applied in the rest of the world, there's a significant, indirect affect. The same applies to our deep water and tight oil technologies.

Senator PORTMAN. Yes. No, and methods of hydraulic fracking and horizontal drilling. It's not natural gas. It's natural gas.

It's tight oil. In my State of Ohio right now we have wet gas, dry gas, sand and oil coming from the Utica shale.

It's about a futures market to, isn't it? So it's about what the future might hold with this new technology.

Mr. GRUENSPECHT. Right.

Senator PORTMAN. That can have an effect. Let me ask one more question. Feel free to jump in here. I've only a few seconds left.

But in terms of this issue of affecting the price of gas at the pump on taxes, you know, I look at what happened with the Windfall Profits Tax. I look at what happened in the UK and their experience. But let me hear from and maybe a counter point of view here if you disagree with me.

But what do you think the affect would be on the price of gas at the pump if the taxes were raised on oil companies by let's say, $25 billion, over the next 10 years? Would it have a positive or negative affect or no affect?

Mr. VERRASTRO. So to the extent you're paying more in tax and less investment in ENP activity you're reducing supply. Right? That's pretty clear.

In terms of the direct impact——

Senator PORTMAN. You can take it to the next level.

Mr. VERRASTRO. I'm sorry?

Senator PORTMAN. So what does that mean?

Mr. VERRASTRO. Yes, so that I was just going to take that a little bit further. So when you get to the point that increased production is a good thing I think your assumption that production, all things being equal, lowers price. More production, more supply, good for the world.

But there's a demand side as well. So I don't know that there's a definite guarantee you increase production but prices don't necessarily go down because we are 18 million barrels a day, give or take, of demand in a 90 million barrel a day world. We produce about 7 million barrels a day of liquids.

So you increase that by 400,000 barrels a day that's a great thing. It's more than Iraq is increasing. It doesn't mean that the fundamentals change all that much.

So I just think we have to be careful.

Senator PORTMAN. Yes, but all else being equal if you didn't have that additional supply it would have a converse effect.

Mr. VERRASTRO. I absolutely agree with that. I think the additional supply has been terrific and it's very helpful. I think the concern that this is a dynamic market and there's leads and lags in investment needs to be made.

But to make the assertion that more or less production, unless it's a huge scale, you know, two or three million barrels is a big deal. Two or three hundred thousand barrels a day, significant, that's a big contributor. It's great for the United States. It doesn't affect, materially, market prices.

Senator PORTMAN. Thank you very much.

Thank you, Mr. Chairman.

The CHAIRMAN. Senator Coons.

Senator COONS. Thank you. Thank you, Mr. Chairman. Thank you for the opportunity to be a part of this hearing today.

In Delaware, where I'm from, we've had some real success in reopening the Delaware City Refinery which was idled. But there have been some difficult announcements in the past year by Sunoco and Conoco Phillips that they are either idling or closing 3 major refineries on the Delaware River in Pennsylvania. That in combination, represent half of the refining capacity on the East Coast.

Chairman Bingaman and Senator Risch have previously asked questions about refining capacity, logistics and how that contributes to price. I'm concerned about trying to make clear whether or not Federal Government regulatory actions have contributed to these decisions to idle or close these refineries and the very negative impact that can have on employment and possibly on gasoline prices or whether these are really the result of market decisions and of private business decisions.

Mr. Verrastro, do you have any opinion about that?

Mr. VERRASTRO. Thank you, Senator.

So 2 quick points.

I think we were due for a rationalization of domestic refining capacity in this country. In point of fact, if East Coast refineries are operating at 70 percent utilization and two closed down, Delaware City actually will be better economically, all things considered.

I think we're actually going to be going through a bigger rationalization in the future for some of the reasons the Senators have raised about domestic production increasing from the mid-continent. This is lighter, sweeter oil. Our Gulf Coast refineries are configured to be able to run heavy, sour oil and make a lot of nice products as a result of that. But this is kind of the big build that's coming.

In terms of refinery economics you look at the total cost and then the total value of the product. I would argue that refiners have been under siege with higher prices if you have an unsophisticated refinery because crude oil prices that you need and Senator, you talked about crude oil, light, sweet, heavy, sour, naphthenic verses paraffinic, not necessarily good and bad. When you're buying a specifically type of crude oil you need that to produce the product slate that your customers demand.

So if product prices are competitive at the back end and your crude oil cost goes up, that's the big driver. So clearly have EPA regulations have an impact on the prices in terms of maybe, cents per gallon. That's true. There's a CAPEX and an OPEX piece here.

I don't think that was just positive in the closure of those refineries.

Senator COONS. There was a study that was recently released by DBL Investors that looks at the historical role of Federal subsidies in shaping the energy market. They concluded that 94.6 percent of all Federal subsidies and support over the last century have gone to oil, gas and nuclear and roughly 5 percent, less than 5 percent, to the development of biofuels and renewables.

Dr. Yergin, does that suggest anything about what our path forward ought to be if we're going to pursue an "All of the Above" energy strategy and try and over the long run work our way out of facing higher gasoline prices?

Mr. YERGIN. Who did that study?

Senator COONS. DBL Investors.

Mr. YERGIN. Right. I think EIA has done a different, very different view.

Mr. GRUENSPECHT. Thanks, Dan.

[Laughter.]

Mr. YERGIN. I'll let him answer.

Mr. Gruenspecht, do you want to take that one?

Mr. GRUENSPECHT. It's hard to put these things together. We try to do it from a neutral perspective.

What you include, what period of time you look at, how you measure some of these things are all factors. We've done a series of studies including one pretty recently looking at Federal subsidies and support.

I think it changes over time. In reality there's been significant support for renewable technologies and some significance for efficiency. Some of the subsidies, like of the subsidies for synthetic coal, have expired. So things change over time.

There have been specific subsidies to both fossil and non-fossil fuels and increasingly to efficiency.

Senator COONS. Last question if I might.

Mr. YERGIN. Can I just? Can I just?

Senator COONS. I'm going to run out of time.

Mr. YERGIN. OK.

Senator COONS. So if I could focus you, Dr. Yergin, on the last question.

Master limited partnerships is one of the ways that financing has been made available that's help build transmission pipelines and help with capital investment. With capital investment that's not currently open to all forms of energy. Would opening up existing support, tax advantage, financing support like master limited partnerships to all energy strategies be a possibly sustainable path forward to broadening our energy market?

Mr. YERGIN. Again, I haven't studied that. But I think, for instance in terms of wind farms it might apply. It might be a reasonable way to do it.

If I can, just go back to the subsidies thing. I think what Senator Risch said that, you know, that word subsidies incentives goes back and forth. I did read one study that said that the on the subsidies to the oil and gas industry and by far the largest one was the Foreign Tax Credit.

I then checked the footnotes and there was only footnote and it was to a book called, The Prize, which I know very well, said kind of just the opposite thing. So I think that as Howard said, how these things get defined are really, lead to very different conclusions.

Senator COONS. Thank you.

The CHAIRMAN. Senator Hoeven.

Senator HOEVEN. Thank you, Mr. Chairman.

Mr. Yergin, I will probably start with you although I'm going to refer to comments that each of you have made. You've talked about the supply and demand equation. World demand is going higher for crude oil and for energy in general. So we have tight or very little spare capacity in the crude oil markets.

So that, kind of, there's two aspects of that, the supply and demand equation creates upward pressure on gas prices today based on supply and demand. But also then there's the anticipated futures situation. If we know we have growing global demand. We're not growing supply that creates upward pressure on gas prices as well.

Mr. Yergin, is that accurate so far in terms of reflecting your statements?

Mr. YERGIN. Yes.

Senator HOEVEN. OK.

So my question to you and to the others is going to be, so if the Administration has policies and if this Congress sets policies that allow for more access, on shore drilling and offshore drilling, on Federal lands and offshore. If we allow more access would that tend to help create more supply? Would that tend to reduce gas prices both today in terms of actual supply as we start to produce more. But also in terms of market signals saying hey, we're going to try to produce more energy rather than constrict it?

Mr. YERGIN. I think the increase in supply would have an impact. Here I have a slight disagreement with Frank. I think a 3, 4 hundred thousand barrel a day increase in the United States, if we saw that kind of increase coming out of Iraq or some other country, we'd be thrilled.

I think that here too, that that's actually quite a significant number of barrels coming into the market when every barrel counts. I think this kind of what Frank did describe. This change in both psychology and outlook in the United States, that we have a more resource rich opportunity here than was thought of a few years ago.

That will contribute to the psychology of the market. You know, it just doesn't happen overnight.

Senator HOEVEN. Right.

But there's both aspects. There's both the immediate supply/demand equation, but also anticipated in terms of where we're going. That affects outlooks in terms of pricing decisions and also drives prices as well.

For example, if we have policies that provide more access onshore and off that for example, if I was to build pipelines rather than blocking pipelines. Logistics, I think one of you referred to the importance of logistics earlier. That streamline permitting rather

than adding regulatory red tape that reduce regulatory burden rather than add to regulatory burden.

Wouldn't those types of factors send clear signals that we're going to work to expand supply and the market would take that into effect in pricing? I'd like each of you to respond to that question if you would.

Mr. YERGIN. Yes, well just to finish. I think, yes. I think one of the things you pointed to is the expediting of decisionmaking would be very valuable to people who are committing capital and making investment decisions in terms of giving them the confidence to go ahead.

Senator HOEVEN. Dr. Gruenspecht.

Mr. GRUENSPECHT. I really think my answer to Senator Portman's earlier question about both direct and indirect effects is probably where I would stand on that.

Senator HOEVEN. But you would agree that if you take a whole range of steps to increase supply that would tend to help in terms of dollar and pressure on prices verses a whole step, a whole range of steps that constrict supply would tend to create upward pressure. Would that generally be true?

Mr. GRUENSPECHT. Yes, I think all else being equal, that is true.

Senator HOEVEN. Very good. Thank you.

Mr. Verrastro.

Mr. VERRASTRO. So I think part of the issue is timing, right? So there's a difference in this currently tight market if you bring a lot of barrels to bear immediately it has a big impact. Saying that you're going to do something that results in production 15 years down the road, even 5 years down the road, has less of an impact.

Just to clarify I think I'm in the same boat with Dan on this. I mean, I'm not downplaying the Bakken. I think production of 3 or 4 hundred thousand barrels a day is enormously helpful.

Senator HOEVEN. But I want you to respond to my question, not Dr. Yergin's or——

[Laughter.]

Mr. VERRASTRO. Senator, you managed to describe Keystone without saying Keystone. I think that there's a couple things happened with Keystone. I think there's—should a pipeline be built if some people are willing to put up $7 billion and build a pipeline to bring oil sands to the Gulf Coast.

Is that a good thing?

Absolutely.

Senator HOEVEN. Very good. That's a great place to stop. Thank you, Dr. Verrastro.

[Laughter.]

Mr. VERRASTRO. I need to say one more thing.

Senator HOEVEN. Dr. Horsnell.

Mr. VERRASTRO. One more point. Right now there's between 700,000 barrels a day and a million barrels a day excess capacity rail and pipe that can bring. There's no limitation on what's coming down from Canada right now and probably won't be until 2016.

So I don't think it's a national security issue right now.

Senator HOEVEN. But there's a big difference when it's hauled by rail which adds a significantly higher cost to it.

Mr. VERRASTRO. The bulk of that——

Senator HOEVEN. There's also the issue of Canada being the—having the third largest oil reserves in the country. The question of whether we're going to develop them with things like in situ which is better environmental stewardships.

Mr. VERRASTRO. Absolutely.

Senator HOEVEN. Similar to conventional drilling or see that product go offshore, Doctor. But I do want to give Dr. Horsnell an opportunity to respond as well.

Mr. HORSNELL. Yes. I think it's a question of timing. I think that expectation that the supply situation may have turned and may improve as we move into the midterm is something which starts to anchor longer term price expectations. Early there does seem to be much more stability in longer term price expectations over the last year or so with most of them pointing to $90 to $100 as a good long run price.

So your price where the oil sands are developed where the alternative technologies do come on and where this development continues. So for anchoring the long term, but doesn't perhaps not bring a down pressure on short term prices.

Mr. YERGIN. Right. Our expectations are changing exactly for the reasons your saying.

Senator HOEVEN. I am over my time here. So just very quickly, but Mr. Verrastro, would you agree that logistics are important that building pipelines and making sure we can access oil is—would you agree that those logistics are very important in terms of pricing around the country?

Mr. VERRASTRO. Senator, that's it. Absolutely. Absolutely.

The big build is the next thing that's coming.

Senator HOEVEN. So you'd say it's very important we do that?

Mr. VERRASTRO. Absolutely.

Senator HOEVEN. Very important?

Mr. VERRASTRO. Yes.

Senator HOEVEN. Thank you.

Mr. HORSNELL. If I could just add to that in answer. I noticed on the agenda of the Canadian Energy Research Institute which has a conference every year in Calgary. They're spending a session talking about native land rights.

Very clearly, saying that they wish to develop that resources. If they can't get the pipeline to come down South then they will try to build it out toward the coast and sell it to China. So again, those pipeline logistics are absolutely critical for long term trade patterns.

Senator HOEVEN. Thank you, Doctor.

The CHAIRMAN. Thank you.

We are in the middle of a vote. So I'm going to go to the floor to vote. Senator Wyden has already voted and has returned.

Senator Shaheen, you go ahead with your questions and then Senator Wyden will conclude the hearing with any additional questions he has or any other Senators. But thank you all very much for being here.

Senator Shaheen.

Senator SHAHEEN. Thank you very much, Mr. Chairman.

I listened to all of your testimony earlier. I'm confused, I think, as I think many of my constituents are. If supply is up and demand

is down, why are we not seeing the market react in a way that—why are we seeing gas prices go up so precipitously? You know, I appreciate the geopolitical impact on prices, but why is there not some leavening impact from having demand down?

Oil and oil products are really global markets. While supply is up in the United States and demand is down in the United States, as has been discussed in this hearing, globally demand is still rising because of the developing countries and, as discussed by my colleagues because of some of the supply issues.

So I think that is the answer. Although it's not what your constituents would obviously like to hear.

Senator SHAHEEN. Right.

But it does speak to the fact that given that, even if we dramatically increase supply here and reduce demand we're still going to be at the whim of what happens in the global markets.

Senator SHAHEEN. Yes.

Mr. GRUENSPECHT. The bottom line is if in fact one can find alternatives or displace oil demand than we are less subject to the global winds. In terms of supply contributing to the global United States supply, United States supply does matter also.

Mr. YERGIN. I think that if you go back to what happened in the mid 1980s, our supply went way up. Our demand went down. That was a big factor that led to oil prices coming down.

So what happens in the United States really does have an impact because we're still the largest consumer. But we're part of this global market. But if we make a big shift, if we continue to become more efficient, if our supply increases, then that will affect the prices that your constituents pay and the pump and what they pay for heating oil.

I mean even, you could look at Norway which is, you know, produces much more oil than it needs. Its citizens still pay world prices because it's one market. If we were 110 percent self sufficient, then it would be a different game.

Senator SHAHEEN. Mr. Verrastro, I was interested in your policy model, the triangle, that has energy efficiency in the center. I will tell you I'm particularly interested in this because Senator Portman and I have legislation that tries to incentivize energy efficiency in our building sector, throughout the government, in our industrial sector. I wonder if you can speak to the importance of energy efficiency in that model?

Mr. VERRASTRO. Sure, Senator. When we try to compare security, availability, affordability, the only sweet spot was efficiency. Right?

You can get all of those gains from efficiency. It's grossly overlooked. I mean I think it's better in the United States than it is in a lot of places around the world. It's true that a barrel saved, you know, here on the Beltway, is the equivalent of a barrel saved in China.

I don't think we put enough attention to it. It's difficult to get your arms around, especially in the building code because there's state and local codes. There's just incentives between, for example, renters and the people that own the buildings, right? So in new construction I think there's a way of doing it, but the regulatory structure really needs to be overhauled as well.

But it's critically important.

Senator SHAHEEN. Actually our legislation does include voluntary building codes that have incentives to try to encourage states to adopt them. So I appreciate the point you're making.

Mr. Yergin, the New Hampshire legislature has just asked the Public Utilities Commission to look at the use of, the growing use of, natural gas in New Hampshire with the concern that as we have in the past been over reliant on oil and coal that there is some concern that we might become over reliant on gas. I wonder if you could speak to that in light of the new reserves and whether there's reason to be concerned about that or whether we should be looking for a diverse—and whether we shouldn't be looking for a diversified portfolio?

Mr. YERGIN. I think a diversified portfolio is prudent under any circumstances. Just to go back to your previous questions. In The Quest, I talk about energy efficiency is the fifth fuel. That indeed, we are twice as energy efficient as a country today than we were 20 or 30 years ago and we ought to become twice as efficient again.

I think that, you know, I think a lot of people raise the question, as we've seen the shale gas develop over the last 5 years, is this going to be another cycle. Are these supplies going to disappear? I think that progressively you've seen consumers, industrial companies, utilities, more and more confident that there is major supply here and that that supply is going to continue. We're not going to have another one of these whipsaw.

But prudency just says that, you know, obviously don't put all your eggs in any one energy basket.

Senator SHAHEEN. We should pass energy efficiency, right?

Mr. YERGIN. Absolutely.

Senator SHAHEEN. My legislation with Senator Portman?

Mr. YERGIN. Right. Immediately.

Senator SHAHEEN. Thank you all very much for your testimony.

Senator WYDEN [presiding]. Thank you all very much for being with us. Apologies that it's so hectic. You can see Senators running hither and thither trying to keep up with hearings and the floor.

