INNOVATIVE TECHNOLOGY FOR ENERGY AND ENVIRONMENTAL SUSTAINABILITY FOR AMERICA'S ENERGY COAST HEARING

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September 30, 2009

1:30 p.m. - 5:00 p.m.

InterContinental Hotel, Cabildo Room

New Orleans, Louisiana

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REPORTED BY:

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Henri Boulet, LA 1 Coalition
Sidney Coffee, America's WETLAND Foundation
Mark Davis, Tulane University
Ted Falgout, Port Fourchon
Sandi Fury, Chevron
Karen Gautreaux, The Nature Conservancy
Chris John, Louisiana Mid-Continent Oil and Gas Assoc.
Fiona Hanrahan, Chevron
Mark Hurley, Shell
Mary Margaret Hamilton, Shell
Val Marmillion, America's WETLAND Foundation
Simone Maloz, Restore or Retreat
Ben Moss, Louisiana Department of Insurance
Fred Palmer, Shell
Dean Peeler, Alabama Petroleum Society
Tina Shumate, MS Department of Natural Resources
Robert Twilley, LSU

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MR. HURLEY:

First of all, I want to thank you very much for attending. My name is Mark Hurley. I'm president of Shell Pipeline. And I want to welcome you to our conference that we have called Innovative Technology for Energy and Environmental Sustainability for America's Energy Coast. And I wasn't sure if I was going to memorize that whole thing or not, but I got through it. It's a long title and it's a very important subject, so thank you very much for coming and thanks to those who are both coming to listen and to testify today.

The work that you are going to hear has grown out of an initiative that we call America's Energy Coast, and you see the branding for that around the room. And I'll say a little bit more about America's Energy Coast in a minute. But one of the things that we did when we formed this group, which is all about sustainability, is that we identified the critical issues that exist for the four Gulf Coast states in looking at the sustainability of the region into the future. And one of those issues was around domestic energy security. And so we assigned task forces to each of these critical areas. And the work that you are going to hear today is the work that has come out of this task force. And so it's exciting work. Energy technology and technology for sustainability, in general, is a very critical area, and so it's one of the more important pieces of work that we have done and we are very proud to bring it to you.

America's Energy Coast, for those of you who are not familiar with it, is a group that brings together a very diverse set of stakeholders along a four state region that includes Texas, Louisiana, Alabama and Mississippi. And our focus is on sustainability of this region and recognizing the importance of this region to the energy security of the United States. Representative of the group are members of industry like Shell and Chevron and others, along with federal, state and local governments and various groups from the community that represent interests, such as environmental preservation, navigation, recreation, cultural sustainability. And so it's a group that historically may not have agreed on everything. We may have agreed on very little, but we have come together to really find common ground and find solutions for the sustainability of the region.

We have only been together for two years, but I'm very proud of the accomplishments that we lay claim to. We have issued an accord for sustainability that really kind of lays out a framework for sustainability for the region. We have put together an action plan or an action framework to put more specific plans in action around how to go forward and who to engage and things that have to be done. We recently issued a report on conflicting federal policies because when you get into the area of coastal restoration, you quickly find that a number of federal policies conflict with one another, and those things stand in the way of making progress and stand in the way of restoration of the coast. We have issued a number of resolutions. One of those was around the use of the Harbor Maintenance Trust Fund; another was around the preservation of culture along the coast. Cultural preservation is a critical issue for us because as the coast erodes and washes away, unfortunately much of the culture goes with it, and so we issued a resolution around the preservation of that culture, which is unique, of course, to Louisiana.

Shell has been a part of this, the America's Wetlands Foundation, and a part of America's Energy Coast for a number of years, as have a number of other companies, and we appreciate that participation. We donate our resources, our technical know-how, our financial resources, the time of our people and so forth; and so do a number of other stakeholders. And so I thank you out there for those of you that do that.

Onto the presentation for today, the domestic energy security task force is headed up by two co-chairs; one, Karen Gautreaux of The Nature Conservancy; and Sandi Fury of Chevron. And at this point, I will turn it over to Sandi.

MS. FURY:

Thank you, Mark. As Mark mentioned, I serve as co-chair of AEC's domestic energy security and development task force, along with my co-chair, Karen Gautreaux. I'm with Chevron and Karen is with Nature Conservancy, and I think the partnership has been a great one and I think it's been particularly valuable because I think as we look forward toward the future energy security in this nation, sustainability is only going to happen if we can actually build the belief that this industry can work in concert with the environment. So our partnership on this task force has been very valuable to me. I have learned a lot and I think together working this issue, I think we will be able to bring a lot to the table on those issues and how that you have to work together to be sustainable into the future.

I think I can state for both of us that the testimony today will give us much needed information toward achieving the goal of sustainability of this rich and diverse coastal region. All of us in the room understand that the energy coast here is a working coast; the coast from Texas, Louisiana, Mississippi and Alabama. It's a working coast that has unique energy, environmental and economic assets that not only serve us here, but serve the nation. And even with severe challenges to sustainability, it's important to the future it can't be underminded or misunderstood.

Right here is where we need to continue to build capacity in science and engineering. If you think back to the past, much of what has happened with energy development globally actually was seeded here in this region years ago. So thinking forward that this region will continue to play in building that capacity in science and engineering, I think, is exciting and very appropriate. We export. We need to look forward to a future of exporting innovative science, technology and best practices throughout the nation and throughout the world. And that is why we are here today, to talk about innovative technology, energy, environmental sustainability and how this region can continue to supply the U.S. with its energy supply and do it in a way where we balance environmental and sustainable energy, sustainable coastal needs.

In addition, all of the testimony that will be presented today, we have tried to put together an agenda where you will hear a mix of topics from the conventional today to what the future might bring to us from the region. Our task force, we hope to learn from this, from this hearing today. We hope to better inform our task force in a way where we can continue to develop messages that we need to bring and share with our politicians both at the state and federal level as they continue to look at what their role might be in advancing energy for this country.

In today's hearing we have many speakers. We do have -- I think it's a pretty robust agenda for the amount of time, but I think we have plenty of time for you to be well informed. We ask for you to listen carefully, engage with questions and hopefully when you leave here today you will leave better informed as well as we are. Karen.

MS. GAUTREAUX:

Thank you, Sandi. I would just like to also welcome everyone and thank you for coming out today. I know some people traveled a pretty good distance to be with us. I also would particularly like to thank Lisa Noble, who is from the America's Wetland Foundation, who scrambled hard, along with the other staff; not to say you didn't do a very good job too.

And particularly my co-chair, Sandi, in helping us organize the events today. And I want to echo some of Sandi's remarks. Although this region is key to domestic energy security, a lot of times our expertise and experience is not incorporated to the degree it needs to be in shaping a national energy policy. And we also need to make sure that the nation is aware, much more aware, of the contributions of this area.

Just a few statistics that we would like to remind people of. This energy corridor provides 90 percent of domestic offshore oil and gas supply and is tied to 50 percent of the nation's refining capacity. Navigation facilities along the Mississippi River and the Gulf Intercoastal Waterway serve as one of the largest port systems in the world. And of great importance to The Nature Conservancy, of course, is this region is home to two of the largest flyaways in North America for migratory waterfowl and songbirds and the nation's most productive fisheries outside Alaska, and an ecosystem that serves as the nursery grounds for marine life in the Gulf of Mexico. And unless we have a cooperative and constructive discussion among public and private interests, our rich natural resources; productive landscapes; and energy, maritime and environmental assets will remain at risk. So I look forward to hearing the testimony today. What I would like to do really quickly, since we do have some guests coming in that are not familiar with some of the participants in the energy coast, I would like us to go quickly around the room, or around the table, please, and introduce each other.

MS. COFFEE:

I'm Sidney Coffee and I'm with America's Wetland Foundation.

MR. FALGOUT:

Tim Falgout. I'm port director of Port Fourchon down on the Gulf of Mexico in Louisiana.

MS. HAMILTON:

Hi, I'm Mary Margaret Hamilton with Shell Oil.

MR. MOSS:

Ben Moss with the Louisiana Department of Insurance.

MS. MALOZ:

Simone Maloz with Restore or Retreat.

MR. PRENDERGAST:

I'm Mike Prendergast from MMS Gulf of Mexico Region.

MR. PALMER:

Fred Palmer with Shell based here in New

Orleans.

MS. JAFFE:

Amy Jaffe with the Baker Institute, Rice University.

MR. JOHN:

Chris John, president of Louisiana Mid-Continents Oil and Gas Association.

MS. HANRAHAN:

Fiona Hanrahan with Chevron.

MR. PEELER:

Dean Peeler, director of the Alabama Petroleum Council, API, Montgomery, Alabama.

MR. BOULET:

Henri Boulet with the Louisiana Highway 1 Coalition.

MS. SHUMATE:

Tina Shumate with the Mississippi Department of Marine Resources.

MR. DAVIS:

Mark Davis with the Tulane Institute of Water Resources Law and Policy.

MR. MARMILLION:

And Val Marmillion with the America's Wetland Foundation.

MS. GAUTREAUX:

Thank you. So we are ready to move on to the first panel about the future of conventional energy, and our panelists are lined up nicely in order. So with that, I will invite Chris to start.

MR. JOHN:

Karen, thank you very much for all of your work. Sandi and Mark, and really all of the players with America's Energy Coast. Louisiana Mid-Continent Oil and Gas is the largest oil and gas trade association in Louisiana. We represent the major oil and gas producers, explorers. We represent all of the pipelines and also all of the refineries. We have been a part of the America's Energy Coast initiative from the very beginning and very proud of it. In fact, I believe, personally, that it's been an incredible forum for us to come together to understand each other, not only from an energy sector, but also from a culture, also from the fisheries, the wildlife and fisheries, and all of the other things that go on on the energy coast in the Gulf of Mexico. And it's really been an incredible place for us to talk through some of these issues. Because as I like to say representing the industry is that the oil and gas industry needs the coast as much as anyone else because of the infrastructure and all of the assets that are in this region that provide energy security for

America.

Now, the title of this panel is to talk about the future of the oil and gas industry, the conventional oil and gas industry. In thinking about how I could frame it, it was pretty exciting because you only have to look back a couple of years, back to really only 2007. Of course, the oil and gas industry has been around for a hundred years. They understand roller coasters in production and prices and other things, but I don't think anyone was ready for the tumultuous ride that has happened over the last couple of years. And I think to look at the future, you have to look at what has happened in the last 24 months to the energy sector to try to get a clearer picture of what we are up against, the challenges and certainly the opportunities.

If you look back to 2007 through about mid-'08 some of the things that happened here, two of the largest lease sales in the history of the Gulf of Mexico. October the 7th, $3 billion; March the 8th, $4 billion. The second and the largest lease sale in the Gulf of Mexico. And from an industry we understand that, but to look at the amount of money and resources, financial resources, that were put into the Gulf during those two short periods of time, that is only the right to produce energy. So the real dollars and the real benefits economically come after the lease sales. So the fact that those two were historic, I think was a big plus for the re-emergence of the Gulf of Mexico.

Of course, on July the 3rd, 2008, oil closed at $145 a barrel, which certainly caught the attention of the American people because with that rise that rapidly in oil prices came the rise of energy, just energy to the consumers, continued unsettling of governments around the country that play in the oil industry and the oil fields and the oil countries. The huge technological breakthrough in Shell gas happened right at the beginning of '07. We all knew it was there, but the announcement and the publicity it got in '08 was very exciting. And, of course, at the end of 2007, the lifting of the moratorium in the Gulf of Mexico for the first time. Being in Congress as long as I was, we tried that for years and years and years.

So if you pack all of that into '07 and half of '08, you think that the future, the short-term future, was very bright for the oil and gas industry. And then here comes '08, the middle half of '08. And looking at some of the things that happened. Of course, obviously, the economic slowdown, the financial institution meltdown, the tightening -- or not even tightening -- the credit crunch where there was not a lot of money available out there. You don't have to look very far at the two previous lease sales, from the ones I spoke of earlier. The one in March of '09 and August of '09, $350 million and less than that in these last two. Also, Hurricane Ike and Gustav in '08, and a whole new administration in Washington, D.C. A new president, a new mindset about energy. So you pack all of that into the latter part of '08, and in two years you have gone from the opportunities and a lot of optimistic views to a lot of uncertainty. And, of course, the oil and gas industry has really been around for a very, very long time and it really understood that these rides come and go, but certainly not at this peak and this valley.

I think some interesting things come out of those two years that I think are going to help America not only from the economic standpoint, but certainly for the mission of what this foundation and what this initiative is doing, is bringing awareness to how important energy is, how important the Louisiana Mississippi, Alabama, Texas energy coast is. Because frankly, in my mind, when gasoline last summer reached $4 a barrel, I think it had a permanent effect on the American people, not just in Louisiana, on the American people to try to understand what we have preached from an industry for years and years and years; that to provide economic security, you must have energy security. And I think a lot of that mindset started to really sink in and to penetrate for people to focus in -- American people to focus in on what you are doing here, how important the coast is. If you look at not only Katrina and Rita, Ike and Gustav and look at what happened to the economy, what happened to the fuel supplies; not only here in this region, as much as it is up in Chattanooga and Atlanta. If you remember the bubble after those two hurricanes.

So I believe that what has happened, although it's been very difficult and trying, it serves up an opportunity; it serves up an opportunity for us as an oil and gas industry and also as the American people and as your initiative for people to look at why is it important to sink the revenues and the attention to the energy coast, why to address it, why is Louisiana's port system and the Gulf of Mexico's energy -- why should we spend federal dollars down there. Those questions were hard to answer prior to these events, I believe. But I think that this is a great opportunity for us to talk about this industry working together, the sustainability of a coast. And, you know, with the new administration, there are new challenges there, but I think that you have seen this mindset change.

I mean, you don't have to look too far. If you look at the State of Florida -- being in Congress one of my best friends in Congress was Allen Boyd, who represented Destin. Many of us have been to Destin. But offshore oil and gas drilling was just not politically sustainable in Florida. But you look at what the Florida senate did this year, 17 or 13 or whatever the vote was to actually allow offshore exploration and production within three to ten miles. It didn't pass in the house. But the fact that the Florida legislature actually is starting to understand that, you know, we have seen the oil and gas industry react responsibly and act responsibly during these hurricanes. You know, these hurricanes, there were no major spills in the offshore oil and gas industry. And I think they are starting to see and catch on that it is not a good thing for us to be so dependent on foreign sources. It is very advantageous for us to take our energy portfolio and look at it and focus on some alternative fuels, but also not do that at the risk of crippling an industry that creates, at least in Louisiana's mind, a $70 billion economic engine for our state.

So I think there are some good opportunities that can come out of this. I think for the first time people are understanding better what is at stake, and I think that in the long run that is going to help us as an industry and certainly America's Energy Coast trying to plant that seed and that message that it is worth pumping the federal dollars, it is worth a national effort to revitalize and rebuild our coastline because there is a lot at stake.

MS. GAUTREAUX:

Thank you, Chris. Why don't we -- what we will do, if we have questions, we will just take them at the end of the panels, if that is all right with everyone. So the next person on the agenda is from OCS, Mike Prendergast from MMS. He is going to give us an overview of the OCS program.

MR. PRENDERGAST:

Thank you and good afternoon. I want to thank the leadership of America's Energy Coast for giving MMS the opportunity to participate in this important hearing concerning the nation's and the Gulf Coast's natural resources. Minerals Management has the authority -- Minerals Management Service has the authority and the responsibility to manage the nation's resources, energy resources, on the nation's outer continental shelf, or the OCS. This includes regulating offshore oil and gas operations to ensure that the exploration, development and production activities are conducted in a safe and environmentally sound manner.

I was asked to speak about the outer continental shelf program, but before I start to update you concerning the overall OCS program, I would like to share some information on activities, a brief update of Gulf of Mexico activities. Currently, there are approximately 7,000 active leases in the federal waters of the Gulf of Mexico. As of February 2009, there were approximately 2,000 producing oil wells and 1700 producing gas wells. As of March 2009, estimated daily production from federal waters of the Gulf of Mexico was 1.3 million barrels of oil per day and 7 billion cubic feet of gas per day.

In 2009, MMS held two lease sales in the Gulf of Mexico, one offering blocks in the Central Gulf of Mexico, which is pretty much south of Louisiana and parts of the Mississippi Alabama coast; and then one offering blocks in the Western Gulf of Mexico, which is off of the Texas coast. From Central Gulf Sale 208, a total of 328 leases were awarded and more than $690 million were received into the federal treasury from high bonus bids. At the Western Gulf Sale 210, this past August, the total of 162 blocks received bids. High bids from that sale totaled more than $115 million.

MMS is currently in an analysis process it has undertaken right now to determine fair market value to make sure that the public receives fair value for those high bonus bids. And we don't have the final number of leases awarded from that sale yet.

