NATIONAL COAL COUNCIL MEETING

HELD AT

THE FAIRMONT HOTEL

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A P P E A R A N C E S

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DAVID SURBER
CHRISTOPHER LING
STUART DALTON
ALEX FASSBENDER
JANET GELLICI
RICHARD BAJURA
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FRED MOORE
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GREG WORKMAN
FRED PALMER

P R O C E E D I N G S

MR. EAVES: Good morning, ladies and gentlemen. My name is John Eaves and I'm chairman of the National Coal Council.

The Spring 2013 Meeting of the National Coal Council is hereby called to order. This morning, we're very fortunate to have a number of very special guests. We're pleased to welcome this morning the Acting Assistant Secretary of Fossil Energy, the Honorable Chris Smith. We really look forward to working with Chris as the Council moves forward with its work this year. Thanks for being here, Chris.

MR. SMITH: Thank you.

MR. EAVES: We also have some exceptional speakers on today's agenda. They are Fred Palmer, the chairman of the Council's Coal Policy Committee who will give us a summary of the recent council reports, as well as lay out the vision for coal well into the 21st century. Christopher Ling, Booz Allen Hamilton, who will speak to us about the challenges presented in the cyber security sector of the economy. Don Newell, with the Kentucky Department of Natural Resources. And

Fred Moore with Nuclear Alliance, who will speak to us about the interesting opportunities to marry technologies in nuclear power and the production of liquid fuels from coal.

We've also got to conduct some Council business today. I'm pleased to recognize Bob Wright, where's Bob, as the DOE's Office of Fossil Energy as a federal designated officer. Welcome, Bob. Appreciate you being here today.

So, as you can see, we've got a very full agenda this morning. This meeting is being held in accordance with the Federal Advisory Committee Act and the regulations that govern that act. Our meeting is open to the public. I'd like to welcome guests from the public who have joined us here today. An opportunity will be provided for the guests to make comments at the end the meeting.

Full and complete minutes of this meeting are being made, as well as verbatim transcripts. Therefore, it is important that you use the microphone when you wish to speak, and that you begin by stating your name and affiliation.

Council members have been provided a copy of the agenda for today's meeting. I would appreciate having a motion for adoption of the agenda.

Do I have a second?

MS. GELLICI: The first is from Ram. I just need it for the record. I'm sorry. Ram, thank you. Second?

MR. EAVES: All in favor?

MS. GELLICI: Mike Durham. Thank you.

MR. EAVES: All in favor.

(Chorus of ayes.)

MR. EAVES: Opposed?

(None.)

MR. EAVES: Thank you. Next, I'd like to announce the Secretary has appointed several new members of the Council. I'd like to introduce them now and ask them, if they're present, to please stand.

Phil Ren, Taider Corporation. Is Phil here? Desmond Chan, Bechtel Corporation. Desmond. Daman Walia, ARCTECH Corporation. Oh, none of our new members are here today.

You know, it's my pleasure to introduce our

first speaker, the Honorable Chris Smith, Acting Assistant Secretary of Fossil Energy, which encompasses coil, natural gas and oil.

You know, prior to his appointment to the DOE in 2009, he served in several managerial positions in the private sector. Chris began his career in the Army as an office with tours in Korea as well as Hawaii. He then worked for Citibank and JP Morgan in Emerging Markets.

Chris has a Bachelor's in Engineering from West Point and an MBA from Cambridge. Please welcome Chris Smith.

MR. SMITH: Well, thank you very much, John, for that kind introduction. And thanks to all of you for inviting me to come and speak before this group.

I've met many of you in various capacities. I was just in a conference in Pittsburgh where I got an opportunity to talk to many of you there. So, you know, for me this is always an opportunity to talk to a group of subject matter experts and decision makers like this, all kind of gathered together under one roof. So again, thanks for having me here.

I got to spend some time with Bob Wright, who's helped me understand some of the things that this federal advisory can help us do within the Department of Energy. One thing I will say is I'm certainly no stranger to federal advisory committees. I've got a profound understanding of the things that groups like this will help the Department to do in our quest to serve the public mission.

One of the things that we've really emphasized in Department of Energy is, you know, we're the technology organization, we're responsible for developing the technologies that we're going to move us into the clean energy economy of the future. But if we don't do that hand-in-hand with the private sector, if we don't understand how the work that we do will impact the investments that companies make, then we're not going to be successful in getting the outcomes that we desire. So, this type of interaction is critically important to us and it's very valued by leadership at every level at the Department of Energy.

I know that you're not here for the money. Right? In terms of being part of the federal advisory

committee. You're volunteering your time to serve your country in this capacity. So again, one of the main things I want to say here today is just simply thank you to this group as you kick off an important day of work.

So, for me personally, this is a really exciting time. I've been in this role for about a little -- I think about 75 days now. I previously was the Deputy Assistant Secretary for Oil and Natural Gas and I came into that job back in November of '09. And it's been a really exciting time for energy. You know, in my previous capacity, I was a federal official for the commission that was created by the president after the Deepwater Horizon disaster, the macondo blowout in the Gulf of Mexico. We've also seen a rapid rise in shale gas that's brought concerns about hydraulic fracturing, issues around flaring, international issues, LNG exports. So, lots of things happening very rapidly.

Certainly, the job that I ended up doing was very different than the job I thought I was taking when I came to Washington D.C. four years ago. And that

continues now as I transition into this new role as the Acting Assistant Secretary for Fossil Energy.

So, this is a tremendously exciting part of the portfolio and one that the Department's going to care a lot about and one that's really going to be one of our focuses. So, I can say certainly that our new secretary, you know, as of yesterday, who is confirmed, Secretary Moniz, this is an area of particular concern to him, and particular knowledge as well. He understands this area, he understands the technologies, he understands the policies behind this. And he's going to have a real interest in what work are we doing here in DOE to make sure that we're moving this ball forward.

So, this is going to be, you know, a tremendously important mission. You know, back in November when I was at the presidential inauguration, I personally was excited to hear the president talk very directly not only about the challenges of climate change in a way that was very direct and unambiguous, but also about the role that the development of technology is going to place in making sure that we

rise to that challenge, that we move forward, and that America takes a leadership role.

And I'll just read a quote from the president, at that speech. He said, "The path towards sustainable energy sources will be long and sometimes difficult. But America cannot resist this transaction, we must lead it. We cannot cede to other nations the technology that will power new jobs, new industries, we must claim its promise." So, that's what the president said back at his inaugural address.

And as I listened to those words, for me it was very clear that that ambition, that that goal that he had very unambiguously given to not only Department of Energy and the federal government, but to the nation, that the quest for carbon capture technologies, for sequestration technologies, the advances of technologies to utilize CO2 for beneficial causes, that was at the very center of that quest.

The clean energy economy of the future is going to be a carbon-constrained world. That's something that we know going forward. These are challenges that we have to rise to. Now, in the clean

energy economy of the future, there are going to be winners and there are going to be losers. So, the winners are going to be those countries that develop the technologies, that innovate, that pioneer and sell those technologies to other countries. And the losers are going to be those countries that are buying those technologies from the winners.

And there's going to be that split. So, this is a time for us to rise to the challenge to make sure that we're doing everything that we can to make sure that we're on the right side of that equation, that we're developing these technologies right here in the United States, that the federal government is partnering with private sector partners to innovate, to demonstrate, and to move forward. And that's at the very center of our mission.

This administration has made an historic $6 billion investment in carbon capture and sequestration. And it's not a theoretical project; it's something that is making real impacts on the ground. And so this is actually a fun time for me to be transitioning into this job, because you know, the projects that we

announced, you know, some time again, are now coming to fruition. Just last year -- last week, excuse me, I was down in Port Arthur, Texas for the ribbon cutting for the Air Products Project that's taking two steam methane transformers, converting or creating CO2, putting that into a pipeline and using it for EOR applications, which is really an historic project.

First of all, it came in -- on schedule and under budget. And we like under budget. Right? Particularly in this budgetary environment. So, I think we were able to work with that particular partner to apply things that we've learned in the lab and demonstrate them on the field. So again, on time, under budget and 700,000 work hours without a lost time incident. So, that was something that I was very proud to have the opportunity to congratulate, very directly, the construction managers who had their hands on that site and who actually made that happen. So, that was a great achievement.

But it's also showing that we can take the things that we're understanding in the laboratory, where the innovations that we're achieving not only at

NETL, but also through our academic partners and through industry, and we're able to apply it. So, that was exciting.

On that same trip, I took a trip down to Thompson, Texas to the NRG project where they are doing a carbon -- a post-combustion CCS project, again for CO2-EOR, putting that into a pipeline and sending it to a field some 40 miles south of the project.

That was notable for a couple reasons. First, I found the business model to be really interesting. So, here NRG, they own the plant, they operate the plant, they're investing in the CCS and the capture technology. They're investing in the pipeline and they're also investing in the field. So, you've got a ring fence around the entire operation in this particular case. One single business model that is integrated from capturing the CO2 all the way to producing the oil.

The second thing that was interesting for me for that particular project, was the fact that the -- when the original solicitation went out and it was won by NRG, the original specification for that plant was a

60 megawatt flue gas stream that they were going to capture and turn into the CO2, put into the pipeline and put it into the ground and produce oil. And so when they went through the process of doing further engineering and design on that project and understanding some of the limitations of the pipeline network, and also understanding what they actually needed in the field to recover the volumes of oil that they were -- that they had predicted, they realized they had to go from 60 megawatts to 240 megawatts. So quadrupled the size of the capture project.

But at no additional cost to DOE. No additional cost to the taxpayer. Which shows for us a couple of things. The fact that we're working this business model to, I think, to effect. I think that we do have partners who are looking to make this work. And for us, it's encouraging that we're seeing that type of progress.

I also got the chance to go down to the Southern Kemper Project down in Mississippi, the IGCC Project, of which DOE's a partial investor, about 50 percent complete. So, you know, again, as I kind of

transition to this role -- and there are many other projects, I'm just going to mention the ones that I've actually seen with my own eyeballs, right, so that will limit it to what I've mentioned. And there are other projects which we all love. Right? So, if I didn't mention your project, it doesn't mean that we don't love it.

But those are the ones I've seen thus far. And again, you know, coming on board at a time in which these projects are actually hitting the ground, that we're making them operate, that's something that we'll be able to go back to the American public and say, "We're making progress with this investment. You know, we're taking these taxpayer dollars, we're investing them effectively."

And not only are we developing the technologies of the future that American businesses, the American economy are going to have the opportunity to sell to other countries, but we're also doing tangible things right here in the United States to increase oil production, reduce our reliance on imports. So, that's tremendously important, it's at

the very center of our all of the above mission, tremendously important mission.

You know, so I came from industry, I was at Chevron for 11 years before I came to DOE. And I worked in banking before that. And I've got a profound -- so, I've been in a position where, you know, I've been talking to my board of directors trying to get them to unloose money to do stuff and I know that's hard to do.

It's hard to over emphasize the -- first of all, the vision and the courage it takes to go first, to be that serial number one. To take something you've understood in the lab and be that first pioneer, that first company to go out and apply that in real life, to create a new business model. So, to go first is difficult. But in order to move this forward, in order to move this technology forward, it's going to be critically important that we get these demonstrations up and running, that we get them off the ground, that we demonstrate to the public that these projects are not academic exercises, that they're real, and that we can make them work.

And by doing those first projects, we're going to get smarter. We're going to get better. We're going to push costs down. And we're going to demonstrate that there is a wider application for these technologies.

Now clearly, we need to get the costs down. And NETL is working very hard on second generation technologies, and I'll talk about that in a second. But, going first now, getting those demonstrations on the ground, getting them up and running, operating them, letting the regulators see them operating, getting a track record of monitoring and verification, so we can go back to the -- to our partners here in the federal government, the EPA and other agencies, so we can go to state regulators throughout the United States and say, you know, "Here's something that will give you some confidence to allow to permit these projects, push them into the rate base, because we're demonstrating that they're viable and they're possible." So, that's really important. We're learning by doing here.

But at the same time, we are working on those second generation technologies. So, you know, we do

have some very specific goals going forward, projects that we're working on that's going to reduce the cost because, you know, we do have to get the cost per capita down.

So, in looking at those second generation technologies, we do have some very specific goals. You know, by 2020 to get current costs, that are somewhere between 60s and $70 per ton, to get that $40 per ton by 2020. And receive a 20 percent reduction in the total cost of electricity generated from power plants with CCS. So, that's our kind of medium term goal for 2020.

And then for about 2030, further reducing that cost down to $10 per ton and achieving a 40 percent reduction in electricity that's generated from power generation with CCS.

Another one of our 2020 goals is to achieve 99 percent monitoring and verification, so again, we can demonstrate to the communities that we understand what happens when that CO2 goes in the ground, not only theoretically in our algorithms and our models, but we're demonstrating that in the field.

