UNITED STATES OF AMERICA
DEPARTMENT OF ENERGY
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NATIONAL PETROLEUM COUNCIL

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121ST MEETING

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THURSDAY
SEPTEMBER 15, 2011

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The meeting came to order in the Astor Ballroom of the St. Regis Hotel, 923 Sixteenth Street, NW, Washington, DC at 9:00 a.m., David J. O'Reilly, Chair, presiding.

PRESENT:

DAVID J. O'REILLY, NPC Chair

HON. STEVEN CHU, Secretary of Energy
HON. DANIEL B. PONEMAN, Deputy Secretary of Energy
PHILIP R. SHARP, Vice Chair, Policy
DANIEL H. YERGIN, Vice Chair, Demand
CLARENCE CAZALOT, JR., Chair, NPC Committee on Future Transportation Fuels

JAMES T. HACKETT, Chair, NPC Committee on Resource Development
D. CLAY BRETCHES, Chair, Coordinating Subcommittee, Committee on Resource Development
LINDA A. CAPUANO, Chair, Coordinating Subcommittee, Committee on Future Transportation Fuels

PRESENT(Cont'd):

CHRISTOPHER CONOSCENTI, Chair, Macroeconomics Subgroup, Committee on Resource Development

FIJI C. GEORGE, Chair, End-Use Emissions and Carbon Subgroup, Committee on Resource Development

PAUL D. HAGEMEIER, Operations and Environment Task Group, Committee on Resource Development

ANDREW J. SLAUGHTER, Chair, Resource and Supply Task Group, Committee on Resource Development

SUSAN F. TIERNEY, Chair, Policy Subgroup, Committee on Resource Development

KENNETH L. YEASTIN, Chair, Demand Task Group, Committee on Resource Development

THURMAN ANDRESS, Member

W. BYRON DUNN, Member

C. R. PALMER, Member

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9:01 a.m.

CHAIR O'REILLY: Good morning, ladies and gentlemen. I'd like to call to order the 121st meeting of the National Petroleum Council.

Welcome to all of you, members of the Council, honored guests and members of the press and public. I hope, I think we have an efficiently structured and informative meeting for you this morning.

For the members of the Council, if there's no objection I'll dispense with the calling of the roll, and the check-in over here inside the Chandelier Room will serve as our official attendance record.

So any member or observer who didn't get a chance to sign in, I'd appreciate if you would do it later on today so that we can have an accurate record of attendance at the meeting.

We also have an extended audience

joining us by Webcast, and the Internet audience can follow our study presentations today and will be able to download the resources study draft report at the end of the meeting.

I would now like to introduce to you and for the record, the participants at our head table. On my immediate right is the Council's Co-chair, the Honorable Steven Chu, Secretary of Energy.

Mr. Secretary, we are pleased you are here with us this morning and look forward to hearing your comments later today, so thank you for being here today. Thank you.

(Applause.)

Next is Jim Hackett, who is chair of the NPC Committee on Resource Development, and beside him is the Honorable Daniel Poneman, Deputy Secretary of Energy and Resource Committees.

Next to Dan are two of the four vice-chairs of the Resource Committee, Dan

Yergin, Vice-chair for Demand, and Phil Sharp, Vice-chair for Policy.

And next to Phil is Clarence Cazalot, who is chairing the NPC Committee on Future Transportation Fuels. As you know, we have two studies underway.

We're reporting on the first one today, the second one Clarence will be giving us an update on later this morning.

At the table to my left are representatives from the resource studies Coordinating Committee who have worked tirelessly over the last year and a half to complete this study, and they will be introduced to you shortly.

Our primary business this morning is to review the work of the NPC Committee on Resource Development, discuss their findings and recommendations, and vote on adoption of their proposed final report as the Council's response to the Secretary's request.

Many members of the Council

provided outstanding leadership as well as significant contributions of their personal time and their organizations' resources to respond to the Secretary's request for this important study.

Jim Hackett has been chairing our Committee on Resource Development, and he will kick off the presentation on the results of the resource study.

So Jim, take the podium.

MR. HACKETT: Thank you, Dave, and good morning to the Council members, our honored guests, members of the press and those joining us via the Web.

Extraordinary events have affected energy markets in the years since the National Petroleum Council reported on the Hard Truths about Energy in 2007.

That study concluded that the world needed increased energy efficiency in all economic forms of energy supply to meet projected increases in global demand.

This is still true today, yet fortunately in the few years since then significant advancements in technology have fundamentally changed and expanded the availability of North American natural gas and oil reserves.

These vast new supplies of energy have numerous positive benefits for jobs, the economy, cleaner air and our nation's energy security.

With the opportunities often come challenges as we've seen with concerns related to the environmental impacts of offshore drilling, pipeline infrastructure, oil sands and shale and oil gas development to name a few.

Within this context and with an understanding that the positive outcomes have increased North American natural gas and oil resources can only be realized if safely developed in a manner that protects the environment and public health, the NPC has

completed a study that we hope will improve the general understanding of the natural gas and oil resource base including it's scale and significance, and set a course for future policy that will allow for prudent development of these large domestic sources of energy.

Our objective this morning is to provide an overview of the study's findings and recommendations.

We hope that many of you have read or will read the report in its entirety including the topic papers which will be made available on the NPC website.

I do want to emphasize the report itself is full of important details that simply cannot be covered in a 40-minute presentation.

The background and analyses that you will find in the report will be helpful for clarification of many of the key points and recommendations that you hear in the presentation today.

Here to describe the highlights of the report is a leadership team from the study's Coordinating Subcommittee. They have been on this assignment for over a year and a half to make this day possible.

On my immediate left is Clay Bretches, who chairs the Coordinating Subcommittee. Next to Clay is Andrew Slaughter, for Resource and Supply.

Next to Andrew are Ken Yeastin for Demand, Fiji George for Emissions, Chris Conoscenti for Macroeconomics, Paul Hagemeier for Operations and Environment, and finally and not least, Sue Tierney for Policy.

I would also like to recognize Chris Smith in the audience here up in the left, the Coordinating Subcommittee's government co-chair, for his leadership and engagement throughout the process. So Chris, thank you.

Many members of the Council provided their outstanding leadership as well

as significant commitments of their time and their organizations' resources. And this is all in response to the Secretary's request for this important study.

And to those of you who responded to requests to make people available to commit the time needed for the study, we certainly give you our heartfelt thank you.

We now turn to the consideration of the proposed final report of the NPC Committee on North American Resource Development.

On behalf of the committee, I am pleased this morning to present the results of this comprehensive study to the membership for your consideration and action.

Clay Bretches will now lead off the presentation. Clay?

MR. BRETCHES: Thank you, Jim, and good morning, ladies and gentlemen. Thank you for joining us today as key members of the resource studies Coordinating Subcommittee

present a summary of the 2011 Prudent Development Report.

We have divided this presentation into four broad categories. First, I will describe the study approach, the team on the stage will describe what we learned during the course of the work and sharing our principle findings by functional segments, and then how these findings are interwoven to produce the study's integrated findings.

The leaders will also identify the integrated set of core strategies that we believe are essential for our nation to pursue.

So the genesis of this report occurred on September 19, 2009, when Secretary Chu issued a letter requesting that the National Petroleum Council address five key tasks.

Assess the North American resource space. Describe the operating practices and technologies that will be used to minimize the

environmental impacts and in expanding accessible resources.

Assess the supply and demand through 2035 with views to 2050. Identify emission reduction stemming from increased use of natural gas, and advise on policy options that will allow prudent development consistent with the objectives of environmental protection, economic growth and energy security.

The study teams and methodology were designed around the Secretary's questions to handle the topics of North American Resource and Supply, Demand, Operations and the Environment, Emissions and Macroeconomics.

We then broke the subject matter down further and enlisted expert resources to address the complex energy issues within our many subgroups.

Participation in the study was broad with over 400 participants from the members' organizations and beyond. You will

see here that over 50 percent of the participants came from outside the oil and gas industry.

In total, the participants in the study represent over 100 companies, agencies and institutions.

In addition, we conducted outreach presentations to multiple third parties involved in the energy sector for their ideas and opinions throughout the study.

Although this study may have some characteristics similar to previous studies, it has some unique features as well.

First, rather than creating yet another integrated supply and demand modeling run, we spent our time and effort amassing publicly available studies relevant to our framing questions so we could analyze ranges of outcomes rather than deterministic forecasting.

And we used a method to gather proprietary information that enabled us to

compile data and look at trends on an aggregated basis.

So you will see both in the resource and the demand findings what we learned from various firms that were surveyed. Another unique characteristic of the study was the depth and the breadth of the work on environmental and emission issues.

The range of topics considered was quite large, and the participation level in this area greater than any preceding National Petroleum Council study.

The list of topics ranged from conventional to unconventional play types, onshore to offshore operations, the history of environmental laws and future expectations.

The work also included such timely topics as sustainable strategies, environmental management systems and onshore councils of excellence to name but a few.

Before my colleagues walk you through the details of the study, I think it

would be beneficial to outline the highlights of what you're about to hear.

There is a tremendous amount of natural gas and oil in North America, and estimates of the resource base have increased substantially since the last resource study the National Petroleum Council conducted.

This resource base can produce huge quantities if the industry has access to supply. There is enough natural gas to meet even our highest projections of demand without significant LNG imports.

