NATIONAL COAL COUNCIL

2007 FALL FULL COUNCIL MEETING

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I N D E X

P R O C E E D I N G S

(9:20 a.m.)

Welcome and Opening Remarks

MS. NELSON: Good morning, ladies and gentlemen. My name is Georgia Nelson. I'm Chair of the National Coal Council. The regular meeting of the National Coal Council is hereby called to order.

At our meeting this morning, we are fortunate to have a number of very special guests.

We're pleased to welcome this morning the Under Secretary of Energy, Bud Albright. Chairman of the White House Council on Environmental Quality Jim Connaughton, who had planned to join us will be unable to do so due to a scheduling conflict.

Also, we have the following speakers on today's agenda: Roger Bezdek, Management Information Services, Inc.; Alex Fassbender, ThermoEnergy Corporation; and David Mazyck, University of Florida.

In addition to the speakers, we must also conduct the regular business of the Council, so we have a very full agenda.

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, in addition to representatives of our members.

I would like to welcome guests from the public who have joined us today. If any of the representatives of our members care to offer comments during our meeting, they are welcome to do so. An opportunity will be provided for other guests to make comments at the end of the meeting.

Full and complete minutes of this meeting are being made as well as a verbatim transcript. 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 the adoption of the agenda.

MR. MARTIN: So moved.

MS. NELSON: Do we have a second?

MR. LONG: Second.

MS. NELSON: All in favor:

(Chorus of ayes).

MS. NELSON: All opposed?

(No response.)

MS. NELSON: Thank you. The Secretary has reappointed most of the current members of the Council for the new 2008/2009 term and has also appointed several new members. I would like to ask that if any

of these new members are here, that they please stand so that we can recognize them.

Mike Sutherlin, Joy Global. John Meade, Southern Illinois University. Ken Wilmot, Alliant Energy. Paul Feldman, Midwest ISO. Klaus Lambeck, Public Utilities Commission of Ohio. Majoh Guha, Professional Engineer. Dan Jack, Reschini Agency, Inc. Frank Burke, Private Consultant. James Mellody, FirstEnergy Solutions. Joe Hopf, PPL Energy Plus. Gregory Workman, Dominion Resources, Inc. Tom Linebarger, Cummins, Inc.

Congratulations on your appointments. We are very happy to have you on board.

We are also pleased to welcome Jay Braitsch as the designated federal official for our meeting.

I would now like to introduce Under Secretary Bud Albright for some remarks.

Bud Albright was nominated by President George W. Bush to serve as Under Secretary of Energy on June 21st, 2007, and was unanimously confirmed by the Senate on August 3rd, 2007.

Under Secretary Albright oversees the Department of Energy's Energy and Environment Programs, including its diverse portfolio of applied energy research and development activities, nuclear waste

management efforts, and environmental clean-up of the nuclear weapons complex.

Prior to joining the Department of Energy, Mr. Albright was Republican Staff Director for the U.S. House of Representatives Committee on Energy and Commerce. In that role, he worked to address issues facing the country's energy, environmental, telecommunications and health industries. Before joining the committee, Mr. Albright was Vice President of Federal Affairs for Reliant Energy.

Mr. Albright also served as Deputy Associate Attorney General at the U.S. Department of Justice, as well as Deputy General Counsel of the U.S. Department of Housing and Urban Development.

Additionally, Mr. Albright was an Associate Counsel on the U.S. Senate Select Committee investigating the Iran-Contra incident. From 1981 through 1986, he also served as an Assistant United States Attorney in the Eastern District of Virginia.

While attending law school, Mr. Albright worked on the U.S. Senate Judiciary Committee as a legislative aide and personal aide to Senator Strom Thurmond. He has also worked as a law clerk at a private law firm.

A native of Rock Hill, South Carolina, Mr.

Albright holds an undergraduate degree in History and Political Science from Presbyterian College in his home state and a Juris Doctorate degree from George Mason University School of Law in Virginia. Mr. Albright lives in Virginia with his wife and their two children.

(Applause).

Remarks

HON. ALBRIGHT: Thank you, Georgia, for that nice introduction, and thanks to the National Coal Council for inviting me to join you this morning.

Let me begin by saying that the Department, and Secretary Bodman, appreciates your concern regarding the industry that produces the majority of the electric power that keeps our country running.

The Secretary is looking forward to receiving the NCC report he recently requested concerning technology options to allow broader use of clean coal. Your report will be a welcome complement to the president's efforts to ensure that coal remains a key component of the nation's energy mix, as we grapple with the new energy reality here at home and abroad.

We do have a new energy reality. The facts are clear. Worldwide demand has outstripped supply. Over the next 25 years, global energy consumption will increase by an additional 50 percent, with 70 percent

coming from the world's emerging economies. We have changing world conditions. Infrastructure is more extensive and expansive. It is more vulnerable to terrorism and disruption.

Opportunities for exploration and production are limited by an increasing trend toward resource nationalism. Two-thirds of the world's oil and gas reserves are in countries that substantially limit or prohibit any foreign investment. Resource nationalism, limited access and infrastructure constraints may limit production to less than what is required.

Conditions must be considered in the context of global climate change and the future reality of a carbon-strained environment. That makes this a very new energy reality. Now the question is how do we address it?

Let me now turn to the Administration efforts. We know that it takes technology and science. We know that it takes a strong economy, and we know that it takes investment.

Since 2001, the United States has invested nearly $18 billion in clean energy technology research and development. The president's current budget requests $3.9 billion in funding, a 14 percent increase over last year's appropriation.

But there is no silver bullet that will solve our energy challenge. Instead, the solution requires action on multiple fronts, all of which this Administration is pursuing: heavy emphasis on renewables and alternative fuels, Advanced Energy Initiative, increased funding for basic science research, American Competitiveness Initiative, enhanced energy efficiency, expansion of clean, safe nuclear energy, and investment in clean coal technologies.

The Coal Challenge. While we are rightly emphasizing renewables, alternative fuels, we also must recognize that our economy is, and will remain, heavily dependent on fossil energy. This nation is blessed with an abundant coal supply - 250 year domestic supply at current consumption rates.

The challenge: find ways to use coal more cleanly and efficiently to reduce, if not eliminate, its environmental impacts.

The Administration is answering the challenge: developing carbon sequestration capacity. Last month, the DOE awarded funds for three of seven large-scale carbon sequestration projects to conduct tests for the storage of CO2 in deep saline reservoirs. DOE and its partners plan to invest over $300 million over 10 years for these important projects.

Collectively, these formations have the potential to store more than 100 years of CO2 emissions. This will help enable us to one day use coal without emitting greenhouse gases into the atmosphere.

The president's Clean Coal Power Initiative is a 10-year, $2 billion effort. It is a government-industry partnership to support the development of advanced new clean coal technologies on a demonstration scale. In September, Secretary Bodman joined Southern Company and its partners for groundbreaking of the advanced IGCC facility in Orlando, Florida.

With regard to tax incentives, last year, DOE and the Treasury provided $1 billion in tax credits to support nine advanced technology plants, with an additional $650 million scheduled for next year, with top priority going to projects that include carbon capture and storage.

There will be loan guarantees to help sponsors raise the upfront capital necessary for clean energy technologies, such as clean coal. Last month, DOE issued final regs for the program. We can anticipate up to $13 billion to guarantee loans for projects that avoid, reduce or sequester greenhouse gas emissions and get critical technologies to market

faster.

And finally, let me say a few words about the FutureGen Project, our effort to design and build the first near-zero emissions fossil fuel plant.