One thing that's become very evident to me in

my previous responsibilities as the Deputy Assistant Secretary for Oil and Gas is, you know, we can talk about the EPA, we can talk about state regulators, we can talk about BOEM or BSEE or offshore regulators, but at the end of the day, when you're looking at how we're going to develop energy in America and how we're going to produce it and use it, and how we're going to power our economy, the license to operate is not going to come from ultimately from the regulators. The license to operate is going to be a social license to operate that comes from the people who live and work in the communities, that are close to the places where these industrial activities are being carried on.

So, we have to take community concerns seriously, we have to understand concerns. We have to bring science to the concerns that communities might have. And we have to be able to very transparently demonstrate to communities that we scientifically mitigate -- we scientifically quantified those concerns that they might be concerned about and that we can demonstrate that the regulatory system that's in place is sufficient to mitigate those risks that we've

scientifically quantified.

So, as we look at our CCS projects, as we look at our regional partnership that are doing demonstrations, one of our primary goals is going to be to ensure that we're backing into the science that allows us to go back to the regulators and say, "We understand what happens when we put this stuff in the ground. We have data and insights and scientific rigor that goes behind those investigations." And that we can give them the tools that they need to then go back to their constituencies, their communities, and say, "This is a project we want to permit here in this district. It's going to create opportunities; it's going to create jobs. And we had demonstrated and validated that this is a process that's safe."

And I can guarantee you, we've -- you know, I spent a lot of time on shale gas here recently and I spent some time on the -- some of the fun, technical challenges of how fractures propagate and how you best manage that production. But we spend an awful lot of time working with communities and, very candidly, helping -- in some cases, helping industry groups back

themselves out of some holes that they've dug themselves into.

It's hard to make money in an industrial operation if you've -- if you're in a situation where there has been animosity that's generated toward your industry. So we worked very closely with companies across the spectrum to make sure that we're all moving forward in lock step.

The last thing I'll mention is that there are a lot of things that we can do here in Washington D.C.

and for us to operate more effectively. One of our challenges is that we've got lots of federal agencies that do lots of stuff here. We are in our own individual silos.

If I look at the work I've been doing for the last few years, I've got counterparts at EPA, I've got counterparts at USGS, and we literally, if you look at the org chart, we meet at the president, because we serve different secretaries. And if you don't actively specifically do something to break down those silos, they will never be broken down.

And you could have an ad hoc conversation

that's based on personalities, you can have subject matter experts kind of reaching across the field because some of them have worked in different agencies and they know each other. But until you institutionalize that, you're not going to make those processes better.

So, one thing we've done on the oil and gas side is we've created a single steering team, which I chaired over the last year, that's taken the research and development program at EPA, at DOE, and USGS, and put them under a single framework, under a single steering team that I was the chair of for the last year. And it rotates among the agencies so that chairmanship is now pushed on to the -- to DOI. And I think that's really helped us have a single, more sustainable, more maintainable, more transparent research and development function.

So, as I come into this role and I kind of look at the way that we interact with EPA, I think there's some real improvements that we can make there. We're pushing towards a common goal of building economic prosperity, building jobs, importantly,

reducing greenhouse gas emissions, protecting the environment, but also building our economy in a way that gains the confidence of the people who live in the communities.

So, we've got this common goal, which means that we're going to have to work together, between the Department of Energy and the Environmental Protection Agency. We have to ensure that we have a good understanding of the impacts that rules will have on companies who are making investments. And we also have to have a good understanding of the things that our technology can deliver, such that we're all pushing together towards one outcome.

And that's something that I've personally committed to trying to achieve for the next period of time, should I be formally nominated to this position. But I can say that there's a real appetite for doing that, for trying to do that well and that's something that we're going to try to push forward on and improve and achieve.

So, with that again, I just want to say thank you to this group. Again, I've got a profound

understanding for the value that federal advisory committees bring. It's very easy to get hypnotized here within the Beltway, all of us talking to one another, so these engagements are always a welcome infusion of subject matter expertise from outside of Washington D.C. and outside of government, to help us -- help guide us and help us think about what we need to be doing next.

So, I'm very interested in ideas that you might have for your future studies and having -- opening a two way dialogue about how can we better ensure that this federal advisory committee has a real impact on the work that we do.

So, with that I just want to say thank you and I'd be happy to take a few minutes of questions if there are any questions.

MS. GELLICI: Thank you, Chris.

Do we have any questions?

MR. NARULA: My name is Ram Narula, an independent consultant. You talked about reducing the cost of CO2 capture, the goal of what, $10 a ton by 2030 or thereabouts. Now, the best ton of CO2

sequester is the one which is not generated in the first place, which is improving the efficiency. And our Department, DOE, invested over $50 million in developing the materials for advanced critical technology.

So, my question is, what are the plans to go to the next phase which will lead to actually component testing of those materials and then to an ultimate demo plant.

MR. SMITH: Well, thanks for that question. So, our advanced work in super critical processes in turbine efficiencies and materials, that remains an important part of what we do. You know, so here's one of our challenges throughout everything we do. This is a -- what I can only characterize as a ferociously difficult budget environment. We're in a situation where we're going to have to do more with less and we're going to have to find ways to ensure that we're partnering with industry in a way that we attract the right type of cost share and we're able to move these technologies forward.

So, throughout every budgetary process, and

our budget just came out not too long ago, through every budgetary process, there's a certain amount of funds that the Department has that there's a -- you know, there's an enthusiastic and vigorous competition for those funds, like say the assistant secretaries. And then once we have those allocations we have to make some hard decisions about where we are investing.

But I can assure you that those projects are of interest. They're certainly on the fundamental science side. There's work that's going on right now. And I tell you, one of the things that we would really appreciate from this group, as you consider what studies you undertake, is if there's guidance or advice on how we can better target funds to get the right types of outcome, you know, we're all ears.

But I will say that certainly that the idea of the most efficient way of capturing CO2 is by not producing it in the first place, and increasing efficiency is a philosophy that we carry throughout DOE. In fact there's, you know, outside of our program, we've got a big efficiency effort and efforts to put in place regulatory schemes that don't penalize

greater efficiencies, through decoupling. So, that is certainly a philosophical point that we understand and that we support and we'll endeavor to move forward on.

MS. GELLICI: Other questions?

MR. PALMER: Mr. Secretary, welcome and thank you for being here. I'm Fred Palmer with Peabody Energy and I'm next, you don't have to stay. But you're welcome to stay.

You made the comment about working with EPA and of course there's a lot of concern in the utility industry and in the middle of the country, where I live in St. Louis, Missouri, which Missouri is 60 percent coal-fired, Indiana 90 plus percent, Kentucky 90 plus percent, et cetera.

With the new source performance standards on greenhouse gas emissions, and to the efficiency point, there is a very strong school of thought that says the coal fleet efficiency today, at 31 percent, is stuck in the mud because of EPA and we can't go forward with increasing the efficiency of the existing fleet because of the issues surrounding NSPS and the difficulty that utilities have in upgrading the existing fleet.

I just wondered if you'd had any discussions of that yet, in your new role, and whether that's something that you think would be worthwhile exploring with EPA as we go forward.

MR. SMITH: Yeah. So, first of all, thanks for the question. So, certainly that would be I think at the very center of the types of things that we'd be discussing. Again, we want to ensure that the work that we're doing, not only the technology, but also on the regulatory side, has a desired effect of incentivizing technology development, adaptation of technology and importantly pushing down greenhouse gas emissions at the same time that we build our economy.

So, those are -- we certainly don't see those as conflicting mandates. In fact, we need to ensure that we're moving forward in a way that they are coordinated.

But when you talk about, you know, what type of coordination do we need between EPA and DOE, I think within the Department we've got a -- first of all, we've got a great understanding of the technologies that are emerging, what technology can develop and an

understanding of the impact that particular regulations might have on the way that the capital is allocated.

And so when we talk about how DOE interacts with the other agencies, you know, right now we've got something of an ad hoc relationship I think that we can formalize. And I think at the department level, I think we need to have a more definite answer to those types of questions.

And when you ask me and you ask EPA you should get the same answer. I don't think you get that right now, simply because it's just where we are. You know, one insight I'll give you is -- or observation, I don't know if it's insightful. But, you know, when I came into my last job, as soon as -- I didn't even have the seat warmed up before there was a line of people outside my office door coming to see me from all the oil companies.

And so I say, "Hey, great. You know, people want to come talk to me. Great." And they come in and before they even get to hello, basically their entire line of argument is complaints about EPA. They're here to see me because I can help them with EPA. Right? So

I mean, no one wants to talk to me, they just want to talk to me about what can I do about EPA.

Now, on the other side of the street, at EPA, you've got NKOs and other entities that go to EPA to complain about industry and about DOE.

And so you have this potential to create these two sock puppets between DOE and EPA that are kind of being moved by these outside forces that aren't pointed in the same direction. And it's a doubt way to do business.

So, you know, one specific goal that I would have is that -- first of all, I think we did a good job of stopping that on the business that we were working on before, because we got EPA and DOE pointed in the same direction, which I think impacted both of our organizations. It made us think a little bit differently about how we do things. And it also, I think, compelled EPA to think a little bit differently.

So, it's our goal -- and this is hard, by the way, you know, so we're not going to get this done next week, but certainly an aspirational goal, to create an environment in which you've got one federal government

pushing in one direction with full transparent understanding of the risks and opportunities of that strategy and it becomes more coordinated.

So that's the big kind of change Washington strategy. And, you know, ask me in a year and half how far we've gotten. I hope we do make some progress. I do have a lot of energy for that.

MR. EAVES: One more question?

MR. FRIEDMAN: Hi there. Julio Friedman, Lawrence Livermore National Laboratory. I was hoping you'd just take a minute and talk about both your office or DOE's efforts as a whole with respect to U.S./China engagement, both in the context of collaboration around research, but also support of business to business opportunities.

MR. SMITH: Yeah, so thanks for that question, Julio.

So, I probably should be asking you about that; right? Because I think you probably know more about that than anyone in this room. But I can give a little bit of insight in some things that we're doing. And you know, when that question from Peabody actually

made me think very directly of China because I was just in Xinjiang Province out in the western part of China, meeting with the -- China's -- sorry, the provincial governor, Governor Nuri (ph) and the party secretary, Party Secretary Zhang.

I was accompanying Ambassador Locke on his very first visit to that province in over 20 years. So, 20 years since a senior U.S. official has made an official visit to Xinjiang Province, out in Western China. And as some of you know, it's where the weaker minority population lives and there's been various reasons why there's been strained relations with the United States in that part of the country.

So, without delving too much into the politics of some of that history, I can say that we certainly saw, that part of the country, 20 years of pent up demand in that visit and lots of interest in opportunities for American companies to come and make investments. Peabody, very specifically, had an issue out there that was raised by the ambassador.

So, there is -- I think there are big opportunities in China for us to achieve. I'll make a

couple comments. First, we -- you know, I tried to emphasize the fact that the demonstrations here are important for us. I mean, we have to be building things in order to move forward, we can't just do them in the lab.

And we not only have to build them here, we have to make sure they build them over there. And, you know, for many of you who spend a lot of time in China, this last trip was probably the worst I've seen in terms of, you know, looking out your window and not being able to see across the street. I mean, it was dramatic; it was really dramatic this time. And maybe I've just been there -- I've been lucky when I've been there before.

But certainly other parts of the world are becoming sufficiently prosperous that they've got the luxury of worrying about environmental issues, which we think is unambiguously good. Because we can work on the carbon problem here, we can reduce CO2 emissions here in the United States, but if we're not doing things in China and India, if they are not doing things, if they're not building demonstrations, if

they're not actually applying the technologies there also, we're not going to accomplish anything. We're not going to keep our mission.

So, working together with China is critically important. There has been a longstanding relationship between the Department of Energy and NEA in China, so we think we do have this long relationship, we've got good ties, I think we've got good communication. And our goal is really to ensure that we're creating -- first that -- I guess two goals.

First, we think that our and the Chinese interests are aligned in increasing clean energy production and reducing CO2 emissions from carbon-fired -- coal-fired power plants in China. So, we are unambiguously pointed in the same direction there. A success for China is a success for America, including terms of reducing greenhouse gas emissions.

We're also very explicitly interested in creating opportunities for American companies in China. It was actually fun to watch Ambassador Locke manage that engagement. The current ambassador to China was the former commerce secretary and is still very much in

commerce secretary mode when he's talking about commercial issues. So, we understand the issues that companies have and we have a very clear and unambiguous mission to create opportunities for American companies in China.

So it's an area of focus for us. You know, and we certain appreciate the guidance and advice that we get from this group and from Julio in particular. And we see that this is a reason that we can capture some wins.

MR. EAVES: Do we have time for maybe one more?

MS. GELLICI: One more. That's it.