And the biggest opportunity for increased natural gas use is in the power sector, and there are big needle movers for large-scale greenhouse gas reductions resulting from natural gas use.

There are other material economic benefits for our nation too. Millions of high paying jobs, robust domestic industrial development and enormous tax and royalty revenues for local, state and federal

governments.

The only way that we can realize these benefits fully is if the resources are developed prudently. Prudent development is the lynchpin, and we will tell you what that looks like.

Pulling it all together, we have huge resources, can meet robust demand with big potential upside benefits, and it all depends on doing it right.

Here to explain the Resource and Supply is Andrew Slaughter. Andrew, if you would start us off, please.

MR. SLAUGHTER: Good morning, everybody. First of all, I think one way of considering North American supply of oil and gas it's appropriate to remember where we're starting from.

The U.S. and Canada together are global leaders in production of both natural gas and oil broadly equivalent to energy giants like Russia and Saudi Arabia. And that

we don't often appreciate enough or give due credit to.

But in addition, this continent has been the center of development and deployment of game changing energy technologies starting in the Arctic in the 1970s, moving to the deepwater, moving to oil sands and more recently, unconventional gas.

These technologies have each changed the global energy picture significantly and they've been developed and deployed here first.

So it's a tremendous success story and this gives a great platform for future development of oil and gas within the North American region.

Let's talk about gas first. This slide shows a development of technically recoverable resource estimates for natural gas over the last decade or so.

And if you look on the left hand side of the chart you see a range of

assessments from towards the beginning of the last decade, and on the right hand side of the chart you see resource estimates for more recent times, in the last three to four years.

And there's a range of costs because different organizations produce these with slightly different assumptions. But the growth is quite astounding.

It's in some cases doubling or even tripling of the amount that we can recover. And this is entirely due to the unconventional gas revolution, shale gas, horizontal drilling, et cetera.

And it creates a great platform not just for having a resource base, but for supplying the market for decades to come. Supplying a growing market, reducing the need for LNG imports and maybe even moving towards LNG exports.

Staying with gas, let's have another, a slightly different look at the resource base. These resource curves are

taken from the recent MIT natural gas study, which is one of the external studies we analyzed.

And the horizontal access shows resource base in trillion cubic feet. The vertical access shows wellhead development costs in dollars per MMBTU.

And let's just look at where the yellow arrow intersects. The blue line is the median resource base estimate, and that intersects with the highest demand outlook that was analyzed from this study on a cumulative basis to 2035 at a relatively low wellhead development cost.

So that shows you, shows the complete transformation of the outlook from what people were talking about as recently as five years ago.

And the two takeaways from this are one, there are decades of potential supply beyond 2035, if you look to the right of that point. And second there's a lot of supply at

moderate development cost.

Now of course we don't draw any conclusions regarding price from that, because there are many other factors that go into the price outlook, but from a cost basis this is a much more stable and rich resource base than was seen as recently as five years ago.

If we move to oil, a similar story. We've looked at a range of potential oil supply outlooks to 2035, and like gas the unconventional piece is playing a critical role.

So we've made major breakthroughs in tight oil, the Canadian oil sands already are already showing significant growth. And so the unconventional piece which depends on some of the same technologies as unconventional gas, is critical to the future oil supply.

Now there are two potential bookends to this range. There's a high potential bar to the right of the chart, and

that shows very, very significant potential growth if access and regulatory frameworks and technology deployment basically goes ahead based on the potential options that are available.

Now the choice is if we do not deploy technology, if we do not develop access and leasing frameworks then oil supply in North America could continue its decline of recent years and end up in 2035 actually below recent levels. And that illustrates the range of the choices available.

So if we look at oil and gas, we see a portfolio of options available for supply. And a portfolio is valuable if you keep options available.

This portfolio we characterize by resource type, by geography, by technological intensity, and over time. So a very rich range of development choices that we have available.

In the near term, we have world

class producing basins in the Gulf of Mexico, in Alberta, and the onshore both on the oil side and the unconventional side.

These can be sustained because we have a high, a large market in North America to serve. But in the medium term, if we want to grow oil supply and gas supply then we need to embark in new exploration in the Arctic and new offshore areas to take us through the next several decades.

And in the very long term, we're talking about more novel resources like methane hydrates and Colorado shale oil, which require technology development in which the track record of development of energy technology in North America should serve us well to bring those potential very large resources into the supply mix around the middle of this century or just before.

So the portfolio is rich and provides plenty of opportunities for development choices going forward.

Finally, how does the policy sphere interact with this picture? There is a role for policy, and we think that there are five areas we'd like to emphasize.

First of all, appropriate leasing and royalty frameworks, fiscal frameworks, regulatory frameworks, which apply to the different resource types.

Very different in the Arctic from the Gulf of Mexico. Very different onshore from offshore. And so we can work on those areas.

Long-term technology partnerships for these more novel resources between government agencies, academia and the industry are very important to move down the technology development pathway.

Government energy data and analysis capabilities serve a very key role in creating a common framework and a common language between all stakeholders in looking at energy policy choices.

And then resource estimates, we need to maintain and update our resource estimates for current and prospective resources, because if we don't know the scope we can't make smart choices. We need to know the scope of the resources available.

Infrastructure is important. It's often neglected. But resources can only be developed if they're linked to market, so we need to maintain an effective infrastructure permitting process both for natural gas and oil.

And with that I think I've covered the highlights of the Resource side and I'll turn it over to Ken Yeastin to talk about Demand.

MR. YEASTIN: Thank you, Andrew. Most of the variation in U.S. natural gas demand in 2020 and 2030 comes from the power sector.

The variation in demand from the power sector comes from differences in key

assumptions on economic growth, the impact on coal generation from the proposed, and in some cases, final EPA rules on greenhouse gas regulations, carbon policies and other factors.

Power sector natural gas demand affects not only the outlook for overall demand, but also for the potential for natural gas to provide emissions reductions.

As you just heard, the natural gas resource base for the U.S. and Canada can cover a wide range of gas production assuming reasonable access and reasonable regulation.

As mentioned earlier by Clay, we chose not to develop our own integrated supply and demand forecast.

To address the lack of an integrated projection, we chose instead to stress test the ability of the North American natural gas resource base to meet a very high potential estimate of demand and exports for 2035 as shown on the right.

Again, with reasonable access and reasonable regulation, supply can meet or exceed even a very high potential estimate for demand and exports.

However, if more restrictive regulation or access is imposed then the resulting gas supply could be insufficient to meet demand, leading to an increased reliance on LNG imports.

As we found in the Hard Truth study, energy efficiency is a cornerstone of any energy policy. Energy efficiency investments improve our standard of living, improve economic and energy security, all while reducing emissions.

The first four recommendations focus on energy efficiency. We're recommending a full fuel cycle analysis methodology be developed that will facilitate choosing the most energy efficient or least emitting alternative when considering energy from primary source through ultimate end use.

Measures to increase energy efficiency of buildings and appliances is encouraged by recommending implementation of updated codes and standards.

Disincentives for utilities to promote energy efficiency need to be removed as well as barriers to greater use of combined heat and power. Both need to be done in a manner that is fair and equitable for all stakeholders.

The last two recommendations focus on enhancing the regulation of energy markets to facilitate the greater use of natural gas in the power sector while continuing to assure reliable gas and electric service.

Fiji?

MR. GEORGE: Thank you, Ken. As part of this study, the NPC reviewed life cycle emissions of coal and gas.

And life cycle emissions in this study were defined as emissions from the production, delivery and consumption of coal

and gas, and in case of the natural gas from the wellhead and in the case of coal from the mine mouth to the burner tip.

As you can see in the slide, when accounting for efficiencies that are typical for a coal and natural gas plant in the U.S., natural gas-fired combined cycle plants are about 50 to 60 percent lower in greenhouse gas life cycle emissions than coal.

This inherent lower emissions profile, higher efficiencies of natural gas plants and market dynamics resulting from bond and supplies provides us the great opportunity to use natural gas in end use sectors especially in the power sector.

Now we evaluated U.S. greenhouse emissions, and under current business as usual conditions the projections of U.S. emissions are rising.

However, if policymakers consider options to reduce greenhouse gas emissions we find that natural gas can be an important part

of the solution.

Our study indicates that greater use of natural gas especially in the power sector in terms of displacing coal fired generation, along with EPA non-greenhouse gas regulations and policies such as price on carbon, makes natural gas an attractive option in a suite of options to meet a 50 percent reduction by 2050.

However, to achieve deeper greenhouse gas reductions, i.e., around 80 percent by 2050, there will be the need for additional low to zero emitting technologies such as Carbon Capture and Sequestration.

I understand this is a busy slide, but here are our major recommendations. Our first recommendation is to provide certainty to the power sector on the EPA non-greenhouse gas rules.

Number two, consider partnerships to improve measurement and develop technologies to measure and reduce emissions

in the natural gas value chain.

Number three, as policymakers consider environmental and energy policy they should recognize that the most effective and efficient method would be to put a price on carbon that is national economy-wide in scope, market based and part of the global framework.

And as I mentioned before, deeper reductions will require inclusion of technologies like Carbon Capture and Sequestration, hence, it's important to consider the options to conduct R&D for CCS that is fuel neutral and that includes natural gas.

And with that I pass it over to Chris Conoscenti.