I'm pleased to say that the EIS for the project was completed last week. The DOE remains committed to the goals and objectives of FutureGen. However, as most in this room are aware, the heavy industry sector has experienced rapid and steep cost escalation in recent years. FutureGen's price tag has doubled and could go higher. We are working with our industry partners, the FutureGen Alliance on a path forward to ensure sustainability of the project in the face of rising costs.

I'll close today by returning to a theme from the outset of my remarks. We are facing a new energy reality, both at home and overseas. In past years, our economy, and the world, has grown accustomed to relatively inexpensive energy, whether gasoline, electricity or natural gas. For reasons that we've touched upon today, increased demand, global instability, and the need to control emissions, that is no longer the case.

Considerable technological and scientific challenges lie ahead of us, but we can and we will meet

them. This will not come cheaply, and we must face the reality that costs will rise. But we are on the right path and I hope you agree with me that the president is correct when he says America must move quickly down the road to greater energy efficiency, diversified energy supply, and reduced reliance on energy imports.

Much work remains to be done, but we can build on our successes thus far and ensure that goal will be an environmentally-safe and abundant source of energy well into the future.

Thank you.

(Applause).

MS. NELSON: Thank you.

Council Business

MS. NELSON: Before we get to our featured speakers, I'd like to conduct our Council Business.

By letter, dated August 15th, 2007, in my position as Chair of the National Coal Council and on behalf of the members of the Council, I signed a letter to Secretary Bodman requesting his approval to conduct a new study that would build on the work of the previous two Council studies.

In his letter of response, dated October 12th, Secretary Bodman approved of the Council conducting this study.

While not much time has passed since the Council has received this approval, we have been working diligently to establish a management team to conduct this work. Council member Mark David Goss, Chairman of the Kentucky Public Service Commission, has agreed to chair the study for the Council. Council member Paul Cicio, President of the Industrial Energy Consumers of America, has agreed to chair the Study Work Group.

I would now ask that first Fred Palmer, Chairman of the Coal Policy Committee, and then Paul Cicio come to the podium and give a brief status report on the study.

MR. CICIO: Before I get into the study, I just want to be sure that everyone in this room, every member of the National Coal Council understands that the Industrial Energy Consumers of America values its participation in the National Coal Council.

We have our challenges and we are all in this together, and I hope that we will take this meeting and the announced study and increase our participation in the National Coal Council, that we have all of the coal companies and all of its suppliers and all of the electric utilities and all of the consumers on board. We have an important message, we have an important

role, and much is at stake.

Specifically for the Industrial Energy Consumers of America, we are large, large consumers. It's the paper industry, the steel industry, the aluminum industry, the brick industry, the cement industry, the bit processing industry, fertilizer.

Unfortunately, we use a lot of energy. Energy costs have gone up and we have paid the price and these jobs are moving overseas. We need affordable and reliable energy, specifically electricity. That's one of the reasons why we've built so much capacity here in the United States.

But unfortunately, with higher energy costs since 2000, we have lost in the United States a total of 18 percent of all manufacturing jobs, 18 percent, 3.1 million high-paying good jobs.

When I say what's at stake here, I challenge anybody to increase the GDP of this country without increasing the use of these products. Cement. How are you going to build roads without cement? How are you going to build your infrastructure without steel? Bridges? High-rises? How are you going to increase your food production without more fertilizer? How are you going to build lightweight vehicles or airplanes without more composite plastics and aluminum and on and

on and on?

My point is, is that, the Industrial Energy Consumers certainly value the role of coal in the energy mix in this country and we are dedicated to work with you to find good technology solutions, not only for the country but for the world, and to help us as a world reduce our carbon footprint. It's good for everybody.

Now with that, as has been announced, the Secretary has approved the Council to conduct a green coal study and to also simultaneously meet our nation's environmental challenges.

There are five parts to the study. Part 1, beneficial electrification of the economy from low-cost coal with carbon capture and storage and zero criteria pollutant emissions.

Number 2 is turning coal into pipeline quality syn gas with up to 99 percent carbon capture.

Number 3 is producing liquid transportation fuel from coal with superior air quality properties with 80 percent carbon capture.

Number 4 is use of electricity from green coal to fuel hybrid plug-in electric vehicles.

Number 5 is exploring the feasibility of in situ coal gasification with near zero emissions.

The study is going to focus on operating projects. It will incorporate performance and economic data. Consistent with the National Coal Council guidelines and our standard operating procedure, we will be calling a meeting shortly with Mark David Goss and the Council leadership to arrange for our first meeting. All of you will be notified of that meeting, the time and place, and we, as always, we need your input. We are all in this together, and we look forward to working with you on this project.

Thank you very much.

MS. NELSON: Thank you, Paul. I might mention that in your packet, there should be a copy of the letter requesting this study and explains the study in some detail.

In addition, let me underscore one of the comments that Paul made. One of the reasons that the Council studies have been so well received and so robust in terms of their subject matter and content is because of the participation of everyone on the Council, and so please, as you receive the e-mail, if you have something to contribute, if you have an interest, if there's someone in your company, on your staff, whatever, they can add to the thinking, we welcome all of your participation.

We have one other item of Council Business before we move on to our guest speakers. So, I would like to dispense with the Council Business first. We'll take a short break and then come back for speakers.

But I'd like Bob Beck to give you a brief report on the 2007 Audit and the 2008 Budget.

MR. BECK: Thank you, Georgia. The report is on behalf of Rich Eimer, who's the Chairman of the Finance Committee, who is involved with his own board meeting this morning and could not be with us.

As per usual, Chaconas and Wilson is the auditing firm that we will once again have conduct our audit and that will be taking place some time in the first part of next year.

As for the 2008 budget, as Rich reported to you all at our Spring meeting this past June, we are in an effort to rebuild our reserve account which has basically gone to just about zero. The invoices for the 2008 dues were mailed on Friday. So, when you all get back to your offices, check your snail mail and hopefully those invoices will be there.

As Rich announced at that meeting, the Executive Committee has requested that folks consider doubling this year's dues payment in order to build

back those reserves. That is reflected in the invoice. We understand that some of you may be able to do that and some may not, but whatever help you can afford the Council would be greatly appreciated.

Other than that, if, when you get back and you see the invoice and you would like it worded in some other manner, some of you have requested that from time to time, please feel free to give us a call or shoot us an e-mail and we will do that for you.

We do not routinely approve the budget at this meeting because that's a function of the Executive Committee, but if anyone does want a copy of the 2008 budget, if you can't sleep at night and you'd like to read numbers that are really tiny, we would be more than happy to give you copies of that. Again just see me or give me a call or whatever.

That's really all for the report and -- oh, one other thing I might point out on the study. Several of you have asked me if the study will also look at the legal ramifications of liability, due diligence, ownership of the CO2 that we're trying to store.

We fully intend to do that, so that would be, I guess, Paul, maybe Point Number 6 to the study that would run throughout the concept of the study as well.

Thank you.

MS. NELSON: Thank you, Bob. Okay. Let's take a 10-or-15-minute break. We'll reconvene at about 9:45. How's that?

(Whereupon, a recess was taken.)

MS. NELSON: Please begin to take your seats. We're going to start here in a couple of minutes. Thank you.

(Pause).

MS. NELSON: Welcome back. We'll reconvene. I'd like to introduce Mike Mueller, who's the Vice Chairman of the National Coal Council. Mike's going to handle the speaker portion of the program.

Mike?

MR. MUELLER: Good morning, everybody. It's my pleasure to welcome and introduce our guest speakers today, and our first speaker is Dr. Roger Bezdek, and as Fred had mentioned a little bit earlier, he's going to talk to us about coal to liquids today.