MR. DALTON: I'm glad I have an opportunity to address you. I'm Stu Dalton with the Electric Power Research Institute and I want to commend some of the past efforts of the fossil energy on things like HAPS, water, efficiency, et cetera. There's been a good partnership, I think, with industry.

And I point out that one of those areas where I think we need to figure out how to continue the partnership is water. I know there's a lot of issues

and discussion within DOE. There's a Energy Water Nexus Task Force, et cetera. And I know there have been some limitations, not just budget, but restrictions on the last few years of joint work with industry.

But one of the successes in the past has been with air. And what our members are now telling us is water is the new air. Water is where it goes. One law Congress can't pass is the law of unintended consequences. We've had a number of things that we've taken out of the air now and we're dealing with in water. And we did a lot of work together with industry on mercury, for instance. And now we're getting concerns about arsenic, selenium, and other things and we're seeing the new EPA proposals.

So, all those issues which you talked about before on how we have to work on this with the EPA and go across the silos, I think, you know, some of the water issues go across to nuclear, go across to gas. And I'm just hoping that you'll be able to make the kind of progress that we did in the past on that area. Thank you.

MR. SMITH: Well, thanks for that comment. And, you know, water's the new air, I'm going to work that into my talking points. That's a good way of saying that.

But yeah, I mean, I won't say too much except to concur with everything that you just said. I talked a bit about breaking down silos between EPA and USGS and DOE and that's kind of -- that kind of feels like world peace because we're still breaking down silos between EERE and also fossil energy and nuclear, because many of the water issues that we have span the different organizations. So you're obviously aware of the intra-agency, intra-DOE task force that we're trying to piece together some of those efforts.

Because, you know, the work is going to remain -- I mean, we're not going to create an office of water, although I think there was legislation at one point that was compelling DOE to do something like that. But we do need to make sure that what we're doing within fossil energy, from water issues from coal-fired power plants to issues with hydraulic fracturing, are coordinated with the things we're doing

on the nuclear side, with biofuel side, with solar side. And there's certainly some synergies we can accomplish. So, your point's well taken.

MS. GELLICI: Thank you, Assistant Secretary.

MR. EAVES: Thank you very much, Chris. That was very insightful. We certainly do look forward to working with you on ideas on new studies. And so we will be coming to you shortly with some potential new ideas.

Next, I'd like to introduce Fred Palmer, who actually needs no introduction. He is our chair of our policy committee. Fred and his team have worked very hard in looking back over the last nine studies and developing a vision for the 21st century and I think you'll like what he's got to say.

So, Fred, welcome.

MR. PALMER: Thank you very much. It's a continuing source of honor for me to be in front of you and to work closely in the -- with the chairman and the management team, Janet, welcome, the National Coal Council to help produce these studies and to serve in the role that I serve at Peabody.

I want to first thank Secretary Smith for being here. I have no doubt the nomination process will go smoothly for him. And, welcome. It's really important that we have somebody as steeped in the hydrocarbon arena, with his experience, serving in this role.

Secretary Moniz, congratulations. We have worked -- we worked with Professor Moniz for many years, at MIT, in the carbon capture and sequestration program that they undertook. Peabody was a contributor to that. And I've spent a couple of really informative sessions up in Massachusetts listening to his wisdom and the very robust program that they had going on there, which has advanced the technology goals that we all aspire to.

I want to personally thank Secretary Smith for being in Xinjiang Province, Urumqi, which is the capital and I have been there a couple of times. I've met with the party secretary who is a really impressive man and the management team there, the governor and the vice governor. And we did have a delegation there. We have publicly announced a joint venture we're working

on with Xinjiang Province, with a state-owned enterprise that they created, to put in a surface mine best practices by Peabody in Western China.

I'm going to China tomorrow for the World Coal Association meeting next week. And it's -- at this stage of my career, it's really been a pleasure for me to get this exposure in the international coal arena. I say to people that, having been in the coal industry for the United States for a while, that coal is coal and that coal people are coal people. The cultures are different, the language is different, the mannerisms may be different, the way they do business, not a lot different, but they're coal people. And so, coal is coal, and that's been my life and of course that is Peabody, under Greg Boyce's leadership.

I also want to comment and thank the Obama Administration and the president for the very strong ties that do exist between the United States and China. I said last week at an Orlando event that President Obama I think understands the importance of the China relationships better than any president that I've had experience with. And the relationship with the

People's Republic of China in the energy arena could not be stronger.

The DOE/NEA collaboration, the joint projects that are under way, the clean coal centers here and there that both have set up is really important and I think bodes well for the development of the world economy and indeed the continued advancement of progress, both in the United States and in China, on our shared economic and environmental goals.

So, let me take you quickly through this deck that we have that takes us back through what we've done in the -- since 2000. And here's a brief reminder of our charter. I'm a lawyer. We have a client. Our client is DOE and Secretary Moniz, and we act that way. We try to be responsive, at the same time being educational. Do we have a point of view? We might. But we always do it in a professional way and in a shared value way. And there will be ongoing discussions with Secretary Smith in terms of areas of inquiry that they'd like to see examined and some ideas that we have.

If you go back to 2000, here are the full

panoply of studies that we have performed. There are nine of these studies. And the very first study that's listed there actually was chaired by Steve Lear, John Eaves predecessor as CEO and chair of Arch, and looked at the increasing electricity availability from coal-fired generation in the near term.

And that, as my question indicated, is an area of inquiry today. How do we maximize the value of the existing coal fleet in the United States that is at 31 percent efficiency, when super critical, ultra super critical coal plants going in are in the low 40 percent efficiency range up to 46 percent in Japan?

In the middle of these studies you see the 2006 study, "Coal America's Energy Future." And that was chaired by the man I report to, Peabody's chair and CEO, Greg Boyce, setting forth a vision that we think is still there for coal in the 21st century.

The 2009 study, "Meeting U.S. Energy, Employment and CO2 Emission Goals with 21st Century Technologies," took the President's -- identifying with an 80 percent reduction in greenhouse gas emissions by 2050 and showed how that can be accomplished through

developing the full development of the nation's coal fleet, with not just carbon capture utilization and storage, enhanced oil recovery, as Secretary Smith discussed this morning, but also deep geologic storage.

FutureGen lives. I'm on that board, it's still going forward. And it is something that we need to do. If we're going to achieve that goal, that 80 percent reduction goal, you have to have FutureGen and you have to have many FutureGens and that's been recognized by all the leadership of the OECD West and has been recognized by the People's Republic of China, the GreenGen Project near Tianjin that Peabody's a part of. These things have to happen. If they don't happen, we won't achieve the goals and we will still be using coal. So, the urgency for sure is there.

And then the most recent study that we did last year, that Dick Bajura chaired and the excellent job that he did, the enhanced oil recovery study, "Harnessing Coals Carbon Content to Advance the Economy, Environment and Energy Security." So, this is a vision, a true vision, in these studies, for 21st century coal that are relevant. The 2011 study, done

by Chairman Lear, is as relevant today as it was then. And of course, last year's study is relevant. And we the EOR activity going on right now, which we applaud and find it very, very reassuring of Secretary Smith's embracing of those developments this morning.

Our vision we strongly believe is good for the economy, good for the environment and good for people. The continued and expanded utilization of America's vast coal endowment is overwhelmingly in the public interest. Coal-based energy is a foundation of social development that allows more people to live better and live longer. Coal conversion to electricity, liquid fuels, substitute natural gas and chemicals will enable the United States and the world to meet the ever-rising tide of energy demand.

Is there anywhere in the world that's done? Yeah, right now, it's called China. Clean coal technology, including higher efficiency generation, carbon capture utilization and storage are the pathways to sustainable energy, economic growth and climate change policies. And affordable and reliable electricity from coal enables the expansion of electro-

technologies, beneficial electrification, what Mark Mills calls ecowatts, which are the basis of modern society.

So, here's the -- this is the cover from the 2006 study. And many of those same themes are set forth there and I won't reiterate them, that I just discussed from the previous slide. But this is an important point at the bottom.

"Affordable and reliable electricity is the first value." Air, food, water, electricity, necessities of modern life. I believe I saw a quote from Secretary Smith in Xinjiang that identified this and identified this value. And we are -- we subscribe to that.

All of us in the coal industry, the coal chain industries, in the regulatory arena, in academia, the people that are interested in coal share that value. And that is the one we have to keep in front of us.

And I mean it when I say, in Missouri the concern over what we talked about earlier with EPA, there's a foot note in the proposed draft order, new

source performance standards, that says to meet the standards, coal-fired electricity goes up 82 percent, the cost of it, 82 percent. And coal is the dominant electricity fuel in the United States, so what does society look like with an 82 percent increase in electricity costs? Obviously, we can't -- that will not happen, can't happen, but these are the kind of educational points that we need to continue to make.

In the scope of these studies, over the last 12 years, you will find the following. The goal, of course, near zero emissions. As we put it, continual emission improvements leading to near zero emissions, starting with efficiency improvements at the existing plants, the 2001 study. Building new super critical and ultra super critical plants. Demonstrating and deploying IGCC and carbon capture utilization and storage and ultimately geologic deep storage. Advancing carbon capture utilization and storage and BTU conversion, coal to liquids with enhanced oil recovery, for example. Retrofitting the existing coal- based generation with carbon capture and storage up to 90 percent lower CO2 emissions, with CO2 enhanced oil

recovery.

But on that other -- on the point of retrofitting existing coal-based generation, one of the best documents on the importance of that is from DOE. And it was put out the day the FutureGen 2.0 was announced. And it identified oxy-combustion as the path forward for FutureGen. And it identified the importance of oxy-combustion development on an affordable and reliable basis to retrofit the existing fleet of power plants in the United States.

I used portions of that presentation in my presentations and I use them here, and I use them abroad, and I use them in China. And I've given several of these in China, I'm giving another one in September and it is an extremely important development and FutureGen needs to go forward.

So, here's the progress we've made over the years with coal-based generations, GDP per capita growth and the strong correlation between the two. And at the same time, the huge reduction in criteria mission pollutants, NOx, SOx and there's a mercury coal benefit identified with scrubbers EPA has accepted

around 90 percent.

This same pattern can be followed, going forward, on CO2 emissions, if we deploy the technology correctly. If we do not -- if we are not able to do that as a society, coal will still be used, but the CO2 will not follow that emission path downward.

Coal's versatility is its greatest value. We say carbon is a product, not a problem. Enhanced oil recovery, construction, food, electricity, industrial gas, pipeline quality, SNG, steam for ethanol, diesel, jet fuel, hydrogen, chemicals and fertilizers, all of those, except ethanol, are being done today in the People's Republic of China and China has embarked on a CO2 capture and sequestration demo project, and that's Shenua in Inner Mongolia, and of course GreenGen, which is the IGCC Project, with enhanced oil recovery in Bohai Bay.

Here is -- this slide is from the 2006 study, identifying our aspirational goal of 2.4 billion tons of coal production and consumption in the United States, for electricity and all the things we talked about before. Will this happen? Can this happen?

Should this happen? In a carbon constrained world, whether through government or the fact that there's not enough carbon in the world to go around, we think this happens. Because coal, with carbon capture and storage, if the rules are applied equally to natural gas and coal, in terms of the emissions footprint, is the low cost, low carbon, hydrocarbon and therefore the low cost, low carbon source of energy for not just the United States but also the world.

And we forget in the United States -- we talk about the developing world, we forget we are a developing country. So, John F. Kennedy once is quoted as saying that we came over on different ships, but we're all in the same boat, because we are a nation of immigrants and that is absolutely true and that will continue to be true.

I grew in the American Southwest, that was part of Mexico. There are parts of Arizona that are still a part of Mexico. Tucson, where I went to school, for example. But we've got 80 million people coming, population-wise by 2035, $12 trillion growth in GDP, a huge increase in the consumption of electricity

and also a huge increase in the number of vehicles on the road. So, the U.S. is a developing country.

And there's our coal resource. From the lignite fields in the southeast to the Northern Plains and primarily North Dakota, to the Powder River Basin where both Peabody and Arch are major producers. The other western reserves, including the southwest, into my home state of Arizona, the Navajo Hopi Reservation that you see there right above Four Corners, the Illinois Basin, Northern and Central App and yes, the central interior, where they actually mined coal in Missouri for steam generation not too long ago, and I believe that will happen again in the world we see coming.

And we forget that the coal fleet that was -- that we enjoy today came out of really strong bipartisan support in the late '70s and early '80s, and primarily the late '70s, and it was President Jimmy Carter that called for Project Energy independent because of the oil shocks in the '70s. Jim Schlesinger was the first Secretary of Energy. Dr. Schlesinger was on the Peabody board and I know him well.

We were -- in the late 1970s, we were 17 percent of our electricity generation was from imported oil and it was going up. And that is why we turned to coal generation, coal and nuclear at the time. And you see the quote from President Carter at the bottom, so coal has flourished in a bipartisan way in the United States, since we first started using it in a robust way and that's why I like to say our political party is coal. And it is.