MR. CONOSCENTI: Thanks, Fiji. The Macroeconomic subgroup in addition to reviewing commodity price volatility and business models used by the industry, really focused our efforts on looking at the macroeconomic impacts of the oil and gas

industry domestically.

So we looked at employment, GDP, labor income and government revenues derived by industry activity. We reviewed dozens of studies.

The most comprehensive national study covering the entire value chain of the oil and gas industry that we reviewed was the Price Waterhouse study that was done in 2009 and updated in May of this year.

According to that study, the oil and gas industry directly employs 2.2. million Americans. Even if you exclude gas station workers from that total it's still quite impressive at 1.3 million Americans.

And when you look at all the jobs that are required to support the activities of oil and gas companies and their employees that total jobs supported by the industry is over nine million jobs.

None of these totals include incremental jobs that have been added in the

petrochemical industry in recent years that have been enabled by abundant supplies of domestic resources.

Importantly, jobs that are focused on oil and gas extraction in the U.S. for the most part must be performed domestically. These are American jobs and these are good paying jobs.

The graph on this slide illustrates that oil and gas extraction jobs on average pays 74 percent above the national average.

Aside from gas station jobs, every other category of employment in the oil and gas industry pays above the national average.

In addition to the natural gas and oil industry's important role in GDP, employment and labor income contributions, the industry is a significant source of government revenue.

The graph on this slide shows that in aggregate the natural gas and oil industry

is the third largest payer of federal corporate income taxes.

However, federal corporate income taxes are only a fraction of the total federal, state and local government revenue generated by the industry.

Once royalties on government lands, severance, sales, property and use, payroll and excise taxes which are ultimately borne by consumers are counted, the total federal, state and local government revenue from the industry exceeds $250 billion annually.

Lastly, the Hard Truth study mentioned the impending retirement of baby boomers. That wave of retirement has begun. In 1997, only 27 percent of members in the Society for Petroleum Engineers were over the age of 50.

In 2010, that percentage had jumped to 45 percent. That is not a unique pattern to the private sector. Sixty two

percent of petroleum engineers working for the federal government are age 50 or older. The same goes for geoscientists.

Baby boomers started turning 65 this year and at many companies the eligible age for retirement is younger than 65. Compounding this demographic shift is the insufficient number of university and postgraduate students to fill the gap of retiring technical professionals.

The good news is that enrollment has increased in the petroleum engineering field as illustrated on this slide, and to a lesser degree in the geosciences.

However, even with the increase in population of students in these disciplines there is still a wide experience gap between new hires and retiring professionals with 30-plus years of experience.

This workforce issue is not just a private sector problem. Federal and state governments that oversee the activities of

natural gas and oil companies need technical professionals to adequately perform their regulatory roles.

Given these challenges, the NPC recommends that the federal government and natural gas and oil companies work together for a solution.

The federal government has the ability to direct research grants to fields that lead to areas of interest for careers in the natural gas and oil industry.

Also, over 25 percent of the students enrolled in petroleum engineering and the geosciences are not U.S. nationals. The federal government could modify regulations that would allow more of these students to eventually work in the U.S.

Lastly, K through 12 education, particularly math and science education at those levels, provides the foundation necessary to pursue higher education that can lead to careers as technical professionals in

the industry.

The recent publication of Rising Above the Gathering Storm, by the National Academy of Sciences reinforces this point and highlights the amount of improvements that the U.S. needs to make in its math and science education at the K through 12 levels.

National gas and oil companies will need to take the lead with additional recruiting efforts and training opportunities for undergraduate and graduate students.

The combined efforts of the federal government and the industry participants can make a significant impact in the great crew change that is already underway.

With that I'll turn it over to Paul.

MR. HAGEMEIER: Andrew has shown us the vast oil and natural gas resources available to our country. Developing these resources requires us to balance

considerations that are sometimes competing and sometimes complementary.

Goals of economic growth, environmental stewardship, sustainability, energy security, health and human safety, must all be taken into account as we consider how best to develop the resources.

During the 150 years of development, 4.3 million oil and gas wells have been drilled in the U.S. and much of Canada.

But the development of any energy resource comes with environmental impacts. This is as true for oil and natural gas as it is for solar, wind, coal or nuclear power.

Clearly, to access the new resources that Andrew has discussed we will have to drill more wells, build more processing facilities and construct more transportation infrastructure.

Secretary Chu asked us to look at operating practices in the environment. This

study has taken the most detailed review of operating practices and impacts of the environment of any end piece study to date.

And in truth, much of the public attention on the development of these resources has been focused on operating practices.

We need to acknowledge those concerns and at the same time we need to address them with facts regarding the regulatory framework, the operating and environmental practices that have evolved over the past 150 years.

As you can see, the resources cover every physiographic region of North America and in shallow and deep offshore environments.

In the future, continued focus on operating practices and in the environment will be critical to the NPC and the industry as going forward.

The NPC is very fortunate in the

diverse set of individuals that participated in this endeavor. We had stakeholders from academia and the regulatory and environmental community.

We held discussion groups with environmental stakeholders outside the NPC process itself in order to help define the issues of interest, the diversity of opinions generated, ideas and recommendations that would not have been considered otherwise.

Our group reviewed over 700 individual studies, reports, articles and other references. In doing this we realized that examining history is critical.

Understanding the development of oil and natural gas on and offshore and the history of technological improvements and regulation were key.

Advancing technology has been and will continue to be central to the industry. And different specific technologies have been developed to address different types of plays

in different settings.

Three big ideas came from this. First, that technology leads regulation. That is, as industry adopts new cost effective technology, the regulation of that industry follows behind.

As a result, information sharing between the industry and the regulatory community is important.

Second, innovation and technology and governmental support of innovation is important. This enhances resource development of course, but even more crucially, over and over again improved technology has contributed to minimizing environmental impacts.

For example, horizontal drilling has both increased access to the resources and has also greatly reduced the amount of surface land needed to access those resources.

The DOE's commitment to research will be critical in the future as well. Third, history demonstrates a consistent

continuous improvement in environmental performance by the industry.

Another thing that the group learned is that there is a comprehensive set of state and federal regulations in place that govern all aspects and phases of oil and natural gas production and environmental protection.

This starts with the leasing process involving state and/or federal agencies, and must adhere to federal laws such as the Endangered Species Act and local zoning ordinances.

That process continues all the way through the final restoration and release of the site complying with different laws, regulations and regulatory agencies getting along in every step of the way.

Because different types of plays exist in diverse environments, different regulatory approaches are needed in those areas. Most state agencies have been involved

in regulating oil and gas development for longer than the federal government.

These agencies have unique knowledge and expertise relative to the local geological, hydrological, environmental and land use characteristics.

Hydraulic fracturing is an example of one of the issues where there's a broad divergence of opinion and substantial misunderstanding as well as concern in some portions of the public.

But as this graphic shows, the use of technology can help us better understand what the impacts really are.

Using microseismic technology, we see that hydraulic fracturing treatments of Barnett shale gas wells do not propagate fractures to any length that would threaten fresh water aquifers, demonstrating the degree of protection that natural geologic formations provide and separating the gas production zones from the fresh water aquifers.

There have been over one million fracture treatments in North America, and this kind of technology and others like it can help demonstrate protection.

The EPA and the DOE are both studying the hydraulic fracturing issue and these studies have to be welcomed and supported by the industry. More independent and impartial analysis can only help.

In considering environmental impacts, the group also realized that the environmental impacts need to be considered across energy sources.

For example, water use for natural gas production is a key issue. We need to understand it to maximize the efficiency and to compare it to water use for other fuels.

We recognized that we must examine the entire spectrum of environmental impacts for each key energy source in order to provide relevant information to policymakers.

For example, as these charts show,

natural gas from shale formations uses less water than coal but more than wind, but it has a lower land footprint than either.

However, even though policymakers need foot printing information for key energy sources, there isn't a uniform and consistent methodology. As a result, policy decisions are less informed than they should be.

We need better information across energy sources, more data and a common vocabulary to discuss this. Recommendations that came out of my group are as follows.

Robust and well-functioning institutions are important in helping both industry and government support prudent development.

Regional councils of excellence would help industries share effective environmental health and safety practices with each other and with the regulatory community.

Organizations like the Society of Petroleum Engineers and other standard setting

institutions can assist. Regulators, for example, need adequate funding to ensure adequate personnel, training and expertise.

Organizations like the State Review of Oil and Natural Gas Environmental Regulations, or STRONGER, should be supported. These stakeholder and regulator partnerships are also essential.

The industry needs to continue to commit to community engagement and continuous improvement, and advanced technology research should be supported and advanced.

We need environmental footprint data across key energy sources to allow common vocabulary from which we can formulate sensible policy.

We recommend such research be conducted to better inform the ongoing debate on the benefits and impacts of different energy resources.

With that I will turn it over to Sue.

MS. TIERNEY: Thank you very much. Our four integrated findings will come as no surprise because they've been built upon the findings that you've just heard about from my colleagues.

Our first major conclusion is that natural gas is an enormous abundant resources. As you can see, the shale gas plays themselves are located around much of the country.

Natural gas supply previously locked up underground and now economically accessible thanks to the applications of new technologies and old technologies in new ways, these unconventional resource areas are opening up.

This could mean transforming of benefits in power generation, transportation, industrial feedstock, international geopolitics, provided however, that there is consistent application of responsible development everywhere that gas is extracted.