I read all of your testimony last night. Of course, we're lucky to have all of you 4 individuals with lots of expertise in this area. I come to really try to zero in on a couple of factual judgments. It really stems from some of the discussions you and I have had, Dr. Yergin, with respect to changes in the energy business.

Let me ask specifically about the oil futures business. When I look at the numbers it seems to me that there has been a dramatic change in the last 4 years. I want to just see if we can get on the record whether you share that view?

It looks to me like 4 years ago the non-commercial trader, the person, who is in effect, called a speculator. These traders held less than half of the futures contracts for crude oil. So a number of years ago we were talking about, you know, people who held these futures. They were trucking companies. They were airlines. These kinds of people who weren't, you know, traders.

Now today according to the Chairman of the Commodities Futures Trading Commission, these traders now account for 85 percent of the crude oil futures market. I read your testimony last night and none of you touched on this factor, the changes in the

oil futures market. So I think the first question I want to get into and just go right down the row.

Do each of you believe that this change in the significant number of traders, commercial traders, in the oil futures market is significant? Just a yes or no, let's go down the row.

Doctor.

Mr. GRUENSPECHT. Maybe is not allowed? I actually think it's a legitimate question and one that we're very interested in. But it's a hard questions for a short answer.

Senator WYDEN. We're not imposing any gag orders.

Mr. GRUENSPECHT. OK. That's good. Because someone has a title or how they're categorized as an organization does not necessarily tell you what the motivation is behind a particular trade is one question.

There's a lot of activity that goes on off the exchanges that is not included in the data. I would tend to agree with you that's there's a lot more activity.

Senator WYDEN. Very good.

Mr. GRUENSPECHT. But I'm just trying to be straight forward.

Senator WYDEN. We're just going to try to see if we can get some facts on the record. Then I'm going to ask some questions that will get any of your opinions.

Dr. Yergin.

Mr. YERGIN. It's hard——

Senator WYDEN. Particularly for you because you have educated me on the fact that there are a lot of changes going on. Because you all didn't touch on this one in your testimony, I just want to see if you all share my view that this has been a significant change.

Mr. YERGIN. I think, yes, it's been a significant change. I don't think based upon our understanding today that it is the driving force that can accentuate things. I was thinking that when there was a crisis with Iran in 1979 and 1980, there were no futures markets and the price also went up very sharply.

So that it's part of the mix and a very visible part.

I guess, Frank, it's your graphic.

Mr. VERRASTRO. So Senator, part of the reason I think we didn't go in detail in any of our testimony was because at one point I think we anticipated a second panel with the Commissioners, CFTC Commissioners. So we were going to leave that, kind of, to their area of expertise.

I agree with what Howard and Dan said. I mean, I think there's been a change in the market. I don't want to characterize it as necessarily good or bad.

There are new players. It's part of what we're calling the, kind of, the new fundamentals which used to be just supply, demand and inventory. There's a lot more. It's a lot more complex market.

Senator WYDEN. OK.

Mr. HORSNELL. I think the reason it wasn't really highlighted in testimony is that, you know, we're reasonably happy with the supply/demand explanations as to where prices are and why they've behaved. There's not a big residual left over to be explained by something else. So in that sense I don't think that change makes a difference as to where the price is today.

I think I'm back on it some ways. This is a great American business success story, the success of these changes in deepening the liquidity, deepening the involvement. For me more liquidity is a good thing. These are a significant part, but of a very large, global oil market that makes up, which has all kinds of other bits on top of it.

Seeing more liquidity come onto regulated exchanges, again, should actually be seen as good news. I'd much prefer to see activity taking place somewhere where I can see it. So I don't think it's a problem in terms of increasing prices.

One further thing on this and just go back on stuff. I do think we need to draw distinction between activity by institution, investors and hedge funds.

Senator WYDEN. Let me just see if I can get one additional question in.

Goldman Sachs has produced an analysis suggesting that the speculation premium on crude oil could be $23 a barrel or 56 cents a gallon at the pump.*

The Consumer Federation produced their analysis concluding speculation adds 20 percent to the price at the pump or roughly 50 cents.*

A year ago as we discussed briefly, earlier, the Exxon Mobil CEO stated that speculation had increased the price of a barrel of oil by $20.**

Now can I just get a yes or no with respect to this question whether you think these analyses, because all 3 of them, all 3 of them, agree that there was a speculative premium for a barrel of oil. I would just like to know whether the 4 of you think that all of these analyses are wrong.

Let's just go right down the row and I've taken an extra minute. But they were 3 separate analyses done by 3 different organizations with different philosophical roots. All of them concluded that there was a speculation premium.

I'd just like to know if you think those analyses are wrong.

Let's just go right down the row.

Mr. GRUENSPECHT. I would want to read the specific studies first before I commented on them. Sometimes the different assessments of the role of speculation have to do with the standard of proof or burden of proof that's applied. If you apply an innocent until proven guilty beyond a reasonable doubt standard, I think my reading of the literature as a whole, not just these 3 studies which I haven't read, is that speculation wouldn't be convicted.

If instead you assume that guilt is confirmed unless innocence is demonstrated beyond a reasonable doubt a standard that some jurisdictions use when considering whether to exonerate and release convicted prisoners, speculation is probably not going to get out of jail anytime soon.

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*Goldman Sachs, Global Energy Weekly: Commodities Research, March 21, 2011, or http://www.energianews.com/newsletter/files/80e9ebe0ff67bd94432a4031ee17c2b9.pdf.

*Consumer Federation of America, Excessive Speculation and Oil Price Shock Recessions, October 2011 or http://www.consumerfed.org/pdfs/SpeculationReportOctober13.pdf.

**Reference: ['CNBC Transcript: Rex Tillerson, ExxonMobil Chairman & CEO, Speaks with Erin Burnett, March 9, 2011' and 'Senate Finance Committee hearing, May 12, 2011']. For CNBC Transcript follow link: http://www.cnbc.com/id/41947400/CNBC__EXCLUSIVE__CNBC__TRANSCRIPT__REX__TILLERSON__EXXONMOBIL__CHAIRMAN__CEO__SPEAKS__WITH__ERIN__BURNETT__TODAY__ON__CNBC

Senator WYDEN. I'm going to take that as a no. You think these analyses——

Mr. GRUENSPECHT. No, no. I have a feeling that different people who have this discussion are really applying different standards of proof. That's the issue as much as the competition of these different results.

That's my view.

Senator WYDEN. Dr. Yergin.

Mr. YERGIN. Oil prices, natural gasoline prices are both up 20 percent since the U.N. issued its report about Iran's nuclear program. So I would not call it a speculative premium, I'd call it a risk premium or a security premium. But there is a premium that reflects this increased tension and anxiety in the market.

Mr. VERRASTRO. Not surprisingly I agree with both Howard and Dan. I mean, I think that there is a premium in the market over and above finding and development costs. I wouldn't attribute it all to speculation. I would like to see what the studies are and the definitions are really important, Senator.

Mr. HORSNELL. Yes, likewise. It's a no for me. Those studies don't sound or those results don't sound very plausible.

I think part of the evidence of this is if there was a large speculative premium then prices would then be higher than a market price which should mean that we'd be seeing large surfaces building up. People in the fiscal market will be asking for discounts because they want to play the proper fiscal price, not the inflated speculative price. What we actually see in the International Fiscal Market today in Brent, people paying large premiums to get their deliveries accelerated.

It's quite the reverse. There is no global surplus building up and so we have limited spare capacity. We've had 8 straight quarters of global inventories draws.

We finally have a balanced market at this price. So I just think that is, it's incorrect to think in terms of speculative premium.

Senator WYDEN. Let's go to Senator Murkowski.

I just think it's striking, gentlemen, when all 4 of you say that organizations from Goldman Sachs to the CEO of Mobil are off base. We've got to do some more digging on this because I will tell you I don't just operate under the assumption that somebody with a Xerox machine can turn out a study. That ought to be what we make public policy.

But when you have this cross section of groups and individuals representing such a wide array of philosophies saying that there's a significant speculation, you know, premium. That's something that has to be addressed by policymakers.

I gather that Senator Murkowski was here, but she's had a turn, so——

Senator MURKOWSKI. I've had a turn.

Senator WYDEN. Then let's recognize Senator Udall.

Senator UDALL. Thank you, Mr. Chairman and Senator Murkowski, as always, is very gracious.

Gentlemen, this has been informative, enjoyable. I've learned a lot, as I think we all have this morning.

I want to just piggyback on what Senator Wyden just pointed out. That is that we ought to be realistic as policymakers here in

Washington that if we're going to squeeze Iran, that we're going to see a risk premium then build into international oil markets. I think you all agree.

I think it would behoove all of us here when we start to talk about high oil prices and therefore high prices at the pump. We've become outraged. We first ought to say, we've all, for the most part here in Washington said it's in our national security interest to squeeze Iran. As a part of that process we can anticipate gasoline prices are going to rise.

We ought to be straight with the American public that that's in part what's happening. I do think that Senator Cantwell made some good points about the difference between legitimate hedgers and speculators. It would be interesting to try and differentiate between the two.

But in that context I wanted to follow up on what she began to allude to which is international global energy markets. Could you all address how the U.S. could support competitive and open global energy markets? How do we work with the international community so we can reduce the pain at the pump, not just for our citizens, but as Senator Cantwell pointed out, Japan, the Europeans and the Chinese?

I've been pushing the State Department and the USTR to see what they could do to use all options diplomatic and economic to help stabilize prices in that arena. But I'd be curious of your thoughts starting with you, Dr. Gruenspecht, of how we could do that.

Mr. GRUENSPECHT. EIA is not a policy agency, but I will point out that the State Department is establishing for the first time a new bureau of energy at the Assistant Secretary level. I believe that that's an initiative. I think the nominee has been nominated and has actually had his hearing recently.

I think even before that, I think there's been a lot of outreach. In the shale gas area there's been a lot of international outreach done by the Department of Energy and the State Department about sharing technology. There's a lot of interest, a lot of investment in foreign companies, in our horizontal drilling and hydraulic fracturing operations in part because they would like to gain some experience in the tight oil in the United States.

Tight oil has been a big, important game changer leading to some of the increases in production in North Dakota and the Eagle Ford in Texas and some other places as well if that technology becomes more globally available as one would expect happened with shale gas, which began in the United States, and has become global. Maybe tight oil will become global and become an opportunity to really change the supply/demand balance in world oil markets.

So I think there's a lot of opportunity.

Senator UDALL. So exporting our technology——

Mr. GRUENSPECHT. I think exporting our technology and exporting our efficiency technologies, again, because the same thing here to the extent that vehicles are more efficient globally. You know, we're the biggest gasoline market, but there are other markets for gasoline and diesel fuel around the world. Things we can do to disseminate technologies that either increase supply or reduce demand and frankly, both are very, very important.

I know that the State Department and others in the government are very interested in that.

Senator UDALL. Dr. Yergin, I know you've got the answer here.

Mr. YERGIN. Hardly. But I think what you're also talking about is encouraging other countries to have more open markets to investment and to a timely ability to make timely investment. I think that, as your suggesting, as part of our trade agenda, would be a very constructive to this cause that again, gets more supplies into the market and more quickly.

Mr. VERRASTRO. So augmenting what my colleagues have already said, I think there's two additional pieces. When you look at international institutions, I think the use of the IEF, the International Energy Forum and the bilateral arrangements. I actually think that by bringing Saudi Arabia into the G20 it really helped them in the post Libyan conflict.

There was a day in July, it was either end of June or July, when we had a Global Security Forum at CSIS and Mike Froman was on our panel. It was the same day as an OPEC meeting. It was—Minister Al-Naimi described it as the worst OPEC meeting ever. There was concern about the U.S. Government expressing concern that OPEC didn't step up to the table and increase supplies given that Libya was offline.

The Saudis did. I mean, so the hawks in OPEC, Venezuela and Iran looked to increase price not volume. The Saudis actually stepped up and said we want a balanced market, we'll increase supply. So I think we're deluding the impact of OPEC by actually bringing responsible players in the G20.

I do think and Senator Murkowski, I know you've talked about this before, that the IEA sharing arrangement really needs an overhaul in terms of obligations and how we identify stockholding and a bunch of things that we do on a joint basis. How we engage China and India. I mean, unless we make the change that institution is very much in danger of being irrelevant.

Senator UDALL. Dr. Horsnell, do you want to bring an EU perspective to us or a British perspective so to speak?

Mr. HORSNELL. I am not certain I have grounds enough to do that, but on a personal spread, I mean, I think I'll say that there are, as mentioned already, specific circumstances where there is a foreign policy aspect. I've already mentioned perhaps the one that surprises people that the biggest supply interruption today is the situation in South Sudan and Sudan. So again, I'm sure that's something which State is fully aware of that there is a major oil component onto that.

I really think—endorse the comments or working with the IEF working—Howard's team is working with Jody improving the transparency of the global market is always an extremely good thing.

I think one thing I'll say also is the IEA and the role of the IEA I think that has been a drift in recent years for energy policy to become a little unilateral, a little bit bilateral, when clearly multilateral response it will work better to these kinds of aspects. It's been worrying, perhaps a little bit over the course of the last couple of months that the potential effectiveness of some of the levers that are left to control over heated markets might be diluted by this

move toward unilateral, bilateral energy policy when perhaps we should be building up the IEA rather than undermining it at this point.

Mr. YERGIN. If I could add one other thing to follow on that. What Howard says, the U.S. State Department now has an energy bureau. The reason it has an energy bureau is because the U.S. Senate encouraged it to have an energy bureau. That is a difference to have that as a clear component in foreign policy.

Senator UDALL. I'm sure that was driven by Senator Bingaman, Senator Murkowski, who ably lead this committee. I would finally just propose that, to my colleagues, that we could go back to the Murkowski/Bingaman bill that we produced in the last Congress and move it forward. We would see a lot of positive results on this very topic we're discussing today.

Thank you, Mr. Chairman.

Senator WYDEN. Thank you.

Senator Murkowski.

Senator MURKOWSKI. Thank you, Mr. Chairman.

I thank my colleague for the plug there on our energy bill.

Let me ask, this is good discussion here about the role of speculation. I'm going to ask you to speculate just a little bit here. What do you think the response in the market would be if there were a commitment here in this country to bring on a million, two million, barrels a day?

Even if we recognize, OK, it's going to be 5 years before we actually see that out in the market. But a commitment say whether it is an opening of ANWAR, whether it's substantial commitment to additional production. Even though it's not here today, how do you think that impacts the market?

Dr. Gruenspecht.

Mr. GRUENSPECHT. I think it really depends on the amount of oil and the nature of the commitments because a lot of commitments get made.

Senator MURKOWSKI. Let's just assume for discussion sake that it could be a real commitment, a real commitment of a million barrels a day.

Mr. GRUENSPECHT. OK. Over 10 years, I think only modest price impacts would be expected frankly. If supply from drilling in one area, like the United States is offset by reductions in supply from other parts of the world which could happen or if demand is relatively more responsive to changes in supply, that is, demand is more price responsive over a longer time period.

So in the short run the million barrels tomorrow is a different thing than a million barrels 10 years from now, both in terms of offsetting supply responses and in terms of the demand response.

Senator MURKOWSKI. So you're going to have a modest impact on prices today?

Mr. GRUENSPECHT. Modest impact on prices, but again, a lot of economic, environmental and geopolitical benefits. I mean, those are the things that I think you could be more confident of.

Senator MURKOWSKI. What about the rest?

Dr. Yergin.

Mr. YERGIN. I think we can, you know, looking over the imbroglio with Iran right now. I think you can sort of see a change in expec-

tations in the market already occurring among other countries and participants in the market as they see the U.S. instead of being in this inevitable decline is on an upsurge and it's demand going down. So I think it's there.

So to use a variant on what Paul Horsnell said, I think it would re-anchor longer term expectations. Obviously it's not—it has to be credible and people have to see it coming. But I think even now things that can increase the sense of confidence.

What we need and this goes back to Senator Wyden's question about why is this premium there? If there's a greater sense of confidence and it can come from many different directions, it is an ingredient that would be even helpful in the short term.

Senator MURKOWSKI. Yup.

Mr. Verrastro.

Mr. VERRASTRO. So I guess I am more in line with Howard's comments. Dan's comments are very well advanced. I think that the value add here is especially as we move into the unconventionals since we're doing it first.

If the U.S. can demonstrate that they can get it right in terms of both shale gas and tight oil production, it has huge implications throughout the globe. Then if you're looking at a global supply/demand balance you can increase volumes by huge numbers.

I guess though that the next piece is this kind of great dilemma idea. It's just like what do we want to be when we increase. I know the environmental community gets very upset when you talk about 200 years of natural gas because if you're looking to move to a lower carbon economy that delays that reckoning date.

There was some sense of, in terms of the narrative being consistent, that if you on the path to a cleaner fuel economy because you were running out prices were getting higher and volatility was increasing. That gave you additional impetus. If now you're sitting on a vast and abundant resource and you develop it, you extend, which I think probably needs to be extended.

But you extend the life of conventional fuels. They're cleaner. They're safer. But they go on longer.

In my mind that actually gives us breathing space to figure out the next step because we're not there yet.

Senator MURKOWSKI. Dr. Horsnell, I'm going to ask you a more specific question, if I may. This is my last. But I wanted to ask that one because as we talk about to the potential for ANWAR, the push back that we get on it as well.

It's not going to have any impact because you won't be able to see production on line for a period of 8, 10 years under a best case scenario. So therefore just don't even start. I don't accept that logic. I do think that it does help to bring exactly the confidence that Dr. Yergin has mentioned here.

Dr. Horsnell, the last question for you is if you can share with us a little bit of the experience that Great Britain had a couple years ago faced with high gas prices. They made a decision to increase their taxes, quite dramatically. We just came from a vote that would attempt to basically do the same, effectively increase the taxes on the oil and gas industry.

