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THE DEPARTMENT OF ENERGY'S FUTUREGEN PROGRAM

HEARING

BEFORE THE

SUBCOMMITTEE ON ENERGY AND ENVIRONMENT

COMMITTEE ON SCIENCE AND TECHNOLOGY

HOUSE OF REPRESENTATIVES

ONE HUNDRED TENTH CONGRESS

SECOND SESSION

APRIL 15, 2008

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THE DEPARTMENT OF ENERGY'S FUTUREGEN PROGRAM

TUESDAY, APRIL 15, 2008

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
Washington, DC.

The Subcommittee met, pursuant to call, at 10:12 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Nick Lampson [Chairman of the Subcommittee] presiding.

BART GORDON, TENNESSEE
CHAIRMAN

RALPH M. HALL, TEXAS
RANKING MEMBER

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY
SUITE 2320 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515-6301
(202) 225-6375
TTY: (202) 226-4410
http://science.house.gov

Hearing on

The Department of Energy's FutureGen Program

Tuesday, April 15, 2008
10:00 a.m. – 12:00 p.m.
2318 Rayburn House Office Building

Witness List

Panel I

Mr. Bud Albright
Under Secretary at the Department of Energy

Panel II

Mr. Paul Thompson
Senior Vice President, Energy Services, at E.On, LLC and serves as the Chairman of the FutureGen Alliance Board

Mr. Ben Yamagata
Executive Director, Coal Utilization Research Council

Mr. Jeffrey N. Phillips
Program Manager, Advanced Coal Generation Electric Power Research Institute

HEARING CHARTER

SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

The Department of Energy's FutureGen Program

TUESDAY, APRIL 15, 2008
10:00 A.M.–12:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

Purpose

On Tuesday, April 15, 2008, at 10:00 a.m. the House Committee on Science and Technology, Subcommittee on Energy and Environment will hold a hearing entitled "*The Department of Energy's FutureGen Program*." The purpose of the hearing is to gain a better understanding of the Department of Energy's decision to restructure its FutureGen program, the process through which the decisions to restructure were made, and to obtain information about the impacts this revised approach to the FutureGen initiative may have on carbon capture and sequestration technology development. This hearing is an opportunity to assess the potential of this programmatic shift to provide a cost-effective and timely path for development and demonstration of carbon capture and sequestration technologies.

Witnesses

Panel I

Mr. Bud Albright, Under Secretary at the Department of Energy. Under Secretary Albright will explain the process through which the Department made the decision to revise FutureGen including a discussion of the specific factors that led to the restructuring decision. The Under Secretary will also outline the rationale for the restructured program and describe the plan for the restructured program including timelines for the proposed activities.

Panel II

Mr. Paul Thompson, Senior Vice President, Energy Services, at E.On, LLC and serves as the Chairman of the FutureGen Alliance Board. Mr. Thompson will describe the role of the FutureGen Alliance before and after the Department's decision to restructure the program. He will describe the impacts the Department's decision could have on the overall federal effort to develop and deploy carbon capture and sequestration technologies.

Mr. Ben Yamagata, Executive Director, Coal Utilization Research Council. Mr. Yamagata will discuss the role of the FutureGen program in a comprehensive federal research and development effort to develop and deploy carbon capture and sequestration technologies. He also will provide an assessment of the proposed restructured program's potential to complement other federal research and development efforts on carbon capture and sequestration technologies including the Clean Coal Power Initiative.

Mr. Jeffrey N. Phillips, Program Manager, Advanced Coal Generation Electric Power Research Institute. Mr. Phillips will discuss the suitability of the revised program to overcome technical and financial challenges with the deployment of carbon capture and sequestration technologies.

Background

In early 2003, the Department of Energy announced plans for the Federal Government to build a $1 billion pollution-free power plant known as the FutureGen Initiative. The venture was promoted as a near-zero emissions power plant intended to combine electricity and hydrogen production. Under the original FutureGen program, the Department of Energy (DOE) would oversee a consortium of industrial interests, now known as the FutureGen Alliance, which would manage the advanced

275 megawatt power plant project that would also serve as a test bed for new technologies, including the capture and sequestration of carbon dioxide.

In the Department's February 27, 2003 press release, Secretary Abraham stated "FutureGen will be one of the boldest steps our nation has taken toward a pollution-free energy future. Knowledge from FutureGen will help turn coal from an environmentally challenging energy resource into an environmentally benign one. The prototype power plant will serve as a test bed for demonstrating the best technologies the world has to offer."

There were three main components of the original FutureGen program. The program would be a state-of-the-art power plant that would turn coal into a hydrogen-rich gas before combusting it in a turbine to produce electricity. This power plant would serve as a prototype plant leading the way on development and demonstration of technology to capture carbon dioxide and sequester it in deep underground geologic formations. In addition, there was an emphasis placed on the FutureGen initiative serving as model hydrogen-production facility for the Administration's initiative to advance the production of fleets of hydrogen-fueled vehicles. FutureGen also was intended to serve as a test bed for cleaner coal technologies in terms of emissions and for development of operational efficiencies.

As late as November 30, 2007, the Department was preparing to go forward with the original FutureGen program. In his letter to Representative Johnson (IL), Secretary Bodman stated that DOE was "diligently working to complete the process and issue the Record of Decision in a timeframe that supports FutureGen site selection by the end of December 2007."

On January 30, 2008 the Department of Energy announced a major restructuring of the FutureGen program. Under the new program, DOE will no longer build a small-scale clean coal power plant that can test CCS technologies and provide for the demonstration of an integrated carbon capture and sequestration system. Instead, the Department plans to capitalize on industry's investment in IGCC clean coal power plants by providing funding for the CCS component of the IGCC power plants. Under the revised program, the Department proposes to partner with companies with plans to build Integrated Gasification Combined Cycle (IGCC) clean coal power plants by providing funding for the addition of carbon capture and sequestration technologies (CCS) to these plants.

On January 30, 2008 DOE issued a Request for Information (RFI) on its new path forward to demonstrate advanced technology for electricity production from coal with a March 3, 2008 deadline for public comments. DOE anticipates evaluating the comments on the RFI, issuing a solicitation, and selecting projects by December 2008 or no later than January 2009.

Issues Raised by the Restructuring Plan

Concerns have been raised by Members of Congress and by some in the electric power industry about both the process by which DOE made this decision and the restructured program's suitability for facilitating timely demonstration and deployment of integrated carbon capture and sequestration systems.

The recent FutureGen announcement takes the program in a dramatically different direction. According to DOE, the primary reason for the abrupt change in the FutureGen program is the escalation in the estimated costs for the program. The Administration also cites the increased potential for the adoption of carbon dioxide regulation in the near future and the implementation by several states of a requirement for permitting construction of new coal plants to include addition of CCS or the ability to add these technologies in the near future. The Administration suggests the restructured approach will better maximize opportunities for innovation and the private sector's investment in new coal plants.

Initial estimates indicated that FutureGen would cost approximately $1 billion. The Department's more recent cost estimates anticipate a cost of $1.8 billion. Initially, the cost-share arrangement for the program was 80 percent federal and 20 percent non-federal. That arrangement was adjusted later to a cost-share arrangement of 74 percent federal and 26 percent non-federal. To date, approximately $174 million has been appropriated for the original FutureGen Initiative, and the 2009 budget request includes $156 million for FutureGen.

DOE believes the restructured program will deliver more progress for less than the cost of the original FutureGen program. However there are remaining questions about whether the funding levels for the proposed program are sufficient to fund a robust technology demonstration program. There is also concern that the process of revising the FutureGen program will further delay the demonstration of CCS technologies.

The Department states in its Request for Information (RFI) that "DOE will contribute not more than incremental cost associated with CCS technology for the sin-

gle power train. Approximately 90 percent CO_2 capture and sequestration for the integrated power train will be required." There is concern that the 90 percent capture requirement will deter industry from participating because the turbine technology to achieve that goal needs further testing. In addition, there are questions about the ability of the Department to conduct multiple projects given the estimated costs for making the necessary design modifications to the proposed commercial IGCC power plants.

The Department has several other clean coal programs that are working on CCS technologies. It is still unclear how the revised FutureGen program will support and complement the Clean Coal Power Initiative and the Carbon Sequestration Partnerships program to ensure a path forward to full-scale demonstration and deployment of integrated carbon capture and sequestration systems.

Timeline of Events at the End of 2007 to Beginning of 2008

May 25, 2007: Department of Energy issued its draft Environment Impact Statement for the FutureGen Project.

November 9, 2007: Department of Energy announces the completion of its Final Environmental Impact Statement (EIS) for the FutureGen Project. The EIS evaluated four potential sites to host the project: Mattoon, IL; Tuscola, IL; Jewett, TX; and Odessa, TX and it preliminarily found that all of these sites were acceptable locations for the FutureGen project.

November 30, 2007: Secretary Bodman sends letter to Representative Johnson stating the Department is diligently working to complete the EIS process and issue the Record of Decision on a schedule that permits the FutureGen site selection by the end of December 2007.

December 6, 2007: The Chief Executive Officer of the FutureGen Alliance writes to Under Secretary Albright in response to the Department's proposed cost-share amendment to the FutureGen Cooperative Agreement between DOE and the Alliance. The amendment sought review of the Federal Government's financial risk with the FutureGen project. The letter also informed the Department of its intention to make a site selection on December 18, 2007.

December 11, 2007: The Acting Principal Deputy Assistant Secretary of the Office of Fossil Energy responds to the December 6th letter stating the December 18, 2007 announcement of the site selection is inadvisable.

December 18, 2007: The Alliance announces Mattoon, IL as the final site for the FutureGen Project.

January 10, 2008: Alliance Chief Executive Officer writes to Under Secretary Albright proposing a new approach to financing FutureGen.

January 22, 2008: Acting Principal Deputy Assistant Secretary writes to Alliance CEO underscoring its commitment to its earlier proposal which would require the Alliance to bear an equal share of the project cost increases beyond the current cost estimate.

January 24, 2008: Alliance CEO writes to Under Secretary Albright offering to meet again to further discuss a detailed path forward to finance FutureGen and stating the willingness of the Alliance to boost its cost-share for costs above the $1.8 billion from 26 percent to 50 percent.

January 30, 2008: Under Secretary Albright writes to Mr. Thompson, Chairman of the Alliance Board expressing its concern about the uncertainty of federal expenditures for the FutureGen Initiative and announcing that the Department does not intent to approve a Continuation Application beyond the current budget period which expires June 15, 2008. The letter also stated that the Department would restructure the FutureGen program.

Chairman LAMPSON. This hearing will come to order. Everyone, a good morning and welcome to today's hearing on the Department of Energy's decision to undertake a major restructuring of its key climate change technology initiative, FutureGen Project.

Climate change is a tremendous environmental challenge, and if we are to meet this challenge, new low-to-no emission technologies are absolutely necessary. Our ability to rely on coal to produce electricity depends upon the successful development and deployment of carbon capture and sequestration systems. For the last five years the Administration has told us that FutureGen was the key project that would move coal-fired electricity production forward. But now they are telling us we must go in a new direction.

I have several concerns about the Department's revision of the FutureGen Program.

High profile, costly, multi-year technology development efforts should not be started and stopped without careful analysis of costs and technological feasibility. I am not convinced that those analyses have been done. Programs should also not undergo this level of revision without consultation between Congress and the Administration.

This process does not represent the type of partnership between the legislative and executive branches of this government or between the government and industry that is needed to accomplish a technological shift of this complexity. We simply must do better.

I am sure there were some Members who questioned the feasibility of the original project when it was first rolled out by the Administration in their fiscal year 2004 budget proposal. Congress supported this program convinced by the Administration's support of it and because of the importance of demonstrating the ability to utilize coal in a manner that does not further jeopardize our climate system.

Five years and about $176 million later the Department of Energy abruptly announces it is abandoning this project and embarks on a new program under the old name.

I need to understand the analyses that support this decision. The Department told us the original FutureGen was the best approach. Now it is not. Before we begin to take yet another approach, we need something more substantive than the current request information, request for information.

I am aware of the Department's concerns about the escalating cost estimate for this program. Apparently the Department and the industrial alliance managing the project were working cooperatively to advise, to devise an acceptable funding approach for the FutureGen Program as late as last December.

However, the costs are going up for all energy projects, and we all know that large projects suffer from this problem. I am not convinced that the new program will cost less and achieve more as the Administration claims. The same factors that were driving up the costs of the FutureGen Program will apply to the new program as well. And we all know that time is money, and at a minimum the decision to restructure this program will result in a delay in the CCS technology development of several years.

I look forward to hearing more about the Department's rationale for restructuring FutureGen. I want to understand how this new program fits with the other ongoing clean coal programs at DOE.

And finally, I want some assurance that we have a comprehensive federal effort in partnership with industry on carbon capture and sequestration that can deliver the cost-effective technological breakthroughs that we need to generate electricity with coal without degrading the climate.

[The prepared statement of Chairman Lampson follows:]

PREPARED STATEMENT OF CHAIRMAN NICK LAMPSON

Good morning and welcome to today's hearing on the Department of Energy's decision to undertake a major restructuring of its key climate change technology initiative—the FutureGen program.

Climate change is a tremendous environmental challenge. If we are to meet this challenge, new low- to no-emission technologies are absolutely necessary. Our ability to rely upon coal to produce electricity depends upon the successful development and deployment of carbon capture and sequestration systems. For the last five years, the Administration has told us that FutureGen was the key project that would move coal-fired electricity production forward. But now they are telling us we must go in a new direction.

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And finally, I want some assurance that we have a comprehensive federal effort in partnership with industry on carbon capture and sequestration that can deliver the cost-effective technological breakthroughs that we need to generate electricity with coal without degrading the climate.

Chairman LAMPSON. At this time, I would like to yield to my distinguished colleague from South Carolina, our Ranking Member, Mr. Inglis, for an opening statement.

Mr. INGLIS. Thank you, Mr. Chairman.

You know, in South Carolina right now Duke Energy faces a dilemma. They would like to be producing energy free of CO_2 emissions, but because of the extensive licensing hurdles of nuclear and the high costs of wind and solar, Duke has been forced to meet increased energy demand by building coal-powered plants. Perhaps if we had clean coal and carbon capture technologies readily available and affordable, companies like Duke would be able to meet growing energy demand with coal and without emissions.

We are using lots of coal. We need to focus on ways to make that consumption cleaner and more efficient. And that is what clean coal and carbon capture and sequestration technologies are all about.

We need these technologies to be affordable and attractive to U.S. and global industry alike. America can lead the way with technological innovation that can be easily integrated into existing coal plants worldwide.

The Department of Energy's decision to restructure the FutureGen Program raises questions about how our nation will maintain our leadership toward clean coal technologies. Without the research that was planned to begin at the FutureGen site or the construction of a joint IGCC and carbon capture facility, I am interested to know how DOE will encourage the many benefits of clean coal and carbon capture and sequestration technologies.

The future of renewable energy promises an end to our dependence on fossil fuels like oil and coal. But for today, we must work to make sure that our coal consumption is as emission free and energy efficient as possible, bringing benefits to both industry and the environment.

Thank you, Mr. Chairman, for holding this hearing, and I look forward to hearing from our witnesses, especially our distinguished first witness, the gentleman from South Carolina.

[The prepared statement of Mr. Inglis follows:]

PREPARED STATEMENT OF REPRESENTATIVE BOB INGLIS

Thank you for holding this hearing, Mr. Chairman.

Duke Energy faces a dilemma in South Carolina. They would like to be producing energy free of CO_2 emissions, but because of the extensive licensing hurdles of nuclear, and the high costs of wind and solar power, Duke has been forced to meet increased energy demand by building coal-powered plants. Perhaps if we had clean coal and carbon capture technologies readily available and affordable, companies like Duke would be able to meet growing energy demand with coal and without emissions.

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The future of renewable energy promises an end to our dependence on fossil fuels like oil and coal. But for today, we must work to make sure that our coal consumption is as emission-free and energy efficient as possible, bringing benefits to both industry and the environment.

Thank you again for holding this hearing, Mr. Chairman, and I look forward to hearing from our witnesses.

Chairman LAMPSON. Thank you, Mr. Inglis.

We are honored to have the distinguished Chairman of the full Science Committee here with us this morning, Mr. Bart Gordon. Mr. Gordon, you are recognized for five minutes.

Chairman GORDON. Thank you, Chairman Lampson, and good morning to everyone. I am very pleased that the Energy and Environmental Subcommittee is holding this hearing today to receive testimony on the Department of Energy's major restructuring of its centerpiece climate change program, FutureGen.

This committee worked diligently and carefully to include increased authorization levels for a comprehensive carbon capture and sequestration program.

We are well aware that implementing such a comprehensive carbon capture and storage system for the Nation is vastly complicated. Until less than three months ago FutureGen was a significant part of the Federal Government's research, development, and demonstration effort toward full-scale operation of a near-zero emissions coal-based power plant.

Most of us in this room recognize that the January announcement to restructure FutureGen takes the program in a dramatically different direction. I think it is unfortunate that the Department chose to make this sudden shift in the FutureGen Program with no Congressional consultation, or for that matter, it seems with no consultation anywhere, including its partners that had put up millions of dollars.

Beyond that, I am very concerned about the effectiveness of the new program. Over the last five years we appropriated nearly $175 million for the original FutureGen Program. In a pay-as-you-go world, I would like to know that we didn't throw that money away.

I am very concerned that this major revision of the FutureGen will delay our development of these technologies, which, in my opinion, would be terribly unwise.

Climate change is one of the most urgent environmental challenges we face today. The answers to these global problems are not easy, and the technology solutions will not come cheaply.

We cannot afford to take any steps backwards in our federal initiatives to address the change or the challenge of climate change.

So I look forward to the testimony of our witnesses today so that I can better understand the rationale behind this major revision of the FutureGen Program and its new approach to FutureGen puts us on the best path to accelerate the development of carbon capture and sequestration technologies.

I want to especially welcome my friend from a variety of different lives and past histories, Under Secretary Bud Albright. I am glad you are here for at least my intention is this is not an effort to play a gotcha game. Quite frankly, I don't think you were there long enough to screw this up. So you inherited a mess, even though it was poorly handled, I think that the plate was or the table was set before you got there.

But what I would like to know is—and I think the Department owes the taxpayers, as well as its partners, an explanation—what is this new plan? We have heard, you know, a little bit of conversa-

tion about it. What is its cost, what is its framework, and why is this going to be better? I think this is a good opportunity to get on the record and talk with some of your partners here in Congress about this new direction. We would like to know. So thank you for being with us today.

[The prepared statement of Chairman Gordon follows:]

PREPARED STATEMENT OF CHAIRMAN BART GORDON

Good Morning.

Thank you Chairman Lampson. I am very pleased that the Energy and Environment Subcommittee is holding this hearing today to receive testimony on the Department of Energy's major restructuring of its centerpiece climate change program, FutureGen.

This committee worked diligently and carefully to include increased authorization levels for a comprehensive carbon capture and sequestration program.

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Beyond that, I am very concerned about the effectiveness of the new program. Over the last five years, we appropriated nearly $175 million dollars for the original FutureGen program. In a pay-as-you-go world, I would like to know that we didn't throw that money away.

The direction for FutureGen must be one that accomplishes the goal of full-scale demonstration of carbon capture and sequestration technologies in a cost-effect and rapid timeframe.

I am very concerned that this major revision of FutureGen will delay our development of these technologies which in my opinion is terribly unwise.

Climate change is one of the most urgent environmental challenges we face today. The answers to this global problem are not easy and the technology solutions will not come cheaply.

I believe that investment in advanced technologies such as renewables, increased energy efficiency, and carbon sequestration are integral pieces in reducing our greenhouse gas emissions.

We cannot afford to take any steps backwards in our federal initiatives to address the challenge of climate change.

I look forward to the testimony of our witnesses today so that I can better understand the rationale behind this major revision of the FutureGen program and if this new approach to FutureGen puts us on the best path to accelerate the development of carbon capture and sequestration technologies.

Chairman LAMPSON. Thank you, Mr. Chairman.

I would ask unanimous consent that all additional opening statements submitted by the Subcommittee Members be included in the record. Without objection so ordered.

[The prepared statement of Mr. Costello follows:]

PREPARED STATEMENT OF REPRESENTATIVE JERRY F. COSTELLO

Mr. Chairman, I appreciate the Subcommittee looking into this issue, as the FutureGen project has been one that I've worked on very closely over the past five years.

The day after the President announced the FutureGen Clean Coal Initiative in his 2003 State of the Union address, I was on the phone with the Department of Energy (DOE), working to get the project off the ground. After five years of work in which a non-profit Alliance was formed, the terms of a Cooperative Agreement were negotiated, an Environmental Impact Study was completed, and a final site selection in Mattoon, Illinois was made, you can imagine how disappointed I was to learn that the DOE had scrapped the FutureGen project in favor of a "re-scoped" plan. After reviewing DOE's plans for a restructured FutureGen, I fail to see the

advantages, and instead see delays, wasted taxpayer money, and poor stewardship of a potentially ground-breaking project.

Moreover, I still have not heard valid justification for this decision—Secretary Bodman has stated in previous Congressional testimony that cost over-runs were not the problem, and that inflation, a factor that affects all construction projects, was the cause of any cost increases, not mismanagement. Despite the Alliances' willingness to negotiate, DOE took issue with the financing proposal submitted to address DOE concerns, one that used tools commonly found in DOE-partnered energy projects to help ensure success.

Finally, DOE has claimed technological advancements made since the project was first introduced have rendered the originally-envisioned FutureGen project inappropriate. The new "re-structured" project, which relies only on the installation and operation of CCS on commercial-scale IGCC projects instead of creating a prototypical $1.3 billion research and development facility, strikes me as falling far short of our initial goals.

I look forward to hearing testimony today, because despite Congressional testimony on this issue and multiple meetings with DOE, the facts do not add-up. The progress that was reached for five years before the plug was pulled on this project was real, and it was promising. A matter of weeks separates the date of a letter to members of the IL delegation indicating DOE's commitment to the project and the date Secretary Bodman announced he was "restructuring" it. I want to know when discussions began to end FutureGen and I want to know why. Thank you, Mr. Chairman.

Chairman LAMPSON. I recognize Mr. Costello for a unanimous consent.

Mr. COSTELLO. Mr. Chairman, Thank you.

Mr. Chairman. I would ask unanimous consent that two of our colleagues, Mr. John Shimkus from Illinois and Tim Johnson from Illinois, be allowed to participate, sit with the Subcommittee, and ask questions of the witnesses.

Chairman LAMPSON. Without objection, so ordered.

Join us.

It is my pleasure to introduce our first witness this afternoon. Mr. Bud Albright is the Under Secretary of Energy at the Department of Energy. Mr. Albright will have five—you will have five minutes for your spoken testimony. Your full written testimony will be included in the record for the hearing. When you have completed your testimony, we will begin with questions. Each Member will have five minutes to ask questions.

And you may begin.

Panel I:

STATEMENT OF MR. CLARENCE H. "BUD" ALBRIGHT, JR., UNDER SECRETARY OF ENERGY, U.S. DEPARTMENT OF ENERGY

Mr. ALBRIGHT. Thank you, Mr. Chairman, Congressman Inglis, Members of the Subcommittee. Good morning, and thank you for the opportunity to be here and to testify. Thank you for the reference to South Carolina, which I am a proud native.

I am very glad to be here today to have a chance to explain the rationale behind the Department of Energy's decision to restructure our program to successfully demonstrate carbon capture and storage technology on a commercial scale commonly known as FutureGen.

Coal, the most abundant, lowest priced fossil fuel in the United States is a critical strategic national energy security resource. Our recoverable reserves are projected to last more than 200 years at

today's rate of consumption. In 2007, the U.S. consumed 1.1 billion tons of coal, which is expected to grow to an estimated 1.5 billion tons by 2030, a 37 percent increase, and this is according to our Energy Information Administration.

Unfortunately, our consumption of coal and the energy production process is not without costs. Principally, the production of climate-altering greenhouse gas emissions. The objective of the—of President Bush's FutureGen initiative is, was and is to demonstrate on a commercial scale that our coal resources can be used in an environmentally-responsible way. The Department of Energy has made a substantial investment in this effort underwritten by the American taxpayers. It is my belief and it is Secretary Bodman's belief that we have an obligation to insure that investment is handled responsibly.

In January the U.S. Department of Energy announced its intention to restructure FutureGen to maximize our investments to demonstrate carbon, cutting edge carbon capture and storage technologies at multiple sites, rather than at just one experimental facility as we had originally expected we would do. The decision to restructure was a difficult one, but I believe a correct one.

Originally launched in 2003, as a $950 million investment, FutureGen cost estimates escalated to $1.8 billion in the following years and would likely have continued to rise. During this same period the clean coal marketplace saw significant changes.

When FutureGen was first announced, few proposals for the construction of Integrated Gasification Combined Cycle or IGCC, coal plants existed. Today in addition to the two IGCC plants currently operating on coal in Florida and Indiana and one operating on petcoke in Delaware, two proposed IGCC power plants have passed the permitting process, and one is in Illinois and one in Indiana. And around 30 of these plants have been publicly announced and are in various stages of planning. These facilities as they are built and operated, they will provide experience not only with advanced power technologies, but also could utilize advanced CCS technologies supported under our restructured FutureGen Program.

The goal of our restructured FutureGen Program remains the same as the original FutureGen approach announced in 2003, to maximize our national investment in clean coal research by demonstrating cutting edge CCS technologies. The difference is that under the restructured program our plan is to support not just a single, less than commercial-scale demonstration plant, but rather to provide funding to equip multiple commercial-scale clean coal power plants with advanced carbon capture and storage technologies.

I have provided the Committee with written testimony that includes a more in-depth discussion of our efforts in this area, but I would like to conclude by saying that our investments like the marketplace and science itself must be dynamic. Government must continually reassess its costs, keep pace with the changing nature of the marketplace, and account for new developments in technology.

Let me say in closing just one more thing and that is to reemphasize this was a tough decision. It was a decision that was not entered into lightly. It was a decision that was entered into with

the understanding of the political difficulties that we would face, but I am convinced that we did the right thing, and I think it is in the taxpayers and the public's best interest to take the approach we are now taking.

I thank the Subcommittee and would be happy to answer any questions.

[The prepared statement of Mr. Albright follows:]

PREPARED STATEMENT OF CLARENCE H. "BUD" ALBRIGHT, JR.

Chairman Lampson, Ranking Member Inglis, and Members of the Subcommittee, I thank you for inviting me to be here with you to discuss the status of the Department of Energy's FutureGen program. Our goal for FutureGen remains unchanged: to make our most abundant and least costly fuel resource for electricity generation—coal—burn even cleaner, with dramatically reduced carbon emissions into the atmosphere.

In January, the U.S. Department of Energy announced its intention to restructure the FutureGen program. We restructured this program to maximize our national investment in clean coal research and technology (R&D) by demonstrating cutting-edge carbon capture and storage (CCS) technologies at more than just one power plant. Before I discuss the new direction of FutureGen, I think it would be helpful to briefly discuss the role of coal in America's energy portfolio.

The Importance of Coal in America's Energy Portfolio

Coal is a strategic, national energy, security resource. It is the most abundant, lowest-priced fossil fuel in the United States, with recoverable reserves projected to last about 240 years at today's usage rates and prices. It is also an abundant natural resource for much of the world and will remain a major source of energy in the United States and for many other countries well into this century. Coal accounts for almost a third of America's total energy production and just over half of all U.S. electricity generation. In 2007, the U.S. consumed 1.1 billion tons of coal, which is expected to grow to an estimated 1.5 billion tons by 2030, a 37 percent increase, according to DOE's Energy Information Administration.

We are committed to using coal more cleanly and efficiently while, at the same time, reducing its environmental impacts. Since 2001, the Bush Administration and Congress have called for the investment of more than $2.5 billion in clean coal research and development. With the President's FY 2009 budget proposal, we have asked Congress to appropriate the funds needed to expand this investment. The budget requests $648 million for DOE's advanced coal research, development and demonstration program—the largest amount requested for DOE's coal program in more than 25 years.

Recent Technology Advancements

When FutureGen was first announced, few proposals for the construction of integrated gasification combined-cycle (IGCC) coal plants existed. Today, in addition to the two IGCC plants currently operating on coal in Florida and Indiana, and one operating on pet-coke in Delaware, two proposed IGCC power plants have passed the permitting process (an AEP plant in Illinois and a Duke plant in Indiana), and around 30 of these clean-coal plants have been publicly announced and are in various stages of planning. As these facilities are built and operated, they will provide experience not only with advanced power technologies, like IGCC, but also could utilize CCS technologies supported under our restructured FutureGen program.

Carbon capture and storage technology has also made important strides since the original FutureGen program was launched in 2003. DOE's Carbon Sequestration program has created a network of seven Regional Carbon Sequestration Partnerships to help the program develop the technology, infrastructure, and regulations necessary to implement large-scale carbon dioxide (C02) sequestration in different regions and geologic formations within the Nation. The large-scale tests are a continuation of the 25 small-scale geologic storage tests that the Partnerships are implementing today. The Carbon Sequestration program's small and large-scale field tests, launched by DOE in 2003, form the centerpiece of national efforts to develop the infrastructure and knowledge base needed to place carbon sequestration technologies on the path to commercialization.

The Restructured FutureGen Program

FutureGen was first announced in 2003 as a $950 million initiative to create a single coal-based power plant to demonstrate advanced clean-coal technology. The project was designed to produce hydrogen and electricity on a smaller-than-commercial scale, serving as an R&D testing laboratory. Our goal then, as now, was to find a way to produce electricity from coal with dramatically lowered emissions into the atmosphere.

The Energy Department joined with industry, in the form of the FutureGen Alliance, in a cost-sharing agreement calling for taxpayers to shoulder up to 74 percent of the cost of this demonstration project. The FutureGen Alliance partners would cover 26 percent, and we looked to international governments for contributions as well. However, as plans for the demonstration plant moved ahead, the project's estimated total cost escalated sharply. In fact, cost estimates reached $1.8 billion and would have likely continued to rise, perhaps dramatically as had occurred recently. After several months of discussions with the FutureGen Alliance, it became evident that we could not reach agreement to revise the cost-sharing arrangement in a manner that would limit in a reasonable way the government's financial exposure on this project. Moreover, issues arose involving the Alliance's insistence to leverage major portions of its 26 percent contribution as debt against the project. This, coupled with the changes in the market discussed above, led the Department to restructure the program.

The goal of our restructured FutureGen program remains the same as the original FutureGen approach announced in 2003: to maximize our national investment in clean coal research by demonstrating cutting-edge system integration of CCS technologies. The difference is that under the restructured program, our plan, with current cost estimates, is to support not just a single less-than-commercial-scale R&D testing laboratory, but rather to provide funding for commercial demonstration of integrated advanced carbon capture and storage technologies.

Unlike the original approach, the new plants will operate commercially from the start and will provide a significant amount of electricity to our nation's electric grid. This will help meet the Nation's rapidly growing demand for energy, while also demonstrating the commercial viability of permanently and safely storing carbon dioxide deep underground. These commercial plants will be able to be replicated around the world. The power sector will be able to plan and to finance new state-of-the-art coal facilities based upon cutting-edge system integration of CCS technologies at commercial plants under the restructured FutureGen program.

The restructured approach harnesses the power of private sector innovation, limits taxpayer exposure, and maximizes the impact of the federal investment while substantially increasing our likelihood of success. At current cost estimates, some of the benefits we anticipate include:

- Sequestering at least double the amount of CO_2 expected from the original FutureGen program. The CO_2 generated by each plant will be sequestered in a saline formation, or possibly used in other applications that result in permanent sequestration such as enhanced oil recovery.
- Building on technological R&D advancements that have been made since the FutureGen concept was announced in 2003, which includes small-scale carbon sequestration projects, the Regional Sequestration Partnerships, and IGCC research.
- Accelerating the timeframe for full-scale commercial operation of IGCC or other advanced technology coal power plants with CCS, enabling market use as soon as the plants are commissioned.
- Joining with industry in its efforts to build clean-coal plants by providing funding for the addition of CCS technology to multiple plants.
- Demonstrating the integration of CCS technology and clearing hurdles associated with early technology demonstration, thereby increasing the likelihood of rapid commercial deployment after 2015.
- Helping provide the technology basis to inform regulatory and technology development to the next generation of coal plants, many of which are facing cancellations due to concerns about the legal and regulatory situation relating to greenhouse gas emissions.

To move this restructured FutureGen program forward, DOE launched an aggressive schedule for its implementation. The Department initiated this schedule with a Request for Information (RFI) to secure industry input in advance of a competitive solicitation to provide financial assistance for CCS demonstrations integrated with market-ready, commercial IGCC or other clean technology coal power plants. The

deadline for the public to submit comments was March 3, 2008. I am pleased to report to you that we have had strong interest from approximately 50 parties that responded to the RFI. DOE staff is currently reviewing and analyzing the input received from these parties, and our next step will be to issue for comment a draft Funding Opportunity Announcement (FOA) in May. Following the subsequent issuance of the final FOA, we will evaluate the applications received, and anticipate announcing selections no later than January 2009. After successful completion of *National Environmental Policy Act* (NEPA) analyses, commercial operations could begin in 2015.

Conclusion

To be successful in confronting the energy and environmental challenges before us, we cannot continue the business-as-usual approach. We must continually ask if we are efficiently using our taxpayer investments to achieve a cleaner, more sustainable, more affordable and more secure energy future. Where we are not, we must make changes; that's what we are doing with the FutureGen program.

The Department appreciates the support we have received from Congress in our efforts to advance clean coal technologies, and we look forward to continuing that partnership. We hope you will join us in supporting the restructured FutureGen program.

I thank you, Mr. Chairman, for scheduling this hearing and for your interest in the new FutureGen program, and I look forward to answering any questions that you and Members of the Subcommittee may have.

BIOGRAPHY FOR CLARENCE H. "BUD" ALBRIGHT, JR.

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

Under Secretary Albright oversees the Department's Energy and Environment programs, including its diverse portfolio of applied energy research and development activities, nuclear waste management efforts, and environmental cleanup 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 as 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 Doctor Degree from George Mason University School of Law in Virginia. Mr. Albright lives in Virginia with his wife and their two children.

DISCUSSION

Chairman LAMPSON. Thank you, Mr. Albright.

Before we start, well, at this point we will have our first round of questions, and the Chair recognizes himself for five minutes.

Before we start the questions I have some housekeeping tasks to raise with Mr. Albright. First, I ask unanimous consent to enter a packet of materials into the record. These are documents that the Committee received late Friday afternoon in response to a request from this subcommittee, and they have been shared with the Minority. [*The information appears in Appendix: Additional Material for the Record.*]

EXECUTIVE PEROGATIVE?

The very first document in this packet is the letter signed by Eric Fygi, Departmental counsel, that indicates that some materials were withheld on the grounds of executive prerogative. I don't know what an executive prerogative is, but I know it is not a privilege. No privilege is asserted here. The message seems to be that we are entitled to all the materials, but the Department just doesn't want to give them up.

Mr. Albright, you worked for Mr. Barton on the Energy and Commerce Committee. You can imagine how Mr. Barton and Mr. Dingell would respond to a letter from an agency that included language about executive prerogatives. They would insist on getting those documents. Maybe in a nice way and maybe in not so nice a way.

So I am insisting also. I want you to go back and explain the perspective of the House on such matters to the Secretary and indicate that he will be getting a letter on this matter, and we expect full cooperation. Will you do that, please? Will you promise to do so?

Mr. ALBRIGHT. Absolutely I will.

INFLATION OVER THE LIFETIME OF FUTUREGEN

Chairman LAMPSON. Thank you. Now, my questions.

Let me read from a December 13, '07, memo. It is Exhibit 2A to the Secretary from Lisa Epifani, Assistant Secretary for Congressional Affairs. "DOE's original internal project cost estimate was $950 million priced in '04, cost dollars." Her quote. When you price a project in constant dollars, Mr. Albright, you take out all the inflation over the life of the project. Isn't that right?

Mr. ALBRIGHT. I will accept that.

Chairman LAMPSON. Typically usually I would expect that would be a yes answer. So continuing the quote, "The current total cost estimate is approximately $1,757,232,710, 1,757,232,310." As spent dollars, Mr. Albright. As spent dollars on a project cost estimate or dollars that include the effects of inflation over the life of the project. This project would run a decade, so there is a lot of inflation. Is that correct?

Mr. ALBRIGHT. That is correct. Yeah.

Chairman LAMPSON. It would appear to me then that these two numbers are just two different ways of expressing essentially the same project costs. One is big because it includes inflation, and one is small because all the inflation is taken out of it. Am I wrong?

Mr. ALBRIGHT. Basically I don't think you are wrong. No.

Chairman LAMPSON. Okay. So has there then been any actual, real, substantive price increase incurred, or are we just talking about constant versus current dollars in this comparison?

Mr. ALBRIGHT. I think we are talking about real cost increases. The entire industry, not just this industry, but all industries are undergoing extraordinary cost increases due to the increased cost of coal, steel.