Secondly, and quite surprising to

many of us, North American oil resources are very large as well, and they can provide substantial support for our domestic uses for decades to come.

These are genuinely world class resource basins. As you've heard they're especially true in unconventional oil resources, remote offshore areas and in the Arctic.

Tapping these resources technically and economically has also occurred because of the U.S. and Canadian technology leadership as well as sustained investment by the industry. This is true today and will continue to be true for decades to come.

In going forward here for oil resources, maintaining access to the places we now have access and have it open, and gaining access to other areas will depend on prudent development as well.

Third, and you know this one very well, America needs oil and gas resources.

Our economy and standard of living depend on these resources in countless ways.

Even assuming that we diversify our energy resources and even assuming that we use energy much more efficiently tomorrow than we use it today, oil and gas will be woven into virtually every part of the fabric of our economy for the foreseeable future.

Economic activity associated with production, delivery and use of these resources provides much needed domestic jobs and government revenues for the U.S., for local and state governments as well.

A dependable and affordable supply of natural gas is important to produce power with lower emissions, to heat buildings, to provide feedstocks for industries to keep them competitive in global markets.

And even so, even with all of these benefits and these requirements for oil and gas use, we know we need to use these resources more efficiently, so there are many

sources of untapped or underutilized avoided energy in buildings, in industries, in power generation in the vehicle fleet.

Finally, and really as a bottom line to our study, these benefits that I've just described and you've heard about and you will read about in our report, depend upon prudent development.

Realizing the benefits of natural gas and oil depends upon all companies in all places making sure that they adhere to and carry out environmentally responsible development.

Of course, what that means in one type of resource area is different than what it means in another. Offshore and onshore differences are obvious, but even regional differences, geological conditions, land use conditions in one area or another will lead to different ways that we develop things responsibly.

Regulators too, must ensure that

such responsible practices are required, implemented and enforced in the various areas, and regulators themselves must continue to evolve with the changing technology and knowledge, and they need to bring adequate staffing resources to the task.

These activities are important not just for the realities of environment, safety and health, but for assuring public trust in the way that we're doing our business.

So prudent development really underpins all of the benefits that we see flowing from these abundant oil and gas resources in the United States and Canada.

Clay, it's your turn.

MR. BRETCHES: Thank you, Sue, and the team. Moving forward, to fulfill the notion of prudent development the team proposes five key core strategies to assist markets in meeting the energy challenges of 2035 and beyond.

All five are essential and we

believe adoption of these strategies with a sustained commitment to implementation will lead to U.S. competitiveness by responsibly and realistically addressing America's economic, environment and energy security objectives.

The synopsis of the five essential strategies is as follows. First, support prudent development and regulation in natural gas and oil resources through such measures as regional councils of excellence that are effective at identifying and disseminating environmental health and safety practices.

Commitment by leaders of governments to efficient and effective oil and gas regulation bolstering the organization called STRONGER and increasing the scope of its activities.

Engaging affected communities to establish a shared understanding of expectations and awareness of issues and facts.

Reducing methane emissions and providing sufficient access to resources with an understanding that certain remote leases require longer lead times and that lease provisions should reflect as much.

Second, better reflect environmental impacts in markets and fuel technology choices by using full fuel cycle and environmental footprint analysis.

As the government considers energy policies it should recognize that it will be difficult to achieve significant cuts in carbon without a price on carbon.

And the deepest cuts in carbon cannot be achieved without advancements in technologies such as Carbon Capture and Sequestration.

Third, enhance the efficient use of energy and consider incentives for buildings and products that are more efficient than required by laws or standards, such as Energy Star qualifying products, and remove

barriers to utilities' promotion of energy efficiency as well as combined heat and power.

Fourth, enhance the functioning of energy markets by allowing utilities to effectively manage price risk through hedging and fixed price transactions.

Harmonize natural gas and electricity markets and provide investment certainty to power producers with regard to EPA regulations.

And fifth, support the development of a skilled workforce through increased public and private financial support for educational and training activities.

So the key takeaway for us as a team is that our nation can realize enormous benefits from the abundant resources in North America and the technologies that make it all possible.

We can meet even the highest estimates of natural gas demand if we can reduce our reliance on oil from geopolitically

volatile regions of the world.

The key to realizing the benefits is attaining the highest levels of environmental performance by leveraging technology in a commitment to excellence by industry and government alike.

So this concludes the team's presentation and I now turn the program back to Jim Hackett. Thank you.

MR. HACKETT: Thanks, Clay. I want to thank the members of your Coordinating Subcommittee too, and as many of you know who have worked in these studies, the heavy duty of leadership and work time falls on these people in front of you to my left and to your right.

And we certainly appreciate the time, the effort, mostly the patience and the goodness with which they came together to make this all happen.

Chairman O'Reilly, before we open the meeting to questions and comments from the

floor, I just wanted to see if my committee co-chair or any of my vice-chairs have any comments about the presentation.

DEPUTY SECRETARY PONEMAN: Thank you, Jim. In terms of the substance, I will defer and wait with anticipation for the Secretary's remarks.

I would just say as a matter of process having had a chance to observe it closely over the months, I take my hat off to you, Jim, for your leadership, to Clay for his, and the members of the Coordinating Subcommittee and all involved.

It was a tremendous effort that I think you can see the integration of so many aspects of it in the presentations we just heard, but all substantive comment I will defer.

MR. HACKETT: And Dan, do you have any comments?

VICE CHAIR YERGIN: Only again to echo the thanks that you expressed to this

tremendous effort that everybody put into making this report happen, the Coordinating Committee and everybody who worked with them.

MR. HACKETT: Thank you. And Phil, did you want to say anything?

VICE CHAIR SHARP: I'd just join in confirming the thanks for the good work, but I would stress the incredible effort that was made to really reach out to a broad set of voices in the non-government community which is both useful for educational purposes but for input purposes.

And I think you and others can be applauded for this.

MR. HACKETT: And Phil, I might thank you too, and Dan, because I think a large part of that engagement was because of the leadership of the two of you and the reputation the two of you have for fairness and objectivity.

So we very much appreciate your willingness to take leadership roles in this

effort. But Dan, thank you as well, and we'll look forward to your introduction of the Secretary.

Mr. Chairman, before we make any motion that we adopt the report, I should inform you and the Council that we did receive a small number of dissenting comments in the final study report, and I'll summarize these for you.

One of the industrial Council members is concerned that the report recommends some form of carbon tax policy to be implemented and objects to that idea.

This member also expressed concern that the report is calling for additional regulation in the power sector, and as a major power user they are concerned about the costs that that might imply for them.

Two oil and gas producing Council members expressed concerns that the report portrayed the operations side of gas and oil producing firms in an overly negative light and they

disagree with that portrayal.

One of these companies also had a concern that industry-led activities such as the proposed new Councils of Excellence will not be an effective alternative to inform and affect of state regulation.

They also believe that the report goes too far in stating that the gas and oil industry should ensure flawless operations in order for development to proceed.

Two environmental advocacy organizations remain concerned that the final report focuses on the size and maximal use of the North American petroleum resource without a similarly focused consideration of the consequences of developing that resource on human health and the environment.

We also received some general language clean up comments that were considered and resolved by the Coordinating Subcommittee leadership team yesterday, and these changes are incorporated in the final

report you will see.

Although we did receive these negative comments that I have summarized above, the overwhelming majority of the study committee supports moving this report to the full Council for approval.

In response, I move that the Council adopt the report subject to final editing and approve the transmittal letter to Secretary Chu. David?

CHAIR O'REILLY: Thank you, Jim, and the Subcommittee leaders for that comprehensive report and briefing to all of us.

So I have a motion that the NPC approve this report subject to some of the final editing that Jim just mentioned, and approve the transmittal letter to Secretary Chu. Do I have a second?

PARTICIPANT: Second.

CHAIRMAN O'REILLY: Thank you very much. Are there any comments or questions

from Council members on the final report? We have a microphone at the back here if anyone has a question, comment?

Okay, we have a motion and a second to adopt the proposed final report of the NPC Committee on Resource Development, all those in favor say aye.

(Chorus of ayes.)

CHAIR O'REILLY: Opposed, nay? Did I hear a nay? One nay. The report -- two nays, thank you. The ayes have it, the report is adopted.

I'd like to thank the vice-chairs of the Committee and all the folks involved in this tremendous work. And Mr. Secretary, it's with great pleasure that the National Petroleum Council submits this report to you.

The effort that went into the study was as exhaustive and thorough as you heard, and considered the input of hundreds of organizations as well as the team of over 400 people involved in the study in different ways

and means.

We are particularly grateful to you, Mr. Secretary, for the cooperation and support you provided from your Department as well as some other government agencies.

And we trust that you and others in national, state and local governments will find the assembled data in this report useful and helpful in addressing the balance between environmental, economic and energy security goals.

Now the Council looks forward to sharing these study results with you, the administration, and the public as we go forward.

What I would like to do now is call on Clarence Cazalot, chair of the Committee of Future Transportation Fuels, who will review the progress of his committee work to date.

As you know, this is the second study that is underway at the Council. So

Clarence?

MR. CAZELOT: Thank you, Mr. Chairman, and Jim, congratulations to you and your team. Outstanding job. Our aspiration in the Future Transportation Fuels study is to deliver as high a quality of product as you guys have just done.