You've now reversed that position because it's my understanding that in the 2-years since the increase in taxes, what you have seen

is a tripling of the decline in production in the UK in these past 2 years. So you're reversing that. Can you just speak to the experience there and what led to the decision to impose the taxes and now to reverse those?

Mr. HORSNELL. Yes. That's a very good question. I think it is fair to say that the tax increase was greeted by the industry with a certain amount of shock, not only just because of it was a tax increase, but also because it made the whole fiscal regime somewhat unstable.

It was a surprise. It was industry making some very long term decisions on how to exploit the declining phase of the North Sea and then finding that the fiscal regimes bounced around. It certainly meant that in the occasional polls where people are asked, you know, what's the most dangerous or what's the best place to invest? What's the worst place to invest?

I think the government may, of course, be surprised to see the UK was pretty close to the top as being a bad place to invest. The political stability was being undermined by some of that fiscal instability.

Senator MURKOWSKI. So in other words in a country like the United Kingdom you were stacked up against other Nations like Angola and saying you are a bad investment opportunity?

Mr. HORSNELL. Yes. Again it shows the—of the investment in the North Sea is very much that one of that enhanced oil recovery in making the best of the last stage. But it did appear that the capital could be more effectively employed elsewhere and really to sort of stem the prospects of any migration of capital to make sure that the tail in the North Sea continues. That was part of the reversal running through.

Again, I'm not an expert on UK tax. But in terms of the broad sweep of what's happened there I think the instability of the tax regime was something which did impact on the flow of that investment.

Senator MURKOWSKI. Thank you. I appreciate the fact that you have come all the way to be part of the testimony this morning. Very credible panel. You have certainly enhanced that credibility. We appreciate that.

Thank you, Mr. Chairman.

Senator WYDEN. Thank you, Senator Murkowski.

Gentlemen, let me leave you with one other kind of thought. Because I know, not just this committee, but others in this country are going to ask your opinion about some of the policies that we're going to have to address in the days ahead. I sort of, start this judgment and come to the hearing to offer up the idea that to get good public policy you've got to get your arms around at least some common ground on the facts.

You may not get everybody to agree on every aspect of the factual situation. But you've got to find some ways to get to common ground on some of these key facts. In particular I serve on the Intelligence Committee, for example, and I certainly share the judgment that Iran is part of this whole debate. There's no question about this.

But I will tell you I'm very reluctant to accept the idea that all of the risk is the situation in Iran. That's, to a great extent, where

you all have guided much of this discussion. You look, for example, at the fact that Goldman Sachs practically invented the commodity index fund. I mean, these are people who know a lot about the impact of non-commercial investment.

These are people who have played an enormous role in this sector. They produced an analysis suggesting that the speculative premium on crude oil could be $23 a barrel or 56 cents a gallon at the pump. You have the CEO of the largest, you know, oil company stating that speculation had increased the price of a barrel of oil by $20.

So these are significant judgments. I hope that as we go forward we can continue to have this discussion. I understood that a number of you said that you hadn't had a chance to look thoroughly at these studies. I respect that.

But I hope that you will. I would very much personally like to have your judgments with respect to whether you think those analyses are wrong. I just want you to know as somebody who has been on this committee for quite some time, I'm prepared to accept the proposition based on my work here and on the Intelligence Committee that the situation in Iran is certainly a part of this calculus.

But I don't buy the theory that this is the entire concern that we're dealing with. I hope that you will take a look at those studies because it was the fact that there were 3 of them and certainly by two sources with considerable expertise in industry activities.

One, the Consumer Federation advocates for consumers but they do a good job of getting the facts and doing their homework. The fact that all 3 of them reached this judgment, to me, has got to be a significant part of this debate as we try to at least see if we can find some common ground to make policies. I'm prepared, as part of that effort, to make policy to acknowledge there's no question that the situation in Iran is part of the debate.

Dr. Yergin, your colleague got his hand up first. But we're happy to hear from both of you.

Mr. GRUENSPECHT. I just want to say that the EIA is very interested in this topic. In 2009 we launched the Energy and Financial Markets Initiative, precisely with the aim of assessing the influences of financial activities and market speculation, hedging on prices, as well as how traditional fundamentals work.

We've produced a website, Energy and Financial Markets. What drives crude oil prices? We certainly discuss the role of futures trading and we are very interested in increasing the evidence, the body of evidence, so to speak.

We update that website on a monthly basis. We've brought together many of the leading researchers in the area. I know there's a paper by Professor Singleton, actually a former colleague of mine that when I was at Carnegie Mellon, he's now in California.

We brought him in. We brought the CFTC over. We are working with them. We've held a couple of workshops.

We need to improve our understanding of physical and financial market linkages. We want to continue to collaborate with other Federal agencies to improve both the data in this area which is a lot of our mission and the analysis in the area. This is a serious commitment by EIA.

I know that the, I guess the nominee to be the Administrator of EIA has been before this committee recently. He's very interested in and has great expertise in this area. I think it will help us get more traction in this area.

Given the standard of proof that people apply does vary, what's important is to get more evidence. That's where EIA's role should be.

Thank you.

Senator WYDEN. Dr. Yergin.

Mr. YERGIN. I think that the financialization of commodity markets which you're describing has really been quite marked since 2005. So it is really important to understand it. It affects the oil market.

I think in terms of facts on the ground I think there's a general agreement that there's a premium. It's kind of what's driving the premium. Just want to say it isn't all Iran.

I mean what is unique about this situation with Iran, it's not only the tension. But it's that the policy of the U.S. Government, the policy of Europe is to drive down Iranian oil in the market. Drive a million, maybe more, barrels out of the market in a very tight market.

So the second factor is that we have a very tight market anyway that it does in its tightness remind me of 2005. It reminds me of the eve of the 1973 oil crisis. It's kind of that tight.

We were using a number of 750,000 barrels a day of other outages. I noticed Paul's number is even higher, closer to a million barrels a day of sort of above average. So it's Iran, but it's also and the concerns there and the focus of policy of what's going to start happening before or after the end of June.

But on the other hand it's also that this is all occurring in a rather tight market to begin with. So that's certainly part of it.

Senator WYDEN. There's never been a time when Dr. Yergin didn't highlight additional issues in my judgment on this question. Without keeping you here all afternoon, I'd just note that Saudi Arabia has 2.5 million barrels a day of capacity. They're now engaged in a major drilling program to expand their capacity.

Reuters is reporting now of 140 drill rigs operating in Saudi Arabia. So this conversation is obviously going to be continued on the question of capacity, on the question of Iran, on the question of speculation. But I want the 4 of you to walk out of here with a request from me that I would be very appreciative if you would analyze those 3 studies, the Goldman Sachs analysis, the Consumer Federation of America and we can certainly get you the testimony that led the Exxon Mobil CEO to offer the judgment of speculation that increased the price of a barrel of oil by $20.

I would like to hear from you four, recognized authorities in the field whether you think those 3 studies are off base because I'm stipulating to the fact that I think Iran is a factor. I stipulate trying to follow, almost daily, what's happening in the capacity area. But it is hard to walk away from these judgments from 3 people who have spent a considerable amount of time, all of whom, concluding there is a significant speculation premium.

So the door is going to be open to you. I would be very interested in your reaction.

[The information referred to follows:]

EIA is working hard to improve understanding of the determinants of oil prices, including both physical and financial factors, through the Energy and Financial Markets Initiative that was launched in September 2009. That initiative seeks to assess the influences of financial activities and markets, such as speculation, hedging, investment, and exchange rates on energy price movements in addition to EIA's traditional coverage of physical fundamentals such as energy consumption, inventories, spare production capacity and geopolitical risks. In addition to developing a website feature "Energy and Financial Markets: What Drives Crude Oil Prices?," which among other material presents data on correlations between oil prices, other commodities, and financial instruments and is updated on a monthly basis, EIA has also brought together many of the leading experts in the area of oil price formation for a workshop in August 2011 (with another planned for this summer) to improve our understanding of physical and financial market linkages. We will be continuing our collaboration with other federal agencies and market participants to improve data and analysis in this area.

As discussed in greater detail below, the three studies you reference that directly or tangentially consider the effects of futures markets transactions on physical oil prices are fairly limited and quite inconclusive. My observation during the hearing—that differing assessments of the role of oil futures speculation in price formation often turn to a significant extent on the standard of proof that is used—still seems relevant.

Committee staff has indicated that your request regarding the Goldman Sachs analysis concerns a statement from the March 21, 2011 edition of the Goldman Sachs Energy Weekly that reads as follows: "We estimate that each million barrels of net speculative length tends to add 8 to 10 cents to the price of a barrel of oil." I would offer the following observations:

- EIA is not sure what calculation underlies this statement, but it appears that the cited relationship may reflect a simple linear regression between weekly changes in money manager positions reported by the Commodity Futures Trading Commission (CFTC) Commitment of Traders (COT) report and the front month futures price for West Texas Intermediate (WTI) crude oil.
- The existence of an empirical relationship between prices and a measure of net speculative length over a given period does not speak directly to causality. In this regard, some current research by experts suggests that it is more likely that traders and investors respond to oil price movements rather than the reverse. Parties identified as producers or consumers in COT reports may also be engaged in speculative activity. That is, the categorization of traders used in the COT reports may not reflect the actual motivation for individual trades.
- Some analysts, including Goldman Sachs, have also noted that speculative length in oil tends to move with leading economic indicators and also that changes in speculative length can be used to assess "what the market is pricing in" at a particular point in time.
- As noted by both Committee members and witnesses in previous hearings, a large share of energy derivatives trading occurs outside of exchanges and is not reflected in the CFTC COT position data. While the price of exchange-traded contracts should be representative of prices in the broader market given the opportunity for arbitrage, the extent to which measures of net speculative length in the broader market track the measure for exchange-traded contracts is unknown.

Rex Tillerson, the CEO of ExxonMobil, was asked at a May 2011 hearing of the Senate Finance Committee what the oil price might be if it were based on the fundamentals of just supply and demand. His response referenced a purely economic approach in which competition drives the price to the cost of developing the next marginal barrel. He identified that cost as falling in the $60 to $70 per barrel range. Responding to a question regarding the role of futures markets, Mr. Tillerson noted that the market operates by considering a whole range of things it worries about and then translates that back to a price today. I would offer the following observations:

- The model of perfect competition in economic textbooks referenced by Mr. Tillerson does not reflect the situation in current world oil markets, where key member countries of the Organization of the Petroleum Exporting Countries (OPEC) exercise significant market power. In particular, global resources are generally not developed in marginal cost order, as certain OPEC member countries hold undeveloped high-quality resources that could be developed at a significantly lower cost than resources being developed in other countries. Re-

source development decisions are also significantly influenced by tax and production sharing policies and legal regimes that vary significantly across countries.

- The fact that oil resource development is not governed by the textbook competitive model of a resource-extraction industry creates significant risk to developers of high cost oil resources and alternatives to oil. I would not expect that companies would use the current price of oil, about $120 per barrel for light sweet crude oil with ready access to waterborne transport, as the cost threshold for decision making regarding new oil development or alternative fuel projects. Rather, I would expect that they would want their projects to meet their investment return criteria even if the actual oil price were well below the present level. The application of lower oil prices in "stress testing" new projects reflects past experience with oil price variability and the recognition that changes in economic conditions, technology, or the policies of key OPEC producers could significantly impact prices that might prevail by the time a development project that could require a decade or more to reach fruition begins to produce.
- Both supply and demand are relatively unresponsive to price movements in the short-term. This means that modest shifts in demand functions, including those attributed to strong economic growth particularly in developing countries, or in supply functions, which can arise from geopolitical events, disasters, and other causes, can require relatively large price adjustments to restore market balance. Very inelastic supply and demand may provide an opportunity for non-fundamental factors to play a significant role in price formation in the short term. For example, spreads between futures contracts with different delivery dates could create a profitable opportunity to accept physical delivery as part of an arbitrage strategy, resulting in higher demand that, in the face of inelastic supply, puts upward pressure on spot prices.
- Over an extended period of time, both supply and demand are likely to be much more responsive to price changes than they are over a short time period. For this reason, supply and demand adjustments may be more effective in bounding prices over a period of decades than they are over a short time span.

The paper by the Consumer Federation of America (CFA) argues from a number of different perspectives, including discussion of the statements by Goldman Sachs and Mr. Tillerson of ExxonMobil discussed above. It also presents some empirical relationships. I would offer the following observations:

- The CFA paper uses a limited number of fundamental crude oil variables to arrive at its estimation of a price that excludes oil futures trading, and then attributes the difference between the estimated price and the actual price as due to futures trading.
- All of the variables presented focus solely on crude oil production and inventories, ignoring world demand for petroleum products. Over the last decade, the increased demand for crude oil to produce petroleum products, especially from emerging market economies, is a very important factor that should be included in any analysis of crude oil prices.
- The CFA paper uses global finding costs and reserve-to-production ratios, but does not take into account differences in the behavior of OPEC and non-OPEC producers, which as already noted appear to exert a significant effect on world oil markets.

Returning to the "bottom line" question, it is clear for the reasons outlined above and others that measuring the effect of trading in oil futures and options markets on the price of oil is a challenging task. While the two statements and the paper you referred to address important questions that merit close attention from EIA and other energy market analysts, they are far from conclusive in quantifying how futures markets transactions have impacted oil prices.

Gentlemen, if you have something you feel strongly about I'll let you offer it. Otherwise I think we've got to wrap this up. Would either of you like to?

Mr. HORSNELL. Yes, I mean, just on that point. Look, personally I'll be very happy to look at all 3 of those organizations on that point.

Senator WYDEN. Good.

Mr. HORSNELL. Cause I believe they are wrong. But I wouldn't like you to——

Senator WYDEN. I got the drift on that.

[Laughter.]

Mr. HORSNELL. I wouldn't like you to have the impression that those views represent the majority of views or the consensus among oil analysts. It's very much a minority view. I think it's an incorrect view based on faulty analysis.

Senator WYDEN. That's why you are being welcome to show us why people like Goldman Sachs are wrong.

Alright. Gentlemen, we thank you. You've been very patient through a morning that's been hectic even by Senate standards. With that the Energy committee is adjourned.

Let me also say for the information of all members, all questions and additional statements for today's hearing are due by 5 p.m. tomorrow, March 30.

We are adjourned.

[Whereupon, at 12:05 p.m. the hearing was adjourned.]

APPENDIXES

APPENDIX I

Responses to Additional Questions

RESPONSE OF HOWARD GRUENSPECHT TO QUESTION FROM SENATOR BINGAMAN

Question 1. Senator Coons (at the 116 minute mark), cited a report from DBL investors that 94.6% of federal subsidies over the last century have gone to oil and gas production, and nuclear energy. He then asked Dr. Yergin if that data suggested anything to him about what the federal government's path forward should be given its pursuit of an "all of the of the above" energy strategy and move away from high gasoline prices. Dr. Yergin deferred to Dr. Gruenspecht, mentioning that EIA had conducted a study that had reached a much different conclusion.

The report to which Dr. Yergin referred was published by EIA on August 1, 2011 and entitled "Direct Federal Financial Interventions and Subsidies in Energy in Fiscal Year 2010." As I understand it, the EIA report is much more limited in scope than the DBL Investors report because it only focuses on one year of federal support for energy. Further, the year on which it focuses, 2010, contains significant "one-time" spending on energy as a result of the Recovery Act. As a result this "snapshot" data appears to me to be not at all representative of historical U.S. energy policy.

Dr. Gruenspecht, do you view 2010 as an anomaly or the norm (in the context of the past century) in terms of federal spending on renewable energy and biofuels production? Can you offer EIA's assumptions about federal spending on renewable energy and advanced biofuels in the current Annual Energy Outlook? Are these projected to increase or decrease? By how much? How will that affect the deployment of renewable energy systems and the availability of advanced biofuels?

Answer. EIA's report, "Direct Federal Financial Interventions and Subsidies in Energy in Fiscal Year 2010," indicated that many federal provisions will sunset soon, which makes 2010 an unusual year in the context of the past several decades. Measuring federal support to various forms of energy can be significantly affected by the criteria used to identify subsidies and the time horizon one chooses. EIA's study provided a snapshot for the FY2010 and was "limited to subsidies that are provided by the federal government, provide a financial benefit with an identifiable federal budget impact, and are specifically targeted at energy markets."

The report identified the unusual number of relatively recent Congressional actions that increased subsidies in some areas, "A key factor in the increased support for conservation programs, end-use technologies and renewables was the passage of several pieces of legislation responding to the recent financial crisis and subsequent economic downturn, particularly the American Recovery and Reinvestment Act of 2009 (ARRA) and the Energy Improvement and Extension Act (EIEA). Some of the ARRA-related programs that account for a large portion of the growth in subsidies and support between FY 2007 and FY 2010 (Table ES2) are temporary and the subsidies associated with them are scheduled to phase out over the next few years (see "Energy Provisions Included in Legislation Responding to the Recent Financial Crisis"). Other recent legislation impacting energy subsidies included the Food, Conservation, and Energy Act of 2008, which provided significant new subsidies to biofuels (primarily ethanol and biodiesel) producers, and the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010, which extended the sunset dates for several tax expenditure programs, as well as the grant program for qualifying renewables."

EIA's Annual Energy Outlook 2012 (AEO2012), makes projections assuming that statutory provisions affecting energy production terminate on their scheduled sunset dates. This approach enables EIA's Reference case to be used as a baseline for anal-

yses that consider the effect of changes to current laws and policies. In particular, blending tax credits for most biofuels end in 2011, the production tax credits for wind expires in 2012, and credits for other renewable sources end in 2013, resulting in a significant change in the rate of renewable power builds, particularly wind power. For biofuels, the expiration of blending tax credits does not significantly alter projected biofuels production since increasing biofuels use is still mandated by the federal renewable fuel standard.