Dr. Bezdek is the President of Management Information Systems. He has 30 years' experience in research and management in the energy, utility, environmental and regulatory areas, serving in private industry, academia, and the federal government.

Dr. Bezdek has served in many capacities.

Some of those include corporate director, corporate president, CEO, university professor, research director in ERDA and DOE, and special advisor on Energy in the Office of the Secretary of Treasury. He has served as a consultant to the White House, federal and state government agencies, and various corporations and research organizations.

During 2003-2004, Dr. Bezdek served on the federal task force charged with rebuilding the economy of Iraq and is currently serving as a member of the Joint U.S. National Academies of Science/Chinese Academy of Sciences Committee on Energy Futures and Air Pollution in Urban China and the United States.

Dr. Bezdek received his Ph.D. in Economics from the University of Illinois, Urbana, is an internationally recognized expert in energy market analysis, research and development assessment, and energy forecasting. He is also the author of four books and of 200 articles in scientific and technical journals.

He's a recipient of numerous honors and awards. He has also served as a U.S. representative to international organizations on energy and environmental issues.

With that, please join me in welcoming Dr.

Roger Bezdek.

(Applause).

Presentation on Department of Defense CTL Projects

DR. BEZDEK: Thank you for the introduction.

Today, I'm going to talk about the importance of coal to liquid in the nation's energy mix and then look at how the Department of Defense views it and the importance of it for civil aviation as well.

As most of you know, we are becoming increasingly dependent on energy imports for both oil and natural gas. These are the latest EIA forecasts of our increasing dependence. By 2030 EIA, it's forecasting that we could be importing two-thirds of our oil and as much as 25 percent of our natural gas. Other forecasters are less optimistic, saying that we could be importing up to 75 percent of our oil and 25 to 30 percent of our natural gas.

There are obvious serious and increasing risks to this excessive energy dependence. It will depend on OPEC and a small number of countries. There's a potential of excess dependence on imported natural gas, which I'll say more about in a minute, as well as oil. Real oil production may have already peaked, if not, it will certainly peak within the next seven or eight years, and by peaking, I do not mean

running out of oil, simply the demand for oil is increasing faster than available supplies, and that situation is likely to get a lot worse for the foreseeable future.

Worker trade deficit. Almost 800 billion in 2006, caused in large part by imports of energy, increasing global competition of energy supplies from China and India and other developing nations.

Concurrent with this, of course, there's very serious natural security concerns expressed by the Department of Defense as well as this Administration. The lack of secure, reliable source of energy obvious, the dependence on foreign oil, ultimately becoming more dependent on foreign refined fuels, the supply chain vulnerability and the obvious threat of terrorism and natural disasters. All of these again are natural security concerns of which the Department of Defense is quite worried.

This signifies the beginning of peak oil. Oil for the past couple of years has gone from $20 a barrel to it's now, having shot to where it is today, it's approaching triple digits, and again peak oil does not mean the world is running out of oil. There's one or two trillion barrels left. It's simply the fact that we cannot -- the world cannot produce it fast

enough. It's demand-driven, in large part not only by the United States but the increasing demands of economies from China and other nations.

I was at an energy conference in Houston here last month which was very good and very depressing. Some of the top energy experts in the world were looking at future oil supplies and demand and the situation is quite bleak. Talking with T. Bone Pickens, he said that he expects $100 a barrel oil by Christmas. The way things are going, he may well be right.

Right behind this, I think, especially with oil approaching $100 a barrel, there's general awareness of our problems with being more and more dependent on imported oil. Natural gas situation is close behind that but not nearly the recognition.

U.S. natural gas production peaked what, four or five years ago. Natural gas production in Canada has also peaked and is decreasing. Any forecast you want to look at indicates that we're consuming more and more and producing less and less and therefore we'll be importing more and more, being as the EIA has changed their forecasts somewhat, but the situation again is quite disturbing, certainly cause for concern. Again by 2030, we could be importing 20-25-30 percent of our

natural gas, almost all of it in the form of LNG, which means the LNG situation -- everyone from Alan Greenspan on down has stated that LNG will be our salvation. Somehow it's going to save us from natural gas problems.

Aside from the fact that LNG is a global economy priced off of oil, but increasingly being priced as an international commodity, very similar to passing effects and problems, very similar to that of imported oil in terms of excess dependency, security risks, balance of payments problems and so forth.

The other thing which we have been talking about for at least a decade now, many of the same people who express concern about our excessive dependence upon foreign oil from unstable regions and nations, people that just don't like us, haven't realized that much of the LNG we will supposedly import in the next 20 years come from the same regions and the same nations.

So, if you're concerned about the problems of excessive dependence upon imported oil, then you need to be even more concerned about being dependent upon those same people and nations for imported natural gas in the future, if the forecasts I've just shown are anywhere near to coming true.

Also, especially with respect to the liquid fuels problem, people just don't recognize, in general, the scale of the problem. This is a little exercise we did at the request of DOE last year after President Bush's famous reference to addiction to oil and dependence on foreign sources, et. cetera.

The subtitle I put up there is the first thing you have to do is stop digging. Then we asked what are the implications of not becoming more dependent upon foreign oil imports but just maintaining the level of dependence as it was in 2005 at about 13 million barrels a year? Well, you heard one report said 13 million barrels a year, U.S. consumption continues to increase and U.S. production, domestic production of oil continues to gradually decrease and you've got the upper wedge there, there's a supply gap.

By 2025, this tells us that not to reduce our dependence on foreign oil but just to keep it where it was in 2005, we'll need an additional, an incremental five million barrels a day of liquid fuels. That's a lot of liquid fuels. For example, that's more than five times the amount of liquid fuels that the entire country of Australia currently uses.

So, just to stop digging, we need an additional five million barrels of liquid fuel within

certainly less than 20 years. It's an enormous problem, the scale of which, you know, people when they talk about energy dependence and they talk about various alternatives, such as windmills and affordable tax and the rest, simply don't realize the problems we face.

These graphs are from a study we conducted for the Southern States Energy Board last year. We tried to determine if we were serious about reducing or eliminating oil imports by 2030, what would it take? Well, it takes a whole portfolio of options obviously. We have to become much more energy efficient in the transportation sector. Everyone seems to agree on that.

We're still going to need an awful lot of incremental liquid fuels, as U.S. consumption goes up at some rate and U.S. production of liquid fuels goes down. For those people who think you can reduce total U.S. consumption, I have two figures for them. 300 million in the United States today and in 35 years, there will be 400 million. So, we're talking at best reducing the rate of increased consumption.

Among the portfolio of options we have that we looked at that are technologically and commercially feasible, again there's transportation efficiency

obviously, biomass liquids, enhanced oil recovery, oil shale, and, of course, coal to liquids. Coal to liquids is not exclusively the only part of the solution, but it is the key part of the solution and requires upwards of about -- it's about a third of the solution to the problem.

CTL, we feel, is capable of producing about 29 or 30 percent of the incremental liquid fuels we need by 2030. This presupposes a massive aggressive effort over the next quarter century in all of these areas, but in coal to liquids, CTL has to be a major part of the solution. We can't come close to eliminating or significantly reducing oil imports without CTL.

Theoretically, the U.S. can't become what some people are calling the conservative estimate of domestic coal resources in the oil equivalent. We have about twice as much oil equivalent, U.S. coal reserves. Forget about oil and shale and the rest. Just the U.S. coal reserve is twice the volume of oil equivalent as in the entire Middle East.

CTL technologies. There's nothing exotic. It's been around for at least 80 years. It's gasification conversion and then upgrade to clean, ultraclean synthetic fuel.