And the reason we do that is because of the recognition that electricity enables people to live longer and better. And this is a slide showing the Human Development Index from the United Nation. Every tenfold increase in per capita electricity use drives a ten year increase in longevity and that theme is a constant in our studies.

Here is EIA's projection of coal going forward to 2040. And while they don't have it at 2.4 billion tons, they have it as a remaining as still the dominate electricity fuel in the United States, coal. And that is going to stay. And given that, Washington D.C.

needs to pay more attention to coal, with all humility, Mr. Secretary. And this town, having been around it for a while, likes to talk about everything but coal, in a robust way. And yet coal is what has powered the economy and will continue to power the economy.

This is another way of saying the same thing. U.S. coal produces more electricity than its share of capacity and will continue to do that, even with the retirement, in the intermediate term, of some of these smaller, older plants. And why is that? Because coal is lower electricity rates and you can -- and from this slide, you see the coal dominate states are -- the coal using states have the lowest electricity rates.

And we like to say, and we do say, and we believe this, that at the end of the day, this isn't about coal; it's about people. And it's about people, in terms of how they live their lives, how they get one of life's basic necessities, electricity and energy, what it costs them, what's the impact on it if we get this wrong and we make it scarce and expensive, as opposed to reliable, affordable and abundant. That's

coal and that's why these states are where they are, versus the high cost states, like California, for example, that has an electricity standard for coal emissions that have been identified by EPA as where EPA wants the country to go.

The answer we get as a country is where California is, if we do that. And the people in Missouri, Wisconsin and the lower cost states are not going to be happy.

Why coal? Because affordable electricity is good and more is better. Our studies demonstrate the positive impacts from beneficial electrification, again, ecowatts and the widespread deployment of electro-technologies.

China's new president, Xi Jinping, gave a speech in Hainan Beach about four weeks ago and talked about the need to develop a common source of energy for the world, what he called "inexhaustible power." Well, we have a source of inexhaustible power; it's called electricity. And coal is electricity. And we have trillions of tons of resources, as opposed to reserves, just like the shale gas people talk or the oil people

talk, that is available as technology is available and prices go up to continue to supply electricity to the United States and indeed, to a growing world. And not just China, of course, but India.

Retrofit programs would increase efficiency, decrease emissions. These are estimates, the concepts taken from the 2001 study as we discussed, updated to today. You see AEP estimates that upgrades on their fleet would yield reductions of more than 3.5 billion tons of CO2 per year in its existing coal generation fleet.

The socio-economic benefits of advanced coal facilities have been documented in a number of these studies, in terms of jobs created, dare I say green jobs? I think so. 6.9 million job years, $1.1 trillion in increased economic activity, labor income to hard working men and women with well-above average pay rates, in the $60 to $70,000 per year range of $368 billion, the number of jobs, output, et cetera.

We haven't done a coal study on exports, but it's been implicit in here, and there is a controversy of sorts surrounding coal exports on the West Coast.

This concept has been introduced with the policymakers on the West Coast and it is President Barak Obama, in his State of the Union 2010 where he announced a President's National Export Initiative.

We need to export more of our goods, because the more products we make and sell to other countries, the more jobs we support right here in America. We will double our exports over the next five years, an increase that will support 2 million jobs in America.

We have to seek new markets aggressively, just as our competitors are. If America sits on the sidelines while other nations sign trade deals, we will lose the chance to create jobs on our shores. Coal exports obviously qualifies, and it is the view that has been expressed in these studies, that coal exports, to a world that is turning to coal, with coal soon to become the world's dominant fuel, over oil and over natural gas, that U.S. coal exports to be deployed in super critical and ultra super critical power plants, which are being built in China and India, are overwhelming in the public interest.

Here's a slide on the China driving demand

for seaborne coal. Their exports this year are projected - - or their imports this year are projected to be in the 300 million ton range, rising up to 400 million tons by 2017. So obviously, that is a source of demand for more coal exports from the United States and more economic activity in the United States.

India is likewise a rapidly growing coal importer. The Indian coal imports are projected to reach 200 to 220 million tons per year by 2016.

Thank you, Mr. Secretary.

Coal conversion to chemicals. Again, this is an outline of some of the matters that we addressed in these several studies, that we have put on the table and the job creation associated with these studies is outlined right here.

CO2 for enhanced oil recovery will be increasingly economical, as Dick's study showed and these figures are from that, from EIA and from their annual energy outlook. And the U.S. oil is there, more CO2 is needed.

I like to say that coal's competitive advantage is its carbon content, because in a CO2

constrained world, we have a home for it, and that is more production from our stranded oil fields.

The demand for CO2, again from Dick's study, is right here. The CO2-EOR can accommodate a major portion of CO2 captured from coal-fired power plants for the next 30 to 40 years, from the president of ARI, Vello Kuuskraa, really the -- maybe the most important individual in the EOR space. The magnitude of economic impact on jobs from CO2-EOR again, this is from the 2012 study.

Will crude oil prices continue to rise? EIA says they will. I think it is a given that they will, because there is not enough around for the people that are coming and the people that are going to be used. So, the market for enhanced oil recovery in the United States will be robust and the need for CO2 from coal utilization equally will be robust.

Is tight oil a game changer in this space? This is John Hofmeister, former CEO Shell Oil, on U.S.

shale output, just last year. "It's a trickle when we need a river of new supply." So, the demand for EOR and coal -- CO2 from EOR will stay.

And finally natural gas, are we in a market now where natural gas is going to be four dollars forever? I don't think so. The goal of the producers, in promoting the LNG export facilities certainly is to get a higher price for it, and to have this LNG be priced off oil and therefore, U.S. natural gas output priced off oil. We are not opponents of shale gas in any way, shape, or form. I think it's a tremendous development that we have seen and will lead to load factor power. It's really, in many ways, a coal world because of the increased activity from the chemical plants and the new industries that will surround the natural gas that is available for those plants.

And then finally, the overarching message in all of these has been advancing clean energy from coal, low carbon emission coal, China's GreenGen, Australia's Coal 21 Fund, U.S. FutureGen and down the list. And of course the U.S. Department of Energy National Carbon Center is a hugely important player in that space and we applaud the work that DOE is doing there.

And finally, the summary of a decade of National Coal Council Research highlighting the points

that I have just covered, in terms of the social -- the importance of coal for social development through coal energy and the opportunity that is there for us as we go forward in a growing nature of 425 million people by 2050, the urgency of sustainable coal for American citizens has never been more apparent. And that, I believe, was our 2008 study.

Thank you very much.

MS. GELLICI: Do we have any questions for Fred? Thank you, Fred.

MR. PALMER: One other thing, if I might -- just one of the things we have been discussing, and Janet is working on this with the coal policy committee, are the ideas we might have, as Secretary Smith just indicated, for future studies. So, input from any and all of you absolutely is welcomed.

One thought we have is the -- have had, which I think has merit, is preserving the existing fleet. So, the plant closures are going to go forward because some of these are very old plants, very small plants; the amount of money having to be invested in those plants is problematic for many of the utilities. But

there is a cadre of coal plants that's there that will take us back to where we were two or three years ago, as natural gas prices come up and coal regains market share from those plants.

But it's only going to be there if the plants are there. So, the question is, how do we get that concept in play right now, with this administration. And can the National Coal Council serve a role in educating Secretary Moniz and his team and Secretary Smith doing that kind of a study. Okay?

I want to thank you all very much. And thank you for the work that you do.

MS. GELLICI: Thank you, Fred.

MR. EAVES: Thank you, Fred. Let's give both speakers a hand. Good job.

MR. EAVES: You know, if we could, let's take about a ten minute break. We'll reconvene about 10:25 and get started on the second session. Thank you.

(Whereupon, a short recess was taken.)

MR. LONG: Okay, good morning.

ALL: Good morning.

MR. LONG: I'm John Long. I'm the vice-chair

of the Council. And I'd like to ask David Surber, chairman of the National Coal Council Communications Committee to come up and introduce our next speaker.

MR. SURBER: Mr. Chairman, friends and colleagues on the National Coal Council, in a speech made during his presidency, Jimmy Carter observed, "The fruits of technology are bitter and sweet." So too with the technology of the internet and sadly, its vulnerability to threats and attacks from those who mean us harm.

Former Defense Secretary Leon Panetta suggested that cyber terrorism could be our next Pearl Harbor. For those of us in this room whose responsibility it is to keep the lights on, the grid safe and the digital controls, which make it possible to mine and ship coal, I make bold to ask that we pay close attention to our next speaker, Christopher Ling, executive vice president of the important cybersecurity firm Booz Allen Hamilton.

Mr. Ling works under the direction of Admiral Mike McConnell, who was head of the National Security Agency under Presidents George Bush and Bill Clinton.

He brings a sobering message today, which we dismiss at our peril. It is my prayerful hope that we may take comfort from the observation, "Fortune favors the prepared."

It is my honor to introduce Christopher Ling.

MR. LING: Thank you very much. Thank you for having me. I must admit that I'm a stand-in. The original invitation went out to Admiral McConnell himself. And so it's with trepidation that I actually come here and try and speak to you about this subject when someone can do it so more eloquently than I and has much more experience.

Mike and I have actually worked together for many, many years. He was at Booz Allen after he left the National Security Agency. And in 2001, obviously when we had 9/11, there was a huge push back into the intelligence community to rejuvenate a lot of the human-based intelligence and analysis that was going to be needed to sort of track terrorism. And so he and I started working together then.

At the end of -- during the course of that, he was actually asked by the Bush administration to

come back and serve as the director of National Intelligence, which he did in 2007. And then he returned to Booz Allen Hamilton in 2009. It was at that time when he came back, he and I had been quite -- grew quite close as friends.

And one of the unique things and one of the most difficult things about Mike is actually getting time on his calendar, which actually is why he couldn't be here today because he had a previous engagement. But there was that window of opportunity when he first came back to Booz Allen for a couple of weeks where his calendar wasn't completely full and he had some time.

My background is in military intelligence. And so I lead that portion of the business. So one of the major clients I had is U.S. Central Command, which is down in Florida. And I was just happening to have lunch with him the day before and I said, "You know, they're really struggling with this whole resurgence in the scale of troops we had there, obviously."

There was a corresponding uptick in the intelligence and restructuring for all of that to prepare for the surge of troops there. I said, "You

know, my client asked me to come down there and talk to them because we need to restructure the way we're going to support that operation. You know, wouldn't it be great if you joined me and came down?"

And so I think someone who got a sense of freedom that actually, "Hey, my entire day is not planned out tomorrow 15 minutes at a time. I could actually jump on an airplane and go down to Florida. That would be great." He said, "Christopher, I'll go down with you. This will be wonderful." I said, "What a surprise."

Could you imagine going to see a client and you've got the former DNI who only stepped down a couple of weeks ago to actually talk about such an important subject in context of the military and also for the nation? So we go down to National Airport. He walks up to the counter and buys a one-way ticket in cash. And we go and we stand in line.

So we're standing in line at National Airport and people are, like, "Oh, my god. Admiral McConnell, it's nice to see you. Oh, my god." You know, everybody's coming in. It's Monday morning. All the

people are coming in from the Congressional hearings and everything and coming back from their constituencies. And, of course, a lot of people recognize him.

So we're standing in line. So, of course, we're just about to board the airplane and he gets pulled out of line, you know -- cash, one-way ticket. They pull him out.

So he's standing there. Okay. So I'm standing there alone and everybody goes, "Okay. Put them up." And, like, they're searching him and everything and said, "Okay. You know, where have you been? Where are you going? How come you're (inaudible)?"

And people walk by, "Hello, Admiral McConnell. Hi, hi." He's over there, pulled out of the line. So the TSA agent searching him looked up at him, you know, as he's getting down to his legs and he searching his pants to make sure he's not carrying a weapon, looks up. He says, "I saw you on TV last week." "Really?" "Yeah." He goes, "Oh, I appreciate it," put his hands down. "Whoa, whoa, whoa. I'm not

finished yet."

So he sheepishly gets back in the line. I said, "Hey, welcome to the real world."

One of the other things that actually I've been focusing on as well that Booz Allen has, as I'm sure you've all heard about, the U.S. Cyber Command that's been stood up recently. What's really interesting about that is that the military didn't just create a command to fight in a different region of the world.

They actually designated a command to sort of harness all the elements of the different services and create a mantra and a capability around new tactics, techniques and procedures to engage in the cyberspace domain. And they actually articulated it as a domain, which is really a big deal, because they have air space, ground space, sea -- are all domains.

And so now, there's a whole idea that we're not just treating this as a sort of a technical problem, but we're actually going to organize to actually fight in this domain. But this cyber -- but that's new to the military. Cyber is not something

that's new, nor has this ongoing battle for these new techniques that we perceive as being new -- they've been instantiated for many, many years.