The AEO2012 Early Release reference case forecasts that the share of U.S. electricity generation coming from renewable fuels (including conventional hydropower) will increase from 10 percent in 2010 to 16 percent in 2035. This increase in generation is expected to be led by non-hydro renewables. Similarly, liquid biofuels are expected to increase from 1 percent of domestic energy consumption in 2010 to 4 percent of domestic energy consumption in 2035. The outlook for cellulosic biofuels has become less optimistic: "Although liquids production from many sources is higher in AEO2012 than was projected in the AEO2011 Reference case, production of advanced cellulosic biofuels is lower. Over the past three consecutive years, production goals for cellulosic ethanol in the EISA2007 RFS have not been achieved. While EIA has projected a need for waivers in all Reference case projections since the passage of the EISA2007 RFS, EIA's view of technology development and market penetration rates for cellulosic biofuel technologies has grown somewhat more pessimistic in AEO2012."

Responses of Howard Gruenspecht to Questions From Senator Cantwell

OIL COMPANY PROFITS

From 2003 to 2008, oil revenues for the top five oil companies increased by 86 percent while profits increased by 66 percent. Yet oil output by the five major oil companies over this same time period declined by more than 7 percent, from 9.85 million to 9.12 million barrels per day. These additional profits were not earned as a result of additional production effort on the part of the oil companies but due almost entirely to the record crude oil prices, which are set in the world oil marketplace.

Combined, it's been literally a trillion-dollar decade for the oil and gas giants. From 2002 to 2011, ExxonMobil gained $310 billion, Shell $204 billion, Chevron $152 billion and BP $147 billion—despite its loss year because of the 2010 Gulf of Mexico oil spill. As the price of oil rose, company revenues and profits soared with ExxonMobil eventually becoming the most profitable corporation in the history of American industry.

That's a really good return for an era of volatile, but significantly lower oil prices than we are seeing today and are likely to see in the future.

Question 1a. Given that the 5 major oil companies made over a trillion dollars in profits over the last decade—and that's profits, not revenues—and their cost of production is still around $11 per barrel, what do you estimate their profits will total over the next decade?

Answer. EIA does not estimate oil company profits. As your question suggests, profits are sensitive to oil prices, but many of the major oil companies also have extensive refinery operations and have a diversified portfolio, including natural gas. Developments affecting those markets, as well as the costs of upstream and downstream operations and the terms of production sharing agreements and other contractual arrangements between resource-owing countries and major oil companies are other key factors that will drive future profits.

Question 1b. And when it comes to gas prices, many of my constituents complain about oil company profits. From an oil producer's perspective, how much profit is there in each gallon of $4 gas?

Answer. The price of crude oil directly affects oil producers' profits and returns to owners of oil resources. There are times when the wholesale price of gasoline falls below the price of various crude oils, and oil producers and resource owners still receive the price of crude oil for revenue. Refinery profits are generated from product revenues less crude oil costs and other feedstock, energy use, and operating costs. As indicated in my testimony, the high price for gasoline stems mainly from the high price for crude oil, not refining profits.

One misconception about oil industry profitability is that high profits in the upstream portion of the business (e.g., crude oil production) subsidize the downstream refining and marketing sectors. Within the United States (U.S.), about 45 percent of refining capacity is run by companies that are independent of any upstream business (e.g., Valero), about 40 percent is operated by integrated oil and gas companies (e.g., ExxonMobil), and the remaining 15 percent is associated with joint ventures

(e.g., Motiva, a joint venture between Shell and Saudi Arabia Refining Inc.). After ConocoPhillips finishes splitting its company into two separate companies (one that produces oil and one that refines and markets products), only 30 percent of refining capacity will be associated with integrated companies and 55 percent will be operated by independent refiners. That is, most U.S. refining capacity must survive financially on its own. However, even within integrated companies, refining and marketing are run as independent businesses from the upstream business.

Question 1c. The tightening supply of oil and reduced spare capacity has been cited as the major driver for today's price increases. Based off our experience of rising oil prices from 2003 to 2008, how will this market adjust to this tightening supply?

Answer. Between 2003 and 2008 total world liquid fuels consumption increased by an average 1.1 million barrels per day (bbl/d) each year, with China accounting for 41 percent of the increase. During this 5-year period total production from non-OPEC countries increased by an average of only 0.18 million bbl/d, compared with an average annual growth of 0.77 million bbl/d over the previous 5 years. Consequently, a greater reliance was put on OPEC-member countries to increase production, which contributed to a decline in surplus crude oil production capacity from an estimated average of 5.4 million bbl/d in 2002 to 1.4 million bbl/d in 2008. This trend contributed to rising crude oil prices.

Higher prices motivate consumers to consume less and competitive producers to produce more. We have already seen a consumption response in the United States with total liquid fuels consumption falling from a high of 20.8 million bbl/d in 2005 to 18.8 million bbl/d in 2011 even as total U.S. population and real GDP increased over this period by 5.7 percent and 5.5 percent, respectively. For example, households are driving less, mass transit ridership is up, and the fuel economy of new vehicles has improved significantly.

We have also seen a response by firms to increase production through new technology and drilling activity, although as discussed above, activity now results in production later. For example, according to Baker-Hughes the number of rigs drilling for oil in the United States averaged 200 in 2005. On April 5, 2012 there were 1,329 rigs drilling for oil. In addition, during 2005 only about 13 percent of the rigs were drilling horizontal wells. By 2012 the share of horizontal rigs, which allow firms to maximize production from tight oil and gas formations, had increased to 59 percent. As a result of past activity, EIA expects that total production by non-OPEC countries will increase by 0.85 million bbl/d in 2012, compared with an increase of 0.04 million bbl/d in 2011.

However, the lead time required to develop and drill new resources can be lengthy, particularly offshore. Consequently, the market's response to unexpected supply disruptions can be limited and dependent on readily-accessible supplies, such as surplus crude oil production capacity, which is held only by OPEC member countries. In the April 2012 Short-Term Energy Outlook, EIA projects OPEC surplus crude oil production capacity to increase slowly from an estimated 2.5 million bbl/d in March 2012 to 3.7 million bbl/d at the end of 2013. This is due to OPEC member countries increasing their production capacity, non-OPEC supply growth, and the recovery of production in countries currently experiencing supply disruptions, such as Libya, Syria, Yemen, and Sudan/South Sudan.

Question 1d. Because oil companies enjoyed greater profits while producing less oil when prices increased from 2003-2008, what incentive exists for these companies to produce more in response to a tightening market?

Answer. At 9.12 million barrels per day, the total production of the five largest investor-owned oil companies in 2008 was less than 11% of the world's total production of liquid fuels. Because each company has such a small share of the total market, they are much better off producing more oil even if the incremental production causes a small decline in the world oil price.

There are several reasons why international oil company production can decline even as oil prices rise. Most of the oil produced by the largest oil companies is produced overseas under "production sharing agreements" (PSA), which are contracts with foreign governments that specify the government and company production shares under different oil prices. PSAs are designed to increase the foreign government's share of total production—and to reduce the international oil company's share—as oil prices rise. Even if total oil production from an overseas oil field is growing, under the terms of a PSA, the international oil company's share of production from that field can decline if rising oil prices reduces the company's share of the total production.

Depletion and restricted access are also reasons why international oil production might decline even as oil prices increase. Typically, large, low-cost oil fields are discovered and developed first; with smaller, more difficult, and/or more costly pros-

pects being developed later in an oil province's production history. The depletion of low-cost oil fields can cause production in an oil province to decline even as oil prices rise. Finally, international oil company production can decline even as prices rise and world oil production increases because the investor-owned companies do not have commercial access to many of the most prolific oil regions in the world.

ALTERNATIVE FUELS PROVIDE COMPETITION AT THE PUMP, LOWERING GAS PRICES

While I appreciate the expert testimony that I think has been helpful in understanding the current dynamics of world oil markets, I am more interested in real solutions that will lower prices at the pump. That's what my constituents care about and probably what every American family and business cares about. We know that no amount of domestic oil drilling is going to change the world price of oil. AP's recent analysis of the last 36 years of data shows there is no statistical correlation between how much oil comes out of U.S. wells and the price at the pump. Similarly, the EIA found that even the most comprehensive domestic drilling proposals would only decrease gasoline prices by 3 to 5 cents—and not until 2030. But I think there is less awareness that broadening fuel choices can harness the power of free market competition to keep a lid of gasoline prices and the price volatility that keeps hammering our economy. Simply put, we need to prioritize ways to end the monopoly that oil has over our transportation system. Alternative fuels, such as methanol and ethanol, can compete within an open market. These fuels can be produced from domestic energy resources available in every state—including natural gas, agricultural waste, energy crops, and even trash—often for less than the price of gasoline.

That finding is clear in the experience Brazil has had with flex fuel vehicles (FFVs). In 2008—as the U.S. and most of the world was over a barrel with no alternative to $147 oil—90 percent of the vehicles on the road in Brazil were FFVs. These were vehicles, many made by American car manufacturers, capable of burning blends ranging from 100 percent gasoline to 100 percent alcohol. When prices spiked, Brazilians made the obvious choice and simply bought more of their domestically-produced biofuel than gasoline, which was as much as three times the price of alcohol. It only costs around $100 or less to manufacture a flex fuel capable vehicle, an investment that will quickly be recouped by savings at the gas pump.

Methanol could be the key to breaking oil's monopoly over the transportation system and our foreign oil dependence. That's because methanol is easily produced from America's abundant new natural gas supplies at the equivalent of $3 per gallon. It can also be produced from other domestic resources such as coal and biomass, which could keep hundreds of billions of dollars in the American economy rather than enriching foreign treasuries. Methanol capable vehicles were first produced in the United States in 1980s and are broadly available on the Chinese market today. This investment is also an important insurance policy against future oil price spikes likely in response to international events like Iran shutting down the Strait of Hormuz.

The U.S. Energy Security Counci—the highest level non-governmental group ever assembled to address our nation's urgent energy challenges—believe an Open Fuels Standard is the simplest, least-cost approach for reducing the strategic importance of oil, and the corresponding liability of gasoline price spikes that wreak havoc on our economy and American family budgets. In fact, this Council—a bipartisan group of former cabinet Secretaries, Senators, oil company and Fortune 500 CEOs—said that making new cars capable of running on alternative fuels was the single most important thing Congress can do to have a lasting impact on America's energy security.

So I would like to know what would happen if millions of gallons of alternatives to petroleum became available and effectively ended the monopoly oil has on our nation's transportation system.

Question 2a. Let's say that 20 to 30 percent of our nation's petroleum demand could be replaced with alternative fuels such as methanol derived from natural gas or ethanol from non-food biomass at prices less than the current price of gasoline, what impact do you think that would have on overall gasoline prices?

Answer. A scenario in which 20 to 30 percent of U.S. petroleum demand could be replaced by alternative fuels that could be profitably produced and sold at prices below the price of gasoline in energy equivalent terms, if realized, could exert significant downward pressure on both crude oil and gasoline prices. If comparable penetration of such fuels could also be achieved in foreign markets for motor fuels would also increase downward pressure on prices. An important factor in considering the posited scenario involves the extent to which alternative fuels are compatible with existing vehicles and infrastructure.

Question 2b. Do you think that having competing fuels at the gas pump would help lower prices because consumers can switch between fuels?

Answer. Given the uncertainties associated with global fuel markets, if significant long term growth in economically competitive alternative fuel consumption were achieved, a large displacement of crude oil could result in a material reduction in the prices of petroleum based transportation fuels. An increase in the price-responsiveness of demand for petroleum-based motor fuels could also reduce the size of the change in the oil price needed to restore market balance in the wake of a shock affecting oil supply or demand.

Question 2c. How do continued elevated oil prices, say any level above $80 a barrel, make petroleum alternatives more competitive?

Answer. High oil prices allow petroleum alternatives to sell for a higher price than they would under low oil prices, which provide a potential market opportunity for certain higher cost alternatives to become economically viable. Absent policy initiatives, alternative fuels must compete against the wholesale cost of the fuel they displace. Crude oil has generally made up the overwhelming majority of the wholesale gasoline price. In 2010 the annual WTI spot price was $79.48 per barrel (or about $1.90 a gallon) and wholesale gasoline in New York Harbor was available for an average of $2.10 per gallon. However as mentioned in the first part of the question, alcohols must generally now compete on an energy equivalent basis as additional volumes must be added for high-level blends (e.g., E-85). To be competitive with retail regular gasoline at $2.00 a gallon in a high-level blend; ethanol and methanol would need to be available for $1.35 a gallon and $1.03 a gallon, respectively.

FUTURE OIL PRICES

Question 3a. My take aways from the witnesses today is that the era of cheap oil over, and world demand, particularly in developing countries, is ready to take off. That makes sense because the reality is the world today is overly dependent on the giant, conventional oil fields discovered back in the 1950s and 1960s. The chief economist for the International Energy Agency was very direct on this point in an interview in October 2010. He said,

> "The era of cheap oil is over. Each barrel oil that will come to market in the future will be much more difficult to produce and therefore more expensive. We all—governments, industry, and consumers—should be prepared for oil prices being much higher than several years ago."

Yes, it's true that we can find more oil if we drill deeper and deeper and in waters farther away from land. We can also squeeze more oil out of more tar sands or shale. But all those options greatly increase costs and environmental impacts. It is important to note that this supply crunch happens at the very same time world oil demand is expected to increase rapidly. According to the International Energy Agency, not only will world oil demand grow by 25 percent by 2030, but 93 percent of new demand will come from non-OECD countries—mainly China and India. So not only will there be more people demanding access to a shrinking, limited supply of oil, we'll now be fighting with China and India who can now afford to bid against us for this finite and currently irreplaceable resource.

Even a top Saudi Arabian energy official recently expressed serious concern that world oil demand could peak in the next decade which explained why they were working to diversify their country's economic base. If the Saudi government is talking about diversifying, I think that should be a wakeup call for all of us: we need to be figuring out how we diversify A.S.A.P.

The price of a barrel of oil is roughly the same as the price at the beginning of 2008. And today's national average price of gasoline is only 20 cents below its highest ever in the summer of 2008 when oil reached almost $150 per barrel. Yet few would say our economy is quite as robust now as it was then.

I would be interested in hearing what the panelists would estimate the price of oil to be today, given all the new economic and geopolitical factors, if our economy was firing on all cylinders again?

Answer. Recent experience demonstrates that world oil prices can be extremely volatile, and it is very difficult, even in the short-term, to estimate the sensitivity of world oil prices to an individual factor, such as U.S. economic growth. Global economic growth is likely to be a more important influence on oil demand than growth in the U.S. economy alone. However, the price of oil is affected by numerous factors that occur on a global basis and there is a very wide range of uncertainty about the future probability of occurrence and values of many of these factors.

As reported in EIA's Short-Term Energy Outlook for April, the 95% confidence interval for January 2013 oil prices (WTI) ranges from $68 to $164 per barrel. The upper and lower bounds of this range are estimated using the market prices of WTI call and put options, and the breadth of the 95% confidence interval reflects the high uncertainty among market participants about the future values of a number of factors that significantly affect oil prices

Question 3b. I think we are only a few years from the whole world being back to 2008 levels of growth or beyond. What will that mean for world oil prices within the next five years?

Answer. In 2008, oil prices reached a high of $145 per barrel in July (daily spot price in nominal dollars) and a low of $30 per barrel in December of that year as the global recession substantially dampened demand. Improving economic conditions, especially in the developing economies, largely supported continuing oil price increases from 2009 and into 2011. Continuing unrest in many oil-supplying nations of the Middle East and North Africa has helped to keep oil prices high into 2012.

Because so many different factors affect oil prices and there is such great uncertainty regarding the future value of those factors, it is not possible to state definitely how one of those factors will affect future oil prices. Recognizing the uncertainty in long-term oil prices, EIA presents three price paths in its long-term energy outlooks that span a very wide range of potential prices (and still do not encompass all possibilities). The 2020 oil price assumptions in the International Energy Outlook 2011 vary from $51 per barrel to $186 per barrel (real 2010 dollars). These price paths represent possible scenarios that vary expectations about world oil demand and decision-making by key OPEC member countries with access to high-quality oil resources. These factors, in addition to the economics of non-OPEC conventional liquids supply and the unconventional liquids supply in both OPEC and non-OPEC regions, will all play a role in determining future oil prices.

Question 3c. Is it safe to say that the era of cheap oil is over? Will the average price of oil be over $100 for the foreseeable future, unless we have another economic collapse like the one in 2008?

Answer. Many analysts expect rising demand for oil in the developing world to push crude oil prices higher in real terms over the coming years. EIA's Annual Energy Outlook Early Release Reference case, projects the price of light sweet crude oil at Cushing, Oklahoma in real 2010 dollars will rise to $120 per barrel by 2016 and then steadily increase to $145 per barrel by 2035. However, past experience suggests that analysts should be humble in making long-term price projections, which are highly uncertain. There is always a possibility of surprises in alternative fuel technologies, in identifying new sources of traditional fuels, as has recently occurred in natural gas markets with the advent of shale gas, or in production policies adopted by OPEC member countries with access to high quality resources that can be developed at relatively low cost. Therefore, I think it would be unwise to completely rule out the possibility that annual average oil prices would fall below $100 absent an economic collapse.

RESPONSE OF HOWARD GRUENSPECHT TO QUESTION FROM SENATOR LANDRIEU

Question 1. Dr. Gruenspecht, your study—Potential Impacts of Reductions in Refinery Activity on Northeast Petroleum Product Markets—has been widely cited since its release in February. One issue that has received attention is EIA's contention that American domestic tank vessel capacity might be in "short supply" if another Northeast refinery closes and more product must move from the Gulf to the Northeast. I understand that three weeks ago you learned that EIA's analysis accidentally counted only American tankers and did not count American tank barges, including modern articulated tug barges. According to American Maritime Partnership, EIA has undercounted American tank vessel capacity by approximately 50%.