There's been a number of studies over the past year or so looking at the potential of CTL in the U.S. energy mix. We mentioned the SSEB study last year, see that we get to 5.5 million barrels or more by 2030. Again, this presupposes a massive crash effort starting hopefully this year or next.

The National Energy Technology Laboratory study published in July of 2006 said we'd get to about 5 or 5.1 million barrels by 2027. The NCC study last year said more than 2.5 million by 2025. The DOE Unconventional Field Task Force said 2.5 million by 2035. A range of estimates, but the bottom line is all studies indicate that the potential for CTL in the U.S. is tremendous, is very significant any way you wish to cut it. Again, CTL has to be part of the solution.

DoD is very interested in FT fuels, especially CTL. The program using nine different kinds of battlefield fuels, we want to reduce that to one, and FT process fuels are the way to go, they feel.

Well, what this series of pie charts simply shows is that the government uses about two percent of the liquid fuels in the country, 93 percent of that is DoD, and upwards of 60 percent of DoD's is the Air Force. So, the Air Force is, you know, obviously and logically by far the largest user of liquid fuels in

the federal government, a very significant user as far as the entire country goes.

This is the Air Force view of the situation. They feel just like DoD, that energy is both an economic security and national security issue. The costs are obviously going up two and three and fourfold over the past several years and when the data come in for 2007, we'll see another huge increment.

National security issue. I mentioned that earlier. In terms of the Air Force, it's reducing the flying hours and hurts training and combat readiness. They're looking for assured domestic supplies of fuel for obvious reasons and a resilient and reliable energy distribution capability.

They feel, certainly after the hurricane situation several years ago, that the oil markets are very dicey, to say the least. Energy price forecasts remain elevated through 2007, obviously through 2008, '09, '10 and so forth.

Of course, the Air Force concerns are a subset of the national concerns. The Air Force can demonstrate leadership. They're trying to develop a comprehensive Air Force strategy. They want to develop enough independence to have assured domestic supplies for aviation purposes.

These graphs simply indicate how the Air Force costs have increased both in total as well as gallons per flying hour and et. cetera. The lines go up and up and again when you get to the data for the most recent year, those lines will simply be a lot higher.

All right. The Air Force has a program. They want to accelerate development and use of alternative fuels, especially FT fuels. They want to increase use of the syn fuels to a hundred million gallons in the next two years. They want to certify the entire aircraft fleet on FT fuels by 2011. They've also already certified the B-52 fleet on FT fuels and are now in the process of certifying all the other airplanes they have in their fleet. They want to extend contracting authority to 25 years. This is very important for stimulating a commercial syn fuel CTL industry, that the Air Force will be able to offer firm priced contracts for the products for the next 25 years. That is currently going on in Congress.

They have a goal by the year 2060, 50 percent of the fuel they use will be syn fuels, primarily FT fuels, derived from coal. I mentioned the B-52 bomber test has been successfully completed. Again, the Air Force wants to partner with industry for the

development of the U.S. syn fuel industry.

The Fisher Fuels have enormous benefits for the Air Force, for military aviation as well, of course, for civilian aviation, as we'll see in a minute. So, I'll talk more about that in a second. Superior low temperature properties and excellent thermal stability of high temperatures.

So, as far as the Air Force is concerned, FT-derived fuels are really a win-win-win situation.

The Air Force does have environmental concerns. They'll not buy the fuel unless it's greener. CTL-derived fuels can meet this Air Force goal. These are the emission reductions relative to typical diesel fuels from CTL. You'll see very substantial reductions at the burner point from sulphur aeronautics, hydrocarbons, carbon monoxide particulates, NOX, and CO2.

In addition, the Air Force wants to ensure that the carbon footprint of their syn fuels be less than imported oil. CTL can achieve this with the CS. This is data from the Department of Energy's National Energy Technology Laboratory. You'll see that both Illinois Coal and Wyoming Power Basin Coal with CCS will have a much smaller carbon footprint than imported oil.

So, there's been so much misinformation over the past year or two about dirty coal and how dirty CTL fuels are or will be. If you retain anything from this presentation this morning, remember this graph and this one to refute those arguments. These are in today's environment very, very important points to remember.

Commercial airlines are also very concerned about rising fuel costs and if you have been reading the papers or watching television the past month or two, this concern has been increasing drastically. Beginning in 2006, for the first time in history, fuel exceeded labor as the major cost for U.S. airlines. Fuel is now 27-28 percent, labor is 23 or 24 percent. This is 2006 data.

When the data for 2007 comes out, I expect that fuel costs will be closer to 30 percent of airline costs. Again, a major change the first time in the history and as any of you who have flown recently, airlines have cut back on pretty much everything else in terms of service personnel and reliability and whatnot. But, you know, it cannot cut back on fuel. You need fuel to fly airplanes.

The price of per gallon of jet fuel increased by just one cent a gallon, it costs U.S. airlines an additional $200 million a year in annual operating

expenses. American Airlines uses more fuel than the country of Ireland which I find interesting. In 2006, they paid almost $200 million more for fuel than in 2004. So again, aircraft industry in general and individual airlines in particular.

Most importantly, unlike the other modes of transport, aircraft currently have no alternative sources of fuel. You don't hear about hybrid airplanes. You don't hear about electric airplanes. Airplanes need at present and into the future petroleum-based fuels to fly.

In other work I've recently done, I'll just mention a minute here, you look at both the national and international forecasts for growth in airlines, everyone is forecasting that airline miles traveled, revenues, commercial, general aviation, cargo-carrying aircraft, will be increasing somewhere between six-eight-10 percent a year for the next 25 years.

Think about that almost exponential rate of increase compounded over 15 or 20 years and you see why the aircraft industry and the airline industry is concerned.

Again, aviation fuel costs have risen rapidly, tripled in four years, and when the data for 2007 comes out, expect that $38 billion figure to

probably be somewhere in the range of $45 to $50 billion.

The other interesting fact, you talk about the scale of the problem, which I know people just have no comprehension of, a little exercise we did. You look at the EIA forecasts of U.S. domestic oil production in 2030. Then you look at the EIA forecast of U.S. civilian aviation fuel requirements in the year 2030 and you see that by the year 2030, EIA is forecasting, under the reference case scenario, that the liquid fuel needs of the U.S. civilian aviation sector will begin to approach 50 percent of U.S. domestic oil production in that year. That's all aviation. That's general aviation, cargo, passenger, et. cetera.

But think about it for a minute. Somewhere about 45 percent of total U.S. domestic oil production in 2030 may be required by the U.S. civilian aviation sector. What does that leave for the rest of us? For vehicles, for state governments, for emergency vehicles, fire trucks, the Department of Defense, and so forth. Again, it's the scale of what we're heading for, the scale of the problem, that people simply don't seem to realize.

Even if we're off by a factor of 10 or 20

percent, so what? The problem here is enormous and it's not only a problem for civilian aviation. They're not going to get 45 percent of U.S. domestic oil production in that year. I can guarantee you that.

Fortunately, CTL provides a very valuable alternative fuel. Aircraft, both civilian and military, have highly specialized demands for fuel. Syn fuel, using CTL technologies, offers great promise as that alternative aviation fuel. It can meet current specs and no aircraft redesign and no new engines are required. That's very important for both civilian and military aviation. That is, CTL can provide a drop-in replacement for jet fuel. Simply drop it into available airplanes that you have out there.

Biofuels can't do this. For all the talk and hype about used french fry grease and all the rest, biofuels are not compatible with aviation requirements. They probably will not be for the foreseeable future.