Chairman LAMPSON. This cost, is that, are they substantive costs on the project, or is it inflation? Is it the same thing costing more money because we have allowed time to go by in a normal course of action because of inflation?

Mr. ALBRIGHT. Well, yeah. I think put that way, yes. Most of it is inflation. Let me be clear. We are not, there was no assertion that there was mismanagement in the money or that somehow that the costs were estimated costs. And remember, these were estimated costs when this thing went over with the Alliance. I mean, we have paid all the bills I think the Department will be in for some approximately $40 million, and the Alliance is some $14 million.

But these are estimated costs that we are talking about, and clearly we are talking about just that, escalated costs not due to mismanagement but due to market conditions.

EXPLANATION OF COST GROWTH

Chairman LAMPSON. You are looking at either the, you are looking at the costs that was proposed and you are looking at the actual estimate, and that is essentially inflation.

So let me go on. If these are essentially the same project costs just two different ways of explaining the costs, why do I find as the first item in the talking points for Secretary Bodman's call to Senator Durbin, which is Exhibit 3, bullet point three, that the project was canceled due to the cost growth in the project? And why do I find in the talking points of Secretary, of the Secretary for a conversation with Representative Tim Johnson from last November, Exhibit 4, bullet point one, that, "I am extremely concerned about the cost escalation of this project, which has gone from roughly $900 million to $1.8 billion, and we haven't even broken ground yet."

So does the Secretary not know the difference between the constant dollars and estimate dollars in project budgeting?

Mr. ALBRIGHT. I am sure he does. I am sure he does, and——

Chairman LAMPSON. Well, then if that is the case, then he is knowingly misleading Members, because if——

Mr. ALBRIGHT. No, sir. Those are real, that is real money that the taxpayers are going to have to come up with. Whether it is due to inflation, whatever it is due to, that is real money, $1.8, $900 million to $1.8 billion. And there is no one sitting at the table that believed at the end of the $1.8 billion that was going to be the end of it. We firmly believed costs were going to continue to escalate and that ultimately Congress would not be able to or willing to fund this project as currently structured.

Not unlike the super collider in Texas. It broke ground, got started, and then was canceled due to budgetary concerns, and we felt that was an irresponsible direction to take.

Chairman LAMPSON. Of course I think the Secretary knows the difference and yet we will still get this message from the Secretary that the project has suffered enormous cost growth, and this is simply not true.

It looks like the Department has cherry-picked numbers to sell us on your preferences, and when you wanted us to support the FutureGen, you bragged about the cost in constant dollars, taking all the inflation out since that was a smaller number. When you wanted us to look the other way, as you abandoned the project, you emphasized the bigger number with inflation added back in to make it appear that there had been tremendous cost growth.

Has the Department gone through all of its big construction projects, Savannah River, GNEP, Yucca Mountain, to decide which of these should be stopped due to increasing construction costs?

Mr. ALBRIGHT. We are constantly evaluating costs. Absolutely. And we are constantly refiguring——

Chairman LAMPSON. And canceling them, though?

Mr. ALBRIGHT. Beg your pardon?

Chairman LAMPSON. And canceling them, though?

Mr. ALBRIGHT. There are, I can't sit here and tick them off. I will be glad to get you information on that. I just last week signed a three-year delay on a project due to costs. Some projects are canceled due to costs.

Let me go back if I may to your original proposition that the $900 million did not figure inflation in. I am not sure whether it did or it did not. As I understood that was total estimate project costs, but the one thing I can assure you is that we are not playing with numbers. We are not jimmying things trying to mislead Congress in any way. I wouldn't do that, the Secretary wouldn't do that, and that is not what this is about.

Chairman LAMPSON. I will recognize Mr. Inglis for five minutes.

IS MOMENTUM LOST DUE TO THE TERMINATION OF FUTUREGEN?

Mr. INGLIS. Thank you, Mr. Chairman.

Maybe anticipating the questions from our colleague, John Shimkus or Tim Johnson or Jerry Costello, but the thing that would concern me, Mr. Albright, about the change of the program would be the potential loss of any critical mass that has developed there.

Is there a sense that some critical mass was there and will be lost and momentum will be lost towards some of these solutions, or is it the Department's sense that, no, actually we can get more creativity, more input by spreading these, this work out? Is that—I am concerned about the loss of critical mass and the loss of momentum.

Mr. ALBRIGHT. And I understand that. I believe that at the, once we get, once we break ground and get some of these projects moving forward, that we will benefit from a time perspective as well as from a technological and commercial knowledge base perspective.

Remember, we hadn't broken ground on anything yet. We frankly hadn't—there was still some outstanding issues regardless of whether we went forward with the Alliance. There were some outstanding issues to negotiate regardless. So a lot of engineering work had been done, a NEPA study had been done, other things like that had been done, but we were not at a point of informing the Board on exactly what technologies we were going to use.

So I don't think we have lost momentum. I think this will gain momentum. Remember that we are moving from a purely experimental facility to facilities, plural, that will be commercially operating the day that we begin. So I think that is a key. That was the goal of FutureGen from the beginning, was to supply electricity onto the grid, onto the commercial grid, generated with coal as fuel and emitting into the atmosphere near zero emissions. That re-

mains the goal, and I think the restructured approach will bring us to that goal ultimately faster than the old approach would.

And I certainly believe we will enjoy a capture of more carbon dioxide, greater sequestration under the new program. And the generation of additional electricity. Even if we were to do one, we are requesting that we generate 300 megawatts versus 275 megawatts. The plan is to do multiple plants.

FUTUREGEN RESEARCH

Mr. INGLIS. FutureGen had a research component to it, and I guess that will continue with these scattered sites, or how would that work?

Mr. ALBRIGHT. Part of this will continue. The continuation will be focused primarily on the carbon capture and sequestration elements of this. We had to, we did have to scale back on some of the research that would be done at the facility. That research, hydrogen research, and other parts of the research will be, will continue at our various labs and at various sites around the country. We are not moving away from that research. We are just scaling back on what we could do here, and we are scaling back principally on that because of cost concerns.

GEOLOGY OF FUTUREGEN SITES

Mr. INGLIS. We see geology particularly favorable to sequestration at the FutureGen location, or is that not a factor?

Mr. ALBRIGHT. At Mattoon?

Mr. INGLIS. Yeah.

Mr. ALBRIGHT. That is, I believe that was and one of the things that the Alliance did was study the various geologic properties of the optional sites and narrowed down to, I believe it was four sites, potential locations that had a variety of factors, one of those being geologic that made it a feasible site.

Mr. INGLIS. And I guess that same geology will drive these additional sites, these multiple sites?

Mr. ALBRIGHT. That is part of it, yeah. That would be part of it. Certainly. And certainly the site announced by the Alliance in Mattoon would have, I believe, will have some advantages over some of the other sites in that they have done that geologic work, they have done a NEPA study, although the NEPA study would have to be redone, but they do have a head start on a lot of that type of work.

Again, that is going to be determined now by the private sector where they decide to locate, but I would certainly envision that they would be, they would look favorably or interested at least in a site that had done that much work in a state that has done as much work as Illinois.

Mr. INGLIS. Thanks. Thank you, Mr. Chairman.

Chairman LAMPSON. Thank you, Mr. Inglis.

I recognize Chairman Bart Gordon of the Full Committee for five minutes.

DOCUMENT REQUEST

Chairman GORDON. Thank you, Mr. Chairman.

First, Mr. Albright, let me just quickly go to the document request that Mr. Lampson asked for earlier. As he pointed out, as the Chief of Staff in Energy and Commerce Committee, you know the need that this committee has for that and the bad press it would incur if we didn't get it. I hope as you said you are going to take this message back. We are going to waste a lot of time, you are going to waste a lot of time, your Department is going to waste time, and somebody can get in trouble if we don't move forward with this. So let us just, you know, you know what is the right thing to do. I hope you will communicate that to them, because, you know, you will be spending a lot of time otherwise.

Now——

Mr. ALBRIGHT. If I just may——

Chairman GORDON. Okay. Sure.

Mr. ALBRIGHT.—let me try to make the—at least one of the operative parts of the letter that we are willing to work with the Subcommittee in an effort to accommodate the Subcommittee's legislative needs. So, you know, we certainly are, and we want to work with the Subcommittee. We have put these documents together on pretty short notice. We got everything up here that the lawyers believed was clear should come up. The others we want to talk about and see what we can do.

So I will tell——

Chairman GORDON. Yes. Typically you, when you withhold information, you specifically say what you are withholding and why, and so I think that would be the next good step.

Mr. ALBRIGHT. And that clearly is what we will do.

Chairman GORDON. Okay. So, again, let us just, we are going to all work on good faith and try to move forward on that, because I think there are other things to get done.

FUTURE CHANGES AND PLANS FOR FUTUREGEN

Let me admit to you that I did not have a chance to read your full testimony. In your abbreviated testimony you referred to it and so I am hoping there is some greater insight into what is really going on here, because I still don't quite understand it.

Now, as I understand, what the plan is rather than to have one more major site, you want to have these variety of sites around, and that you are going to let the private sector move forward, start on their projects, and then you are going to in whatever way it is, say, "Okay, that is a good one, this is a good one, that is not such a good one." And then you are going to invest money there in terms of the carbon sequestration. Is that crudely, you know, what you are planning on doing?

Mr. ALBRIGHT. That is broadly I would say. Yes.

Chairman GORDON. Okay. Now, this seems to me, so how is this going to alter the timeframe, what kind of costs are you estimating, and what funding sources are you going to have for that?

Mr. ALBRIGHT. The time we believe that we can be operative on the commercial grid. I believe it is 2016, or 2017.

Chairman GORDON. And that is contingent upon what? I mean, that is your end. What, when do you have to start for that end to be realistic?

Mr. ALBRIGHT. Well, we have already started. We did a request for information, reaching out to I was going to say the industry, but we reached out to the world as a whole. We got nearly 50 comments back from, you know, primarily industry but other interested——

Chairman GORDON. Well, let me tell you what I think would be helpful to all of us. Have you set forth a timeline when you need what, you know, different elements of this, so that we can track that? Have you been able to do that?

Mr. ALBRIGHT. We have put forth a timeline of when we believe we will be making announcements. We hope to make announcements by the end of this Administration.

Chairman GORDON. Well, I am not talking about announcement, but is there a strategic plan forward so that there are seven elements that need to be reached, and this is the time for number one, number two, number three?

Mr. ALBRIGHT. There are those, as you know, those time estimates, regardless of a project, are not absolutely firm as to——

Chairman GORDON. So I guess you are saying that you haven't done that then?

Mr. ALBRIGHT. No, sir. I am not saying that. We have.

Chairman GORDON. Oh, you have done it? Oh, good. So then will you share that with us?

Mr. ALBRIGHT. I would be happy to sit down with you and talk to you about sharing that.

Chairman GORDON. So we are going to talk about whether you can share it with us? And why don't you give me, since you are here, maybe a reason or two why you wouldn't. I mean, like what will we be talking about, just out of curiosity?

Mr. ALBRIGHT. Well, I am not saying we wouldn't. I would say I would be happy to sit down and talk with you. Congressman, Chairman, I will be totally blunt with you. I don't want to get into a situation where I say on July the 23rd something is going to happen, and if we are at July the 24th, be hauled up here to say, hey, you are running late, you are not going to accomplish your project.

Chairman GORDON. Well, let me be, you know, blunt, too. We have a responsibility to the taxpayers. I mean, there has already been one could say a lot of money squandered already, and so you are saying, "trust me." Well, you haven't really demonstrated why there should be a trust. I don't think it is too much to ask that there be a strategic plan forward. Clearly, you know, it probably won't be an April 15. It may be a range or period.

Mr. ALBRIGHT. I would be happy——

Chairman GORDON. But, I mean——

Mr. ALBRIGHT.—to share that.

Chairman GORDON.—it would really make me less confident that, I mean, I can't do things without a plan.

Mr. ALBRIGHT. No. We have a plan. I will be happy to share a plan.

Chairman GORDON. Good. Good.

Mr. ALBRIGHT.—going forward with you.

COST ESTIMATES FOR THE NEW FUTUREGEN PLAN

Chairman GORDON. And then will that plan have, again, not the, you know, down to the penny, but is it going to have some cost estimates?

Mr. ALBRIGHT. What we will get back in our funding opportunity announcement are cost estimates. We will get the cost estimates from those who are going to be spending the money in the private sector as we evaluate whether or not to select a given project.

Chairman GORDON. Well, what about the public sector dollars? I thought you were going to choose——

Mr. ALBRIGHT. Well, we are, but what we——

Chairman GORDON. But you don't have cost estimates on that?

Mr. ALBRIGHT. We have estimates. Yes, sir.

Chairman GORDON. Okay.

Mr. ALBRIGHT. We believe we can do multiple plants for less money than we were going to spend earlier.

Chairman GORDON. All right. And——

Mr. ALBRIGHT. On the Alliance FutureGen.

Chairman GORDON. Are you going to need to ask for additional funds?

Mr. ALBRIGHT. Yes, sir.

Chairman GORDON. Okay. And so, again, what I think would be very helpful for you and for us would be to know what, again, the strategic plan in terms of a timeframe of what you are going to accomplish, when you want to get it accomplished, what kind of public and private dollars that you are looking for, and where that request would be made.

And, again, that is just so that we can, you know, understand this. I don't want to wake up, you know, you are going to be gone, I would assume, hopefully, well, I won't say hopefully, but before I am going to be. I mean, it is fine with me for you to be there a long time, but I suspect I am going to be here longer than you are going to be there.

Mr. ALBRIGHT. Yes, sir.

Chairman GORDON. And so——

Mr. ALBRIGHT. I hope so on both counts.

Chairman GORDON. Yes. So, you know, we have got to answer these questions later on, and we have got to, we are going to be held responsible. So, it is really our job to try to get this information now because, you know, later on, you know, I won't—anyway, we have to take——

Mr. ALBRIGHT. I understand.

Chairman GORDON.—responsibility for this.

Mr. ALBRIGHT. We will get you a strategic plan.

Chairman GORDON. Good. Thank you.

Mr. ALBRIGHT. And certainly would be happy to do that.

Chairman GORDON. Thank you very much.

[The information follows:]

INSERT FOR THE RECORD

Two versions of the "Draft Strategic Planning Document for Revised FutureGen," one from the December–mid-January 2008 timeframe and one from the late January 2008 timeframe, were transmitted by the Department to the Subcommittee on June 26 and July 1, 2008, respectively.

Department of Energy
Washington, DC 20585

June 26, 2008

The Honorable Nick Lampson
Chairman
Subcommittee on Energy and Environment
Committee on Science and Technology
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

As requested, transmitted herewith is a copy of the Department's "Draft Strategic Planning Document For Revised Futurgen." This draft document was initially prepared in the December 2007 time frame and the copy being provided to the Subcommittee today is a version from that time frame. I am informed that it has been revised in some respects since that time, remains a draft document to date, but it has not been completely vetted within the Department.

The draft document contains several categories of sensitive information. First, there are several pages of information that are business sensitive to the Department because they reflect internal Departmental cost estimates of restructured FutureGen, including the third bullet on page 5, the entire section on "Project Cost and Cost Sharing" (pp. 10 – 14), and the entirety of "Appendix A." Public release of this information would negatively impact the Government's bargaining position in the recently announced Funding Opportunity Announcement process.

The second category of sensitive information is contained in the last two bullets on page 16, which outline potential negotiating issues regarding intellectual property under restructured FutureGen.

The third category of sensitive information, relating to close out costs under the Cooperative Agreement with the Alliance, is business sensitive to the Department because it could impact on the Government's ability to recoup money from the Alliance under original FutureGen. That information is found in the "2007" section of the chart on page 15.

The final category is information potentially proprietary to the Alliance, including the entirety of "Appendix B."

The Department respectfully requests that the Subcommittee refrain from publicly disclosing the above enumerated portions of the Strategic Plan.

Also enclosed are two additional documents responsive to the Subcommittee's April 2, 2008 letter.

If you have any questions, please contact me or Ms. Lisa Epifani, Assistant Secretary for Congressional and Intergovernmental Affairs, at (202) 586-5450.

Sincerely,

Eric J. Fygi
Deputy General Counsel

Enclosures

cc: The Honorable Bob Inglis
Ranking Member
Subcommittee on Energy and Environment

The Honorable Bart Gordon
Chairman
Committee on Science and Technology

The Honorable Ralph Hall
Ranking Member
Committee on Science and Technology

The Honorable Brad Miller
Chairman
Subcommittee on Investigations and Oversight

The Honorable F. James Sensenbrenner
Ranking Member
Subcommittee on Investigations and Oversight

Internal Deliberative
-- Not for Public Distribution --

DRAFT STRATEGIC PLANNING DOCUMENT FOR REVISED FUTUREGEN

DEMONSTRATION OF INTEGRATED ELECTRIC POWER PRODUCTION AND CARBON CAPTURE AND SEQUESTRATION

Goal

To prove and accelerate commercial deployment of Integrated Gasification Combined Cycle – Carbon Capture and Storage (IGCC-CCS) technology for coal-based systems on the basis of a more reasonable allocation of risk among the public and private sectors and at a cost more appropriate for the taxpayer to bear.

Mission Need and Background

On February 27, 2003, when the President announced FutureGen, a $1 billion cost-shared initiative to create the world's first coal-based, IGCC-CCS power plant, the focus was on developing a revolutionary coal technology that addresses climate change concerns resulting from atmospheric carbon dioxide, a greenhouse gas (GHG). Five years later, the goal of a technology solution for climate change relating to coal use remains the same. Coal remains a strategic domestic, low cost energy resource for our Nation's energy and economic security. The FutureGen initiative also continues to support recommendations in the National Energy Policy (NEP) issued in May 2001, which highlights the need for a broad policy to "protect national and economic security by promoting a diverse, secure source of reliable, affordable and environmentally sound energy," and recognizes that "If rising U.S. electricity demand is to be met, then coal must play a significant role." Since that time, changes in market realities have reinforced the need to accelerate the deployment of this concept in the market place in order for coal to be a viable clean energy source for the future. Thus there is a need to restructure the program by emphasizing more immediate and commercial-scale demonstrations of the feasibility of IGCC-CCS technology in our Nation's energy sector sooner rather than later.

Today, more than ever, the concept of FutureGen is a centerpiece for the future of coal utilization. FutureGen directly addresses a primary goal of the Department of Energy's (DOE) 2006 Strategic Plan under the Theme for Energy Security to promote America's energy security through reliable, clean, and affordable energy: Environmental Impacts of Energy: "Improve the quality of the environment by reducing greenhouse gas emissions and environmental impacts to land, water and air from energy production and use." Eliminating environmental issues as barriers to coal use through the use of efficient coal generation technologies such as Integrated Gasification Combined Cycle (IGCC) and carbon sequestration will enable the continued use of secure, domestic coal resources for our future energy needs. Widespread replication of this technology by the private sector will help to meet the energy and environmental needs of our Nation's expanding economy, growing population, and rising standard of living. Absent the low emission capability of IGCC with carbon capture and sequestration, coal's contribution to the Nation's energy mix could be severely curtailed, thus limiting the fuel diversity of our electricity supply portfolio, and increasing our dependence on more expensive and less secure sources of energy.

Since the inception of FutureGen, changes in market realities have altered the energy/power and environmental landscape. These changes include a serious escalation in material and labor costs for new

power plants, a growing near-term interest in the promulgation of carbon dioxide (CO_2) emissions regulations, and several states such as Florida, Kansas, California, and Washington requiring coal plants to consider CCS. These changes in the market landscape, in particular the issue with respect to atmospheric emissions of CO_2, have lead to greater environmental challenges to the future of fossil-based power generation, especially coal, have presented serious potential barriers to the power industry to finance and build new coal-based generation capacity, and have catalyzed the need to demonstrate the commercial viability of a new generation of advanced coal-based power systems (namely, Integrated Gasification Combined Cycle, or IGCC) with CCS technology.

In parallel with these developments, a growing demand in the United States for electricity through 2030 of an additional 199,000 megawatts of power needed over the next 22 years is projected by the Energy Information Administration. In response, the utility industry has proposed a number of new coal plant projects, including IGCC technology. However, due to challenges mentioned above and uncertainty about the cost and performance of IGCC-CCS, plans for many new coal-based power plants are being abandoned or postponed. So, while there is a growing demand for electricity, there is also a critical need to accelerate the commercial demonstration of advanced coal-based power technology with CCS that can cost effectively meet a carbon-constrained future. Government leadership with the power industry is required to address the additional financial burden and risk associated with adding CCS to an advanced technology such as coal-based IGCC that has seen only limited commercial-scale operation. As such, the Revised FutureGen program is looking to accelerate commercial demonstration of coal-based IGCC projects coupled with CCS and expand the application to multiple sites.

For FutureGen to effectively meet its goal under these new market realities, it is necessary to adopt a new strategic approach, one that emphasizes early commercial experience with near-zero emission coal plants (IGCC with CCS) through a series of demonstrations linked to the commercial operations of IGCC. This "Revised FutureGen" approach differs from the Original FutureGen which focused on the large-scale integration of advanced R&D technologies in a "living laboratory" setting to be followed by commercial demonstrations and subsequent deployment. With the Revised FutureGen, the commercial demonstration route will allow for early deployment of nearer term IGCC-CCS technologies along side commercial IGCC operations. Revised FutureGen will address early on the challenges associated with near-zero emissions plants, including siting issues, and help drive the regulatory frameworks for CO_2 transport, injection and storage associated with power generation. More importantly, Revised FutureGen will still address the very critical technical feasibility question of advanced technology clean coal plants.

FutureGen's integration of concepts and components is essential to proving technical and operational viability to the generally conservative, risk-adverse coal and utility industries. Integration issues such as the dynamics between upstream and downstream subsystems (e.g., between interdependent subsystems such as the coal conversion and power and carbon capture and storage systems) can only be addressed by a large-scale integrated facility operation. Unless the production of electricity from coal integrated with sequestering carbon dioxide can be shown to be commercially feasible and cost competitive, the coal industry will not make the investments necessary to fully realize the potential energy security and economic benefits of this plentiful, domestic energy resource.

Rationale for Adopting Revised Approach

Under the Original FutureGen approach:

- The Federal Government would have shared 74% of the cost of building both an IGCC plant and the CCS technology, with the majority of the cost due to construction of the IGCC plant portion of the facility.

- The Federal Government would have borne 74% of all increases in the cost for both the IGCC and CCS components.
- DOE acknowledges that costs have increased simply due to rising construction costs generally seen throughout the power industry worldwide; however, DOE can no longer afford the Original FutureGen approach as projected costs have nearly doubled since project inception.
- The Federal Government must limit taxpayer exposure to only those costs for which there is an appropriate Federal role, specifically RD&D of unproven technologies, and the private sector should bear the costs of constructing commercially viable, proven IGCC technology that may be deployed with or without CCS.
- Attempts to restructure the current cost share arrangement are stalled and action is needed now.

Because of the changes in energy markets and environmental landscape over the past five years, as it may affect coal, there is a need to emphasize early demonstration of coal-based IGCC with CCS. The FutureGen project, as originally structured for large-scale R&D testing, is no longer optimal to achieve the goal of accelerating the commercial demonstration and deployment of advanced, integrated coal-based power systems including CCS. For these reasons, the Department has developed a new strategically restructured approach – "Revised FutureGen" -- with the overall aim of advancing FutureGen's goals and objectives that limit the government's financial exposure while leveraging its investment across a wider range of nearer-term coal based IGCC-CSS projects.

Further, the Revised FutureGen concept continues to satisfy the primary technical goals of the Original FutureGen program including:

- accelerating the deployment of CCS technology;
- establishing the technical feasibility and economic viability of producing electricity and hydrogen from coal with near-zero emissions (including CO_2);
- verifying the sustained, integrated operation and the effectiveness, safety and permanence of a coal conversion system with carbon sequestration;
- establishing standardized technologies and protocols for CO_2 monitoring, mitigation and verification;
- sequestering CO_2 at an operational rate of at least one million tons/year in Saline formation;
- capturing at least 90 percent of CO_2 from a single, commercial-scale power train;
- capturing at least 90 percent of mercury emitted;
- removing >99 percent of sulfur emitted,
- reducing NOx emissions to <0.05 lb/million Btu, and
- particulate emissions to <0.005 lb/million Btu.

Technical and Financial Benefits of Revised Approach

The revised direction for FutureGen means accelerated and wider demonstration of the IGCC-CCS concept in coal-based power generation at commercial scale that will promote a more rapid investment by industry in near-commercially available technologies for carbon capture and storage. This approach addresses two key challenges: IGCC-CCS integration; and accelerated deployment under the current commercial market setting that would address the regulatory and permitting challenges of CCS earlier rather than later. Further, the Revised FutureGen approach envisions multiple demonstrations which will produce the following additional outcomes:

- Validation of CCS at multiple sites;
- Injection into and monitoring at multiple geologic formations;

- Integration, at commercial scale, of multiple gasification-based power production technologies;
- Development of a regulatory and permitting framework for CCS in multiple states;
- The potential for a broader engagement of critical U.S. stakeholder participants;
- The opportunity for international participation at more than one project;
- Establishment of a broader set of financial benchmarks for private sector financing of next generation, IGCC plants; and
- Production of a more comprehensive and reliable set of operating data that will serve to reduce uncertainty and promote the early widespread deployment of IGCC-CCS technology.

A Comparison of Key Differences between Approaches

This change in direction means replacing the notion of an experimental "living laboratory" 300 megawatt plant with multiple commercial plants that would include in each commercial plant an IGCC-CCS demonstration of at least 300 gross megawatts – putting a minimum of at least 600 MW of gross electricity generation with CCS into service. Each plant would have a 300 MW unit that demonstrates CCS in conjunction with IGCC power generation technology, achieving at least 90 percent CO_2 capture on a single power train. Each of these units at the plant would capture and store in a saline reservoir at least one million metric tons of CO_2 per year in addition to reducing emissions of sulfur dioxide, nitrogen oxide, particulate matter, and mercury to very low levels.

The following table identifies the major differences associated with each alternative FutureGen approach.

A Comparison of the Key Elements of Each Approach

	Original FutureGen	**Revised FutureGen**
Living Laboratory Host Facility	Yes	No
Innovative Technology Testing and Validation	Yes (but no funding provided; requires funding by other FE Coal Program elements)	No (commercial plant operation – facility availability unlikely)
Commercial Facility	No	Yes
Multiple Demonstration Sites	No	Yes (multiple)
DOE Share of Project Cost	✓ One project site ✓ 74% of project cost + escalation ✓ At least $1.3B	✓ Multiple Project Sites ✓ 20 to 30% project cost ✓ Not to exceed incremental costs of CCS ✓ Not to exceed $1.3B
Nominal Plant Size – Gross Capacity	300 MW	Most likely 600 MW
Plant Construction	2009	2012
Plant Start-Up and Operations	2012-2016	2015-2019
Project Completion for DOE	2018	2020
EOR Potential	No	Yes
Commercial Operation of CCS	Commercial Operations projected to begin ~2020	Commercial Operations projected to begin 2015

The primary differences between the two approaches can be summarized as follows:

- A shift in project focus from FutureGen as a "living laboratory" host facility to be used to test and validate new innovative technologies, to one which is targeted at the full-scale commercial operation of a coal-fueled IGCC-CCS plant;
- An acceleration of the full-scale commercial deployment of the IGCC-CCS concept under the Revised FutureGen is scheduled to occur sooner than under the original plan;
- The Original FutureGen Project requires DOE to share 74% of the costs of the entire facility (both Power Island and CCS) and all project cost overruns. At present the federal investment in the original plan is $1.3 billion, rising and uncertain. The Revised FutureGen approach places the entire cost burden for the power island on the industry, and limits DOE's investment to 100 percent of the CCS portion of the project only. Current estimates of DOE's share of the Revised FutureGen approach is approximately $546 million per project;
- The Original FutureGen Project is a single, research-only plant intended as a host facility for the testing of innovative technologies, at a scale consistent with validating readiness for commercial operation, and funded by other DOE Coal Program elements; the Revised FutureGen Plan entails DOE participation in multiple full-sized commercial-scale projects;
- A typical commercial scale IGCC-CCS plant could be expected to generate approximately 3.5 million tons of CO_2 per year. Since the Revised FutureGen Concept only requires 1 million tons per year storage in a saline formation and this concept anticipates one or more commercial endeavors, this approach presents an opportunity for supplemental project financing via the use of excess CO_2 for enhanced oil recovery.

Integrating the Department's Coal Power RD&D Program

The Revised FutureGen plan offers a set of commercial demonstrations that will address early integration issues such as siting, permitting and storage that will face the utility industry in deploying IGCC-CCS. This activity is important, but alone is not sufficient to achieve the ultimate goal of widespread commercial deployment of cost-effective near-zero emissions coal.

The development and testing of key enabling technology is required to reduce the cost of electricity from coal-based advanced IGCC-CCS plants to market competitive rates. Continued RD&D is essential if near-zero emission coal technologies are to help meet projected U.S. and global growth in electricity demand. This is especially important in the rapidly developing economies of China and India, who will continue to rely on coal as a major source for electricity generation, and, absent the availability of affordable CCS, will continue to emit vast amounts of atmospheric CO_2.

The Revised FutureGen approach offered the opportunity for a fresh look at the commercialization profile of key FE technologies. The following table identifies key technology components for which the Department's Coal R&D Program has made significant investments, presents their current status and scale, identifies the most likely next scale, and provides perspective on the time and cost to carry out the next phase of advanced component testing. It is important to note the comprehensive nature of this table in that it identifies both those technologies envisioned to be tested at the Original FutureGen "living laboratory" as well as other critical technologies necessary for achieving near-zero emission coal plants of the future.

Advanced Technology and Test Options

Program Element (Source of Funds)	Technology[2]	Current Status "Scale" (CY2008)	Next Scale Testing	Envisioned for Testing at Original FutureGen[3] (2012-2016)	DOE Program Alternative– Next Phase[4]	Cost Estimate for Next Phase Testing[5]
Gasification	High pressure dry coal feed pump (e.g. PWR dense phase pump)	Pre-pilot	Pilot (e.g. 1 MW scale)	Y (if dry feed gasifier)	R&D Program (2-3 years)	$2-4 million
	Humid gas cleaning: Halide removal	Laboratory to Pilot	Pilot (e.g. 1 MW scale)	Y	R&D Program (2-3 years)	$1-3 million
	Humid gas cleaning: Mercury removal	Laboratory	Pilot (e.g. 1 MW scale)	Y	R&D Program (2-3 years)	$1-3 million
	Humid gas cleaning: Trace metals	Laboratory (pilot pending)	Pilot (e.g. 1 MW scale)	Y	R&D Program (2-3 years)	$1-3 million
	Humid gas cleaning: Sulfur removal	Pilot	Nominal 50 MW	Y Nominal 1 MW used in humid gas cleaning platform	CCPI (5-10 years)	$10-15 million (depends on scope – S processing)
	ITM	Demonstration	Prototype	Y	CCPI (4-10 years)	$ 5-10 million
	High through-put gasifier	Pre-pilot	Pilot	N	R&D Program (5-10 years)	$25-50 million
Coal Fuels	Humid gas cleaning: Hydrogen membrane	Laboratory	Pilot (e.g. 100 kW scale)	N	R&D Program (2-3 years)	$1-2 million
Carbon Sequestration	Humid gas cleaning: CO2 membrane (or other advanced concepts)	Laboratory	Pilot (e.g. 100 kW scale – such as PSDF)	N	R&D Program (2-3 years)	$1-2 million
	CO2 compression	Pilot	Prototype	Y	CCPI (4-10 years)	$2-5 million
SECA/Fuel Cells	Fuel cell	Small scale modules	5 MW scale tests	Y	R&D Program (5-8 years)	$15 million
Turbines	Low-NOx combustors	Bench scale; less than full basket	Single basket tests	N	R&D Program (simulated syngas at existing facility) (2-4 years)	$5 million
	Oxy-fired combustor	Lab	Single basket tests	N	R&D Program (simulated syngas at existing facility) (2-4 years)	$5 million
	Hi-hydrogen fired combustor	Lab	Single basket tests	N	R&D Program (simulated syngas at existing facility) (2-4 years)	$5 million
Advanced Research	Sensors, instrumentation, materials	Laboratory to pilot	Pilot to prototype	Y	Varies depending on technology	Varies depending on technology

[2] These are technology classes; e.g. R&D is being carried out on multiple technologies for carbon dioxide capture

[3] This is based on the concept that the testing of advanced technology at FutureGen is at the prototype scale such that the technology could be offered commercially with successful testing; technologies listed as 'N' could be tested at pre-prototype scale

[4] Two categories for next phase programs are considered: R&D Program (use of development facilities (e.g. PSDF) or slip streams at operating plants (e.g. Wabash, Tampa, Eastman Chemical, Great Plains)) and new CCPI projects or additions to planned commercial plants

[5] Illustrated cost estimate for the equipment supply and test for one technology in the given technology class; does not include associated R&D or cost of manufacturing facilities that may be required; does not include base facility test cost; actual cost will be dependent on scale, technology and the host plant

Without the Original FutureGen "living laboratory" as host to several key technology components, the Department's RD&D program will be under pressure to find available and affordable alternative sites for the scale-up of these key technologies identified in the table above. The Department's Fossil Energy Core R&D and CCPI Programs will be pursuing potential alternative host sites with interested industry stakeholders. Until discussions with key stakeholders take place, the exact costs associated with the testing and validation of these technologies will remain uncertain. However, as is noted in footnote 4 to the table above, it appears ample opportunity exists for the development and testing of key technology components at other potential demonstration sites.

Critical Milestones

Construction for the originally proposed FutureGen plant would begin in 2009 with plant start up in 2012 and operation through 2016. The project includes 2 additional years of monitoring, after which DOE project completion is scheduled for 2018. Commercial operation of the project is expected to occur around the 2020 timeframe, with the continued monitoring of injected CO_2.

Construction for the Revised FutureGen demonstration plants would begin in 2012, with planned commercial operation in the 2015-2019 timeframe. DOE project completion is expected to occur in 2020. Because the Revised FutureGen plants would be operated commercially from the beginning, commercial experience will occur some 5 years earlier than under the original plan.

Summary of Benefits

The Original FutureGen program was designed to work in concert with CCPI demonstrations, where FutureGen would begin operation in 2012 and provide the-first-of-a-kind integrated coal/CCS power plant using leading-edge technology, as well as a large scale integrated test bed for future technology improvements that could be demonstrated under the CCPI program. The Revised FutureGen would include 2-3 demos using off the shelf technology and start up around 2015.

Significant cost reductions for energy from coal/CCS plants will ultimately be needed for this to be an attractive option in the U.S. and internationally. The Original FutureGen was designed to accelerate the introduction of lower cost components by providing a large-scale test bed. Under Revised FutureGen commercial deployment of cost-reduction improvements could be delayed unless other test approaches are found, such as designing limited test capability (i.e. focused on a particular component rather than many) into Revised FutureGen and CCPI demonstrations.

The change in focus toward commercial demonstration versus a large-scale R&D test facility is important because these demonstrations will provide investors and the marketplace with a much greater sense of certainty about the cost and performance of IGCC with carbon capture, thus enabling earlier deployment of near-zero emission clean coal technology. To meet the projected growth in demand for electric power requires the use of coal, and demonstrations showing that up to 90 percent of the CO_2 can be captured and safely stored. These demonstrations will produce the technology that enables the power sector to use coal, the Nation's most abundant, secure, low-cost energy resource.

As part of this new direction for FutureGen, financially, the Department's plan is to only participate in funding the CCS portion of the demonstration unit of the overall IGCC-CCS plant. In the original investment strategy, the Department would fund 74% of the total plant cost and was also required to share 74% of all project cost growths. The new strategy would limit the Department's exposure to costs associated with only the CCS aspects of the project. The new strategy also focuses the industrial participant on proposing a commercial power plant that would operate profitably. Therefore, it would be

the responsibility of the participant to manage cost overruns based on economic competitiveness of the plant. In this context, DOE's role shifts from the principal funding entity for the project to one with a primary role focused on mitigating incremental risk of the addition of CCS. Furthermore, Revised FutureGen will provide a greater leverage of the taxpayers' investment as the Federal Government will only participate in financing the CO_2 capture and storage system while the private partners will pay the cost of the balance of the IGCC plant.

In summary, under the Revised FutureGen the Department and the Nation would be gaining valuable early commercial experience with IGCC-CCS coal plants. The Revised FutureGen will focus on full utility-scale demonstrations, integrating surface and sub-surface processing, and developing commercial cost, integrated IGCC-CCS performance, and reliability data in order to reduce risk, confirm economics, and facilitate industry-wide private capital offerings. It is expected that these full-scale projects will be in operation in the next six to eight years, and possibly sooner, depending on the site selected. Demonstrating IGCC-CCS technology is a key solution to reducing atmospheric CO_2 emissions from coal-based power systems. The new approach will address early on the deployment risks by replacing the original one-plant research project with multiple commercial demonstrations using nearer-term technologies that will support timely expansion of our generating capacity in response to rising need, while providing technology for mitigating greenhouse gases.