Your study continues to be cited for the proposition that American tank vessel capacity may be inadequate and has led others to suggest Jones Act waivers. It has been three weeks. When do you plan to correct the record? Don't you have the responsibility to let the media, policy-makers and the public know that your conclusions will likely change?

Answer. Updated information on the availability of Jones Act vessels was made public April 4, through EIA's This Week in Petroleum. EIA has modified the report and added a direct link to this article on the home page of the EIA study referenced in your question. The timing of this update was due in large part to the fact that the most widely used information source is private, and ultimately we were not able to obtain the copyright permission to publish data from that source. From our perspective, the issue of needing to move product from the Gulf Coast to the Northeast was not the number of vessels, but rather their availability, which is still a concern

as discussed in This Week in Petroleum. For example, it would take 20 barges with a capacity of 100,000 barrels each to supply 100,000 bbl/d of ultra-low sulfur diesel from the Gulf Coast to the Northeast on a dedicated basis. (If larger vessels were available, fewer would be needed.) These vessels are presumably in service elsewhere now, and it is not clear how their current service would be replaced.

As indicated in the April 4 This Week in Petroleum article, supply disruptions and the largest costs would likely be incurred during the initial transition period following a shutdown of the Sunoco Philadelphia refinery as the market resolves any initial supply dislocations. While the maritime industry is flexible and confident of its ability to supply needed volumes, which could be large, short-term flexibility is more limited than long-term flexibility. If the initial volume need is high, rerouting vessels from existing service may come at a higher cost than usual rates. Imports would play an important balancing role, potentially reducing the need for domestic shipping. While we acknowledge the U.S. maritime industry's confidence, it remains unclear exactly how and at what cost the Northeast would be supplied, and what, if any, additional costs might be incurred outside of the Northeast if significant domestic shipping is diverted from other uses in the short run.

RESPONSES OF HOWARD GRUENSPECHT TO QUESTIONS FROM SENATOR MURKOWSKI

Question 1. I know there are no "silver bullet" solutions that will immediately bring down gasoline prices, but I wonder if you have any thoughts about steps that we might take to at least try and alleviate some of the pain people are feeling at the pump in the short term?

Answer. Although there may be no "silver bullet" to immediately bring down gasoline prices, several ways to save at the pump can be found on the http://www.fueleconomy.gov/ website. Among the many fuel saving tips presented are:

- Drive sensibly.—Speeding, rapid acceleration and rapid braking wastes gasoline. Avoiding this behavior may give an equivalent gasoline savings of $0.19—$1.28 per gallon.
- Remove excess weight from your vehicle.—An extra 100 pounds in your car can reduce the MPG by up to 2 percent. Lightening your load may result in an equivalent gasoline savings of $0.04—$0.08 per gallon.
- Avoid excessive idling.—Idling can use a quarter to half a gallon of gasoline per hour. Reducing idling can lead to fuel cost savings ranging from $0.01—$0.04 per minute.
- Keep tires properly inflated.—Gas mileage can improve up to 3 percent with properly inflated tires, resulting in an equivalent gasoline savings of up to $0.12 cents per gallon.

There are many more gasoline saving tips offered on the website. In addition, this information is also available for mobile devices at: http://fueleconomy.gov/m/.

Question 2. Can you please give us a sense of where our crude inventory is today, vs. six months ago? Do you recall what the inventory was in June of last year, when we sold 30 million barrels of oil out of our strategic stockpile, vs. what it was six months prior?

Answer. According to the latest International Energy Agency (IEA) report, as of January 2012, total OECD commercial crude oil inventories were 916.5 million barrels, which is 44.1 million barrels lower than the level six months prior (as of July 2011). The U.S. portion of January 2012 OECD commercial crude oil inventories was 340.0 million barrels, down 8.1 million barrels from six months prior.*

Prior to the July 2011 release of strategic reserves in response to the Libya supply disruption, OECD commercial crude oil inventories were 977.1 million barrels, which was 20.5 million barrels higher than their level six months earlier. The U.S. portion of OECD commercial crude stocks in June 2011 was 358.5 million barrels, 25.1 million barrels higher than their level six months prior. The EIA's latest initial estimate of U.S. commercial crude oil inventories for March 2012 is 363.2 million barrels, which is 31.4 million barrels above U.S. crude oil inventories six months earlier in September 2011.

* Graph of "Commercial Crude Oil Inventories" has been retained in committee files.

RESPONSES OF FRANK A. VERRASTRO TO QUESTIONS FROM SENATOR CANTWELL

OIL COMPANY PROFITS

Question 1. From 2003 to 2008, oil revenues for the top five oil companies increased by 86 percent while profits increased by 66 percent. Yet oil output by the five major oil companies over this same time period declined by more than 7 percent, from 9.85 million to 9.12 million barrels per day. These additional profits were not earned as a result of additional production effort on the part of the oil companies but due almost entirely to the record crude oil prices, which are set in the world oil marketplace.

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That's a really good return for an era of volatile, but significantly lower oil prices than we are seeing today and are likely to see in the future.

a. Given that the 5 major oil companies made over a trillion dollars in profits over the last decade—and that's profits, not revenues—and their cost of production is still around $11 per barrel, what do you estimate their profits will total over the next decade?

b. And when it comes to gas prices, many of my constituents complain about oil company profits. From an oil producer's perspective, how much profit is there in each gallon of $4 gas?

c. The tightening supply of oil and reduced spare capacity has been cited as the major driver for today's price increases. Based off our experience of rising oil prices from 2003 to 2008, how will this market adjust to this tightening supply?

d. Because oil companies enjoyed greater profits while producing less oil when prices increased from 2003-2008, what incentive exists for these companies to produce more in response to a tightening market?

Answer. As you can imagine, there are a number of factors that affect oil company profits—not the least of which include global supply and demand dynamics, which affect the value of the commodity; production volumes; crude oil quality and refinery operations/needs; transport and infrastructure costs, operational overhead (exploration and production costs), taxes, royalties, cost of capital, etc. , so attempting to predict company profits over the next decade is a humbling and difficult task. Our analysis as well as work done by the International Energy Agency and others suggests that average production costs—given the expense and technical complexity of new sources of production (e.g., offshore, unconventionals, subsalt, etc.)—is considerably higher than the $11 per barrel you have identified. In addition, in just the short period of time since the Senate hearing was convened, oil prices have declined by almost $ 11/barrel, so for a producer with say, two million barrels per day of oil production, realized revenues from oil sales over that period would be reduced, on average, by some twenty-two million dollars a day (or over eight billion a year) before even taking into account any adjustments in cost. Projecting that range of outcomes (with even a moderate degree of confidence) out for a decade requires modeling and assumptions beyond our capabilities here.

It should also be noted that as prices, costs and profits rise and fall, depending on a particular company's resource portfolio, certain resource plays become more or less economic, which in turn, impacts production volumes and revenues going forward.

With respect to the major oil companies' role in gasoline marketing, it is fair to say that they are only tangentially involved in the marketing of gasoline at the retail level. The vast majority of commercial gas stations are either branded franchisees or independent operators. And while crude oil costs represent the single largest component reflected in gasoline prices, federal, state and local taxes as well as refining, transportation and marketing costs are also reflected in the price consumers pay at the pump. In addition, a distinction can be drawn between gasoline costs and final consumer prices and this difference would be attributable to the markup and costs (including profit) of the retail establishments, reflecting their variable lease costs, locations and cash flow requirements (as they typically adjust their pump prices to reflect by neighboring competition and the anticipated costs of their next deliveries). As a consequence, pump prices typically rise when a (upward)

crude adjustment is announced or anticipated even though the "cost" of gasoline in station's tanks reflected prices of crude from an earlier period.

If supply availability continues to tighten (relative to perceived demand), it is reasonable to expect prices to remain high, or rise even higher. Alternatively, a slackening of demand or an oversupply of product forces prices to drop.

Oil companies are in business to produce and sell a product, to keep their customers supplied and reward their shareholders' investment. Since the industry is not monolithic, if markets tighten as a consequence of increased demand or short supply, as prices rise, companies will increase production to ensure competitive viability and increase revenues.

ALTERNATIVE FUELS PROVIDE COMPETITION AT THE PUMP, LOWERING GAS PRICES

Question 2. While I appreciate the expert testimony that I think has been helpful in understanding the current dynamics of world oil markets, I am more interested in real solutions that will lower prices at the pump. That's what my constituents care about and probably what every American family and business cares about. We know that no amount of domestic oil drilling is going to change the world price of oil. AP's recent analysis of the last 36 years of data shows there is no statistical correlation between how much oil comes out of U.S. wells and the price at the pump. Similarly, the EIA found that even the most comprehensive domestic drilling proposals would only decrease gasoline prices by 3 to 5 cents—and not until 2030. But I think there is less awareness that broadening fuel choices can harness the power of free market competition to keep a lid of gasoline prices and the price volatility that keeps hammering our economy. Simply put, we need to prioritize ways to end the monopoly that oil has over our transportation system. Alternative fuels, such as methanol and ethanol, can compete within an open market. These fuels can be produced from domestic energy resources available in every state—including natural gas, agricultural waste, energy crops, and even trash—often for less than the price of gasoline.

That finding is clear in the experience Brazil has had with flex fuel vehicles (FFVs). In 2008—as the U.S. and most of the world was over a barrel with no alternative to $147 oil—90 percent of the vehicles on the road in Brazil were FFVs. These were vehicles, many made by American car manufacturers, capable of burning blends ranging from 100 percent gasoline to 100 percent alcohol. When prices spiked, Brazilians made the obvious choice and simply bought more of their domestically-produced biofuel than gasoline, which was as much as three times the price of alcohol. It only costs around $100 or less to manufacture a flex fuel capable vehicle, an investment that will quickly be recouped by savings at the gas pump.

Methanol could be the key to breaking oil's monopoly over the transportation system and our foreign oil dependence. That's because methanol is easily produced from America's abundant new natural gas supplies at the equivalent of $3 per gallon. It can also be produced from other domestic resources such as coal and biomass, which could keep hundreds of billions of dollars in the American economy rather than enriching foreign treasuries. Methanol capable vehicles were first produced in the United States in 1980s and are broadly available on the Chinese market today. This investment is also an important insurance policy against future oil price spikes likely in response to international events like Iran shutting down the Strait of Hormuz.

The U.S. Energy Security Council—the highest level non-governmental group ever assembled to address our nation's urgent energy challenges—believe an Open Fuels Standard is the simplest, least-cost approach for reducing the strategic importance of oil, and the corresponding liability of gasoline price spikes that wreak havoc on our economy and American family budgets. In fact, this Council—a bipartisan group of former cabinet Secretaries, Senators, oil company and Fortune 500 CEOs—said that making new cars capable of running on alternative fuels was the single most important thing Congress can do to have a lasting impact on America's energy security.

So I would like to know what would happen if millions of gallons of alternatives to petroleum became available and effectively ended the monopoly oil has on our nation's transportation system.

a. Let's say that 20 to 30 percent of our nation's petroleum demand could be replaced with alternative fuels such as methanol derived from natural gas or ethanol from non-food biomass at prices less than the current price of gasoline, what impact do you think that would have on overall gasoline prices?

b. Do you think that having competing fuels at the gas pump would help lower prices because consumers can switch between fuels?

c. How do continued elevated oil prices, say any level above $80 a barrel, make petroleum alternatives more competitive?

Answer. Presenting the consumer with alternatives at the pump is always beneficial from a price competition perspective and the ability to diversify the supply sources is also good from a supply security perspective. That said, the alternative choice must be scalable, economic, and have supportive infrastructure to aid in distribution. In the case of alternative fuels such as ethanol and methanol, there are some barriers to adoption that make deploying this option "at scale" challenging—and these obstacles relate primarily to infrastructure and cost, although energy content (and competitive pricing) also comes into play. They do, however, represent excellent "niche" fuel opportunities, particularly when consumed in areas geographically proximate to their production.

According to estimates by the Energy information Administration (EIA), daily U.S. gasoline consumption is roughly 8.6 million barrels a day (MMb/d) or approximately 361 million gallons a day (mgd)—so a few million gallons of alternatives are unlikely to be large enough to impact oil markets. Today, almost 75 percent of gasoline is blended with ethanol. Last year the United States consumed approximately 850 thousand barrels a day (Mb/d) of ethanol, about 10.3 percent of the total gasoline consumed. To achieve a 20 percent saturation, the United States would need to produce and consume 1.7 MMb/d of alternative fuels and 2.6 MMb/d to achieve 30 percent. Currently, the United States has only a production capacity of 900 Mb/d (EIA). This means that the production capacity would need to increase significantly or imports of the additional biofuels would be required to reach a 20-30% reduction in petroleum-derived fuels.

*Annual U.S. ethanol production and consumption**

EIA 2011

Adoption of either alternative fuel is likely to be much more expensive and would require a significant investment in the infrastructure and production capabilities which may offset the reduction in fuel price due to cheap feedstock prices. According to a NREL study referenced by EIA, it costs about $200 million to build a 69.3 MM gallons/year cellulosic facility (AEO 2007-EIA). Of course, sustained high world oil prices would play a significant role in helping to bring about better technologies which can reduce the cost.

Ethanol and methanol are less energy intensive per volume as gasoline which means that consumers will have to refuel more often than they would now. Ethanol contains .67 times the energy intensity per volume as gasoline does. This means that the miles driven per gallon of ethanol would be 33 percent less than that of gasoline. A consumer would need 1.5 times gallons. This factor increases by 2 times in the case of methanol (Please see the table 1).

TABLE 1.

Fuel	Btu per gallon	Gallons of gasoline equivalent
Conventional gasoline	125,071	1
Fuel Ethanol	84,262	0.67
E85 (74% blend on average)	94,872	0.76
Fuel Methanol	56,800	0.50
M85	65,400	0.57
Distillate fuel oil (diesel)	138,690	1.11
Biodiesel (B100)	128,520	1.03

The feedstock (and other resources, such as water) used in the production of alternative fuels should also be considered: If using food-based feedstock or if farmers switch to fuel crops away from food crops, then we run into the food security vs. fuel security issue. Increased demand for ethanol and methanol could also lead to increased costs for the feedstock to accommodate for the increased demand. If we

*Graph has been retained in committee files.

expect that demand for ethanol and methanol to increase then we should expect that the cost for the feedstock to increase accordingly to accommodate for the higher demand. Further studies would need to be completed in order to identify the price effect if we use our new found abundant supplies of Natural Gas (which are inexpensive and plentiful).

A major concern is the issue of transporting ethanol and methanol to centers of demand from production sites. Since both are very corrosive they are not able to flow through the existing pipeline system. A new infrastructure would need to be built to carry them, which increases costs. On the infrastructure front, refueling stations would need to have dedicated pumps to handle the higher blends of biofuel. Refueling stations will also need to accommodate for larger storage in order to keep multiple fuels and enough inventory on hand. In some locations, where the retail footprint is limited, this could be problematic. In addition, retail outlets that replace existing gasoline pumps with alternate fuels would need to be convinced that they have adequate customers to warrant the investment.

One way to avoid the transportation costs is to consume ethanol and methanol close to their production sites. For example the Midwest would benefit from being close the bio-based production while Pennsylvania would benefit from methanol derived from natural gas production. In this case transportation would not be an issue and a localized infrastructure can be built to accommodate for the transformation in fuel type. A recent report by the Department of Energy shows a lower price for ethanol in the areas closer to the source $3.06/gallon of E85 in the Midwest compared to $3.76 in New England, and a national average of $3.14. (See Clean Cities Alternative Fuel Report January 2012)

	Ethanol (E85) Information Reported by Clean Cities ($ per gal)		Regular Gasoline Information Reported by Clean Cities ($ per gal)	
	Average Price/ Standard Deviation of Price	Number of Data Points	Average Price/ Standard Deviation of Price	Number of Data Points
New England	$3.76 / 0.47	3	$3.60 / 0.17	41
Central Atlantic	$3.23 / 0.20	79	$3.46 / 0.19	38
Lower Atlantic	$3.23 / 0.27	55	$3.46 / 0.14	57
Midwest	$3.06 / 0.19	189	$3.29 / 0.17	172
Gulf Coast	$3.05 / 0.15	32	$3.15 / 0.13	20
Rocky Mountain	$2.99 / 0.24	56	$3.09 / 0.27	52
West Coast	$3.35 / 0.17	70	$3.68 / 0.31	54
NATIONAL AVERAGE	$3.14 / 0.24	484	$3.37 / 0.27	434

In conclusion, while alcohol-based fuels can be produced domestically and hence reduce the United States' dependence on foreign imported oil, significant obstacles remain to rolling this option out on a nationwide basis. There are production constraints, feedstock availability concerns, infrastructure, and transportation limitations. Biofuels should be made available in areas where the feedstock in produced as it can be a good niche fuel.

With respect to the impact of oil prices in excess of $80/barrel and the impact on alternatives, two points are worth noting: first, as you suggest, higher oil prices should help make (currently more expensive) alternatives more economically competitive; but also note that at $80/barrel or more with the addition of new technologies and the vast unconventional resource base, oil is likely to be plentiful for years to come.

FUTURE OIL PRICES

Question 3. My take aways from the witnesses today is that the era of cheap oil over, and world demand, particularly in developing countries, is ready to take off. That makes sense because the reality is the world today is overly dependent on the giant, conventional oil fields discovered back in the 1950s and 1960s. The chief economist for the International Energy Agency was very direct on this point in an interview in October 2010. He said,

> "The era of cheap oil is over. Each barrel oil that will come to market in the future will be much more difficult to produce and therefore more expensive. We all—governments, industry, and consumers—should be prepared for oil prices being much higher than several years ago."