Most importantly, synthetic aviation fuels derive from coal are currently used and have been for the past decade. Any airplane that flies in or out of Johannesburg International Airport is fueled with at least 50 percent of CTL-derived fuel. So, it does work. We know that.

In response, aviation sector and individual

airlines are beginning to encourage syn fuel development. JetBlue, Federal Express, Virgin Airlines. Other airlines are getting active in this area. Last Fall, the ATA Commercial Aviation Alternative Fuels Initiative began to look at this. So, the aviation industry, civilian aviation is aware of what's happening here.

Take that one example of FedEx, obviously a major player in aviation and transportation. $32 billion in revenue, quarter million employees, more than 700 aircraft and 50,000 ground vehicles. 2006, it spent $2.5 billion for fuel. In 2007, $4-4.5-5 billion. We don't know yet, but it's going to be a lot higher than that.

An individual company at the micro level of FedEx has been fuel price hedging and reverted to the good old fuel surcharge. If you've shipped anything by Federal Express in the past year or two, you see that little added part of your bill which is a fuel surcharge. FedEx can get away with it. A lot of other companies probably can't or can to a lesser extent.

They tried price hedging. It didn't work. They're seeking to use more fuel-efficient and hybrid vehicles in their ground fleet. They've had mixed success with it. It's a very long-term program and, of

course, they're exploring the use of alternative aviation fuels for obvious reasons.

At the macro level, Fred Smith, CEO of FedEx, is co-chairing Securing America's Future Energy, which is dedicated to reducing U.S. oil imports and increasing energy security, encouraging the federal government to develop alternative fuels and promoting U.S. vehicle fuel efficiency standards. FedEx realizes that if the country is in trouble, then FedEx is in trouble with respect to liquid fuels. There's certain things they can do as an individual airline. There's other things that have to be done nationwide.

In sum, first of all, U.S. oil imports are increasing and may exceed two-thirds by 2030, may exceed two-thirds next year the way things are going. This dependence is causing obvious economic foreign policy and national security problems. Coal can and must play a key role in reducing U.S. energy imports and enhancing national security.

The U.S. coal reserves are twice the oil equivalent of the entire Middle East. CTL Technology is well proven and currently in use in other nations. Again, I stress that well proven and currently in use which you can't say for any other alternative liquid fuel technology at the present time.

U.S. CTL potential could be as much as five million barrels per day within 23 years. This is technologically and commercially feasible. Whether it happens or not is open to some question, given what's going on in Congress, and as the Under Secretary said here earlier, it's up to the people in this room to try to help to make this happen.

The DoD and the Air Force have immense liquid fuel requirements and really want to rely on CTL-derived fuels. U.S. airlines are also concerned and the bottom line here is U.S. must develop a viable CTL industry.

The Air Force is very serious about using synthetic blends. Their long-term goal, near-term goal, actually, is 50 percent by 2016, as I mentioned. There's a lot of ongoing research and development and use of fully synthetic fuels. They really want to work with industry to develop the U.S. CTL industry.

Finally, civilian airlines have much the same concerns and problems and face many challenges. For the first time in history, the largest single cost for the U.S. airlines. Coal-based syn fuels are the only viable alternative the airlines have, the aircraft have, either in the military or the civilian sector. There's a number of civilian initiatives underway to

address this.

Thank you for your attention.

(Applause).

MR. MUELLER: We have time for a few questions if anybody has any for Dr. Bezdek.

MR. HOLLINDEN: Could you talk a little bit about economics?

I'm sorry. I'm Jerry Hollinden, PBL.

DR. BEZDEK: Well, we've done a lot of looking at the economics of CTL plants over the past several years. Without a doubt, costs and anticipated costs have gone and are going up, but that's true of anything and everything in the energy sector these days, including FutureGen, including offshore drilling, including transmission lines and nuclear power plants and everything else.

The feasibility study we've conducted for a number of clients over the past two years indicates that CTL plants under reasonable assumptions are viable with oil in the mid 40s, $45 a barrel. With the increase in cost we've experienced, it's probably in the range of assuming $50 a barrel today, certainly anything like current oil prices, CTL plants are a winner.

Why aren't they proceeding more rapidly?

Because everyone in the energy industry recognizes what happened in the 1980s where you had oil in today's prices going from a $100 a barrel down to, you know, $30 or $40 a barrel in a matter of several years.

So, if these plants and the products they produce, even if the sequestration and the rest, talk about $55 or $60 a barrel, with oil at $80 or $90 or $100 a barrel, they're money-makers. If oil dips even temporarily, well below $50 a barrel, then there's a problem.

That's why things like the Air Force's 25-year contracting authority is critical to give the industry the confidence and be able to attract the capital, too. There's a massive capital requirement. A 30,000 barrel a day plant would require, you know, at least $3 billion in capital to make it happen.

MR. ALI: Sy Ali with Clean Energy Consulting.

You mentioned that CTL can meet current specs and no aircraft redesign is required. You didn't talk about the engine part of it. I know Wright-Patterson has issued a contract to one of the engine manufacturers to look at the impact of FT-derived fuel.

DR. BEZDEK: Well, the CTL fuels can and do meet current aircraft specs. The Air Force has proven

that in a series of tests in the B-52 and other aircraft, and as I mentioned, there are many civilian aircraft that have been flying for the past decade through and from South Africa using blends containing FT CTL-derived fuels. So, I mean, that's pretty much a given. It is a drop-in replacement fuel.

MR. MUELLER: One more?

MR. NEMETH: Roger, what about regulatory requirements? What are you seeing out there in terms of what states might require in the future with respect to CTL plants?

Ken Nemeth, Southern States Energy Board.

DR. BEZDEK: In terms of air emissions? In terms of water requirements?

Without a doubt, it's going to be a much tougher regulatory environment in the future than it had been in the past or even at the present time.

The projects I've been individually involved with, we have factored in those requirements which take additional time, additional expense for, you know, environmental impact statements, water usage, CO2 emissions, things along those lines, and the thing I'm concerned about is that, given the regulatory environment in some states, even in Kansas these days, that anything dealing with coal is going to be

disproved or disapproved, forbidden, simply for reasons that are not all scientific or, as the Under Secretary said, even logical.

I think we need to have a lot to be concerned about in the regulatory environment the way it's headed.

MR. MUELLER: I also had one quick question for you, Dr. Bezdek.

You had mentioned that FedEx abandoned their fuel hedging practices because it failed. I was just curious. Do you know why, what they did and why it failed?

DR. BEZDEK: No. Fred Smith was a speaker at the SSEB-sponsored Energy Summit we had earlier this year and we were talking with him about that at that time and he said that their experience with fuel hedging was very unsatisfactory and they abandoned that and just went back to the fuel surcharge on everybody's bill, and as I said, if you're doing anything with FedEx these days, you notice your bill, there's always a little extra line called fuel surcharge.

MR. MUELLER: We can manage that risk, so that's why I asked that question.

Our next speaker is Alex Fassbender. He is the Chief Technology Officer and Executive Vice

President of ThermoEnergy corporation with primary responsibilities for technology development.

Mr. Fassbender is also President of ThermoEnergy Power Systems, LLC, where he is leading the development and commercialization of a zero-emission pressurized oxy-fuel process called the ThermoEnergy Integrated Power System.

Prior to joining ThermoEnergy, Mr. Fassbender held engineering and management positions at the Pacific Northwest National Laboratory. He has been awarded 13 patents covering combustion and water treatment and has received four R&D 100 awards.