At both of these sales, the majority of blocks receiving bids were in water depths greater than 1000 feet or what we refer to as deep water in the Gulf of Mexico. Deep water is certainly where the future of oil and gas activity in the Gulf will take place. Currently there is a world-wide expansion of construction of new drilling rigs that can operate in not only deep water, but ultra deep water, that we consider greater than 5000 feet. Various estimates indicate that anywhere from 20 to 30 new floating drilling rigs each year will be delivered in 2009, 2010 and 2011 for the world market. I know Mr. Palmer will also cover the deep water challenges that take place in the Gulf of Mexico in his presentation and discussion next.

Looking to the future, MMS publishes every two years a production forecast for the Gulf of Mexico. The most recent forecast was released at the Offshore Technology Conference in Houston this past May. Deep water activity contributes significantly to future production for the Gulf of Mexico. In that report, oil production is forecasted to rise to more than 1.8 million barrels of oil a day around the years 2012 and 2013. This will come from large projects that are currently coming on right now and that have been sanctioned, as well as some additional industry-announced discoveries that will be announced in years to come.

Natural gas production, on the other hand, which is prominent is shallow water is forecast to level off at about 6.5 billion cubic feet per day during the years 2012 and 2013. This will occur with some additions from undiscovered resources. On the shelf, some of these leases or blocks are drilled and can get into production in a shorter amount of time than in deep water, in one to two years. Some of the larger deep water projects can take ten years or more to get from discovery to first production.

Where does all of this fit in with the bigger picture. Currently, the Gulf of Mexico contributes approximately 25 percent of domestic oil produced and 11 percent of domestic natural gas produced. Considering the entire OCS, MMS oversees more than 1.7 billion acres on the OCS, an area of roughly three-fourths of the size of the United States. Operating under the OCS Lands Act, the secretary develops a leasing schedule called the OCS Oil and Gas Leasing Program. These programs cover a five-year period and are often called five-year leasing programs or plights. We are currently leasing under a program which covers July 2007 through June 2012. Developing these programs usually takes about two years and involves a multistep process which includes many opportunities for public comment from all parties, including interested -- including states, local communities, special interest groups, industry and other federal agencies.

In January of 2009, a draft proposed program was published to develop a new plan. Originally the comment period was scheduled through March of 2009. In February, Interior Secretary Ken Salazar extended the comments period for six months in order to provide initial opportunities for input. The comment period closed on September the 21st, 2009, and more than 450,000 comments regarding the development of a comprehensive offshore energy strategy for the OCS were received. As you might expect, review and analysis of the public comments are expected to take several weeks. The next step in the process is to initiate environmental analysis and public scoping opportunities associated with the five-year plan. This is required by law and for all oil and gas development that may take place in the OCS. And in the words of Secretary Salazar, the offshore energy program we are developing must address our nation's energy security challenges, deliver a fair return to the taxpayers who own the resources and account for the views of local communities, states and tribal nations. In addition, it must take into account several key considerations, including areas of the ocean that are critical to military training and the nation's defenses; other economic benefits of the oceans, including fisheries, tourism and subsidence uses, environmental considerations, existing oil and gas infrastructure, interest from industry and the availability of scientific and seismic data.

I am confident that we will be able to expand our nation's offshore energy portfolio by focusing on development in the right way in the right places. We in the Gulf region are confident that the Gulf of Mexico will continue to play a vital role in the nation's comprehensive energy plan. And as we work more efficiently and effectively with other federal agencies and with the coastal states, MMS will continue to manage our nation's offshore energy resources in a responsible manner that will ensure sustainability for future generations. Thank you.

MS. GAUTREAUX:

Thank you, Mike. And next, Amy Jaffe from the Baker Institute of Rice University will address energy security.

MS. JAFFE:

So in thinking about the region and energy security and thinking about how the public thinks about or should think about that issue, of course there are tradeoffs. But I think we need to go back and think about Hurricane Rita and Katrina because the impact of losing the oil and gas production and the refinery production from this region had devastating effects across the country with gasoline lines as far north as Boston and affecting people up and down the east coast. And people don't really realize that that disruption was only mitigated by the fact that Europe loaned us gasoline from their strategic storage. So if there was a large drop in capacity or accessibility to the energy that gets produced in this part of the country, I think that the sort of post-hurricane period might have given people a flavor of what this country would be like if we had to rely on foreign sources of supply.

I find that when I deal with public sessions that there is a great concern about the environment, both global climate change and local environmental issues, and I'm very sympathetic to those concerns. But in discussing those concerns, sometimes we put aside an understanding of the scale of energy that we are using in the United States. So it's in that spirit that I try to sort of bring up the issue of thinking about energy security and how much energy we use here in the United States to understand how much fossil fuel is used and what the difficulty would be of replacing it.

And so I actually made this calculation for a debate that is taking place now on the Economist's Magazine website. We world-wide use 113,900 terrawatt hours of fossil energy world-wide. That means nothing to anyone in the room that doesn't deal with energy. So I try to think about, you know, how to make that come alive for someone who is not in the energy business but just concerned about our use and so forth. So if we were going to replace that, say we all agreed that climate change is a great emergency and we need to replace that a hundred percent with some other energy form; that means that we would have to construct over 6,000 new nuclear plants. That is more than 14 times the number of nuclear plants that are currently on the globe. If we wanted to do it with solar wind and geothermal energy, we would have to build 133 times the amount of renewable energy that exists today and we would have to replace more than 1 billion liquid fuel vehicles that are on the road in the world. And if we take that line forward, and I highly recommend people read Dan Sperling's book Two Billion Cars. His contention is that by the time we would get to change some of this technology, we will be talking about 2 billion vehicles on the road worldwide. So the challenge of, quote/unquote, replacing fossil fuel is a much larger challenge than sometimes presented in I think the public domain in the United States.

There is this sort of hope and a prayer thought. We will have some miracle technology that is going to appear and have enough energy to replace 6,000 nuclear plants, and that is not going to happen this year and that is not going to happen next year. And if you look at industry projections for the next 20 years, it's going to be difficult to even come up with that kind of newer, cleaner energy in 20 years time. And the administration and the Congress have done some interesting things. We have tremendous potential to move forward in the area of energy efficiency and we have done some work at Rice where we can tell you, you tell us the scenario for CAFE standards with plug-in cars and we will tell you what that means in oil demand in the United States. So the Congress' latest 2007 bill that passed a 35 mile to the gallon standard for an average American corporate vehicle, that is going to eliminate 2.3 million barrels a day of oil use in the United States. That is pretty small when you compare it to our 19 million barrels a day of oil and gas and the 245 million cars that we have on the road. If we were to get up to President Obama's campaign promise and go to 50 miles to the gallon, that would eventually eliminate 6 to 7 million barrels a day of oil use in the United States. Very good policy, one that should be pursued. But, again, the idea that that would somehow mean that we don't need domestic oil production is not correct because we will still need over 10 million barrels a day of oil in this country, even if every car in America on the road was getting 50 miles to the gallon.

So we need to be realistic about what is possible and in what time frame. And I would like to use this other estimate of the comps in the industry, but I think the industry does a pretty good job in its forecasting. People are projecting that we might actually by 2030 be able to -- through just efficiency gains alone -- so building codes, car efficiency and so forth -- eliminate 180 million barrels of oil a day of demand. I mean, that is more than twice all world demand today. And even under those forecasts, which is very really conservative and I think realistic forecast for efficiency, we would still need a substantial amount of oil, maybe the same amount of oil or more oil than we are currently using today, maybe another 10 million barrels a day more than we are currently using in the world, even having eliminated twice as much of today's demand through these new technologies.

So the bottom line is, the United States is going to need to continue to maintain its oil and natural gas production for many years to come, even if we pass a very broad range of stronger climate and energy efficiency policies. And there is no reasonable projection on the horizon for how we could achieve a complete withdrawal for the need for oil and gas in the next two decades. And we need to in thinking about and forging policies for this country, you know, we need to face the scale-up issues of our energy use and the average daily lifestyle of Americans. And we need to balance that against the policies that we want to put in in the ideal world. So there really does come to be a very important place for forums like this or task force like this that can both meet the needs of coastal communities and the environmental protection of coastal communities without sacrificing the supply of oil and natural gas on the fantasy that somehow we have these other policies and we don't need them.

Let me just finish my statement by explaining something that I spent three years on, and I have a book coming out in December; that, again, I don't think the public understands. So during this crisis we just had, we had a financial crisis involving the dollar. I don't know how many of you, like me, took your money out of the bank and put it into something else. I bought treasury bills over the internet so I would be out of the banking system. Right. And I did that because I could see how much wealth we were transferring to the Middle East. And forget what they might spend that money on. The point was, that created such a large trade deficit in the United States. The people on Wall Street and every other community in the world that speculates in markets bet against our currency. And when they were betting against our currency, they decided that they should bet on commodities because commodities will hold their value, so they bought in oil index funds. And that is how we got to $147 and that is how we wound up having a banking crisis because now we have gone into what we call policy finance where everybody is betting the same way, the value of financial instruments start to lose their meaning in any rational form.

And so when you get to the recession, which is what we hit, nothing is worth what it was suddenly worth in the middle of what seemed to be such a robust bubble of asset. Your house isn't worth what it was worth, so therefore you can't actually own that oil index fund because you have to liquidate some of that to pay for the money you lost in some other place, and it all spins out of control. And we have had that happen in this country twice and we are now just going through it again, and we don't understand what the ramifications are going to be over time, but we will be back in this same exact place no matter what we do. We will be back in the same exact place until we change our policies. Right. And not having domestic energy production is not the way to go to make sure that we don't transfer even more money abroad and have it come back as a banking crisis. We absolutely do need to go looking at energy efficiency, we need to look at alternative energy, we need to have a robust program to diversify the sources of energy in this country. There is no question that that is part of the formula. But we definitely don't want part of the formula to be that over time we are buying more and more oil from abroad and so we get back into this cycle and the next thing we know we are transferring more and more money abroad to countries that can't absorb that money because their economies are too thin. It comes back as this bubble of policy finance again, weakens our currency and we are back in the same financial crisis again.

And people focused on China, somehow there was money coming from China, we had too much debt to China. But if you buy my book on Amazon.com in December, I can't remember what page it is, but you will see the chart. And the transfer of hot money into the financial system from Saudi Arabia and Kuwait from 2003 to 2007 was, you know, 30 percent higher or 40 percent higher than the money coming from China, so this oil thing -- this crisis we went through was really world related and we need to understand that in thinking about our energy future.

MS. GAUTREAUX:

Thank you, Amy. And what is the name of your book?

MS. JAFFE:

It's called The Oil Dollars, Debt and Crisis.

MS. GAUTREAUX:

Thank you very much.

MR. DAVIS:

It sounds like some nice seasonal reading for the end of the year.

MR. PALMER:

A Christmas gift.

MS. GAUTREAUX:

All right. Thank you. And now we will hear from Fred Palmer about deep water exploration.

MR. PALMER:

Thank you, Karen. I feel so inadequate now. I don't have a book, I don't even have a blog site to promote. I just want to reinforce a couple of points made by the other panelists, and part of that is just from where I came from before coming here today, and that was being a part of some local businesses. We were meeting with about a half a dozen economic development site selectors that are visiting the New Orleans region today and tomorrow. And I just talked briefly about where I was going from there. You mentioned America's Energy Coast, and I see this all of the time, but as recently as an hour ago, with people getting it. Four dollar gas and hurricane disruptions over the last couple of years; this is a great brand because people -- the awareness and the interest in trying to understand better what is going on here is certainly elevated. So when you say that name, America's Energy Coast, people get it and a lot of questions flow from that.

On the topic of the panel here, you can debate how much it should or shouldn't be, but there is certainly a future for conventional oil and gas as we go forward as part of our energy portfolio. I couldn't have said it any better than Amy just did, so I'll leave it at that. But I will say that as part of that conventional oil and gas, deep water or even ultra deep water is going to play a big role in that, so my comments are going to be not even around exploration, but just the whole challenges and technology and innovation we need to develop and employ to be able to take advantage of the opportunities in the deep water and ultra deep water, not only globally, but certainly in the Gulf of Mexico.

I'm going to use some visuals. I'm a big fan of them. Hopefully they will help make my comments a little bit more interesting. But if you look at the whole deep water environment -- these are more global statements -- but ultra deep water, you know, we are really now -- and you will hear in just a few minutes how we are really talking about 5, 6, 7, 8000 foot of water depth. So we are not really in deep water. We are already into ultra deep water. But they are in remote locations, they are often in harsh environments.

The accumulations of oil and gas that we are able to find -- you know, you hear about the easy oil being gone. They are smaller, they are more difficult to get to. Because they are smaller, they are less economic, so that creates the whole interest around more and more innovation around subsea field development. Discus oil, just the type of oil you are finding. And the low, natural pressures that exist and the energy drive that just naturally takes that oil, gas and water and brings it to the host platform. The high cost of drilling and infrastructure.

In the deep water Gulf of Mexico, even though our economy has softened, prior to it softening for a deep water -- to contract a deep water drilling rig is 6 to $700,000 a day. You then roll in the marine vessel support and other services you need to support that, you get to a million dollars a day per rig for that type, to be able to maintain that type of program. And then often -- this is more maybe a global statement than necessarily the Gulf of Mexico, but even some challenges around lack of local logistics and the service industry to support development in a deep water or ultra deep water environment.

My remaining slides and comments are really going to focus around what better way to try to drive this home than talk about something that is really happening right now, and that is our Perdido project in the Gulf of Mexico. The technology and innovation has certainly been the key to making this whole project feasible. So this facility actually exists on location about 200 miles south of Galveston, Texas. It's in about 7800 feet of water. The spar was installed last year and then the top sides were installed on the top of the spar earlier this year, and it's going through the commissioning and remaining installation process to come on-line and come on production early next year. Shell is the operator. We also have two very important partners in this project: B.P. and Chevron. This will be the deepest spar in the world. There are a number of world records associated with this project. It has a design capacity of 100,000 barrels of oil a day, 200 million cubic feet a day, so that is 130,000 barrel of oil equivalents in equivalency basis. It also has the ability to handle 80,000 barrels a day of water injection, which is going to be important in the life of the field to be able to go into a secondary recovery mode where we inject water to sweep the oil and gas that won't naturally come out under its own pressure.

It can accommodate up to 150 people on the platform. We actually have some temporary locations out there now with a lot of activity. We are at probably about 200 people, what we call personnel on board, at the location today. There are 35 wells associated with this project initially. 22 are called DVA, or direct vertical access. And you will see in a minute with some other slides and a video tour I'll show you of the project, those are the wells. Direct vertical access is a reference to the wells that exist directly below a floating structure. And then there are 13 wells that are remote subsea developments tied back to this spar. It will be the deepest subsea production in the world. One of those deep subsea wells is in almost 10,000 feet of water depth. That is -- that well has been completed. It's just not producing right now. But that again is another world record.

Also to get this oil and gas to the market, we had to construct 77 miles of oil export line and 107 miles of gas export line from the location to existing pipeline infrastructure closer to the coast, and that tie-in had to be done in 5,000 feet of water. That has never been done before and successfully accomplished. But the most important thing and the next to last bullet there, when these leases were required and this field was discovered, the technology to be able to produce in this environment did not exist. It was literally a "if you build it, they will come" type of proposition. What we have to do, we will be initially developing from three formations below the sea floor; at 4, 6 and 11,000 feet below the sea floor. The natural pressures in those reservoirs to bring that oil and gas to the sea floor, let alone overcome the 8,000 foot hydrostatic pressure of water sitting on top of it, doesn't exist. So we needed to find a way to separate the oil, gas and water that naturally exists in these formations at the sea floor and boost them up to the platform. So we have done that. That technology being applied here is serial number one.

Next slide, please. This is a little bit better schematic of the layout of the facility. Again, you see the spar, you see the great white field and then there is also the silver tip and Tobago fields; those last two being the subsea fields about 8 and 10 miles away that will produce back to what we call a floating host in that type of environment. You see by the area map there Perdido's remoteness in the Gulf of Mexico from existing infrastructure. Next slide, please. This is a little bit more about what the footprint looks like on the sea floor directly below the spar. You see those black stubs, those with the wellheads sitting on top of them; you can actually see at the top right one of those actual wellheads with a person standing there to give it some scale. So this is again the infrastructure on the floor that takes the production from the two subsea fields and the great white field, takes them into one of five caissons, which are the stubs you see on the floor there with the five pipes running up out of the picture to the top. And those caissons are where the production, the oil, gas and water will go into those. They will be separated. And then there are 1500 horsepower electrical submersible pumps in those caissons that will boost and drive that oil, gas and water up to the platform.

This is more detail around the boosting system. I am not a technical expert, so I cannot get into a whole lot of detail without getting myself into trouble about not knowing what I'm talking about, other than to again drive home that there you see the actual equipment before it was taken offshore. These are the boosting systems. Again, first time technology ever applied that sit on top of these caissons. The caissons are 35 inch diameter steel pipe that runs about 320 feet into the sea floor where the pump sits. And this boosting system does what it does, and that is, again, to separate those three materials and boost them up to the platform for further treating, compression and putting into the export line.