I think as all of you will see in just a moment, there's been tremendous progress made in the Fuels study, and we really are looking at the full range of vehicle and fuel options technologies, supply and mobility demand forecast, environmental issues, infrastructure, accelerated technology pathways, many, many other elements to this study.

Like the Resource study, we really had outstanding participation. We now have over 330 participants, more than 75 percent from outside our industry. And we continue to engage with numerous other subject matter experts and organizations.

So I simply want to thank all of you here and not here today, for the tremendous commitments you made to this study and for the tremendous effort you're providing.

We said from the beginning that this is indeed a critically important study, which is both complex and far reaching. And as a result, I have to tell you it's going to take us a little more time to complete than we originally planned for.

It's our intent, always has been, to deliver as I said a moment ago, a very high quality product that addresses the questions raised by Secretary Chu.

And we now believe that we'll have a report ready for final NPC approval as early as the spring of next year, but no later than June 1st of next year.

So we originally planned to have it done by the end of this year, it's taking a bit longer, but our intent is to not

compromise on the quality of this and indeed, fully address the issues that the Secretary has given us.

Now that timing reflects a substantial period of feedback and comment by the full study Committee not unlike what we've just seen happen with the Resource study.

So I thank you again for your support. I ask that you continue to engage with us and continue to support us a bit longer than planned, but I believe in the end the resulting study is going to be of the highest quality and well worth the time and effort that we've all put into it.

And so at this point I'll turn it over to Linda Capuano. Linda is chair of our Coordinating Subcommittee, and as Jim just indicated that really is the team that is the glue that pulls together this massive, diverse group of people that are addressing our study questions.

So Linda?

MS. CAPUANO: Thank you, Clarence. I'll remind everybody that you do have a copy of this presentation in your package. I will be going through things fairly quickly.

So first the Slide 2, this is a reminder that Secretary Chu has asked for a study of Future Transportation Fuels, prospects through 2050 for auto, truck, air, rail and waterborne transport.

The study will address fuel demand, fuel supply, infrastructure and technology, and will advise on policy options and pathways for integrating new fuels and vehicles into the marketplace.

Slide 3 shows some of the factors that will be considered and highlights Secretary Chu's supplemental request for us to address what actions industry and government could take to reduce transportation greenhouse gas emissions by 50 percent in 2050 relative to 2005.

The study is organized with a

committee on Future Transportation Fuels and Executive Committee, and a Coordinating Subcommittee with task groups for Demand, Supply and Infrastructure and Technology.

Clarence Cazalot chairs the study Executive Committee with Dan Poneman as government co-chair. The Demand, Supply and Infrastructure and Technology vice-chairs are Jim Owens of Caterpillar, John Watson of Chevron and John Deutch of MIT.

Your Slides 5 and 6 show the diversity of participation. In the Coordinating Subcommittee you see representatives from Federal Express, Walmart, the Department of Transportation, the National Resources Defense Council, and Resources for the Future.

The diversity continues on Slide 6, continues with specialized subgroups where Archer Daniels Midland chairs the biofuels subgroup, Exxon chairs hydrocarbon liquids, Westport Innovations natural gas, University

of South Carolina hydrogen fuel cells, Toyota electric, and General Motors engines and vehicles.

Slide 7 shows the subject matter experts. They are knowledgeable in topics important to the study and their role is to review the technical content of the study for consistency and completeness of analysis.

This is the group we're referring to when you see the technical review notation in the timeline.

Slide 8 summarizes the skills of the 334 study participants which have a balanced reputation of 24 percent in oil and gas, 24 percent transportation manufacturers, 11 percent end users, and a good representation of academia NGOs, government and legal and finance.

But at our heart, this is a technology study with 70 percent of the participants having technical backgrounds complemented by participants specializing in

policy and economics.

The study has been equally broad and diverse in surveying the work that has gone before. The bibliography has reached over 400 references.

The study has also complemented the review of published work with briefings of current activities.

Slides 9 and 10 show you the briefing topics presented to us by organizations sponsoring the work.

The examples, we had briefings on fuel and vehicle technologies, environment and efficiency, and infrastructure and investments from DOE, national academies and the PEW Center to name a few.

Slide 11 discusses the study process. The study begins with the analysis of individual fuel vehicle supply chain pathways of biofuels, electric, hydrocarbon liquids, natural gas and hydrogen fuel cell vehicles.

Step 1 analyzes the potential to maximize the commercial vehicle availability of each supply chain without considering the impact of competition from another supply chain.

When we move to the Step 2, the 3 by 3 matrix pictorially represents the Step 2 integration where we consider the potential fuel vehicle portfolios that could result when multiple vehicle supply chains compete to meet the 2050 demand to move passengers and freight.

The mobility supply, the vertical axis, represents the Step 1 output, which is the analysis of how aggressive technology and infrastructure development can overcome technical and non-technical barriers to produce commercial fuel vehicle portfolios which meet the forecast in mobility demand represented by the horizontal axis.

Note that the study's reference points is the Department of Energy's annual

Energy Outlook for 2010, because this provides us with a well documented and publicly available starting point.

And since we are considering accelerating alternative fuels and vehicles, our analysis will spend more time looking at the aggressive development cases represented by the top part of the matrix.

The study will continue to consider a variety of fuel vehicle portfolios and we will discuss the characteristics of those portfolios relative to environment, economic competitiveness and energy security, considering characteristics like greenhouse gas emissions, cost of mobility, oil usage and a robust fuel supply, to name just a few.

On the next slide, as we execute the study plan we added the specialized teams you saw on Slide 6, and we have drafted the mobility demand reference case and individual fuel vehicle supply chain chapters, which were reviewed by our subject matter experts and the

Coordinating Subcommittee during the first quarter of 2011.

Moving through the timeline which is shown on the next slide, the bottom of the next slide, with the drafting and the review we transitioned from Step 1 in the first quarter to the integration of Step 2.

And we are just beginning the drafting of the integrated chapters with report completion date planned during the first half of next year, and we plan to enter 2012 testing our insights, findings or recommendations with the broader community.

Outreach in communications has been ongoing, as shown on the next slide, and you can see that we have started communicating and soliciting input early and will continue to schedule more.

So I've kept my comments brief. You have the reference material. I will stay after the close of the meeting if anyone has some extensive questions, but we'll take a few

short questions now.

Do we have time? Or should we --

CHAIR O'REILLY: Yes. Stay where you are, Linda. There's no action by the Council required at this point because there is no, this is just a status report.

But Linda and Clarence are certainly open to questions on the study, where it's going, any more details you would like. And I think we have a moment or two if you'd like to do that.

MS. CAPUANO: Okay.

CHAIR O'REILLY: Are there any questions? Well, thank you for the offer to stay behind, Linda.

And thank you both, Clarence, Linda, thank you to the team for the progress report and we look forward to seeing a completed report in the first half of next year.

And just as a heads up to the Council membership, we will be working with

the Secretary and with Clarence to try to schedule a suitable Spring 2012 date to report on the final study when it reaches completion.

At this point it is a great pleasure to invite Deputy Secretary Dan Poneman to the podium to introduce the Secretary and say a few words. So Dan?

DEPUTY SECRETARY PONEMAN: Thank you, Dave, for the introduction and for your outstanding stewardship and leadership of the National Petroleum Council.

It's a venerable organization, one that has its roots in World War II and the days in which Harold Ickes was helping President Roosevelt figure out the war effort, and it shows how deeply the energy equation, the oil and gas equation has been woven into our national fabric ever since.

The War Council that was working on these issues was of such value that President Truman decided in 1946 to ask Harold Ickes to set up this National Petroleum Council.

And in the charter when he asked him to do so, he called on the establishment of a competent, responsible and representative body.

And I would say those three aspects have been the hallmark and must be the hallmark of an effort of this character that is so deeply infused throughout our national economy, throughout our national security.

The way in which the Council brings together, has brought together so many diverse views as we've already heard here this morning from the industry, from academia, from government, from tribal leaders, is absolutely essential as we are working our way through some of these very challenging issues.

And indeed, it is in no small measure the very diversity of opinions that are brought to bear on these fundamental issues facing our future that make NPC studies such a valuable and unique resource for the Department.

One of our speakers already this morning said that examining history is critical. And in fact, I think when you examine that history you will find that through these kinds of efforts when the United States has faced a great challenge, we have always risen to meet it.

Having had no small part of my life spent in government I think one thing you learn early on is to expect the unexpected. And I think this has happened to every president.

I learned much of my history in this sphere from my good friend, Dan Yergin. And sometimes it might be something like Quemoy and Matsu in the Eisenhower era, but -- or the Berlin Wall for President Kennedy, but so many of these surprises in our history have been energy related.

And presidents can't really prepare for those unexpected developments. President Nixon could not have prepared for the '73 oil

crisis nor Jimmy Carter for the '79 oil crisis following the Iranian revolution.

And it is in this spirit that I recall that having developed a coherent, comprehensive energy strategy in which Secretary Chu was supporting the president, that no one could have expected Deepwater Horizon.

And I think it is in no small measure the fact not only that Dr. Chu is the Secretary of Energy, but his deep scientific expertise and his absolute intellectual integrity that the president turned to him in that crisis to lead an extraordinary effort to stop the flow from Macondo well.

An incredible challenge, one not looked for and one that the Secretary embraced, pulled together a team, went down. As anyone who knows him and has the privilege of working with him, he goes deep in every aspect of it.