Yes, it's true that we can find more oil if we drill deeper and deeper and in waters farther away from land. We can also squeeze more oil out of more tar sands or shale. But all those options greatly increase costs and environmental impacts. It is important to note that this supply crunch happens at the very same time world oil demand is expected to increase rapidly. According to the International Energy Agency, not only will world oil demand grow by 25 percent by 2030, but 93 percent of new demand will come from non-OECD countries—mainly China and India. So not only will there be more people demanding access to a shrinking, limited supply of oil, we'll now be fighting with China and India who can now afford to bid against us for this finite and currently irreplaceable resource.

Even a top Saudi Arabian energy official recently expressed serious concern that world oil demand could peak in the next decade which explained why they were working to diversify their country's economic base. If the Saudi government is talking about diversifying, I think that should be a wakeup call for all of us: we need to be figuring out how we diversify A.S.A.P.

The price of a barrel of oil is roughly the same as the price at the beginning of 2008. And today's national average price of gasoline is only 20 cents below its highest ever in the summer of 2008 when oil reached almost $150 per barrel. Yet few would say our economy is quite as robust now as it was then.

a. I would be interested in hearing what the panelists would estimate the price of oil to be today, given all the new economic and geopolitical factors, if our economy was firing on all cylinders again?

b. I think we are only a few years from the whole world being back to 2008 levels of growth or beyond. What will that mean for world oil prices within the next five years?

c. Is it safe to say that the era of cheap oil is over? Will the average price of oil be over $100 for the foreseeable future, unless we have another economic collapse like the one in 2008?

Answer. With respect to forecasting oil prices under a more robust economic scenario, I will defer to my colleagues/panelists that have extensive econometric modeling capabilities. I agree with the assertion that greater economic growth (even with improved efficiency) means greater demand for energy, including oil—especially in the transport fleet.

On the issue of supply response, however, I would note that one of the "benefits" of today's higher prices has been to push innovation and technology to be able to unlock a vast new unconventional resource base, both in the U.S. and globally. At present prices, extraction of resources from ultradeep water, pre-salt, lower tertiary, tight oil, shale oil and oil sands plays, etc., has the potential for dramatically altering the production profile landscape—and adding several million barrels per day of new production growth in the not too distant future. This added output (depending on demand growth and OPEC policy decisions) should help moderate price spikes and restore available "spare" capacity cushions.

RESPONSES OF FRANK A. VERRASTRO TO QUESTIONS FROM SENATOR MURKOWSKI

SHORT TERM SOLUTIONS

Question 1. I know there are no "silver bullet" solutions that will immediately bring down gasoline prices, but I wonder if you have any thoughts about steps that we might take to at least try and alleviate some of the pain people are feeling at the pump in the short term?

Answer. As indicated in my testimony, typically gasoline prices tend to rise and fall seasonally. And while we began (for a variety of reasons, both domestic and internationally) 2012 with elevated gasoline prices, downward adjustments are already working their way through the distribution system. Current gas prices are averaging about $3.73 per gallon nationwide, down from just under $4 per gallon only a few weeks ago.

Reduced demand through trip consolidation or ride sharing, public transit options and telecommuting can help alleviate short term expenses as would proper tire inflation and engine maintenance, but as you have indicated, there are no immediate "silver bullets." Suspension of gasoline taxes, even temporarily, are not an answer, as the pump price reductions (if they were to occur) serve to increase demand and drive prices upward. Further, reinstating the taxes would prove problematic politically and in the interim deny the Highway Trust and other state funds of needed revenue sources.

REFINERY CLOSURES / TRANSPORT CONSTRAINTS

Question 2. I wonder if you could talk a little bit about the supply issue we will likely face on the East coast, as we stand to lose over a million barrels a day of refined product output from refinery closures there, and considering that we have so little pipeline capacity to move products like gasoline and home heating oil up from the Gulf. I know we have become a net exporter of refined products and I just wonder why we couldn't simply use those products up East? Other than pipeline, what is the most efficient way to move products up from the Gulf Coast?

Answer. During the March 29 hearing, we discussed expansion of the Colonial pipeline and movement of refined petroleum products from the Gulf to the East coast using both Jones Act and non-Jones Act vessels. As indicated in my testimony, compensating for the East coast refinery closures and transport constraints—at least in the near term—are issues of logistics and timing. At this writing, Bakken crude (from North Dakota) is being moved eastward (via rail) to the northeast and barged down to the Pennsylvania area. Refined product is being rerouted (by rail and tanker truck) to service areas where refineries are closed and crude pipelines and tanks are being converted to handle increased refined product flows. Product imports are also being increased to certain areas.

SPR

Question 3. We've seen in the news that the U.S. has asked France and Great Britain to coordinate a release from our strategic petroleum stocks, and that the release could take place in a matter of weeks. Not only has the head of the IEA responded that that a coordinated IEA release is not warranted because there is no significant supply disruption on world oil markets, it is becoming clear that neither Germany nor Italy are willing to participate in such a sale, with the German government stating that there is no physical shortage at the moment. What are your thoughts about the use of our strategic stockpiles at this time?

Answer. As I indicated in my statement, I believe oil markets are currently adequately supplied, inventories are building and production is increasing even as concern over demand and economic growth continues. And while conditions can change dramatically in the space of weeks or in reaction to a major supply disruption event (or even the removal or more Iranian oil from the market as a consequence of successful sanctions), at the present time, I see no reason to release strategic stockpiles.

MARKET PERCEPTION OF NEW PRODUCTION

Question 4. Would you say that the markets react better to "good" oil projects vs. "challenging" oil projects—in other words, is new production viewed more credibly when it comes from more fiscally and politically stable sources?

a. What sorts of governmental actions can reduce the fiscal or political stability of an oil producing nation?

Answer. The "market" typically takes into account a variety of factors when evaluating oil prospects, including project commerciality, sustainability, continued access, security, crude quality relative to refining and consumer demand, technical challenges, availability of infrastructure to move commodities to market, governance and geopolitics—to name a few. All things being equal, secure and stable projects are preferred, but resource size and the ability to monetize assets in a reasonable timeframe also come into play. Government actions to facilitate or improve any of the above factors are welcome.

Question 5. In your opinion, if, ten years ago, the U.S. had scaled back its exploration and development so that 2 million fewer barrels per day were now online (without assuming any changes to what we have witnessed in global supply and demand trends over the same period), would that have translated to higher prices today?

Question 6. In your opinion, if, ten years ago, the U.S. had increased exploration and development so that U.S. production were now at 10 million barrels per day (without assuming any changes to what we have witnessed in global supply and demand trends over the same period), would that have translated to lower prices today?

Answer. As indicated uniformly by all of the panel members, oil prices at any given point in time reflect both the perception and reality of global supply, demand, the state of inventories, and political risk/events. That said, all things being equal, increased supply generally translates into lower prices, while reduced supply does the opposite. OPEC actions and cumulative demand levels are worth noting here,

however. OPEC reductions in output can always be used to offset production increases by certain nations with the net effect of maintaining tight markets and higher prices. Two million barrels per day of extra production should have allowed spare capacity cushions to improve and thereby moderate any price spikes but in a 90 million barrel per day world, even 2 million barrels represents a bit more than a 2% cushion.

Question 7. You testified that while 2-300,000 barrels per day coming online would probably not make a meaningful difference in prices, that 2-3 million barrels per day is "a big deal." Can you define "big deal?"

Answer. My point was that in the current (i.e.,89-90 million barrel per day global) market with persistent instability in the MENA counties, ongoing outages in a variety of areas, the ongoing turmoil with Iran, etc., incremental output on the magnitude of 200-300,000 barrels per day, while a welcomed addition, would likely be, in and of itself, insufficient to substantially reduce prices. Adding 3 million barrels per day of "prompt" near term barrels to that same market, could, however, have a meaningful impact, especially if market sentiment suggested a resumption of output from Iraq and Libya, sustained increased production from Saudi Arabia and a possible resolution to the Iranian threat.

Question 8. Is there any scenario in which major increases in production and spare capacity lead to higher prices?

Answer. The only arguable case where major production increases beget higher prices would result from unanticipated increases in demand (which offset the output additions). Such instances (see 2003-04) usually are accompanied by reductions in spare capacity as it takes time for new incremental production to ramp up and get to market. Your question specifically posits increased production AND spare capacity growth, which necessarily suggests that supply exceeds demand, and thus should lead to a reduction in price.

REFERENCE PRICES FOR SENATE RESPONSES

On March 29, 2012, the price for Brent crude oil was $ 123.23/barrel; On May, 16, 2012, the price had fallen to $111.63; Similarly, the price for West Texas Intermediate (WTI) on the day of the Senate hearing was $102.79/barrel; on May 16, the price was almost $10 less at $ 92.97.

RESPONSE OF PAUL HORSNELL TO QUESTION FROM SENATOR BINGAMAN

Question 1. During a discussion of the effect of tax incentives for oil and gas on the price of gasoline prompted by a question from Senator Portman (111 minute mark of the recording), Mr. Verrastro noted that, all things being equal, removal of $23 billion in incentives over ten years would cause the price of oil and gas to increase, but he also noted that the effect would likely be small. I am curious to get the reaction of the other witnesses to Senator Portman's question—moving beyond simple economic theory into an actual analysis of the pricing effects. A recent Congressional Research Service Memo to my office will be a good starting point. It notes that, in the highly unlikely case that oil and gas companies are able to pass on all (and not just a portion) of the costs of removing $23 billion in tax incentives over ten years, consumers will see only a maximum increase in gasoline prices of 1.7 cents per gallon. For a fifteen gallon tank of gasoline, that equals twenty-five cents.

Please comment on the accuracy of this analysis and also on the ability of these companies to pass on all of the costs associated with a removal of certain tax incentives.

Answer. The impact on domestic gasoline prices, given that these are formed in a global market, would appear to be very limited. The impact of reduced US production (muted by some switch of activity elsewhere) is unlikely in my view to have a discernible impact. The more tangible effects are perhaps likely to be on other indicators, such as the US balance of payments and the composition and scale of oilfield employment. However, in terms of our medium-term projections of global oil market balances and prices, this is not a factor that we would assign a large weight to in that global context.

RESPONSES OF PAUL HORSNELL TO QUESTIONS FROM SENATOR CANTWELL

OIL COMPANY PROFITS

From 2003 to 2008, oil revenues for the top five oil companies increased by 86 percent while profits increased by 66 percent. Yet oil output by the five major oil

companies over this same time period declined by more than 7 percent, from 9.85 million to 9.12 million barrels per day. These additional profits were not earned as a result of additional production effort on the part of the oil companies but due almost entirely to the record crude oil prices, which are set in the world oil marketplace.

Combined, it's been literally a trillion-dollar decade for the oil and gas giants. From 2002 to 2011, ExxonMobil gained $310 billion, Shell $204 billion, Chevron $152 billion and BP $147 billion—despite its loss year because of the 2010 Gulf of Mexico oil spill. As the price of oil rose, company revenues and profits soared with ExxonMobil eventually becoming the most profitable corporation in the history of American industry.

That's a really good return for an era of volatile, but significantly lower oil prices than we are seeing today and are likely to see in the future.

Question 1a. Given that the 5 major oil companies made over a trillion dollars in profits over the last decade—and that's profits, not revenues—and their cost of production is still around $11 per barrel, what do you estimate their profits will total over the next decade?

Answer. On the revenue side the average crude oil price over the past ten years has been $68.50 per barrel for Brent. As a working assumption we would estimate that the average Brent price over the next ten years would be at least 50% higher than that. As an offset, on the supply side we would expect to see a significant escalation in production costs, a high proportion of incremental global output accruing to national oil companies rather than integrated companies, and fiscal regimes on a global basis that are more rent acquisitive for producer governments. As a non-equity analyst, I will leave the full cash-flow calculation of the net effect to the equity analysts. However, in broad terms I would expect company profits over the next decade to increase, but by significantly less than average Brent prices will. Refining operations are expected to remain a source of losses for integrated companies.

Question 1b. And when it comes to gas prices, many of my constituents complain about oil company profits. From an oil producer's perspective, how much profit is there in each gallon of $4 gas?

Answer. According to the Energy Information Administration, the national average for regular unleaded ($3.85 at the time of the EIA's calculation), can be broken down as 67% crude oil cost, 16% refining, 6% distribution and marketing, and 11% taxes. Midstream and downstream profitability (outside of Midwest refining) is limited, it is the upstream that is the main profit generator, and that profit is realized in the transaction between the producer and the refiner, not between the retailer and the motorist.

Question 1c. The tightening supply of oil and reduced spare capacity has been cited as the major driver for today's price increases. Based off our experience of rising oil prices from 2003 to 2008, how will this market adjust to this tightening supply?

Question 1d. Because oil companies enjoyed greater profits while producing less oil when prices increased from 2003-2008, what incentive exists for these companies to produce more in response to a tightening market?

Answer. The Barclays oil equity analysts have estimated that the increase in oil company capex plans in 2012 is 11%, and the average breakeven price for this investment as required by the integrated group is $109 Brent post capex and dividends. Strategy updates from the companies imply that in 2012 they are typically basing spending and volume projections on a $100 Brent average compared to $75 Brent in 2011, and the associated increase in capex does seem to imply that there is an effective incentive to invest more at higher prices.

ALTERNATIVE FUELS PROVIDE COMPETITION AT THE PUMP, LOWERING GAS PRICES

While I appreciate the expert testimony that I think has been helpful in understanding the current dynamics of world oil markets, I am more interested in real solutions that will lower prices at the pump. That's what my constituents care about and probably what every American family and business cares about. We know that no amount of domestic oil drilling is going to change the world price of oil. AP's recent analysis of the last 36 years of data shows there is no statistical correlation between how much oil comes out of U.S. wells and the price at the pump. Similarly, the EIA found that even the most comprehensive domestic drilling proposals would only decrease gasoline prices by 3 to 5 cents—and not until 2030. But I think there is less awareness that broadening fuel choices can harness the power of free market competition to keep a lid of gasoline prices and the price volatility that keeps hammering our economy. Simply put, we need to prioritize ways to end the monopoly that oil has over our transportation system. Alternative fuels, such as methanol and

ethanol, can compete within an open market. These fuels can be produced from domestic energy resources available in every state—including natural gas, agricultural waste, energy crops, and even trash—often for less than the price of gasoline.

That finding is clear in the experience Brazil has had with flex fuel vehicles (FFVs). In 2008—as the U.S. and most of the world was over a barrel with no alternative to $147 oil—90 percent of the vehicles on the road in Brazil were FFVs. These were vehicles, many made by American car manufacturers, capable of burning blends ranging from 100 percent gasoline to 100 percent alcohol. When prices spiked, Brazilians made the obvious choice and simply bought more of their domestically-produced biofuel than gasoline, which was as much as three times the price of alcohol. It only costs around $100 or less to manufacture a flex fuel capable vehicle, an investment that will quickly be recouped by savings at the gas pump.

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So I would like to know what would happen if millions of gallons of alternatives to petroleum became available and effectively ended the monopoly oil has on our nation's transportation system.

Question 2a. Let's say that 20 to 30 percent of our nation's petroleum demand could be replaced with alternative fuels such as methanol derived from natural gas or ethanol from non-food biomass at prices less than the current price of gasoline, what impact do you think that would have on overall gasoline prices?

Answer. Depending on the taxation regime, were 20 to 30% of total US demand capable of being replaced by competitive alternative fuels, that would reduce US oil demand by between 3.5 mb/d and 5.5 mb/d. Were that transition achieved over a very short period, the opening up of a surplus on the global market should drive prices towards their sustainable cost floor close to $80. Were the transition more prolonged over years, I would expect damping pressure on back of the curve prices but no sudden collapse or structural change in prices at the front of the curve.

Question 2b. Do you think that having competing fuels at the gas pump would help lower prices because consumers can switch between fuels?

Answer. The gains from competitive switching at the pump appear perhaps more limited than wholesale switching through choice of vehicle technology. On current automobile technology and the limits to switching with current models, there is the danger that the infrastructure costs and duplication might outweigh any competitive gains. The margins available for the retail sale of gasoline are thin enough as to suggest that there is a danger of losing retailers, particularly if they had to bear the cost of increasing pump provision and extra storage tanks etc.

Question 2c. How do continued elevated oil prices, say any level above $80 a barrel, make petroleum alternatives more competitive?

Answer. Sustained prices above $80 could allow some alternatives to become competitive, dependent on the relative fiscal regime applied to gasoline and alternatives. However, on a pure like-for-like basis, with no subsidies for alternatives or relative taxation disadvantages against oil, gasoline remains surprisingly competitive relative to many alternatives at $80 on a pure energy basis, even before one factors in the advantages of the current scale of gasoline and existing infrastructure.

FUTURE OIL PRICES

My take aways from the witnesses today is that the era of cheap oil over, and world demand, particularly in developing countries, is ready to take off. That makes sense because the reality is the world today is overly dependent on the giant, con-

ventional oil fields discovered back in the 1950s and 1960s. The chief economist for the International Energy Agency was very direct on this point in an interview in October 2010. He said,

> "The era of cheap oil is over. Each barrel oil that will come to market in the future will be much more difficult to produce and therefore more expensive. We all—governments, industry, and consumers—should be prepared for oil prices being much higher than several years ago."