This is what -- you can't help but have a little sales pitch here about this is what Perdido looks like at night. Of course, Entergy doesn't run out to here, so we generate our own power. But I just think this makes it very real. There are actually people now that are working out there two weeks on, two weeks off, and will be over the life of this field producing oil and gas to help meet our energy needs in a remote, challenging type of environment. What I would like to share with you next is a video. It's an animated tour of this project from the bottom up. There is no sound associated with it. I will describe some things as we go along, but there will just also be some quiet time. And there we go. That is some of the actual 3-D imaging from the wells that we generated in our 3-D seismic center. But this is the ocean floor. And some people you show this to think it looks like Park City, Utah type of environment. That is the ocean floor in about 8,000 feet of water. And even deeper in the bottom of that canyon you see there, it's about a thousand feet wide and about a mile and a half deep. We will travel up as if we were in the remote operated vehicle, the ROV, traveling up through the canyon. You can see some of the tensioners or the -- that hold the platform in place.

One of the things unique about this platform -- not unique; it's done in other parts of the Gulf, but in this particular setting there is a drilling rig on the production platform, so we can both produce as well as drill in intervening wells and drill new wells. But to be able to site that rig over a location, rather than on most platforms where it's on skids and you move it on the top sides to get it to where it needs to be, we will actually have to move the whole spar, the whole structure, to put it over the location where we want to drill. This is what you have already seen. That shark you see there, we actually had a sighting of a Greenland sleeper shark; which the shark is not rare, but that is the first sighting of one in the Gulf of Mexico. We also have some great squid video that was found of a squid that was floating out there in November of 2007 when we were completing one of these wells. You see the caissons there with the production risers; again, five of them that go back to the platform. There is a sixth riser on the platform, and that is the drilling riser.

There you see the spar from the bottom to the water surface. It's about 550 feet tall. That bottom tank is called the soft tank. It was towed out on its side horizontally. A molten material put in that bottom tank, which eventually solidifies. And the spar was uprighted and put itself in place. The bigger tank is called the soft tank, and that is where water is either entered into it or taken out of it to adjust the ballast to compensate for weight and activity onboard and how much freeboard it needs up out of the water. There you see the top sides which sit on top of the spar. Again, all of this kit, if you will, is on location and being finalized as far as assembly and commissioning process.

You see the life boats. We actually have -- that bottom one is a fast response vessel because of its remoteness. We have an extra life boat there that is a fast response vessel that if a helicopter had to ditch on its way out, we could quickly get to it and accommodate all of the passengers in that boat. That is now the largest helipad in the Gulf of Mexico. Again, because of its remoteness, we are using Sikorsky S-92 helicopters that can carry 24 people and a crew of two. It's the offshore industry's pickup truck. We can park two of those S-92s on the helipad, if we had to.

Now we start to get into the guts of the facility. Which this part that you are seeing right now is actually different from a typical type platform. Because the oil, gas and water is separated subsea, this whole equipment up here has a little bit different look to it because this is where you would normally separate the oil, gas and water on the top sides. You can see a stick figure there just to give you some scale. And we will fly down through the middle of this in a minute. Those red larger pipes you see, those are the five production risers and the one drilling riser. The riser being the conduit, if you will, to get the production up or to have the drill pipe and drill bit inside of to do the drilling operations. All of this has to be designed to be able to accommodate -- the structure is designed to float and adjust to the seascape, so it moves sideways, up and down and all of this to be able to do it without putting the equipment and pipe under undue stress.

We are flying down through the middle of the spar back up through the bottom. That little item you see on the right side there, that is the ROV, so you just get a feel for the scale of this thing. This would be the view if you were flying out to it by helicopter and approaching it for a landing. I think with that, we will leave it at that. But I hope between the comments and the video and seeing something along with what is being said, it's of interest to you and helpful and I'll be happy to address any questions that I guess we will start to get into now. Thank you.

MR. PEELER:

Did you say, Fred, for new drilling you have to move the spar?

MR. PALMER:

To be over a certain well. There are six slots on the platform, five of them are for the production risers, one for the drilling. So other platforms you would have a drilling rig on a skid, on a metal skid that you would move this way or that way to get it over one of the slots on the platform. On this, the drilling rig stays in one location on the platform and you move the whole spar to get it over the well.

MR. PEELER:

With the flow lines attached?

MR. PALMER:

Yeah.

MR. PEELER:

So they have a lot of flex in them?

MR. PALMER:

Yeah. Again, they are built in a way to accommodate the seascape, including hurricane conditions.

MR. PRENDERGAST:

I might add, that is for the wells directly below the spar, right. But this facility is also designed as a regional host and it can potentially produce from other discoveries up to, what, about a 30 mile radius around the facility, and we have -- we call those central processing hubs. We have other facilities already in the Gulf of Mexico that produce subsea from other discoveries or fields back to those hosts. About 65 percent of all of our projects in deep water are subsea projects back to some other facility.

MS. GAUTREAUX:

Thank you, Fred. We were almost getting dizzy with that animation. Thank you. Do the panelists have any questions for our -- any additional questions for our speakers? Okay. Thank you.

MR. DAVIS:

This may be just a question which would also be applicable to the panel of alternative energy, but I think we can all accept the fact that conventional oil and gas is going to be a big part of not only America, but world-wide for a long time to come. But, you know, in these coastal regions that have been playing host for a long time, they also have special additional needs. I was wondering how you or any of the future panelists see the interplay of the need for, for example, coastal Louisiana -- or I could make the same argument for Texas, Mississippi, Alabama -- for freshwater input as touring systems need that, but increasingly natural gas production and a lot of alternative energy like solar requires, quite frankly, mind-blowing amounts of water.

How do we actually begin to balance the needs of those freshwater resources to produce energy of whatever sort and to maintain the integrity of these coastal systems such as the Mississippi River Delta and the Gulf Coast? Because it's often a conversation that happens separately where we see, you know, the desire for energy independence in one room and we see the idea for, if you will, low carbon fuels in another, and then the idea for ecosystem maintenance and sustainability in another; when, in fact, there are common issues and those haven't been addressed. And do you think, you know, this initiative is a place to at least begin some of that conversation so we don't end up, you know, being surprised by anything?

MR. PALMER:

You know, I'll try to address that, Mark. I don't have the intellect or the background or skill set to really address the heart of your question.

MR. DAVIS:

Neither do I.

MR. PALMER:

But I think you are right. I think this effort, you know, where it is at a relatively young age is the type of environment that you can start to have those discussions much -- even within the companies, let alone efforts like this. We do too many things in silos and we need to break down those silos and have more of that collaborative holistic discussion. So I think this is an environment in which to do that. There is a little bit of an onshore analogy that I can think of where I think there is a challenge around things within our industry, for instance, in the Haynesville Shale in Northwest Louisiana where, again, water is a critical issue. Where you see companies -- we are very competitive as an industry in companies, but you see companies coming together and trying to find broader solutions to things. That it may be a number of solutions, but they are done more collaboratively because I think the society expects the industry to collaborate more on these kind of things, put all of that technology and innovation to work and share the best that everybody has to offer and come up with the best solutions. And in the past we have been very competitive about trying to do that for our own particular part of the play, if you will, but I think you are seeing the expectations for something more than that. So I think we are seeing that actually happening, and this is a great forum for which that discussion can happen in the Gulf of Mexico and Gulf Coast respectfully.

MR. MARMILLION:

I have a question. Amy, assuming -- and, of course, we do -- your estimates are correct for conventional sources into the near future, can this region bear the brunt of producing the amounts needed to keep up with domestic demand? Where is this going to come from and how much can be produced here?

MS. JAFFE:

Well, you know, actually, the truth is this $147 we all complain about, maybe that wasn't quite as important as the $15 per million BTU gas price. It did stimulate a lot of things that, again, I don't think people are really aware of the scale. So deep water in Gulf of Mexico is still a huge potential. West Stafford, even. You know, more and more finds are being announced. But when you look at natural gas, which, of course, is a cleaner fuel, and if you think about the way technology is going, so maybe I'm going to have a car that can run on both fuel and electricity over time or I'm going to have technologies that can convert natural gas into other kinds of fuels, the interesting thing about what is happening in this country, just in the last five years, is we went from having people like Matt Simmons explain that we are running out of natural gas and there is just no potential left in this country to now having five times the amount of natural gas as Qatar, the country that used to have the largest single gas field in the world and was thought to be the sort of leading province for natural gas supply in the world, you know, 10 or 20 years out.

So we now have developed so much understanding of the shale play in the United States that the estimates keep going up and up. And I'm a big believer in technology. I mean, you just have to watch that simulation and think about how many scientists actually work at Shell. We went from the Barnett Shale from being an obscure play that a handful of guys decided they would do and they were crazy because this $15 gas price would never last and it was costing them $12 to do that play, to having large companies with a lot of engineering think about how to do those plays in other parts of the country that might not be quite as complex as Barnett, and numbers like 4 or $5 gas. And my belief is from watching the industry that those numbers will come down over time. And I tell the story that I like to say because I work at a university. So to me the question is not can we. It's what is the time scale. Right.

So we actually have something at Rice that is also called the AEC, ironically. It's called the Advanced Energy Consortium. And it looks to look at how nanotechnology might improve energy systems, you know, both in solar energy -- imagine the roof being made out of a million, you know, little nano dots that collect the sun -- to things that you can do offshore, like you can go down with these nano robots and see where the oil and gas is and be more precise in your planning for recovering the stuff underground. So there is two issues there. Number one is, what is left. Number two is, what percentage of it can we recover. So when I first came into the business -- I don't want to date myself because I'm a woman, but, you know, people were recovering an average of 10 to 15 percent of the oil in a find they would get. The industry is moving more and more towards the realistic possibility that they can recover 50 percent of a field and bring that to bear. And that is a huge amount of resource just in changing your recovery rates.

And you mentioned -- the other gentleman mentioned this issue of water, how much water does it take to do this. And, again, when you look at nanotechnology, this AEC has developed a synthetic sand that works better than sand in fracing the shale rock; and so, therefore, it is going to require dramatically less water. And to sort of confirm what Mr. Palmer was saying, this AEC is a consortium of ten energy companies working together funding scientists at Rice to come up with these kinds of technologies, and we are doing so actually rather quickly. The AEC is only two years old. We already have the nano sand. We already have tested the nano bots for deep water drilling. And I like to tell this story of optimism because there is a group working on nano soil. And so I would like to feel that some day we will get to these technologies that will be the eventual replacement technologies.

So I tell the story about Jennifer West and Naomi Hollis, who are two very talented scientists at Rice, who decided in the late '90s to take these little nano materials and come up with a treatment for breast cancer. And you would think to come up with some little robot that you need some $400 million or maybe even more expensive microscope to see, it would take you a really long time to figure out how to program those little things to go into somebody's blood stream, float around until it found the cancer cell, get into the cancer cell, pick up the radiation from her treatment, kill the cancer cell and then expel itself through a regular human process. The treatment by 2004 was in FDA clinical trials at the Texas Medical Center. So the pace of science that we see today is much more dramatic. So I feel very optimistic about some of these technical problems and the ability of the industry to come up with good and concrete solutions.

MS. FURY:

Anyone else? Okay. I would like to thank the panelists. And we will take a few seconds here and I'll ask the next panel to come forward and Lisa will seat you at the table. Thank you.

(A break was held in the proceedings.)

MS. FURY:

Okay. I would like to ask everyone to take a seat and we will get started with our next panel. I thought the first panel was very good setting the stage for conventional resources and what they look like today in this region. The next panel we thought would bring us a little bit more into the future as we hear more and more about CO2, CO2 capture, CO2 sequestration. We thought it would be appropriate to hear from some panelists relative to the topic of leveraging CO2 for energy production. It's been proven, it's been around for a long time, but it's been limited in its applicability based on the availability of CO_2. However, that picture may change. So we hope that today you will hear -- you will be informed by our panelists about activities ongoing today relative to leveraging CO_2 for the benefit of energy production.

So with that, we have two panelists, and we are going to start with Charlie Gibson. And Charlie is going to talk with us about the CO_2 recovery process. And just so we capture this again, this hearing is really for purposes of us to capture information, capture it for the record in hopes that we can use this information in informing our constituents here locally, at the state and federal level too, in policy discussions. So to make sure we get good information, please restate your name and your affiliation so we get that captured into the record, if you don't mind. So we will start with Charlie.

MR. GIBSON:

Okay. Thank you. My name is Charlie Gibson. I work for Denbury Resources, which is an oil and gas company located in Dallas, Texas. I thank you for inviting me to talk today. There is a couple of things that hit home for me. I grew up on the West Bank in a little town called Plaquemine, Louisiana. And I went to Louisiana State University. And the environment is very important to me, especially since I still have family here and my father-in-law is a big-time fisher and hunterman. So I think it's very important to protect our environment. And the second issue is, my little company, which is a $3.7 billion company. I say it's little, but it's no longer little. We have production in the states of Alabama, Mississippi, Louisiana and Texas, so it's very applicable to America's Energy Coast. So it's with great pleasure that I'm here to talk about my company and what we do.

My company is an EOR company, which that stands for enhanced oil recovery. We use CO_2 as the source to recover additional oil which would not be recovered through normal oil recovery processes. The CO_2 recovery process is very interesting, yet very complex. The CO_2 molecule, which when it comes in contact with oil, will swell the oil, improve its viscosity and eventually, and hopefully, will get the oil molecule to mobilize. We estimate an additional 10 to 20 percent of the original oil in place can be recovered with this process. Of important note to everyone, this is not a new fandangled process that someone came up with in the last couple of years. The oil industry has been applying this process since the 1970s. Even though this technical process at times seems overwhelming, several obstacles prevent universal expansion. And I would like to briefly discuss some of these obstacles that come to my mind.

The first obstacle is CO_2. There aren't many naturally-occurring deposits or sources of CO_2. My company, fortunately, has one in the Jackson, Mississippi area. It is the only naturally-occurring source of CO_2 east of the Mississippi River. So one of the potential solutions for this is manmade CO_2. We can capture the CO_2 and use it for enhanced oil recovery. There is one small issue with that, and that is the cost of capture. And it's extremely high and the technology hasn't really caught up to help solve that cost. The second issue that I would like to talk about is pipeline systems, or network of pipelines. There aren't many pipelines in the United States dedicated solely for the use to transport CO_2. And if you look on the map from the projection, it shows -- the green solid lines shows all of the known CO_2 pipelines in the United States. You can see in the Western United States from Colorado into the Permian Basin in West Texas, the network has been extensive and it has been used for many, many years. And then again also in Wyoming there are some sources. I think Exxon produces natural gas and strips off the CO_2 and they use the CO_2 to those fields in Wyoming.

If you look in Mississippi, that is our system. That is an old Shell pipeline system. Shell Oil Company put this in place in the 1980s. There is nothing along the Gulf Coast where CO2 is emitted everyday from our chemical plants and refineries. So there is no system in place to capture that CO2 and move it to oil and gas fields. One of the things that my company has done, we have built some pipelines because we believe in the enhanced oil recovery process. And we are currently building a pipeline from Donaldsonville, Louisiana to Houston. And you can see that by the dashed line as demonstrated on the map.

So some things to help solve that. One of the things the states can do is make the -- give some rights to the company to install the pipeline, eminent domain rights. And the State of Louisiana has given us some of those rights along the way. And, also, as was mentioned earlier this morning to me, there are old pipeline systems in place that could be refurbished and used for CO2 capture. The third item that I would like to say is an obstacle is capital markets, or capital. Our projects are typically very capital intensive. Our projects from start to finish take at least three years. It is similar to an offshore platform where you drill the discovery well and then two or three years later you begin to produce oil. Well, that is very similar to our process. It's very capital intensive. It takes at least three years before we begin to make oil production.

Some of the things that we have seen that have helped us, the State of Louisiana gave us a tax abatement to recover our capital, until we recover our capital. So that was a big help for us to spend money in the State of Louisiana. The State of Mississippi has given us tax reductions. The normal severance tax in the State of Mississippi is six percent severance tax. And they reduced that for enhanced oil recovery to three percent, and that definitely encouraged investment in the State of Mississippi. So those type of programs can encourage investments in various states. Another major obstacle for us in the State of Texas is unitization. There are tremendous -- or big, big reservoirs; big, big fields in the State of Texas. And in comparison, the State of Louisiana, you are able to force the unitization of the reservoir. And that is primarily done to conserve and to protect the reservoir and to prevent waste, to protect earlier rights of the mineral owners. The State of Texas has chosen not to force unitization. They allow production on a lease basis. And that represents major obstacles when Company "X" owns 25 percent of the reservoir and Company "Y" owns another 25 percent and my company owns 20 percent. It's virtually impossible to CO2 that reservoir. So I think there needs to be some legislation effort in the State of Texas to encourage operators to unitize to protect the reservoir and prevent waste.