Performance Parameters Required to Obtain Desired Outcome (Revised FutureGen Description and Scope)

One of FutureGen's fundamental goals is to overcome environmental constraints, especially climate change impacts of CO_2 emissions, associated with producing electricity and other forms of energy from coal -- the Nation's lowest cost and most abundant domestic energy resource. It is expected the Revised FutureGen approach, in concert with continuing R&D for advanced cost-effective technologies, will still prove the technical and economic feasibility of near zero emission IGCC technology while capturing and sequestering the CO_2 generated in the process.

Projects selected will employ near-term coal conversion technologies to gasify coal, oxygen, and steam to produce a hydrogen-rich "synthesis gas." After exiting the conversion reactor, the composition of the synthesis gas is "shifted" to produce a concentrated gas stream of hydrogen rich fuel gas, steam, and CO_2. Following separation of these three gases, the produced hydrogen can be used to cleanly generate electricity in a combined turbine cycle using combustion and steam turbines. Steam from the process can be condensed, treated, and recycled into the gasifier or added to the plant's cooling water circuit. CO_2 from the process will be sequestered in deep underground geologic formations that will be intensively monitored to verify the permanence of CO_2 storage. Suitable geologic reservoirs for sequestration must be located in close proximity to the plant. Under the Revised FutureGen, focus will be placed on utilizing the synthesis gas for power (electricity) generation. Figure 1 below provides a simplified flow diagram for a prototype IGCC with CCS plant.

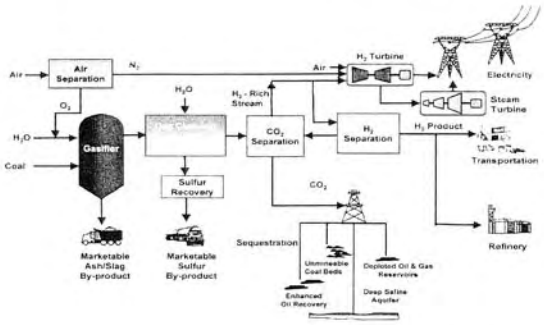

Figure 1 – IGCC-CCS Plant Configuration

The overall objectives are to:

- Demonstrate commercial integrated operation of a coal conversion system with carbon sequestration;
- Gain acceptance by the coal and electricity industries, environmental community, international community, and public-at-large for the concept of coal-based systems with near-zero emissions through the successful commercial demonstration of operating FutureGen plants;
- Through commercial demonstration, establish standardized technologies and protocols for deployment of IGCC –CCS, including CO_2 measurement, monitoring, and verification;
- Establish feasibility of integrated electricity production from coal with advanced clean coal technologies (including CO_2 capture); and
- Verify effectiveness, safety, and permanence of carbon sequestration.

The functional performance requirements for the selected projects include plant performance and sequestration monitoring and verification criteria. The *performance criteria* for the single-train demonstration unit of the overall plant are:

- Sequester CO_2 at an operational rate of at least one million tons/year;
- Produce electricity consistent with market needs (equivalent to plant capacity of ~300 MW gross electricity output for the demonstration portion of the commercial plant);
- Sequester at least 90 percent of CO_2;
- Plant location consistent with adequate feedstock availability, market for products, and proximity to geologic formation for sequestration (e.g., unmineable coal seams, depleted oil and natural gas reservoirs, deep saline aquifers, basalt formations);
- Environmental requirements:
  - ✓ 99 percent sulfur removal;
  - ✓ < 0.05 lb/million Btu NOx emissions ;
  - ✓ < 0.005 lb/million Btu particulate matter emissions;
  - ✓ 90 percent mercury removal; and

- Design includes demonstration of integrated IGCC with CCS that allows for enhanced operability and reliability in a commercial setting.

The *CO_2 Sequestration Monitoring and Verification performance criteria* are:

- Accurately quantify storage potential of the geologic formation;
- Detect and monitor surface leakage, if it occurs (capability to measure CO_2 slightly above atmospheric concentration of 380 ppm) and demonstrate effectiveness of mitigation; and
- Develop information necessary to estimate costs of future CO_2 management systems.

When operational, the technologies selected will enable the cleanest fossil fuel-fired power plants in the world and demonstrate the commercial feasibility of integrated IGCC-CCS technology. Through multiple commercial demonstrations in the Revised FutureGen, technical and economic risk associated with near-zero emissions coal plants can be better quantified with more certainty, thus enabling private financing decisions of future plants of this type. An industrial base exists for the use of several critical components, such as gasifiers, clean-up systems, turbines, and CCS although their efficiencies, environmental performance, reliability and economics must be demonstrated in an integrated mode. The key piece of Revised FutureGen is demonstrating the viability of CCS and its integration with IGCC.

Project Cost and Cost Sharing

Under the Revised FutureGen plan, it is anticipated that only one "train", or power unit (~300 MW), of a two-train IGCC plant (~600 MW) would be equipped with CCS. Such a plant would be capable of capturing well over one million metric tons of CO_2 per year while DOE was involved in the project during the first four years of operation. The following text contains a summary of the major cost components and uncertainties for this revised approach. More details of the Revised FutureGen plan cost estimate can be found in Appendix A. For comparative purposes, Appendix B contains cost details for the Original FutureGen project.

The total, escalated, as-spent capital cost of a nominal 600-MW IGCC plant is estimated to be $2,767 million (mixed-year dollars). When one train is equipped with CCS, the cost increases to $3,061 million. Under the revised plan, DOE would cover the incremental as-spent capital cost of $294 million, assuming that all of the captured CO_2 is injected into a deep saline formation.

In addition to increasing the plant's capital costs, adding CCS would also reduce the plant's net revenues during the four year operational period. Costs would rise due to increased O&M expenses at the plant as well as additional O&M expenses associated with CO_2 transport, storage and monitoring. Simultaneously, and more significantly, revenue from electricity sales would decrease due to lowered net plant output. The total reduction in net revenue over the first four years of operation is estimated to be $252 million in mixed-year dollars.

Thus, the total, as-spent DOE cost is estimated to be $546 million ($294 plus $252), expended as tabulated below.

Revised FutureGen Plan Annual DOE Expenditures		
Year	Capital	Operations
2012	19.7	
2013	87.7	
2014	88.9	
2015	98.0	
2016		60.1
2017		62.0
2018		63.8
2019		65.7
Subtotal	294	252
Total	546	

Cost estimates for the Revised FutureGen plan included contingencies to allow for changes that experience shows will likely be required due to incomplete project definition and technical uncertainty. For the power plant, project and process contingencies equaled 23% of the bare erected capital cost (unescalated). For the CO_2 transport, injection and monitoring systems, project and process contingencies equaled 51% of the bare erected capital cost (unescalated). Overall, contingencies comprised 16% of the total project capital cost (unescalated).

Another scenario that should be considered is the potential use of captured CO_2 for enhanced oil recovery (EOR). If one million metric tons of CO_2 are injected into a saline formation and the remaining CO_2 is sold for enhanced oil recovery at the plant gate, the most likely total, as-spent DOE cost would be reduced to $476 million ($276 million for capital and $200 million for lost revenues). Under this scenario, capital and O&M costs for the CO_2 pipeline and injection wells would be decreased, and income from CO_2 sales would mitigate the reduction in net revenues.

Uncertainty Analysis Although the $546 million is considered to be the "most-likely" DOE cost, an analysis was performed to quantify the uncertainty of this estimate. The accuracy of any project cost estimate is a function of that project's level of definition. Presented in the table below is how the American Association of Cost Engineering International (AACE 1998) relates cost estimation accuracy with various levels of project definition for the process industries.

AACE Classification Matrix for the Process Industries

Estimate Class	Level of Project Definition Required	Typical Purposes	Expected Accuracy (after contingency*)
5	0 - 2	Concept Screening, Long-Range Planning	-50% to +100%
4	1 - 15	Feasibility Study, Preliminary Budget Approval	-30% to +50%
3	10 - 40	Budget Authorization	-20% to +30%
2	30 - 70	Detailed Budget Control Baseline	-15% to +20%
1	50 - 100	Support Bid Checks and Vendor/Contractor Negotiations	-10% to +15%

*The +/- accuracy value represents typical percentage variation of actual costs from the cost estimate *after contingency is included within the estimate of the most likely cost* [6].

The AACE guidelines were consulted to determine how key cost estimation factors were varied in an uncertainty analysis of DOE costs. It should be noted that as-spent DOE costs are extremely sensitive to the future rates of escalation/inflation, which are the most uncertain factors in the cost estimate. Accordingly, the uncertainty analysis was performed both with and without variance of escalation/inflation rates such that decision-makers have the option of whether or not to consider the additional uncertainty associated with future inflation/escalation rates. The results of the uncertainty analysis are summarized in the below table and the bullets that follow.

[6] "Most likely cost" is taken here to mean that, according to recommended cost engineering practice for process-related systems (AACE 1998), contingencies were applied to achieve a 50% confidence interval, i.e., a 50% probability that actual costs will be equal to or less than the estimate.

Revised FutureGen Plan Uncertainty Analysis			
Cost Estimation Factor		**Variance Range**	
		-	**+**
Power Plant Bare Erected Cost		20%	30%
Power Plant Owner's Costs		20%	30%
Transport, Injection & Monitoring Capital Cost		50%	100%
Fixed & Variable O&M Costs		20%	30%
Fuel, Power, CO2 Prices		20%	30%
Inflation/Escalation Rates		*50%*	*100%*
Change in DOE TOTAL COST (Escalated, As-Spent Dollars)...			
...when all factors EXCEPT	inflation/escalation are simultaneously varied	27.7%	48.1%
...when all factors INCLUDING	inflation/escalation are simultaneously varied	38.7%	108.4%
Change in DOE CAPITAL COST (Escalated, As-Spent Dollars)...			
...when all factors EXCEPT	inflation/escalation are simultaneously varied	33.8%	62.4%
...when all factors INCLUDING	inflation/escalation are simultaneously varied	44.4%	134.5%
Change in DOE OPERATIONS COST (Escalated, As-Spent Dollars)...			
...when all factors EXCEPT	inflation/escalation are simultaneously varied	20.6%	31.3%
...when all factors INCLUDING	inflation/escalation are simultaneously varied	31.9%	77.8%

If all the key cost estimation factors EXCEPT inflation/escalation rates were simultaneously varied across their accuracy limits:

- The DOE TOTAL COST varied from $395 to $808 million.
- The DOE CAPITAL COST varied from $195 to $478 million.
- The DOE OPERATIONS COST component varied from $200 to $330 million.

If all the key cost estimation factors INCLUDING inflation/escalation rates were simultaneously varied across their accuracy limits:

- The DOE TOTAL COST varied from $335 to $1138 million.
- The DOE CAPITAL COST component varied from $164 to $690 million.
- The DOE OPERATIONS COST component varied from $171 to $447 million.

The following table provides a comparison of estimated costs for the Original FutureGen Project and for the two most likely cases which may occur under the Revised FutureGen Plan. Original FutureGen Project amounts are derived from the most recent FutureGen Alliance Initial Conceptual Design Report, dated May 2007. Revised FutureGen Plan amounts are based on recent analysis completed by NETL's Systems Engineering Group, details of which are described above.

Comparison of DOE Expenditures					
Year	Original FutureGen Plan	Revised FutureGen Plan			
		CCS on One Train of a Single-Train IGCC (~300 MW)		CCS on One Train of a Dual-Train IGCC (~600 MW)	
		Capital	Operating	Capital	Operating
2006	15.1				
2007	35.4				
2008	49.5				
2009	164.4				
2010	344.7				
2011	297.9				
2012	130.9	19.0		19.7	
2013	85.3	83.5		87.7	
2014	93.1	84.6		88.9	
2015	95.9	93.5		98.0	
2016	7.1		57.6		60.1
2017	9.5		59.3		62.0
2018			61.1		63.8
2019			62.9		65.7
2020					
2021					
2022					
2023					
Totals	1329	281	241	294	252
		521		546	

Summary of DOE Funding of Approaches

The Original FutureGen project was based on the government paying 74% of an entire power plant. Because of changes in the market, including interest in IGCC technology and regulatory drivers on the horizon for carbon constraints, the Revised FutureGen approach proposes that the government only contribute to the cost of carbon capture and storage, which represents approximately 25% of the total demonstration unit cost of the facility. That is, it is envisioned that DOE's contribution to the Revised FutureGen would be capped at the incremental cost associated with use of CCS technology.

Based on these costs, DOE would anticipate selecting multiple demonstration plants for a total cost of up to $1.3 billion in as-spent dollars. A summary program funding profile is provided in the table below showing a comparison to the Original FutureGen project structure.

Estimated DOE Project Funding Profile (in as-spent $M)		
FY	Original FutureGen	Revised FutureGen
2004	9	0
2005	18	0
2006	18	0
2007	53	Assume $59M "Original FG" funding available for "Revised FG" calculated as follows: • Total FG appropriations thru end-FY07 ~$98M • FG Alliance costs incurred thru end-Jan 2008 ~$23M • Potential DOE "early termination liability" ≤$10M • Ongoing DOE NEPA Costs ~$6M Note: Total BP 0 + BP 1 obligations to FG Alliance equal ~$39 million
2008	108 (75 approp.)	75
2009	156	156
2010	285	250
2011	228	250
2012	150	210
2013	150	200
2014-2018	125	100
Total	1,300	1,300

Schedule

Under the Revised FutureGen approach, through multiple commercial demonstrations, the technical and economic risk associated with near-zero emissions coal plants will be reduced, thus enabling private financing of future plants of this type. This will enable earlier commercial adoption of coal fueled power generation. It is anticipated that full-scale commercial demonstrations of IGCC with CCS would come on line as early as 2015.

Fiscal Year Activities and Milestones

The following is a profile of the principal Revised FutureGen project activities and milestones by fiscal year. These milestones are aggressive and dependent on the actual timing and availability of funds for project expenditures, and will have to be updated to reflect the actual funding situation. Although not broken out explicitly, each of these activities includes inherent costs for industry's involvement with all aspects of project management. Included in project management is an important continuing effort on broad stakeholder involvement, education and outreach that goes beyond that associated with the National Environmental Policy Act (NEPA). This effort is intended to work towards broad understanding necessary for general acceptance of sequestration and the goals of near-zero emission coal concepts.

Principal FY08 Activities
Activities include drafting and finalization of a Revised FutureGen Program Plan, notification of international participants of change to FutureGen approach (i.e., Revised FutureGen), development of draft Revised FutureGen Request for Information (RFI), posting of RFI at the Federal Business Opportunities website (FedBizOpps.gov), preparation of draft Funding Opportunity Announcement (FOA), receipt of public comments on FOA, issuance of final FOA, and beginning evaluation of proposals received against FOA.

Principal FY09 Activities
Activities include completing review and evaluations of proposals, announcement of selections, initiation of negotiation of awards, and initiation of NEPA requirements.

Principal FY10 Activities
Activities include completion of negotiation of awards and NEPA documentation.

Comparison of Intellectual Property Provisions of Original and Revised FutureGen Approaches

The Revised FutureGen Plan cooperative agreements will follow the same basic intellectual property approach as the original project:

- pre-existing patents and proprietary information related to privately owned technology will remain privately owned and will not be subject to public release unless the recipient otherwise agrees;
- the recipient may obtain ownership of subject (new inventions) either by law if a small business or non-profit institution, or through a DOE patent waiver if a large business. DOE retains the right to use subject inventions for government purposes;
- technical data first produced under the project will be available for public release except to the extent that DOE agrees such data may be protected from release for up to 5 years.

The primary differences between the Original FutureGen approach and the revised approach are:

- The current FutureGen Cooperative Agreement grants DOE broad march-in rights to complete the project in the event of Alliance default or withdrawal. DOE may take ownership of the facility, take possession of all project information, and assume subcontracts/vendor agreements. Commercial power developers will be less tolerant of DOE's march-in rights than the Alliance. DOE will likely need to relax the march-in provisions when working with commercial interests in its revised approach.
- The current FutureGen Cooperative Agreement includes an International Agreement Appendix which requires the Alliance to cooperate with DOE in support of the proposed FutureGen Multilateral Agreement. The current agreement covers site access for representatives of contributing countries, dissemination of project information and allocation of intellectual property rights among the parties, and the potential for collaborative research with visiting researchers from contributing countries. Revised FutureGen agreements may include a similar appendix; however, commercial concerns may not be willing to engage in the same amount of international participation as the Alliance.

Request for Information from Industry Cooperators

Early feedback on the restructuring of FutureGen into a "Revised FutureGen" is expected to come from responses to the Request for Information that will be issued at the Federal Business Opportunities website (FedBizOpps.gov). These comments and inputs from the RFI will help shape the drafting and final issuance of a Funding Opportunity Announcement anticipated for the 2QTR of 2008.

Likely Industry and Financial Community Reaction

IGCC projects have been postponed or cancelled in some states under regulatory or political pressure because there was no way to deal with concerns about CO_2 – no commercially proven technology for capture and storage from power plants has been demonstrated to reassure investors. What is needed on a global scale is reliable information and the operation of commercial scale integrated projects at more than one sequestration demonstration site. Revised FutureGen should fill this developing need of utilities interested in siting new coal power plants which have been deterred by changes in market expectations and public perception. Entities interested in siting new coal power plants should react favorably to the Revised FutureGen approach.

The incorporation CCS on a commercial scale IGCC facility will add capital costs and operating costs to the facility's economics and is still perceived by the electricity generation industry as an emerging technology. Concerns remain over the integration and scale-up risks associated with IGCC, and a cost gap still remains when compared to conventional coal power plants. Therefore, industry's reaction to the approach will depend on the magnitude of the government's commitment to the project. The Department's commitment would need to reasonably satisfy these concerns and allow the economics of the plant to function competitively, and will require superior project proposals in order to garner both interest and commitment from their host states and communities.

Specific responses to the planned Request for Information (RFI) will likely be varied and largely dependent on the forces under which the industrial respondent competes. Regulated utilities subject to traditional rate regulation will likely maintain their focus on the introduction of new plants into their rate base. Wholesale utilities, on the other hand, will be concerned over the competitiveness of new base load power plants in an era of carbon regulation and may balance this concern against competitiveness concerns associated with their new plant's cost of electricity. In general, several concerns are likely to be voiced by industry, including concerns over DOE commitment to the project given the recent course of FutureGen events, liability concerns in the absence of a sound regulatory framework, and the sheer magnitude of investment required of a utility to participate under the Revised FutureGen.

Likely International Reaction

We anticipate the expected response of the international community to the announcement that FutureGen will be taking a "new approach" to be favorable. The ultimate goal of the FutureGen program (promoting a near-zero emission technology solution for coal) is well received internationally. Since the ultimate goal of achieving near-zero emissions coal is not changing in the Revised FutureGen approach, it is anticipated that there will be little objection to the overall direction of the program. In fact, the development of IGCC technology coupled with CCS (a major focus of both the "old" and "revised" FutureGen approach) will continue to be of interest on a global scale.

The new international approach would aim to strengthen ties between near-zero emission coal plants worldwide and raise the efficiency of information sharing. The revised approach will create a mechanism for the international community to participate in the FutureGen program, which may not necessarily

involve the level of cost-sharing in the Original FutureGen project. Participation in the proposed "FutureGen Government Steering Committee" (GSC) required a commitment of $10 million USD over a 5-year period. The revised approach may propose a mechanism that would make it easier and less costly to join, thus potentially gaining greater international interest than the Original FutureGen Project. Therefore, this revised mechanism will likely be well received. In addition, the revised approach for FutureGen will necessitate the return of $4.4 million USD to India and $2.0 million USD to South Korea, since they have already sent in contributions which have not yet been utilized. A sustained international interest in the development and proliferation of zero emission coal power plants should ensure that the international interest in the FutureGen program remains high.

APPENDIX A: COST DETAIL FOR THE REVISED FUTUREGEN PLAN

Plant Scenarios	
1a	Nominal 600-MW IGCC [three gasifiers (**one spare**) and two 7FB turbines] with no CO2 capture.
1c	Case 1a with 90% CO2 capture on one of the two trains. All captured CO2 sequestered in a saline formation.
1c-EOR	Case 1c with one million metric tonnes of captured CO2 sequestered in a saline formation and the balance sold for sequestration via enhanced oil recovery (EOR).

	Plant Scenarios		
	1a	1c	1c-EOR
GENERAL DESCRIPTION	1a	1c	1c-EOR
Technology	IGCC	IGCC	IGCC
Fuel	IL #6 Coal	IL #6 Coal	IL #6 Coal
Net Output, MWe	640	595	595
CO2 Capture Percentage	0%	45%	45%
Heat Rate (HHV Basis), Btu/kWh	8,922	9,654	9,654
Capacity Factor (Average Over First Four Years)	72.6%	70.9%	70.9%
Steel Cost Component of BEC, %	0.36	0.36	0.36
Annual Power Generation at Capacity Factor, million MWh/year	4.07	3.70	3.70

CO2 DISPOSITION	1a	1c	1c-EOR
Fuel Carbon Intensity, lb CO2 per MMBtu	200	200	200
Uncontrolled CO2 Emissions at Capacity Factor, million metric tonnes/year	3.30	3.24	3.24
CO2 Captured at Capacity Factor, million metric tonnes/year	0.00	1.47	1.47
Amount of CO2 Captured at Capacity Factor that is Sequestered in a Saline Formation, million metric tonnes/year	0.00	1.47	1.00
Amount of CO2 Captured at Capacity Factor that is Sold for Sequestration via EOR, million metric tonnes/year	0.00	0.00	0.47
Controlled CO2 Emissions at Capacity Factor, million metric tonnes/year	**3.30**	**1.77**	**1.77**

Revised FutureGen Plan Unescalated Capital Costs*, 2007-year dollars (millions)			
Cost Element	Nominal 600-MW IGCC		
	1a	1c	DOE Share (Delta)
Coal/Sorbent Handling, Prep and Feed	67.91	68.10	0.19
Feedwater System	28.06	28.14	0.08
Gasifier & Accessories	276.51	278.43	1.92
ASU and Oxidant Compression	152.79	160.43	7.64
COS Hydrolysis or Shift	5.80	8.57	2.77
Acid Gas Removal	61.39	85.99	24.60
Sulfur Recovery	24.54	24.74	0.20
Syngas Cleanup/Conditioning BOP	6.85	7.08	0.23
CO2 Compression and Drying	0.00	16.19	16.19
Combustion Turbine and Accessories	94.83	98.29	3.46
HRSG and Stack	47.08	47.22	0.13
SCR System	9.71	9.76	0.06
Steam Turbine Generator and Accessories	54.07	53.30	-0.77
Cooling Water System	21.29	21.35	0.06
Slag/Ash Handling System	36.21	36.32	0.11
Accessory Electric Plant	53.93	54.08	0.15
Instrumentation and Control	17.53	17.58	0.05
Improvements to Site, Buildings & Structures	26.90	27.20	0.30
Adder for Union Labor (vs. merit-shop)	106.42	112.62	6.20
EPCM Services	101.54	107.45	5.91
Power Plant Contingencies	222.73	262.39	39.66
Financing Fees (not including AFUDC)	55.30	55.30	0.00
NEPA	0.00	8.00	8.00
Other Misc. Project Development Costs	7.46	7.78	0.32
Cost of Land & Site Infrastructure Improvements	70.70	70.70	0.00
Pre-Production Costs	43.89	45.85	1.96
Inventory Capital	38.87	39.91	1.05
CO2 Transport, Injection & Monitoring Systems	0.00	60.51	60.51
CO2 Transport, Inj. & Mon. Contingencies	0.00	30.94	30.94
Total Unescalated Capital Costs*	1632	1844	212
*excluding AFUDC costs (which don't affect DOE cost-share)			

Revised FutureGen Plan Escalated, As-Spent Capital Costs, mixed-year current dollars (millions)				
Year	Cost Element	Nominal 600-MW IGCC		
		1a	1c	DOE Share (Delta)
2012	Capital Expenditures	351.48	371.21	19.73
	AFUDC	22.68	22.68	0.00
	Annual Subtotal	374.16	393.89	19.73
2013	Capital Expenditures	571.43	659.12	87.70
	AFUDC	82.25	82.25	0.00
	Annual Subtotal	653.67	741.37	87.70
2014	Capital Expenditures	578.81	667.66	88.85
	AFUDC	161.99	161.99	0.00
	Annual Subtotal	740.80	829.65	88.85
2015	Capital Expenditures	736.37	834.35	97.98
	AFUDC	261.98	261.98	0.00
	Annual Subtotal	998.35	1096.34	97.98
Total Escalated, As-Spent Capital Costs		2767	3061	294

Revised FutureGen Plan Unescalated Operating Costs & Revenue, 2007-year dollars (millions)			
Cost Element	Nominal 600-MW IGCC		
	1a	1c	DOE Share (Delta)
Net Output, MWe	640	595	-
Capacity Factor (Avg over First Four Years)	73%	71%	-
Heat Rate (HHV basis), Btu/kWh	8922	9654	-
Plant Fuel Cost	65.37	64.25	-1.12
Plant O&M	53.71	55.61	1.90
CO2 Transport, Storage & Monitoring O&M Cost	0.00	0.56	0.56
Revenues from Power Sales	488.43	443.68	44.75
Net Revenues	369	323	46

Revised FutureGen Plan Escalated, As-Received Net Revenues, mixed-year dollars (millions)				
Year	Cost Element	Nominal 600-MW IGCC		
		1a	1c	DOE Share (Delta)
2016	Net Revenues	481.92	421.77	60.15
2017	Net Revenues	496.38	434.43	61.95
2018	Net Revenues	511.27	447.46	63.81
2019	Net Revenues	526.61	460.88	65.72
Total Escalated, As-Received Net Revenues		2016	1765	252

Revised FutureGen Plan Annual DOE Expenditures		
Year	Capital	Operations
2012	19.7	
2013	87.7	
2014	88.9	
2015	98.0	
2016		60.1
2017		62.0
2018		63.8
2019		65.7
Subtotal	294	252
Total	546	

Global Assumptions		
2007 to 2010 Steel Escalation,	Nominal Average Annual	0.250
2010 to 2015 Steel Escalation,	Nominal Average Annual	-0.014
General Inflation Rate		0.030
CO2 for EOR - Sales Price (Pressurized at the Power Plant Gate), 2007-year dollars per metric tonne		20
Average Revenue from Power Sales, 2007-year dollars per MWh		120

Assumptions and Notes

1. Bared Erected Cost (BEC) comprises the cost of process equipment, on-site facilities and infrastructure that support the plant (e.g., shops, offices, labs, road) and the direct and indirect labor required for its construction and/or installation. Total Plant Cost, or "overnight construction cost", includes BEC plus the cost of EPCM services (including related fees), project contingency and process contingency.

2. The cost to secure long-lead equipment items is estimated to be 15% of the "equipment" portion of BEC, which equates to about 10% of total BEC for IGCC.

3. "Owner's and Other Costs" may include: premiums for performance-based risks; allowance for funds used during construction; land cost; conceptual or "project feasibility" engineering studies; site-specific improvements to the site or local infrastructure; environmental permitting; environmental monitoring / characterization; financing fees; legal fees; initial working capital; spare parts inventory capital; feedstock inventory capital (fuels and other consumables stored on-site); first fills of chemicals and catalysts within process plant vessels; operator training; startup labor costs; allowance for inefficient operation during startup period; transmission interconnect cost.

4. For IGCC plants, 36% of bare erected cost is assumed to be comprised of steel costs (based on the assumption that 72% of BEC is comprised of equipment and materials costs, and 50% of equipment and materials costs are steel costs).

5. All values (capital costs, O&M costs, CO2 credits, power sales revenue) are escalated at the assumed inflation rate except for steel costs. Historically, the escalation of steel prices (an analog for TPC) lags the escalation of oil prices by three years. Therefore, 2007 to 2010 TPC escalation is assumed to be equivalent to the historical escalation of world oil prices between Jan-2004 (28.00 $/bbl) and Jan-2007 (54.63 $/bbl), which is an average nominal rate of 25%. (World oil prices are the average spot prices for all countries, weighted by export volume as reported by the EIA.) 2010 to 2015 plant cost escalation is assumed to be equivalent to the average annual projected escalation in world oil prices between 2007 (71 $/bbl) and 2011 (68 $/bbl). Oil price projection taken from Morningstar's "Five Year Oil Price Deck" as of 11-19-07.

6. Capital costs are assumed to be incurred over four years. In the first year, a portion of owner's costs, a portion of EPCM costs, and costs for long-lead equipment items are incurred. Ground is broken in the second year and construction takes place in years two, three and four. (In addition, AFUDC costs are incurred in each of the four years.)

7. Upfront costs to secure long-lead equipment items are assumed to be 10% of total BEC (incurred in the year before construction begins). This is based on the assumption that the cost to secure long-lead equipment is 15% of total plant equipment costs, and that equipment costs comprise 65% of total BEC.

8. In addition to costs for detailed design, construction permitting, construction management and EPC engineering support during startup, the EPCM fee is assumed to cover the costs for the Front-End Engineering Design study and construction permitting (but not environmental permitting). Sixty percent of the EPCM fee is assumed to be for design/permitting (incurred in the year before construction begins). Thirty percent of the EPCM fee is assumed to be for construction management (spread evenly over the three construction years). Ten percent of the EPCM fee is

assumed to be for startup support (incurred in the final year of construction). These ratios are based on guidelines supplied by Parsons.

9. Construction costs (less long-lead equipment costs and not including EPCM costs and contingency costs) are assumed to spread evenly (in real terms) over the three year construction period. Owner's costs are assumed to be expended in two years (split evenly in real terms): the year before construction and the last year of construction.

10. Assumed project financing structure has a 50/50 debt: equity ratio, with nominal annual interest rates for debt and equity of 8.5% and 14.5%, respectively. To incentivize IGCC projects, the Indiana PSC allows IOUs to increase their ROE by three percentage points to cover the "owner's risk premium" when the owner (rather than the EPC firm) assumes performance-based risks. The "base" ROE rate allowed by the PSC is around 11.5%, so adding the risk premium yields 14.5%. All of these assumptions were based on a 1/9/08 communication with Scully Capital.

11. Per EPRI TAG guidelines, the before-tax weighted cost of capital is used to calculate the allowance for funds used during construction. AFUDC is calculated on the escalated, as-spent costs less the DOE contribution (which is not financed). For each year, it is assumed that twelve uniform draws are made on monthly basis.

12. The cost (expressed in base year dollars) of securing financing (including fees and closing costs but not including AFUDC) is assumed to be 2% of the total, as-spent, capital costs that are financed (i.e., not including DOE contributions), expressed in mixed-year dollars. This rule of thumb is based on guidance obtained during a 1/9/08 communication with Scully Capital.

13. Costs of adding an SCR and for a transmission interconnect ($50 million) are based on the FutureGen Alliance cost estimate in the Initial Conceptual Design Report (May 2007).

14. According to a 12/21/07 communication with Worley Parsons, Midwest union labor costs would be approximately 40% higher than Midwest merit shop labor costs.

15. The following assumptions were made using EPRI TAG as a guideline. Technology fees (e.g., prepaid licenses/royalties) equal 0.5% of BEC. Pre-production costs (operator training, equipment checkout, startup costs) equal the sum of: one year of fixed O&M labor costs, 3 months of non-fuel variable O&M costs (@100% CF), one month of fuel cost (@100% CF). Spare parts inventory capital is equal to 0.5% of TPC. The cost of stored feedstock's (in addition to first fills) equals 3 months of fuel and non-fuel variable O&M costs.

16. Including a buffer zone, power plants are assumed to require 300 acres of land.

17. Duke Energy's Edwardsport, IN IGCC plant is proposed to include construction of a railroad spur between 5 and 18 miles in length. As a representative owner's cost, the cost of construction of a 12-mile railroad spur is included in estimates for coal-fueled plants. The cost was assumed to be $1.6 million per mile. This rough rule of thumb was based on a communication with RDS/Worley-Parsons on 1-9-08.

18. Captured CO2 is assumed to be transported through a fifty-mile pipeline and injected into a saline geologic formation. Project and process contingencies of 30% and 20%, respectively, were included for transport and injection capital costs. The capital "trust" fund for monitoring the injected CO2 included project and process contingencies of 30% and 35%, respectively.

19. At the 2007 EOR Carbon Management Workshop (December 3-4, 2007 in Dallas, TX). presentations from Petrosource and Denbury indicated that a power plant would be paid the following prices for delivering pressurized CO2 at the power plant gate: ~$10 for a target oil price of $30/bbl; $19-$29 for a target oil price of $75/bbl.

20. Average capacity factors were assumed for the first four years of operation based on the following schedules. For IGCC plants with a spare gasifier, capacity factors are assumed to eventually reach 85% (source: GE's Reference Plant Availability Target, presented at the 2007 GTC meeting). Thus, capacity factors for years one through four are assumed to be 60%, 68.5%, 77% and 85%. For IGCC plants without a spare gasifier, capacity factors are assumed to eventually reach 82% (source: EPRI UDBS Version 6). Thus, capacity factors for years one through four are assumed to be 57%, 65.5, 74%, and 82%. For each train that has carbon capture, the capacity factor of power generation associated with that train is assumed to fall by 5 percent. If only one train in a dual-train IGCC has capture, the total capacity factor is the average of their individual capacity factors, weighted by their individual power generation.

APPENDIX B: COST DETAIL FOR THE ORIGINAL FUTUREGEN PLAN

Original FutureGen Plan Project Costs, Unescalated 2006-Year Dollars (Millions)

Capital Cost	
Coal/Sorbent Handling, Prep and Feed	43
Feedwater System	25
Gasifier & Accessories	82
ASU and Oxidant Compression	78
Shift	34
Acid Gas Removal	75
Sulfur Recovery	14
Syngas Cleanup/Conditioning BOP	20
PSA System	1
CO2 Compression and Drying	52
Combustion Turbine and Accessories	53
HRSG and Stack	24
SCR System	4
Steam Turbine Generator and Accessories	29
Cooling Water System	31
Slag/Ash Handling System	8
Accessory Electric Plant	38
Instrumentation and Control	10
Improvements to Site, Buildings and Structures	34
EPCM Service/Fees	57
Contingencies and Sales Tax	106
Technology Upgrades and Non-Traditional Cost (Allowance for R&D, Visitors Center, Architectural Features)	28
Plant Owner's Cost	162
Sequestration Infrastructure and Operating Cost (includes post operations monitoring and closure)	107
NEPA Cost	25
Total Capital Cost	**1,137**
4-Year Power Plant Operations Allowance	254
Total Project Cost	**1,391**

FutureGen Project Expenditures, Total As-Spent Mixed-Year Dollars (millions)[1]

Year	Project Expenditures	Alliance Expenditures	DOE Expenditures[2]
Capital Expenditures			
2006	17.8	2.7	15.1
2007	44.7	9.2	35.4
2008	63.4	14.0	49.5
2009	222.2	57.8	164.4
2010	465.8	121.1	344.7
2011	402.6	104.7	297.9
2012	89.3	23.2	66.1
2013	8.8	2.3	6.5
2014	9.3	2.4	6.9
2015	3.9	1.0	2.9
Total	1327.8	338.4	989.4
Operations Expenditures			
2012	87.6	22.8	64.8
2013	106.4	27.7	78.8
2014	116.5	30.3	86.2
2015	125.7	32.7	93.0
2016	9.5	2.5	7.1
2017	12.8	3.3	9.5
Total	458.6	119.2	339.3
Combined Capital and Operations Total			
Total	**1,786.3**	**457.7**	**1328.7**

Notes:
1. Individual cell values rounded to the nearest 0.1.
2. DOE Expenditures represent FutureGen Alliance spend plan and do not represent historical DOE spending nor DOE historical or requested Appropriations.

Shaffer, Carrie

From: Shaffer, Carrie
Sent: Thursday, December 13, 2007 2:53 PM
To: Bates, Quentin
Subject: FW: FutureGen call

fyi no memo needed but assigning bud lead

carrie

From: Kupfer, Jeffrey
Sent: Thursday, December 13, 2007 2:52 PM
To: Shaffer, Carrie; Getto, Ben
Subject: RE: FutureGen call

Bud is lead; no memo.

From: Shaffer, Carrie
Sent: Thursday, December 13, 2007 2:29 PM
To: Kupfer, Jeffrey; Getto, Ben
Subject: FutureGen call

Should Bud be lead and do we need a memo? NEC said it would be no problem to have S1 call in w/ Al and also said it would be fine to have some of our staff call in. They asked for names, so let me know who you think should be included.

Carrie Shaffer
U.S. Department of Energy
202-586-5534

Shaffer, Carrie

From: Getto, Ben
Sent: Thursday, December 13, 2007 3:38 PM
To: Gordon, Anne
Cc: Shaffer, Carrie
Subject: FW: FutureGen call

Carrie-
Please add Bud and Adam to the call--list as:

Attending: Kupfer
Attending via phone: Albright, Ingols

Anne--you may want to get Jeff a car over there, he'll ride back with S1.