And there's a silent lore that's been going on between nations over decades about trying to exploit each others' systems, take information, and also protect. So we usually classify cyber in those three elements: exploit, which is gaining access; attack, which is actually putting something into the system, which will either just corrupt the system, erase information that's in there or change the information; and of course, the other side of the coin is we also defend the system.

And the National Security Agency has been given the mission to do a lot of that, but inside the intelligence community. So they do it to protect the military-based systems. Cyber Command is going to look at that more broadly to defend the nation from external threats.

Now, what's happened over the years, because this has been the case, is that many major nations have gone out and invested millions of dollars and had

created thousands of experts to actually build this -- what we call malware, all the pieces that go into creating an attack.

So there's a whole point of probing a system, figuring out where the vulnerabilities are, where the patches are. There's this great term out there called "zero-day exploits," which is a way you've found your way into the system that nobody knows about yet. But, of course, once you do it, they figure it. They patch it.

But there are a bank of these things out and actually, they're like gold. People sell them as a commodity. So all the people who've worked for these nation states that have created all of this incredible technology, now, we see more of it being filtered out into the black market. And so what do we have?

So it used to be in the old days we had these huge sophisticated nation states that had thousands of people that were experts working on that. And then you always had this 15-year-old kid that was sitting in his parents' garage, the people that we're worried about. But there really wasn't anything in the middle.

And so what's really changed is that the middle is starting to fill in. So you see criminal groups that have been out there and said, "Oh, this is a great way we can gain financial access into systems," and sort of sell that capability. They are also actively engaged in the black market and they buy many of the things that trickle down from the nation states.

So those pieces of malware that have been used a couple of times are not so valuable. You know, they're available to be purchased and used.

We see activist groups, Wikipedia -- I'm sure you -- I won't go into all of that, but you've read a lot of that. And so you have different elements that are now banding together and developing new techniques to do that.

In addition, I don't want to obviate the fact that the nation states are becoming more active. So what's really interesting about that is that for the most part, here in the U.S., we don't think much about the intelligence community beyond national security. That's its major focus. That's its only focus.

In many other countries, intelligence

communities and their agencies, not only do they have that mission, they also use it for economic espionage. So it's a part of their natural repertoire that they're in there, if they come across something, is they're poking around in systems that is proprietary -- is huge financial or competitive advantage for companies in certain industries.

They're -- they will -- they have an ability to share that with their industry base. And so they've actively been doing that for years and years and years. So what have we seen out of this? What's really interesting is that the DNI have published a document two years ago, which is the first time it really unclassified what we've known has been going on but it was the first time it was actually seen in unclassified state.

And what is that? We know that the Chinese are the most prolific and the most active in this area. And they use that to their economic advantage. And they have that synchronized with their trade partners. They create partnerships with U.S.-based companies. A lot of money flows initially out of that. Deals are

won inside China.

And then, you know, two years into it, the deals sort of fall off a bit. Six months after that, there's a company that opens up down the street inside China that has the same capability. They start winning contracts. They have similar technology. Lo and behold, you know, there's been a whole transition and a whole life cycle to transition that intellectual capital over.

Out of this report it notes that the Russians are very good also. And they are very specific and targeted, so much as the Chinese are. Everywhere the Russians are very focused on what they're doing and the information they're trying to gather. And also, we see the Iranians are heavily involved. So what we see is less sophisticated nations that didn't have that capability have been able to utilize this black market and buy these capabilities and come up to speed quite quickly.

A good example of that is what we see happening in the financial services industry, that I'm sure you've read about over the last six months, these

distributed denial-of-service attacks, which really in terms of sophistication is very low; on a scale of 1-10, maybe a 2, but obviously very effective in shutting down systems.

And what was most interesting about these particular attacks is how more sophisticated the attacks became. So we used to see distributed denial-of-service attacks that were basically 1 to 3-gig per second that would sort of take down a website. These were really on the order of anywhere from 80-gig to 120, so it was huge.

It was going beyond just shutting down banks. It was overwhelming the communications grid that were leading to the banks. So how did the banks deal with this? They have proxies that they use. So they have almost a way that they dump that flow that's coming in. Once the flow overwhelms them, they pass it off to a third party. The third party tries to filter through that, figure out what's bad, what's good and send the good stuff to the bank and then dump the bad stuff.

Part of the problem is, all the banks, they use the same company to do that or same small group of

companies to do that. So what happens? You saw the attacks were sequential. Guess what's going to happen next? They're going to be in parallel. Then we're going to see the secondary part of this collapse.

I thought I'd also give you a couple of facts. In 2012, there were 198 incidents reported to the IC Cert (ph). Forty-one percent of those were in the energy sector. And from what I just saw in the previous presentation, you are the biggest proponent or the biggest part -- component of the energy sector and clearly, a supply chain for the energy grid here.

Separately, of all the attacks that have been documented, 96 percent of them were not particularly difficult, not sophisticated. They didn't take thousands of man hours to pull together. I could either buy it for cheap. Someone mostly was inexperienced or not being disciplined on the defensive side -- left a hole open. And as I probe in there, I find something and I get through.

Attacker -- it's not that the attackers are not sophisticated, but why put any more effort into it than you need to if you can gain access in the simplest

path forward?

Another interesting fact is 85 percent of those attacked took weeks to discover. And what's actually interesting is sometimes they take months to do.

So I talked earlier about the exploitation part. The exploitation part is the key fundamental foundation before you get to the attack. You have to gain access to the system. So it's often the case that someone gains access to the system and they can spend weeks or months probing around before they actually figure out what they're going to do and how they're going to do it. So they're actually lurking on the system for quite some time. But we never think to actually go into the system and try and find them.

Also what's interesting is that 97 percent of these attacks could be avoided by just taking simple counter-measures. Now, RSA, which is sort of the leading industry proponent of looking at different security elements in companies, and they work on different tools, started to think about this and wrote a report which covered that perimeter defense in itself

is not itself.

So I'm sure everybody hear is familiar that you go through the process of -- as you boot up your computer, sometimes something comes in, an email comes in, and -- or if your computer's slow on getting started up and it usually says, "I'm updating the virus software." So what's actually going on? It's basically there's a look-up library. And so basically all these things that happened, they're compiled on a weekly basis and they're downloaded to your computer.

So everything that -- something comes in, an email comes in with an attachment, this library looks at it. And it says, "Is this on the library? Yes, it is. Okay." And then it gets quarantined. And then you go, "Oh, my god, something's quarantined on my computer." It just gets shunted to the side.

Or it says if it's not in the library, it comes through. And this is what the zero-day exploit is. What happens if it's not on a list? It just comes right through. And those are the pieces of technology that are most valuable. And so continuously managing these patches is what's critically important. So how

do we do that?

We have this antivirus software that everybody knows about. We have these different firewalls that are in place that are supposed to do that. But all of that is basically a perimeter defense mentality. You know, it's much similar -- you know, more guards, more gates, you know, we'll be more safe. But at the end of the day, that in itself is not enough.

And I think the key point of what RSA noted is that we -- the time has come now where we need to look at threat-based intelligence, cyber threat intelligence. I really am more interested in knowing who's coming after me and spending a lot of my resources on that instead of just trying to blow more into what's actually happening on the perimeter and try and improve the strength from the outside.

So this is the challenge we had before us probably a year ago or so. And that's when Mike came to me and said, "You know, we need to figure out how to do this." We have a lot of people up in the National Security Agency. We're the largest contractor up

there. We have some intellectual capital and figure out how to do this. It's most important also for the critical infrastructure of this country.

So, you know, we've obviously focused quite heavily in the financial services sector because that's where there's been a lot of activity recently. We did have to figure out and sit down, how do we actually do that? The NSA actually has a dual-loop system in the way they deal with these things. Something bad comes in, it's almost like a hospital. There's an emergency room.

You know, someone comes in. They're immediately hurt. You triage that. You know, heavy diagnostics -- emergency room -- how do I fix this? All I'm interested in doing is stabilizing the patient, fixing it. They've also got a second loop that really looks more strategically at best practices and how do I strengthen the system over time and position so I'm not in that situation?

So we extrapolated from that and we came up with a model that we call "dynamic defense." And the cornerstone of dynamic defense is this threat-based

intelligence. Intelligence is a key element of this because it allows you to optimize your allocation of resources. So I'll let you in to a little secret. I said earlier that I've been in the military intelligence arena for ten years. I'm not actually an intelligence analyst. I have a consulting background.

And so when I sat down with all these intel analysts, as we were trying to gear up after the 9/11 piece, I really wanted to understand, what's the secret, what's the holy grail? How is it this intelligence works? How do we actually do predictive analysis, which is what everybody wants?

And when you -- really boils down into three simple elements. The first is that you have bad actors. So you have people with intentions. And if you could really focus on the people with the bad intentions, you get a better idea about who might be acting against you. The second element is capabilities. What are the things that are out there that really could hurt you, independent of who actually might use them?

You know, a good analogy is if you think back

to the Soviet Union, we had -- we didn't have a great deal of insight into what their intentions were on a day-to-day basis. And so we spent a lot of time and we built an entire intelligence infrastructure of a manner to look at their capabilities.

So as they built new bombers, new missiles, you know, we always have to have counter-measures to those things. And all of that was used to try and reverse-engineer what their long-term strategy was. When we moved over to counterterrorism, the problem was that there were so many capabilities available to terrorists; we really had to burrow in on the intentions directly. And that was really the huge lift in what the National Security Agency was doing in the SIGINT side of the business.

And so I'm sure you've seen the background on the capture -- or the killing of Osama Bin Laden. A huge portion of that was really all SIGINT-based. And where the human and the SIGINT really came together was a huge fundamental shift in the thinking and the trade craft of intelligence analysis that really hadn't existed during the Cold War at that level.

And the third component that really comes into it is opportunity. Where is the most opportune time to actually strike? And so if we think about it in cyber, you're combining these three elements -- would really give us insight and allow us to move past this perimeter defense into what we call this sort of dynamic defense capability.

And so now, we have -- and it's this intelligence capability, which is the first part of this -- really focuses on understanding where those triumvirate of things come together. So we -- for agencies and for companies, we look at their -- what we call their attack surfaces.

And the attack surface is not simply, you know, the network as it exists. It's how people engage in the network, how they use their mobile devices to get in there. It's how suppliers use it. It's how customers engage with them on the web, all these sorts of things. All of these places are creating opportunities.

And we look at the sets of individuals that we know through social network and social media

analysis that are actively out there, you know, that have grievances or concerns around these individual companies or agencies that may be state actors, criminal actors, activists, all of those sorts of people. We categorize them and we watch them, their activities in open source.

And lastly, we're very familiar with the types of capabilities in this malware. What's really interesting about malware is it almost has a DNA pattern to it. Somebody will use it. And then what happens is they sell it and then somebody else changes it slightly and uses it for something else. And then it gets sold again and changed again.

But anyway, you can almost trace back all the people that have used it and who's had it last and what they've used it for. And so when you see the triumvirate of those three pieces coming together, you know, an opportunity opens up, there's a bad actor out there that has an intention, and all of a sudden, you can see activity around the capability, you know, then you get an idea that something could be coming.

And so after you determine that, there are

basically two steps we walk our clients through. One is what we call our reactive response, which is basically -- and this is much like the emergency room I mentioned before -- where specific pieces of software that can go in and hunt down malware that exists on systems.

And so I'll tell you that in the entire history that we've had this capability that was developed at NSA -- and it's a non-signature base, so it doesn't work on a library. It goes through from the ground up and identifies the things that ought not to be there. And then there's a huge amount of human interaction to determine what the nature of that malware is.

In the six years that we've had this capability -- and we've deployed it over almost 100 systems -- we have never once not found malware on any system, whether it be in the government or in the private sector.

The other path that we go along, so there's not an immediate emergency, is really around preventative actions. So these are our best practices

that can be instantiated. What levels are you -- there's a -- in the software industry, there's something known as a "capability maturity level" and we've adapted that into the cyber element, which actually can measure how mature is any individual organization or company and where do you stack up against your peers? And what level do you need to be, given the threat level that's against you?

So if you were informed by this intelligence around what's going on around you, how -- at what level do I need to be? And so we've got this going through 1 through 5. And at any time, as the threat dynamically changes, you can make investment decisions about whether it's important to move up a maturity level or not. Also changes as based on companies have different suppliers.

I saw an interesting slide earlier on the last presentation about now exporting to China and India. I mean, there's always these great stories about, "We should just outsource everything to, you know, India. It's -- we're going to have great cost savings." And, you know, most of the people now -- you

call, you know, to make an airplane reservation or you need helpdesk, you know, all of that stuff gets routed someplace else in the world.

But with that, there's some security risk that obviously comes into play when you extend your network over that. And no one's ever been able to quantify it. So the whole idea of this maturity model is you can make those trades and understand what you're doing. So you may realize cost savings in one area, but you're obviously going to have to increase in other areas to keep a modest risk level in play.