The fifth item that I think that needs some help is technology. As Ms. Jaffe mentioned earlier, and other folks, most of the -- most of the work in the domestic U.S. has been on unconditional natural gas sources, the Barnett Shale, Haynesville Shale and the Marcellus Shale. We never hear any technology on the black oil reservoirs. Black oil reservoirs are sort of the forgotten resource in our country. We import 19 -- wait. We use 19 million barrels of oil per day. And to put that in prospective, my little company makes 40,000 barrels of oil per day. We are a $3 billion company. We are like the dot -- not even a dot on the "I" in terms of how much oil we use in this country. So there needs to be some type of domestic energy policy to encourage domestic oil production. I think that is essential. We import of that 19 million barrels of oil per day that we use, we import 14 million barrels. 14 million. Every time -- every time you fill gas in your car or when I fly home tonight in an airplane, I'm using a portion of those barrels. It's hard to imagine our life without the conveniences we have, so that amount of energy creates a tremendous burden on our system.

CO2 cannot solve this shortfall. I don't want to imply that at all. But every barrel we produce from our country is important. It can help. The last obstacle I see, and it ties into what Ian is about to talk about, is the relationship between EOR and sequestration. The big buzz word in our country is carbon capture and sequestering the waste gas CO2. So the logical solution in my mind for this CO2 is to use it in the enhanced oil recovery process. I think it becomes a win-win situation for everyone. We can dispose of the CO2 molecule and at the same time use it to produce domestic energy. There is an obstacle for that. It sounds real simple on paper.

In most states there is a conflict between who owns the mineral rights -- I don't know how to say this -- and who owns the sequestration rights. And I can just give you an example for the State of Wyoming because that is the one I'm aware of. The mineral rights are owned by the royalty owners. The sequestration rights are owned by the surface owners. So if I am an oil and gas company and I want to use CO2 for enhanced oil recovery, I flood my field. And when

I'm done, how do I -- how do I make the transition from mineral royalty to surface ownership for the sequestration rights. It becomes a very complicated issue. And I think the states have to help us solve that issue.

Finally, to put this into perspective, ARI -- and I think they are an independent research company -- in 2008 estimated that the original oil in place along the Gulf Coast states was 44 billion barrels of oil. So I'm going to repeat that. 44 billion barrels of oil along our four states. They estimate an additional 7 billion barrels of oil can be recovered from CO2 operations. So in my mind, it's not when should we use this process, it really -- sorry, let me back up. So it's not when we should use this process, it's when will we use it. We must use it. And we need to universally get this moving in a much faster pace than we have in the past. That is it.

MS. FURY:

Thank you. Okay. Now we will move onto -- I'll introduce Ian Duncan, and Ian is with the Bureau of Economic Geology, University of Texas. And he is going to talk to us about the future of carbon sequestration.

MR. DUNCAN:

Thank you. My name is Ian Duncan. I'm the associate director for environmental systems at the Bureau of Economic Geology, University of Texas at Austin. The Bureau is the second largest research institute at the University of Texas. I say that because people often ask me what is the largest one. Well, it's the applied research lab, but I can't tell you what they do there but it involves carbon fibers and backscattering of radar and things like that. The Bureau has been working on carbon sequestration related issues for nearly 10 years. I have been working on it for 5 years. It's a very exciting field.

Texas and the Gulf Coast have the largest carbon footprint of any area within the United States. Texas, for example, if it was an independent country, I think would rank No. 7 in terms of carbon production. This is not because the people who live in Texas or the people who live in the energy coast are bad people. It's because we produce a lot of the energy for the rest of the country. So all of these pipelines radiate out from the Gulf Coast carrying gasoline and other products and a lot of the carbon emissions related to the petrochemicals and the refineries here are credited to the energy coast. As well as having the largest carbon footprint, the energy coast also has the largest capacity within the United States to do something about these emissions. So we have the largest sequestration capacity that is co-located with emissions probably in the world. There are other places that have just as large a capacity but they don't have the emissions of CO2, so they are basically stranded with sequestration sources.

So a concept has developed called carbon capture and storage. And the idea is that we capture CO2 from stationary sources, compress it, transport it and then inject it deep underground to somewhere it will stay hopefully forever. The main stationary sources that we are talking about are power plants; coal power plants, possibly natural gas power plants. Just an interesting aside there, in Texas there is actually more CO2 being emitted from natural gas power plants than coal power plants, just because of how much power gets generated in Texas from natural gas. Natural gas generates about 42 percent of the CO2 per kilowatt hours of a coal plant. Some people have the impression that natural gas is the clean fuel and therefore emits no CO2. Well, it's slightly less than half. Unfortunately, post-combustion capture of CO2 from flue gases is rather expensive, and that is because CO2 is a fairly dilute component in flue gas from power plants. For example, a typical coal power plant flue gas is about 88 percent nitrogen and 12 percent CO_2. So when we are capturing the CO_2, what we are trying to do is grab those 12 percent of CO_2 molecules out of this vast vent of hot nitrogen that is going up the smokestack. For natural gas plants, the situation is even worse. The CO_2 content is on the order of 4 percent, so it's even more expensive.

So at the moment, if you had to set up a capture plant today using existing commercially available technologies, we believe that the capture from a coal plant, post-combustion capture, is going to be on the order of 30 to $40 a ton. Capture from natural gas plants, on the order of 70 to $80 a ton. Now, it turns out if you do the math, those costs are fairly comparable because you have got more kilowatt hours per molecule of CO_2 in the natural gas plants, so it's about even in terms of cost if you look at it on the basis of kilowatt hours of electricity. The hope of the Department of Energy is to get capture costs down on the order of $5 a ton. However, at the moment there is no technology that comes close to doing that that has ever been tested on a scale larger than, say, you know, a bread box. In other words, it's at the test tube level. So we have no technologies that we know of that are just about to become commercial. So this is definitely a problem. Capture is by far the largest component of cost in carbon capture and storage.

Now, what do we know about carbon sequestration. Well, we have over 37 years of experience injecting CO_2 into oil fields, and this is by far the largest tangible evidence that we have of what happens when you try and do CO_2 sequestration into geological reservoirs. We have transported from the Permian Basin in Texas about 600 million tons of CO_2 over the last 37 years, and we have injected probably more than 1,200 million tons. The reason we have injected more than we transported in the pipelines is that you recycle the CO_2. So when you produce the oil, the CO_2 separates out at the surface; as it de-pressurizes, you capture that and re-inject it. So we have a larger injection experience than we have in a pipeline transportation experience.

My personal experience -- my personal specialty at the moment is evaluating the risks associated with CO_2 sequestration. I just got a $2 million Department of Energy grant to work on that over the next 4 years. One of the interesting things is that in this transportation of 600 million tons of CO_2 and 1,200 million tons of injection, we have never had a single serious accident in terms of anybody getting injured and no fatalities. One of my problems in terms of doing risk analysis is it's very hard to do statistics on what we call the null set. In other words, if you have no incidents, you can't extrapolate the future, so that is my problem that I have to deal with. So the EOR industry has an excellent safety record.

In the Gulf Coast, Charlie talked about ARI's estimates about 7 million -- billion barrels of oil produced from CO2 EOR. Some of my industry friends think that is unduly optimistic. But it's of that order of magnitude. In other words, it's billions of barrels of oil. I would prefer to say somewhere like 3 to 7 billion barrels of oil depending on how optimistic you are and also depending on what oil prices do and how the CO2 market evolves and a whole bunch of other impugnrables. The one thing that we do know is that that is a small fraction of the CO2 that is going to be emitted from the energy coast over the next 50 years. Chances are we are going to emit, if things go on the way that they are going on, extrapolating in a linear sense what is happening, we will be emitting 40, 50, 60 billion tons of CO2 over the next 50 years. So the chances are that only about 10 percent of that could ever be used in CO2 EOR.

However, we also in the energy coast have a very large capacity for brine sequestration. This is putting CO2 into formations a mile or more beneath the surface into water that is typically three times the salinity of seawater, so it's highly unlikely to ever be -- I don't know why you would ever want to desalinate something that is three times the salinity of seawater. Obviously, it's going to be cheaper to desalinate seawater. So you are putting it into very salty brines and putting in into places where we believe as geologists that it's going to be sequestered on a scale of hundreds of thousands or potentially millions of years. There is a lot of research going on looking into what the possible risks of this are. My group is spending a lot of effort in trying to look at whether this could potentially harm water resources, freshwater resources, etc., etc. But this looks like it is a way that we can get rid of the order of magnitude of CO2 that is going to be produced in this region over the next 50 years.

Now, I hesitate to talk about this in a situation here where you are talking about sustainability because this is not sustainable in the long-term. In other words, we are not going to be doing carbon sequestration in another 200 years. We probably will not be doing it in another 100 years. What carbon sequestration does is it gives us a breathing space to develop new sources of energy. So it is not a new way of doing business that is just going to carry us on forever. We have a finite sequestration capacity.

There are also some niches in the energy coast where CO2 sequestration might have multiple benefits. I know some of you are here from the Wetlands Foundation. One of the things we are interested in is can we restore Wetlands using CO2 sequestration. And we might be out to do something beneficial there. Part of my purview at the Bureau is coastal geology, coastal hazards in wetlands. And we know in Texas and also in Louisiana that production of fairly shallow gas reservoirs has lead to subsidence of wetlands. And there are areas along the Texas coast where I can show you examples where we have got satellite imagery and aerial photography showing an area of wetlands and then ten years later half of it is submerged and you can see the fault. And what happened in the meantime was a shallow gas reservoir was produced. If we put CO2 down into some of these gas reservoirs and we pressurize the reservoir back up, you will recover some, but not all of that compaction that occurred when the gas was produced.

So we are very interested in what is called enhanced gas recovery, putting CO2 in the gas fields and seeing if we can get some more gas out of them and basically filling them up with CO2. Just to give you an example, I did a little study concerned with the W.A. Parish Power Plant in Houston, Texas, which is one of the largest coal fire power plants in Texas and along the Gulf Coast. It produces about 15 million tons of CO2 a year. I have looked at all of the oil fields within 50 miles and looked at how much CO2 that it would use up, and it would never happen this way, but you could basically fill up all of those fields with two years of production from the Parish plant of CO2. The Parish plant is about 30 miles from the Katy gas field, which was a 5 TCF gas field which is now no longer producing. It has about 2 TCFs of gas left in it. And it would take about 15 years of the Parish plant's CO2. So that just gives you some idea of how much CO2 you could put into the natural gas fields. It's not necessarily an economic thing in that CO2 is very bad for natural gas. It destroys the economics of it. So you have -- nobody has ever successfully done an enhanced gas recovery project with CO2. So we are not quite sure how it will work or whether it would be economic.

Also, I did some rough back of the envelope calculations that would suggest that to make it economic, you would probably need $12 gas, which I for one wouldn't like to see, but that is just me. In terms of obstacles to making all of this happen, obviously cost is a major obstacle. I am supposed to be giving a talk on the transition between fossil fuels and renewables in Beijing next month. And one of the points I'm going to make is that this transition, should it occur, is going to be the first major transition in energy that is driven by government policies and not by economics. So it's going to be interesting to see how all of this plays out.

Now, in terms of obstacles to CO2 sequestration, I think legal obstacles definitely are significant. Of course, ownership is a prominent one. Regulation is another one. At the moment in Texas, if you were doing a CO2 EOR project and you decided to turn it into just a sequestration project, even if it was just your thought process changed, you would move from being regulated by the Railroad Commission to being regulated by TCQ, Texas Commission on Environmental Quality, because the law is based on what your intent is which is inside your head rather than what you are doing. Sort of interesting. There is also issues about liability that I think are going to become more important and there are issues about having the people power to do it.

The Congress in their infinite wisdom shut down the oil and gas research program within the Department of Energy about two years ago. And so there is a decline in the number of people -- students being trained in oil and gas. And it's that same expertise that you need for carbon sequestration. So that is a major problem, whether we are going to have the people who can do this. And people smarter than me who have looked at this thing say that in order to put away the amount of CO_2 that people are saying we need to put away into sequestration, we have to have an industry on the scale of the current petroleum industry in this country, which means we essentially have to double the number of people being trained. A lot of this is going to fall down into this region. This is where a lot of the people are trained, this is where the expertise is. And most of the expertise on transporting CO_2, compressing CO_2 and injecting CO_2 is down here in the energy coast. Thank you. Oh, I would just like to apologize. I didn't have any slides. I didn't have any videos. I'm not writing a book. And I keep my money in a coffee jar in the freezer. Thank you.

MS. FURY:

Thank you very much. I would like to go

ahead and open up the floor to questions from the panel.

MR. MARMILLION:

Well, I have to ask the obvious question. If this region is going to be penalized for the amount of domestic oil and gas consumed, what kind of policy can we encourage that does not allow this penalty to move more aggressively forward? I mean, how can we as a region produce oil and gas for consumer demand and be penalized for doing it, and where does this interaction begin to take place where policy can be better informed or -- I understand the politics behind this, but how can we better inform this region that this is a looming threat?

MR. DUNCAN:

I think that is a major problem. One of the things that is hurting the region at the moment is that because many of the state governments here are controlled by fairly conservative Republicans, they are not getting a seat at the table up in D.C. It's partly because our politicians say, well, we don't like what is happening, therefore we are going to boycott it. It's partly that, I guess, people down here are busy doing what they are doing and aren't paying as much attention maybe. I don't know.

I have testified three times in the last eight months to Congress on these issues, but I don't think we have enough involvement by our state government leaders, our governors, our congressional delegations. I don't know so much about in Louisiana, but, you know, Texas does not have the same kind of clout that it used to have 10, 15, 20 years ago in Congress. You know, we used to have a lot of speakers of the house, we used to have a lot of seniority, we used to have senators like Lloyd Benson whose --

MR. DAVIS:

You used to have presidents.

MR. DUNCAN:

We used to have presidents. And I think this area is losing out by not getting a voice in a lot of these decisions that are being made. And I think that a lot of the -- there is a thing called RGGI, which is the New England States' carbon thingy. And they are getting together and they are putting rules and regulations, and a lot of this stuff is going to end up dominating what happens in the federal sphere. And the perspective from down here is not being heard enough, I don't think. And I think that is problematical. You know, I think it's misleading to say that, you know, we are the problem, we are the CO2 problem. Everybody in the country is the CO2 problem. It just happens to be focused here because that is where all of the petrochemical plants are and so on, but everybody is using the gasoline.

So it would be -- I think I gave testimony about 14 times in the last legislative session in Texas and several of the representatives and committee chairman made the same point you are making; you know, well, this is not fair. But just because it's not fair doesn't mean that the rules, the legislation that comes out of Congress is going to be fair. The only way to change that is by speaking up and having a voice.

MR. PEELER:

In my view, it goes beyond fair and unfair. When we have a hurricane, we get blamed for causing the price of gasoline to increase in Maine and everywhere else. But then we get told that we don't have enough refineries, we need more refining capacity, we need a refinery everywhere we turn. Well, who is going to build one of those. But then on the flip side, EPA, which has a lot of clout in our society, they say that the refineries are responsible for 4 percent of the emissions, okay. But then they really hook big oil by taking the tailpipe emissions and adding that back to the refinery to get the refinery up to 44 percent. So we have no Michael Moores in our corner for Republicans or Democrats to listen to.

MR. DAVIS:

I have one point I would like your thoughts on. The issue of fairness, I agree that, you know, it may be unfair, but that doesn't mean that it doesn't happen. And it also doesn't mean we can't get smarter about how we play the game from our end. And I do think that as we have talked in previous AEC meetings that the tone of conversation that comes from this region too frequently politically is that climate change and carbon management is a philosophical, political issue, not a management issue. And I think we need to find ways of, you know, collectively making -- getting past that because it's very clear that it is now a management issue.

And, secondly, and this is what really intrigued me about Mr. Duncan's presentation, is that if we really are looking at something that is going to be managed roughly at an industrial level equivalent to what we now see at least the petrochemical side of energy being, if we do see that the opportunities for doing something significant and developing techniques is actually centered in this energy coast, are there ways that we within this conversation here can begin to develop that intellectual capital, whether it's in the universities, whether its through industry partnerships or NGO partnerships. Because it really strikes me that is, you know, the place where if we are going to develop the efficiencies to bring the costs down to address the technical legal or policy or philosophical hurdles, no one is going to do it for us. We have to start that conversation amongst ourselves. And, first of all, do you think that makes any sense? And if so, do you have any thoughts for what the next steps should be?