Mr. Fassbender holds a B.S. in Chemical Engineering from the University of California, Berkeley, and a Master's in Chemical Engineering and an MBA from the University of Washington.

With that, please join me in welcoming Alex Fassbender.

(Applause).

Presentation on the Development and Commercialization of the TIPS Oxy-Fuel Process

MR. FASSBENDER: Thank you, Mike, for that kind introduction.

The Under Secretary talked about clean and efficient and we heard a number of things that I think

have really well teed up this talk.

As has been mentioned, I think any industry that's based on fossil fuel combustion is going to transition from a time when they could emit the greenhouse gases associated with that combustion for free to a time when there will be a monetized cost for the emission of those greenhouse gases. I think that's generally accepted.

One of the things I want to mention is that carbon capture and then its sequestration, this is a technology step change. This isn't a little add-on or an adjustment or a tweak. The end state of the power cycle is no organized state. So, you have changed the fundamental thermodynamics and so like powered flight or nuclear energy, you're going to have new materials, new design approaches. You're going to have new institutions, new industries develop, and as an example that's been brought up in different ways, the nuclear industry would not have moved at all without the Price Anderson Act to deal with the open-ended indemnification associated with it and perhaps something along that line might also be necessary for sequestration.

I'm not a lawyer but it's for more lawyerly people to look into than me, but something along those

lines might be needed before you'll get companies to commit to that kind of a business.

So, it's not an incremental change, and when you have a fundamental change like this, it's always good to go back and look at the fundamental intentions. What are your intentions? So, I have two daughters that are grown up now, but when they were teenagers, always when the boys came over, I wanted to know what their fundamental intentions were and so it's good to know that.

I want to digress a little bit about what do I mean by intentional design of fossil fuel power? That means that it's deliberate. It's on purpose. You're doing it for a very specific purpose and we'll get into what those purposes are and that design that has to be focused on the intended outcome. What is it you're trying to achieve?

Any kind of step change or clean sheet design, you need to be advised and informed by what's gone before but not constrained by it. If you own a Hummer factory and you want to enter the Indy car race, you don't convert a Hummer into an Indy car because it has big tires and a big engine, four tires and a big engine. You're probably going to have better results in that outcome with a clean sheet design.

So, borrowing a phrase from an architect I once heard, design follows intention. So, let's talk about the end state intentions for this fossil fuel industry we need to get to to grow this industry and to have it be the vital part of our economy that we absolutely need it to be.

We need zero asset gas and toxic emissions. We need carbon capture. We need it to be reliable, especially for the utility industry, and the corollary to reliability is simplicity. We need to accomplish this in as few process steps as we can, and then it has to be efficient, both in terms of fuel and capital.

What are some of the things you'd like? You'd like it to be fuel source flexible. You'd like it to be able to use all ranks of coal, biomass, whatever you can throw into it. Finally, there may be a time between the capture stage and the sequestration stage that you'd like it to have a fairly seamless transition between catch and release and capture and sequester.

Well, the technology, we call TIPS, is pressurized oxy fuel and we examined this thoroughly with the help of many universities, many well-known scientists, national laboratories, reviewed by many companies that are involved in the building of these

plants, and this is a clean sheet design that is focused on these end state intentions that I mentioned.

It's supported by existing art. The basic unit operations are things that have been done in industry before, and we believe that this approach maximizes the achievement of these design intentions.

Now you've all seen this diagram so many times and, of course, the top line, we have folks working on systems and others working on efficient ways to deal with the existing power fleet. We have the central line, the precombustion, and there's nothing cogent that I can -- any words I can say that say anything more than the actions of utilities, like Tampa Electric, and the bottom line is us, and I show two gold stars. We actually have three.

It's not atmospheric pressure oxy fuel. We have all the costs and none of the benefits. It's thermodynamics. It's no free lunch. This is pressurized oxy fuel. You pay the piper upfront, but on the back end, you get some really good benefits. We can recover the latent heat from the produced and entrained water, so if you have to slurry the coal to pump it in, when you vaporize it, you can recover a large fraction of that latent heat on the back end at a useful temperature.

When you do that, you also scrub out all the particulates and the acid gases. You also wind up, if you manage this right, you can wind up with a CO2 stream at the end that is at liquid conditions or near liquid conditions that is ready to go into a pipeline.

Very simply, all you're doing is taking the existing combustion rank and cycle system that you have today and instead of burning it with air, using oxygen, you're doing a separation upfront and then you're doing the whole thing under pressure. So, you pressurize the air separation plant in coal. You pressurize them. You combust it. You take the heat into a standard rank and cycle unit. We'll talk about the impact on super critical and ultra super critical systems in a minute, and then the gas that comes out is essentially water and CO2 with a little bit of schmutz added to it, the acid gases and whatnot, and you've got to remove that and condense the water and then condense the CO2.

Very straightforward. It builds on the past. Why put up with the pressure? It seems like such a headache. Well, there's a lot of good reasons. Dr. Beer mentioned efficiency. I think that was mentioned several times and that's what you get out of it. You get higher efficiency. It not only can withstand point of the fuel but for materials. I'll dwell on that in a

minute.

So you can recover latent heat vaporization, those big plumes that go up the stack that people talked about. Well, you would have one of those because all that vapor water we're going to collect. It's useless at atmospheric pressure, but at the temperatures, at the pressures that we're talking about, it's 550 degrees Fahrenheit. That's a useful temperature. We can put that back into the boiler feedwater, put that back into the rank and cycle.

How do we increase the efficiency of the rank and cycle? It's straightforward. Super critical, ultra super critical and multiple reheats. Nothing you didn't learn in first year thermodynamics.

The other thing that's really a surprise to us and one of the things KenMet pointed out when we worked with them was the fact that doing this simplifies the CO2 recovery train and there's some movement behind that.

You basically are already at pressure, so you've got some options with the CO2 recovery and if you manage your oxygen production in the front right and you do the rest of it, you can wind up with a CO2 that is pretty close to being pipeline ready. Minimal low energy processes to get it that way.

There's also another thing when you talk about oxy fuel. Whether it's atmospheric or pressurized, any time you sit down with anybody who's seriously started, you know, banging the numbers on Aspen and their Excel spreadsheets will tell you that there's a ratchet effect with efficiency, with the air separation plan. The less efficiency, the more coal you have to burn, the more oxygen you need. So there's a ratchet effect there and so if you go oxy fuel, you really want to go toward as high efficiency as you can possibly get because the ratchet effect works the other way as well.

Finally, the other way you deal with pressure is lower cost. How can that be? It's because carbon steel is much cheaper than hasloy. Well, there's a lot of inferences and references on this, including the Steam Handbook by Babcock and Wilcox, but using Aspen Plus and Aspen Task Plus, which is the standard heat transfer, heat exchanger design software out there that generates basic designs and cost estimates, we picked a number of a 100 megawatt plant, Illinois Number 6, and did the math on this.

What would it take in terms of heat exchangers to do this and the only thing we changed on that was the pressure at which we conducted the

combustion. The numbers are quite amazing there. The overall heat transfer coefficient is nine times greater, but there's a ratchet effect with regard to the heat exchangers themselves because you've got so many interconnects and so many heads and sheets and tube sheets and whatnot, and it turns out that in the work that KenMet did, the pressurization in the vessels to pressurize these things are relatively inexpensive compared to the hasloy tubing for your ultra super critical 4,000 psi, you know, 1,400 degree steam.

Then the other thing is that the CO2 product recovery train again uses a low energy process.