I guess the last component I would pull into this is that a lot of this intelligence that I talked about is really what we call "actionable intelligence." It needed to be folded in the construct of decision-making so it's valuable to the end user. I think that's a piece that's been missed in many components of intelligence.

The U.S. has a huge intelligence apparatus in place that monitors capabilities, manages overhead, assets that cost billions of dollars. And we track very well sort of nation states in their development.

As I mentioned before, I think through the evolution that we've had since 9/11, the human intelligence in the SIGINT has become very, very good.

There's a vast quantity of data that's out there. Many times we hear the saying, "I'm drowning in data and starving for information. I don't know how to extract from all that data something that's actionable." So you have to have a context to really understand how that all plays together. So I guess the reason I bring that up is it's something that I know that military operators are always struggling with all the time. It's not that they want more information; they want the right information.

I bring this up because, as we say, we've learned a lot over -- about cyber over many, many years. And like I said, this has been going on for decades. A lot of those lessons learned can be immediately brought into the commercial sector. That can be valuable to you. As the infrastructure becomes -- the critical infrastructure becomes more and more of a target.

And I think the financial services is just

the first step of what we're going to see. We're going to see significantly more activity by nation states that maybe are not the Chinese and the Russians who are more interested in stealing information, but sort of second- tier nations who would like to cause us harm, who would like to disrupt the services that we have, and can do it for -- asymmetrically for a minimal investment over time.

And those are the elements that we need to focus on. So every time you take a step in security, you're almost retarding your ability to be effective, because it's just not the cost associated with security, but everybody sees security as slowing things and as additional overhead. This is the type of thing that you want to ratchet that up when you know the risk is out there.

But if you can delineate that the risk is not there immediately, then you can ratchet that back down and gain the efficiency again. So there's always a constant balance that's going on between those two things.

And so I think tailoring this information in

a way that's within context of senior decision-making -- just make those critical trade-offs -- is what will be successful at the end of the day. Because we can't just continue to add more and more layers of security and slow things down and add the costs. Because at the end of the day, that's not going to get us to that level that we wish to achieve.

And I think I'll just close by saying that I think many of these things have been realized and understood. There's legislation on the floor for the government to be actively involved to do something about it. There's a huge battle going on, financial services being at the forefront of this because of what's happened recently. They don't want to be overly regulated and so that's a problem.

And so that's been going back and forth and has stalled a lot of the elements that are in there about legislation. I think the greatest concern that potentially would be out there -- and David mentioned it before -- is this whole idea that there would be some cyber Pearl Harbor that would force the government to act.

And when the government acts, regulation is the mechanism they would probably use to do that. And it's fair to say that it would probably be a significant rotation in that arena to compensate for what clearly would be a huge public outcry if things -- if the -- you know, people didn't have money in their bank accounts, the lights didn't come on, you couldn't travel, and those sorts of things.

And so it's really important that industry be actively involved in helping to shape this legislation to tune it properly, to get you to the point where you can actually make these tradeoffs if you eventually start to build this capability yourself, to inform your senior leaders, to understand and mitigate risks, you know, as the threat changes. Thank you.

MR. DALTON: Hi. Stu Dalton with the Electric Power Research Institute. And I couldn't agree with you more on both the fact that in the electric power industry -- what was it? The greatest engineering accomplishment of the 20th Century -- not the 21st -- was the electric grid, the overall system. But it's a combination.

It's a combination of physical, analog, and computer-aided systems put together. And it hasn't all been updated and it hasn't all been changed. We have things like -- that are marvelous inventions that allow us to control and modify those controls, programmable, logic computers -- or controllers, pardon me.

Good example, we know those can't be reprogrammed. And we know that the threat coming in from anywhere by anyone is something that we now have to worry about a lot more in our system. And EPRI is doing some R&D in this area and we're involved in a number of those areas.

But it strikes me that coal, which has a fundamental security in the fact that you can put a three-month supply on site -- oh, that's great. I mean, have -- I don't have to worry about the supply chain. It provides security. But what about the things that could impact the use of that -- impact the grid? We see the electric power industry as one of those areas that is trying to inform its upper-level management. We are making presentations to the board level advisors of EPRI because we see this as an

increasing area.

Any comments, particularly for the electric power industry and coal and any nuances you'd like to add on that?

MR. LING: Yeah, I think you bring up a critical point. This whole idea of the move to the smart grid will fundamentally change the risk profile. I mean, I get -- that is a great example of what I was trying to talk about earlier, more in generic terms, but would be a great specific example of some of these tradeoffs that exist.

I used outsourcing as an example, but this is another one. So the electric companies -- okay, we're going to move to a smart grid. That's great. Homes are going to, you know, on demand have energy, share energy and all that. How is that going to be controlled? It'll be controlled through computers.

So all of a sudden, you have a centralized thing, where basically what you're worried about are these PLCs or SCADA systems that are maybe internal, at least physically to your own organization. Now, you have, you know, millions of these small computers

running into almost everybody's house that are somehow integrated into this network that are either used for forecasting, for demanding and those sorts of things.

And there's going to be a huge tradeoff. So when the decision is made to implement that, the corresponding security balance to that has to be, "Okay. Now, what am I going to spend and how am I going to develop security architecture around that?" And that's just not a technical piece. It's policy. It's people. It's training. It's all of those elements that need to go into that.

We did an analysis that said, you know, "What are the top 50 companies that are spending against cybersecurity at the moment?" What's really interesting is there's no energy companies in the top 50 today. But in ten years from now, there'll be three. So that -- and of the other 50, none of them really changed. That is the biggest change in any one industry in the top spending -- or the top realization that cyber is going to have -- is going to be the biggest threat and will require the biggest spin-up in any sector.

MR. DALTON: Mr. Ling, is this on?

MR. LING: Yes.

MR. DALTON: All right. Thank you. Are you able to say or do you care to say that within, let's say, the next five years there could be one way or the other, somehow or the other, a cyber attack on the United States power grid which would shut all the power off in the country and this either from some zany operating out of his attic in Sweden or by conspirators?

Is it possible that in the next five years we will see all the lights go out and possibly stay out for several days?

MR. LING: I don't know if I would go so far as to say it would be directed at the power grid. But I will say this. And you and I brought it up when we were discussing this before. Usually, in any industry, there is a clear element of a single point of failure. And if something were to happen drastically there, it could shut everything down.

The -- I'll use the financial services as an example. In the U.S., economy is $14 trillion a year.

There are two banks in New York that handle $7 trillion a year in transactions a day. If anything happened to any one of those two banks, it would paralyze the flow of money, not just inside the U.S., but globally.

And so the ability to identify those key elements -- very I said -- I'm sure in the power industry there are probably similar examples. There are a few key critical notes. And either not having a redundancy around that, not developing any policies around that -- and again, if I go back to the example I used before, 97 percent of all attacks were not highly sophisticated.

So it's not that, you know, someone's going to spend, you know, 40 people working two years to try and take down the power grid. It could be something simple just in one of these critical things. I think it's fair to say that there'd probably be a significant cyber event in the next five years. I don't know if it would be in this particular industry.

But we're certainly seeing indications of the sophistication and the quantity and severity of those attacks certainly increasing over time, almost on a

six-month basis.

MR. DALTON: I'm not quite sure I understand. I'm paying close attention. The -- just as you're concerned about the financial underpinnings and the country being suspended by it being, you know, diverted or somehow nullified, as -- I think everybody in this room knows that the electrical power grid in the country isn't in the best of shape first of all.

And I'm not sure how it's going to be responding to increased demand. But the power grid is controlled from several physical points in the United States. I believe I'm correct in that statement. Now, why can't these crazies get into those points, as you have alluded, the nodes, if you will, and tweak it in such a way and just order the thing to shut it down?

You're -- are you saying that -- it's possible; isn't it?

MR. LING: Yes.

MR. DALTON: Okay, thank you.

MR. LING: It's just not possible to -- by the way, it's not possible just to shut things down. It's possible to go into systems and change the

information. Right? So I think Stuxnet was a great example of that. It wasn't that anything got shut down. It's that things were changed and people didn't really even know about it.

MR. FASSBENDER: Yeah, it gets back to, I think -- this is Alex Fassbender, Ecovia Corporation. It gets back to what President Lincoln said. He's not so worried about what he doesn't know as much as he's worried about what he knows for sure that simply isn't so.

The question I have for you relates almost directly to what you were talking about, the two banks and the nodes that previous questioner asked. Centralized versus distributed systems -- have you done any studies on the resiliency of centralized systems versus distributed systems? And is there -- are there any lessons to be learned there?

MR. LING: I'll tell you, in the studies that we have done, when we look for opportunities, if you're the attacker or if you're the defender, what we call vulnerabilities, oftentimes, it's not so much the technology or whether the systems are centralized or

decentralized; it's the people that engage with the systems. It's the thumb drives. It's the patching. It's the policies that are in place or the lack of training, the passwords.

It's all very, very simple things, actually. I mean, if we could just clean up those things, it would make a huge difference. So before you even get to the technology architecture, you have those pieces. What's really interesting though about the technology architecture, since you bring it up, is we have done excursion studies on saying, "You know what? We don't know anything about this company. Let's put our intel analysts on it and see what we can figure out about what we do we know -- what could we delineate about what their architecture looks like?" "Is it centralized or decentralized? What are the components?" You go to LinkedIn. You find the senior people. You look at their resumes. You see who they work with. You see who they're friends with. You can also piece together exactly the widgets of technology that are being used by companies. And once you know the technology, then you go back and you find out what the exploits are.

Then you can go out into the black market and buy what you want. And I mean, it is a pretty transparent process. And I'll tell you, centralized or decentralized, vulnerabilities exist in both.

MR. FASSBENDER: Thank you.

MS. GELLICI: One last question. Go ahead, Doug.

MR. BAJURA: Thank you, Janet. I'm Dick Bajura. I'm with West Virginia University. I was particularly intrigued on your analysis of how things happen internationally. You get money for the first two years, then interest goes away and then the other company is founded in the other country.

From a practical standpoint, how could one tell -- what are the lessons that you have learned, for example, and how do you sense when these things are happening so that you might alter your interactions with people so that you can figure out how to avoid getting your technology taken away?

MR. LING: Yeah. We don't produce anything as a company so it's not for ourselves. Obviously, we have clients that do. And I think that right now, it's

a policy problem. And it really becomes a business decision about how you're going to do business. Obviously, China is an area that's booming and lots of people want to do business.

You go there. You know, they want you to have a local presence. You open an office. Somebody shows up and says, "Okay. We want to put this black box on your network." "Well, we don't want to do that." "Well, then, okay. Then you can be registered to do business here." Now, it becomes a trade. So companies say, "Okay."

To get your point, then they say, "Okay. Well, we'll air-gap that network. That network is separate. We'll have to physically take everything off and move it and put it over here. I mean, over time it becomes a major problem. This is a long-term strategy on the adversary's side.

Because the way it works is, if you want to do business there, you have to have presence there. If you have presence there, you have to comingle and find a local partner to work with. So intellectual capital gets traded that way or it's taken that way.

You know, we've had issues where attorneys have gone in to represent large-scale clients to do deals in there. And as the attorneys come in, they bring their laptops with them. They have their whole negotiation strategy in there. They go to the hotel. They plug in to check the email. Guess what? The strategy's gone.

I mean, it is a prolific problem at the moment. And the question is, if you want to do business there, there's got to be a balancing act. The other part of this is that once you realize that's something's gone wrong and you want to do something about it, you want to take legal action, it has to be dealt with in the Chinese court.

So the Chinese courts don't see anything, but Chinese companies. So this whole thing has eventually got to be resolved. It's a very complicated problem. Again -- I think right now we haven't even gotten to the technical aspects of it. It's really got to be a -- it's a policy issue at the moment that's got to be dealt with.

MS. GELLICI: Christopher, thank you very

much.

MR. LING: Thank you for having me.

MR. LONG: Thanks, Christopher.

Our next presentation is about nuclear-enhanced coal-to-liquid fuels production. And we have two speakers that are going to tag-team. First is Fred Moore. He's president of Manufacturing Excellence Consulting and executive director emeritus, NGNP Industry Alliance, Limited. Fred's currently the president of manufacturing for that company and executive director emeritus for the Next Generation Nuclear Plant Industry Alliance.

His consultation company specializes in safety and reliability consulting in the manufacturing industries. Previously, Fred was global director of manufacturing and technology for the energy business in Dow until he retired in 2012. In this role, he was responsible for the safe and reliable production of power, steam and other utilities for Dow globally, which represents approximately $8 billion in assets, or more than 10 percent of Dow's asset base.