MR. DUNCAN:

I think you are exactly right. I think that the energy coast down here has the potential to actually turn this into a win-win situation. I think at the moment people in Houston, you know, people in Louisiana have the expertise that has been gathered over the last 30 years or so injecting CO2 pipeline CO2. One of the first pipelines in the world was built from Central Mississippi down into Louisiana, now being run by Denbury. And so there is a huge amount of expertise here. And I think the universities, academic institutions, community colleges can start -- should be starting to think about getting into this in terms of training people, in terms of developing research expertise. And I think that that would be a good way for state governments to start going to invest in this.

So I think you have really nailed the -- nailed -- what is it --

MR. DAVIS:

I was just listening to the two of you. So thank you.

MS. FURY:

I have two questions. And, Todd, could you pull up a map. We had put together -- we have a map of pipelines and I just wanted to ask you, Charlie, when you talk about capital investments and the use of CO2 in applying it, you know, to oil field for enhanced recovery, key is capital. And one of the things that we do have an abundance of that is part of the equation is we have existing infrastructure. And if that infrastructure could be converted to transport CO2, I guess the question is, do you see that potential?

MR. GIBSON:

It's possible. We are building a pipeline from Baton Rouge to Houston and it's costing us about $2 million a mile, so put that in perspective. So it's a several million dollar deal. So if you could use some of the infrastructure that is already in place, the capital will be reduced. I just don't know -- I'm not a pipeline expert by any means, so I don't know which pipelines are active and inactive.

MS. FURY:

Yeah. And the point being that there is just a lot of it, so thoughtful, you know, about looking to the future what this actually could help to develop here. But I guess on the other side going to the policy side -- and, Ian, maybe you can answer this -- the current direction of policy, is it directed towards -- it is directed towards carbon capture, but is it really directed towards reuse of it or just stick it somewhere so we don't see it again?

MR. DUNCAN:

Well, the only significant reuse of CO2 in this world is for enhanced oil recovery. The other uses are very, very small in terms of quantity. So the main uses for CO2 other than EOR -- and they would be some small percentage of the EOR usage -- is for creating your favorite carbonated beverage, as well as Coors and Budweiser. Apparently all of this natural fermentation is a total lie. One of the things that we had to do when we did our first CO2 injection in Houston was we could only do the experiment in the winter time. We wanted a couple thousand tons of CO2 and the only CO2 available -- everybody wants to get rid of it; but when you want some, you can't get it. I should call Denbury. So food grade CO2 is the only CO2 available in Houston, and it costs about $300 a ton. And you can only get it in the winter time because in the summertime beer consumption goes up and it's all being used by Coors and Budweiser and you can't buy it. Sorry, I digressed.

MS. FURY:

No, thank you. Any other questions for the panel?

MS. HANRAHAN:

Yes, just one here. With the current focus on climate change in the direction of the legislative procedures, there is an anticipation of a potential carbon tax or cap in trade or some type of value on carbon. Would you just like to comment on what role you see that playing with the use either for enhanced oil recovery or sequestration?

MR. GIBSON:

Again, that is not my expertise, but we are actively talking to industries about capturing their CO2, and it's constantly a topic when we talk to, say, a DOW Chemical and we try to capture their exhaust CO2; it's always a question of who is going to get the cap in trade credits, so it's a real issue in everyone's mind. But as far as Denbury's concerns, as far as increasing the number on enhanced oil recovery fields, it's not included in our economics on a field by field basis.

MR. DUNCAN:

Every time I testified to Congress in the last year or so the chairman of the committee has asked me what I thought about cap in trade. And I replied that I try not to think about it. It makes my head hurt. But that is basically because I didn't want to answer the question because I'm not an expert in this kind of thing, and you destroy your credibility with Congress if you start pontificating on things that you know nothing about. However, since this is not on Congressional record, I am prepared to pontificate. I think that if you get a significant price on carbon, it's going to have a huge effect on the industry. You know, the devil is in the details about how it all works out and so on. But at the moment, if you look at an EOR project, about 40 percent of the cost of the project is buying the CO2; about another 40 percent or so is the recycling, capital equipment for the recycling plant, building the recycling plant.

And largely because of these two things, what Charlie said is true, it takes three or four years before you even get your cash back; in other words, your cash flow is in the negative for the first four, five, you know, six years. They probably got their cash back faster. They were doing the Permian Basin; they have better recoveries. It might be seven or eight years sometimes on a permanent basis. So these are not only cash intensive projects, but you have a negative cash flow for a large number of years. And I don't do this kind of thing, but people who do invest money say that having a seven-year negative cash flow is pretty rough; it's not something that people like. So if you get a significant carbon price such that the carbon price is larger than the actual cost of the CO2. So typical cost for CO2 at the moment is probably out in the Permian Basin at least 12, $15 a ton, let's say. So if you have a $20 or $30 price on carbon, then all of a sudden CO2 rather than being the biggest cost of the project would start to turn up in the positive of the balance sheet and it will change your capital, your cash flow significantly and make these projects a lot more interesting to do; that is if the EOR project gets the benefit of these. But potentially it could increase. Also, it may change the way CO2 EOR actually takes place.

At the moment -- and, again, Denbury is the exception to the rule. But most people do something called "Wagging," which is water-assisted gas; they put in slugs of CO2, slugs of water. The reason they do that is they are trying to minimize the amount of CO2 they use. And so a lot of technologies have evolved to minimize CO_2 usage. So you can see that maybe if the economics change, also it will drive technological innovation where you might have a different approach where you are trying to maximize the amount of CO_2 being used. Which if we do it smart, you might actually increase recovery.

As a matter of fact, the Bureau is doing a fairly large project at the moment, part of the carbon sequestration partnership that Denbury's Cranfield field -- I always have trouble with that, the Cranfield field. Where what we are doing is injecting about a million tons of Denbury's CO_2 down deep in the water level so it's down deep at the oil field. And we have monitoring wells and we are going to look as the CO_2 moves from the brine -- that is our experiment. We promised the DOE we would put a million tons of brine. Well, that CO_2 is going to continue to move up and it's going to go through the residual oil field. It's going to be very interesting to see how much of that residual oil -- because normally you don't mess with it. The EOR actually gets mobilized and pushed up into the oil field. So we will have a rather large scale experiment to see whether you can increase recoveries by getting down into the residual oil reserve. So things like that are going to start to happen.

Back in the 1980s there was another CO_2 flood in Weeks Island, Louisiana where they did what is called a gravity stable flood where they put CO_2 at the top of the field and pushed it down, and that had a recovery of like about 68 percent of the oil in place, which is huge. And that was just a little testing. So these kind of different technologies approach to the EOR could increase the amount of CO_2 used and also increase the return of oil. Sorry for such a long answer.

MS. FURY:

No, thank you. And just to comment to close that, the comment you made, Ian, relative to the time for investment, you know, trying to shorten that time for investment when you actually see some returns. As energy development here in the Gulf of Mexico continues to move to deeper and deeper water, that is what we are faced with. It's five to seven to ten years. And, therefore, if you look at the portfolio of players, the people who can play are only the people who can afford that kind of investment for a long period of time before reaping anything back. So if you want people to play in CO_2 for enhanced oil recovery, shortening that will be important.

MR. DUNCAN:

That is another reason why you will probably never get CO_2 EOR in the offshore fields in our lifetime because the wells are so far apart. If you inject CO_2 into one, it will take such a long time to have any effect in the production well. The economics are terrible.

MS. FURY:

All right.

MR. MARMILLION:

I have one tiny, tiny point for Mr. Gibson. And it would be very helpful if you -- and I know this is going to put you on the spot, but if you have thought about this policy that deals with this issue of who owns mineral rights and sequestration rights, some language at some point will need to be floated, and we would appreciate having that from you.

MR. GIBSON:

Our people are working with, in particular, the State of Texas, where we are trying to unitize a field and at the same time get sequestering rights. So it's an EOR project and a sequestering project simultaneously. So as soon as we get that language, I'll be happy to share it with you.

MS. GAUTREAUX:

One thing very briefly that was mentioned at our task force meeting, MMS is also going to have to consider policies in terms of if a field is finished with production, do you make them close it up or preclude an opportunity for carbon sequestration? And I think that is something a lot of businesses are going to have to consider as well. So that is an interesting policy question.

MR. GIBSON:

As we talked this morning, MMS should really consider delaying the plugging and abandonment of these monster fields. The small fields are not an issue. But the big monster oil fields, I think it would be wise to hold onto those structures, if possible.

MS. GAUTREAUX:

Thank you. All right. Thank you very much. And let's move on to our next panel. That was very interesting and informative. Moving on to the energy spectrum, we are going to look at the potential for alternative energy development in the Gulf corridor.

Okay. We are going to start this session. And just because the battery ran out, I'm going to repeat that we are moving on to the potential for alternative energy development in the Gulf corridor. And the first speaker on this topic -- and we are looking at the alternative energy outlook -- is John Guidroz, Free Flow

Power.

MR. GUIDROZ:

Thank you very much. I wanted to first thank you very much for your mission, your goals and the way you work. I'm a 10th generation from Louisiana. My family has been down here for some time and I have a camp down in Terrebonne Parish and I grew up fishing out in it. It has gone from freshwater fishing to saltwater fishing and a few hurricane hits that has been sort of serious and noticeable over the last 10 years. I am in energy. My father and his brothers are all in the energy sector, as well, down in Terrebonne Parish. So it's an honor to be here and thank you for the opportunity to discuss renewable energy development potential in the Gulf corridor.

My name is John Guidroz. I am director of development with Free Flow Power Corporation. Free Flow Power is the developer of over a hundred hydrokinetic and hydropower generation projects in the United States. Our projects on the Mississippi River within the Gulf corridor have the capacity to generate over 600 megawatts of clean, renewable electricity at a price that is competitive with all corners of renewable energy generation. These projects will increase our energy independence and security while reducing our greenhouse gas emissions and stimulating the regional economy with new jobs and affordable electricity prices.

Hydropower works. In 1940, 40 percent of our nation's electricity came from hydropower. That was before anyone cared about greenhouse gas emissions. Concerns over the environmental impact of dams have since reduced the hydropower share of the U.S. energy generation to only 7 percent today. Even though hydro accounts for 75 percent of all renewable energy generated in the United States, until recently there has been a widespread perception that there is little or no opportunity to grow hydropower. Thanks to the recent technology advances, regulatory reforms and legislative incentives, this prognosis has changed.

And I really want to make two points today. First, the Gulf corridor has an extraordinary opportunity in developing hydrokinetics. Hydrokinetic energy, for those of you that don't know, is energy generated from the free flow of water in rivers, tides, currents or conduits without requiring a dam or any diversionary structure. Hydrokinetic turbines are submerged and have little or no visual impact. The Mississippi River Basin is the largest channelized river system in our planet. It drains more than 40 percent of the North American Continent. The Gulf corridor has established itself as a leader in servicing energy infrastructure and green environments. These two facts make our region well positioned to be the first in the world to commercialize hydrokinetics on a utility scale.

Other forms of renewable energy generation like wind and solar were really developed in other countries and since brought to the United States fully baked, and later embraced. But we have a river system unlike any other in the world and it's up to us to realize our nation's potential in hydropower. Free Flow Power is currently investigating conditions on over 80 sites along the Mississippi River, including all sites of the river adjacent to the city of New Orleans, which we believe collectively to have a potential to generate well over 600 megawatts of electricity. Our turbine generator system has been developed with slow-moving rotors, few moving parts and no chemical lubricants in order to avoid harm to fish and any other aquatic life. We are planning to install a demonstration project within the next year on the Mississippi River and plan to submit applications to the federal energy regulatory commission and the Army Corps for licenses at the end of 2010. We are about two and a half years into a five-year process.

Qualified hydropower, which includes

incremental generation on existing hydroelectric facilities and new hydropower on existing dams is also an extremely valuable source of renewable energy. For example, there are about 75,000 dams in the United States, only 2000 of which produce electricity. Most of these dams, which were built for flood control, water supply or irrigation purposes aren't going anywhere. They are there to stay. And we can fulfill the objective of generating renewable energy from these sources within the Gulf region without new environmental effects by putting them to work.

The second thing I wanted to touch on is the perception of hydropower does not have the same growth potential as other renewables like wind or solar is incorrect. New technologies and a leveling of the playing field in terms of federal and state incentives are making this potential very real. Legislative incentives on renewable energy are critical drivers of progress. The proliferation of wind projects is a direct result, for example, of the federal tax incentives and state level renewable portfolio standards that have recognized wind as a valuable renewable alternative. Hydropower is growing more slowly than wind or solar in large part because it does not have the same incentives as wind and solar. In September of last year, Congress passed a production tax credit for hydrokinetic generation and qualified hydropower equal to 50 percent of the credit that applies to wind projects. More importantly, this February Congress extended a 30 percent investment tax credit to hydrokinetic and qualified hydropower projects in lieu of the production tax credit.

So now for the first time ever, these most benign forms of hydropower are on a level playing field with wind and solar energy in terms of tax incentives. Adoption of renewable electricity standards would include hydrokinetics and qualified hydropower as a groundbreaking step towards creating a market for these categories of renewable energy and stimulating investment in qualified projects.

I'll close with a quote from Dr. Steven Chu, whose is Secretary of the U.S. Department of Energy. He made these comments two weeks ago during a White House forum on clean energy technologies. Quote, I have heard repeatedly that hydropower in the United States is maxed out. It's not going to expand anymore. And for a while, I just listened and said, This must be true. But then we began to look at it. And since I've become secretary, I have really looked into it. The exact numbers may differ, but in our estimates we have 70 gigawatts of additional hydropower which would have minimal impact. The fact is, 70 gigawatts -- 70 gigawatts of new and 96 gigawatts today of hydro, so we are going to nearly double it. 70 gigawatts is 70 nuclear power plants, maybe 100 new coal plants. If you look at the economics of hydro, it's far less than any of those. It's one of the best kept secrets. All of us at Free Flow Power are excited about the opportunity to grow hydropower and believe it is critical to our achieving energy independence and addressing climate change. Thank you very much for this opportunity to appear.

MS. GAUTREAUX:

Thank you, John. Our next speaker is Art Johnson and he will tell us about the future of hydrate.

MR. JOHNSON:

Okay. Let's see, I guess we will go. I have some slides to show on this. I'll show some slides that I presented to house and senate committees a few months ago. And also I got to spend the afternoon with Secretary Chu. And it's not often one gets to correct the scientific misunderstandings of a Nobel prize winner, but I got the opportunity to do that. I have been working actually on hydrate since I was at Chevron, and I was real appreciative of Sandi calling me up last week asking me to present this. I have been an advisor to the administration actually going back to the Clinton years. I keep getting re-appointed. I say I give advice; that doesn't mean anybody takes it.

But the next slide is kind of critical. And I show this at every presentation I give, whether it's the high school group, civic groups or to cabinet members. It's our total energy demand in the United States, all sources. What is our supply? And the main point here is oil and gas is about two-thirds of that, and coal is almost a fourth. The renewables -- this slide needs to be updated a little bit. I think renewables are up to about 7 percent. But, again, about half of that is hydro. In fact, over half of that is hydro. And my message to the Secretary and to Congress is, Don't dismantle the U.S. oil and gas industry until you actually have something to take its place, and right now you don't. And I'm amazed they keep re-appointing me. I think it's for comic relief or something. But a key number down there is that one at the bottom, and at 2008 -- and we are probably holding pretty close to that -- about 24 trillion cubic feet, 24 TCF per year. I want you to hold that number in your mind because I'll be showing some other numbers that will be able to sort of play against that.

Let's show our next slide. This actually I pulled from the Department of Energy. They are looking at going out to 2030 for power generation. What their estimate is, coal is going to increase and gas is going to decrease. And I said, What on earth are you thinking of here in terms of carbon and all of the rest. What they are saying is the reason behind that is they don't believe the gas resource is going to be there to displace coal and so a big part of what I have been working towards is how do we find the gas resources. Because, again, I think the shale gas is big and it will continue to grow, but as we look out 30 years we need to have additional resources as well.

Let's go on to the next one. We will talk about gas hydrate. What this is, if you have gas and water together under conditions of high pressure and low temperature, they form a solid. And anyone who has worked in the gas industry on a cold winter's day has found hydrate. We learn to hate hydrate. It forms in pipelines and clogs them. Well, those same conditions also occur in nature in deep water areas in the sediment, in the deep water Gulf of Mexico and, in fact, on every continental margin and also in arctic areas. A couple of things about it. Again, it concentrates gas. A cubic foot of gas hydrate will give you a 160 cubic feet of natural gas and also a little bit of water. I also note CO_2 forms a hydrate as well. You can make CO_2 hydrate. We do that in our lab, and I'll tell you a little bit about hydrate for sequestration at the very end. But it's very abundant.