And so it was no surprise either

when a few months later, the events in Libya took net the time we were looking at this challenge, 130 million barrels of sweet light oil off global markets.

Once again, President Obama turned to Secretary Chu for his deep understanding, his expertise and his recommendations on how to address that crisis, how to deal with the shortage, how to do this in an issue that was extraordinarily complex in many dimensions including the global economics of oil trade.

In any and all these things, Secretary Chu has in his own work and that work which he asks of others, valued deep, rigorous intellectual analysis.

And that's why early on, and I remember it was one of my first weeks in the Department when Dave O'Reilly and Claiborne Deming who I see out there, came in to suggest a few topics from what might be selected for the studies for the NPC, Secretary Chu immediately thought of both the prudent

development of our oil and gas resources in North America and the future of our transportation fuels.

I must say both Dave and Claiborne looked a little drawn when they realized they were going to have to undertake double the effort that they had anticipated. And seeing how much effort goes into it, I think everyone in this room understands what that implied.

But I think the history in the year and a half or so that has followed, shows how prescient the Secretary was in asking for both of these subjects to get the deep analysis that they deserve.

I admit it's rather a high bar when your charter for your study comes from a Nobel Laureate and the guy who is doing the cleanup drafting was a Pulitzer Prize winner, but I'm sure that we'll all benefit from that bookending of this outstanding study.

And so with that I would like to ask you to join me in welcoming to the podium

the Secretary of Energy, Dr. Steven Chu.

(Applause.)

SECRETARY CHU: Thank you, Dan. And first let me just say how, as I was listening to the brief review of the National Petroleum Council's report, how impressed I was by the very hard work, someone said the exhaustive study, I hope it was not too exhausting either.

I happen to know that two of the people who worked on this report we also drafted to work on another report, the Subcommittee of the Secretary of Energy's Advisory Board on Shale Fracking. So to those people I'm doubly thankful for your service.

The subject matter covered in the report and the thoughtful way you went about it is very, very impressive, and my hat is really off to your Committee and to all the members and to the American Petroleum Council.

I also know that many of the subjects that we've dealt with can be quite

contentious. There are very strong opinions on either sides, or there's just not two sides actually, there are multiple sides because these are multiple dimensions.

And so I'm very appreciative that the Committee and the American Petroleum Council as a body sees this I hope as a valuable tool both for your business and also for the government.

So I want to talk a little bit about, first initially step back and take a very high view of what's going on and then go into some of the details.

The view I want to take actually goes back to the Industrial Revolution some 250 years ago.

And before the Industrial Revolution, fundamentally the things we needed to get done as human beings was really powered by human power and animal power. And then all of sudden you're liberated from that.

And if you fast forward now 250

years what we find is a reasonably large fraction of the world population now expect their homes to be warm in the winter and cool in the summer and lit at night.

There is access to information and goods and personal mobility that nobody could have dreamed of.

If you think about it, we in developed societies, many of us go to the local market driving an automobile with a pull of at least 100 horses, to buy products, produce, fish either grown or caught thousands of miles, sometimes halfway around the world.

We fly across continents and oceans on jet planes using engines that in the case of let's say a 747, the horsepower of those engines is about equivalent to a 120,000 horses. 777, a little bit smaller, 78,000 horses.

So it's this ability to use energy and in mobility, and particularly oil that has been the driver of a lot of the prosperity in

the world.

The ability to ship goods by rail, by freight, by air, by truck, also has been a huge driver in the world's economic engine.

Now you look at how things are going to progress in the future, the energy demand and oil demand and gas demand are really intimately tied so far to the health and growth of the economies of the world.

And in an IEA report, a recent one, World Outlook 2010, you make some certain assumptions about the growth of the world economy. They happen to assume 3.2 percent per year.

And the rising population by 2035 there'll be eight and a half billion people. They say that the energy consumption of the world will increase by 50 percent. That's a lot.

What about global oil consumption? Well, we're right now about 85 million barrels a day, and if we continue with the current

policies, with current improving efficiencies, all those things, we'll go to about 105 million barrels a day, a 25 percent increase by 2035.

I don't know how the, you know, as Yogi Berra said, predictions are hard to make especially about the future.

Let me tell you about one prediction turning out not to be true, which predicted in China that from the year 2000 to 2010, the number of vehicles in China, automobiles, trucks, buses, all the vehicles would increase six-fold. It turned out not to be true. It increased 20-fold.

And so your market will not go away. A little bit scarier, again we don't know if this prediction will turn out to be true, but certainly right now the United States has 250 million vehicles, China is very close to that.

In 2010 they sold 16.7 million cars, we sold about 11 million I think.

They're going to go over 20 million very shortly per year, and by 2030 the prediction is perhaps 600 million vehicles in China alone.

India will follow very quickly, and other rising economies. So there's going to be a need for oil and gas. And in the meantime we also want to decrease our dependency on imported oil.

And the president has laid out, he's called for a plan to decrease our oil imports by one third by 2025. And there are three parts roughly to this plan.

One is just increase the efficiency of the automobiles, and as you all know the fuel efficiency by 2016 will be about 35 miles to a gallon for cars and light trucks. And by 2026, I think it is, 54 miles to a gallon.

This will go a long way to helping, actually without efficiency improvements, amazing as the technology developments are, one would be hard pressed to meet the

anticipated oil demand.

The other thing besides increased production and efficiency are a hard look at alternative fuels, and I'll mention a little bit about that later and look very much forward to the report.

So we have, this is what we're facing. We are increasing -- let me talk a little bit about, and it was mentioned in the outline of the report -- and let me also I want to stress how impressive the technologies for the exploration, extraction of oil and gas, how impressive they have been over the last several decades.

It used to be as you well know, I mean you know much better than I, but it used to be 10, 20, 30 percent recovery of oil in the ground, is now it's more than doubled, 60 percent in some cases going to 75 percent, a recovery of the oil in the ground. It's remarkable.

Remarkable technology developments

that would enable people to go deeper and deeper offshore. The shale gas has been a remarkable story. The Department of Energy supported this work.

I think it began in 1979 in the midst of these oil shocks that Deputy Secretary Poneman talked about. We stopped supporting horizontal drilling in 1992, Schlumberger had picked it up by 1991.

The hydraulic fracking and the horizontal drilling actually as noted in the report, transformed the gas industry. And it's actually beginning to transform actually the oil industry in shale oil as well.

So these are examples of how the technologies enhance oil recovery again transforming the industry, and the Department of Energy is looking to seeing whether it would be possible to capture sources of carbon in the Midwest of the United States.

There's a lot of older oil, gas reservoirs, pockets here and there, and to

capture that carbon dioxide and increase production in the continental United States for those reservoirs, we think that it's economically recoverable and it actually will help coincidentally, but not coincidentally, by design it would help us understand a lot more about how carbon dioxide interacts with rock and sequestration.

So we're making these great discoveries, great technological finds. We also know that the discovery of what we will call conventional oil, this is conventional oil on land not in northern Arctic oceans, not deepwater, those conventional reservoir estimates have been declining, have peaked for sure we think and are expected to decline.

But as technology improves, as one is able to deal with deep offshore and Arctic and bituminous oil, the oil sands for example, those supplies will continue.

But as one increases in the technology, one also wants to be sure that the

technology also keeps up with the environmentally safe extraction of these very valuable resources.

And again, this is part and parcel of your report and I very much appreciate that.

The Subcommittee's report, or the Secretary of Energy's Subcommittee's report on shale fracking simply states that it is possible to extract shale gas in an environmentally responsible way there, and it is possible definitely to extract deepwater in an environmentally safe and responsible way.

Now it is absolutely true that no one can guarantee that one will not have an accident. It is impossible to do that. It's like trying to guarantee that no more airplanes will ever crash.

However, when things do happen we learn from them and we improve and we go forward. And I think this is something that we will be doing, certainly we will be doing

that with the deepwater drilling.

We will do that, you know, finding out what's actually happening in shale gas recovery and fracking is the first step. There are a few good studies, some are not so good studies.

We want to encourage a few more good studies to actually figure out what's happening and again to improve these methods not only in finding, attracting, producing, but also in the safety.

So these are things I think we can do. The oil and gas industry is, really has this amazing technology. But let me talk about, and I love the title, prudent production of gas and oil, and I've heard that many, many times in these discussions and it's a great word.

Let me talk to you a little bit about some other prudent things. There's prudent risk management of, you know, the exploration and recovery of oil and gas.

There's another thing that I want to, you probably, if you wouldn't, haven't expected it -- well, anyway I also want to talk about other prudent risk management, and that is the fact that I do want to remind you that the scientific evidence for the climate changing is not decreasing.

In fact, for those who follow what is happening on a yearly basis, it is increasing. New methods are eliminating some of the question marks. Let me give you an example.

The experts in the oil and gas industry know that you can use carbon-13 as a good proxy for telling whether oil or gas is, or let's say in natural gas, is fossilized or not. So let me take one minute to explain.

Carbon-13's an isotope of carbon. Living matter actually prefers to take carbon-12 rather than carbon-13, but after a living matter dies there's a slow exchange.

By looking at the ratio of carbon-

12 and carbon-13, you can actually tell if natural gas is due to microbial degradation in a swamp, natural gas that will occur naturally, or whether it's natural gas that's been fossilized.