Fred's a graduate of Purdue University. He

began his career with Union Carbide in 1975. He's been a corporate media spokesperson, lobbied at the state and federal levels of government, served on a joint venture board of directors, and has been chairman of or served as board member of several state and industry trade association groups.

And Don Newell is from Kentucky Energy and Environment Cabinet. For the last six years, Don has been acting director for fossil energy development in the Kentucky Energy and Environment Cabinet. Prior to that position, Don spent eight years with Kentucky Division for Air Quality, including six years as the air permitting manager.

Don has a Bachelor of Science degree from Purdue as well and a Master's Degree in Management from the Krannert School of Management at Purdue. His work experience prior to employment by the Commonwealth of Kentucky includes the microelectronics and aluminum industries and a lengthy stint in the United States Air Force.

And a lesser-known fact -- and you'll have to talk to him after the meeting -- is he used to be a

hooker. So let me welcome our next speakers, Don and Fred.

MR. NEWELL: John, thank you, I think.

First, let me clarify. I am not Fred Moore. Though, after John's introduction, I'm not sure that I wouldn't prefer to be Fred. Let -- yeah, let's go ahead and clear the air. John has a couple of sons that have played rugby and I used to play rugby. And one of the positions that I played -- actually, my specialty -- was what's called the hooker. And he's the guy in the front of the middle of the scrum.

So that was quite a surprise, but thank you for that introduction.

Now, to try to get back on track. Over a year ago, our cabinet secretary, Dr. Len Peters, agreed with the Next Generation Nuclear Plant Industry Alliance that Kentucky would participate in a study of coal-to- liquids industry, assisted by nuclear energy and cut the carbon footprint.

And how do I get this slideshow started? Okay. There, it's starting now. What moves it forward? Sorry about that. I'm not very technically

competent either.

But he agreed to do that and he did it for one simple reason: Kentucky is a coal state. Between the jobs, between the amount of electricity that's generated in Kentucky from coal, between its impact on the tax base, gross domestic product, et cetera, et cetera, there is not a citizen in the state of Kentucky that is not touched by coal.

Now, we heard Secretary Smith make the comment that technology is needed in the 21st Century to keep us viable and energy developing. If we're going to keep coal as one of the options in the 21st Century, then we're going to have to deal with the fact that, as the Secretary pointed out, we will be operating in a carbon-constrained world.

On a big picture viewpoint, that leaves us with two options. Either you control the CO2 that you make or, as some of our commenters have pointed out as an option, you avoid making CO2, either through higher efficiency, through better materials and such, whether it's through upgrading existing power plants, new technologies and new ones -- whatever, you can avoid

making that CO2.

Nuclear-assisted coal-to-liquids industry addresses directly that option of avoiding CO2 at a potentially lower cost than would be incurred by trying to control CO2 after it's made. Now, why does Kentucky care about that, specifically down more on the grassroots level? We have two reasons. And I'm not going to read you these slides.

But I would like to point one thing out on the Paducah Gaseous Diffusion Plant slide. Paducah Gaseous Diffusion is going to close inside of a year. That's 1100 jobs in Kentucky that, with a $160 million payroll, is $145,000 a year on average. That is unique in Kentucky. And we are going to lose that employer.

The second reason is Eastern Kentucky and Eastern Kentucky Central Appalachian Coal. Again, I don't believe that I have to highlight to this group what's going on in Appalachia's coal region or why it's been going on. But again, one thing to point out, the result of all of these factors is that production is down 25 percent in the last year.

This year, during the first four months, it's

keeping on that tailspin decrease. And the possibility exists that, with the regulatory environment, the other competitions of oil and natural gas and such, there may not be a recovery in the traditional coal, i.e., power industry.

So we're on board with taking a look for new markets. We're on board for taking a look at new ways to achieve the goal of keeping coal in the energy mix. That's what led to our collaboration with the Nuclear Alliance.

And now, I'll turn it over to Fred. And he will outline the results of that study and talk about the opportunities that are available.

MR. MOORE: Thanks, Don. I'll stand back here.

Let me just start very briefly. In my energy role with Dow, I became interested and actually involved in this technology in 2007, because I gave a talk on energy at the NEI, Nuclear Energy Institute, annual meeting. And then-Assistant Secretary Dennis Spurgeon for the Office of Nuclear Energy came up and grabbed me by the arm and said, "I need you to meet

some people."

I'll tell you at the beginning two things that attracted my attention about this high-temperature gas reactor technology. One was its intrinsic safety and I'll elaborate on that further in a minute. And two, it was the first technology that I had seen -- and as owner of the energy technology in Dow that had ability -- the ability to be a game changer in terms of low carbon production of high-temperature process heat.

The alliances -- when this began, the alliance was a group of six of us. It's expanded since then and it continues to expand. Certainly big companies like Dow and ConocoPhillips are large energy hogs. I mean, Dow consumes for energy and feed stocks the equivalent of about 900,000 barrels of oil a day. That's about 0.15 percent of the world's energy supply.

Energy's a big deal. Right. Conoco, a big player in the tar sands. The Petroleum Technology Alliance of Canada, which is a consortia of all the major oil players that are extracting bitumen in the oil sands. I don't know if you know this, but with the SAGD process, to extract about one barrel of oil or 6

million BTUs, it takes about 1.3 million BTUs of natural gas. And that goes out as CO2.

Two of the largest nuclear system suppliers in the alliance, Areva and Westinghouse, a number of nuclear suppliers at Grafite (ph) and other technologies and other interested parties including one of newest numbers, State of Wyoming, which we've also done work with on nuclear-assisted coal-to-liquids. And I'll talk a bit more about both of those in a minute.

The real opportunity that I'm here to discuss, particularly with all of you tied to coal, is that there truly is an opportunity for, I think, long-term use of the coal for other than have been traditionally applied. Although, certainly there's coal-to-liquids applications that exist today. In fact, Dow Chemicals has been working on their coal-to-liquids facility with Shenhua in Yulin, China for some time. Right. And that's continuing to progress.

But the nuclear assist brings a unique application and I would argue it brings a very large multiple -- and the return on the coal assets. And I'll talk more about that in just a moment.

Both of these studies, the studies for the State of Wyoming and the State of Kentucky are on our website. If you're interested in getting access to them, drop me your card. I'll send you the link direct to the website so you don't have to fuss around and look for them but they are available. And they both fundamentally looked at the kind of generational approach, which would be, for example, the first coal-to-liquids facility might be just with existing technologies.

And as people have spoken about before, because you're using an oxygen process, gasification, take the CO2 for EOR. One of the limits of EOR in our view is that you -- as we looked at it, for example, in the State of Wyoming is, you know, after you build the first two or three 50,000-barrel-a-day plants, there's no more EOR capacity available in the state. So what do you do?

Or what happens if you get a price of carbon or you're faced with sequestration? And I think I heard every -- just -- I was up in Chicago the day before yesterday. And Robin -- it eludes me -- was

talking about CCS and said, you know, probably $100 a ton current cost estimates.

MR. DALTON: Billion?

MR. MOORE: Yeah, the billion. Anyways -- and we're always wrong. We're always low. We're probably low on our capital estimates, too. But I'm going to talk specifically about that transition to the high- temperature gas reactor assisted coal-to-liquids.

Let me briefly tell you why this technology is different than any other nuclear technology you're probably familiar with. The high-temperature gas reactor, first and foremost -- and I will tell you that's the reason that companies like Dow and ConocoPhillips even consider it is because it's intrinsically safe.

And that means that there are no scenarios where a catastrophic event would cause people outside a very small exclusion zone to have to shelter in place or evacuate, which means that you could site one of these near to or adjacent to a multibillion dollar -- $10, $20, $30 billion integrated petrochemical complex and not worry.

Why is it intrinsically safe? It's really fairly simple. And I'm not a nuclear guy, but I've been able to figure it out. One, the entire components in the inside of the reactor, the ceramic fuel and the pyrolytic graphite are not reacting with anything in the system. It's helium cooled. It has a negative reaction temperature coefficient, which means as it heats up, it actually physically shuts itself down.

In fact, it's been demonstrated with prismatic designs in Japan and the pebble design recently in China. Andy Kadak, who is a former MIT professor in nuclear witnessed the test in China about two years ago. Seven of these reactors of various designs have actually been built and operated, including one in the U.S. at Fort St. Vrain from '79 to '89.

You literally could decide you're having a bad day and everybody could leave and nothing bad would happen. As the reactor heats up, it actually shuts itself down well before any of the elements in the reactor, the ceramic fuels or pyrolytic carbine -- or carbon are impacted.

It has control rods, but don't need to drop. The spent fuel is air cooled. It has no active or passive safety systems. That is a true Gen IV reactor system. The other key attributes that come with this -- it said, "Okay. Now" -- the intrinsic safety says, "I'll go let you -- I'll consider having one of these next to where I'm having the large integrated petrochemical complex."

It's two-fold. One is it provides high temperature process heat. Reactor at a temperature of 750 C. That means I can just place virtually all my natural gas-fired high-temperature process heat -- right. I can make 1500-pound steam for a cracker very easily with this, with sufficient superheat. That's something you can't do with a light water reactor -- either the larger or small modular designs.

Secondly, if you look at the size, it's 625 megawatts thermal. That's about the same size as an F-Class gas turbine/steam turbine combination. That means so that if you would put in a four pack or six pack of these to supply high temperature process heat and power and a cogeneration application, it -- you

could actually have one down -- one trip and still have two other supplying reliable steam to your facility connected to the grid.

So what's this got to do with coal? Well, today if you wanted to do a coal-to-liquids facility, this is an example of a traditional Fischer-Tropsch -- includes a water shift reaction -- most of you are probably familiar with that. In order to get the right CO/hydrogen balance, you've got to throw some water in there. You convert a whole bunch of CO to CO2 in the process and make hydrogen.

The net result is to have 25,000 barrels a day of diesel coming out the back end. It takes about 14,000 tons a day of coal going in the front. And guess what? Seventy percent of the carbon ends up going out the stack as CO2.

Nuclear assisted does two things. One is it - - using the nuclear plant to produce high temperature steam electrolysis to produce the hydrogen allows you to avoid the water shift reaction. That means that you don't have to do any discharge of CO2. In fact, this is almost virtually no CO2 emissions from this

facility.

MS. GELLICI: We are not picking up everything on the (inaudible).

MR. MOORE: Yeah. You want me to go to the mike? All right. You can turn me off. I'll talk at the mike.

MS. GELLICI: Thank you.

MR. MOORE: Sure. So for literally roughly a third of the same amount of coal, you get the same amount of production out the back end. This is not unique but it is special. To give you an indication, the State of Wyoming produces about 1.1 million tons a day of coal today. If you attached this scenario to that 1.1 million tons a day of coal, you could produce 6 million barrels a day of transportation fuels -- roughly 50 or 60 percent of the U.S. demand.

I won't get into the graph here but suffice to say that, you know, there -- you can probably do a traditional coal-to-liquids facility with EOR somewhere in the $80-a-barrel range, compete with oil at $80 a barrel. The nuclear-assisted high-temperature steam electrolysis, we currently -- our economics look to be

in the $140-a-barrel range.

So that means that if -- well, if it's $140, you could make money coming out the back end on the synthetic fuels plant with the nuclear assist. That's without a price for carbon. If the alternative is paying $100 a ton to put in the ground or $50 a ton tax, this becomes economic well below $100-a-barrel oil.

Just on a relative time line, there's probably been about $500-$600 million spent by the Department of Energy so far on helping put together fuel qualification, graphite qualification. And I guess everybody realized it's a large economic lift for any new nuclear technology. Financing, like everybody else these days, is a challenge but we're still hoping to get this reactor technology commercialized in the mid- 2020 time frame.

So the end of the day, my ask of this group is, you know, are you interested? If you are interested, I'd certainly be more than willing to have a longer-term -- a longer discussion about what the opportunities this could bring to your industry, and

particularly in taking advantage of coal that's now being displaced, either through the shut-down of existing, small, inefficient plants or may potentially be the subject of a future regulation or other costs that would drive this.

This is a strategic view. And I'll give you an example. Dow Chemical is being strategic in its view and support of this, having been the first executive director and now executive director emeritus. But this is actually mentioned in Dow's energy plan for America. It was in the 2010 plan and it's in the current 2012 plan that's on their website.

Because again, I would say companies with foresight, who understand that some inevitable addressing of carbon will come to fruition -- if you're strategic in that viewpoint, this ought to be considered as optionality. And so the alliance continues to look for other partners to work with us and -- whether it's through studies or joining the alliance or going up and advocating on the hill to get some of the DOE funding.

So with that, I will close and open it up for

questions.

MR. NEMETH: Fred, I'm Ken Nemeth with the Southern States Energy Board. Just a question regarding the regulatory side. How do you see all those pieces fitting together, NRC having to make decisions about the nuclear side? And then, you know, what -- we throw EPA into the equation on the other side. What -- how hard is this going to be?