And I want to talk about -- the next slide. A picture of it. You can light it and it burns; everybody likes it; you can hold it in your hand and it burns, but let's move on. From our drilling program -- and, in fact, I have to tell you, I've worked international, I've worked hydrate programs in a lot of countries. And they figure they have got success when you have a chunk of hydrate and you can hold it in your hand and it burns. And, yet, from a commercial standpoint, that isn't the resource; it's going to be the hydrate that is in the pore space of a sand that you probably aren't even going to be able to see. But there is no hype in that. So like when our boat came in after doing work off of Chile, the president of Chile was there to meet the boat so he could see pieces of hydrate burn. And as a scientist, I have a real hard time with that; and as a business person, even more so because I look at how do you make money off of a resource, not how do you get your picture in the paper for it.

The big thing here is every continental margin we found it. We found a lot of it in the Gulf of Mexico both on the surface, which is not really the resource, but also in the subsurface. Next picture, next slide. This one, it gets thrown around a lot, and it's a little bit misleading, but it says, Where is all -- What is the global carbon distribution? And really what this one says is there is as much carbon tied up in gas hydrates worldwide as all of the oil, gas and coal combined. Now, that number may be wrong. Some people are saying, no, it's only about half of that, to which I say fine. But that is not really our issue; not how much it is, but in what form it is.

Next slide, please. This is the one we are using now as our gas hydrate pyramid. At the top of the pyramid is where I actually have arctic sandstones with hydrate where we already have infrastructure, places like the Park River, Milne Point, Bruno Bay. There we have tens of TCF in hydrate. Away from a structure, other parts of the north slope are into the hundreds. Deep water Gulf of Mexico, we are talking thousands of TCF. Now, remember that number I was telling you about, that 24 TCF per year is what we use. That thousands of TCF is why we are interested here. And the question is, can we make a business out of this. Is this something that from an environmentally-sound point and a commercial standpoint we can make a go at. By comparison, the resource on the right tells you what the other gas resources look like, in terms of reserves and then undiscovered.

Basically, the smaller pyramid, conventional gas is about equal to the big -- the top of the big pyramid. That deep water low permeability, you will hear them talking about hundreds of thousands of TCF in a hydrate, but the fact is, it's a few percent dispersed in shale at 10,000 feet of water. That isn't even a hazard. It's certainly not a resource. Next. So our challenge is we have to identify where is the hydrate concentrated, we have to establish commercial viability and we have to establish environmental impact assessment protocol. We want to make sure that we can do this safely. Next.

So our production scenarios -- and I'm going to be showing you just to give you a heads-up. Within the next year we will probably be proving or disproving commercial viability. We are that close with the test going on. What you can do with this because it's stable at high pressure/low temperature, either de-pressurize it, treat it like a coal bed methane -- and we have done that on the north slope of Alaska. You can heat it, and we have some technology for that where you use about 10 percent of the gas you produce to heat the reservoir and get more gas up. Or the fun one that we are getting ready to test is chemical exchange; put CO_2 into the reservoir and you end up with a CO_2 hydrate permanently parked because of the pressure/temperature conditions and you produce the methane out. Next.

Some things we have going on north slope of Alaska, BP has a project there with three-fourths of the funding coming from DOE. We drilled in 2007, we confirmed our exploration model. We can find the stuff. Again, this is arctic. So bear with me, I'll bring us back to the Gulf Coast. We did confirm we could produce it, we have a long-term production test coming up this winter. And ConocoPhillips has a CO_2 sequestration test planned. And if they can get all of the partners together on that one, January is when they start. It will be a January through April project. Next. This is the ConocoPhillips version of it. You basically put the CO_2 in and you get the methane natural gas out. But another one, just another approach that we have looked at -- next. This is one of our designs. Again, putting the CO_2 in, in one well and get the methane out the other. I should also mention that because the CO_2 hydrate is far more stable than a methane hydrate, we can even go into wet sands that don't contain any gas, just water, put CO_2 into them and form a CO_2 hydrate there. And, again, very long-term sequestration.

I was also mentioning to Ian, when it comes to concentrating, to liquify the CO_2 right now they are doing a three-stage compression test. Very energy intensive. Do one phase of it, take it to 300 PSI, add some water and make a hydrate; when you dissociate the hydrate, you get liquid CO_2. Half the energy. We have done this. So there is a lot of technology and a lot of things we can do here. Next.

Go to Gulf of Mexico. MMS has done a terrific job of doing the geology right, putting all of the pieces together. It's called a petroleum systems approach. Their assessment, again, with a lot of unknowns here, there is a wide range of values; they came up with an estimate of 6,717 TCF in sandstone reservoirs. Remember that number. 24 is what we use per year. Last April, Chevron -- we have a consortium led by Chevron. They logged hydrate-bearing sands in the Gulf of Mexico. It's out there. Next. So real quick, Canada has a production test, Japan is going for their offshore. And, again, don't think of Japan as a major producer of anything in terms of hydrocarbons. They are going to be testing in 2011, on production 2015, ramping up to 1 TCF a year from the Nankai Trough, which is amazing. That is still not going to solve -- they are using 20 TCF a year. They are using almost as much as we are, or will be by that time. India, China, South Korea; and we are involved with all of these. Next.

So to conclude, we are looking again -- this is really my message to Congress. They have been underfunding this program for years and we are finally getting some funding for it. By 2015 we think we are going to be able to be producing this in the arctic. We are going to understand what is happening in the marine environment. They have already spotted -- some of the research we have done, worked with some companies -- for Shell and Chevron people, we have talked to your competitors. There are hydrate prospects around existing platforms. When you get to the point of certain depletion and you are ready for, gee, I have got some spare capacity on my platform, there are hydrate prospects out there and within a few years they will be doable. And, again, on the left is the Canadian flare. Thank you.

MS. GAUTREAUX:

Thank you. I have not seen that before. That is really interesting.

MR. JOHNSON:

If anyone wants a presentation; companies, civic groups, foundations, whatever, talk to me. I'll will be happy to chat with you.

MS. GAUTREAUX:

All right. Continuing the transmission of good information will be Mike Karst with Entira, and he will talk about biomass potential on the Gulf corridor.

MR. KARST:

My name is Mike Karst. I'm a senior partner in Entira. I was formerly with BASF Chemical working in agricultural chemicals and designing 20 year strategic planning for BASF. I have got some slides as well. If we could just go to the second slide. As I sat here and listened today, it occurs to me that the agricultural industry looks at the Gulf Coast in a totally different way. We see weather patterns that have favorable rainfall, long growing seasons and lots of sunshine. We really don't look at the ocean too much. You have got those slides. If we look at the Gulf Coast, one of the things that you can see in the chart here, the darker the red the more intense the crop production. You have some very heavy row crop production in the Gulf Coast. The gray areas that you see are great because those are primarily pine forests. So that is still a very positive biomass.

One thing -- one myth I would like to dispel; many people have heard of 20 million acres of land available in the United States for biomass production. Now that we cover all 50 states at looking at biomass, if it's there, I don't know where it's at. With commodity prices of $6 per bushel for corn, $15 for soybeans last year, $20 for wheat; if a farmer had an acre of land, it went into production. So if land is not in row crop production today, it's unlikely it's ever going to go into row crop production.

In this area there are some easy alternative crops. Energy cane, very close relative to sugar cane. And energy sorghum, very close relative to sorghum that is grown. A key point -- and I heard a question earlier about water usage. You know, sugar cane uses a lot of water, rice uses a lot of water, corn uses a lot of water. Energy sorghum doesn't use much water at all, and it creates a high level of good quality biomass. If we could go to the next slide. You may be wondering why I'm talking about cattle. There is a reason that crops are produced where they are. The red area in Texas is cattle feedlines. And what do cattle eat, they eat corn, they eat sorghum and they eat wheat. So any time we take an acre of production and use it for anything other than the crop that it's used on today, it has an impact somewhere else on our value chain. If we take the area of Texas that is growing corn and sorghum and wheat to feed those feedlines and put it into energy crops, where are those cattle going to go, where are we going to get our steaks for tonight. Next slide.

This is a fairly complex slide I guess. The food, feed and fiber value chain. You will notice industrial and fuel is not on there. When this was done, alternative fuels -- this was done in the early 2000s I guess. Alternative fuels were just getting started. As we begin to put processing for alternative fuels and use the acres that have been growing food, feed and fiber and grow something else, we must change other aspects of the value chain. You know, ethenol got blamed for the high corn prices last year. Amy mentioned the devaluation of our currency. If we really look at it, that cheap currency allowed overseas nations to buy up our corn supply. The effect of ethenol was about a nickel per bushel when it went up about 3 or $4 a bushel. So any significant amount of acres of any alternative crop to be used for energy or fuel production will without a doubt affect our food supply and the cost of food. There is just no way around it unless, of course, there is 20 million acres hiding somewhere in North America. Next slide.

Growers are the people who maintain the acres. There was a comment earlier about the surface owner has the sequestration right. The surface owner is who is going to grow these crops. And there is only eight things that a grower really needs. Competitive profitability. We can ask the grower all day long to grow switchgrass, miscanthus, any energy crop; if it doesn't outcompete his next lowest profit margin crop, they will never grow it, no matter how nicely we ask. There has to be a sustainable market. Farmers by their nature are relatively untrusting of people coming and saying, Hey, I've got a great deal for you. They want to see steel on the ground, they want to know it's being processed. More importantly, their bankers won't loan them the money unless they see the processor supply agreements with people like you sitting around the table. If someone says they will build a pellet mill for biomass and they are going to contract with the farmers, the banker needs to see the supply agreement that the pellet mill has to sell the pellets.

The crop has to disappear every single year. They need risk mitigation tools, crop insurance, government programs, marketing tools. They need the capital from the banks. I heard earlier that an oil well takes two to three years before -- from the time you start building it to the time it goes into production. Perennial alternative crops take two to three years from the time they start planting it to the time it's ready to start harvesting. The difference is, the farmer gives up one hundred percent of their revenue on that acre every year until they start harvesting. So they just take a zero. In fact, they are taking a loss because they still have the cost of maintaining that acre with no revenue at all in some cases.

Landlord approval. Most land in the United States is not farmed by the people who own it. Most of it is owned by people like us. People who live in cities, people who inherited it from grandma and grandpa. And they are used to getting a check every year. So when we ask a farmer to take a three-year loss of revenue, we are really asking the landlord in Chicago and New York and L.A. to bear with us, we will pay you in three years. And guess what, those landlords are not going to do that unless we find some way to help them upfront to get over that hurdle. Government program inclusion; we will talk about that in just a little bit. That is a big one. Agronomic tools and support. In many ways, we don't know how to grow these crops. We were having a side discussion here about miscanthus, which is one of the popular energy crops. The blades are like razor blades. You can't even begin to get close to it. It cuts you up. So farmers aren't too keen about growing that crop.

And, finally, there is labor. Farmers struggle with well qualified labor. When you are asking someone to climb into a 250 to $400,000 piece of equipment, you want someone who has an education, not someone you picked up off the street to climb in. Next slide. Risk mitigation and capital I mentioned. It does include crop insurance, which we don't have for alternative crops. Marketing tools. Think of how would a farmer sell switchgrass today. Someone has to offer him a price; whereas in typical crops they are pricing against the Chicago Board of Trade. They know how to hedge their crops; they know how to play the marketing games, which help them mitigate their risks. We don't have that for any alternative crops. Capital includes operating loans to establish crops and to offset the lost revenues in the early years. If we are asking someone to grow a ten year crop and they don't get their first full harvest until year three, they will not -- a farmer will not survive that period of time. They don't have the capital reserves.

Government programs are huge. Every farmer -- most every farmer in America participates in government programs in some way, whether that means they are getting a counter-cyclical payment if the world price of corn goes into the tank, and they get their payment to keep them alive, or whether they are being given subsidies to put in environmental programs on their land. Alternative crops don't qualify right now. "B" cap is helping. But if we ask a crop farmer to switch to switchgrass, which is a logical trend, they give up a hundred dollars an acre on their cotton subsidy base acres right off the bat. So we can't compete with that hundred dollars. The programs vary by program, by state, by county, even by individual farmers. So the complexity is enormous and we have to get into -- get the new crops into the programs. Next slide. So that is it. If you have any questions, please ask. Thank you.

MS. GAUTREAUX:

Okay. Thank you. We will ask for Kara's presentation next on emerging technologies for alternative energy, and she is with the New Orleans Regional Planning Commission. And, Kara, can you please tell me the correct pronunciation of your last name.

MS. RENNE:

Certainly. It's Kara "Ren-Knee."

MS. GAUTREAUX:

"Ren-Knee." Thank you.

MS. RENNE:

And as you stated, I am a planner at the Regional Planning Commission. The Regional Planning Commission, just for those who are unfamiliar, is both the metropolitan planning organization and the economic development district for the five parish area, which includes St. Tammany, Orleans, Jefferson, St. Bernard and Plaquemines Parishes. Once a month the elected officials come to our venue and basically they discuss issues that are regional in nature, both related to transportation and economic development. About a year ago we co-hosted a workshop with MWH Engineering, and this workshop really focused on how we could work on building a more sustainable region by reducing our carbon footprint. We had a series of speakers that came from across the country and some international. One of the highlighted keynote speakers was Andy Mangan of the U.S. Business Council for Sustainable Development. And we were really intrigued by Andy's byproduct synergy program and really thought this would be a great thing to get launched within the Greater New Orleans area. So I'm here sharing today a little bit about byproducts synergy and what the U.S. Business Council for Sustainable Development does.

The U.S. Business Council for Sustainable Development is actually a member of a larger coalition, which is the World Business Council for Sustainable Development, which is an organization which has more than 200 companies and is CEO lead. They basically come around the three pillars of economical growth, ecological balance and social progress. Next slide, please. The U.S. Business Council has multiple members throughout the country, and I really wanted to acknowledge one of its supporting leading members that is here today, and that is Shell, and we have Mary Margaret Hamilton here who is on the board, actually, of the U.S. Business Council for Sustainable Development.

MS. HAMILTON:

Thank you.

MS. RENNE:

Next slide, please. Really what the U.S. Business Council for Sustainable Development does is they work to create public/private partnerships and they work to break down silos, so that way you have more of the public sector and the private sector talking and really, more importantly, different companies within the private sector starting to cross fence lines. Next, please. What they do through the byproducts synergy process is they bring together all of the business leaders, the plant managers, and have concerted discussions. And in these discussions what they do is they talk about their waste products, their inputs and their outputs. And a lot of times what will happen is they will find synergies based upon products that they may not have -- that they are able to build or able to develop that was not possible previously internal just to their own company. So they are able to look outside of their fence lines, and what was a waste product for one company now becomes something -- a new raw material for another company. Next, please. This slide here just kind of shows the traditional production process where Company "A" produces its waste and it goes to disposal, whereas Company "B" has its raw material and makes its product. Next slide. What this does is this next slide shows really that closed-loop process that I had discussed. And through this process, companies are able to cut pollution, save energy, reduce their material costs, improve their internal processes and improve their bottom lines. This is quite different, just so you know, than a materials exchange because what it does is it proactively seeks opportunities and it also allows for more continuity of operations because people are able to identify partnerships with other companies and then have a reliable product and be able to know what they are going to be capable of sourcing in the future.

Presently there are a number of byproduct synergy projects that have taken off across the country. Chicago is really a leader in this. Houston also has an active program. ConocoPhillips, Shell and Dixie Chemicals were all founding partners of the Houston project. Mobile also has one that they just launched in May. And we would like to get one going in the Greater New Orleans area. The hope is that eventually we could knit all of the Gulf Coast byproduct synergy processes together. Here is just a list of participants, and you can see that there are a great diversity of different organizations that are involved. You can see everyone from the City of Chicago Department of Water Management to Kraft Foods. And that diversity is really one of the keys to a successful byproduct synergy project. They found that having a lot of different kinds of businesses is where the synergies really start to arise because most people know their businesses inside and out already.

Some of the success stories that have come out from the BPS projects that have already taken place since 2007, Chicago's Waste to Profit network cut more than 50,000 tons of CO2 equivalent emissions. They also diverted 22,000 tons of landfill-bound waste, and in one year created four and a half million dollars in savings and new revenues. Kansas City, who also has a program that launched, cut a little over 19,000 tons of CO2 and 140 tons of NOx a year. And the Houston BPS project is really kind of taken a forum focus on greenhouse gas reduction opportunities. DOW Chemical has done BPS projects internal to their own organization and they were able to achieve an annual cost reduction of $15 million per year, and that was really just looking at all of their companies internally and not even reaching across the fence lines. We talked about Chicago and I think Kansas City's. They were also able to divert over 33,000 tons per year. One of the really interesting projects that has taken place has been over in England in the UK. They have made this a national program. And what they have done is created a database that has all of the inputs and the outputs from the companies. And by doing this, they have had significant achievements. They were able to create and retain over 2000 jobs, and their -- it stimulated private investment over 116,000 pounds -- or million pounds. I'm sorry.

Moving forward, the New Orleans Regional Planning Commission has reached out to GNO, Inc. and we are hoping to get their participation helping to recruit companies. Right now we have had several discussions with local companies about their interests in helping to be a champion partner in our area, but we are still waiting for a positive response.