Because if it's fossilized it will have a different ratio of carbon-13 and carbon-12 than stuff being made on the surface, okay.

And so studies like that actually they have, that's means there's a fingerprint as to whether the gas is fossil gas or whether the gas is produced by normal vegetation decay.

There's also carbon-14. Carbon-14's made in the upper atmosphere by cosmic ray bombardment and constantly mixes with the atmosphere and finally the biosphere.

You have carbon-14 in your body and there's a certain ratio. But remember, it's mixed by, the source of the carbon-14 is coming from the upper atmosphere.

And when you die and let's say you die or I die and they put me away and they're really good at it and they put me away for 20 million years, I will have no more carbon-14 in me because the lifetime's 5,700 years.

Now if you take me out and use me as fossil fuel, I'm going to be, my carbon goes into the atmosphere but is depleted of carbon-14.

And so what happens is if you're putting a substantial amount of carbon into the atmosphere that's just not cycling from the air to the land to the water and back, which will happen if a tree grows, dies after a 150 years. Microbes take it away, it gets recycled, okay.

In the lifetime of carbon-14, 5,700 years it's just all the same. But if you take a whole hunk of carbon and stick it in the atmosphere that's been buried for a million years or ten million years or thirty million years, you're introducing carbon-12

predominantly, carbon-14's gone.

Also so if you look at ratios of carbon-12 and carbon-13, what we're finding is the increase in carbon dioxide has depleted levels.

Okay, so the same isotopes technology that can be used for deciding whether the methane in a water tap or water well is due to microbes and normal vegetation, or due to fossil stuff, also can tell you whether the carbon increase in the atmosphere is due to humans or not. It's due to humans.

So it would be prudent risk management to take some steps in order to look at ways of making transitions. Now how long does it take to make a transition? Decades, probably half a century maybe more.

Look at how long it took to make a transition from coal to liquid transportation fuel when everything told you how much better liquid transportation fuel was.

If you look at, you know, the

invention of the internal combustion engine by Benz and Diesel and coupled with the assembly line production of cars by Ford and the discovery of oil and the development of oil by Rockefeller, actually Nobel, Rothschild, others, instantly you had a way of moving goods and people around that was much, much better than coal-driven steam engines.

And yet it took many decades to make that transition. Now you've got something really very good. If you look at that amount of energy in a gasoline or diesel or jet fuel tank, it's several hundred times higher density than you can get in today's batteries, about a thousand times, okay.

So in order to replace liquid transportation fuel with something else, this is going to be a challenge, but it's going to be something, so you'll be in business for a half a century, or a century.

But on the other hand we do have to develop alternatives for two reasons. If you

look at the demand of personal vehicle and trucking and airplane transportation in the world, you're going to need a diverse supply anyway, even if you don't believe that the climate is changing and that we are running risks.

And so developing those diversifies the, and alternative fuels and energy efficiency including electrification are a very big deal for a lot of reasons. For purely economic reasons to prepare, because it's going to take decades in order to make this transition.

So I'm very much looking forward to the Transportation Fuels Report. I'm very much looking forward to reading this report. When I look at the cast of characters you've asked to participate in the study and the experts you use to review it, is truly a stellar cast.

And you've really reached out to all sectors in the United States for that.

For that I'm very appreciative and I'm sure it's going to be an excellent report.

So with that -- I'm trying to see whether I left out anything else. I think I've got it all. But with that I think I can stop and take questions.

But again let me thank the American Petroleum Council, the Committee who worked so hard on this report, and I will very much look forward to reading it in the coming days.

CHAIR O'REILLY: Thank you, Mr. Secretary, thank you.

(Applause.)

CHAIR O'REILLY: The Secretary has agreed to take some questions from the Council membership, so now's your chance. If you have a question, please raise your hand.

And if you wouldn't mind identifying yourself as you ask the question that would be helpful. Thank you. Are there questions?

The microphone was off. Let me

repeat what I just said. The Secretary has agreed to take some questions from the Council membership, and it was an opportunity for a few minutes to do that.

So if any of you have any questions, please identify yourself as you ask the question and Secretary Chu will be happy to take your question.

I have one maybe, as the Chair. Does somebody -- oh, here we are. We have one, good. Thank you.

PARTICIPANT: Secretary Chu, thank you for what you just said and explained. In terms of climate change, global warming, carbon counts, natural gas and its new abundance from the shales can play a major role in reducing carbon for quite awhile on a practical basis.

By that I mean we can keep established economies running, the emerging economies blossoming and we can do it with technology that we have now. It needs to be

deployed in with the resource we have now, it needs to be deployed.

It's still a fossil fuel but it's a great help for a long time. And I don't believe this is adequately recognized or understood.

And we're subject to a lot of demagoguery and attacks, when actually we're much more part of the solution than we are of the problem.

And I wonder if you could, I'd like to see an increased understanding of what natural gas can do, a hundred-year study of the world's energy use and the environmental consequences scenario analysis so we can understand how much good we can do. I think it's substantial.

SECRETARY CHU: No, actually I agree with you. And if you look at the SEAB Subcommittee report, also I mean this is a great resource.

It's a resource in our borders.

Yes, it's a fossil fuel but it's a clean burning fossil fuel you can design. And it's actually going to be needed increasingly as the price of renewals goes down.

Natural gas and hydro are the only two ways that you can actually build an electrical generator when these intermittent sources -- you know, if the wind stops blowing and the sun stops shining, you can actually make now natural gas generators that have over 60 percent thermal efficiency, and yet can ramp up in a matter of 15, 20 minutes.

And it's an incredible technology development and you can ramp up and down. You know, ten years ago natural gas generators couldn't ramp up and down rapidly.

Coal still can't ramp up and down rapidly, they're afraid they'll just simply break.

But the new gas turbines can do this and it is a necessary part of actually growing renewables which I don't think are

appreciated.

It could have some impact on transportation, you know, we don't know yet. We're going to do, we probably need some things as well, and it's on our own borders.

And as pointed out in this report, if you look at combined cycle natural gas and compare it to even super critical coal plants, there's roughly a factor of two.

Ultra super critical are a little bit better but not that much better, a factor or two less carbon and there's a lot less of other pollutants currently.

Now in the end we're going to have to learn how to clean up natural gas. We're going to have to learn how to clean up coal, because as we learn to use those more cleanly to capture the carbon, then we can continue using these.

So it is a matter of technology development. Right now the cost of capturing and sequestering carbon dioxide using today's

technology, MEA, cold ammonia, all those things are very costly.

And so the Department of Energy is very focused on dramatically bringing down those costs so we can have affordable electricity, just as we're very focused on improving the energy capacity and lowering the cost of batteries.

If we can lower the cost of batteries by a factor of three and increase the energy density by a factor of three then you've got something, you know, the $20,000 car without subsidy that can go 300 miles. That becomes very attractive.

And the pathway to gaining factor two is probably there, factor three not yet there, and so again a lot of research and development.

But to your point, natural gas is a very important fuel for the United States, a very important transition fuel. Again I see many decades of use of oil and natural gas.

But we still have -- given the long time it took to transition from one fuel source to another fuel source, we have to start thinking and developing these technologies today.

So in the meantime, you know, the industry is getting very much better at developing new sources. So, you know, the short answer is yes, I agree with you.

PARTICIPANT: Mr. Secretary, thanks for being here. I want to talk just a little bit about the talent pool. You've just acknowledged as has this report that oil and gas are going to be here for awhile.

Unconventionals are new. There's a lot of fundamental questions that are being examined in them now, basic research that's going on.

Currently the Department of Energy doesn't fund much basic research in oil and gas, a little bit but not very much relative to other energy sources.

The talent pool in the U.S., let's face it, at universities, and you've been there, the color of money matters. Where you get your funding matters. It's great to get support from the oil and gas industry which is happening in U.S. universities now, the corporate welfare moniker.

But you're also accused of being biased rightly or wrongly when you take industry money for that. American universities could benefit from some federal support in oil and gas research, fundamental basic questions that still need to be asked.

What are DOE's plans for the future?

SECRETARY CHU: Well, just as we had funded, actually at a time when the oil and gas industry was not that interested in horizontal drilling and that led to shale gas, we also were funding methane coal bed research, the displacement of methane in unminable coal, same as with carbon dioxide.

That is also increasing. By the way that is a very good way of sequestering carbon dioxide.

We are funding a program in methane hydrates. Can you actually recover the methane in a way where the geology is stable and it doesn't plug your lines and -- oh, yes, you can also displace carbon dioxide with, you know, putting in carbon dioxide and displacing methane.

So there's are areas which you don't whether it's going to be realizable or not. The good news is there may actually be some economical environmental benefits as well as getting your hands on this very important natural resource.

So we are funding that. You know, there are others who feel that the oil and gas industry is wealthy enough they can do this on their own, and I for one think that are certain areas in oil and gas research that we should be funding no matter what.

That includes some of these safety issues, understanding what's really happening in fracking, in deepwater drilling. I think something like methane hydrates where for the most part the oil industry, the gas industry is going, you want to avoid those things. They clog your lines.

But there would be a tremendous resource there. And again in the end, I think when we do learn to capture carbon dioxide and either use it to get more fossil fuel out and sequester that so that it's a utilization, so you're beginning to recycle carbon, and eventually and when we sequester it then we can continue using these energy resources.