I know this is a very detailed table here, but it's too important not to put it in. We talked again about high efficiency and that includes both energy and materials and with the cost today, you know, everything in a giant sucking sound, China and India, they're buying everything they can get their hands on and driving the prices of all these materials through the roof, it's not going to change any time soon, and this is part of our analysis and, you know, if you're going to build these highly-efficient plants and move to super critical, ultra super critical conditions and move to multiple reheats, this heat exchanger issue is going to rear its head, and I think you can see just

from this analysis that, you know, we offer, you know, pretty substantial savings there and whether these are the actual numbers or whether, you know, it's a factor of two, it's still pretty good.

So pressurized oxy fuel. You condense the exhaust water and recover the CO2. It's a closed system. So, it scrubs out all the particulates, acid gases, and mercury. Mercurials, of course, speciate into the oxidized and elemental and it'll show up in either the condensed water or the condensed CO2, but you'll get it out. You can recover the reheated vaporization and get CO2 in an easy way.

Talk about sequestration ready here. In order to capture CO2, you need to have it ready for transport and sequestration and NETL has a guideline paper on this that talks about what those specifications are and they're actually quite tough to meet, and the real advantage of this process, one of the real advantages is on that back end. It makes it really easy to clean up and that's also sort of going with the flow.

If you're going to compress this stuff, you're going to compress this gas, what do you want to compress it? You want to compress it and it comes out of the ASU and it's clean and cool or do you want to

try and compress it on the back end after you have to clean it and cool it and separate it and take a dirty stream and do that. This is very straightforward.

The steam hydro scrubber is a device. It's actually in Perry's Handbook if you're a chemical engineer, and it's also mentioned in work done by McDermott and Babcock and Wilcox and KenMet, but essentially it's the unit removable of small particulates.

If you ever noticed the little stream of bubbles coming off the side of your champagne or your Coca-Cola glass, that's essentially a nucleate formation process where you have a saturated stream. It's changing phase at an imperfection.

Well, this is the same thing in reverse. Small particulates act as nucleation sites, like seeding clouds for rain, and essentially that's what the condensing heat exchanger does. You're condensing the water in that heat exchanger and it scrubs everything out and the fact that you're doing that at a temperature that is industrially useful.

For instance, in some of these industrial plants, you look at pulp and paper, you've all seen the vast plumes of steam coming off. Well, imagine if you encapture all that steam and turn around and make

eight-pound steam to put back into the plant. It's a big number.

We've done material science. Let me go quickly here. I'll come back to those. This is the first presentation I sent. But it deals on the past and the present and I think the other thing is fuel flexibility.

When you look at this, there's intrinsically no reason you can't use this for a wide variety of fuels and if you're going to slurry the stuff, the water content's not as big of an issue starting off on it.

Then following on Roger's talk, looking at coal to liquids, roughly 20 to 30 percent, depending on the various processes that they use and whether it's headwaters or SAS oil or whomever, you know, if you go with the SAS oil approach of once through a fishatrobe so the tail gas and no recirculation, substantial fraction of the carbon mass is in the tail gas and if we take that tail gas and run it through this process, basically we get wonderfully efficient production of power and steam to run the plant and we capture the CO2, but importantly, we get the water back and we get the water back in a form that's useful to go back into the front end of the plant and water is going to be one

of the major constraints to these coal to liquids plants. You may have the coal in Mongolia, but you don't have the water.

The other thing you can do is a graceful transition from catching the least to capturing sequestered. You've got essentially zero emissions of toxics and CO2. They're intrinsic to the nature of the process cycle and the rank and cycle, since it's an indirect cycle, it's unaffected by the fate of the CO2. The steam doesn't know what you're doing with the CO2. It's unrelated.

So, if you were in a time when you wanted to build one of these plants and you didn't have a place to sequester it yet, you could go ahead and run the CO2 back through an expansion cycle, get the power off of that, about two-three percent, and then when the time came that you could put this in a pipeline, the rest of the plant wouldn't know you did it.

So, we have advanced this technology using Aspen models. We've done the material science with the condensed heat exchanger. We're currently doing the liquid vapor equilibrium testing for the CO2 condensation. We're working with KenMet, the Action Systems Engineering, University of Nevada, Reno, NETL, The Alaska Energy Authority, and EPA, and we gratefully

acknowledge their support.

You know, when KenMet did this, they said that their economic analysis indicated that the TIPS is the lowest cost option for carbon capture in general and may be the only cost-effective option for lignite. We're currently enlisting technical partners and financial partners as team members, one of the reasons we're here, and those partners can offer our patent position. We have this essentially entire thermodynamic pathway patented and we have issued patents in the U.S., Russia, China, Mexico, South Africa, and Australia, and pending everywhere else pretty much.

I think that's it. So, if there's any questions, I'd be happy to answer them.

MR. MUELLER: There's time for one question, if anybody has one.

MR. PALMER: Thanks for the interesting presentation. This is Fred Palmer with Peabody.

Have you done a costing of combined power generation-CTL plant?

MR. FASSBENDER: No, we've not done that yet. We did just a straight coal. We've been working on a shoe string here.

MR. PALMER: Okay. And would you make -- is

this presentation going to be available? Could you --

MR. FASSBENDER: I'd be happy to.

MR. PALMER: Thank you very much.

MR. FASSBENDER: And this is the -- you know, they told me not to make this too technical. We can go into the weeds real quick if you want to.

MR. MUELLER: One more here.

MR. BEER: Two questions. One is cleaning up the CO2 for sequestration, do I understand it that you willing be cleaning up to such an extent that there is no stack, that there is -- all the combustion products can be sequestered as they totally?

MR. FASSBENDER: I think that there's a specification on that and it really gets down to how much NO, what's your fuel source.

MR. BEER: That's right.

MR. FASSBENDER: You know, how much NO is going to be in there.

MR. BEER: Yes.

MR. FASSBENDER: There's one or two non-condensables and then looking at the air separation, the ACU, you know, there's not much of an energy penalty going to a 97 percent oxygen resting argon. So, you don't have any nitrogen in there and then how much nitrogen is left in your coal and do you really

have to get that out? If you're working with KinderMorgan on their pipeline, are they going to let you put it in there?

MR. BEER: That's also an environmental question.

MR. FASSBENDER: Right.

MR. BEER: You have to look at that. If it is non-pressurized, then, of course, you have to take into account also the compressor and the pipeline.

MR. FASSBENDER: Yeah. Absolutely.

MR. BEER: Yes, the next question is lignite. How do you feed the coal into that pressurized vessel? Is it a slurry?

MR. FASSBENDER: I think right now, yes, we look to slurry.

MR. BEER: If it is a slurry, the slurry will have something like 35 percent water in the slurry plus the 35 percent water in the lignite.

MR. FASSBENDER: That's right.

MR. BEER: We are very close to watermelon in water content.

MR. FASSBENDER: That's right. And there is a break point on that with regard to the energy content of the coal and how much you can recycle and the pressure point, but, you know, the other question to

get back is what else are you going to do with lignite?

MR. BEER: So that may be a problem.

MR. FASSBENDER: Thank you very much.

(Applause).

MR. MUELLER: We're going to take a five-minute break.

(Recess).

MS. NELSON: If we can ask those in the back of the room to please take your seats, thank you. Thank you.

Our third speaker, David Mazyck from the University of Florida, is missing in action. We've called his office and there's no answer and we assume that he is desperately trying to get here, but he has not arrived.

So, we are going to move on with the agenda and Jim Connaughton, the Chairman of the White House Council on Environmental Quality, was due to be with us today and, as most of you are aware from news reports, there's a lot of discussions surrounding energy policy this week here in Washington, and he has been called over to the White House for some critical discussions. So, he is not going to be with us today, but he had a number of items that we thought were important to discuss and he has briefed Bob Beck and so I have asked

Bob if he would fill in for Jim and give us an overview.