-----Original Message-----
From: Kupfer, Jeffrey
Sent: Thursday, December 13, 2007 3:35 PM
To: Getto, Ben; Shaffer, Carrie
Subject: Re: FutureGen call

I'm going to go over there to meet SB.

Bud and Adam can be on the call from over here.

----- Original Message -----
From: Getto, Ben
To: Kupfer, Jeffrey; Shaffer, Carrie
Sent: Thu Dec 13 15:31:42 2007
Subject: RE: FutureGen call

Who else should call in Jeff?

You and Bud?

From: Kupfer, Jeffrey
Sent: Thursday, December 13, 2007 2:52 PM
To: Shaffer, Carrie; Getto, Ben
Subject: RE: FutureGen call

Bud is lead; no memo.

From: Shaffer, Carrie
Sent: Thursday, December 13, 2007 2:29 PM
To: Kupfer, Jeffrey; Getto, Ben
Subject: FutureGen call

Should Bud be lead and do we need a memo? NEC said it would be no problem to have S1 call in w/ A1 and also said it would be fine to have some of our staff call in. They asked for names, so let me know who you think should be included.

Carrie Shaffer
U.S. Department of Energy
202-586-5534

Department of Energy
Washington, DC 20585

July 1, 2008

The Honorable Nick Lampson
Chairman
Subcommittee on Energy and Environment
Committee on Science and Technology
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

As requested, enclosed is what I am advised is the most recent version of the Department's "Draft Strategic Planning Document For Revised FutureGen," which was circulated within the Department on January 30, 2008. I am also advised that it was described colloquially at that time as the "final" version, even though the title styled it as "draft."

The enclosed version is similar in most respects to the version provided to you previously, and as such contains many of the same categories of sensitive information. First, there are several pages of information that is business sensitive to the Department, including the third bullet on page 5, the entire section on "Project Cost and Cost Sharing" (pp. 10-14), and the entirety of "Appendix A." Public release of this information would negatively impact the Government's bargaining position in the recently announced Funding Opportunity Announcement Process.

The second category of sensitive information, relating to close out costs under the Cooperative Agreement with the Alliance, is business sensitive to the Department because it could impact on the Government's ability to recoup money from the Alliance under the original FutureGen Cooperative Agreement. That information is found in the "2007" section of the table on page 15.

The final category is information potentially proprietary to the Alliance, including the entirety of "Appendix B."

The enclosed version does not contain the sensitive information relating to intellectual property that was contained on page 16 of the earlier version.

The enclosed version and the earlier version differ in one significant respect. The earlier version included estimates for "lost revenues" in the operating costs for potential projects under the restructured FutureGen approach. Those amounts were deleted from the later version because it was determined that those "lost revenues" would not be allowable costs under the standard terms and conditions used in the Department's financial assistance awards. This realization caused adjustments to be made to the figures in the tables and narrative on pages 11-14, and to figures elsewhere in the enclosed version.

Printed with soy ink on recycled paper

Please note that there are some differences between the January 30 planning document and the recently released FutureGen Funding Opportunity Announcement (FOA). The FOA reflects the Department's current FutureGen plan.

As before, we respectfully request that the Subcommittee consult the Department before determining to disclose the document transmitted by this letter.

If you have any questions, please contact me or Ms. Lisa Epifani, Assistant Secretary for Congressional and Intergovernmental Affairs, at (202) 586-5450.

Sincerely,

Eric J. Fygi
Deputy General Counsel

Enclosure

cc: The Honorable Bob Inglis
Ranking Member
Subcommittee on Energy and Environment

The Honorable Bart Gordon
Chairman
Committee on Science and Technology

The Honorable Ralph Hall
Ranking Member
Committee on Science and Technology

The Honorable Brad Miller
Chairman
Subcommittee on Investigations and Oversight

The Honorable F. James Sensenbrenner
Ranking Member
Subcommittee on Investigations and Oversight

Internal Deliberative
-- Not for Public Distribution --
7.1.2008

DRAFT STRATEGIC PLANNING DOCUMENT FOR REVISED FUTUREGEN

DEMONSTRATION OF INTEGRATED ELECTRIC POWER PRODUCTION AND CARBON CAPTURE AND SEQUESTRATION

Goal

To prove and accelerate commercial deployment of Integrated Gasification Combined Cycle – Carbon Capture and Storage (IGCC-CCS) technology for coal-based systems on the basis of a more reasonable allocation of risk among the public and private sectors and at a cost more appropriate for the taxpayer to bear.

Mission Need and Background

On February 27, 2003, when the President announced FutureGen, a $1 billion cost-shared initiative to create the world's first coal-based, IGCC-CCS power plant, the focus was on developing a revolutionary coal technology that addresses climate change concerns resulting from atmospheric carbon dioxide, a greenhouse gas (GHG). Five years later, the goal of a technology solution for climate change relating to coal use remains the same. Coal remains a strategic domestic, low cost energy resource for our Nation's energy and economic security. The FutureGen initiative also continues to support recommendations in the National Energy Policy (NEP) issued in May 2001, which highlights the need for a broad policy to "protect national and economic security by promoting a diverse, secure source of reliable, affordable and environmentally sound energy," and recognizes that "If rising U.S. electricity demand is to be met, then coal must play a significant role." Since that time, changes in market realities have reinforced the need to accelerate the deployment of this concept in the market place in order for coal to be a viable clean energy source for the future. Thus there is a need to restructure the program by emphasizing more immediate and commercial-scale demonstrations of the feasibility of IGCC-CCS technology in our Nation's energy sector sooner rather than later.

Today, more than ever, the concept of FutureGen is a centerpiece for the future of coal utilization. FutureGen directly addresses a primary goal of the Department of Energy's (DOE) 2006 Strategic Plan under the Theme for Energy Security to promote America's energy security through reliable, clean, and affordable energy: Environmental Impacts of Energy: "Improve the quality of the environment by reducing greenhouse gas emissions and environmental impacts to land, water and air from energy production and use." Eliminating environmental issues as barriers to coal use through the use of efficient energy generation technologies such as Integrated Gasification Combined Cycle (IGCC) and carbon sequestration will enable the continued use of secure, domestic coal resources for our future energy needs. Widespread replication of this technology by the private sector will help to meet the energy and environmental needs of our Nation's expanding economy, growing population, and rising standard of living. Absent the low emission capability of IGCC with carbon capture and sequestration, coal's contribution to the Nation's energy mix could be severely curtailed, thus limiting the fuel diversity of our electricity supply portfolio, and increasing our dependence on more expensive and less secure sources of energy.

Since the inception of FutureGen, changes in market realities have altered the energy/power and environmental landscape. These changes include a serious escalation in material and labor costs for new

power plants, a growing near-term interest in the promulgation of carbon dioxide (CO_2) emissions regulations, and several states such as Florida, Kansas, California, and Washington requiring coal plants to consider CCS. These changes in the market landscape, in particular the issue with respect to atmospheric emissions of CO_2, have lead to greater environmental challenges to the future of fossil-based power generation, especially coal; have presented serious potential barriers to the power industry to finance and build new coal-based generation capacity; and have catalyzed the need to demonstrate the commercial viability of a new generation of advanced coal-based power systems (namely, Integrated Gasification Combined Cycle, or IGCC) with CCS technology.

In parallel with these developments, a growing demand in the United States for electricity through 2030 of an additional 199,000 megawatts of power is projected by the Energy Information Administration. In response, the utility industry has proposed a number of new coal plant projects, including IGCC technology. However, due to challenges mentioned above and uncertainty about the cost and performance of IGCC-CCS, plans for many new coal-based power plants are being abandoned or postponed. So, while there is a growing demand for electricity, there is also a critical need to accelerate the commercial demonstration of advanced coal-based power technology with CCS that can cost effectively meet a carbon-constrained future. Government leadership with the power industry is required to address the additional financial burden and risk associated with adding CCS to an advanced technology such as coal-based IGCC that has seen only limited commercial-scale operation. As such, the Revised FutureGen program is looking to accelerate commercial demonstration of coal-based IGCC projects coupled with CCS and expand the application to multiple sites.

For FutureGen to effectively meet its goal under these new market realities, it is necessary to adopt a new strategic approach, one that emphasizes early commercial experience with a series of demonstrations of CCS linked to the commercial operations of IGCC. This "Revised FutureGen" approach differs from the Original FutureGen which focused on the large-scale integration of advanced R&D technologies in a "living laboratory" setting to be followed by commercial demonstrations and subsequent deployment. With the Revised FutureGen, the commercial demonstration route will allow for early deployment of nearer term IGCC-CCS technologies along side commercial IGCC operations. Revised FutureGen will address early on the challenges associated with low emissions plants, including siting issues, and help drive the regulatory frameworks for CO_2 transport, injection and storage associated with power generation. More importantly, Revised FutureGen will still address the very critical technical feasibility question of advanced technology clean coal plants.

FutureGen's integration of concepts and components is essential to proving technical and operational viability to the generally conservative, risk-adverse coal and utility industries. Integration issues such as the dynamics between upstream and downstream subsystems (e.g., between interdependent subsystems such as the coal conversion and power and carbon capture and storage systems) can only be addressed by a large-scale integrated facility operation. Unless the production of electricity from coal integrated with sequestering carbon dioxide can be shown to be commercially feasible and cost competitive, the coal industry will not make the investments necessary to fully realize the potential energy security and economic benefits of this plentiful, domestic energy resource.

Rationale for Adopting Revised Approach

Because of the changes in energy markets and environmental landscape over the past five years, there is a need to emphasize early demonstration of coal-based IGCC with CCS. The FutureGen project, as originally structured for large-scale R&D testing, is no longer optimal to achieve the goal of accelerating the commercial demonstration and deployment of advanced, integrated coal-based power systems including CCS. For these reasons, the Department has developed a new strategically restructured approach – "Revised FutureGen" -- with the overall aim of advancing FutureGen's goals and objectives

that limit the government's financial exposure while leveraging its investment across a wider range of nearer-term coal based IGCC-CSS projects.

Further, the Revised FutureGen concept continues to satisfy the primary technical goals of the Original FutureGen program including:

- accelerating the deployment of CCS technology;
- establishing the technical feasibility and economic viability of producing electricity and hydrogen from coal with near-zero emissions (including CO_2) through implementation on a single, commercial-scale power train;
- verifying the sustained, integrated operation and the effectiveness, safety and permanence of a coal conversion system with carbon sequestration;
- establishing standardized technologies and protocols for CO_2 monitoring, mitigation and verification;
- sequestering CO_2 at an operational rate of at least one million tons/year in Saline formation;
- capturing at least 90 percent of CO_2 from a single, commercial-scale power train;
- capturing at least 90 percent of mercury emitted from a single, commercial-scale power train;
- removing >99 percent of sulfur emitted from a single, commercial-scale power train;
- reducing NOx emissions to <0.05 lb/million Btu from a single, commercial-scale power train; and
- particulate emissions to <0.005 lb/million Btu from a single, commercial-scale power train.

Technical and Financial Benefits of Revised Approach

The revised direction for FutureGen means accelerated and wider demonstration of the IGCC-CCS concept in coal-based power generation at commercial scale that will promote a more rapid investment by industry in near-commercially available technologies for carbon capture and storage. This approach addresses two key challenges: IGCC-CCS integration; and accelerated deployment under the current commercial market setting that would address the regulatory and permitting challenges of CCS earlier rather than later. Further, the Revised FutureGen approach envisions multiple demonstrations which will produce the following additional outcomes:

- Validation of CCS at multiple sites;
- Injection into and monitoring at multiple geologic formations;
- Integration, at commercial scale, of multiple gasification-based power production technologies;
- Development of a regulatory and permitting framework for CCS in multiple states;
- The potential for a broader engagement of critical U.S. stakeholder participants;
- The opportunity for international coordination at more than one project;
- Establishment of a broader set of financial benchmarks for private sector financing of next generation, IGCC plants; and
- Production of a more comprehensive and reliable set of operating data that will serve to reduce uncertainty and promote the early widespread deployment of IGCC-CCS technology.

When operational, the technologies selected will enable the cleanest coal based power plants in the world to demonstrate the commercial feasibility of integrated IGCC-CCS technology. Through multiple commercial demonstrations in the Revised FutureGen, technical and economic risk associated with near-zero emissions coal plants can be better quantified with more certainty, thus enabling private financing decisions of future plants of this type. An industrial base exists for the use of several critical components, such as gasifiers, clean-up systems, turbines, and CCS although their efficiencies, environmental

performance, reliability and economics must be demonstrated in an integrated mode. The key piece of Revised FutureGen is demonstrating the viability of CCS and its integration with IGCC.

A Comparison of Key Differences between Approaches

This change in direction means replacing the notion of an experimental "living laboratory" which was approximately 300 megawatt plant with multiple commercial plants that would include in each commercial plant an IGCC-CCS demonstration of at least 300 gross megawatts – putting a minimum of at least 600 MW of gross electricity generation with CCS into service. Each plant would have a 300 MW unit that demonstrates CCS in conjunction with IGCC power generation technology, achieving at least 90 percent CO_2 capture on a single power train. Each of these units would capture and store in a saline reservoir at least one million metric tons of CO_2 per year, thus producing a more comprehensive set of CCS data. Additionally, each plant would reduce emissions of sulfur dioxide, nitrogen oxide, particulate matter, and mercury to very low levels.

The following table identifies the major differences associated with each alternative FutureGen approach.

A Comparison of the Key Elements of Each Approach

	Original FutureGen	**Revised FutureGen**
Living Laboratory Host Facility	Yes	No
Innovative Technology Testing and Validation	Yes (but no funding provided; requires funding by other FE Coal Program elements)	No (commercial plant operation – facility availability unlikely)
Commercial Facility	No	Yes
Multiple Demonstration Sites	No	Yes (multiple)
DOE Share of Project Cost	✓ One project site ✓ 74% of project cost + escalation ✓ At least $1.3B	✓ Multiple Project Sites ✓ 20 to 30% project cost ✓ Not to exceed incremental costs of CCS ✓ Not to exceed $1.3B
Nominal Plant Size – Gross Capacity	300 MW	Most likely 600 MW
Plant Construction	2009	2012
Plant Start-Up and Operations	2012-2016	2015-2019
Project Completion for DOE	2018	2020
EOR Potential	No	Yes
Commercial Operation of CCS	Commercial Operations projected to begin ~2020	Commercial Operations projected to begin 2015

The primary differences between the two approaches can be summarized as follows:

- A shift in project focus from FutureGen as a "living laboratory" host facility to be used to test and validate new innovative technologies, to one which is targeted at the full-scale commercial operation of a coal-fueled IGCC-CCS plant;
- An acceleration of the full-scale commercial deployment of the IGCC-CCS concept under the Revised FutureGen is scheduled to occur sooner than under the original plan;
- The Original FutureGen Project requires DOE to share 74% of the costs of the entire facility (both Power Island and CCS). At present the federal investment in the original plan is $1.3 billion, rising and uncertain. The Revised FutureGen approach places the entire cost burden for the power island on the industry, and limits DOE's investment to no more than the CCS portion of the project. Current estimates of DOE's share of the Revised FutureGen approach is approximately $302 million per project;
- The Original FutureGen Project is a single first-of-a-kind plant intended as a host facility for the testing of innovative technologies, at a scale consistent with validating readiness for commercial operation, and funded by other DOE Coal Program elements; the Revised FutureGen Plan entails DOE participation in multiple full-sized commercial-scale projects;
- A typical commercial scale IGCC-CCS plant could be expected to generate approximately 3.5 million tons of CO_2 per year. Since the Revised FutureGen Concept only requires 1 million tons per year storage in a saline formation and this concept anticipates one or more commercial endeavors, this approach presents an opportunity for supplemental project financing via the use of excess CO_2 for enhanced oil recovery.

Integrating the Department's Coal Power RD&D Program

The Revised FutureGen plan offers a set of commercial demonstrations that will address early integration issues such as siting, permitting and storage that will face the utility industry in deploying IGCC-CCS. This activity is important, but alone is not sufficient to achieve the ultimate goal of widespread commercial deployment of cost-effective near-zero emissions coal.

The development and testing of key enabling technology is required to reduce the cost of electricity from coal-based advanced IGCC-CCS plants to market competitive rates. Continued RD&D is essential if near-zero emission coal technologies are to help meet projected U.S. and global growth in electricity demand. This is especially important in the rapidly developing economies of China and India, who will continue to rely on coal as a major source for electricity generation, and, absent the availability of affordable CCS, will continue to emit vast amounts of atmospheric CO_2.

The Revised FutureGen approach offered the opportunity for a fresh look at the commercialization profile of key FE technologies. The following table identifies key technology components for which the Department's Coal R&D Program has made significant investments, presents their current status and scale, identifies the most likely next scale, and provides perspective on the time and cost to carry out the next phase of advanced component testing. It is important to note the comprehensive nature of this table in that it identifies both those technologies envisioned to be tested at the Original FutureGen "living laboratory" as well as other critical technologies necessary for achieving near-zero emission coal plants of the future.

Advanced Technology and Test Options

Program Element (Source of Funds)	Technology[2]	Current Status "Scale" (CY2006)	Next Scale Testing	Envisioned for Testing at Original FutureGen[3] (2012-2016)	DOE Program Alternative–Next Phase[4]	Cost Estimate for Next Phase Testing[5]
Gasification	High pressure dry coal feed pump (e.g. PWR dense phase pump)	Pre-pilot	Pilot (e.g. 1 MW scale)	Y (if dry feed gasifier)	R&D Program (2-3 years)	$2-4 million
	Humid gas cleaning: Halide removal	Laboratory to Pilot	Pilot (e.g. 1 MW scale)	Y	R&D Program (2-3 years)	$1-3 million
	Humid gas cleaning: Mercury removal	Laboratory	Pilot (e.g. 1 MW scale)	Y	R&D Program (2-3 years)	$1-3 million
	Humid gas cleaning: Trace metals	Laboratory (pilot pending)	Pilot (e.g. 1 MW scale)	Y	R&D Program (2-3 years)	$1-3 million
	Humid gas cleaning: Sulfur removal	Pilot	Nominal 50 MW	Y Nominal 1 MW used in humid gas cleaning platform	CCPI (5-10 years)	$10-15 million (depends on scope – S processing)
	ITM	Demonstration	Prototype	Y	CCPI (4-10 years)	$ 5-10 million
	High through-put gasifier	Pre-pilot	Pilot	N	R&D Program (5-10 years)	$25-50 million
Coal Fuels	Humid gas cleaning: Hydrogen membrane	Laboratory	Pilot (e.g. 100 kW scale)	N	R&D Program (2-3 years)	$1-2 million
Carbon Sequestration	Humid gas cleaning: CO2 membrane (or other advanced concepts)	Laboratory	Pilot (e.g. 100 kW scale – such as PSDF)	N	R&D Program (2-3 years)	$1-2 million
	CO2 compression	Pilot	Prototype	Y	CCPI (4-10 years)	$2-5 million
SECA/Fuel Cells	Fuel cell	Small scale modules	5 MW scale tests	Y	R&D Program (5-8 years)	$15 million
Turbines	Low-NOx combustors	Bench scale; less than full basket	Single basket tests	N	R&D Program (simulated syngas at existing facility) (2-4 years)	$5 million
	Oxy-fired combustor	Lab	Single basket tests	N	R&D Program (simulated syngas at existing facility) (2-4 years)	$5 million
	Hi-hydrogen fired combustor	Lab	Single basket tests	N	R&D Program (simulated syngas at existing facility) (2-4 years)	$5 million
Advanced Research	Sensors, instrumentation, materials	Laboratory to pilot	Pilot to prototype	Y	Varies depending on technology	Varies depending on technology

[2] These are technology classes; e.g. R&D is being carried out on multiple technologies for carbon dioxide capture

[3] This is based on the concept that the testing of advanced technology at FutureGen is at the prototype scale such that the technology could be offered commercially with successful testing; technologies listed as 'N' could be tested at pre-prototype scale

[4] Two categories for next phase programs are considered: R&D Program (use of development facilities (e.g. PSDF) or slip streams at operating plants (e.g. Wabash, Tampa, Eastman Chemical, Great Plains)) and new CCPI projects or additions to planned commercial plants

[5] Illustrated cost estimate for the equipment supply and test for one technology in the given technology class; does not include associated R&D or cost of manufacturing facilities that may be required; does not include base facility test cost; actual cost will be dependent on scale, technology, and the host plant

Without the Original FutureGen "living laboratory" as host to several key technology components, the Department's RD&D program will be under pressure to find available and affordable alternative sites for the scale-up of these key technologies identified in the table above. The Department's Fossil Energy Core R&D and CCPI Programs will be pursuing potential alternative host sites with interested industry stakeholders. Until discussions with key stakeholders take place, the exact costs associated with the testing and validation of these technologies will remain uncertain. However, as is noted in footnote 4 to the table above, it appears ample opportunity exists for the development and testing of key technology components at other potential demonstration sites.

Critical Milestones

Construction for the originally proposed FutureGen plant would begin in 2009 with plant start up in 2012 and operation through 2016. The project includes 2 additional years of monitoring, after which DOE project completion is scheduled for 2018. Commercial operation of the project is expected to occur around the 2020 timeframe, with the continued monitoring of injected CO_2.

Construction for the Revised FutureGen demonstration plants would begin as early as 2012, with planned commercial operation in the 2015-2019 timeframe. DOE project completion is expected to occur in 2020. Because the Revised FutureGen plants would be operated commercially from the beginning, commercial experience will occur some 5 years earlier than under the original plan.

Summary of Benefits

The Original FutureGen program was designed to work in concert with CCPI demonstrations, where FutureGen would begin operation in 2012 and provide the-first-of-a-kind integrated coal/CCS power plant using leading-edge technology, as well as a large scale integrated test bed for future technology improvements that could be demonstrated under the CCPI program. The Revised FutureGen would include 2-3 demos using off the shelf technology and start up around 2015.

Significant cost reductions for energy from coal/CCS plants will ultimately be needed for this to be an attractive option in the U.S. and internationally. The Original FutureGen was designed to accelerate the introduction of lower cost components by providing a large-scale test bed. Under Revised FutureGen commercial deployment of cost-reduction improvements could be delayed unless other test approaches are found, such as designing limited test capability (i.e. focused on a particular component rather than many) into Revised FutureGen and CCPI demonstrations.

The change in focus toward commercial demonstration versus a large-scale R&D test facility is important because these demonstrations will provide investors and the marketplace with a much greater sense of certainty about the cost and performance of IGCC with carbon capture, thus enabling earlier deployment of near-zero emission clean coal technology. To meet the projected growth in demand for electric power requires the use of coal, and demonstrations showing that up to 90 percent of the CO_2 can be captured and safely stored. These demonstrations will produce the technology that enables the power sector to use coal, the Nation's most abundant, secure, low-cost energy resource.

As part of this new direction for FutureGen, financially, the Department's plan is to only participate in funding the CCS portion of the demonstration unit of the overall IGCC-CCS plant. In the original investment strategy, the Department would fund 74% of the total plant cost and was also required to share 74% of all project cost growths. The new strategy would limit the Department's exposure to costs associated with only the CCS aspects of the project. The new strategy also focuses the industrial participant on proposing a commercial power plant that would operate profitably. Therefore, it would be

the responsibility of the participant to manage cost overruns based on economic competitiveness of the plant. In this context, DOE's role shifts from the principal funding entity for the project to one with a primary role focused on mitigating incremental risk of the addition of CCS. Furthermore, Revised FutureGen will provide a greater leverage of the taxpayers' investment as the Federal Government will only participate in financing the CO_2 capture and storage system while the private partners will pay the cost of the balance of the IGCC plant.

In summary, under the Revised FutureGen the Department and the Nation would be gaining valuable early commercial experience with IGCC-CCS coal plants. The Revised FutureGen will focus on full utility-scale demonstrations, integrating surface and sub-surface processing, and developing commercial cost, integrated IGCC-CCS performance, and reliability data in order to reduce risk, confirm economics, and facilitate industry-wide private capital offerings. It is expected that these full-scale projects will be in operation in the next six to eight years, and possibly sooner, depending on the site selected. Demonstrating IGCC-CCS technology is a key solution to reducing atmospheric CO_2 emissions from coal-based power systems. The new approach will address early on the deployment risks by replacing the original one-plant research project with multiple commercial demonstrations using nearer-term technologies that will support timely expansion of our generating capacity in response to rising need, while providing technology for mitigating greenhouse gases.

Performance Parameters Required to Obtain Desired Outcome (Revised FutureGen Description and Scope)

One of FutureGen's fundamental goals is to overcome environmental constraints, especially climate change impacts of CO_2 emissions, associated with producing electricity and other forms of energy from coal -- the Nation's lowest cost and most abundant domestic energy resource. It is expected the Revised FutureGen approach, in concert with continuing R&D for advanced cost-effective technologies, will still prove the technical and economic feasibility of near zero emission IGCC technology while capturing and sequestering the CO_2 generated in the process.

Projects selected will employ near-term coal conversion technologies to gasify coal, oxygen, and steam to produce a hydrogen-rich "synthesis gas." After exiting the conversion reactor, the composition of the synthesis gas is "shifted" to produce a concentrated gas stream of hydrogen rich fuel gas, steam, and CO_2. Following separation of these three gases, the produced hydrogen can be used to cleanly generate electricity in a combined turbine cycle using combustion and steam turbines. Steam from the process can be condensed, treated, and recycled into the gasifier or added to the plant's cooling water circuit. CO_2 from the process will be sequestered in deep underground geologic formations that will be intensively monitored to verify the permanence of CO_2 storage. Suitable geologic reservoirs for sequestration must be located in close proximity to the plant. Under the Revised FutureGen, focus will be placed on utilizing the synthesis gas for power (electricity) generation. Figure 1 below provides a simplified flow diagram for a prototype IGCC with CCS plant.

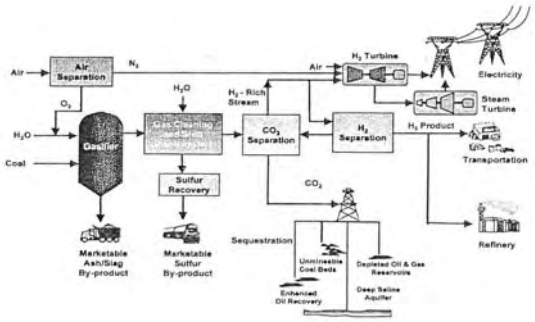

Figure 1 – IGCC-CCS Plant Configuration

The overall objectives are to:

- Demonstrate commercial integrated operation of a coal conversion system with carbon sequestration;
- Gain acceptance by the coal and electricity industries, environmental community, international community, and public-at-large for the concept of coal-based systems with near-zero emissions through the successful commercial demonstration of a single power train of each operating FutureGen plant;
- Through commercial demonstration, establish standardized technologies and protocols for deployment of IGCC –CCS, including CO_2 measurement, monitoring, and verification;
- Establish feasibility of integrated electricity production from coal with advanced clean coal technologies (including CO_2 capture); and
- Verify effectiveness, safety, and permanence of carbon sequestration.

The functional performance requirements for the selected projects include plant performance and sequestration monitoring and verification criteria. The *performance criteria* for the single-train demonstration unit of the overall plant are:

- Sequester CO_2 at an operational rate of at least one million tons/year;
- Produce electricity consistent with market needs (equivalent to plant capacity of ~300 MW gross electricity output for the demonstration portion of the commercial plant);
- Sequester at least 90 percent of CO_2 from a single power train;
- Plant location consistent with adequate feedstock availability, market for products, and proximity to geologic formation for sequestration (e.g., unmineable coal seams, depleted oil and natural gas reservoirs, deep saline aquifers, basalt formations);
- Environmental requirements for the single power train:
  - ✓ 99 percent sulfur removal;
  - ✓ < 0.05 lb/million Btu NOx emissions ;
  - ✓ < 0.005 lb/million Btu particulate matter emissions;

✓ 90 percent mercury removal; and

- Design includes demonstration of integrated IGCC with CCS that allows for enhanced operability and reliability in a commercial setting.

The *CO_2 Sequestration Monitoring and Verification performance criteria* are:

- Accurately quantify storage potential of the geologic formation;
- Detect and monitor surface leakage, if any occur (capability to measure CO_2 slightly above atmospheric concentration of 380 ppm), and demonstrate effectiveness of mitigation; and
- Develop information necessary to estimate costs of future CO_2 management systems.

Project Cost and Cost Sharing

Under the Revised FutureGen plan, it is anticipated that only one "train", or power unit (~300 MW), of a two-train IGCC plant (~600 MW) would be equipped with CCS. Such a plant would be capable of capturing well over one million metric tons of CO_2 per year while DOE was involved in the project during the first four years of operation. The following text contains a summary of the major cost components and uncertainties for this revised approach. More details of the Revised FutureGen plan cost estimate can be found in Appendix A. For comparative purposes, Appendix B contains cost details for the Original FutureGen project.

The total, escalated, as-spent capital cost of a nominal 600-MW IGCC plant is estimated to be $2,767 million (mixed-year dollars). When one train is equipped with CCS, the cost increases to $3,061 million. Under the revised plan, DOE would cover up to the incremental as-spent capital cost of $294 million, assuming that all of the captured CO_2 is injected into a deep saline formation.

In addition to increasing the plant's capital costs, adding CCS would also increase the plant's operational costs during the four year operational period. Costs would rise due to increased O&M expenses at the plant as well as additional O&M expenses associated with CO_2 transport, storage and monitoring. The total increase in operational costs over the first four years of operation is estimated to be $7 million in as-spent, mixed-year dollars.

Thus, the total, as-spent DOE cost is estimated to be up to $302 million ($294.3 plus $7.4), expended as tabulated below.

Revised FutureGen Plan Annual DOE Expenditures		
Year	Capital	Operations
2012	19.7	
2013	87.7	
2014	88.9	
2015	98.0	
2016		1.8
2017		1.8
2018		1.9
2019		1.9
Subtotal	294	7
Total	302	

Cost estimates for the Revised FutureGen plan included contingencies to allow for changes that experience shows will likely be required due to incomplete project definition and technical uncertainty. For the power plant, project and process contingencies equaled 23% of the bare erected capital cost (unescalated). For the CO_2 transport, injection and monitoring systems, project and process contingencies equaled 51% of the bare erected capital cost (unescalated). Overall, contingencies comprised 16% of the total project capital cost (unescalated).

Another scenario that should be considered is the potential use of captured CO_2 for enhanced oil recovery (EOR). If one million metric tons of CO_2 are injected into a saline formation and the remaining CO_2 is sold for enhanced oil recovery (EOR) at the plant gate, the most likely total, as-spent DOE cost would be reduced to $232 million (via reductions in capital and O&M costs associated with sequestration and the receipt of EOR revenues).

Uncertainty Analysis: Although the $302 million is considered to be the "most-likely" DOE cost, an analysis was performed to quantify the uncertainty of this estimate. The accuracy of any project cost estimate is a function of that project's level of definition. Presented in the table below is how the American Association of Cost Engineering International (AACE 1998) relates cost estimation accuracy with various levels of project definition for the process industries.

AACE Classification Matrix for the Process Industries

Estimate Class	Level of Project Definition Required	Typical Purposes	Expected Accuracy (after contingency*)
5	0 - 2	Concept Screening, Long-Range Planning	-50% to +100%
4	1 - 15	Feasibility Study, Preliminary Budget Approval	-30% to +50%
3	10 - 40	Budget Authorization	-20% to +30%
2	30 - 70	Detailed Budget Control Baseline	-15% to +20%
1	50 - 100	Support Bid Checks and Vendor/Contractor Negotiations	-10% to +15%

*The +/- accuracy value represents typical percentage variation of actual costs from the cost estimate *after contingency is included within the estimate of the most likely cost*[6].

The Association for the Advancement of Cost Engineering International (AACE International) guidelines were consulted to determine how key cost estimation factors were varied in an uncertainty analysis of DOE costs. It should be noted that as-spent DOE costs are extremely sensitive to the future rates of escalation/inflation, which are the most uncertain factors in the cost estimate. Accordingly, the uncertainty analysis was performed both with and without variance of escalation/inflation rates such that decision-makers have the option of whether or not to consider the additional uncertainty associated with future inflation/escalation rates. The results of the uncertainty analysis are summarized in the below table and the bullets that follow.

[6] "Most likely cost" is taken here to mean that, according to recommended cost engineering practice for process-related systems (AACE 1998), contingencies were applied to achieve a 50% confidence interval, i.e., a 50% probability that actual costs will be equal to or less than the estimate.

Revised FutureGen Plan Uncertainty Analysis		
Cost Estimation Factor	Variance Range	
	-	+
Power Plant Bare Erected Cost	20%	30%
Power Plant Owner's Costs	20%	30%
Transport, Injection & Monitoring Capital Cost	50%	100%
Fixed & Variable O&M Costs	20%	30%
Fuel Price	20%	30%
Inflation/Escalation Rates	*50%*	*100%*
Change in DOE TOTAL COST (Escalated, As-Spent Dollars)...		
...when all factors EXCEPT inflation/escalation are simultaneously varied	33.9%	62.7%
...when all factors INCLUDING inflation/escalation are simultaneously varied	44.5%	134.6%
Change in DOE CAPITAL COST (Escalated, As-Spent Dollars)...		
...when all factors EXCEPT inflation/escalation are simultaneously varied	33.8%	62.4%
...when all factors INCLUDING inflation/escalation are simultaneously varied	44.4%	134.5%
Change in DOE OPERATIONS COST (Escalated, As-Spent Dollars)...		
...when all factors EXCEPT inflation/escalation are simultaneously varied	38.9%	76.0%
...when all factors INCLUDING inflation/escalation are simultaneously varied	47.6%	138.3%

If all the key cost estimation factors EXCEPT inflation/escalation rates were simultaneously varied across their accuracy limits:

- The DOE TOTAL COST varied from $199 to $491 million.
- The DOE CAPITAL COST varied from $195 to $478 million.
- The DOE OPERATIONS COST component varied from $4 to $13 million.

If all the key cost estimation factors INCLUDING inflation/escalation rates were simultaneously varied across their accuracy limits:

- The DOE TOTAL COST varied from $167 to $708 million.
- The DOE CAPITAL COST component varied from $164 to $690 million.
- The DOE OPERATIONS COST component varied from $4 to $18 million.

The following table provides a comparison of estimated costs for the Original FutureGen Project and for the two most likely cases which may occur under the Revised FutureGen Plan. Original FutureGen Project amounts are derived from the most recent FutureGen Alliance Initial Conceptual Design Report, dated May 2007. Revised FutureGen Plan amounts are based on recent analysis completed by NETL's Systems Engineering Group, details of which are described above.

Comparison of DOE Expenditures					
Year	Original FutureGen Plan	Revised FutureGen Plan			
		CCS on One Train of a Single-Train IGCC (~300 MW)		CCS on One Train of a Dual-Train IGCC (~600 MW)	
		Capital	Operating	Capital	Operating
2006	15.1				
2007	35.4				
2008	49.5				
2009	164.4				
2010	344.7				
2011	297.9				
2012	130.9	19.0		19.7	
2013	85.3	83.5		87.7	
2014	93.1	84.6		88.9	
2015	95.9	93.5		98.0	
2016	7.1		1.4		1.8
2017	9.5		1.4		1.8
2018			1.5		1.9
2019			1.5		1.9
2020					
2021					
2022					
2023					
Totals	1329	281	6	294	7
		286		302	

Summary of DOE Funding of Approaches

The Original FutureGen project was based on the government paying 74% of an entire power plant. Because of changes in the market, including interest in IGCC technology and regulatory drivers on the horizon for carbon constraints, the Revised FutureGen approach proposes that the government only contribute to the cost of carbon capture and storage, which represents approximately 25% of the total demonstration unit cost of the facility. That is, it is envisioned that DOE's contribution to the Revised FutureGen would be no more than the incremental cost associated with use of CCS technology.

Based on these costs, DOE would anticipate selecting multiple demonstration plants for a total cost of up to $1.3 billion in as-spent dollars. A summary program funding profile is provided in the table below showing a comparison to the Original FutureGen project structure.

Estimated DOE Project Funding Profile (in as-spent $M)		
FY	**Original FutureGen**	**Revised FutureGen**
2004	**9**	**0**
2005	**18**	**0**
2006	**18**	**0**
2007	**53**	**Assume $59M "Original FG" funding available for "Revised FG" calculated as follows:** • **Total FG appropriations thru end-FY07 ~$98M** • **FG Alliance costs incurred thru end-Jan 2008 ~$23M** • **Potential DOE "early termination liability" ≤$10M** • **Ongoing DOE NEPA Costs ~$6M** **Note: Total BP 0 + BP 1 obligations to FG Alliance equal ~$39 million**
2008	**108 (75 approp.)**	**75**
2009	**156**	**156**
2010	**285**	**250**
2011	**228**	**250**
2012	**150**	**210**
2013	**150**	**200**
2014-2018	**125**	**100**
Total	**1,300**	**1,300**

Schedule

Under the Revised FutureGen approach, through multiple commercial demonstrations, the technical and economic risk associated with a near-zero emissions single commercial-scale, power train will be reduced, thus enabling private financing of future plants of this type. This will enable earlier commercial adoption of coal fueled power generation. It is anticipated that full-scale commercial demonstrations of IGCC with CCS would come on line as early as 2015.