MS. HAMILTON:

I just wanted to add a couple of real-life examples of what waste to -- one person's waste is another person's treasure or feedstock. At the Shell refinery in Putrid Sound, we had spent caustic soda. And if you think Fred wasn't a technical person, I'm really not a technical person. So there is this spent caustic soda that was being shipped by railroad lines down to the Gulf Coast for disposal. And you don't want to go into the CO2 and everything with that. What we found through being part of this project is there was a pulp and paper mill within five miles of our refinery that could use this spent caustic soda as feedstock. So, you know, win-win for everybody.

One that I do understand a lot better than spent caustic soda, and it has nothing to do with my industry, but it does have to do with Owens Corning had glass shades that they had to put into landfills. Within two miles of where their headquarters are was a countertop maker that needed the glass as shininess for the synthetic countertops that we have. So instead of having to spend money to dispose of it, ship it and the environmental damage that could be done or the impact that was done, that they found uses for it there. So I think this especially here -- and, Mr. John, I'm talking to you with the industry. I think it's a good opportunity for the industry in this area to find creative ways of using some of our waste products that is here and finding new ways of using it. And I am the rush committee for the U.S. Business Council, so if anybody wants to be involved, please let me know and we can talk later on. But thank you, Kara, for giving this and I really hope you will think about being a part of this project.

MS. GAUTREAUX:

Let me ask, I noticed the U.K. seemed -- or England seemed to take pretty good statistics and track what they were accomplishing. Has there been any thought recognizing that their business profile is going to be a little different than what we have down here? Has there been thought given to looking at the particular connections they made and then hunting down and using the rush committee to go approach those particular businesses for those kinds of win-wins?

MS. HAMILTON:

Yes.

MS. GAUTREAUX:

I knew you would be on top of this.

MS. HAMILTON:

Yes, we are looking at all of that. And, actually, this was the U.S. project that the British took over and then just ran away with it and made it a national program that is not only just in England, it's in Ireland and Scotland. So we are looking at it. And Kara is heading us up here for this region. For those of you in other regions, we do have other things going on. And if you would like to talk about a project in your areas, let us know too.

MS. GAUTREAUX:

Very good. Thank you. Any questions from our panel?

DR. TWILLEY:

I have one.

MS. GAUTREAUX:

Robert.

DR. TWILLEY:

It was an interesting presentation. And I guess, you know, when we formed this group, one of the things that we wanted to make sure we tried to cover is, you know, the challenges of actually being in a deltaic system because we have this watershed that is up there that really influences. So we do look out for the ocean and look at what is going on. So I want to tell you how complicated this is down here from a watershed perspective, and I would like to get some response.

For example, you know, the hydrokinetics from John, you know, which is -- you are right. It's one of those untapped -- I have heard industry talk about the tapping on the water flow. And so the challenge is -- I guess what I'm curious is if you know of any examples where you can expand the hydrokinetics in a major deltaic system and watershed and not disrupt the sediment that we need for our restoration program?

MR. GUIDROZ:

Sure, absolutely I can comment on that. We are actually in the middle of a study plan phase right now under the federal energy regulatory commission guidelines. What that means is we are being asked to study and prove a number of elements of the projects, including sediment transfer. The modeling we are using, the tests we are planning to conduct will all be done in 2010, so I will have more results for you as we move forward. But all of our analysis thus far shows very minor interruption to sediment transport. We are neutrally in the water column, so the bed movement predominantly is further down in the water column than where we are. The heavier sediment, in other words, is deeper.

MR. JOHNSON:

If I could add to that as well. I'm past president of the New Orleans Geological Society and we have been having symposia with the levee commissioners and all the rest. One of the things that came up in our most recent symposium was the idea of considering the sediment in the river as a resource; that is something that should not just be dumped out into deep water as it's done now. And, actually, to some extent, slowing the flow of the river will cause more sediment to drop out, making it easier to collect and use for restoration. So, in fact, what I think -- and a lot of what I think we have seen today is the best economics come when you start leveraging one technology with another; that the waste product of one becomes the feedstock of another. The CO2 you are trying to sequester can be used for something else. All of these things begin to interact. And from the oil industry perspective, it's that value chain that we all discovered about 20 years ago that, you know, the whole is worth more than the pieces sometimes. And I think that is true here as well. That we need to look at that whole broad picture and how it plays into the coastline.

And some of the energy crops we are looking at that use far less fertilizer. Well, we have a dead zone off of our coast that I think most people would say is largely due to the amount of fertilizer waste. If we could develop crops that use -- especially on some push land or whatever, or crops where we have in the sugar industry that one year in three or four where the land lies foul that we grow sorghum on that. The use of things that don't require a lot of fertilizer and can get us energy, we start leveraging one and the other and all together there is an economic benefit. I think we have to make sure we are not fighting against each other, but working together.

MR. KARST:

If I could make a comment. I have a real pertinent point. If you look at some of the things that we have just talked about on the perennial crops, many of those would be placed outside the levee protection up river from New Orleans with the goal of, one, being able to grow a significant crop outside the levee; but, secondly, to stop soil erosion drastically. The second thing is that the carbon sequestration plans that are being put forth in row crops in the upper midwest are demanding or requiring very little soil disturbance and maximum soil residue left on the top, which will greatly slow sediment flow from farther upstream. So what is being done up there to be environmentally correct could harm you here.

DR. TWILLEY:

Yeah. I mean, we don't yet have the metrics of finding benefits that occur up in the watershed that actually influence our situation relative to the restoration down here. I mean, there is not a basin level accounting of risks, you know, that you have to deal with on a farmland and seeing how that risk also translates to what we are dealing with with risks down here. And basin-wide risk analysis is really what is required in any of these enterprises. And there are some win-wins. In fact, I was going to ask, you know, do you know of a situation where actually a diversion in a hydroelectric actually worked very well together. And it's the old river control structure. I mean, that is a fabulous win-win situation because it is a situation where it is -- you know, it generates hydropower. And probably the only land building that is occurring in our coast right now, of course, is Wax Lake in Atchafalya, which is there because of the old river control structure of diverting the river.

And I think the idea of settlement of sediment and geographically where that occurs, if you have that added cost to get that down here, where nature would do it for free, then there are some real economics there that you really have to take into account. But I guess, you know, this is our challenge as a group here is to try and make sure that whatever risk aversion is done upstream to pay benefits for those industries and activities upstream don't cause us more risk downstream. And in the case of ethenol production, we saw an increase in nitrate loading to our coast. When corn went to $6 a bushel, our nitrate levels in the river went up. So we have to do a risk aversion related to what, you know, you would expand upstream, because that is what has got us where we are today. And I think some -- I don't know how that is done, but I think that is one of the outcomes of, hopefully, our panel up in Washington. We have to get it back to where we did -- and we did this at one time. Big river basin analysis of how we manage these resources. And so I really encourage it. If you can help us push that, we will be much appreciative down here on the end of the river.

MR. FALGOUT:

Mike, you mentioned you probably don't have 20 million acres of new land available anywhere in North America, but we probably have a couple of million that is turning into shallow open water in Coastal Louisiana and is quite capable of growing aquatic plants that could be turned into biomass. And hundreds of thousands of those acres are privately owned and have the opportunity with river diversions and turning the system fresher to grow water hyacinths or other plants, hopefully, that could be converted into biomass and it may be some opportunities for land that has been never used to grow plants for commercial purposes. And I'm going into that business, believe me.

MR. KARST:

It must be an interesting opportunity, but many of the crops they grow in those areas are actually prohibited species or non-native invasive species that the federal government has programs in place where they spent millions of dollars to eradicate what you might consider a crop in that land.

MR. FALGOUT:

Well, we will talk.

MS. FURY:

Can I ask a question to follow that up? Is that an issue, a governance issue too? I mean, are some of the crops that you would grow not allowed due to the fact that --

MR. KARST:

A good example would be Chinese tallow

trees, which are non-native invasive species right here. People call them "chickenfoot" trees. Tremendous oil producing tree, but you can't get the farmer to even think about growing them because they have been trying to kill them for 50 years, and the government has been paying them to kill them. So it may take a generational reversal to make something like that happen.

MS. GAUTREAUX:

Well, from a TNC perspective, I kind of hope that doesn't happen in terms of inviting invasives. But at the same time, there is a huge need for eradication, so perhaps during the eradication process if we could figure out how to utilize those wood products that we are paying people to get rid of, you know, and maybe getting rid of some of those aquatic invasives in the production of bio-energy is where we need to look.

We are kind of running a little bit late, so what I would like to do, if it's okay, is move on to the next panel, but I want to thank you-all. That was a lot of good information.

MS. FURY:

Okay. Our last panel of the day. I think it's a good way to wrap this thing up and it's really talking about innovative science/private sector collaboratives and what they have to offer. And we are going to hear from two speakers about projects that are in play today. And I think based on what we have heard today, I think there is plenty of opportunity for more projects in the future. So with that, I will introduce our first speaker, and that is Dr. Robert Twilley of LSU and he will talk about coastal sustainability studio.

DR. TWILLEY:

Thanks. My comments are somewhat specific related to higher education in two different areas of energy and water, which I think are pertinent to us. Some of the discussion today -- and I was actually going to try to expand it a little bit. The National Academy published a report that as much as 85 percent of the measured growth in the U.S. income per capita from 1890 to a 1950 period could not be explained by increase in capital stock or by other measurable inputs. The unexplained portion, this 85 percent, was referred to as residual, and has been highly attributed to the effects of technological change that occurred in industry during that time. And one very important part of that residual, that 85 percent of per capita income increase during that period was, at that time, the vast expansion of engineering and scientific education efforts to meet that technological change that occurred in our society.

And what I would argue is what you have heard today are these technological changes -- and you know this region was probably at the forefront of that technological change and that per capita income and the engineering that was involved with that. But what I would argue is that what we are discussing here today and the technological changes that we see that is going to be faced for our society in the future, it will be incredibly important to keep in mind that a large part of that formula is investments we make in higher education and in our engineering capacity.

Recently, however, in education and industrial circles there is a concern that we as a nation are not producing enough engineering graduates at all levels, either undergraduate, master's or Ph.D. This is not only reported in the popular press, but also by leading institutions such as the National Research Council. For example, let me give you some numbers. In 2004, more than 600,000 engineers graduated from institutions of higher education in China. In India, that figure was 350,000 students in 2004. In the U.S.A., we graduated 70,000.

There is also outsourcing of both jobs and facilities. According to the National Academy study, in 2004 chemical companies shut down 70 facilities and tagged 40 more for closure in 2005 in the U.S., but there were 120 large chemical plants worth more than a billion dollars that were being built around the world, and only one of those plants was being built in the U.S. More than 50 of those plants were being built in China. For the cost of one chemist engineer in the U.S., a company can hire five in China and 11 in India. Assuming that the financial incentives can be improved, that remains an issue of support for student education and maintenance of engineering and teaching and research facilities at all universities.

Unfortunately, there are two things that are occurring right now that work against any kind of maintenance of our engineering capacity and facilities in higher education. One is inadequate expansion of research funding from all sources. And second is an emphasis of government funding agencies on the sides over engineering and research funding. This is in itself inducing an unhealthy bias against teaching engineering, even in engineering schools, because the scramble for research funding is leading more of us in higher education towards theoretical approaches than actually partnering in more traditional concerns of how to solve problems in engineering that can support the public sector.

Funding for academic research that was essential to keep university programs alive is either shrinking or not keeping up with inflation. What is difficult in academic funding, particularly for civil and environmental engineering, and also I would argue that for the new technological engineering that you described here today, is that the major sources for industrial support for these engineering is moving away and into these specialties that are occurring, such as information management and technology. That is the new funding sources for engineering in higher education, not the funding for more of the civil and environmental and I would even argue what I would call non-traditional energy engineering. Because the public sector focus is very important to these other engineering components; and, again, such as civil and environmental. And the point I want to make here is that the type of engineering that is really getting cut and the type of funding that it traditionally needs to have is engineering that goes toward the public sector problems. And what we are moving toward is we are funding engineering, but they are in areas of more theoretical and types of funding that doesn't solve the kind of problems that we are discussing here on the Gulf Coast.

Much has been written about this. And may I add that because of that, one of the major areas where that public sector funding has decreased, and I want to make this a very important point, is that what we really lost is what historically was a well-established private sector collaborative. That if you go back into the late 1800s and look at some of the major water resource institutions and look at some of the major university facilities that were built to solve some of our public sector problems, a large part of those major institutional investments came from the private sector. It was a huge investment in engineering during that period. Much has been written about the need to improve science and mathematics in the U.S. from kindergarten to 12th grade. It certainly is desirable and will make a big improvement in our scientific literacy. But it will not necessarily solve the problems that we see in civil and environmental energy engineering education.

Better industry university collaboration on research and training has also been widely suggested. And this certainly is, I think, one of the most important components of restructuring how faculty research can be directed away from more of the basic science and disciplines toward those more research application that, again, I would argue supports our public sector. So it's not just, you know, monetary investments in engineering and academia, but it's looking at the content in higher education that that additional funding would actually support. A good example of that is actually the type of investments in specific engineering content that will deal to solve the problems in deltaic coasts around the world.

Nowadays, more than 50 percent of the world population live, work and spend their leisure time in deltas, coastal areas and river basins. Delta areas have a major economic potential because of their strategic location close to the sea and waterways. They are the ground that is fertile and rich in minerals and raw materials. We know that in the Gulf Coast, as well as any other region in the world. And, however, these delta areas are very vulnerable. They are usually soft soil subsidies; therefore, they require very specific investments in geotechnical type of training. There is sea level rise and river levels that are unpredictable; therefore, engineering in water and civil and environmental is very important, and these are areas where the environment sustainability is in jeopardy.

And, therefore, again, what I want to emphasize is that because you live in deltaic coasts, it requires a new investment, a new type of content in engineering, which, again, is not only civil and related to geotechnical and related to how we build engineering capacity as we have in the past, but a new type of engineering capability that will also deal with the complexity of living in deltaic coasts, which means bringing in some ecological aspects. An example is the new master's and Ph.D. program in coastal ecological engineering that is being submitted to the Board of Regents, in fact, today. Which there has been presently a moratorium on all programs in higher education. And as all of you know, if you have been reading in the newspaper, another projected cut of 146 million in higher ed. in the State of Louisiana. There is a committee that has been formed to look at those kind of cuts, in addition to the cuts in higher education that we had last year.

So the trend of where we have been talking about such great aspects of technological change that society is going to see and this comment that I made in the beginning of my talk that if you look back in 1850 -- 1890 to 1950, the parallel between our per capita income associated with what we made investments in higher education, the GI field is one perfect example, and the development of engineering programs in universities with essentially our land grant expansion, I see that we are moving in the opposite direction than where we should be. We should be at a point in time where major investments in our engineering capacity, but it seems that we are moving away and abandoning the role of higher education in economic development.

There is concern -- and let me make one final point. I will just sort of ad-lib as I normally do from points on because I'm off the text already. Is that there is also a concern with the content of engineers from the more traditional sense of civil and environmental in some of the fields that we have been associated with. But I want you to think about the type of engineers that we have to train today, particularly to work in deltaic coasts, because of the complexity of the problems that they have to deal with. You know, nowadays an engineer -- a student trained in engineering in water resources, let's say, or just typical civil engineering dealing with the complexity of water; nowadays they have to deal with water scarcity, they have to deal with water quality, they have to deal with ecosystem protection and they have to deal with recreation aspects. In other words, the demands on understanding all of the complexities of how water influences society not only requires the principles of engineering but you have to deal with policy, law, environmental benefits and all of those aspects of managing that project that are much more complex than when we were just building sewerage treatment plants around the U.S.

So the very specific nature of solving problems in deltaic coasts and the complexity by which we have to deal with the fact that we are not building a bridge in our region, we are building ecosystems, we have to manage a river and a watershed that extends up to Canada; that this really requires us to have a very renewed investment in the type of engineering capacity that we need in our region. And I'll just leave you with three examples that I thought of when I was going through, and to give you some perspective. I happen to serve on the advisory panel for the Iowa Institute of Hydraulics. It's one of those institutes that was formed in the late 1800s that had a huge impact. It is a facility built on campus, a land grant campus; and, again, largely supported by private sector and industry investment. St. Anthony Falls. I am a co-PR on a project that is funded by the National Science Foundation out of St. Anthony Falls lab up in Minnesota and in St. Paul. Again, an institution that was built on a university campus that was a co-laboratory of industry working in partnership with universities to develop products that, again, went to the public sector.

And, again, I think that is what captures what we are hoping to achieve; that same type of complexity training for engineering and other skills in our coastal sustainability studio. And with the support of Chevron, which we are very thankful for. But this is, again, the kinds of complexity and multidisciplinary training that I want to emphasize not in the theory, but in the practice, where we have to have real projects and have real products.