I mean, I see your last slide on, you know, state opportunities and working with states. But to me, the real crux of the matter is going to be will NRC approve this? You might be able to give us a little background on Fort St. Vrain and --

MR. MOORE: Sure.

MR. NEMETH: -- you know, that having been shut down and so forth and where we go from here.

MR. MOORE: Well, I mean, Fort St. Vrain was a little bit different design but similar in terms of being a high-temperature gas reactor. Now, first of all, nobody associated with this -- and again, I'm not a nuclear expert -- but including Idaho National Labs and others, the nuclear system suppliers like

Westinghouse and Areva don't believe that this is a technical issue in terms of it being licensed. It's really an economic hurdle at this point to get the license.

The other thing that this facility does is -- it's modular in design so that it's actually -- it's a helium-cooled reactor with a helium-to-steam intermediate heat exchanger. That's the nuclear island. Everything else is going to be outside the nuclear island. So, you know, from a license perspective, they're going to be the same license for every reactor or set of reactors.

I don't want to dismiss or underestimate the amount of effort it's going to require to get the first license for this because recognize that today every reactor that's operating in the U.S., all 104 -- or 103, I think they're shut -- Dominion's shutting one down or it has -- but, you know, are water reactors.

Fully half of the current Part 50 or Part 52 licensing requirements do not apply to this technology. Okay. It does not apply because there's no water. Now, all those things you worry about with water don't

exist. Lots of work, but we all think it's very doable.

MR. BAJURA: Hi. I'm Dick Bajura with West Virginia University. One of my first jobs professionally was with the Babcock and Wilcox Company and their pressurized water reactor. In listening to your presentation, if you could produce a hot steam at 750 degrees C, what are the economics of using your gas cold reactor technology for just regular steam generation using the heat exchangers as in PWR technology?

MR. MOORE: Great question. And the answer is it's actually quite economic in most parts of the world today for production of high-temperature process heat. That wasn't the focus of the talk today, but we -- our current estimates that we've done and we think are reasonably conservative say that this technology for producing process heat, i.e., steam, is competitive in the $5-$7-dollar natural gas range -- $5-$7 in the MBTU natural gas range with no price for carbon.

Each 50 -- each $10-a-ton price for carbon makes that more competitive by about $.50 in the MBTUs.

So a $50-a-ton price for carbon would make that competitive from about $2.50-$5.50 in the MBTUs.

On electricity basis, it competes at about the light water reactor level today, at about $85 or $90 a megawatt. It is -- it does have some other unique things. It -- for those -- for power production, it can operate in arid regions and be air cooled without the significant efficiency losses that occur with a light water.

A light water reactor would have such enormous efficiency losses. It would be difficult to do air cooled because, again, the return temperature on this high-temperature gas reactor is between 325 and 350 C. So you can still do effective air cooling, but very little -- you know, virtually no water condensing load would be required. Good question. I'm happy to talk about that.

Like, Dow's looking at it from cogen applications.

MR. ALI: Sy Ali with Clean Energy Consulting.

MR. MOORE: Yes.

MR. ALI: Your presentation is based on the whole premise that HTGR will be a product to help the coal industry. How close to commercialization is your HTGR?

MR. MOORE: We were -- we currently see that the first reactor could become operational in the mid-2020 time frame. That assumes that we continue to get the funding in the intermediate process to complete the fuel qualification and graphite qualification and materials qualification.

Fuel testing and graphite qualification is already underway. Part of the -- you know, as I said, there's probably been about $500 million spent at Idaho National Labs with -- through that advanced test reactor. The fuel has been through some rigorous tests already.

Babcock and Wilcox actually has helped develop -- actually developed the TRISO fuel that's used in this reactor. It took -- well, it used to be an art and turned it into a science.

So again, the -- one other interesting thing about this technology: at these temperatures, there

really aren't any metallurgical issues. I mean, there are chemical companies today that use superheated steam at 800 degrees C. So -- and the alloys that would be required for this technology exist. It's not a stretch. The ceramics that are used have already been used in high-temperature gas reactors around the world.

And the ceramic fuel is actually proving to be very robust and actually is the basis for the inherent safety.

MR. FASSBENDER: Alex Fassbender. Kind of a nerd question, but could you comment about the fuel and its life cycle and kind of contrast that with the fuel for a light water reactor?

MR. MOORE: Again, I'm not a nuclear expert. So -- but I know enough to be dangerous. The fuel actually uses a slightly higher enrichment than light water reactors, which are -- they say, what, 3, 4, 5 percent. So it's above -- I think it's going to be above 10, has to be less than 20.

It actually -- the initial tests that have been completed at Idaho National Labs show that it has probably about an 18 percent fuel burn-up versus a 3

percent fuel burn-up in the light water reactor. So it's about six times more effective.

And you've got to remember that for every light water reactor fuel element that's been put in since they've started in the 1970s, only 3 percent of the uranium fuel was actually utilized. The other 97 percent is still sitting in dry cask storage at each of the nuclear facilities.

Storage is usually an issue I get questioned about when I talk about this and even from my wife. And I remind her that it's -- if you took all the fuel -- as Admiral John Grossenbacher, who's the director of INL, has said that if you took all the fuel -- spent fuel over the 25 years and stacked them on top of each other on a football field, you'd -- it would be 20 feet high.

So, yes, waste is an issue, but volume's not. And those people who are steeped in nuclear say it's really a future resource. And we have not reprocessed any of that fuel, unlike Japan and France do today.

MS. GELLICI: Thank you, Fred. Thank you, Don.

MR. LONG: Now, for some Council business. I would like to ask Dave Surber to come back up as chairman of the Council's Communications Committee to give us a short report on yesterday's committee meeting.

David?

MR. SURBER: I will take my cue from the way you introduced me as giving a short talk. The three B's of public speaking are be brief, be sincere and be seated. The -- I will confine myself to say that in everyone's packet is what is, in fact, my report.

The agenda for the Communication's Committee, which met yesterday afternoon for about an hour, had -- the first eight points are what we talked about. You can refer to them and we'd be happy to hear from you on your reaction to those. And then as important was a one-page and seven-point plan of work of the Communications Committee of the National Coal Council for 2013 and beyond.

And I'll confine myself to just the first paragraph. "This," meaning the plan of work -- "This in order to increase public awareness of the existence

of and the goals and work of the National Coal Council and more widely disseminate its reports and studies and have its meetings more routinely and extensively covered consistent with our mandated requirement to be open and transparent."

That's my report. I'm sitting down now.

MR. LONG: Thanks, David. And now, I'd like to ask Greg Workman, who is chairman of the Finance Committee for the Council, to come up and give his report.

Greg?

MR. WORKMAN: Thank you, John. Thank you, Mr. Chairman.

My name is Greg Workman. I serve as the chairman of the Finance Committee of the National Coal Council. I will now report on the Finance Committee meeting that was held jointly by telephone conference call on May 7th with the Executive Committee.

At that meeting, the Finance Committee accepted the 2012 audit report from the Council's auditors, Chaconas & Wilson. Following the action of the Finance Committee, the Executive Committee also

accepted that report. I'm very happy to report that the Council received a clean determination.

Also at this time, I'd like to publicly thank everybody for their dues -- 2013 dues -- submitting those. I do ask those who have not done so at this time to do so as soon as possible. The financial state of the Council continues to be stable but only because of the support of the membership and the generous timely giving.

Financial problems faced by many in this -- in our country and indeed around the world continue to challenge that stability. If we all do our part, the Council will have the necessary financial resources to continue to effectively carry out our mission.

With that -- thank you, Mr. Chairman -- concludes my report.

MR. LONG: Thanks, Greg. Do we need a motion, Janet, on the audit? We don't?

MR. PALMER: No, we do not.

MR. LONG: Okay. Okay. You know, I think you guys heard me say yesterday, we're certainly pleased to be able to entice Janet Gellici to join the

National Coal Council after 30 years with American Coal Council. She's got some great ideas. It's clear she knows what she's doing by the success that we've seen at the American Coal Council.

So with that, I'd like for her just to make a few comments and kind of give everybody a perspective on where she's coming from. Janet?

MS. GELLICI: Thank you, John. I appreciate the opportunity to have the last word today. So about 20 years ago, I was approached by Jim McAvoy. For those of you who've been with the Council, of course, you know that Jim was the first executive director of the National Coal Council.

And he approached me and asked if I would be interested in possibly apprenticing to serve as the next executive director of the National Coal Council. And this was back in the early '90s. And I had just taken over as executive director of the American Coal Council. I was living in Denver. I was happy there. I was settled. I was not really ready for primetime in Washington, D.C.

And so I graciously declined. I told Jim,

"I'm just really not ready." I'm ready now.

I'm really ready now. I'm very, very, very excited about the opportunity to be up here and to serve you all. I was so very excited. My last day at the American Coal Council, after 30 years, as John said, was on May 15th. So Wednesday night, before the meeting started yesterday -- and I could barely sleep on Wednesday night.

And I had that same feeling, I remember, when I went to kindergarten. I just always wanted to go to school. I was just so excited. I was vibrating and I have that same feeling. So it was just really very, very exciting. I had my partner, David, take a picture of me and we're going to put, like, "Janet's first day at school," just a few years later.

So it's been very gratifying over the past few months and weeks to get letters and emails from folks, members of the Council and others in the coal industry in support of my taking over this position. And I really greatly appreciate that support. I know Bob Beck is not here but I did want to acknowledge and thank him for his stewardship of the council for the

last 15 years while I've been getting ready.

And I did want to thank him as well for his assistance with the transition, also to thank Larry Grimes with his help and Pam Martin for their help with the transition and John Eaves. John and I have been meeting every three weeks or so for the last two or three months -- very patient. Appreciate it.

During the transition time, I think things can be very unsettling. You know, there's a lot of chaos. There's some uncertainty, a little bit of upheaval and folks not sure where things are going. I think it was Isaac Asimov who said, you know, "Life is pleasant. Death is peaceful. It's the transition that's really troublesome." So -- and I think that kind of about sums it up.

But I think we can look at transition in another way. I think we can look at it as an opportunity for reevaluation, a refreshing, a reassessment. And I think that's what we're going to be doing. And I know that's what we're going to be doing.

The National Coal Council Executive Committee

has already been making plans. We've got a plan to plan, as it were, that we've been working on for the last two or three months. We're in the data gathering phase right now. In the middle of July, we will be hosting a strategic visioning session with a few of our top leaders to charter direction forward for the National Coal Council, which we hope will expand and enhance the activities of the National Coal Council going forward.

And I would like to ask for your help during this transition to take the opportunity afforded by this transition to provide us with your input. I'd welcome -- I'd actually encourage your input on what NCC can do, what we can do better going forward to achieve our objective, which ultimately is to provide advice and guidance to the Secretary of Energy.

And it's not just the National Coal Council that's going through a transition right now. I think it's an appropriate time for us to be undergoing a leadership transition in the midst of an industry that's also experiencing its own transitions and its own transformations. So we're kind of in step with

that.

During these periods of transition, I think we have the greatest opportunity to kind of orchestrate our future. Gustav Mahler said, "The real art of conducting consists in the transitions." And if you think about that when you listen to a symphony, it's really the transitions that the conductor is leading us through.

And I think NCC has an opportunity to help shape and conduct the future of the coal industry. NCC can and should be, I think, the vision keepers for the coal industry going forward. We should be holding in place and envisioning that greatest, highest, best use for coal in our nation. And not just in our nation, but for the betterment of emerging nations worldwide. I think we have tremendous domestic resources that can fuel our economy. And we have an opportunity to help the world's emerging economies as well.

Each of you, as National Coal Council members, can contribute to defining that vision. I would encourage you again to use the NCC as an opportunity to serve as a catalyst to eliminate that

path forward towards the future of our industry. Again, I invite you to join us in that effort, take advantage of this leadership transition to please recommit your energy, your time, your finances, to echo Greg's comments, towards the National Coal Council.

Go ahead and unleash your inner conductors. Help us orchestrate the future for the coal industry. We have a tremendous resource here with the National Coal Council and our opportunity to liaison with the Department of Energy. So I encourage you to join us and invite you and your support. And I thank you very much for your support and your confidence in me going forward.

Thank you.

MR. LONG: Thank you, Janet. I mean, we're so glad to have you. I think there's never been a more important time for us all to pull together. I mean, we're in a challenging environment but at the end of the day, coal will prevail.

The meeting today is duly authorized and publicized and is open to the public. The public can submit comments to the DOE or if any individual wishes

to speak, they may do so at this meeting.

Is there anybody that wishes to speak at this time?

(No audible response.)

Hearing none, let me announce that we've planned to have the fall meeting here in Washington, D.C. Once we have a date and a time, we will announce that. Hearing no other business to come before the Council, I stand adjourned. Thank you.

(Whereupon, at 11:45 a.m., the National Coal Council Meeting was adjourned.)

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