Fiscal Year Activities and Milestones

The following is a profile of the principal Revised FutureGen project activities and milestones by fiscal year. These milestones are aggressive and dependent on the actual timing and availability of funds for project expenditures, and will have to be updated to reflect the actual funding situation. Although not broken out explicitly, each of these activities includes inherent costs for industry's involvement with all aspects of project management. Included in project management is an important continuing effort on broad stakeholder involvement, education and outreach that goes beyond that associated with the National Environmental Policy Act (NEPA). This effort is intended to work towards broad understanding necessary for general acceptance of sequestration and the goals of near-zero emission coal concepts.

Principal FY08 Activities
Activities include drafting and finalization of a Revised FutureGen Program Plan, notification of international participants of change to FutureGen approach (i.e., Revised FutureGen), development of draft Revised FutureGen Request for Information (RFI), posting of RFI at the Federal Business Opportunities website (FedBizOpps.gov), preparation of draft Funding Opportunity Announcement (FOA), receipt of public comments on FOA, issuance of final FOA, initiation of NEPA requirements, and beginning evaluation of proposals received against FOA.

Principal FY09 Activities
Activities include completing review and evaluations of proposals, announcement of candidate sites, the initiation of negotiation of awards, and.

Principal FY10 Activities
Activities include completion of NEPA documentation and negotiation of awards.

Comparison of Intellectual Property Provisions of Original and Revised FutureGen Approaches

The Revised FutureGen Plan cooperative agreements will follow the same basic intellectual property approach as the original project:

- pre-existing patents and proprietary information related to privately owned technology will remain privately owned and will not be subject to public release unless the recipient otherwise agrees;
- the recipient may obtain ownership of subject (new inventions) either by law if a small business or non-profit institution, or through a DOE patent waiver if a large business. DOE retains the right to use subject inventions for government purposes;
- technical data first produced under the project will be available for public release except to the extent that DOE agrees such data may be protected from release for up to 5 years.

Request for Information from Industry Cooperators

Early feedback on the restructuring of FutureGen into a "Revised FutureGen" is expected to come from responses to the Request for Information that will be issued at the Federal Business Opportunities website (FedBizOpps.gov). These comments and inputs from the RFI will help shape the drafting and final issuance of a Funding Opportunity Announcement anticipated for the 2QTR of 2008.

Likely Industry and Financial Community Reaction

IGCC projects have been postponed or cancelled in some states under regulatory or political pressure because there was no way to deal with concerns about CO_2 – no commercially proven technology for capture and storage from power plants has been demonstrated to reassure investors. What is needed on a global scale is reliable information and the operation of commercial scale integrated projects at more than one sequestration demonstration site. Revised FutureGen should fill this developing need of utilities interested in siting new coal power plants which have been deterred by changes in market expectations and public perception. Entities interested in siting new coal power plants should react favorably to the Revised FutureGen approach.

The incorporation of CCS on a commercial scale IGCC facility will add capital costs and operating costs to the facility's economics and is still perceived by the electricity generation industry as an emerging technology. Concerns remain over the integration and scale-up risks associated with IGCC, and a cost gap still remains when compared to conventional coal power plants. Therefore, industry's reaction to the approach will depend on the magnitude of the government's commitment to the project. The Department's commitment would need to reasonably satisfy these concerns and allow the economics of the plant to function competitively, and will require superior project proposals in order to garner both interest and commitment from their host states and communities.

Specific responses to the planned Request for Information (RFI) will likely be varied and largely dependent on the forces under which the industrial respondent competes. Regulated utilities subject to traditional rate regulation will likely maintain their focus on the introduction of new plants into their rate base. Wholesale utilities, on the other hand, will be concerned over the competitiveness of new base load power plants in an era of carbon regulation and may balance this concern against competitiveness concerns associated with their new plant's cost of electricity. In general, several concerns are likely to be voiced by industry, including concerns over DOE commitment to the project given the recent course of FutureGen events, liability concerns in the absence of a sound regulatory framework, and the sheer magnitude of investment required of a utility to participate under the Revised FutureGen.

Likely International Reaction

We anticipate the expected response of the international community to the announcement that FutureGen will be taking a "new approach" to be favorable. The ultimate goal of the FutureGen program (promoting a near-zero emission technology solution for coal) is well received internationally. Since the ultimate goal of achieving near-zero emissions coal is not changing in the Revised FutureGen approach, it is anticipated that there will be little objection to the overall direction of the program. In fact, the development of IGCC technology coupled with CCS (a major focus of both the "old" and "revised" FutureGen approach) will continue to be of interest on a global scale.

The new international approach would aim to strengthen ties with advocates of near-zero emission coal plants worldwide and raise the level of information sharing. The revised approach will offer the international community an opportunity to coordinate with more than one CCS project and may not necessarily involve the level of cost-sharing in the Original FutureGen project. Participation in the proposed "FutureGen Government Steering Committee" (GSC) required a commitment of $10 million USD over a 5-year period. The revised approach may propose a mechanism that would make it easier and less costly to join, thus potentially gaining greater international interest than the Original FutureGen Project. Therefore, this revised mechanism will likely be well received. A sustained international interest in the development and proliferation of zero emission coal power plants should ensure that the international interest in the FutureGen program remains high.

APPENDIX A: COST DETAIL FOR THE REVISED FUTUREGEN PLAN

Plant Scenarios	
1a	Nominal 600-MW IGCC [three gasifiers (one spare) and two 7FB turbines] with no CO2 capture.
1c	Case 1a with 90% CO2 capture on one of the two trains. All captured CO2 sequestered in a saline formation.
1c-EOR	Case 1c with one million metric tonnes of captured CO2 sequestered in a saline formation and the balance sold for sequestration via enhanced oil recovery (EOR).

	Plant Scenarios		
	1a	1c	1c-EOR
GENERAL DESCRIPTION	1a	1c	1c-EOR
Technology	IGCC	IGCC	IGCC
Fuel	IL #6 Coal	IL #6 Coal	IL #6 Coal
Net Output, MWe	640	595	595
CO2 Capture Percentage	0%	45%	45%
Heat Rate (HHV Basis), Btu/kWh	8,922	9,654	9,654
Capacity Factor (Average Over First Four Years)	72.6%	70.9%	70.9%
Steel Cost Component of BEC, %	0.36	0.36	0.36
Annual Power Generation at Capacity Factor, million MWh/year	4.07	3.70	3.70

CO2 DISPOSITION	1a	1c	1c-EOR
Fuel Carbon Intensity, lb CO2 per MMBtu	200	200	200
Uncontrolled CO2 Emissions at Capacity Factor, million metric tonnes/year	3.30	3.24	3.24
CO2 Captured at Capacity Factor, million metric tonnes/year	0.00	1.47	1.47
Amount of CO2 Captured at Capacity Factor that is Sequestered in a Saline Formation, million metric tonnes/year	0.00	1.47	1.00
Amount of CO2 Captured at Capacity Factor that is Sold for Sequestration via EOR, million metric tonnes/year	0.00	0.00	0.47
Controlled CO2 Emissions at Capacity Factor, million metric tonnes/year	**3.30**	**1.77**	**1.77**

Revised FutureGen Plan Unescalated Capital Costs*, 2007-year dollars (millions)			
Cost Element	Nominal 600-MW IGCC		
	1a	1c	DOE Share (Delta)
Coal/Sorbent Handling, Prep and Feed	67.91	68.10	0.19
Feedwater System	28.06	28.14	0.08
Gasifier & Accessories	276.51	278.43	1.92
ASU and Oxidant Compression	152.79	160.43	7.64
COS Hydrolysis or Shift	5.80	8.57	2.77
Acid Gas Removal	61.39	85.99	24.60
Sulfur Recovery	24.54	24.74	0.20
Syngas Cleanup/Conditioning BOP	6.85	7.08	0.23
CO2 Compression and Drying	0.00	16.19	16.19
Combustion Turbine and Accessories	94.83	98.29	3.46
HRSG and Stack	47.08	47.22	0.13
SCR System	9.71	9.76	0.06
Steam Turbine Generator and Accessories	54.07	53.30	-0.77
Cooling Water System	21.29	21.35	0.06
Slag/Ash Handling System	36.21	36.32	0.11
Accessory Electric Plant	53.93	54.08	0.15
Instrumentation and Control	17.53	17.58	0.05
Improvements to Site, Buildings & Structures	26.90	27.20	0.30
Adder for Union Labor (vs. merit-shop)	106.42	112.62	6.20
EPCM Services	101.54	107.45	5.91
Power Plant Contingencies	222.73	262.39	39.66
Financing Fees (not including AFUDC)	55.30	55.30	0.00
NEPA	0.00	8.00	8.00
Other Misc. Project Development Costs	7.46	7.78	0.32
Cost of Land & Site Infrastructure Improvements	70.70	70.70	0.00
Pre-Production Costs	43.89	45.85	1.96
Inventory Capital	38.87	39.91	1.05
CO2 Transport, Injection & Monitoring Systems	0.00	60.51	60.51
CO2 Transport, Inj. & Mon. Contingencies	0.00	30.94	30.94
Total Unescalated Capital Costs*	1632	1844	212

*excluding AFUDC costs (which don't affect DOE cost-share)

Revised FutureGen Plan Escalated, As-Spent Capital Costs, mixed-year current dollars (millions)				
Year	Cost Element	Nominal 600-MW IGCC		
		1a	1c	DOE Share (Delta)
2012	Capital Expenditures	351.48	371.21	19.73
	AFUDC	22.68	22.68	0.00
	Annual Subtotal	374.16	393.89	19.73
2013	Capital Expenditures	571.43	659.12	87.70
	AFUDC	82.25	82.25	0.00
	Annual Subtotal	653.67	741.37	87.70
2014	Capital Expenditures	578.81	667.66	88.85
	AFUDC	161.99	161.99	0.00
	Annual Subtotal	740.80	829.65	88.85
2015	Capital Expenditures	736.37	834.35	97.98
	AFUDC	261.98	261.98	0.00
	Annual Subtotal	998.35	1096.34	97.98
Total Escalated, As-Spent Capital Costs		2767	3061	294

Revised FutureGen Plan Unescalated Operating Costs, 2007-year dollars (millions)			
Cost Element	Nominal 600-MW IGCC		
	1a	1c	DOE Share (Delta)
Net Output, MWe	640	595	-
Capacity Factor (Avg over First Four Years)	73%	71%	-
Heat Rate (HHV basis), Btu/kWh	8922	9654	-
Plant Fuel Cost	65.37	64.25	-1.12
Plant O&M	53.71	55.61	1.90
CO2 Transport, Storage & Monitoring O&M Cost	0.00	0.56	0.56
Total Cost	119	120	1

Revised FutureGen Plan Escalated, As-Spent Operational Costs, mixed-year dollars (millions)				
Year	Cost Element	Nominal 600-MW IGCC		
		1a	1c	DOE Share (Delta)
2016	Total Costs	155.47	157.13	1.76
2017	Total Costs	160.03	161.84	1.81
2018	Total Costs	164.83	166.70	1.87
2019	Total Costs	169.78	171.70	1.92
Total Escalated, As-Spent Costs		650	657	7

Revised FutureGen Plan Annual DOE Expenditures		
Year	Capital	Operations
2012	19.7	
2013	87.7	
2014	88.9	
2015	98.0	
2016		1.8
2017		1.8
2018		1.9
2019		1.9
Subtotal	294	7
Total	302	

Global Assumptions		
2007 to 2010 Steel Escalation,	Nominal Average Annual	0.250
2010 to 2015 Steel Escalation,	Nominal Average Annual	-0.014
General Inflation Rate		0.030
CO2 for EOR - Sales Price (Pressurized at the Power Plant Gate), 2007-year dollars per metric tonne		20

Assumptions and Notes

1. Bared Erected Cost (BEC) comprises the cost of process equipment, on-site facilities and infrastructure that support the plant (e.g., shops, offices, labs, road) and the direct and indirect labor required for its construction and/or installation. Total Plant Cost, or "overnight construction cost", includes BEC plus the cost of EPCM services (including related fees), project contingency and process contingency.

2. The cost to secure long-lead equipment items is estimated to be 15% of the "equipment" portion of BEC, which equates to about 10% of total BEC for IGCC.

3. "Owner's and Other Costs" may include: premiums for performance-based risks; allowance for funds used during construction; land cost; conceptual or "project feasibility" engineering studies; site-specific improvements to the site or local infrastructure; environmental permitting; environmental monitoring / characterization; financing fees; legal fees; initial working capital; spare parts inventory capital; feedstock inventory capital (fuels and other consumables stored on-site); first fills of chemicals and catalysts within process plant vessels; operator training; startup labor costs; allowance for inefficient operation during startup period; transmission interconnect cost.

4. For IGCC plants, 36% of bare erected cost is assumed to be comprised of steel costs (based on the assumption that 72% of BEC is comprised of equipment and materials costs, and 50% of equipment and materials costs are steel costs).

5. All values (capital costs, O&M costs, CO2 credits, power sales revenue) are escalated at the assumed inflation rate except for steel costs. Historically, the escalation of steel prices (an analog for TPC) lags the escalation of oil prices by three years. Therefore, 2007 to 2010 TPC escalation is assumed to be equivalent to the historical escalation of world oil prices between Jan-2004 (28.00 $/bbl) and Jan-2007 (54.63 $/bbl), which is an average nominal rate of 25%. (World oil prices are the average spot prices for all countries, weighted by export volume as reported by the EIA.) 2010 to 2015 plant cost escalation is assumed to be equivalent to the average annual projected escalation in world oil prices between 2007 (71 $/bbl) and 2011 (68 $/bbl). Oil price projection taken from Morningstar's "Five Year Oil Price Deck" as of 11-19-07.

6. Capital costs are assumed to be incurred over four years. In the first year, a portion of owner's costs, a portion of EPCM costs, and costs for long-lead equipment items are incurred. Ground is broken in the second year and construction takes place in years two, three and four. (In addition, AFUDC costs are incurred in each of the four years.)

7. Upfront costs to secure long-lead equipment items are assumed to be 10% of total BEC (incurred in the year before construction begins). This is based on the assumption that the cost to secure long-lead equipment is 15% of total plant equipment costs, and that equipment costs comprise 65% of total BEC.

8. In addition to costs for detailed design, construction permitting, construction management and EPC engineering support during startup, the EPCM fee is assumed to cover the costs for the Front-End Engineering Design study and construction permitting (but not environmental permitting). Sixty percent of the EPCM fee is assumed to be for design/permitting (incurred in the year before construction begins). Thirty percent of the EPCM fee is assumed to be for construction management (spread evenly over the three construction years). Ten percent of the EPCM fee is

assumed to be for startup support (incurred in the final year of construction). These ratios are based on guidelines supplied by Parsons.

9. Construction costs (less long-lead equipment costs and not including EPCM costs and contingency costs) are assumed to spread evenly (in real terms) over the three year construction period. Owner's costs are assumed to be expended in two years (split evenly in real terms): the year before construction and the last year of construction.

10. Assumed project financing structure has a 50/50 debt: equity ratio, with nominal annual interest rates for debt and equity of 8.5% and 14.5%, respectively. To incentivize IGCC projects, the Indiana PSC allows IOUs to increase their ROE by three percentage points to cover the "owner's risk premium" when the owner (rather than the EPC firm) assumes performance-based risks. The "base" ROE rate allowed by the PSC is around 11.5%, so adding the risk premium yields 14.5%. All of these assumptions were based on a 1/9/08 communication with Scully Capital.

11. Per EPRI TAG guidelines, the before-tax weighted cost of capital is used to calculate the allowance for funds used during construction. AFUDC is calculated on the escalated, as-spent costs less the DOE contribution (which is not financed). For each year, it is assumed that twelve uniform draws are made on monthly basis.

12. The cost (expressed in base year dollars) of securing financing (including fees and closing costs but not including AFUDC) is assumed to be 2% of the total, as-spent, capital costs that are financed (i.e., not including DOE contributions), expressed in mixed-year dollars. This rule of thumb is based on guidance obtained during a 1/9/08 communication with Scully Capital.

13. Costs of adding an SCR and for a transmission interconnect ($50 million) are based on the FutureGen Alliance cost estimate in the Initial Conceptual Design Report (May 2007).

14. According to a 12/21/07 communication with Worley Parsons, Midwest union labor costs would be approximately 40% higher than Midwest merit shop labor costs.

15. The following assumptions were made using EPRI TAG as a guideline. Technology fees (e.g., prepaid licenses/royalties) equal 0.5% of BEC. Pre-production costs (operator training, equipment checkout, startup costs) equal the sum of: one year of fixed O&M labor costs, 3 months of non-fuel variable O&M costs (@100% CF), one month of fuel cost (@100% CF). Spare parts inventory capital is equal to 0.5% of TPC. The cost of stored feedstock's (in addition to first fills) equals 3 months of fuel and non-fuel variable O&M costs.

16. Including a buffer zone, power plants are assumed to require 300 acres of land.

17. Duke Energy's Edwardsport, IN IGCC plant is proposed to include construction of a railroad spur between 5 and 18 miles in length. As a representative owner's cost, the cost of construction of a 12-mile railroad spur is included in estimates for coal-fueled plants. The cost was assumed to be $1.6 million per mile. This rough rule of thumb was based on a communication with RDS/Worley-Parsons on 1-9-08.

18. Captured CO2 is assumed to be transported through a fifty-mile pipeline and injected into a saline geologic formation. Project and process contingencies of 30% and 20%, respectively, were included for transport and injection capital costs. The capital "trust" fund for monitoring the injected CO2 included project and process contingencies of 30% and 35%, respectively.

19. At the 2007 EOR Carbon Management Workshop (December 3-4, 2007 in Dallas, TX), presentations from Petrosource and Denbury indicated that a power plant would be paid the following prices for delivering pressurized CO2 at the power plant gate: ~$10 for a target oil price of $30/bbl; $19-$29 for a target oil price of $75/bbl.

20. Average capacity factors were assumed for the first four years of operation based on the following schedules. For IGCC plants with a spare gasifier, capacity factors are assumed to eventually reach 85% (source: GE's Reference Plant Availability Target, presented at the 2007 GTC meeting). Thus, capacity factors for years one through four are assumed to be 60%, 68.5%, 77% and 85%. For IGCC plants without a spare gasifier, capacity factors are assumed to eventually reach 82% (source: EPRI UDBS Version 6). Thus, capacity factors for years one through four are assumed to be 57%, 65.5, 74%, and 82%. For each train that has carbon capture, the capacity factor of power generation associated with that train is assumed to fall by 5 percent. If only one train in a dual-train IGCC has capture, the total capacity factor is the average of their individual capacity factors, weighted by their individual power generation.

APPENDIX B: COST DETAIL FOR THE ORIGINAL FUTUREGEN PLAN

Original FutureGen Plan Project Costs, Unescalated 2006-Year Dollars (Millions)

Capital Cost	
Coal/Sorbent Handling, Prep and Feed	43
Feedwater System	25
Gasifier & Accessories	82
ASU and Oxidant Compression	78
Shift	34
Acid Gas Removal	75
Sulfur Recovery	14
Syngas Cleanup/Conditioning BOP	20
PSA System	1
CO2 Compression and Drying	52
Combustion Turbine and Accessories	53
HRSG and Stack	24
SCR System	4
Steam Turbine Generator and Accessories	29
Cooling Water System	31
Slag/Ash Handling System	8
Accessory Electric Plant	38
Instrumentation and Control	10
Improvements to Site, Buildings and Structures	34
EPCM Service/Fees	57
Contingencies and Sales Tax	106
Technology Upgrades and Non-Traditional Cost (Allowance for R&D, Visitors Center, Architectural Features)	28
Plant Owner's Cost	162
Sequestration Infrastructure and Operating Cost (includes post operations monitoring and closure)	107
NEPA Cost	25
Total Capital Cost	**1,137**
4-Year Power Plant Operations Allowance	254
Total Project Cost	**1,391**

FutureGen Project Expenditures, Total As-Spent Mixed-Year Dollars (millions)[1]

Year	Project Expenditures	Alliance Expenditures	DOE Expenditures[2]
Capital Expenditures			
2006	17.8	2.7	15.1
2007	44.7	9.2	35.4
2008	63.4	14.0	49.5
2009	222.2	57.8	164.4
2010	465.8	121.1	344.7
2011	402.6	104.7	297.9
2012	89.3	23.2	66.1
2013	8.8	2.3	6.5
2014	9.3	2.4	6.9
2015	3.9	1.0	2.9
Total	1327.8	338.4	989.4
Operations Expenditures			
2012	87.6	22.8	64.8
2013	106.4	27.7	78.8
2014	116.5	30.3	86.2
2015	125.7	32.7	93.0
2016	9.5	2.5	7.1
2017	12.8	3.3	9.5
Total	458.6	119.2	339.3
Combined Capital and Operations Total			
Total	**1,786.3**	**457.7**	**1328.7**

Notes:
1. Individual cell values rounded to the nearest 0.1.
2. DOE Expenditures represent FutureGen Alliance spend plan and do not represent historical DOE spending nor DOE historical or requested Appropriations.

Chairman LAMPSON. Mr. Akin, you are recognized for five minutes.

COAL VERSUS NUCLEAR POWER

Mr. AKIN. Thank you.

I am not intimately engaged or involved in your particular project, but having a little bit of a background in engineering, it seems like to me just by common sense was saying if you have got to capture the CO_2 that is generated from burning coal, I assume that is what you are doing.

Mr. ALBRIGHT. Yes, sir.

Mr. AKIN. That sounded to me like that is going to cost a lot of money, or there is not going to be a super efficient way as opposed to just letting the CO_2 go into the atmosphere the way we currently do.

I guess my question is have there been any studies done on the comparison of what it would cost to generate, you know, a kilowatt hour or whatever it is, of nuclear energy versus coal when you have to do the sequestration? Is there any competition at all, or is nuclear far more efficient, or is nuclear more expensive, or do you know anything about that?

Mr. ALBRIGHT. Well, gosh. I don't know enough to really sit here and talk too intelligently about it. The costs, I believe, are comparable. Coal still may be with carbon capture and sequestration may be a bit less expensive, but I am not sure exactly what the megawatt per hour is.

Mr. AKIN. Okay.

Mr. ALBRIGHT. Or megawatts.

Mr. AKIN. That is the only question I had.

Thank you, Mr. Chairman.

Mr. ALBRIGHT. I will be happy to get that to you, though. We will get that.

[The information follows:]

INSERT FOR THE RECORD

Several studies have been done to attempt to answer the question of cost competitiveness between nuclear, coal with CCS, and other technology options. The Energy Information Administration (EIA) studied the costs of generating electricity using various technologies, including nuclear and coal with CCS. According to EIA estimates, generation from coal with sequestration and nuclear power are within the same competitive range, and both technologies could be pursued depending upon regional market conditions.

Chairman LAMPSON. Mr. Costello, you are now recognized for five minutes.

PROBLEMS WITH THE DOE'S DECISION TO TERMINATE FUTUREGEN

Mr. COSTELLO. Mr. Albright, Chairman Gordon talked about the importance of you and the Department providing a plan to the Subcommittee and Members of Congress, and I agree with that. It is important that we understand where you are going.

However, I am a little interested in how we got to where we are. So I am going to ask a few questions, but before I do, this is a project, the FutureGen Project, that I have been involved with for

over five years from the very first day when the President announced in his State of the Union Address in 2003, that we were going to embark on this initiative. In fact, I called the Department of Energy the very next day and said that I think this is a great project and that I want to support the project and anything we can do to promote it here in the Science Committee and in the Congress we were more than willing to do so.

I was told several weeks later that the Department of Energy wanted to form an alliance to get the private sector involved so that we would get professionals involved in partnering with the Federal Government, not only for their expertise but also that there would be financing that would be provided both by the Federal Government and by the private sector.

And I thought that was a good sign, that we were partnering with the private sector and also that we would remove politics from the process, that we would actually have people from the industry in the private sector making decisions concerning, many decisions concerning the project and of course, the ultimate decision as to where the plant would be located.

So, it was a good sign, and I think that everyone thought that it would be very competitive. In fact, the Department and the Alliance said that it would be competitive. Any state who wanted to apply who felt that they had the geology, the natural resources to qualify could apply to have the project located in their state. Many states did apply, and in fact, the State of Illinois, we were very aggressive. The State spent hundreds of thousands, if not millions of dollars under the former Administration, Governor Ryan and then Governor Blagojevich, and then, of course, when the Alliance announced in January of '06, that it had narrowed the project down to four sites, that the finalists would either be a site, one of two sites in Texas, or one of two sites in Illinois, you could imagine how excited people were in the State of Illinois.

Then in December, on December the 18th, when the Alliance said that it was coming to Mattoon, Illinois, in Mr. Johnson's district. It is not in my district. It is not in Mr. Shimkus's district, but people were excited. My phone started ringing the next day, and said, "My gosh. We have lost this project to Texas, haven't we?" And I said, "No, we haven't. Two sites in Texas, two sites in Illinois. The Alliance is going to make this decision, not the White House, not the Department of Energy."

In fact, I remember that I spoke at a civic club meeting about a week before the Alliance made the decision that it would come to Mattoon, Illinois, and we did a QandA afterwards, had probably three or 400 people there, and one gentleman suggested that I was rather naive in thinking that Illinois, in fact, would get serious consideration, that it was going to Texas, the President's home state.

And I said, "No, that is not the case. I had faith in the Alliance, I had faith in the process. This is going to be based on science, and it will not be based on politics." So obviously when the Alliance said it is coming to Mattoon, Illinois, people were excited based upon the geology, based upon the science, and then when the Department pulled the plug in January just weeks later, you can imagine the people in Illinois, what they were saying. They were saying, "Texas obviously didn't get it. The Alliance didn't go along

with the White House and the Administration. So they are pulling the plug on this, and they are going to restructure it so Texas can be a part of this."

Let me just say that initially the line out of the Department of Energy was they were pulling the plug because the costs were out of control. In fact, you clarified this morning, Secretary Bodman clarified as well, that it wasn't simply that there was mismanagement or the Alliance did anything improper, that they were restructuring and that it really wasn't costs. We were looking at several small projects so that we could get a better bang for our buck.

I got to tell you that people in Illinois believe that they were misled, grossly misled. People are disappointed. I think that it is safe to say that, you know, you mentioned a few minutes ago that the momentum has not been lost. I disagree with you. I think momentum has been lost because who in the private sector or in the international community is going to want to partner again with the Department of Energy on a project where we have spent millions of dollars, countless hours on the part of not only the states and the Federal Government, but also the Alliance, the private sector, and the international community who expressed interest in this project.

So, I have to tell you that I think that there are a lot of questions that have to be answered, and when I get to the opportunity to ask you some questions, I am interested in knowing when and who in the Department of Energy made the decision to restructure, to go to these smaller projects and to abandon FutureGen. Was that a decision that was made at the White House? Was it made in the Department of Energy? When did the discussion begin? Who was notified with the Alliance or in the Congress? Any of the stakeholders, countries that expressed an interest in this project?

So I want to go back a little bit in time so I can go home and say to my constituents and other people who are interested in this project and who are disappointed they have lost faith in the process, I want to be able to tell them that this wasn't a decision that was made after December 18th when the project was decided by the Alliance that it was coming to Illinois. That it was then that the White House or DOE decided, well, we are going to scrap the project and go to a restructuring. I want to know when the thought process, when the discussions began at the Department of Energy, who came up with the idea, was anyone at the White House consulted, or was it suggested by someone at the White House?

So when I get my time for questioning, those are the type of questions that you can expect from me.

Thank you, Mr. Chairman.

Chairman LAMPSON. Thank you, Mr. Costello.

Mr. Lipinski, I recognize you for five minutes for questions.

FUTUREGEN INTERNATIONAL FUNDING AND COOPERATION

Mr. LIPINSKI. Thank you, Mr. Chairman. I want to follow up a little bit on part of what Mr. Costello was asking about.

In terms of the funding from other countries, has funding, how much funding has gone into this program from other countries, and what is the current situation with that? Because originally FutureGen was supposed to, you know, be cooperative and be

bringing in funding. And I was just wondering is that still the plan for the project as it is moving forward?

So, first, how much money has actually come in, if any, from other countries, and is there still, is it still supposed to be a cooperative, international cooperation on this?

Mr. ALBRIGHT. We had, Congressman, thank you. We had, I am not sure how many agreements with, international agreements. There were a number, and we had received funding, actual funds from I believe India, around $4 million, and I think Japan. I am not sure, but I know one other country that actually provided part of their funding.

One of the problems that we had going forward is we never resolved exactly how the intellectual property was going to be shared with our international friends, and so that was part of the hang up. But most had agreed to spend, the partners had agreed to spend some money but hadn't actually spent it.

We will, we are in discussions, as a matter of fact, I just came back from India. We talked about that very thing. We are in discussions with our international, not just the partners from FutureGen but others who would be interested in some of this technology and how we share it.

The goal, of course, is that we hope that if we are successful and whether it is the original FutureGen or a new FutureGen, that we will be developing an integrated, coordinated plant capturing and sequestering carbon that will be attractive and more plants will be built around the world.

Mr. LIPINSKI. The plan is to hopefully, that there will be more international cooperation, because I raised this question with you before about the international view of the United States in their living up to agreements, and I think it is very important that as we address global climate change that we have this kind of cooperation. That the United States be seen as a reliable partner.

ALTERNATE PROJECTS IN ILLINOIS

Now, bringing it back much more locally for myself, I have no coal in my district or if there is coal in my district, it is not worth digging up the houses to get to it. But for Illinois, which also made an investment in this, it is a big disappointment for the State of Illinois, and especially having put out the money for this. And I was just wanting to ask you what can be done, we talked a little bit about this before, and privately, and you suggested that, well, you cannot really steer any of this project to Illinois now. I just want you to comment on that, and also just ask you what type of investment, what investment is the Department of Energy currently putting into Illinois in regard to any types of projects on, in terms of an alternative energy or carbon sequestration, anything to address energy and global climate change. I just want to know what is DOE putting into Illinois, now that Illinois, you know, from my perspective has put into something that is, you know, not, just hit a dead end because of the decision of DOE.

Mr. ALBRIGHT. One of the things that I think kind of got lost when we announced that we were going to go a new direction in FutureGen, one of the things that got lost is just about the same time, within a day or two, we also announced that we were locating

in Illinois and funding in Illinois a carbon sequestration partnership. We chose seven geologic areas in the United States, and we are in the process of choosing seven. I believe that the Illinois site was the fourth or fifth that we selected. So we are, we do have that investment to focus specifically on that project.

We also, we are encouraging the private sector to look at Illinois. Obviously, I think they will. There is a big demand for electricity there. I would be surprised if someone is not looking at the Mattoon site, but we are not in a position to tell a given private sector entity you will build here or you will build there. What we hope will happen is they will build where the demand, where the need is and where the ultimate goal of being commercially successful at generating electricity at near zero emissions, where that will be successful, where the electricity can be sold and where the carbon can be sequestered, and we can have a successful project.

I would be surprised if somewhere in Illinois someone was not interested. Whether or not that will be, ultimately they will be selected, I cannot sit here and tell you.

Mr. LIPINSKI. Well, certainly DOE does have discretion over some projects that, and I am very hopeful that you would consider the, you know, what Illinois has put into FutureGen and the loss that Illinois has suffered because of that.

Mr. ALBRIGHT. Congressman, I am very aware of that, and we have been taking extra steps to see if there is something we can do extra in Illinois.

Mr. LIPINSKI. Thank you.

Chairman LAMPSON. Thank you.

I will next go to Mr. Bartlett, and you are recognized for five minutes, Mr. Bartlett.

OTHER WAYS TO REDUCE CARBON EMISSIONS

Mr. BARTLETT. Thank you very much, and I am sorry that I couldn't be here sooner.

Obviously the big question about using coal and forms other than coal is the carbon footprint. Have we looked at the tradeoffs between converting coal to liquids and simply using coal to produce electricity and then using the electricity to do things that we are now using liquid fuels to do? Which of those could we implement sooner and cheaper, and which of those would have a lesser carbon challenge?

Mr. ALBRIGHT. We are looking at all of those technologies, coal-to-liquids technology, which as you know creates large amounts of carbon dioxide. The question is then what do you do with the carbon dioxide. Can you sequester it, can you use it for other means, is there a way to develop the CTL technology so, such that it lowers, has a lower carbon footprint? We are looking at that. We are looking at generating electricity to then power vehicles with plug-in technology, plug-in hybrid technology.

We believe there is terrific progress that is and will be made, we hope in the near future, particularly in plug-in hybrid types.

We are. We are looking at all of those technologies, and we are looking at them obviously in a way where we can manage carbon emissions.

Mr. BARTLETT. Of course we have blown 28 years when we knew very well that we would be here roughly at this time with oil at $112 a barrel. Because in 1980, we knew very well that M. King Hubbert was right about his prediction that the United States would peak in oil production in 1970. We are already 10 years down the other side of that peak. In 1979, he predicted the world would be peaking in oil production about now.

So we do not now have the luxury that we would have had a couple of decades ago of spending some time deciding which of these approaches we want to pursue. We have now run out of time. We are at no surplus energy. With any surplus energy oil wouldn't be $112 a barrel.

So how do we decide today which of these approaches is better, whether we should simply use the coal to produce electricity and then go to plug-in hybrids, or whether we should use the coal to make liquid fuels and to fuel the fleet that we now have on the road? How do we make that decision? Because it is a very important decision to make. There is only so much coal out there. There is no 250 years. At current use rates there is about, the National Academy of Science says it is more like 100 years at current use rates. And if you increase its use only two percent, of course, that doubles in 35 years. It is four times bigger in 70 years, and it is eight times bigger in 105 years. The power of exponential growth is just incredible. In fact, Albert Einstein said it was the most powerful force in the universe, the power of compound interest.

How do we make that decision today, and who makes that decision? Because it is very important. There is only so much coal out there. It is very important that we use it most expeditiously. How do we make that decision?

Mr. ALBRIGHT. Congressman, it is a difficult public policy decision. I think what we have done in the past and what I have confidence in as a market economy, it makes those type decisions, private sector principally. I think the role of government is to supply the, help supply the research and the information base necessary in the private sector to make decisions on what fuels to use, how to generate electricity, how to, what to develop as our use as transportation fuels.

And are we going to be perfect in that? No. But I think you see today that we are recognizing, albeit as, from your perspective a little late, but we are recognizing that the need for new means of generating electricity, new means of providing transportation fuels.

We are expending billions of dollars on that type of research. We recognize we have to do that in a carbon constrained world. The Bush Administration has spent over $37 billion since he went into the Oval Office in 2001. The President had directed that we, DOE and other agencies, spend significant money, time, and energy and effort in that effort, and we have done so. I think technology will prove as it has in the past to give us many, many answers to these questions, but I think we have to continue to rely on the market and the market economy to make those basic decisions.

Mr. BARTLETT. Mr. Chairman, I would just like to note that the market works when, at least for one of its options, there are adequate resources. For the liquid fuels market today there are no alternatives to oil that come even close to providing the amount and

quality of energy that we get from oil. The market, sir, you, the market will solve this problem. You will not like the way the market solves this problem. We really need to preempt the market. The signals will be too late. There are not infinite resources out there which the market demands, and you know, government is now 28 years too late. Let us not be 38 years too late.

Thank you, Mr. Chairman.

Chairman LAMPSON. Thank you, Mr. Bartlett, and now I will call on Mr. Shimkus for five minutes.

CAN FUTUREGEN BE SAVED?

Mr. SHIMKUS. Thank you, Mr. Chairman. I want to thank Chairman Gordon. I want to thank you, Chairman Lampson, my good friend, Jerry Costello, for allowing myself and I think, I won't speak for Tim. Tim can speak for himself, for the opportunity to join the Committee. I appreciate it. I also want to publicly thank you for the Science Committee trip to see the shuttle launch, which you, I got an invitation to go to through this committee, which was memorable to say the least.

And just following up with my good friend, Jerry Costello, I was down in, actually in his district but in, at WSIU, the Carbondale radio station in Southern Illinois, which covers both our districts, and as I told you, Bud, in the chamber this was their number one question, and so, of course, that is where my focus, and it is pretty far away. That is pretty far away from that tune in Tuscola and that region. I mean, this is the deep southern part of the State, and they have been following this as long as Jerry has led the battle. And I have done all the kicking and screaming and hollering and crying that I can on this, so I will follow up with a few questions.

But I also want to highlight Chairman Gordon's comment on just the funding, because Tim and I got a chance with your help to make the last final appeal to the President on this. And his response was Bodman told me the costs were too high. That is his answer. So I think focusing on the costs and the inflation thing is appropriate, if that is the reason the decisions were made and everything else, has inflationary cost adjustments. All I know is that is his answer to us when we posed the question.