My final model that I put on the table, of course, is a new Dutch Institute called Deltares. And I think that what you will find is this was actually started in January 1st of 2008. It is a very unique combination of providing geoscience field with water and soil and subsurface disciplines in engineering, as well as environmental benefits in all the coastal environments that are involved in building sustainable coasts. And I think these are the types of models that we need to look at because it is fascinating to sit here and listen to being on the edge of such technological advances. But if we don't invest in our universities to be a leader in that, then we really missed the boat. Thank you very much.

MS. FURY:

Thank you. Now, Dr. Larry McKinney from

the Harte Research Center, Texas A&M.

DR. MCKINNEY:

I think I'm the speaker you-all have been waiting for at this point. I'm the last one. I appreciate the introduction. I think you set the stage for what I want to talk about. As you said, I'm the director of the Harte Research Institute in the Gulf of Mexico. We are a privately funded organization, part of A&M's system. And our mission and vision is very complimentary to what you are trying to accomplish here, and that is why I was very pleased to have the opportunity to come and talk to you. Our research model is basically we bring together expertise in conservation, biology and geologists and ecosystem studies and we combine them with the economist's expertise in economics, policy and law to try to basically hit our mission, which is an economically and ecologically sustainable Gulf of Mexico. So working in partnerships, as we talked about here, is very, very critical. And if we don't have that base, it makes it difficult to do it. And in these times that we have, it's truly important that we make the best use of all the resources of all of those groups.

So what I did is I have picked out -- if you go to the next slide. I picked out three examples to very quickly give you an idea. That is just introductory. The first one, I always carry this one on my computer to show folks that are not from the Gulf Coast. I travel around the country talking to people. It doesn't matter if you were affected by Katrina. Katrina and other hurricanes don't just affect the Gulf, they effect the entire United States. They have a huge impact. And our ability to predict the intensification of those storms, their paths, and those type of things are very important to all of us. And this is a case where the oil and gas industry off of the Gulf has been a big help. And I'm really glad that I picked the example that I did after I heard the introduction going around the table. I picked Shell. And some of the things that they are doing in cooperation with the scientists at NOAA, but this applies across the board.

If you would go to the next slide. As I said, our ability to predict the impact of these hurricanes not only have an economic impact, they have an impact on saving people's lives. So the more we know, the better we are able to talk about and learn about these things; how they affect the coast will be valuable to all of us. One of the things that we have to have to do this is models and data and information. And if you are out in the middle of the Gulf, that is difficult to do. And we as scientists look at oil and gas platforms out there. They are wonderful economically, but what we see is a marvelous platform to put instruments on and to do research from to help us develop these type of things.

I'll just use one example. Go ahead and go to the next one. This is the Shell platform along the coast there. If you hit the next one, I'll pick out Brutus there. And this is one that is going right now. It's a set of instruments to measure water temperature from the surface to the bottom, a thousand feet of water there, which is something we haven't been able to do in the past; but here is the impact of it. Go ahead. This just gives you an idea of some of the temperature readings and what this really means. The next slide. If you look at the path of Katrina going across the Gulf there and you see where it intensifies, the colors go from light to yellow to red, and that is where that hurricane intensified. And the color on the maps there are surface temperatures. You really can't get much out of that as to why that happened. But if you have subsurface temperatures, like we can collect off of these platforms -- we will take the next slide -- then you begin to see something. You can get the impact of why that storm intensified. And if you have these kind of measurements throughout the Gulf, we know what the water mass temperature is, and you can begin to get predictions on intensity and those type of things. And that is the value of this kind of partnership, of getting these instruments together, of using -- of working with industry and government and researchers to work together to gather this information, which obviously it has a great impact to the industry. The Metocean, which is meteorological oceanography, is very important to the industry, but it's also critical to the people who live along that coast and that is a great example of that partnership. Okay.

Another area that is of particular interest to me as I've managed marine fisheries in Texas for about 20 years, and that is artificial reefs and using those structures for artificial reefs type of things. The last five years that I managed the fishery -- and this was economic information developed by other sources, not ourselves, but third parties; that basically over that five-year period, we added a thousand jobs a year for five years in the saltwater recreational fishing industry. And while I'm still working on trying to tease that out, a significant part of that came from our ability to use these rigs and platforms as a point to go fishing around, as probably all of us have done. So it's made a very valuable contribution. There again is private industry taking a win-win for everyone, putting those rigs into artificial reef type situations where they become fish habitats and attractors.

And one of the things I'm concerned about there -- and I have been traveling for the last couple of weeks so I'm trying to remember what town I'm in right now, but I always know I'm in New Orleans. There is no problem there. But I heard some rumors that the Minerals Management may be putting a moratorium on conversion of these platforms into artificial reefs, and that is a concern to me if that is a true fact. I don't know if it is or not, but I would warn the Minerals Management, there is nothing worse than -- hell hath no fury like a thwarted fisherman; so be ready for that, if that is the case. I don't know. But that has been very valuable, a tremendous economic boom for both Louisiana and Texas and Mississippi. So that is my second kind of conservation example.

And the last one is that -- this happened -- I think Louisiana has been doing this for some time, but this is a project that just started up in Texas. Of course, restoration of oyster reefs that have been damaged by hurricanes and overfishing and those type of things is something that we are all interested in. A lot of work has been going into restoring oyster reefs.

Many, many thousands of dollars have gone into oyster restoration and has literally sunk beneath the surface, but it wasn't quite done right. There is a science to be done there, as well as we need more shell material.

And one of the projects that we are working on with restaurants up and down the coast is -- it's not only Louisiana folks that eat lots of seafood. Texans do that too. We eat a lot of it; not as much as you guys do, but we eat a lot. And a lot of oyster shells get produced. So one of the things the project is, is to fund -- in working with restaurants, is to take their oyster shells and rather than going into landfills, to collect them up and to be used at some of our ports. We are working closely with some of our ports to collect the oyster shells to use for oyster reef restoration. I mentioned this project because the whole thing was funded by "SEYA," which was monies that came out of oil and gas; the money coming to us that enabled this project to go forward. It will generate shell, and I think that will be important; but even more important is the awareness that it's going to generate in restaurants, getting them involved in coastal restoration more than they perhaps have been and giving them a real cause to do it. It's just been a big plus. I think that is a great example of another public/private partnership.

And with that, Madam Chairman -- I will tell you this, we are having a couple of workshops ourselves. Next March, a Sea Level Rise Conference. You talked about sea level rise here. That will be coming up in March. And just the month before that in February, we will have another workshop on freshwater influence around the Gulf of Mexico. So you are all certainly invited to come and participate in those to address the issues that you-all have talked about. Thank you.

MS. FURY:

I'll go ahead and open the floor to questions. Any questions from the panel?

MR. MARMILLION:

For the both of you, how could some of the -- let's see how I can ask this diplomatically. Why weren't some of the stimulus funds for education used or plowed into this re-engineering, re-design of capacity for this region? And what could be -- the real question is, what could be done beyond that stimulus package to, you know, build our intellectual capital in the region more?

DR. MCKINNEY:

If we both are going to answer it, I would think that it takes too long. That stimulus money --

when I was looking at the dollars available, they wanted to turn their -- quickly, you know, and get quick results. And what we are talking about here is an investment in the future, which is equally important, but difficult.

DR. TWILLEY:

It's funny you should ask that question. I actually got turned down by NSF today. I got an e-mail from a $3 million project that we submitted from -- it was a multi-research interdisciplinary program which was actually stimulus money for us to put an observation system out on the Wax Lake Delta to look at the capacity of the river to build the delta. So your timing is very good, Val. But, you know, the point is already made. One, you had to have shovel-ready projects at universities. And if you are build -- if you had things ready in a certain arena that I think fit very traditional investments of where the university is going, then that stimulus money did not help it. And I think the things that we are looking at here and we have talked about and, you know, as a group several times is these innovative, you know, sort of cultural changes at universities where we have to re-think how we look at training engineers in other disciplines. And we may not have that infrastructure in place to quickly tap into the money that was available under the stimulus package.

And, you know, the other -- but as far as the other kind of funding under the MRI -- you know, I'm not quite sure of the answer, why we didn't get funding. I don't know if we fall big enough. We don't have many very large -- if you look at the Gulf Coast in general, there aren't very large investments in big programs at our universities in our region. Tulane was just funded I think an "LTER," which is this urban sort of -- L-T-E-R, which is one of the first sort of multi-year large scale fundings. I work in the science and technology center up in Minnesota. You know, we just don't have that history where we -- and that is what you have to have in order to take advantage of when you get a shot of funds like that; you already have to have a legacy that is there of institutional development that can capture those short-term investments.

DR. MCKINNEY:

But the opportunity is not lost. What is going to happen, what is starting to happen is a cascade effect. And I was just in D.C. last week and one of the things we were talking about is that a lot of this stimulus money went to groups like NOAA and others to deal with some of their very severe infrastructure problems that they had with ships, for example. Their research ships are old and all of a sudden they are being able to come up and re-furbish those ships and get money into that type of thing. Well, all of those agencies had huge amounts of money set aside in their regular budgets for that. Now it's being -- those needs are being met with other money. And they have lots of plans of what to do with it, but there is an opportunity of funds there to take a look at let's see if we can get at that and put it at a higher priority. So that is policy type issue that there is just an opportunity to come at that next. So it's going to be a growing cascade of things of whoever can come up with the best idea first has the best shot at it.

MS. FURY:

Dr. Twilley, I have one question. You talked about the complexity of research these days that you have to wear many hats. And I look at the energy industry and look at just gasoline manufacturer and how we have been driven to boutique fuels to meet certain requirements in certain areas. It almost sounds to me like we are creating our engineering programs. We are creating boutique engineers with people with very, very, very special -- they have become very specialized in a very small niche. And I guess I wonder directionally moving away from the core of the fundamental engineering that could really branch out and do a lot of things, are we doing a good thing? Is it really necessary? I'm just curious.

DR. TWILLEY:

That is a really good comment. Some of the statistics I took and the comments that I made come out of a journal that is on contemporary education in water resource management. And there were a series of articles that were actually published about water resource engineering training in higher education. And in that series of papers, of course, there was one paper that, you know, was promoting more interdisciplinary training of engineers to deal with the complexity of what they have to manage. The next article was about "But don't forget your core training and principles." And we have always struggled with this multi-disciplinary, interdisciplinary. We always talk about how the universities are vertically structured. We always say, you know, society's problems are becoming more complex, but universities are becoming more compartmentalized. So problem solving, you know, is not something we have done very well. And it could be, I guess, one of the arguments of society is it doesn't feel like their investment was as good as it was maybe back in the land grant era. I don't know.

Some states and societies do invest very highly in education. But to answer your question, we don't seem to be on that track right now, to be very blunt. But the -- it is an issue. And the way that we are dealing with it in our Ph.D. and master's program is that we require at the undergraduate level the core. And we cut no corners on that core training as an undergraduate. And then you specialize in a master's program. You still have to be trained as an engineer. When you get to the Ph.D., we call it engineering sciences and there you have a lot more electives. And so it really depends on, you know, as you go up, you start opening up more to electives. But when you are starting out, you keep that core. As you know, in engineering training you have very little electives. Tennis just isn't something you fit into your schedule. And so, you know, so I think that is the way we have approached it. But it's a very good question.

MS. FURY:

Just a comment too, for the record. Since this is for the record, Dr. McKinney, I wanted to go ahead and address the rumor on reef -- Rigs to Reef program. And I might ask Mike if he wants to join that. There are a lot of mistruths around that. There is pressure on the Rigs to Reef program. But, Mike, do you want to address that?

MR. PRENDERGAST:

Yeah, I would also like to touch on the discussion you and Dr. Twilley had on the engineering programs too, but I did want to clarify that issue. In MMS' Rigs to Reef program, initially when it was set up, the Louisiana Shrimpers' Association did have a say and there were designated artificial reef sites that were chosen around the Gulf of Mexico, but that had input from the coastal states, MMS and the Louisiana Shrimpers' Association for those sites that were offshore Louisiana. After some of the damage from the hurricanes, both Louisiana and MMS have approved some special artificial reef sites. And in doing that, the Louisiana Shrimpers' Association kind of took a look at that and reminded us of the way the process was initially set up that they really were supposed to have a voice at the table. So really what MMS is doing right now is going back to the original process and getting that voice back to the table. And we are not going back and changing some decisions that we already made, but we are taking a look at specifically some of the special artificial reef sites. We call them SARS, another government acronym. We are taking a look more at those, and you may see a reduction or possibly even an elimination of some of those sites in terms of future requests, but still not at this time talking about ending the program entirely.

DR. MCKINNEY:

This is only Louisiana, or Gulf-wide?

MR. PRENDERGAST:

I believe that is Gulf-wide. It started more with the Shrimpers' Association coming to talk to us about some of these sites.

DR. MCKINNEY:

The Louisiana Shrimpers?

MR. PRENDERGAST:

Yes.

MS. FURY:

And, you know, I think part of it, though, to be honest with you, I think part of it is managing the multiple use issues. I think the other thing, though, a real conundrum coming in the future, though, would be some of those planning areas are actually getting filled. So at some point in time, you know, what does the expansion of the Rigs to Reef program look like because it's been a great program. So a lot of issues there, but, anyway, I just thought we should put that on the record.

MR. PRENDERGAST:

Yeah, I did want to clarify that. Also, I think there were excellent points made in Dr. Twilley's presentation and the point that you brought up too. One thing I would like to add to that, as an engineer myself and as the father of an engineering student who is a senior, he made the focus of his senior project to look at all of the different curriculums in engineering, the types of jobs that would be offered in the future. And he kind of used that to make his choice. One of the things that you have to remember is that when these students make their choice to go into that field, they really will be looking at whatever I choose, Am I going to be able to have a 30 to 40 year career in this, and am I going to be able to do it somewhere closer to home or am I going to be going overseas.

So one of the things, if we would start a new program like that, we would want to have some assurances along, at least the Gulf Coast, that we are going to maintain a commitment to programs in terms of coastal deltaic systems and continue to spend money along those lines. Because that was a big factor in my son's decision when he chose.

DR. TWILLEY:

Yeah. When we put in the -- just take the deltaic restoration as a program. When we were doing the chief engineer's report, we were just pricing out just the restoration part of it, and it was $500 million a year for 30 years. So you can get out of school -- and that is just building; that is not maintenance and operations. So, you know, when you look -- and deltaic coasts around the world, when you look at water resources and the demands on these coastal landscapes because of the richness and fisheries and mineral rights and water and navigation and commerce. Port Fourchon is not going to disappear in 30 years. We hope it doesn't. So I think the job -- what we are building as a program, again, is coastal and ecological engineering, but is to strategically build the infrastructure that we need in the deltaic coast, but also maintain the environment. And we do view that as a public sector type of program and one that industry has a huge investment and it's just not going to go away.

MR. PRENDERGAST:

And I know it costs money and also resources because we are trying to do it at MMS, but also as much as possible when industry can offer internships. I think that is an important thing in terms of getting that actual field experience.

DR. TWILLEY:

Internships and we need to fund the project base. But it was amazing to see -- thinking about moving more towards theory and away from practice is a trend that is going on in engineering, and I think that, you know, we have to get back to work on smart levee systems, we make joint investments, we train students on these kinds of things that we are building. And it's really critical. Some of my basic sciences people would probably shoot me if they heard me say this. Sorry. I got tenure.

MS. FURY:

Okay. Any other questions from the panel? Okay. Well, we are close to on time. I think it's been a great afternoon. Very informative to me. And I look back and say, Hey, you know, we are fraught with challenges, but we sure have a world of opportunity and it's right here in the region. And with that, Mark, do you want to close.

MR. HURLEY:

Well, Hey, I think you said it all. Dr. McKinney said we were waiting for the last presentation. That is not true at all. It's been a fascinating day. It really has. So thank all of the speakers who were here. And it was really a great day, so thank you. We learned a lot.

(The hearing was concluded.)

REPORTER'S PAGE

I, LAINEY B. MARGAVIO, Certified Court Reporter, in and for the State of Louisiana, the officer, as defined in Rule 28 of the Federal Rules of Civil Procedure and/or Article 1434 (B) of the Louisiana Code of Civil Procedure, before whom this sworn testimony was taken, do hereby state on the Record;

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Lainey B. Margavio, CCR
Certified Court Reporter

C E R T I F I C A T E

I, LAINEY B. MARGAVIO, Certified Court Reporter, in and for the State of Louisiana, do hereby certify that the above-named witness, after having been first duly sworn by me to testify to the truth, did testify as hereinabove set forth;

That the testimony was reported by me in shorthand and transcribed under my personal direction and supervision, and is a true and correct transcript, to the best of my ability and understanding;

That I am not of counsel, not related to counsel or the parties hereto, and not in any way interested in the outcome of this suit.

Lainey B. Margavio, CCR
Certified Court Reporter