Yes, it's true that we can find more oil if we drill deeper and deeper and in waters farther away from land. We can also squeeze more oil out of more tar sands or shale. But all those options greatly increase costs and environmental impacts. It is important to note that this supply crunch happens at the very same time world oil demand is expected to increase rapidly. According to the International Energy Agency, not only will world oil demand grow by 25 percent by 2030, but 93 percent of new demand will come from non-OECD countries—mainly China and India. So not only will there be more people demanding access to a shrinking, limited supply of oil, we'll now be fighting with China and India who can now afford to bid against us for this finite and currently irreplaceable resource.

Even a top Saudi Arabian energy official recently expressed serious concern that world oil demand could peak in the next decade which explained why they were working to diversify their country's economic base. If the Saudi government is talking about diversifying, I think that should be a wakeup call for all of us: we need to be figuring out how we diversify A.S.A.P.

The price of a barrel of oil is roughly the same as the price at the beginning of 2008. And today's national average price of gasoline is only 20 cents below its highest ever in the summer of 2008 when oil reached almost $150 per barrel. Yet few would say our economy is quite as robust now as it was then.

Question 3a. I would be interested in hearing what the panelists would estimate the price of oil to be today, given all the new economic and geopolitical factors, if our economy was firing on all cylinders again?

Answer. I estimate that global demand growth this year is likely to be a bit over 1 mb/d, with Japanese demand growth following their nuclear shut downs being the key positive factor within an otherwise sluggish OECD pattern. The decline in US demand in 2012 is currently placed at 0.22 mb/d, after a 0.34 mb/d decline in 2011. Were the US economy to return to pre-2008 rates of growth, oil demand might be in a range from flat to higher by 0.3 mb/d. In other words the global market might be tighter than it is today by up to 0.5 mb/d even when not allowing for the positive spillover effects from an improved US economy onto other economies. That would likely be a source of upside pressure on prices, perhaps, other things being equal, to levels higher than early-2008 but lower than mid-2008.

Question 3b. I think we are only a few years from the whole world being back to 2008 levels of growth or beyond. What will that mean for world oil prices within the next five years?

Answer. In my view there has to be an interplay between global growth and oil prices, and current oil prices would be inconsistent with substantially higher global growth. If a return to 4.5% global growth was factored in, oil market balances would like extremely tight. The net result is more likely to be the combination of higher prices and some throttling back of global growth.

Question 3c. Is it safe to say that the era of cheap oil is over? Will the average price of oil be over $100 for the foreseeable future, unless we have another economic collapse like the one in 2008?

Answer. The market as a whole does appear to be looking for a long-term sustainable floor to prices given by the cost of Canadian oil sands or marginal US production, currently in the $80 to $90 range. That range coincides with consideration of the objectives of key producer countries given fiscal positions. Given short term factors including geopolitics, I would expect prices to average somewhat higher than that sustainable floor. Stress points such as the global economic conditions of late-2008 and early-2009 may drive prices below that floor, but we would not expect that position to be sustainable. Thus, while we may well see periods of low prices, I would not expect to see low prices on a sustained basis unless there was a major and unexpected technological shock on either the supply or the demand side of the market.

RESPONSES OF PAUL HORSNELL TO QUESTIONS FROM SENATOR MURKOWSKI

SHORT TERM SOLUTIONS

Question 1. I know there are no "silver bullet" solutions that will immediately bring down gasoline prices, but I wonder if you have any thoughts about steps that we might take to at least try and alleviate some of the pain people are feeling at the pump in the short-term?

Answer. In my view the short-term might well sort itself out without much in the way of direct market intervention by consumer governments. Wholesale gasoline price pressures should recede if the start of the main gasoline demand season goes without supply hitches, and if the data continues to show relatively good availabilities. In my view the gasoline crack (the differential between wholesale gasoline and crude oil) was driven up too far on fears of the potential from problems (the June crack rose from $15 in December to nearly $35 at the start of April, and there is scoop for that crack to compress from those peaks. With US retail gasoline prices now lower y/y for the first time since late-2010, the upwards momentum in prices does seem to have stalled.

SPECULATION

Question 2. My understanding of speculation is that it is as simple as people buying and selling a good based on their changing view of supply and demand in the future. Would you agree that buying and selling conveys information about current and expected future oil supply and demand conditions?

a. What does the current market environment tell us about expectations of future supply and what are the main factors that could change those expectations?

b. How might the markets perceive a credible commitment to increasing U.S. production by an addition 1 to 2 million barrels, even if it could take 5 years to bring those supplies into production?

Answer. Yes, it is correct that expectations about future fundamentals are reflected in the market, and in the shape of the oil price curve over time. At time of writing, the WTI futures curve is currently showing about $105 per barrel for prompt delivery, and about $85 per barrel for delivery in 2020. That back of the curve price is the lowest it has been for three years, and it has fallen by $10 per barrel over the course of 2012 so far. In my view that sharp change in the shape of the oil price curve and the reduction in longer-dated prices reflects a relatively more relaxed market view about future availability, and the boom in US production has played a particularly important part in that. Given that $10 move down this year, it looks as if much of the impact of the potential for US supply has already been priced in, and further commitment to that might be a matter of consolidating and cementing those gains lest long-term prices start to creep up again.

SPECULATION + RECENT GOLDMAN SACHS REPORT

Question 3. There has been quite a lot of talk lately about a March 2011 Goldman Sachs report that looked at the impact of speculation on the price of crude. A recent Forbes magazine article interpreted the report to say that the premium factored into oil prices due to speculation is as much as $23.39 a barrel. My staff had the opportunity to speak to some folks from Goldman Sachs yesterday who commented that Forbes was "deeply, deeply wrong to mischaracterize their comments in this way." Can you talk a little bit to the role that speculators play in the market and the notion that oil isn't currently trading at its "real price"?

a. Forbes stated in their article that every $10 rise in the price of crude oil translates into a 24 cent rise in the price of gasoline at the pump. Do you agree with this analysis?

Answer. I suspect the Forbes statement is not the result of any statistical analysis and is more of a tautology. There are 42 US gallons in a barrel, and rounded to the nearest cent, $10 divided by 42 is 24 cents. I suspect that the Forbes statement is just that tautology, ie if per barrel prices by $10 that is exactly the same as per gallon prices rising by 24 cents. It becomes less of a tautology when it is a barrel of crude oil being compared to a gallon of gasoline, as in the short term crude oil and gasoline prices can move apart significantly. However, in the longer term the assumption of full pass—through of crude oil costs into gasoline seems a fair one.

I do believe that oil is currently trading close to its real or market clearing price. The clearest evidence of this appears to come from global supply and demand balances. After eight quarters of global inventory draws, the rise in prices seems to

have allowed the global market to balance in Q1 at an average Brent price of just over $118 per barrel. Were the price inflated by other factors, I would expect to see a significant and sustained global surplus of oil, not two years of supply deficits followed by a quarter of rough balance. The oil market currently trades with plenty of liquidity and innovation, with the depth of risk management and market access all along the curve having increased significantly. I would see hedge funds as one source of that increased liquidity.

The specialist commodity hedge funds tend to be driven by their analysis of supply and demand flows, indeed they tend to be more fundamentally driven than many other market participants. In that sense supportive global market balances tend to produce a flow of hedge fund money to the long side, and those funds tend to go to the short side for weaker balances. As of this moment, in my view there is relatively little positioning among the specialist hedge funds in oil. Indeed, in general many of those funds have had a difficult year, having been long last May when prices fell, and having not been long when prices rallied at the start of the year. They do not seem to have driven prices over the past year in particular. There are also speculative flows in natural gas markets, which do not seem to have prevented the readjustment in prices downwards in response to a surplus, and I do not believe oil would have behaved any differently had there been sustained supply surpluses rather than the supply deficits that characterized 2010 and 2011.

IMPACT OF REFINERY CLOSURES & IRAN CONNECTION

Question 4. I am particularly interested in the comments you made that the abrupt closure of so much North American refinery capacity has unsettled the market and led to concerns of tight supplies, at least into the early part of the driving season, when more imports make their way into that market. You pointed out that there has been a rapid buildup in refinery capacity elsewhere in the world, such as China & India and I am wondering if you expect that some of our fuel imports will come from those countries?

a. You stated that ultimately imports and the tweaking of logistical issues and bottlenecks will solve the supply problem, and I wonder if you could explain exactly what that means from a practical standpoint?

Answer. International flows of oil products would certainly rebalance, but I would think it unlikely that direct oil products exports from China to the US would increase significantly, although the Reliance refinery in India could well play a swing role into the US. More likely, product exports of all types from Europe into Asia would decrease, and the European gasoline surplus would continue to be the main balancing item for the US East Coast. The market does seem to have shown some unease as to how precisely the logistics of a greater reliance on product imports will function. That unease should lessen just with the experience of seeing it work, that terminals are flexible enough and the inventory cover is large enough to keep the system working well even with longer supply chains.

MARKET PERCEPTION OF NEW PRODUCTION

Question 5. Would you say that the markets react better to "good" oil projects vs. "challenging" oil projects—in other words, is new production viewed more credibly when it comes from more fiscally and politically stable sources?

a. What sorts of governmental actions can reduce the fiscal or political stability of an oil producing nation?

Answer. In my view it does appear clear that the market has taken a more interested view of the prospects for upstream growth in the US than it has, for example, in the context of the potential for expansion of output in Iraq. The former carries less risk of all types, and it appears to us that expectations of a 2 mb/d expansion in the US by the end of the decade are having a more concrete impact on the oil price curve than potentially larger increases in Iraq in the best case scenario.

Question 6. In your opinion, if, ten years ago, the U.S. had scaled back its exploration and development so that 2 million fewer barrels per day were now online (without assuming any changes to what we have witnessed in global supply and demand trends over the same period), would that have translated to higher prices today?

Answer. In a world of plentiful OPEC spare capacity the difference might have been marginal, if OPEC had increased output to fill that gap and still had a significant cushion of spare capacity. However, an extra 2 mb/d requirement from OPEC as of today would seem difficult and could even exhaust spare capacity completely.

Prices would therefore be significantly higher in order to ration demand and create some supply buffer.

Question 7. In your opinion, if, ten years ago, the U.S. had increased exploration and development so that U.S. production were now at 10 million barrels per day (without assuming any changes to what we have witnessed in global supply and demand trends over the same period), would that have translated to lower prices today?

Answer. Yes, the entire oil price curve would be expected to be lower under those circumstances. The main endogenous reaction would have been from OPEC, and this scenario the increase in US production would likely have been matched by OPEC producing less than they currently are. However, even if overall supply was no higher, global spare capacity would be higher and that would imply downward pressure on the oil price curve.

Question 8. You testified that while 2-300,000 barrels per day coming online would probably not make a meaningful difference in prices, that 2-3 million barrels per day is "a big deal." Can you define "big deal?"

Answer. In this context the reference was to supply changes that make an observable and immediate change in global oil market balances, enough to generate a large enough surplus as to require prices to fall. The impact of the discovery of the East Texas oil field on the oil market in the early 1930s is an example of such a change. The modern oil market is used to fields of 200 thousand b/d coming on stream and the price implications of individual new developments tend to be mild. However, were 2 mb/d to be brought on stream within a short period, the surplus created would likely be such as to either require a sharp downwards repricing unless there was a policy-driven matching supply cut elsewhere.

Question 9. Is there any scenario in which major increases in production and spare capacity lead to higher prices?

Answer. The combination of major supply increases and spare capacity increases would imply that capacity growth was outpacing demand growth, and would therefore generally be associated with lower equilibrium prices. The only sustainable reasons why prices might possibly not fall would be some step change and significant increase in geopolitical risk, and the longer term a scenario of very significant increases in costs.

RESPONSES OF DANIEL YERGIN TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. During a discussion of the effect of tax incentives for oil and gas on the price of gasoline prompted by a question from Senator Portman (111 minute mark of the recording), Mr. Verrastro noted that, all things being equal, removal of $23 billion in incentives over ten years would cause the price of oil and gas to increase, but he also noted that the effect would likely be small. I am curious to get the reaction of the other witnesses to Senator Portman's question—moving beyond simple economic theory into an actual analysis of the pricing effects. A recent Congressional Research Service Memo to my office will be a good starting point. It notes that, in the highly unlikely case that oil and gas companies are able to pass on all (and not just a portion) of the costs of removing $23 billion in tax incentives over ten years, consumers will see only a maximum increase in gasoline prices of 1.7 cents per gallon. For a fifteen gallon tank of gasoline, that equals twenty-five cents.

Please comment on the accuracy of this analysis and also on the ability of these companies to pass on all of the costs associated with a removal of certain tax incentives.

Answer. I am not familiar with that study and its methodology and thus am not in a position to offer an opinion.

Question 2. Senator Coons (at the 116 minute mark), cited a report from DBL investors that 94.6% of federal subsidies over the last century have gone to oil and gas production, and nuclear energy. He then asked you if that data suggested anything to him about what the federal government's path forward should be given its pursuit of an "all of the of the above" energy strategy and move away from high gasoline prices. You deferred to Dr. Gruenspecht, mentioning that EIA had conducted a study that had reached a much different conclusion.

The report to which you referred was published by EIA on August 1, 2011 and entitled "Direct Federal Financial Interventions and Subsidies in Energy in Fiscal Year 2010." As I understand it, the EIA report is much more limited in scope than the DBL Investors report because it only focuses on one year of federal support for energy. Further, the year on which it focuses, 2010, contains significant "one-time"

spending on energy as a result of the Recovery Act. As a result this "snapshot" data appears to me to be not at all representative of historical U.S. energy policy.

Could you please offer your thoughts on how federal support for oil and gas production over the last one hundred years helped the industry develop in the United States, and if renewable energy sources and advanced biofuels should be afforded similar long-term preferences in order to help develop those domestic markets?

Answer. I am not familiar with that DBL analysis. There is, of course, considerable debate as to what constitutes a "subsidy" or an "incentive" and what the difference is between the two!. In past decades, the depletion allowance was the best known for the oil industry, but it is of little relevance today. Some argue that the foreign tax credit constitutes a very large "subsidy". The research I did for The Prize leads me to think otherwise and that the judgments of both the executive and legislative branches in the 1950s confirmed it was indeed an appropriate credit.

The ethanol tax credit, of course, expired at the end of last year, but the requirement for biofuels from the 2007 legislation remains. It may well need to be adjusted depending on the progress on second generation biofuels. Without various forms of subsidies/incentives (and state mandates), the wind and solar industry would not be anywhere close to where they are today in terms of development. While costs have come down greatly, incentives continue to be important to their competitive economics.

RESPONSES OF DANIEL YERGIN TO QUESTIONS FROM SENATOR CANTWELL

OIL COMPANY PROFITS

Question 1. From 2003 to 2008, oil revenues for the top five oil companies increased by 86 percent while profits increased by 66 percent. Yet oil output by the five major oil companies over this same time period declined by more than 7 percent, from 9.85 million to 9.12 million barrels per day. These additional profits were not earned as a result of additional production effort on the part of the oil companies but due almost entirely to the record crude oil prices, which are set in the world oil marketplace.

Combined, it's been literally a trillion-dollar decade for the oil and gas giants. From 2002 to 2011, ExxonMobil gained $310 billion, Shell $204 billion, Chevron $152 billion and BP $147 billion—despite its loss year because of the 2010 Gulf of Mexico oil spill. As the price of oil rose, company revenues and profits soared with ExxonMobil eventually becoming the most profitable corporation in the history of American industry.

That's a really good return for an era of volatile, but significantly lower oil prices than we are seeing today and are likely to see in the future.

a. Given that the 5 major oil companies made over a trillion dollars in profits over the last decade—and that's profits, not revenues—and their cost of production is still around $11 per barrel, what do you estimate their profits will total over the next decade?

b. And when it comes to gas prices, many of my constituents complain about oil company profits. From an oil producer's perspective, how much profit is there in each gallon of $4 gas?

c. The tightening supply of oil and reduced spare capacity has been cited as the major driver for today's price increases. Based off our experience of rising oil prices from 2003 to 2008, how will this market adjust to this tightening supply?

d. Because oil companies enjoyed greater profits while producing less oil when prices increased from 2003-2008, what incentive exists for these companies to produce more in response to a tightening market?

Answer. The companies you cite, between 2000 and 2011, had net income of $970 billion, and their capital investment over the same period was $1.02 trillion. They paid income taxes, on an aggregated basis, at 43 percent. What also helps to bring these numbers into perspective is that upstream capital costs in the first quarter of 2012 were almost two and a half times higher than they were in 2000. In other words, your "going in" costs for a new oil field in 2012 would be more than double even what they were in 2004.

Tight spare capacity leads to higher oil prices. The market adjusts to higher prices through increased efficiency, substitution, and development of alternative supplies. Price shocks can have e very negative economic impacts. (The Quest, pp. 181-83). And that's a big worry for our economy right now.

ALTERNATIVE FUELS PROVIDE COMPETITION AT THE PUMP, LOWERING GAS PRICES

Question 2. While I appreciate the expert testimony that I think has been helpful in understanding the current dynamics of world oil markets, I am more interested in real solutions that will lower prices at the pump. That's what my constituents care about and probably what every American family and business cares about. We know that no amount of domestic oil drilling is going to change the world price of oil. AP's recent analysis of the last 36 years of data shows there is no statistical correlation between how much oil comes out of U.S. wells and the price at the pump. Similarly, the EIA found that even the most comprehensive domestic drilling proposals would only decrease gasoline prices by 3 to 5 cents—and not until 2030. But I think there is less awareness that broadening fuel choices can harness the power of free market competition to keep a lid of gasoline prices and the price volatility that keeps hammering our economy. Simply put, we need to prioritize ways to end the monopoly that oil has over our transportation system. Alternative fuels, such as methanol and ethanol, can compete within an open market. These fuels can be produced from domestic energy resources available in every state—including natural gas, agricultural waste, energy crops, and even trash—often for less than the price of gasoline.