My question, my comments are going to be, as Members of Congress we think if we are going to try to save FutureGen as originally scoped, I believe there are three things that we have to do.

One is we have to place on must-pass legislation language that would not allow the Department of Energy to get out of the contractual agreement. That there would be no ability for the Department of Energy to use the off ramp. Would that be a way, a step one process for us to keep as originally scoped?

Mr. ALBRIGHT. I think the——

Mr. SHIMKUS. I mean, the premise is that you get a chance to walk away in June.

Mr. ALBRIGHT. Right.

Mr. SHIMKUS. Based upon the agreement.

Mr. ALBRIGHT. And the Alliance gets a chance to walk away any time. It is important to remember that.

Mr. SHIMKUS. I am not, yeah. I am just talking about, they are not, they really don't want to walk away. It is DOE that wants to

walk away from the agreement. So if there was legislation attached that the President signed into law that disallowed your ability to walk away, that would be step one.

Mr. ALBRIGHT. Yeah. I think that gets legally pretty difficult but——

Mr. SHIMKUS. Well, I am not going to argue. I am just laying this out. And then step two would be ensuring that through the appropriation process we have the amount of money needed to keep the Alliance moving as originally scoped. That would be the second step.

Mr. ALBRIGHT. All right.

Mr. SHIMKUS. Would you kind of—that would be a legislative response, an appropriation response to try to keep that scope. And then step three, we would then wait for a new President who would, we could then appeal on the benefits of the, of FutureGen as scoped and hope that they would take up the banner and move it forward.

Would that, I mean, I am asking you really to, from our viewpoint as legislators, is that a way that we keep the Alliance, the FutureGen Project as originally scoped viable for a new Administration?

I didn't give you heads up on this question.

Mr. ALBRIGHT. No, no. And I am just trying to think it through. You know, this will always be, any option is really a viable option for a new Administration. A new Administration can decide to scrap——

Mr. SHIMKUS. But does that keep us alive, I mean, that does keep us alive to make the appeal to a new Administration?

Mr. ALBRIGHT. You know, theoretically I think what we would have to do is sit down and talk about, I think the step one there becomes something that is to bind the Administration that way maybe gets legally difficult. I don't want to——

Mr. SHIMKUS. Yeah. It might be legally difficult, but I think the premise that we would come from, this is the President's initiative, announced at the State of the Union, that people have invested time, energy, capital, and really the hopes and for those who are climate change——

Mr. ALBRIGHT. Certainly.

Mr. SHIMKUS.—individuals and would like low-cost power, that would be, I mean, this is kind of the commitment, and I think that is where a lot of us would——

Mr. ALBRIGHT. Well, I don't want to give too many grand ideas here, but one of the things that Congress could do is you could kill funding currently. You could zero the funding out, I suppose, and then not fund until you are satisfied with what you got.

Mr. SHIMKUS. No. We want the project to move forward. I mean——

Mr. ALBRIGHT. I understand that.

Mr. SHIMKUS.—budgetarily you guys have already in essence in the President's budget has already said in essence FutureGen, there is money for FutureGen. Now, you are defining that separately.

Mr. ALBRIGHT. Right.

Mr. SHIMKUS. We could define it as intended, originally intended. So if we prohibit you from walking away, we have the funding dollars available already in the President's budget. Then we live to fight another day, and as much as I am in support of this Administration, this President, I am not supportive of this decision. And I would then relish a chance to make a pitch to a new Administration.

Mr. ALBRIGHT. I understand. Well, this was, the next Administration certainly will be able to make a decision, and this was a Presidential initiative. President Bush initiated it.

Mr. SHIMKUS. Claiming my time, the basic, my focus is that is a way to keep the clock ticking——

Mr. ALBRIGHT. I think that is a way.

Mr. SHIMKUS.—until the new Administration.

Mr. ALBRIGHT. That is probably a way.

Mr. SHIMKUS. Mr. Chairman, that is all the questions I have, and I yield back.

Chairman LAMPSON. Thank you, Mr. Shimkus.

Congressman Johnson, you are recognized for five minutes.

DISCUSSION OF ALBRIGHT'S COMMENTS: "BUILDING A DISNEYLAND IN SOME SWAMP IN ILLINOIS"

Mr. JOHNSON. Thank you, Mr. Chairman. And thanks to you, the Chairman, Mr. Gordon, the Ranking Member and the Members of this committee. You have just been extraordinary and your professionalism and courtesy and kindness and also the assiduousness in which you have approached this really critical issue, I think it is providential, Mr. Chairman, that within a matter of an hour or so you and I leave here to co-Chair the Center Aisle Caucus to, for those of you in the audience that are not aware of that, what that does is the Bipartisan Committee that is, seeks to restore civility to the process. So it is in light of that, Mr. Albright, and despite my strong emotions to the contrary, that I will try to keep these remarks on a very civil note.

I must tell you that in light of your, the Committee's history on this, it is extremely hard for me to maintain that degree of civility, but I will do that.

I will also tell you interestingly that I have, thanks to the professionalism of the Committee staff, a meeting memo that was supplied to me on November 2nd or supplied, indicating a meeting memo in regard to our meeting on November 2nd, and you vetted me fairly well. I didn't realize we had that much Member research, but part of the meeting memo was a biography on me, and you will indicate or you will see in there that I have served almost, well more than, almost 40 years in government. And I must tell you that in the 40 years of government that I have had and been privileged to have at local, State, and Federal, this has got to be the number one example of mismanagement and gross callousness towards our objective as public officials that I have ever seen. And I have seen more than my share.

So with those kind as I can introductory remarks, let me just indicate that on November 2nd we had a memo indicating some concern despite five years of the Administration's commitment to this project, five years of belief on the part of Mattoon, on the part of

Tuscola, and two communities in Texas, that this project was on the wheels and ready to go. And I believe as everyone believed that this is extraordinary technology that means nothing but a tremendous future for energy and otherwise in the United States.

Despite all that, we then have our staff supply to you a letter in November 30, 2007, where you indicated at that point that you were diligently working to "complete a process and issue the record of decision in a timeframe that supports FutureGen selection by the end of December of 2007." The Members of the Committee might want to look at this.

I will also tell you that our delegation, Congressman Costello, Congressman Shimkus, Congressman Lipinski and others have been extraordinary. Jerry Costello's, John Shimkus's leadership as well as Senator Durbin's has been just something that has been off the charts, and I appreciate that.

Let me just ask you a couple of relatively quick questions. In a conversation sometime I think in February of this year you specifically, Mr. Albright, and I am quoting, indicated that the Federal Government is not interested in, "building a Disneyland in some swamp in Illinois."

Is that a fairly accurate characterization of what you said?

Mr. ALBRIGHT. No, sir.

Mr. JOHNSON. So all these quotes, all your apologies to the contrary notwithstanding, all the witnesses have indicated that you said that, have completely misstated the fact you said nothing about——

Mr. ALBRIGHT. No, sir. I——

Mr. JOHNSON.—let me finish. I am just asking you the question. You are indicating you said nothing of that sort?

Mr. ALBRIGHT. No, sir, I am not. I am saying that is not accurate——

Mr. JOHNSON. You are under oath you understand?

Mr. ALBRIGHT. No, sir, I am not. But——

Mr. JOHNSON. Oh, you are not, so then what you tell us is that you have free leash. Is that right? So go ahead and tell us what you said and why you said it.

Mr. ALBRIGHT. I don't sit here with any intention to mislead nor will I mislead. But I did not make any reference to Illinois. I made, and if you, please, because this is, I think, important. If you want to hear my side of the story.

Mr. JOHNSON. Sure.

Mr. ALBRIGHT. I made a statement——

Mr. JOHNSON. I asked you the question.

Mr. ALBRIGHT.—in a small meeting that I was trying to use an analogy that as I have said repeatedly, was a terrible analogy. I recognized in the middle of my analogy that it was just bad. It was one I tried to come up with. As people who know me know I am one to come up with analogies from time to time. This was a bad one. I stopped mid-analogy and said, "Look, this," because someone said, "Wait a minute. Wait a minute. This sounds insulting," and I said, "You know, this is a bad analogy." I don't mean it that way, it is not conveying the point, and but what I am trying to say is we want a commercial facility, not something that is not.

ISSUES WITH THE SUDDEN CHANGE IN DIRECTION FOR FUTUREGEN

Mr. JOHNSON. Okay. Yeah. I understand. Reclaiming my time then, Mr. Under Secretary.

Let us get to the substance of this issue. Over the course of five years of the commitment of the Bush Administration, which I think all of us regard very highly in terms of the whole energy picture of America, Mattoon, Tuscola, and two communities in Mr. Lampson's state, put their heart and soul, and this little town of 18,000 people who put their heart and soul and huge numbers of dollars, all of which will be uncompensated, and a number of which from the private sector, to prepare for a project that is going to put a whole lot of people to work, and is a win-win situation from the standpoint that we have nothing but clean energy in the offing and making ourselves a worldwide pioneer in this area.

And as recently as November, the end of November of 2007, your Department indicated a commitment to that project, and now despite all that time, all that commitment, all that belief, and from my standpoint no downside expressed from anybody at any party, all of the sudden the rug has been pulled out from under us.

I would contend and believe, and I think the Members of this committee believe that that is something that is not only extraordinarily short-sided, it indicates just a callus disregard for not only the environment, but a callus disregard for people in a county of let us say 60,000 people or 50 who had their heart and soul and belief that the government tells them the truth. And the reality is the government didn't tell them the truth.

Now, thank God that we have—I am not suggesting that, we do have elections. That is part of the American process, and both Senator Obama and Senator Clinton have so far not addressed this subject matter, but I have confidence that she will, as well as Senator McCain have indicated a commitment to this technology, and I have reason to believe this specific project.

And so we are going to look forward hopefully to, well, it is certainly going to be a new Administration, and with all due respect to you, Mr. Albright, and to Mr. Bodman, who in my judgment have perpetrated a fraud on the people of our district and the country, we will have the opportunity to revisit an issue that will mean justice and equity for our part of the world, that the government makes, he keeps his commitment when it makes it and that we can have clean technology for the future.

And it would seem to me that all things considered and all due respect to you, Mr. Albright, because you are simply one part of the process, that is something that would be good for democracy and would be good for this country.

And I appreciate your having the courage to be here, but I mostly appreciate Mr. Inglis, Mr. Chairman Lampson, Mr. Lipinski, Mr. Costello, in particular who has been extraordinary on this, who have said, this is an issue. This is an issue that matters to America, and we are going to have, take the time in this committee and other people to actually bring it on the four square. And hopefully all of us working together can mean a turn in policy from an Administration that is certainly well intended, the President in our

conversation with him, certainly well intended, but somehow because of bureaucracy gotten off the wheels.

POLAND'S INVOLVEMENT WITH FUTUREGEN

Chairman LAMPSON. Thank you, Mr. Johnson. Thank you for your interest and by the way, your letter of November 30 has been entered into the record. It is there.

[The information follows:]

The Secretary of Energy
Washington, D.C. 20585
November 30, 2007

The Honorable Tim Johnson
U.S. House of Representatives
Washington, DC 20515

Dear Congressman Johnson:

Thank you for your October 25, 2007, letter expressing continued support of the FutureGen project and for the efforts of many individuals throughout the State of Illinois who have been working on Illinois' proposal to host FutureGen.

The Department of Energy has been working expeditiously to assure that the final stage of the environmental compliance process is thoroughly completed. We have recently issued the final Environmental Impact Statement (EIS). Notice of the EIS availability was published in the Federal Register on November 16, 2007. **We are diligently working to complete the process and issue the Record of Decision in a timeframe that supports FutureGen site selection by the end of December 2007.**

We appreciate your interest in FutureGen and your support for the project. If you require additional information, please contact me or Ms. Lisa E. Epifani, Assistant Secretary for Congressional and Intergovernmental Affairs, at (202) 586-5450.

Sincerely,

Samuel W. Bodman

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We will go to—now to our second round of questions, and I would like to lead Mr. Albright with a question about Exhibit #11, which is in that document package.

On December the 6th a memorandum went from Mr. James Schlutz of the Office of Fossil Energy to the Secretary through you regarding Poland's expression of intent to join the FutureGen Project.

According to that memo discussions had been ongoing with the Polish government and staff of the Office of Fossil Fuel, Fossil Energy soliciting their support. There was a letter drafted for the Secretary to send welcoming Poland's support.

Did the Secretary sign that letter?

Mr. ALBRIGHT. I don't know. I don't have that in front of me——

Chairman LAMPSON. It is——

Mr. ALBRIGHT.—that I know.

Chairman LAMPSON. Well, we don't have either the draft or the signed version. We don't have either one.

Mr. ALBRIGHT. I will have to get back to you with an answer to that. I don't know, Mr. Chairman.

Chairman LAMPSON. We are going to assume at that point that the Office of Fossil Energy was still encouraging international partnership in the FutureGen Project.

Mr. ALBRIGHT. What date was that?

Chairman LAMPSON. December 6.

Mr. ALBRIGHT. Of?

Chairman LAMPSON. '07. Last December.

Mr. ALBRIGHT. I will have to look.

[The information follows:]

INSERT FOR THE RECORD

In late November 2007, DOE staff drafted a letter in response to the Polish Government's expression of interest in FutureGen, but the letter was not sent due to the uncertain future of the FutureGen Project at that time. When the Department decided in late January 2008 to restructure the FutureGen program, Secretary Bodman sent letters on February 1, 2008, to the Polish Government, among other governments, advising them of the restructuring decision.

The Secretary of Energy
Washington, D.C. 20585

The Honorable Piotr Naimski
Secretary of State for the Ministry of
Economy for the Republic of Poland
Plac Trzech Krzyzy 3/5
00-507 Warszawa
Poland

Dear Secretary Naimski:

Thank you for your October 31, 2007, letter that expresses the government of the Republic of Poland's intention to become a contributing member of the FutureGen Project. We are pleased by Poland's interest in this important initiative to build the world's first near-zero emissions coal power plant that would integrate the capture and storage of atmospheric carbon dioxide emissions.

As you know, Department of Energy staff has met with representatives of other governments (Australia, China, India, Japan, and the Republic of Korea) to work towards finalizing a multilateral agreement for international collaboration on the FutureGen Project. Each national government party to the agreement that contributes at least $10 million to the Project will be represented on a government steering committee providing advice on FutureGen.

In your letter you identified the Central Mining Institute in Katowice as the entity that will be negotiating the multilateral agreement on behalf of your government. At your convenience, please provide the address of the Institute, the names, and email addresses of the individual(s) with whom we should communicate regarding this matter. With that information, Dr. Victor Der, Deputy Assistant Secretary for Clean Coal, Office of Fossil Energy, will send the electronic version of the current draft text of the agreement, as requested in your letter.

If you have any further questions, please contact Ms. Katharine Fredriksen, Principal Deputy Assistant Secretary for Policy and International Affairs, at Kathy.Fredriksen@hq.doe.gov.

We thank you again for your interest in participating in the FutureGen initiative, and look forward to hearing from you.

Sincerely,

Samuel W. Bodman

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Chairman LAMPSON. At that point I assume you had to have known that you were likely to stop the FutureGen Program as it was advertised. So my question is when were the Fossil Energy staff told to stop seeking international partners? Then or not at all?

Mr. ALBRIGHT. You know, we were confronted with, that was one of the difficult issues, one of the things that made this a difficult decision. We were in negotiations or discussions with international potential partners as to whether or not they wanted to join this project.

We were also engaged in negotiations with the Alliance. I didn't want on the one hand to say, well, let us not go out and talk to anyone once, when meetings were already planned and scheduled. I didn't want to cancel meetings, because I didn't want frankly to start a public discussion that we at the Department of Energy thought that we weren't going to be successful in our negotiations. As we got towards the end, it became clear it was becoming more and more difficult and more and more unlikely that we reach a final restructured agreement, but that was not a point in time that we could say, all right. Prior to making that final decision we should stop talking.

Chairman LAMPSON. Were they ever told to stop? The Fossil Energy staff?

Mr. ALBRIGHT. Told to stop——

Chairman LAMPSON. Talking to international potential partners.

Mr. ALBRIGHT. Told to stop talking to them?

Chairman LAMPSON. Or were they to quietly spread, soliciting assistance or participation. Or were they going to quietly spread the word to non-partner countries by way of explaining why they can't join?

Mr. ALBRIGHT. We stopped soliciting, and I am not sure how we handled things. I was not in those meetings in December, but we stopped soliciting certainly after it was clear that we were not going to be able to go forward with the Alliance.

Chairman LAMPSON. And when——

Mr. ALBRIGHT. I don't have an exact date on that. That would have been——

Chairman LAMPSON. By the end of——

Mr. ALBRIGHT.—the end of December.

Chairman LAMPSON.—January the Department had completely shifted course on FutureGen, and on January 31 of 2008, the day after a restructured program had been announced, Mr. Schlutz sent another memo through you to the Secretary. This memo urges the Secretary to sign letters to, "notify the international participants of our announcement and indicate that there will be a shift in their role in the project." Those letters went to the appropriate ministers in Japan, Korea, India, China, Australia, Norway, and

Poland. We know that these letters went out. You can find this at Exhibit 12 in the document packet.

It would seem from the memo and the letters that the international partners in this project had not been consulted regarding the changing opinion of the Department of Future, on the FutureGen Program.

Were any of the international partners consulted prior to the Department's announcement? If any were consulted, please specify which ones and when? Were they truly consulted, or were they just informed, and the distinct, it makes a difference. So what was the situation?

Mr. ALBRIGHT. Those discussions were not handled out of my office. They were handled out of our international division. I will be happy to get you that information. I was not in those meetings, those international meetings, and I don't know exactly what was discussed.

[The information follows:]

INSERT FOR THE RECORD

The international partners were notified of the Department's decision to restructure the FutureGen program in late January. Letters were sent on February 1, 2008, from Secretary Bodman to Australia, China, India, Japan, Republic of Korea, Poland and Norway explaining the Department's intent to restructure FutureGen.

Chairman LAMPSON. The Secretary's talking points for January 30 calls to the Hill, Exhibit 6, page 11, and bullet point three in that packet there. The quote was, "I do not want this project to become another superconducting super collider in which the government invested large sums of money and then later canceled the project."

Well, another mistake associated with the SSC was that international partnership was a complete afterthought in the way DOE managed the project. Haven't you made the same mistake here?

Mr. ALBRIGHT. The, our international partners and our relations with our international friends was not an afterthought. It was an ongoing discussion, how do we handle this, when do we talk to them, what do we tell them? It was an ongoing discussion and an ongoing concern.

Again, we were hopeful that we would be able to reach some kind of fiscally reasonable agreement with the Alliance, which we were ultimately not able to do. I did not want to run around alerting people that things may fall apart if we thought, while we were in the midst of negotiations. I mean, you can appreciate, you don't want to walk out the door and say, "Hey, we are not going to be able to reach an agreement in this room," and then walk back in the room and say, "All right. Let us continue talking." You can't negotiate that way.

So it was a difficult position to know when to tell them and when not to. There was nothing, there wasn't an objective line that we said, "All right. On this date let us do it." It was a subjective call. We did the best we could.

Chairman LAMPSON. We have really got to be careful with what we are doing with international partners on projects. The alpha magnetics spectrometer is something that is another project where we asked international partners to put up more than a billion dol-

lars, a billion point two before they built the project. Our promise was to put it on the International Space Station, and we have essentially reneged on that.

We must be careful, and I think in this case your actions communicate the message that the U.S.'s view is that you commit and we will decide. I can tell you that most countries can see what cooperation along these terms means, and I, unfortunately, don't think it speaks well for us.

With that I will recognize Mr. Inglis.

Mr. ALBRIGHT. If I might just say, I just came back from India and had some discussions with India. They are one of the international countries that actually had written a check. I don't, I believe they understand the situation. They did not seem offended in any way. We certainly will continue other negotiations, other discussions, other memorandum of understanding with them on other areas. So our relationship there feels good, and that is from personal experience of two weeks ago.

Chairman LAMPSON. Thank you. Mr. Inglis.

Mr. INGLIS. I have no further questions, Mr. Chairman.

Chairman LAMPSON. Mr. Costello, you are recognized for five minutes.

TIMING OF FUTUREGEN DECISIONS

Mr. COSTELLO. Mr. Chairman, thank you.

Mr. Albright, you, I told you what my line of questioning will be.

Mr. ALBRIGHT. Yes, sir.

Mr. COSTELLO. One is when the decision was made, and I have read your testimony and what you have said in your testimony about why the decision was made.

Was the decision made to restructure the project after the Alliance made the final selection of Mattoon?

Mr. ALBRIGHT. Was the decision to restructure made after——

Mr. COSTELLO. After they made the decision——

Mr. ALBRIGHT. No, sir. As a matter of fact, we urged, I personally urged on several occasions orally, I urged, implored the Alliance not to make their site selection announcement.

Mr. COSTELLO. Well, when did the Department of Energy make the decision that they were going to pull the plug on the project?

Mr. ALBRIGHT. You know, I don't, I will have to go back and look to see. There would have to be a specific date, but it was some time in that, between December and January as we recognized that the Alliance, we were not going to be able to reach a financial agreement that was we believe responsible for taxpayer money. So somewhere between December and January.

[The information follows:]

INSERT FOR THE RECORD

DOE's final decision to restructure the FutureGen project was made on January 30, 2008, after it was determined that DOE could not reach a mutually agreeable restructured cooperative agreement with the Alliance.

Mr. COSTELLO. And who made the decision? Secretary?

Mr. ALBRIGHT. Ultimately that I believe would be the Secretary's decision. It was made upon my advice.

Mr. COSTELLO. And when did discussions begin to talk about, look. We are going too far down the road with this project, our cost is increasing, so we have to do something. When did you start talking about restructuring within the Department?

Mr. ALBRIGHT. I understand that those discussions began some time April of '07, I believe is correct. That was prior to the time that I came to the Department. When I got there, discussions had been underway for some time, and I, you know, in hindsight I said, well, let me give this a try. Let me see can I do something here.

Mr. COSTELLO. When those discussions took place, whenever it may have been, was that communicated to the Alliance that, look, we are going to restructure the project?

Mr. ALBRIGHT. Repeatedly.

Mr. COSTELLO. Back in April or May?

Mr. ALBRIGHT. Oh, April of——

Mr. COSTELLO. '07.

Mr. ALBRIGHT. No, sir. We weren't——

Mr. COSTELLO. Well, you said you started——

Mr. ALBRIGHT.—planning——

Mr. COSTELLO.—the discussion about——

Mr. ALBRIGHT. Started the discussions with regards over cost.

Mr. COSTELLO. Restructuring the project.

Mr. ALBRIGHT. Over costs.

Mr. COSTELLO. And did you ever at any time come to this committee or any committee in Congress or speak with any of the leaders who have been involved in this project in the Congress about restructuring the project?

Mr. ALBRIGHT. Did I? No, sir. Were there discussions? I believe there were, but I can't tell you who, when, or where. I would be happy to check to see if anyone discussed. But, remember, this was a Bush Administration initiative.

[The information follows:]

INSERT FOR THE RECORD

During the many months in which DOE and the Alliance were engaged in discussions about cost share percentages and controlling escalating costs, it was our expectation that agreement could be reached between the Department and the Alliance. However, when it became evident that agreement could not be reached and DOE began to consider restructuring the project, key Members of Congress were notified prior to the public announcement. Discussions were held on multiple occasions between Secretary Bodman and Members of the Illinois Congressional delegation about the Department's concerns with the project. In addition, DOE officials other than the Secretary also had discussions with Members of the Illinois delegation.

Mr. COSTELLO. I understand that.

Mr. ALBRIGHT. I certainly wouldn't have said, "Hey, run up to Congress to help solve my problems."

Mr. COSTELLO. Tell me this. If a discussion started in April of '07, about restructuring the project, why did the Department of Energy sign an agreement in March of '07, 30 days before the same timeframe? The Department is signing a cooperative agreement in March, and in April you are talking about scrapping the project.

Mr. ALBRIGHT. No, sir. We were not talking about scrapping the project. Let me make clear what——

Mr. COSTELLO. Restructuring.

Mr. ALBRIGHT.—we were talking about in April as I understand it was that cost estimates had come in, and I am not sure when those cost estimates came in, but cost estimates had come in that showed escalation of costs that we did not believe were sustainable. So we sat down with the Alliance as a partner to see how do we work through this problem. They had a problem, too. I mean, the costs, they had a cost problem, we had a cost problem.

So we just happened to have 74 percent of the cost problem, they had 26 percent of the cost problem. So we were trying to see as I understand it, how do we restructure this in, restructure is the wrong term there. That is kind of like my bad analogy. Let me withdraw the restructure. We tried to see how do we change things to make this sustainable.

Mr. COSTELLO. So——

Mr. ALBRIGHT. And that was our concern that it would be sustainable.

Mr. COSTELLO.—if the Department knew that back in April, why did you wait, why did the Department wait until after the Alliance selected the site in Mattoon, Illinois, to make the final decision to pull the plug?

Mr. ALBRIGHT. These, this wasn't something, this was a dynamic process. This was not just something static. We were, discussions were ongoing repeatedly or regularly over that period of time. The, I can't tell you why the Alliance decided to make that announcement. I can only tell you that I asked them personally not to make it. I did not believe at that point we were going to reach an agreement with the Alliance that would allow us to go forward. We, I believed we were going to have to restructure, and I believed it was unfair to tell anyone, and I did not know until the morning I heard the announcement where it was going to be, but I didn't think it was right to announce something that we didn't believe was going to happen.

And that is why I asked the Alliance and told them that that is why I didn't think the announcement should be made. They chose for reasons they know not to follow that advice.

Mr. COSTELLO. Mr. Chairman, I see I am out of time. I have further questions, though.

Chairman LAMPSON. Go ahead and continue, Mr. Costello. We will extend your time.

Mr. COSTELLO. Thank you, Mr. Chairman. I appreciate the courtesy.

COST SHARING FOR FUTUREGEN

In your written testimony, Mr. Albright, you indicate three reasons for scrapping the project. One is a desire for more industrial cost share, two is a concern about debt financing, and three, changes in the marketplace.

One on industrial cost share, are you indicating that the Alliance said we are no longer going to talk to you about cost sharing, that we have an agreement, we agreed on the formula here, we agreed on a percentage, and we are not going to talk to you anymore? Or were they willing to discuss or negotiate with the Department of Energy?

Mr. ALBRIGHT. The Alliance has continued, I think even as we sit here, has continued to voice willingness to sit down and talk. What we faced was an inability for those talks to lead to successful negotiations in terms that we thought were reasonable.

Mr. COSTELLO. Did you continue to try and negotiate with them?

Mr. ALBRIGHT. We negotiated with them until there was no negotiating left to do.

Mr. COSTELLO. And what timeframe was that?

Mr. ALBRIGHT. Up until some time in December I believe it was.

Mr. COSTELLO. And the debt financing, your concerns about debt financing just briefly?

Mr. ALBRIGHT. Concerns were that the agreement was that costs would be shared 74/26, that the Alliance's costs would be money that they actually put into the project. At the end we discussed how that would be supplied. They said it would have to be financed, and not only be financed, would have to be financed with debt against the taxpayers on the project. That was unacceptable to us. We did not believe that you could come to this project and say, well, the money we are going to contribute is actually debt leveraged against the project.

Mr. COSTELLO. Other projects have been debt financed by a similar formula. Is that correct? By the Department of Energy.

Mr. ALBRIGHT. I don't believe that is correct, sir. I believe most of those are at least a 50/50 cost share, which is, of course, part of what we were trying to negotiate. So debt against a project would be a different type of project.

Mr. COSTELLO. Well, let me ask you this. If you were trying to negotiate a 50/50 cost share, and I understand you are trying to get as much as you can out of the private sector, why did the Department sign an agreement, a binding, legal agreement that would say that the private sector would put up only 26 percent if you wanted 50 percent?

Mr. ALBRIGHT. I understand and that agreement was for a 900 and whatever, 900 and some odd——

Mr. COSTELLO. I think we have already——

Mr. ALBRIGHT. But what we did——

Mr. COSTELLO. Reclaiming my time, I think the Chairman made mention of the cost here. I mean, I can point to other projects, one in particular close to my district in Illinois, where costs escalated over the same time period by almost the same percentage, and it wasn't because of mismanagement.

Mr. ALBRIGHT. No, sir.

Mr. COSTELLO. It was because of the increased costs of building materials and labor. And that is the case here so——

Mr. ALBRIGHT. Correct.

Mr. COSTELLO.—the Department when they sign the agreement you didn't anticipate increased costs of products, building materials, and labor of a five- or six-year period before we broke ground on the project?

Mr. ALBRIGHT. We did not expect, I don't believe, costs to escalate to the point that we didn't think we could sustain this project under the, in Congress coming back for the kind of appropriations that were needed.

Let me say, too, because this is important, the 50/50 cost share we were trying to negotiate only above costs overruns from the $1.8 billion.

Mr. COSTELLO. Let me ask you, Mr. Albright. I have in front of me the summary of attachments, special terms and conditions of the full scope of the cooperative agreement dated February 17 of 2007. It says total estimated project cost of $1.7 billion.

Mr. ALBRIGHT. Yes, sir. That is February, '07?

Mr. COSTELLO. Of '07. So you knew what the costs were then, and going back to the initial projected costs of 900 million, did you factor in the overall cost of the project increases in labor, material, and things like most projects do in the private sector?

Mr. ALBRIGHT. Congressman, I just simply don't know the answer to that. I can talk to our procurement people and see how those costs were determined, again, prior to my coming to the Department. I am sorry. That is certainly a relevant question, but I just simply don't have the answer. I would be glad to get it for you.

[The information follows:]

INSERT FOR THE RECORD

Our initial estimate of $950 million was made in 2004. That estimate was made in constant 2004 dollars, and did not factor in cost escalation. One year later, however, using cost escalation factors that were available in 2005, DOE calculated the escalated total cost of the project to be approximately $1.1 billion, in as-spent dollars. That was considerably less than the total project cost estimated by the Alliance two short years later ($1.8 billion, as spent).

Mr. COSTELLO. Well, it is pretty clear to me. It is in the agreement, $1.7 billion. I mean, this should not have been a major surprise to anyone.

Mr. Chairman, you have been gracious with my time. Let me, if I can, one or two very brief questions.

DOE MANAGEMENT FAILURE?

Was there, would you, and I have read your written testimony again. Would you say that there was a major management failure on the Department of or on the part of the Department?

Mr. ALBRIGHT. No, sir. I wouldn't say that. And let me clarify again to the 1.7, we were, we had agreed to the 1.7 under the 76, I am sorry, 74/26 percent cost share. What we were negotiating were cost overruns above that amount. That is what we were trying to do, and in discussing the cost overruns, how we would do it, we discussed the entire project. But we were, we went into these negotiations——

Mr. COSTELLO. That is the first time that I heard that explanation.

Mr. ALBRIGHT. All right. And I am sorry if I haven't made that clear. We went into these negotiations——

MARKET CHANGES FOR IGCC PLANTS

Mr. COSTELLO. Tell me about changes in the marketplace of your third concern.

Mr. ALBRIGHT. And I think that is a big one. When we started this project, there were very, very, very few, if any, private entities seeking to build IGCC plants. That is a huge part of the cost of

this. Today there are around thirty. Several have been denied permitting. Excuse me. One in, I know one in Idaho, one or two in Texas, and several other places in the country. They were denied that permitting because they could not assure the Public Service Commissions that they could install carbon capture and sequestration technology on those plants. That is one of the reasons that we saw an opportunity to utilize taxpayer dollars, one to help get those plants built and sited, and two, do the kind of commercial application of the technology that we had hoped to do from the beginning.

So those market conditions changed and allowed us to leverage the money that we——

Mr. COSTELLO. Then you are saying they changed for the better?

Mr. ALBRIGHT. Yes, sir. From our perspective. Yes, sir.

Mr. COSTELLO. According to the information that I have, Source Watch in 2007, 60 coal projects including IGCC plants were canceled in 2007. So your data doesn't line up per square with Source Watch, and if 60 plants were canceled in 2007, how do you explain——

Mr. ALBRIGHT. I don't know about the 60. I am just talking about the IGCC plants. They were denied permitting or canceled as you say, they were denied permitting because they could not assure the Public Service Commissions in the states that they would put the technology, the carbon capture and sequestration technology on these plants. That is what we are now seeking to do, is to take this technology, the government pay the taxpayer dollars, leveraged against this plant to put the carbon capture and sequestration technology on the plants.

MORE ON COST SHARING

Mr. COSTELLO. Final comment, Mr. Chairman. Question. Had the Alliance agreed to a 50/50 cost share, would you have gone forward with the project?

Mr. ALBRIGHT. That alone without bringing, without being able to reach some agreement on how they would bring their "contribution" to the table, not that alone. No, sir.

Mr. COSTELLO. So the first indication from the Department when the Secretary announced the pulling the plug on the project because of costs, it wasn't entirely costs.

Mr. ALBRIGHT. I think that is part of the costs, part of whether or not the taxpayer is going to be saddled with debt leveraged against the project is certainly part of the costs.

Mr. COSTELLO. You have seen the letter from the Alliance dated January 24 to Mr. Schlutz concerning response to the letter of January 22, where the Alliance says, I also want to reaffirm that the Alliance has agreed to boost its cost share for cost above $1.8 billion from 26 percent to 50 percent, which we believed was of paramount importance to the Department. Further, we offered to repay the Federal Government's 50 percent share with post-project's revenues, which would otherwise not go to the Department.

Are you familiar with this letter?

Mr. ALBRIGHT. I am.

Mr. COSTELLO. A comment on that?

Mr. ALBRIGHT. I mean, the Alliance is saying don't scrap the project. We are going to give you 50 percent and additional costs

or reimbursement to the government as post-project revenues. That is a limited partial view of the negotiations and what we were trying to seek to achieve.

Mr. COSTELLO. So, what you are saying is that was not good enough?

Mr. ALBRIGHT. That was not good enough. No, sir. As long as there was going to be debt leveraged against the project, as long as we couldn't reach full agreement on all terms, it could not go forward.

We were ultimately, what we were trying to do was structure a project that we believed we could come to Congress in good faith and have supported by the Congress long term. We did not want to get in the middle of this and have——

Mr. COSTELLO. Reclaiming my time. The Chairman has been very gracious. Let me just say that I have very little confidence that we are headed in the right direction with the decision that the Department has made. We are going to lose more time. I mean, this project had it stayed on course as we believed that it was on course and as the Secretary indicated in his letters, was scheduled to go on line I believe in 2012. Now you are indicating here today that under the best-case scenario we are talking about 2016, to 2017, instead of 2012.

So I would just tell you that there are a lot of questions that have to be answered yet. I look forward to working with the new Administration that is committed to this project and to clean coal technology and carbon sequestration.

Mr. Chairman, again, thank you for being so generous with time.

Chairman LAMPSON. You are very welcome.

Let me recognize Mr. Bartlett, and after him I will have an exceptionally short question, and then we are going to move on.

Mr. Bartlett, five minutes.

DOE RESPONSE TO RISING OIL PRICES

Mr. BARTLETT. Thank you very much.

Mr. Secretary, I would like to take just a moment to put this decision process in a little broader context. Our government through several different entities has paid for four major studies on energy, focusing primarily on oil. The first of those was paid for by your Department. It was done by SAIC. It is known as the Hirsh Report. It was issued I think in February of '05.

The second was one paid for by DOD, and it was done by the Corps of Engineers for the Army and issued in September of '05.

The third one was requested by the Congress, by this committee as a matter of fact, done by the GAO, and that was issued in the spring of '07.

And then the final one was requested I think by the President through your Department, and this was one done by the National Petroleum Council, and that report was issued last fall.

In the first of these reports they made the observation that the world has never faced a problem like this, that there was no precedent, that the peaking of oil was going to happen. The only uncertainty was about when it would happen and that the mitigation consequences would be unprecedented.

Sir, the Department has been conspicuously silent with reference to these four reports, and my question is what is different in the Department of Energy as a result of these four reports? All saying essentially the same thing, that the peaking of oil is either imminent or present with potentially devastating consequences.

The first of these reports was made when oil was at about $55 a barrel. This morning it was $112 a barrel and still going up. What is different in the Department of Energy as a result of this information?

Mr. ALBRIGHT. We are—have embarked and continue to expand on unprecedented research and development of various alternatives to fossil fuel. We are advancing as rapidly as possible our cellulosic ethanol technology research, we are looking at clean coal to liquids research.

DOE FAILURES IN FOSSIL FUEL ALTERNATIVES

Mr. BARTLETT. Sir, if I might for just a moment note that the two initial initiatives of the Department have been rather spectacularly unsuccessful. The first was a hydrogen economy, and somehow we failed to recognize that hydrogen is not an energy source. There is no hydrogen out there free for the having. Hydrogen is produced, of course, by using more energy from another source. Think of it as a battery. It is a neat way of carrying energy from one place to another, and, you know, we have spent maybe a billion and a half dollars on that, and almost nobody ever mentions hydrogen anymore because the fruition of that awaits the development of a good fuel cell, which is probably two decades out. It is a great candidate for fuel cells if we ever get one.