Bob?

MR. BECK: Thanks, Georgia. Jim, I talked with him yesterday and again today, he actually missed our reception as well for the same reason. They have been really working away, I guess, on the various legislative options that are floating through Congress right now and specifically, I think, they're meeting with Congressman Boucher this morning and all of his staff who normally could pinch hit for him are critical to those meetings as well.

So, we did have a bit of a chance to talk. He promises that if we invite him back in the Spring, in May or whenever we have our next meeting, that he will move heaven and earth to be sure that he's here to speak on this particular issue and, frankly, at that time, it will make more sense.

The Major Economies meeting. The first meeting of that group was held here in Washington on September 27th and 28th. The major economies that are involved are national economies, the 16 largest in the world. They are, as you would think, China, India, Russia, the United States, the United Kingdom, Australia, Italy, Indonesia, you know, I'm going off of

memory, but they are responsible for about 80 percent of the, I guess you would call it, the gross world product and about 73 percent also of air emissions.

Large energy users obviously, and this is the president's initiative to address climate change and energy security. The official title is Major Economies Meeting on Energy Security and Global Climate Change. It is a preparatory process for the United States delegation to take new information, new initiatives and positions to the next meeting of the U.N. Conference of Parties which is going to be held in Bali, Indonesia, in December of 2008.

So, this process will be ongoing and therefore for Jim to come back and speak to us in May or thereabouts would be good timing and he possibly could give us even more information than he could have today.

The agencies involved from the United States standpoint include the State Department, Secretary Rice was one of the keynote speakers, Secretary Guterrez from the Department of Commerce, and obviously Secretary Bodman as well. Now, Jim Connaughton as the chairman of the White House Council on Environmental Quality has been specifically appointed by the president to be the point person on this, so he's the

man, so to speak, and he's focused primarily, they're all focused within the U.S. primarily on a lot of the kinds of things that we talked about here this morning.

They are technology-driven. They believe that the whole issue of carbon capture and storage, transportation, et. cetera, is going to be technology-driven and they are involved, I guess you might say, in discussions with the United Nations, but all 16 of these countries have agreed that the primary vehicle for movement on climate change will be the U.N. Framework Convention on Climate Change which is the traditional vehicle that's been used that was signed in Rio in 1992 and has led up through Berlin in '95 and Kyota in '97 and now they're looking for something over and above that.

They have broke into numerous workgroups on various pathways that involve just about every fuel you can think of, coal obviously is involved, and so that process will be ongoing, and we will stay in touch with Jim and his people as well as the folks at Energy and State and Commerce and stay plugged in.

Perhaps even in the Spring, depending on what the status of our study is, we may have not only Jim come over but perhaps somebody from Commerce and from State as well to kind of lend their perspective. We'll

see how that goes.

Madam Chairman, other than that, that's about all that I think I could offer without getting well outside of my area of expertise on that particular issue, and if any of you would like specifics, again feel free to give us a call. We can put you in touch with the right folks. Jim is very open. Bob Dixon off of his staff was here last night for our reception and they're very willing to chat with us and hear your opinions and take your input.

Thank you.

MS. NELSON: Thank you, Bob. This meeting is duly authorized and publicized and is open to the public. The public can submit comments to the Department of Energy or if any individual wishes to speak, they may do so at this meeting. Those who wish to speak may do so at this time. Each speaker is limited to 10 minutes.

I understand we do have a member of the public that would like to address the group today.

DR. WALIA: Good morning. My name is Daman Walia. I am President and CEO of ArcTech, Inc. I had the great pleasure of coming and addressing this group about maybe four or five years ago on this whole new approach of using coal, coal biotechnology.

I did not come prepared, so I just decided to take and ask Bob to give me an opportunity to share with you the kind of status of where we are and the reason is, of course, today, we have oil prices approaching $100 plus. Coal plants have been canceled and more are probably being canceled, and we have, of course, the environmental issues that have continued to compound with the use of coal.

So, we need a new and different approach and I shared with you some years ago but let me kind of -- I'm going to give you a snapshot and then you can look at my website or I'll be happy to follow up and give you an answer.

What we have done is we have taken the coal entirely differently, not as a carbon, not as a BTU, but as a biomass. In fact, you can argue that coal is essentially a biomass. It's a fossil biomass, and we are using these microbes which came out of the termites, termite guts, which can ferment coal to make natural gas and we make coal products which are organic products and I have a plant operating right here in Virginia producing these products on a day-in and day-out basis.

The products are used to grow organic food. In fact, USDA, under the Natural Organic Program, has

approved the use of my product for growing organic food. The EPA has approved its use to combine with pesticide chemicals to make them safe.

The second thing we do is we use this material to clean up all kind of wastewaters, municipal wastewaters, industrial wastewaters. We use this material to convert the military's obsolete bombs and explosives into fertilizer. Just to kind of share with you, just yesterday, my team at McAllister, Oklahoma, plant converted one ton of explosives into fertilizer and I have these plants being built all over the world, in Egypt, Korea, India. I just came back from China.

The India plant gives us a way to actually turn coal into a solution. In fact, with this, we can take out almost five billion tons of carbon dioxide from the atmosphere without doing anything that has to do with, you know, the transportation.

The Defense Science Board had me come and brief their Technology Panel and Policy Panel and they are, of course, you know, supporting the use of this technology. About a month ago, I briefed the Air Force. We heard about the CTL issue. Our technology approach, bottom line is we can make, for every barrel of oil, we can take five tons of carbon dioxide from the atmosphere.

Number 2. We can make liquid fuels, so we can compete with oil even if it goes down to $10 a barrel. We don't need a 25-year guarantee. We need help to, you know, drive this technology forward.

Now, if I take my plant to Virginia, I have 40-foot container which is being loaded with this coal-derived organic material all the way to Egypt. Just two weeks ago, we sent a shipment to Saudi Arabia and if any one of you play golf, I have this product being used on many, many golf courses all over this country.

So, coal, I think we've been kind of fighting this on and on. We need to look at coal from a different side and I'm a scientist by education and I've been in coal, have worked in the coal mining industry for about 25+ years, and I believe that -- I was kind of discouraged when I heard this morning from the Secretary, you know, putting all those gloomy and I think if we look at coal from a different angle and take a new strategy, the U.S. can provide leadership to the rest of the world.

I also would like to share with you another activity we're doing. Not only we have about 200 billion tons of coal, which is a minable reserve, but we have about 5.6 trillion tons of coal which is unminable. It's about 2,000 feet or below that

probably will never be mined, and we have worked on projects in Texas where we can put these microbes in the coal seam itself and produce methane gas less than dollar per million BTU.

So, I think if we took our energy and ingenuity and resources, I believe we can tame the oil and we can make coal to be the basis of the next industrial revolution which is a green revolution which worldwide everybody's looking for.

So, I just want to share this with you and I'm going to -- I brought some one-pagers and I'm going to pass it on and if any one of you are interested, please, you know, you can look at our website or contact me. I'll be happy to do that.

Thank you for giving me the time.

(Applause).

MS. NELSON: Thank you. You can also just leave them on the front table. How about if we do that? Then you can take one as you leave, if you would like to.

Let me announce that we hope to hold the next full Council meeting in the Spring of 2008, location to be determined, and with that, if there is no other business -- anyone have any other business?

(No response.)

MS. NELSON: To come before the Council, we stand adjourned. We are now off the record.

(Whereupon, at 11:05 a.m., the meeting was adjourned.)