That finding is clear in the experience Brazil has had with flex fuel vehicles (FFVs). In 2008—as the U.S. and most of the world was over a barrel with no alternative to $147 oil—90 percent of the vehicles on the road in Brazil were FFVs. These were vehicles, many made by American car manufacturers, capable of burning blends ranging from 100 percent gasoline to 100 percent alcohol. When prices spiked, Brazilians made the obvious choice and simply bought more of their domestically-produced biofuel than gasoline, which was as much as three times the price of alcohol. It only costs around $100 or less to manufacture a flex fuel capable vehicle, an investment that will quickly be recouped by savings at the gas pump.

Methanol could be the key to breaking oil's monopoly over the transportation system and our foreign oil dependence. That's because methanol is easily produced from America's abundant new natural gas supplies at the equivalent of $3 per gallon. It can also be produced from other domestic resources such as coal and biomass, which could keep hundreds of billions of dollars in the American economy rather than enriching foreign treasuries. Methanol capable vehicles were first produced in the United States in 1980s and are broadly available on the Chinese market today. This investment is also an important insurance policy against future oil price spikes likely in response to international events like Iran shutting down the Strait of Hormuz.

The U.S. Energy Security Council—the highest level non-governmental group ever assembled to address our nation's urgent energy challenges—believe an Open Fuels Standard is the simplest, least-cost approach for reducing the strategic importance of oil, and the corresponding liability of gasoline price spikes that wreak havoc on our economy and American family budgets. In fact, this Council—a bipartisan group of former cabinet Secretaries, Senators, oil company and Fortune 500 CEOs—said that making new cars capable of running on alternative fuels was the single most important thing Congress can do to have a lasting impact on America's energy security.

So I would like to know what would happen if millions of gallons of alternatives to petroleum became available and effectively ended the monopoly oil has on our nation's transportation system.

a. Let's say that 20 to 30 percent of our nation's petroleum demand could be replaced with alternative fuels such as methanol derived from natural gas or ethanol from non-food biomass at prices less than the current price of gasoline, what impact do you think that would have on overall gasoline prices?

b. Do you think that having competing fuels at the gas pump would help lower prices because consumers can switch between fuels?

c. How do continued elevated oil prices, say any level above $80 a barrel, make petroleum alternatives more competitive?

I disagree with the argument that U.S. oil production has no impact on the world market. If U.S. production had not risen by 18 percent—almost a million barrels per day—since 2008, we would have had a perilously tight oil market that would have put our economy at great risk.

Answer. Your emphasis on Brazilian experience is very important. (For a discussion of the Brazilian experience and its relevance to the United States, please see pages 651-55 of The Quest. It describes the introduction of the flex-fuel vehicles). Actually, the ethanol share of the Brazilian motor fuel market relative to gasoline

has declined recently owing to the high price of sugar. In addition, Brazil has had to import ethanol from the United States.

The development of Brazilian ethanol is a significant development, important both for Brazil and world markets. But it helps to keep it in perspective. The United States currently produces about two-and-a-half times the amount of ethanol as Brazil. Moreover, just the increase alone in Brazilian oil production since 2000 is twice the country's total output of ethanol.

In the United States, it is generally thought that there are land and food constraints that limit significant further growth in conventional ethanol. It is now an important component in U.S. motor fuel supply—almost 10 percent on a volumetric basis. (On an energy basis, its share is lower).. But there is also generally thought to be a blend wall in terms of further ethanol use in engines. Despite the high hopes for second generation biofuels, none have yet emerged that meet the tests of scale and cost. However, it significant that the research and investment effort continues, and many different groups are trying to find competitive solutions.

FUTURE OIL PRICES

Question 3. My take aways from the witnesses today is that the era of cheap oil over, and world demand, particularly in developing countries, is ready to take off. That makes sense because the reality is the world today is overly dependent on the giant, conventional oil fields discovered back in the 1950s and 1960s. The chief economist for the International Energy Agency was very direct on this point in an interview in October 2010. He said,

"The era of cheap oil is over. Each barrel oil that will come to market in the future will be much more difficult to produce and therefore more expensive. We all—governments, industry, and consumers—should be prepared for oil prices being much higher than several years ago."

Yes, it's true that we can find more oil if we drill deeper and deeper and in waters farther away from land. We can also squeeze more oil out of more tar sands or shale. But all those options greatly increase costs and environmental impacts. It is important to note that this supply crunch happens at the very same time world oil demand is expected to increase rapidly. According to the International Energy Agency, not only will world oil demand grow by 25 percent by 2030, but 93 percent of new demand will come from non-OECD countries—mainly China and India. So not only will there be more people demanding access to a shrinking, limited supply of oil, we'll now be fighting with China and India who can now afford to bid against us for this finite and currently irreplaceable resource.

Even a top Saudi Arabian energy official recently expressed serious concern that world oil demand could peak in the next decade which explained why they were working to diversify their country's economic base. If the Saudi government is talking about diversifying, I think that should be a wakeup call for all of us: we need to be figuring out how we diversify A.S.A.P.

The price of a barrel of oil is roughly the same as the price at the beginning of 2008. And today's national average price of gasoline is only 20 cents below its highest ever in the summer of 2008 when oil reached almost $150 per barrel. Yet few would say our economy is quite as robust now as it was then.

a. I would be interested in hearing what the panelists would estimate the price of oil to be today, given all the new economic and geopolicial factors, if our economy was firing on all cylinders again?

b. I think we are only a few years from the whole world being back to 2008 levels of growth or beyond. What will that mean for world oil prices within the next five years?

c. Is it safe to say that the era of cheap oil is over? Will the average price of oil be over $100 for the foreseeable future, unless we have another economic collapse like the one in 2008?

Answer. If the world economy were "firing on all cylinders", the world oil price would likely be higher—especially at a time when U.S. and European policy is to squeeze down Iranian oil exports.

As always when projecting future prices, one must be alert to "surprises" that change the picture. But the growth of demand from the emerging markets is the dynamic element in the world oil market. The United States has already reached "peak demand". It will be a challenge to meet the needs of these markets as their populations enter "middle income" and start buying automobiles, etc. Fortunately, the U.S. auto fleet is going to become more efficient, which has worldwide impact. Recent developments in supply—tight oil in the United States, oil sands in Canada, and Brazilian off-shore—create somewhat more confidence about meeting the chal-

lenge of demand. As you suggest, price is signaling the need for new supplies, alternatives, and greater efficiency. But many of the constraints to developing new supplies are above ground.

U.S. oil production is up almost 20 percent since 2008. Had that increase not taken place, we would undoubtedly be looking at considerably higher oil prices.

RESPONSE OF DANIEL YERGIN TO QUESTION FROM SENATOR MURKOWSKI

SHORT TERM SOLUTIONS

Question 1. I know there are no "silver bullet" solutions that will immediately bring down gasoline prices, but I wonder if you have any thoughts about steps that we might take to at least try and alleviate some of the pain people are feeling at the pump in the short term?

Answer. Much of what happens in the oil industry is long-term in nature. But we are seeing the rapid development of shale gas and tight oil. Facilitating the growth of tight oil in North America would be helpful. Understanding—and helping to relieve—logistical bottlenecks for new supplies is another step. Getting more supplies into the market on a global basis would be immediately helpful. Encouraging efficiency in the operation of federal government vehicles would be a contribution on the demand side.

APPENDIX II

Additional Material Submitted for the Record

CONGRESSIONAL RESEARCH SERVICE,
March 28, 2011.

MEMORANDUM

To: Senator Jeff Bingaman

Attention: Ryan Martel

From: Molly Sherlock, Specialist in Public Finance, 7-7797

Subject: Repealing Tax Incentives for Major Integrated Oil and Gas Companies: An Analysis of the Repeal Big Oil Tax Subsidies Act (S. 2204)

This memorandum responds, on an expedited basis, to your request for an analysis of the Repeal Big Oil Tax Subsidies Act (S. 2204). As discussed during our conversation on March 27, 2012, this memorandum provides the following information. First, the revenues that would be generated by repealing certain tax incentives for oil and gas are reviewed. Second, how these revenues might result in increased gas prices for consumers is discussed. Third, these revenues are compared to net income levels in recent years for affected companies.

The Repeal Big Oil Tax Subsidies Act (S. 2204) would modify and repeal certain oil and gas related tax incentives.[1] The proposed changes would only affect major integrated oil companies.[2] Specifically, this legislation would: 1) modify the foreign tax credit rules for dual capacity taxpayers that are major integrated oil companies; 2) prevent major integrated oil companies from claiming the Section 199 production activities deduction for oil and gas related activities;[3] 3) limit the deduction for intangible drilling costs (IDCs) for major integrated oil companies; 4) fully disallow percentage depletion for major integrated oil companies;[4] and 5) disallow the deduction for tertiary injectants for major integrated oil companies.

The Joint Committee on Taxation (JCT) has estimated that repealing the tax provisions listed above for major integrated oil companies would generate $24.0 billion in revenues between 2012 and 2022. More than 90% of the revenues would be raised through repeal of two of the five provisions listed above: modifications to the dual capacity rules and limitations on the Section 199 deduction. Over the ten-year period spanning 2013 through 2022, the JCT has estimated that additional revenues would increase by $23 billion or on average $2.3 billion per year.

Repealing tax incentives for oil and gas will result in higher tax payments for affected companies. These higher tax payments reflect the statutory incidence of the tax incentives. The economic incidence of the tax is determined based on how the tax affects prices in markets for oil and gas and related products. Oil companies facing higher tax burdens may pass this additional cost forward to consumers, increas-

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[1] Details on oil and gas related tax provisions that would be repealed can be found in Department of the Treasury, General Explanations of the Administration's Fiscal Year 2013 Revenue Proposals, Washington, DC, February 2012, http://www.treasury.gov/resource-center/tax-policy/Documents/General-Explanations-FY2013.pdf.

[2] A major integrated oil company is defined in the Internal Revenue Code (IRC) as being one with average daily worldwide production of crude oil of at least 500,000 barrels, as having gross receipts in excess of $1 billion, and as having a 15% of greater ownership interest in a crude oil refiner. Generally, major integrated oil companies are believed to be the "big 5," ExxonMobil, Chevron, BP plc, Royal Dutch Shell, and ConocoPhillips.

[3] For more information on this provision, see CRS Report R41988, The Section 199 Production Activities Deduction: Background and Analysis, by Molly F. Sherlock.

[4] Integrated oil companies have generally not been able to claim percentage depletion since 1975. While this bill proposes to prevent major integrated oil companies from claiming percentage depletion, the JCT has estimated that this measure would have no revenue effect.

ing prices for refined petroleum products (e.g., gasoline). Alternatively, affected companies may not be able to fully pass forward higher tax burdens to consumers. If the burden cannot be passed forward, oil and gas companies will see a reduction in their own profits, with the burden of the tax being borne primarily by shareholders.[5] The purpose of this memorandum is not to provide a full analysis of the potential impact on markets from repealing oil and gas tax incentives in S. 2204.[6] Instead, the purpose of this memorandum is to relate the magnitude of the tax revenues that would be raised by repealing these provisions to markets for gasoline and profits of affected companies.[7]

Some may be concerned that repealing tax incentives may lead to higher gasoline prices. In 2011, the U.S. consumed nearly 6.9 billion barrels of crude oil and petroleum products.[8] Of this, nearly 3.2 billion barrels was gasoline. Thus, in 2011, the U.S. consumed approximately 133.9 billion gallons of gasoline.[9] If U.S. prices on gasoline had been $2.3 billion higher in 2011, this would have translated into a 1.7-cent per gallon price increase. In 2011, the average price of a gallon of gas was $3.58.[10] If total consumer spending on gasoline had been $2.3 billion higher in 2011, the average price of a gallon of gas would have been 0.48% higher.

While the numbers above may be instructive for understanding potential magnitude of the proposed changes in oil and gas tax incentives, these figures should not be taken as predictions of market prices should oil and gas tax incentives be repealed. First, the figures above assume that all of tax revenues gained by repealing tax incentives for oil and gas companies would contribute to higher gasoline prices, which is very unlikely to be the case.[11] In reality, crude oil is an input for many products, gasoline being just one. If the burden of the tax was spread across all crude oil, petroleum, and gas-related products, the increase in the price of gasoline would be less. Second, integrated oil and gas companies may not pass the benefits of tax incentives forward to consumers. Instead, these tax benefits may instead contribute to corporate profits.

In 2011, total net income (profits) for the five major oil companies was $132.9 billion.[12] For these five companies, net income in 2011 was higher than it had been in recent years. Between 2007 and 2011, net income averaged $98.8 billion (ranging from $63.7 billion in 2009 to $132.9 billion in 2011). If tax burdens on these five companies were to increase, on average, by $2.3 billion per year, and profits were roughly $98.8 billion per year, the revenues raised would represent roughly 2.3% of profits for the major integrated oil companies. Reduced profits mean reduced returns for shareholders, and could potentially depress wages in the sector. However, given the magnitude of the tax incentives relative to industry profit levels, these effects are likely to be small.

Ultimately, the price of gasoline depends on a number of factors.[13] The price of crude oil is a primary factor explaining the price of gasoline. In the short run, tax policy is unlikely to affect production of crude oil, since current production is a function of past investment decisions. Over time, tax incentives that encourage investment might support additional production capacity. High market prices, however,

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[5] This assumes that the incidence of the corporate tax is borne primarily by owners of capital. Some smaller portion of the burden of the corporate tax is likely borne by labor. For additional background on corporate tax incidence, see Jennifer C. Gravelle, Corporate Tax Incidence: A Review of Empirical Estimates and Analysis, Congressional Budget Office, Working Paper 2011-01, June 2011, http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/122xx/doc12239/06-14-2011-corporatetaxincidence.pdf.

[6] The potential market impacts of repealing certain oil and gas related tax provisions are discussed in CRS Report R42374, Oil and Natural Gas Industry Tax Issues in the FY2013 Budget Proposal, by Robert Pirog.

[7] Tax provisions that affect profits, rather than incremental costs or revenues, are generally believed not to affect output. Both the Section 199 deduction and dual capacity provisions are taxes on profits. Thus, from this perspective, repealing these two provisions that account for 90% of the revenues generated in S. 2204, would not affect crude oil output. With no tax-induced change in oil production, gas prices would not change.

[8] U.S. Energy Information Administration (EIA), Petroleum & Other Liquids, Product Supplied, data available at: http://www.eia.gov/dnav/pet/pet__cons__psup__dc__nus__mbbl__a.htm.

[9] There are 42 U.S. gallons in a barrel.

[10] U.S. Energy Information Administration (EIA), Motor Gasoline Retail Prices, U.S. City Average, available at: http://www.eia.gov/totalenergy/data/monthly/pdf/sec9__6.pdf

[11] For a repeal of tax incentives to increase gasoline prices, the repeal of tax incentives would have to result in reduced crude oil production. Provisions that affect taxes on profits, such as the Section 199 deduction, are unlikely to change current output decisions and current production levels.

[12] See CRS Report R42364, Financial Performance of the Major Oil Companies, 2007-2011, by Robert Pirog.

[13] For additional background, see CRS Report R42382, Rising Gasoline Prices 2012, by Neelesh Nerurkar and Robert Pirog.

will also create an incentive for capital investment to increase production capacity. The small size of the tax incentives relative to market prices and industry profits suggests that changes to these tax incentives are not likely to have a large effect on the oil and gas industry.[14]

EDWARDS ENERGY CONSULTANTS,
Katy, TX, March 29, 2012.

Energy and Natural Resources Committee Office,
304 Dirksen Senate Building, Washington, DC.

Attn: Allison Seyferth

I am concerned that the testimony of Howard Gruenspecht as presented to the committee today may be grossly misleading. He attributes the increase in gasoline and diesel prices entirely to increases in the cost of crude when his own figures contained in his testimony show that refiners' profit margins increased significantly as well.

On the second page of his testimony he states "Recently crude oil price increases have eclipsed other impacts on petroleum product prices, including any downward effect stemming from recent weakness in U.S. gasoline and diesel demand. While both gasoline and diesel prices rose 37 cents per gallon from February 2011 to February 2012, the cost of crude oil to refiners rose by about $20 per barrel (48 cents per gallon) over the same period. Figures 2 and 3 show U.S. retail prices for gasoline and diesel fuel along with refiners' average crude oil costs, illustrating the significant impact of crude oil prices on product prices."

The numbers shown on the Figures 2 and 3, referred to by Mr. Gruenspecht, are not the same as his stated values. The increases in gasoline and diesel fuel, as shown on his own figures, were about 68 cents per gallon and 55 cents per gallon, respectively, about 22 cents per gallon more than Mr. Gruenspecht stated. Had he used the correct numbers he would have had to explain the justification for the additional price increase that occurred, which was more than the increase in the cost of crude. That justification is important and its exclusion and his obscuring this fact are troublesome.

The trend in product price increases greater than crude costs continues to an even greater extent this year. Since the end of last year the wholesale price of gasoline has increased 60 cents per gallon while the price of crude has increased less than 20 cents per gallon. Thus refining profits represent two-thirds of the gasoline price increase. Is there a valid justification for a profit margin increase of this magnitude in light of declining demand and stringent economic times? Should not these facts be highlighted rather than obscured by mis-statement?

I hope my comments are helpful. If you wish further detail or explanation, please contact me.

Best regards,

WILLIAM R. EDWARDS.

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[14] For a full economic analysis of the market effects of repealing tax incentives for oil and gas, see Maura Allaire and Stephen Brown, Eliminating Subsidies for Fossil Fuel Production: Implications for U.S. Oil and Natural Gas Markets, Resources for the Future, Issue Brief 09-10, December 2009, http://rff.org/RFF/Documents/RFF-IB-09-10.pdf.