So we are, and again in part because right now since there is no price on carbon, our Carbon Capturing and Sequestration program is saying, okay, let's capture the carbon, utilize it and sequester it to drive that technology development.

And so those are things I can see

as funding, but again there are other people who feel differently than I do and have to convince them that what we're doing is actually good for the U.S., and it's good for us to fund those areas that I just named for a whole host of reasons.

So not everybody sees it the way I do, a bit candid, and say no, no, no, that's an oil and gas subsidy. And I'm saying, I don't think, you know, try and understand what fracking is.

I mean is there any kind of subsidy, or looking at methods -- we learned a lot from the Macondo oil spill, a waste instrument that would be in the third or fourth decimal place in the hardware.

I learned a fabulous amount of the seismic developments that your industry has been doing. I've been very, very impressed with that.

I mean the seismic stuff and that fracking, those things and other developments

that I see coming along are really wonderful.

That plus infrared imaging of gas, remote, very inexpensive infrared, these things can help a lot and assuage people's fears of a lot of things.

So, you know, support of things like that I think, yes, there should be no argument. Surprisingly, sometimes there is. But the point's well taken by university research.

CHAIR O'REILLY: Any other questions?

SECRETARY CHU: You have a question?

CHAIR O'REILLY: Well, yes. I think just, Mr. Secretary, is there -- maybe you could describe the process. You know, the role of the NPC is to provide advice to the Secretary of Energy and to your Department.

Maybe you just briefly cover the process that you will pursue now to take this report within the Department.

SECRETARY CHU: Sure. These very valuable studies just like the fracking study, are things that will be very useful in guiding policies and how do you actually do the things that can promote the development of industry that's going to be vital for powering the United States, but doing it in an environmentally responsible way. To do it in a way which has been pointed out that there's a lot of jobs in these industries.

In our Department we have, in the last several years, starting with what's called a strategic plan. And now we've been just through the first what we call quadrennial technology review.

And surprisingly, just like the Department of Defense, every four years they have a review of, you know, the mid- and long-range, not what's going to happen next year but what's going to happen over time, then the State Department started doing this.

Surprisingly, the Energy Department

did not do this even though the time scale of energy development or the transition of any energy infrastructure by its very nature are measured in decades.

And yet we seem to be planning year by year by year, budget by budget. And so we've started a process now where we're going to institute quadrennial reviews that will actually shape budget requests that transcend administrations, transcend whether you're Republican or Democrat, because just like Defense, you know, you want to get -- hey, the stakes are too high.

And you want to get a path that enables us to do the things that the country needs to do.

And if you look back, surprisingly, over different administrations, many of the goals, let's say to decrease dependency in foreign oil, things like that, they actually transcend administration to administration, okay.

And so similarly our review wants to do this, and this I see is a very important part of this study.

The most important part, because many, the majority of members are industry members, it also tells us, you know, where's industry at and where -- you know, we have to partner with industry.

You can't get, you know, energy in the U.S. is a private enterprise, and in the end it's going to be industry that actually does this stuff.

And so rather than being in a combative mode we have to be partners. And so your input also tells us where you're thinking and where we can see common ground and go in that direction.

So that's going to be very important for that reason as well. It has a slightly different take than a National Academy study for example, and that's why it's all the more valuable.

CHAIR O'REILLY: Let me just take a moment to thank the Secretary, the Deputy Secretary and all of the staff at Department of Energy for their great support and work in this study.

I know that you have to move to another meeting very shortly, so what I would suggest we do is give the Secretary and his troops a big round of applause.

(Applause.)

CHAIR O'REILLY: And I would like to have the members of the Council stay in their seats while they're leaving. We've got just a few minor business items to deal with before we adjourn. So thank you very much.

Let me move back to some administrative matters on this morning's agenda. There are two announcements.

For the benefit of members of the press here today, five minutes following the meeting's adjournment the study leaders will be available here at the head table to respond

to your questions.

The second announcement is for our online audience on the Internet. The Webcast will pause now and resume with a press conference which should start in about 15 minutes or so.

I'd now like to return to the reports of the administrative committees of the Council.

Our first report this morning will be from the NPC Finance Committee, which is chaired by Chuck Davidson, who is unable to be here today although he was on our call this morning.

And Byron Dunn will present the committee's report. Byron?

MR. DUNN: Thank you, Dave. The Finance Committee met this morning to review the financial condition of this Council.

Representatives from Johnson Lambert & Company, our independent outside auditor, were at the meeting to review their

draft of the audit report for the calendar year 2010.

Based on this review I'm pleased to report that our accounting procedures and controls received very high marks. I'm also pleased to report that we ended 2010 with a small budget surplus.

We also reviewed the charter of the Finance Committee and that outlines the committee's finance, audit and investment responsibilities.

We are in full compliance, and in accordance with that charter we will continue to periodically review those responsibilities.

In June of this year, the committee recommended that the Council approve the calendar year 2011 budget in the amount of $4,960,000.

The member contributions of the same amount were fully funded, and also to say that that amount was fully funded by contributions in the budget.

To date, members' response has been extremely positive. The Council historically enjoys high response rates which will I hope continue into 2011.

If by the way, there's about 25 percent of you who have not responded with your contributions, and so I'm soliciting those in the near term.

Thank you, Mr. Chairman. This completes my report on behalf of the Finance Committee, and Chuck Davidson. I move that we adopt this into, by the Council.

PARTICIPANT: I second.

CHAIR O'REILLY: I heard a second. Are there any questions, comments? Hearing none, all those in favor?

(Chorus of ayes.)

CHAIR O'REILLY: Any opposed? Thank you, again, Byron, appreciate it. And as Byron noted, please get your contributions in. We're getting close there to the finish line on funding our activities for the coming

year.

Our other administrative report this morning is from the Nominating Committee, which is chaired by Ray Hunt, who was unable to be with us this morning, but Bob Palmer will now present the Committee's report.

So Bob, you are up.

MR. PALMER: Well, as Dave mentioned, Ray Hunt is chairman of this committee.

Interesting enough, eight and a half years ago when I retired as chairman of Rowan after 31 years, in my farewell speech I said that my favorite Mexican proverb is, today the rooster, tomorrow a feather duster.

Well, here I am eight and a half years later. I haven't made it to feather duster yet but I aspire to that.

For those that don't know, Arch Rowan was one of the founding members appointed by Franklin Roosevelt, and later a founding member of the National Petroleum

Council.

And when I came into Rowan's Fort Worth office 51 years ago, Arch walked into my office one day and threw down an NPC folder and he said, I'm the NPC member, but you're going to do all my work.

And so I have had a fair run with NPC operations and I think that I can't say enough good things for the work that the NPC has done through the years.

The Nominating Committee agreed on a number of recommendations which we're going to make with regard to officers and chairs and members of the agenda and Appointments Committee of the Council as well as the five at-large members of the NPC co-chairs.

Accordingly on behalf of the Committee, I'm pleased to make the following nominations. That David O'Reilly continues as NPC Chair, Doug Forshee continues as Vice-Chair.

The Agenda Committee is Bob Catell,

John Hamre, Ray Hunt, Gigi Lazenby, Dave Lesar, Andrew Liveris, Mike Morris, Jim Mulva, Rex Tillerson and Dan Yergin, and Larry Nichols is going to serve as chairman of that committee.

For the Appointments Committee, it's George Alcorn, Bob Best, Bill Fisher, Jim Hackett, John Hess, Mike Linn, Aubrey McClendon, Jim Rogers, Diemer True, John Watson, and I'm going to continue on as chair of that committee.

In addition, we recommend the following at-large members of the co-chairs, Kateri Calahan, Marvin Odum, Phil Sharp, Adam Sieminski and Robin West.

In addition, the Committee as always, authorizes the chairman of NPC to make various appointments and substitutes as time goes on for the committees that he deals appropriate.

This completes the report of the Nominating Committee, and on its behalf I move

that the above slate be elected until the next organizational meeting of the NPC. Thank you very much.

CHAIR O'REILLY: Thank you very much, Bob, and you're nowhere near a feather duster. Could I have a second to the nominations?

PARTICIPANT: Second.

CHAIR O'REILLY: Okay, are there any other nominations from the floor? Hearing none, all those in favor please say aye.

(Chorus of ayes.)

CHAIR O'REILLY: Any opposed? Hearing none, the report is adopted. Thank you again, Bob, for filling in.

Ladies and gentlemen, that was the final formal agenda item on our calendar for today. Let me ask if any Council member has any other matter to raise this morning. Okay.

Yes, Thurmon?

MR. ANDRESS: I think we need to give a hand to Hackett and Clay and his whole

group for a great study.

(Applause.)

CHAIR O'REILLY: Thank you, Thurmon, for calling for that. Does any non-member wish to be recognized? On that note I will entertain a motion for adjournment.

PARTICIPANT: So moved.

PARTICIPANT: Second.

CHAIR O'REILLY: All those in favor?

(Chorus of ayes.)

CHAIR O'REILLY: I hear no opposition. You're adjourned. Thank you very much.

(Whereupon, the foregoing matter was concluded at 10:59 a.m.)

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C E R T I F I C A T E

This is to certify that the foregoing transcript

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Before: DOE

Date: 09-15-11

Place: Washington, DC

was duly recorded and accurately transcribed under my direction; further, that said transcript is a true and accurate record of the proceedings.

Neal R Gross

Court Reporter