The second big initiative was corn ethanol, and there was a major headline above the fold in the "New York Times" this morning saying that the leaders of Third World countries are now complaining that their people are starving because of our corn ethanol program, which doubled the price of corn. The farmers diverted acreage from wheat and soybeans to corn, and now they are nearly doubled in price, and of course, these commodities, rice being the fourth one, are now about 50 percent to twice as expensive as they were, and they were complaining that their people were starving as a result of that.

I will tell you, sir, that I think that the results of cellulosic ethanol will be little better. Soils, our top soils out there because they have organic material, I know of no study that indicates the sustainability of raping our soils of this organic material, and until we do that, sir, I am not very sanguine as to how much energy we are going to get, sustainably get. Now, we can go out and rape the soils. I remember during the depression talking to farmers who told me I am now wearing out my fourth farm. Then there few of us and lots of farms. So there are no more farms to wear out.

What is really different? I hear nothing from the Department of Energy telling the American people we face a crisis, we have got to conserve. We have now run out of time, sir. We have run out of excess energy to invest in these alternatives. Who is telling the public that they have a major role to play in this through conservation so that we buy some time and free up some energy?

I have 10 kids, 16 grandkids, and two great-grandkids. I am concerned, sir, about their future.

Mr. ALBRIGHT. And we are, as I say, we are looking at numerous alternatives to fossil fuels. We are looking at conservation efforts, at efficiency efforts.

Mr. BARTLETT. Who is articulating that, sir? I hear nobody from the public pulpit articulating that.

Mr. ALBRIGHT. Well, I guess we are, I am trying to as I give speeches. I gave two last week in which I talked about some of these efforts. I know the Secretary gives those talks regularly as do each of the numerous assistants who work with me and with at least one other Under Secretary of Science who talks about these issues.

Could we do a better job getting the message out? Sure, but in the midst of Presidential nominations and other things that are going on, I guess we are not getting the kind of headlines that we would like. But we are doing the work, we are trying to get the word out, and there is always room for improvement, and we will seek to improve.

If you are not getting the word, then that causes me concern, because you have concerns, you have interest, and you ought to be getting the word of all the work and efforts that go, we are putting into this.

Mr. BARTLETT. Thank you, and thank you, Mr. Chairman.

REPROGRAMMING REQUEST

Chairman LAMPSON. Thank you, Mr. Bartlett.

Mr. Albright, your general counsel said that there is a likelihood that we would have to make a reprogramming request. Will you be making that reprogramming request?

Mr. ALBRIGHT. As Mr. Hall likes to say who is not here, I understand not feeling well today, but I hope he feels better. As Mr. Hall likes to say, I can argue that square or round. There is a discussion to whether or not we have to seek reprogramming. I don't think that has been resolved. We are talking to the appropriators. If there is a determination made that we need to seek a reprogramming, we certainly will. We are prepared to if we need to.

Chairman LAMPSON. We would certainly encourage that from this committee. It would be extremely helpful to the public of the Nation to understand what is going on and cause a lot of satisfaction on the part of many folks I think if that could, indeed, happen.

With that we want to thank you very much for your appearance here this morning, and look forward to future visits with you, and we will take a short break before our next hearing from the next panel of witnesses.

Thank you.

[Recess.]

Chairman LAMPSON. We are back in session, and I would like to welcome our second panel of witnesses. Mr. Paul Thompson is the Senior Vice President of Energy Services at E.On., LLC, and also serves as the Chairman of the FutureGen Alliance Board. Mr. Ben Yamagata is the Executive Director of the Coal Utilization Research Council. Jeffrey Phillips is the Program Manager for Advance Coal Generation at the Electric Power Research Institute.

You will each have five minutes for your spoken testimony. Your written testimony will be included in the record for the hearing. And when you all complete your testimony, we will begin with questions and each Member will have five minutes to question the panel.

Mr. Thompson, please begin.

Panel II:

STATEMENT OF MR. PAUL W. THOMPSON, SENIOR VICE PRESIDENT, ENERGY SERVICES, E.ON, LLC; CHAIRMAN, BOARD OF THE FUTUREGEN INDUSTRIAL ALLIANCE

Mr. THOMPSON. Thank you, Mr. Chairman and fellow Committee Members for scheduling a hearing on this important topic and affording me the opportunity to testify.

My name is Paul Thompson. I am the Chairman of the Board of the FutureGen Industrial Alliance. The Alliance is a global nonprofit consortium of 13 energy companies formed at the request of the U.S. Department of Energy to co-fund, design and construct the world's first full-scale near-zero-emission coal-fueled power plant with hydrogen production and 90 percent CO_2 capture and sequestration. In the balance of my opening remarks, I would like to address three topics: my view as a utility executive on the importance of FutureGen at Mattoon; second, the nature of the Alliance and the Alliance's interactions with DOE prior to the decision to restructure; and three, the Alliance's view on DOE's restructured approach.

With respect to my first point, climate change is one of the most pressing and most challenging environmental concerns the world faces. Our government and other governments around the world either intend to or are in the process of developing policies to address the concern. Irrespective of which specific climate policy is ultimately adopted, the success of that policy and our economic future will hinge on the availability of affordable low-carbon technology. FutureGen at Mattoon offers the opportunity to advance many technologies faster and further than any other project in the world. The Department of Energy and President Bush are to be commended for originally launching FutureGen. Importantly, the FutureGen at Mattoon project will meet or exceed all low-emission goals including 90 percent CO_2 capture, which DOE has reported to Congress numerous times as essential to our energy future.

Further, FutureGen at Mattoon is a fully integrated plant and its component technologies are of commercial scale. FutureGen at Mattoon has five years of demonstrated successes such as, one, using a first of a kind siting process which can and should serve as a model for future commercial projects. A site that is ready to go has been selected on a fair and competitive basis. That site is Mattoon, Illinois. The selection of this site relied heavily on scientific expertise within the DOE laboratory system and premier scientific institutions. Selecting the site included addressing the complex issues associated with legal, liability, regulatory and site geology. It will take years for new projects to go through this process. Second, based on extraordinary work by the States of Texas and Illinois, the Alliance, DOE and many other institutions, a

newly 2,000-page final environmental impact statement has been issued by DOE, which concludes the Mattoon site is environmentally acceptable, and three, a team of nearly 50 engineers and scientists have completed an initial conceptual design and cost estimate for the project. I am prepared to address the cost of the project in response to your questions.

As for my second topic, the nature of the Alliance and the Alliance's interactions with DOE, the Alliance is a nonprofit organization formed specifically at the request of DOE. With this structure, the Alliance and the DOE achieved the goal of openly sharing the lessons of this project with the Nation and the world. Following more than three months of DOE review including review of a conceptual design report and independent cost estimates prepared by the Alliance, the Department of Energy entered into a legally binding cooperative agreement with the Alliance in March 2007. I am proud of the Alliance's efforts to fulfill its obligations under the agreement. I also want to commend the fine technical staff at DOE headquarters and the National Energy Technology Laboratory for their vision and cooperation. Clearly, though, some in DOE's senior leadership, counter to our expectations, backed away from the signed agreement and proposed a new direction in January 2008.

Moving to my third topic, DOE's proposed restructuring, we are disappointed in DOE's proposal for multiple reasons. First, if implemented, it will result in the termination of the FutureGen at Mattoon project. This is an unacceptable loss and a step backwards in advancing carbon capture and sequestration technologies. Further, the restructured approach has a number of business, technical and financial issues which must be addressed. Importantly, it is underfunded. An underfunded approach to such a massively complex problem using several small projects attached to a commercial venture did not make sense for landing men on the moon and it does not make sense for solving the climate change challenge. In a hearing last week, DOE also acknowledged that their new plan will result in delays, DOE stated at least two years. We believe the delay is likely five years or more. Further, DOE stated that they may not meet the critical goal of 90 percent CO_2 capture. This delay and reduced standards do not make sense. In DOE's testimony of last week, it was suggested that two projects would be better than one, yet as it stands now, we have none. FutureGen at Mattoon is already five years down the path of success and it would be a huge mistake to move backward on the progress we have already made.

In closing, as Chairman of the FutureGen Alliance Board of Directors, I want to convey our unwavering commitment to the continuation of FutureGen at Mattoon. We remain open and willing to work with the Congress and the Department of Energy to put FutureGen at Mattoon back on the fast track.

That concludes my opening remarks, and I welcome the Committee's questions.

[The prepared statement of Mr. Thompson follows:]

PREPARED STATEMENT OF PAUL W. THOMPSON

Committee Request:

". . . provide a description of the interactions between the Alliance and the Department of Energy prior to the Department's decision to restructure the [FutureGen] program. Please provide your assessment of the potential impacts of DOE's decision on the Alliance, on the future of the program as originally envisioned, and on the overall federal effort to develop and deploy carbon capture and sequestration technologies. Also discuss the restructured program and the potential role for the Alliance in the restructured program."

The FutureGen program is a global public-private partnership formed to design, build, and operate the world's first near-zero emission coal-fueled power plant with 90 percent capture and storage of carbon dioxide (CO_2). It will determine the technical and economic feasibility of generating electricity from coal with near-zero emission technology. FutureGen has five years of progress behind it. More than fifty-million dollars have been obligated to the effort with the majority spent. It is positioned to advance integrated gasification combined cycle (IGCC) and carbon capture and storage (CCS) technology faster and further than any other program in the world. The location of the plant will be Mattoon, Illinois. The nonprofit structure of the FutureGen Alliance, and involvement of thirteen companies that operate on six continents, is consistent with its mission to facilitate rapid deployment of near-zero emission technology not only in the United States, but throughout the world.

Climate change is one of the most pressing, and most challenging, environmental concerns we face, from both a domestic and international perspective. Our government, and other governments around the world, either intend to, or are in the process of, developing policies to address the concern. Irrespective of which specific climate policy is ultimately adopted by the U.S., the success of that policy and our economic future will hinge on the availability of affordable low-carbon technology. Nuclear, renewables, biomass, and efficiency will all be part of the low-carbon technology solution. However, coal is used to generate over 50 percent of the electricity in the U.S., and is projected to remain the backbone of the U.S. electricity system for most of this century. Given that the growing economies of China and India will be fueled with coal plants, the availability of affordable, near-zero emission coal technology, incorporating carbon capture and sequestration, is essential to our future energy security.

The Federal Government has a pivotal role to play in fostering the development, demonstration, and deployment of near-zero emission coal technology. It is important that, as a nation, we invest at the scale required to develop, prove, and deploy CCS technologies to the marketplace. While estimates vary, the required investment is certainly in excess of $10 billion over the coming decade. This investment in our nation's future must be supported by the development and demonstration of near-zero emission coal technologies and CCS in a variety of applications.

The U.S. Department of Energy (DOE) is to be commended for its vocal support of near-zero emission coal technology, including CCS. Its support of this technology was recognized in backing the FutureGen program as originally envisioned, but a recent proposal to restructure FutureGen fails to recognize the scale of the challenge that this nation, and indeed the world, is facing. DOE's proposal to restructure the FutureGen program will delay technology development and integrated demonstration of commercial scale CCS by five years or more. It backs away from a nonprofit partnership that was created, at the request of DOE, to act in the public benefit and broadly share its technical results throughout the world. It rebuffs the participation of international companies (and countries) that are critical to the ultimate deployment of clean coal technology around the world. It undermines the reliability of the U.S. Department of Energy—and the United States—as a dependable partner.

Therefore, regardless of what other projects or what type of restructuring DOE proposes, it is essential that the Department reaffirms the Unites States' position as a global leader in near-zero emission coal technology and CCS development by maintaining its historical position that FutureGen at Mattoon is the flagship program for advancing CCS technologies.

FutureGen at Mattoon

FutureGen, located in Mattoon, Illinois, is in the national interest and is advancing IGCC technology with CCS faster and further than any other project in the world. Some key features of this program include:

- *FutureGen at Mattoon offers DOE an opportunity to beat its proposed timeline.* DOE's January 15, 2008 Request for Information (RFI) suggests an on-line date of 2015 for projects using its restructured plan. The FutureGen Alliance has already delivered five years of progress, including contract negotiations, an enthusiastic and committed local community, a site that is technically and legally ready to go, a design and cost estimate, a final environmental impact statement, vendor relationships, and a team of fifty engineers and scientists. No fully integrated, near-zero emission power plant project in the world can compete with FutureGen in terms of its ability to move forward with urgency on the required technology development and demonstration.
- *FutureGen at Mattoon will meet or exceed all DOE emissions and CO_2 capture goals.* All emissions and CO_2 capture criteria included in the 2004 FutureGen Report to Congress and DOE's current Request for Information (RFI) will be met by FutureGen at Mattoon, *including 90 percent CO_2 capture.* It is imperative that DOE maintain the requirement of 90 percent CO_2 capture from the entire facility for the FutureGen program.
- *FutureGen at Mattoon is fully integrated and at commercial scale.* FutureGen at Mattoon incorporates a commercial-scale gasifier and commercial-scale "Frame 7" turbine. As configured, and with the commitment to share lessons learned widely, it gives industry a chance to learn about the cost, performance, and operating strategies for an integrated system with CCS.
- *FutureGen at Mattoon is a hallmark for public benefit and information sharing.* As a nonprofit enterprise, the FutureGen Alliance will broadly share information from the project, facilitating the deployment of commercial, near-zero emission power plants throughout the world. It is appropriate for DOE to provide cost sharing for additional commercial CCS projects to facilitate deployment of CCS technology, but it must recognize that commercial projects by their very nature will feature protection of technological know-how and intellectual property within individual companies rather than sharing it for broad benefit.
- *FutureGen at Mattoon is a model that provides international involvement at an unprecedented level, which is essential to the rapid deployment of CCS technologies.* Thirteen companies with operations on six continents are participating as members of the Alliance. Climate technologies must be globally accepted and globally deployed, or they will not be effective. International participation has been exceptionally well-managed and has been a cornerstone of the information sharing in the program. No other project or program can replicate FutureGen at Mattoon's level of international involvement. We need to remember that we are all striving to address "global climate change" not simply "U.S. climate change." What better framework than a global public-private partnership to develop and establish the acceptable to approaches measure, monitor and verify that CO_2 has been successfully captured and permanently stored.
- *FutureGen at Mattoon provides a platform for testing advanced technologies, which accelerates technology development and saves the taxpayers money.* A power plant constructed and operated by any for-profit entity must by its nature operate as much as possible. There is no incentive to periodically shut down to cooperate with the DOE and technology providers to install and test new technologies so as to keep driving down the costs of zero-emission technology. Maximizing the investment is a duty to both rate payers and shareholders.

  Once built, and power generation, carbon capture, and sequestration operations are underway, FutureGen at Mattoon can serve as a test bed for advanced technologies emerging from DOE's Fossil Energy R&D program and industry R&D efforts. Such testing will *not* interfere with the primary mission of the facility to prove integrated CCS technology at a 90 percent capture level and sequester a minimum of one million tons per year of CO_2, and to develop and prove cost-effective approaches to advancing CCS technology. Alternative testing approaches will be far more expensive. Areas where DOE expects advancements to occur include oxygen production, gasifier improvements, gas clean-up, H_2 and CO_2 separation, H_2 turbine advancements and fuel cells. By proposing to end its support of FutureGen at Mattoon, DOE will be increasing the cost and difficulty of testing the very advanced technologies that its program managers seek to develop and deploy.
- *FutureGen at Mattoon's costs are manageable.* All major global energy infrastructure projects, including other DOE projects, are being impacted by rap-

idly rising commodity and equipment and staffing costs. FutureGen at Mattoon is no exception. The FutureGen Alliance includes members who operate and build capital projects around the globe. They all confirmed the increase in costs on the project between 2004 and the present is typical of other capital projects. We cannot delay working on this technology.

The Alliance has every motivation to control costs. The FutureGen Alliance is not simply a contractor billing DOE to perform a service. The Alliance is sharing in the costs pro-rata and is motivated to see technology developed at the lowest possible cost. FutureGen at Mattoon's unique financing structure mitigates taxpayer exposure. The Alliance has pledged approximately $400 million dollars to the program, will return all of the estimated $300 million in plant revenues back to the program, and will direct all of the post-program electricity revenues to public benefit R&D. Industry financial contributors will never receive a single dollar of financial return. This represents an unprecedented level of commitment. Further, the Alliance members are providing their expertise in developing and managing large power plant projects with the discipline that comes from their expertise in developing large power projects. The Alliance is willing to make this commitment because this investment is squarely in the interest of both the Nation and the world.

DOE Interactions

The FutureGen program was initially launched in February 2003 by President Bush. At this time, industry was challenged to organize a consortium of companies to participate in the project. A consortium was judged to be a better approach than DOE's historical approach of co-funding single company projects, as there was a clear objective to have broad industry engagement. DOE representatives clearly conveyed that the business arrangement would be patterned after previous clean coal technology (CCT) cooperative agreements. Also, because of the project scale and the desire to make the effort a global one to accelerate the technology use, it was indicated that the more restrictive CCT requirements would be removed. Specifically, the DOE represented the following anticipated terms:

- 20 percent non-federal cost-sharing;
- no repayment requirement from the industry partner;
- ability to vest ownership of the plant with the industry partner;
- traditional CCT program data protections for the industry partner;
- potential for program income (electricity, CO_2, and byproduct sales) to be shared among project participants proportional to their cost sharing during the four-year project operating program;
- all of the post-project revenues to the industry partner, including any proceeds from a sale of the facility after the project; and
- an advance appropriation of $300 million toward the project through a programmatic transfer of funds from several canceled CCT projects. (Typically, DOE appropriates all of the funds on a CCT project in advance. However, in FutureGen's case, DOE determined full advanced appropriation was not possible).

It was with this framework in mind that industry formed the Alliance, made representations to Congress and around the world, and grew its membership. Further, in the interest of ensuring that neither the DOE nor industry were inappropriately considered to be engaging in "corporate welfare", the Alliance was formed as a nonprofit 501(c)(3) entity. The decision to incorporate as a 501(c)(3) entity is unprecedented for a DOE clean coal project cooperative agreement, and has the following implications for the Alliance members and DOE:

- unlike DOE, the industry contributors can never share in a single dollar of program income or proceeds from the plant sale if that ever occurs;
- any program income or proceeds from the plant sale realized by the Alliance must be reinvested in public benefit R&D; and
- unlike DOE, the industry contributors do not gain any stake in intellectual property rights.

At the time of the project launch the DOE leadership team included:

- Secretary Spencer Abraham,
- Deputy Secretary Kyle McSlarrow,
- Under Secretary Robert Card, and

- Assistant Secretary for Fossil Energy Michael Smith.

The public-private partnership was cemented through an initial Limited Scope Cooperative Agreement signed in 2005. This limited scope agreement supported preparation of a conceptual design report and initiating the site selection process.

By the time of the signing of the initial Limited Scope Cooperative Agreement, Secretary Abraham, Kyle McSlarrow, Robert Card, and Michael Smith had left the Department and were replaced by:

- Secretary Samuel Bodman,
- Deputy Secretary Clay Sell,
- Under Secretary David Garman, and
- Acting Assistant Secretary for Fossil Energy Mark Maddox.

For the Cooperative Agreement, the National Energy Technology Laboratory (NETL) under the Office of Fossil Energy serves as the official contracting entity for DOE on FutureGen. The Alliance is accountable to NETL on all technical and contractual issues. The official contracting officer is the individual with the authority to modify the Alliance's work scope, adjust budgets, or make binding determinations on which activities under the Cooperative Agreement can and cannot proceed. The working relationship with the staff at NETL has been very positive. From our vantage point, it appears that DOE concerns about the project have been raised by its political leadership. It is has also been the case that the DOE political leadership has often provided advice, which was valuable and consistent with contractual obligations, and has been followed.

During the conduct of the Limited Scope Cooperative Agreement, Mark Maddox left the Department and was replaced by:

- Assistant Secretary for Fossil Energy Jeffrey Jarrett.

Following completion of the activities covered by the Limited Scope Cooperative Agreement, in December 2006, the Alliance submitted a conceptual design report and cost estimate to DOE. This material served as basis for negotiating a $1.8 billion Full Scope Cooperative Agreement. Among the provisions in this agreement were:

- Alliance will continue to provide 26 percent industry cost-share (up from the original 20 percent).
- The Alliance and DOE agreed to negotiate an adjustable cap on the DOE contribution, where the level of the cap would be adjusted up or down based on inflation/escalation indices (a common practice in industry). This adjustment would be negotiated after the current project phase.
- The Alliance and DOE agreed to share revenues pro-rata instead of the typical cooperative agreement whereby the private partner keeps all of the revenues. The effect of this was to have 74 percent of the estimated $300 million in revenues be allocated to reduce DOE's cost share.
- The Alliance and DOE agreed to share proceeds from the sale of the facility on a pro-rata basis instead of all being allocated to the industry partner as is typical for industry/DOE co-funded projects. This has the net effect of creating the potential for a material repayment of DOE's cost share. To the best of our knowledge, this is unprecedented in the history of CCT or Clean Coal Power Initiative (CCPI) projects.
- Contributing Alliance members under the 501(c)(3) structure would not receive any repayment of their contributions from project revenues or a facility sale. Such funds must be directed back to research and development.

The Full Scope Cooperative Agreement acknowledged the higher project costs similar to those of every other major energy infrastructure project. In its original estimates DOE had expressed costs as constant Fiscal Year 2004 dollars versus out year dollars. Both the Alliance and members of DOE's leadership team were advised of and were well aware of their increased contributions resulting from global escalation. The project did not change in scope from its inception. DOE agreed to proceed and a Full Scope Cooperative Agreement was signed in March 2007, with a gross cost of $1.8 billion, and a net cost of $1.5 billion.

The Full Scope Cooperative Agreement runs through 2017, with most of the expenditures concentrated in the next five years. Upon DOE's approval of the agreement, Alliance members irrevocably committed $10 million dollars to the current project phase and collectively budgeted nearly $390 million dollars of private money for future project phases. The Alliance's responsibilities in the first phase (termed Budget Period 1) of the Cooperative Agreement include selection of the final site,

additional design, preparation of a site-specific cost estimate, and procurement of long-lead items.

Throughout 2007, the Alliance and the four finalist sites continued to spend millions of dollars to advance the activities. The DOE continued their efforts to bring in government partners including China, India, Japan, South Korea and Australia. Project costs were a part of the negotiation with these countries. A few have already committed funding to the project. The Alliance hired staff, leased office space and retained key global contractors.

At some point after the Full Scope Cooperative Agreement was signed in March 2007, something in the Department had clearly changed or confusion had evidently developed, as Deputy Secretary Sell raised very surprising concerns about out-of-control costs, scope growth, that DOE was liable for 100 percent of the cost growth, and that the Alliance was "mismanaging the project." The Alliance did not agree with these observations and the Alliance promptly suggested a meeting to discuss the new concerns. A presentation from that meeting is included in this testimony as an attachment. In August of 2007, DOE representatives attended an Alliance Board of Directors meeting where they acknowledged to the Alliance Board that the cost growth was now understood to be due to market escalation, recognized that the project was managed by the Alliance effectively, that the Alliance has been responsive to the DOE, and that cost increases were not due to scope growth.

To this day, it is unclear why after a multi-month review process and negotiation for the Full Scope Cooperative Agreement, concerns could have arisen within DOE as early as one month after the signing of a $1.8 billion agreement.

It should be pointed out that both the Alliance and DOE were concerned about marketplace escalation. It was the Alliance's view that the appropriate way to address the issue was to follow the plan in the Cooperative Agreement and complete the current project phase, which included a site-specific engineering cost estimate. At that time all parties could discuss how DOE's financial exposure could be mitigated further. In the Alliance's view it was premature to renegotiate the original agreement when neither party had better engineering cost information or better information about escalation than when the original negotiations and agreement occurred.

Further, to maintain a large capital project on-track, it is important to establish and follow a well designed plan with pre-defined project phases. Had DOE and the Alliance followed the plan as agreed to in March 2007, we would be sitting here today with a final site, Mattoon, a site-specific construction design, and a site-specific cost estimate. There would have been sufficient time during this administration to adjust the Cooperative Agreement based on this new information. Instead, the effort is nearly stalled and valuable time is being lost.

During the late-Spring/Summer of 2007, David Garman and Jeffrey Jarrett left the Department and were replaced by:

- Under Secretary Clarence "Bud" Albright, and
- Acting Assistant Secretary for Fossil Energy Thomas Shope.

In late-September 2007, newly appointed Under Secretary Albright communicated, as general concepts, a set of Cooperative Agreement modifications. This introduced a new series of requests. Most were related to shifting more risk and cost from DOE to the Alliance. Early conversations were cordial and productive. From a business and capital project management perspective it did not make sense to the Alliance to modify the agreement in mid-stream without further project data such as site and cost estimate details; however, there was a recognition and willingness of the Alliance to modify the agreement at the appropriate time. Further, there was Alliance willingness, in principle, to accept DOE's request that after the DOE had expended a mutually agreeable sum, any future cost increases above that sum would be shared 50/50 versus the previously agreed to 26/74. During meetings with DOE, the general concepts were developed in an initial term sheet of modifications for further discussion.

Thomas Shope left the Department during this time period. The Assistant Secretary position remains vacant with no one acting to this day.

In mid-October 2007, a stumbling block was reached when DOE raised for the first time an absolute demand to limit the Alliance's ability to use commercial financing for a portion of the project. Commercial financing is routinely used on DOE clean coal projects and is expressly contemplated in the applicable regulations. Financing is an important tool to manage project cash flow and manage unforeseen risks. Normal private sector energy projects are typically financed 50–80 percent of total project cost. In the case of FutureGen, a lesser amount of 10–20 percent is manageable. Financing had been discussed with DOE as early as 2003 and the Alliance had an obligation to provide a financing plan to DOE prior to the start of the

next project phase. Thus, for financing to be eliminated or highly restricted by DOE came as another surprise.

Still, the Alliance, based principally on a series of strong positive signals to come from DOE and the administration, operated under the view that the DOE concerns could ultimately be resolved no later than the start of the next project phase and that selection of a final site and preparation of a site-specific cost estimate would help in the resolution of those concerns. The Alliance made it very clear that its members would agree to contribute their pro-rata financial commitments of ~$400 million in cash, subject to the availability of matching DOE cost-share. Thus, there should be no concern over the Alliance walking away after construction began. Moreover, the Alliance would have already spent tens of millions of private sector money before construction so there would be the added incentive to see the project to completion.

In parallel to these discussions with DOE, and DOE's position that financing should be highly restricted, the following very positive events occurred over the Fall of 2007 leading up the final site announcement:

- Secretary of State Condoleezza Rice made positive mention of FutureGen in a speech before the United Nations.
- President Bush made positive mention of FutureGen in a meeting of Major Economies on Energy Security and Climate Change.
- DOE issued an approximately 2000-page Final Environmental Impact Statement (EIS) and published a Notice of Availability in the *Federal Register* on November 16th. The EIS described the relationship between DOE and the Alliance, the project costs and cost-share, and DOE's preferred alternative to provide financial assistance to the FutureGen Project.
- DOE issued a press release indicating that completion of the EIS would enable a site announcement by year-end.
- DOE was communicating to Congress that a site would be chosen by year-end.
- The EIS Notice in the Federal Register started an important clock on a 30-day "wait period" before the end of which DOE could not issue a final Record of Decision (ROD). The Alliance and DOE had discussed, multiple times, in the preceding six months, that DOE would issue the ROD when the 30-day wait period expired (December 16 was the expiration date) and the Alliance would announce the site no later than December. DOE provided an advance copy of the final draft ROD for Alliance review. This interaction included a discussion that DOE was on-track in its preparation of the ROD so that it could be issued on December 17, albeit an aggressive schedule. DOE staff were working hard, and it was an excellent team effort.

On the basis of these positive actions by DOE and the administration, the Alliance made the final site decision on December 6, 2007. The Alliance was obligated to make this site selection under the terms of the still active Full Scope Cooperative Agreement. Given the involvement of thirteen companies, communication planners, project staff, and others, within a week approximately fifty individuals knew the site was Mattoon. While still confidential, the Alliance recognized the wheels were now in motion and the site would be known either through an organized message or through an unintended leak. Obviously an organized, versus unintended, release was the preferred approach.

On December 10th, DOE's Deputy Assistant Secretary for Oil and Natural Gas Programs, who was also Acting Principal Deputy Assistant Secretary for Fossil Energy, called the Alliance CEO to indicate a letter would be coming to the Alliance. A letter followed, from Mr. Slutz, indicating a delay in DOE's issuance of the ROD and indicating it was "inadvisable" for the Alliance to schedule an announcement of the selected site while offering compelling reason for a delay. At that time, (with all due respect to Mr. Slutz and his position), the Alliance cannot not recall having heard from him before, nor was he known to be a central player in the Department's project decision making process. Consequently, the Alliance weighed very strongly whether or not to take DOE's advice against other compelling factors for proceeding.

Given that the wheels on the site announcement were already in motion, the site decision was already made and becoming more difficult to keep confidential with so many individuals knowing the final site, and project delays costing as much as $10 million per month, the Alliance felt the reasons for proceeding outweighed the reasons for delay. The Alliance had already reviewed an advance copy of the ROD, which reaffirmed the EIS findings and concluded all four candidate sites were acceptable. It was assumed the ROD would indeed be released on time or soon thereafter without issue, as it was effectively complete. There was also a strong feeling

that it was inappropriate for the Alliance to string along the States of Texas and Illinois with another delay. The states had been spending substantial amounts of their sparse state resources and had originally been promised a site announcement in September, then October, and then November driven by slippage is the EIS release. The efforts of both states were commendable and they earned our admiration for always having been prompt when it came to meeting their deadlines to the Alliance.

While DOE had suggested a possible restructuring to several of the Alliance member companies, this information was only heard by the Alliance management second and third hand with sketchy details. It was not uncommon to hear rumors or misinformation second and third hand that never materialized as correct. No official representative of the Alliance was specifically told of the restructuring plans by DOE prior to the day of the DOE announcement.

DOE's Proposed Restructuring

As currently configured, DOE's proposed restructuring would effectively result in the termination of FutureGen at Mattoon. The Alliance Board carefully evaluated the proposed restructuring and has concluded that neither a thirteen-member consortium nor a smaller Alliance consortium could successfully conduct FutureGen at Mattoon under the newly proposed model. The reasons for this are technical, financial, and business structure related. The Alliance also has serious concerns about the adequacy of funding under the proposed restructuring, and whether any project conducted by any party could meet the stated DOE goals in a timely manner. The Alliance view remains that it is in the national interest to *complement* FutureGen at Mattoon with additional, adequately funded projects in a variety of engineered applications and a variety of geologic formations, but that complementary projects must not come at the expense or delay of the number one priority, FutureGen at Mattoon.

Currently, DOE's proposed restructuring leaves many unanswered issues that are of concern. Some of the specific concerns about the DOE proposed restructuring include:

- *DOE's schedule under the restructuring proposal is unrealistic.* DOE has an important obligation to the taxpayer to follow comprehensive contracting processes, conduct technology reviews, and prepare an environmental impact statement on any new project. The schedule (i.e., a proposed on-line date of 2015) in the Request For Information (RFI) is not realistic for a project that meets 100 percent of the stated goals. Many potential industrial partners are unfamiliar with DOE's required practices, and it is important that the DOE inform them of a reasonable schedule so that they can properly conduct the project and deal with their third-party investors. Overly optimistic schedules are a disservice to Congress, industry, and the public.

  Based on our experience, I would envision the following as a fast-track schedule for DOE to identify an alternative, fully integrated project that meets all of the existing performance goals for the FutureGen program:

  - fi 2009+: project selection and cooperative agreement negotiation
  - fi 2012: completion of preliminary design, environmental impact assessment and record of decision
  - fi 2013: completion of detailed design and procurement of major technology components
  - fi 2017: completion of construction
  - fi 2018: initial operation
  - fi 2022: completion of test period

- *DOE's restructured approach has problematic business parameters.* DOE's proposal implies that 90 percent capture simply involves the addition of new technology to an existing IGCC. It does not. The complex integration of CCS into a commercial IGCC plant will entail significant modifications to many other systems, including commercial systems inside the base plant. It would also largely require a restart of design work done to date on the base commercial plant. Thus, the government, its procurement rules, and its oversight practices could easily extend into the commercial, for-profit power plant. Further, applying FutureGen funds to a project with anything appreciably less than capturing 90 percent of the *total* CO_2 emissions from the *entire* plant would fall short of what is needed to rapidly develop near-zero emission coal plants.

- *DOE's restructured approach does not address the increased marginal cost of electricity due to adding CCS to a plant.* The modified plant that DOE proposes that industry build *will cost substantially more to operate* than a traditional plant. DOE's RFI is largely silent on operating costs. Adding CCS to an IGCC plant is expected to increase the cost of electricity by as much as 50 percent and the marginal production cost by as much as 20 percent. Because power plants dispatch electricity to the grid based on their marginal operating cost, the approach DOE proposes could result in a plant that is too expensive for industry to operate.
- *DOE appropriately retained the 90 percent capture goal in its RFI and must do so in any awarded projects.* However, DOE has recently made public statements that this goal may be relaxed. The FutureGen program has identified 90 percent CO_2 capture as an important requirement to advance CCS technology. This level of CO_2 capture has significant impact on the design of many critical components of the facility, such as the combustion turbine, gas clean-up system, and syngas clean-up system. It would be a serious mistake if this target level is relaxed. Ninety percent is a technical goal designed to ensure a sustainable future for coal in a carbon-constrained world. Today's commercial projects cannot technically or economically achieve this goal and DOE's program should focus on bold technological advances, not incremental change.
- *Plant revenue must go to the industrial partner.* In a commercial project, it is expected that all of revenue would need to go to the industry partner. Unlike FutureGen at Mattoon, in which DOE shared in the project revenues substantially offsetting federal investment, for projects conducted under DOE's new approach, a successful commercial project would insist that plant revenues go to the industrial partner so that private sector participants can generate a commercial return.

In its 2004 report *"FutureGen Integrated Hydrogen and Electric Power Production and Carbon Sequestration Research Initiative,"* DOE acknowledged the necessity for the type and level of risk sharing associated with FutureGen at Mattoon if technology is to advance at the required pace. In its report, DOE said:

> "FutureGen's integration of concepts and components is key to providing technical and operational viability to the generally conservative, risk-adverse coal and utility industries. Integration issues such as the dynamics between upstream and downstream subsystems (e.g., between interdependent subsystems such as the coal conversion and power and hydrogen production systems and carbon separation and sequestration systems) can only be addressed by a large-scale integrated facility operation. Unless the production of hydrogen and electricity from coal integrated with sequestrating carbon dioxide can be shown to be feasible and cost competitive, the coal industry will not make the investments necessary to fully realize the potential energy security and economic benefits of this plentiful domestic energy resource."

Technology advancements and market changes in the last five years have not changed this need for a full scale validation envisioned in DOE's report and FutureGen at Mattoon.

There is no program in the world that can move near-zero emission power and CCS faster or further than FutureGen at Mattoon. The FutureGen Alliance is nonprofit, includes unprecedented international involvement and information sharing, and has a site that is technically and legally ready to go. Alternatives will cost the country five years or more of delay and/or deliver less in terms of results.

As Congress and the administration debate the appropriate structure for the FutureGen program, the Alliance urges that all of these factors be taken into account. FutureGen at Mattoon should be maintained as a global flagship program that is the Nation's top priority for advancing near-zero emission coal technology, and complementary projects should be added to the program as the budget allows.

FutureGen™
ALLIANCE

Clean Energy for a Secure Future

FutureGen

Project Status

Greg Walker, Alliance Chairman (SVP Foundation Coal)
Chris Hobson, Alliance Vice-Chairman (SVP Southern Company)
Paul Thompson, Alliance Director (SVP E.ON – U.S.)
Steve Winberg Alliance Director (General Mgr CONSOL Energy)
Mike Mudd, Alliance CEO

18 April 2007

FutureGen™ ALLIANCE
Clean Energy for a Secure Future

Meeting Objectives

- Answer Any DOE Questions
- Alliance Perspective on the Importance of FutureGen
  - *Right Project at the Right Time*
- Alliance Formation, Make-up and Operations
  - *Right Structure and Leadership*
- Basis upon which Industry Committed
  - *Right Deal*
- Address Project Cost Inflation/Escalation
  - *Right Schedule and Cost Control*
  - *Cost Estimate*
  - *Realities of Inflation*
- Chart Path Forward

FutureGen ALLIANCE
Clean Energy for a Secure Future

FutureGen
Right Project at the Right Time

- Alliance formed in direct response to President's Initiative
  - Industry is contributing nearly $400M with no expectation of financial return
- Alliance members agree FutureGen is central to a technology-based approach to climate change
  - DOE's CCTP and the IPCC suggest advanced technology can reduce the cost of addressing climate change by trillions of dollars
  - FutureGen is central to realizing these benefits
  - Members willing to support pursuit of greater R&D Budget for all DOE
- FutureGen is unique
  - No other fully integrated power plant combining gasification, carbon capture, and sequestration in a deep saline geologic formation
  - FutureGen provides a clear mechanism to assess the cost, performance, and public acceptance of integrated near-zero emissions power plant, which is an essential precursor to commercial deployment

FutureGen ALLIANCE
Clean Energy for a Secure Future

FutureGen
Right Project at the Right Time

- Factors influencing current and prospective future members – why FutureGen is important to members
  - High-level Administration support
  - Aggressive, but realistic, timetable
  - Leading global project to validate models for measuring, monitoring and verifying sequestration results
  - Leading global project in terms of engineering
  - Outside expert/academic input and DOE oversight adds to global credibility
  - Foreign participation, which is crucial to global technology acceptance
  - Operated with commercial business discipline
  - Will provide clarity to commercialization uncertainties: permitting, insuring, bonding, operation, monitoring, complex surface and subsurface rights, etc…
  - Addresses critical R&D needs to move toward DOE's 10% goal – oxygen separation, multiple coal gasifier, H2 production, gas clean-up advancements, hydrogen turbine advancements
  - Creates a self-sustaining R&D facility

FutureGen ALLIANCE
Clean Energy for a Secure Future

FutureGen
Right Project at the Right Time

- Unprecedented global visibility
  - FutureGen is in the press nearly every single day
  - Foreign governments and companies see FutureGen as one of the most, if not the most, important sequestration projects on the planet
  - FutureGen is a catalyst for new projects in other countries, which is exactly what is needed to build global acceptance of the technology and position the U.S. as a leader on climate change solutions
- FutureGen is on an aggressive timeline that is aligned with U.S. and global needs
  - Pressure to address climate change and the long-lead times for equipment procurement and construction demand an aggressive schedule

FutureGen ALLIANCE
Clean Energy for a Secure Future

FutureGen
Right Structure and Leadership

- Industry
  - Established Alliance as 501(3)c non-profit entity
  - Twelve leading companies with operations on six continents
  - Investing nearly $400M* in the project plus recycling 100 percent of electricity revenue back into the project to offset both DOE and Alliance costs
  - Individual companies forgo right to IP, revenues, or assets
  - IP will go to the vendor community and public, as appropriate to facilitate commercialization
  - Alliance brings industrial business discipline, and power plant expertise to the project

ANGLO AMERICAN · bhpbilliton · CONSOL ENERGY · FOUNDATION COAL · Peabody · RIO TINTO ENERGY AMERICA · xstrata

>40 percent of U.S. coal production

AEP · SOUTHERN COMPANY · ppl · e·on U.S. · 中国华能集团公司 CHINA HUANENG GROUP

>20 percent of U.S. coal-fueled electricity production

*$379M in actual dollars through 2017

FutureGen

Right Structure and Leadership

- Alliance views DOE's role as essential
- It's clear FE is committed and has dedicated their "A-team" to the project
- DOE-FE
  - Providing appropriate oversight
  - Ensuring alignment with national technology goals
  - Providing, through in-house and sponsored research, the technical foundations for FutureGen
  - Managing international government participation in FutureGen
  - Conducting NEPA process

FutureGen ALLIANCE
Clean Energy for a Secure Future

FutureGen
Right Deal

- Alliance came to the table with the following understanding:
  - DOE wanted a consortium of companies not a single company
  - 74% government cost-share (Reference: DOE, OMB, CEQ Alliance meeting 2004)
  - Administration to maintain support of FutureGen and other coal programs (Reference: Bolten's letter and FY05 request levels)
  - $950M cost was in FY04 dollars and subject to adjustment for inflation (Reference: Secretary Abraham's Q&As on FY04 budget request)
  - Alliance and DOE to share in adjustments for inflation
  - Industry contributors to the Alliance would get zero financial return and no IP rights (unlike CCPI demonstration projects)
- Alliance built a global enterprise based on this understanding

FutureGen

Right Schedule and Cost Control

- The Alliance has met every major milestone since signing the initial cooperative agreement with DOE
- Alliance is using the same project management techniques that have successfully delivered countless industrial projects, on-schedule and in-budget
- Incentive for Alliance to control costs—we share in growth
- There has been zero cost growth due to scope growth relative to DOE Report to Congress
  - same plant size
  - same CO_2 capture target
  - same SOx, NOx, and Hg targets
  - same commitment to global involvement
  - same plant on-line year

FutureGen

Right Schedule and Cost Control

- FY08 Administration request of $108M was on-target
  - Funds cover continued engineering design and long-lead time procurements
- Scheduling long-lead time procurements
  - Construction begins in the Spring of 2009 with all major equipment deliveries completed no later 2011.
  - Current lead times on selected major equipment components are 24 to 36 months between the time of the order and the time of delivery.
  - Thus, expenditures for long-lead time equipment orders are substantial in FY08 and FY09
- FY09 to FY11 are peak Federal funding years at $233M/yr.
  - Available foreign contributions would reduce this amount

FutureGen

Right Schedule and Cost Control

- The current estimated net cost of the project in nominal, as-spent dollars is $1.484B between FY04 and FY17.
  - $1.484B is the net project cost including both operating costs and revenues
  - Assumed 5.2% inflation per year through 2017
- The Alliance will fund $379M of the total estimated cost.
- The Federal government, consistent with the terms of the deal, would be responsible for $1.105B.
  - ~$ 80M of this is expected from foreign governments
  - $ 99M has been appropriated between FY04 and FY07
  - ~$926M in future appropriations is required
  - ~$233M is the estimated peak annual Federal funding requirement

FutureGen ALLIANCE
Clean Energy for a Secure Future

FutureGen
Cost Estimate Summary

	DOE 2004 Estimate	Alliance 2006 Independent Estimate	
Project Cost (1Q 2004$)	$950M	$954M	Alliance Estimate Confirms DOE Estimate
Scope Growth (1Q 2004$)	--	**Zero**	Project remains focused on original scope and mission as established by DOE
Inflation Multiplier (converts 2006 cost to actual outlays, in future-year dollars, 2005 - 2017)	--	1.56	Based on public Government and Industry Indexes
Net Project Cost (future-year dollars thru 2017)		$1,484M*	Equivalent to DOE's original estimate. Inflation does not exceed inflation for other industry projects. No scope growth.
DOE/FG Cost Share %	**74/26**	**74/26**	
DOE/FG Cost Share $M	**$700/$250**	**$1,105*/$379***	

*DOE's NEPA costs are 100% DOE funded.

FutureGen

Inflation

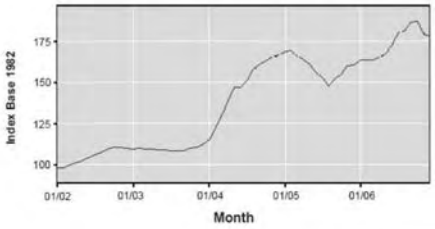
- Inflation reflects the normal up-and-down fluctuations in materials, labor, and services over time.
- Controlled by market forces (supply/demand), not the Alliance, DOE, nor the Congress
- Similar inflation in similar projects seen by all Alliance members globally
- The Bureau of Labor and Standards, as well as other organizations track inflation and report it publicly

FutureGen

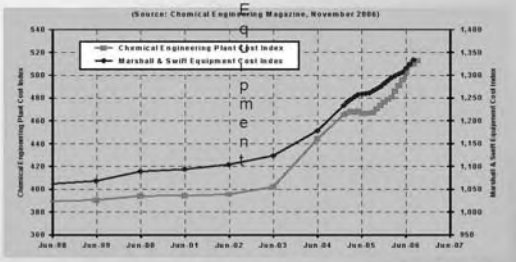
Inflation

- Since DOE completed its original cost estimate in 1Q FY04, the Bureau of Labor and standards reports:
  - well drilling up ~150%**
  - heavy construction up ~30%
  - general A/E services more closely tracked general inflation

Carbon Steel Price Indices



Equipment Cost and Process Plant Costs



**When originally presented to DOE, there was a typo in the number. It was listed at 250 and has been corrected to 150 in this copy.

FutureGen

Right Industry Commitment

- Industry has responded to and remains committed to the President's initiative under the terms of the deal
- Industry is delivering with distinction
- Industry and DOE share the burden of making the project successful in spite of challenges beyond our control
- We trust that DOE shares this vision and plans to provide the political, technical, and financial support required

www.FutureGenAlliance.org

FutureGen ALLIANCE
Clean Energy for a Secure Future

Contact Information:

Greg Walker
Chairman
FutureGen Alliance

Michael J. Mudd
Chief Executive Officer
FutureGen Alliance
mjmudd@aep.com
(614) 716-1585

www.FutureGenAlliance.org

BIOGRAPHY FOR PAUL W. THOMPSON

Paul W. Thompson was named to his current position in 1999. He has more than 15 years of experience in the electric and natural gas utility industry. Prior to this he worked in the oil and gas industry.

Thompson started his career as Manager, Financial Planning at Northwest Industries in Chicago. Prior to joining LG&E Energy as Director, Business Development in 1991, he also had worked for Lone Star Technologies, a Northwest Industries Subsidiary, in Tulsa, Oklahoma, and Dallas; and for Koch Industries Inc. in Tulsa and Boston. Thompson subsequently held several upper-management positions both at Louisville Gas and Electric Company and LG&E Energy. He became LG&E Energy Marketing's Group Vice President before being promoted to his current position.

Thompson has a bachelor's degree in mechanical engineering from the Massachusetts Institute of Technology (MIT), and a master's degree in business administration in Finance and Accounting from the University of Chicago. He has also completed the Executive Program on Leading Corporate Transformation at the E.ON Academy Harvard University. He is a member of the American Society of Mechanical Engineers and an Advisory Board Member for the Center for Applied Energy Research.

Thompson is Chairman of the Board of the FutureGen Industrial Alliance. He is a board member of Electric Energy Inc. and Ohio Valley Electric Corporation. Thompson is on the Advisory Board for the University of Kentucky Center for Applied Energy Research. Thompson is a board member of the Center for Energy and Economic Development.

Thompson is a board member of the Jefferson County Public Education Foundation and Greater Louisville Inc. Thompson is a council member for the University of Kentucky College of Engineering Project Lead The Way. He is Vice-Chairman of the Louisville Free Public Library Foundation Board and served as the 2002 Chair of the Annual Children's Reading Appeal. Thompson is a member and Finance Committee Chair of the Louisville Downtown Development Corporation and a 1998 graduate of Leadership Louisville. Thompson has previously served on the board of the Friends of the Waterfront, represented LG&E as Co-Sponsor of Habitat for Humanity, and he has twice served as Honorary Chairman of the March of Dimes Annual Walkathon.

Chairman LAMPSON. Thank you, Mr. Thompson.

Mr. Yamagata, please proceed.

STATEMENT OF MR. BEN YAMAGATA, EXECUTIVE DIRECTOR, COAL UTILIZATION RESEARCH COUNCIL (CURC)

Mr. YAMAGATA. Mr. Chairman, Members of the Committee, I want to thank you for inviting us to provide this testimony today. I believe I have a crutch with me, which are PowerPoints that I would like to go through with you and hopefully thereby keep my oral testimony to five minutes.

Let me start by summarizing the written testimony, and I think it can be done fairly simply. First of all, we do not believe, the organization that I represent, that FutureGen should be terminated for all of the reasons that Mr. Thompson provided to you. It is a fully integrated facility. We don't have one like that in the world today. We are going to lose three to five years if we do this. I think Secretary Albright's point was well taken in the time frames that he provided to this committee in his previous testimony.

Ninety percent carbon capture, which is something that we may know how to do but we can't do it cost-effectively, and I think you need to keep that in mind as I try to weave through also what the Department wants to do with a restructured FutureGen program, specifically with respect to the 90 percent issue. You have an industrial alliance that has been developed, almost unheard of in the context of large programs of this size, and finally, the international participation. So, when you put all of those things together and for

all of those reasons, we do not believe that FutureGen is a project that should be terminated.

Let me talk a little bit about the alternative program that the Department has provided, and in this context, and I don't want to nuance words but the Secretary talked about cutting-edge technology on large commercial facilities, and we are talking about facilities that cost $1 billion and more and talking about cutting-edge technologies doesn't make a lot of sense to us. There are technologies that you can put on these projects and get carbon capture but I don't think they are cutting-edge technologies that are going to get 90 percent capture, which is one of the requirements in the restructure program, or at least that is what the Department is looking at.

The Secretary also made note of 30-plus IGCC projects that have been announced in the last 24 or so months. Take a look at the number of projects that also have decided not to go forward and I think what you are going to find really is there is a very minimal number of projects, whether they are IGCC or combustion-based new coal projects in this country that are actually going forward. I think that is a shame, and given the amount of capacity and demand that we require in this country, we are going in the wrong direction. But the point I want to make to the Committee is, we can't assume that there are 30 IGCC projects out there. There are very few limited number of projects, two as the Secretary pointed out, that have been permitted. Therefore, my point is that if we have a project that is ready to go, if given the time and the opportunity, we ought not to deny that project from moving forward, and I speak specifically of FutureGen.

I also want to point out in the context of the restructured program that we are looking at a commitment by this Department of Energy of a 14-year program at $1.3 billion, and we are going to do multiple projects off of that $1.3 billion. It is our view that each one of those projects is going to cost anywhere from $300 million to maybe $400 or $500 million for the type of program and project sizes that they have announced, or want to do. If you do the math, that is three or four projects.

I am going to talk to you in a minute about a program that our organization is promoting where we think in order to launch that type of a program, you need to do 20 or 30 projects, 20 or 30 projects in the next 15 to 18 years, but I will get more into that in a moment when we have more time.

Finally, I would like to say in response to another question that the Subcommittee asked, and that is, the relationship of that program, that is the multiple program, restructured program, to the regional partnership program as well as the Clean Coal Power Initiative. The Clean Coal Power Initiative program is a demonstration program of new, advanced technologies. The multiple program or multiple project program that the Department is announcing or is trying to do is really not that. It is intended towards deploying technology we already know something about. In the context of regional partnerships, it does seem to me that we ought to be able to use the CO_2 from these commercial projects to use them in the regional partnership programs. The real question there is timing. We are not going to get this done until 2016 or 2017 and we need

CO_2 earlier than that for the regional partnerships. The timing doesn't seem to fit up there, or at least they don't fit up as nicely as the Department would have you believe.

Let me step back for a moment and talk about all of this in the context of what we really need to do, how much time is it going to take us to get it done, how much is it really going to cost to do the type of things that all of us I think want to see done and then in fact who is going to end up paying for it. I think the point I want to make from this side is, FutureGen really does address that first bullet point. That is what CCS, or carbon capture and sequestration, is all about. But that is the integration of an entire project, and that is what we need to be looking at when we want to use coal and capture CO_2, put it into the ground long-term and keep it there safely. But the other point I want to make is, we ought to be looking at technologies that advance the efficiency of converting coal to useful energy, and the take-away here is that for each one percent increase in efficiency, we reduce CO_2 by as much as two and one-half percent. So you do the math on that. You increase something by five percent and you get 12.5-plus percent reduction in CO_2 without worrying about the capture part of it. We have a large stake in dealing with the research and development of technology and in focusing on efficiency as well.

Let me point out to you that in our program, that is, the Coal Utilization Research Council and then I will wind down. We really are looking at two different programs here, both of them integrated. One is a longer-term research, development and demonstration program that this committee and this subcommittee has focused on responsibly for a number of years. What do we do with the scientific base in this country and utilizing that base in order to get us very good technologies with high efficiency at a consumer-reasonable cost when we have to capture that 90 percent of the CO_2 coming off of coal units, and then secondly and as important, what do we do now with the technologies that we currently have. I want to reemphasize, at least from the Coal Utilization Research Council's perspective, that we think the Department's restructured FutureGen program is something we ought to do. The country should do this, not at the expense of FutureGen but because we have got to get going and we need to do it with the technologies that are currently available and then lead into better technologies farther on.

I am not going to spend any time talking about what those two programs require. Let me just say that we are looking at what one might think is enormous costs. I don't mean to put the chart up here for the shock value but to simply say we are fooling ourselves if we think that $1.3 billion over the next 14 years is going to address the kind of problem that I think we have got. The long-term program that we have defined, research program, is about a $17 billion or $18 billion program but it is over a 15- or 16-year period. The near-term program, that is, let us get something done now, including the type of restructured program that the Department has been proposing, needs to get done now as well. So those are the two pieces.

My final comment is, if you are going to look at a near-term program not in lieu of FutureGen but a near-term program, do not

confine it to gasification only. We need to do combustion-based systems as well. The industry needs options here, not limitations. Thank you.

[The prepared statement of Mr. Yamagata follows:]

PREPARED STATEMENT OF BEN YAMAGATA

Introduction:

This written statement is submitted in conjunction with testimony that will be provided to the Subcommittee on Energy and Environment of the House of Representatives Committee on Science and Technology by the Coal Utilization Research Council (CURC).

The Coal Utilization Research Council is a not-for-profit organization comprised of major coal producers, investor owned and well as public utilities that use coal as a fuel to generate electricity, entities that use coal to produce other useful chemicals and fuels, the major U.S. manufacturers of boilers, gasifiers and oxygen production machinery and equipment, several states and leading universities involved in coal research and development, as well as the Edison Electric Institute (EEI), the National Rural Electric Cooperative Association (NRECA), the America Public Power Association (APPA), the National Mining Association, the United Mine Workers of America, EPRI and others. A complete list of CURC's membership is attached for the Committee's information.

CURC is organized for the specific purpose of promoting the research, development, demonstration and deployment of technology that will enable the long term use of our nation's abundant coal supplies in a cost-effective and environmentally acceptable manner. As the Congress prepares to debate the enactment of greenhouse gas legislation and the regulation of GHG emissions, including principally carbon dioxide CO_2, it is vitally important that technology play a key role. Indeed, with the use of technology the capture and use or long-term storage of carbon dioxide is possible. Equally true, unless carbon capture and storage (CCS) technology is successfully demonstrated and deployed on coal and other CO_2 emitting facilities it is unlikely we will succeed in containing our contribution to the warming of the globe.

The Subcommittee has asked that we address three questions with regard to the Department of Energy's decision to terminate the current FutureGen project and to restructure the program. Those questions are:

(1) What is the value and role of FutureGen towards the development and deployment of carbon capture and storage technologies?

(2) What is the value and role of the restructured program as a compliment to other federal R&D efforts related to CCS technology development?

(3) How will the restructured program compliment the on-going Clean Coal Power Initiative (CCPI) and the regional Carbon Sequestration Partnership Program?

Summary of the CURC Written Statement:

(1) As a totally integrated, ground up commercial-scale demonstration project of IGCC with fully integrated carbon capture and storage this project should not be terminated. The U.S. will lose valuable time and experience (as much as three to five years) in the development and deployment of CCS technology and application if the FutureGen project is abandoned.

(2) The DOE initiative to encourage IGCC projects to install and operate CCS onto planned IGCC projects would be beneficial and CURC supports such a program but not at the expense of the FutureGen project. Moreover, the DOE proposal needs to be funded at a realistic level (the $1.3 billion to be committed over a 14-year is totally inadequate) and such a program cannot be limited to IGCC projects only.

(3) The CCPI program is a separate demonstration program intended to support new technology that is not currently available in the marketplace. The proposed restructured FutureGen program would be focused, presumably, upon a different set of commercially-available technologies to capture and sequester CO_2. However, IGCC and other coal combustion projects that are equipped with CO_2 capture technology could become an important source of CO_2 for the on-going regional Carbon Sequestration Partnerships.

Value and Role of FutureGen to Develop and Deploy CCS:

FutureGen was initiated by the Administration in 2003 and this first-of-a-kind demonstration project has been described as America's showcase for cutting-edge technologies to advance the Nation's climate change initiatives predicated upon the development and use of technology.

FutureGen is unique because the entire project has been conceived and is being executed as an integrated whole—from advanced coal gasification to electricity production to capture and long-term storage of the CO_2. A primary value of FutureGen is this integration. Of equal importance is the demonstration of technology capable of capturing up to ninety percent of the CO_2 emitted through the coal conversion process and then the compression, transport and long-term storage of at least one million tons annually of that captured CO_2 into a deep saline formation. Tomorrow's coal utilization projects will learn from this project—the planning, design, construction and operation of an integrated system, including the IGCC power plant, the integrated CO_2 capture system, and the identification, characterization, field preparation attendant to the CO_2 storage site and then the location and drilling of wells, followed by the injection, monitoring and verification processes for storing CO_2. This has never been done before; FutureGen would be the world's first.

And finally, this project represents the association of industries, both domestic and international, as well as the commitment of the U.S. and foreign governments, to cooperatively plan and develop this project. Not only has the FutureGen Industrial Alliance committed up to $400 million the Alliance also incorporated into the project the DOE's goal that FutureGen serve as a "living laboratory" to lead in the advancement of technology by becoming a testing platform for future advanced coal power plant technology deployment. With international participation, it would appear that FutureGen could also serve as a principal means by which countries, like China, would be able to view first-hand how to construct, operate and use technology to capture and store CO_2 from coal use.

Finally, if DOE is allowed to terminate this partnership it would appear that we could lose as much as five years. How? FutureGen has actively developed this project over the last five years; the planning of a fully integrated IGCC with CO_2 capture will be lost, not to mention the work already done on CO_2 site evaluations storage and selection. We most certainly will also lose the benefits of working together. The importance of this industry alliance, its commitment to the project and its reliance upon the government as a partner should not be underestimated. Withdrawing support at this stage in the project's development sends a mixed message to the market place and to Congress regarding the DOE's commitment to technology development and to the government's reliability as a partner, especially for large-scale projects that require multi-year commitments.

Assessment of Restructured Program:

The CURC has submitted comments to the DOE in response to the Department's Request for Information (RFI) soliciting industry interest in the proposed terms and conditions of a restructured FutureGen program. That submittal is attached to this testimony and it is requested that CURC's information be made a part of the hearing record. The CURC opposes the Department's plan to terminate support of the currently structured FutureGen project for the specific reasons detailed above. However, we do support the initiation of a separate program whereby the government would assist industry by providing financial support to cover the incremental costs of the installation and operation of CCS. The following is a summary of the RFI comments submitted by the CURC:

(1) The amount of funding, $1.3 billion (in as-spent dollars), over a 14-year period (the scope and duration of the proposed FutureGen restructured program) does not appear to be adequate to support "multiple" CCS projects;

(2) The program should not be limited to the installation and operation of CCS on IGCC projects; rather, a separate but parallel program for combustion-based projects, including both post combustion capture and oxy-combustion projects of, at least comparable size, should be established;

(3) The requirement to capture 90 percent of CO_2 and store at least one million tons per year of CO_2 into deep saline structures is overly restrictive; industry needs to obtain baseline data, demonstrated reliability and widespread confidence in CCS systems and these goals can be achieved more cost-effectively by requiring less aggressive percentages of capture;[1] and

[1] The 90 percent capture requirement of total CO_2 emissions is more appropriately applied to the FutureGen project where technology demonstration is a principal goal rather than the type

(4) The lack of a regulatory structure to address the transport and storage (during the life of the project as well as longer-term) of captured CO_2 along with a resolution to long-term liability issues for selected power generation projects must be addressed, otherwise industry involvement is not likely to occur.

CURC has proposed the adoption of a near-term CO_2 reduction program that contemplates, in part, supporting the same goal as the Secretary now proposes through the proposed alternative FutureGen program. Encouraging the early application of CCS technology to commercial-scale power generation facilities, both gasification and advanced combustion-based, is a critical component of CURC's near-term program. But, the CURC program appears to be more realistic as it relates to costs of CO_2 capture equipment and the total amount of support required of government to encourage power plant owners to install and then capture CO_2 and store up to one million tons annually into deep saline formations. The CURC near-term program is described, in detail, in a briefing paper that the CURC issued last November, 2007. A copy of that paper can be obtained at our website at: *www.coal.org.*

The near-term program details a multi-year industry effort focused upon the adoption of technologies that are currently available in the marketplace. The DOE proposed restructured FutureGen program appears to be intended towards the same goal. The CURC program would support CO_2 reductions that could be accomplished now by the application of technologies currently available. We believe that adoption of such a near-term program might result in the prevention or capture of at least 140 million tons of CO_2 annually. The estimated cost of the CURC near-term program is $38 billion in industry and government cost sharing to achieve these early results between now and 2025.

The amount of funding proposed for a restructured DOE FutureGen program is $1.3 billion, over a 14-year period (the scope and duration of the proposed DOE program). The CURC first adopter proposal which practically mirrors the organizational structure and the goals of the DOE restructured FutureGen program would support approximately 9000 megawatts which we believe is a minimum number of units (10 to 15 units) required to launch early experience with CO_2 capture and long-term storage from power plants. This portion (the first adopter program) of CURC's proposal would cost approximately $9.0 billion between now and 2025. We therefore, seriously question the adequacy of the $1.3 billion over the proposed 14-year period to support "multiple" projects as projected by the DOE.

Potential to Complement other DOE programs, including the Department's R&D and CCPI and Regional Partnership Programs:

CURC wishes to emphasize in as strong a manner as possible the importance of DOE's coal R&D program as a critical component to our nation's greenhouse gas mitigation efforts. To achieve the challenging CO_2 emission reduction schedules that have been discussed in Congress, much more significant levels of funding for coal-related technology development, demonstration and deployment will be required, and a multi-year commitment from the Federal Government is needed immediately. Long-term goals need to be agreed upon by industry and government; advance appropriations to support the RD&D programs need to be made to insure that funding is available; and then government must be a steady and reliable partner. The challenge of global climate change and man's contribution to that change will require enormous financial, technical and political commitments and the current DOE budget provides a very inadequate response to the technology challenges involved. CURC and EPRI have jointly developed a long-term RD&D program that specifically addresses the need for targeted programs. This technology Roadmap includes the type of technology that must be supported to achieve specific cost, efficiency and emission reduction goals as well as estimated costs. The costs set forth in the Roadmap, in light of the enormous increase in the costs of basic commodities like steel and copper currently are being revised. A copy of the CURC–EPRI coal technology Roadmap can be obtained by visiting the CURC website at *www.coal.org.*

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of commercial-scale projects contemplated by this proposed program. Furthermore, even after detailed characterization of a sequestration site, there is no certainty that it will be suitable for long term sequestration. Certainty only comes after injection of significant amounts of CO_2 and thus confirmation of predictions about the storage site. Projects need design flexibility to recover non-CCS operation if initial sequestration fails; thus, it is strongly encouraged that the program specifically recognize the possibility that long term sequestration may not be possible and specific allowance should be made for this contingency by insuring that a selected project sponsor will not be penalized and forfeit the DOE's financial support if long-term storage proves unsuccessful.

FutureGen was intended to be the Department's premier demonstration project that would serve as a continuing "testbed" for moving technology from R&D to demonstration. By terminating the current FutureGen project this function may also be lost. More importantly, the important elements of design integration, 90 percent-plus capture of CO_2, and long-term storage of CO_2 is likely to be lost in a restructured program where any industry participants must be focused upon the operation of a commercial, power production facility not the testing of equipment or the capturing of 90 percent of the CO_2 at this early stage in the development of CCS technology.

Where the FutureGen project is intended to complement the DOE's R&D program by serving as a demonstration project (the last element of RD&D) the proposed restructured program has a different set of goals and objectives. These goals and objectives, in our opinion are exceedingly valuable, as well. Government support of those who will undertake early CCS projects (beyond FutureGen) is encouraged.

Finally, and very important, CURC has recommended to DOE and to the Congress that CCS projects utilizing combustion technology (i.e., flue gas scrubbing or oxygen-fired combustion technology) should be made specifically eligible for the restructured FutureGen program if it is ultimately adopted. We have specifically recommended that there be a separate, parallel program established for CCS projects utilizing combustion technology. Our reason for suggesting a parallel but separate program is two fold: first, the requirements to qualify a CCS technology will be entirely different for pre-combustion and post-combustion CCS systems and, second, rapid implementation of the program is essential to insure that CCS projects precede any enactment and implementation of legislation to regulate CO_2 if Congress decides to take such action. That rapid implementation can be accomplished if DOE does not attempt to write one set of qualification criteria for technologies that are very different.

It is not clear how the goals and objectives of the proposed restructured FutureGen program would complement the on-going Clean Coal Power Initiative (CCPI). That program, which has yet to be continued by the DOE (i.e., the Department announced its intent to release a third solicitation last December but has yet to do so), is focused upon the demonstration of new technology that is not widely used in the marketplace.

Finally, the DOE has specified that projects selected through a restructured program must be able to capture at least 90 percent of the CO_2 from the unit and store at least one million tons of CO_2 annually. To that end conceivably these power projects could be used as the source for CO_2 for that needed by the regional partnerships to continue large scale CO_2 injection and testing in saline aquifers.

CONCLUSIONS:

The CURC appreciates this opportunity to provide these comments to the Committee on Science and Technology and we will seek to answer any questions that the Committee and its Members have regarding this very important subject matter.

CURC
COAL UTILIZATION RESEARCH COUNCILSM

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MONDAY, MARCH 3, 2008

Comments submitted to the Department of Energy by the Coal Utilization Research Council (CURC) in response to a Request for Information (RFI) issued by the DOE

Comments submitted by:

Ben Yamagata
Executive Director
Coal Utilization Research Council (CURC)
1050 Thomas Jefferson St. N.W.
Washington, D.C.

INTRODUCTION:

These comments are submitted on behalf of the membership of the Coal Utilization Research Council (CURC) in response to the Department of Energy's request for information related to the Department's intent to restructure the FutureGen project. A list of CURC's membership is attached. These comments address the proposed structure and content of the Department's revised FutureGen program but should not be interpreted, by this submission, as supporting the intention to terminate the government's participation in the FutureGen project.

The CURC opposes the proposed action to terminate DOE support of the current FutureGen project. A copy of our letter to various Members of Congress in which we urge reconsideration of the proposed action is attached for your information. In this same communication CURC also noted its support of the Department's initiative to undertake a solicitation in which the DOE would provide funding for the incremental costs associated with installing and operating carbon capture and storage systems (CCS) on commercial-scale electric power generation facilities.

SUMMARY OF CURC'S CONCERNS ABOUT THE PROPOSED CCS PROGRAM:

(1) The amount of funding, $1.3 billion (in as-spent dollars), over a 14-year period (the scope and duration of the proposed program) is not adequate to support "multiple" CCS projects;

(2) The program should not be limited to the installation and operation of CCS on commercial-scale IGCC projects; rather, a separate but parallel program for commercial-scale combustion-based projects, including both advanced pulverized coal with carbon capture and oxy-combustion technologies, should be established, as well;

(3) The requirement to capture 90 percent of CO_2 and store at least one million tons per year of CO_2 into deep saline structures is overly restrictive; industry needs to obtain baseline data, demonstrated reliability and widespread confidence in CCS systems and these goals can be achieved more cost-effectively by requiring less aggressive percentages of capture;[1] and

(4) The lack of a regulatory structure to address the transport and storage (during the life of the project as well as longer-term) of captured CO_2 along with a resolution to long-term liability issues for selected power generation projects must be addressed, otherwise industry involvement is not likely to occur.

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[1] The 90 percent capture requirement of total CO_2 emissions is more appropriately applied to the FutureGen project where technology demonstration is a principal goal rather than the type of commercial-scale projects contemplated by this proposed program. Furthermore, even after detailed characterization of a sequestration site, there is no certainty that it will be suitable for long-term sequestration. Certainty only comes after injection of significant amounts of CO_2 and thus confirmation of predictions about the storage site. Projects need design flexibility to recover non-CCS operation if initial sequestration fails; thus, it is strongly encouraged that the program specifically recognize the possibility that long-term sequestration may not be possible and specific allowance should be made for this contingency by insuring that a selected project sponsor will not be penalized and forfeit the DOE's financial support if long-term storage proves unsuccessful.

DISCUSSION OF SPECIFIC CONCERNS AND RECOMMENDATIONS:

1. FUNDING LEVEL AND DURATION OF PROPOSED PROGRAM

a. DESCRIPTION OF PROBLEM

On an annualized basis the level of funding proposed by the Department for this initiative is both inadequate and uncertain. Assuming an incremental capture and storage cost of $50/ton CO_2[2], the $156 million in funding requested for FY 2009 is sufficient to support no more than one to three projects for one year.[3] This assumes that the 300 MW project which would likely emit at least two million tons of CO_2 annually and be required to capture 90 percent of those emissions would choose to permanently store only one half of the CO_2 captured and "sell" the remainder to another entity for a beneficial use (e.g., enhanced oil recovery) or "release" such CO_2. If the project could sell the entire amount of captured CO_2 would it not do so? In which case, it would not be eligible for the program; alternatively if there were no opportunity to sell the CO_2 but the CO_2 must be captured, then the per ton of CO_2 benefit is even less given the fact that the government might compensate the project for only one half of the CO_2 captured.

Even if subsequent year appropriations were assured (a highly unlikely event given that appropriation requests are determined annually by Congress and also given the uncertainty beyond 2008 when a new President is in office and support of the program may be terminated) the amount of funding to be acquired annually, in our judgment, is totally inadequate. The CURC has recommended a near term CO_2 program, one element of which is to support the installation and operation of carbon capture and storage on up to 9,000 megawatts of electric generation. The CURC program would provide a 30 percent investment tax credit for CCS equipment and a limited duration—up to ten years per project—production tax credit for CO_2 actually stored or otherwise used for beneficial purposes. The total estimated cost of the CURC program is $8.9 billion. This funding would support five to ten commercial scale projects which we judge to be the minimum number required to provide industry a degree of confidence that CCS is both feasible, reliable and can be made cost acceptable.

b. RECOMMENDATION TO MODIFY THE PROPOSED PROGRAM

Assurances that the contemplated multi-year program will be funded at even the suggested $1.3 billion level are absolutely essential. And, unfortunately, the action taken by the DOE with respect to the FutureGen project is primary evidence of this real concern. In addition, the total amount of funding, as explained above, is not adequate. The DOE is encouraged to modify the program and propose a greatly expanded program, like that already proposed by CURC, which would grant tax incentives to qualifying CCS projects. At a minimum, the Department is encouraged to plan for and commit to a much larger initiative so that there is a program legacy tied to a much more robust industry and government partnership thereby giving both the Department of Energy and industry a basis for encouraging the next Administration to continue a large-scale, industry supported CCS implementation partnership.

The RFI suggests that the DOE may provide support "up to" the incremental cost of a CCS project. The Department is encouraged to clarify the level of support that might be provided. Specifically, a final solicitation should clearly describe what portions of a CCS project (e.g., equipment associated with the capture of CO_2, pipeline transportation infrastructure, acquisition of storage rights, etc.) are eligible for assistance. It is also assumed that the program is intended to cover the entire cost

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[2] DOE (see: Jared Ciferno, National Energy Technology Laboratory, "Existing Coal Power Plants and Climate Change: CO_2 Retrofit Possibilities and Implications" January 24, 2008), and other studies have projected the incremental cost of CCS to be between $40 and $90 per ton.

[3] As an example, a large-scale commercial power project with CCS will need to proceed through a sequence of stages. Those and estimated costs (associated only with CCS) for a 300MW demonstration at ~2MM tons CO_2/yr. (90 percent capture) are:

Phase 1: Initial plant, pipeline feasibility study and preliminary sequestration site screening: $2–$3MM

Phase 2. Plant Front End Engineering Design (FEED), pipeline design and sequestration site detailed characterization: $40–$50MM

Phase 3: Detailed engineering and construction—plant, pipeline, sequestration site facility and wells: $250–$350MM

Phase 4: CCS Commissioning, operation, monitoring for three (3) years: $300MM Total Cost/project: $600MM–$700MM

Thus the program funding of $1.3B is adequate to support only two projects.

of the CCS portion of the project given the fact that the industry participant is willing to add the CCS component to its commercial-scale power generation facility. If this understanding is not correct then the Department needs to explain what is intended. Finally, are annual operating costs of CCS operation for a minimum period of time included in a covered project?

2. ELIGIBILITY OF POWER GENERATION PROJECTS TO PARTICIPATE IN THE CCS PROGRAM:

a. DESCRIPTION OF PROBLEM

The proposed program would be limited to the installation of CCS technology on IGCC units. The goal of the program should be to encourage the application of carbon capture and storage to electricity generation units and not to a single form of electricity generation.

The CURC strongly encourages the Department to expand eligibility to include combustion based systems. This should include post-combustion CCS systems that utilize flue gas cleanup technologies as well as more advanced concepts like oxy-combustion. It is imperative that any program like the one being proposed by the Department seek to insure that all power generation options be incentivized. In this way, the electric utility sector will continue to have a number of options available for the generation of electricity and the capture and storage of CO_2.

Should eligibility be expanded to include combustion-based units then it is also important that the unit size and percent capture criteria be modified, as well. The 300 gross megawatt per unit plant power train is not appropriate for a combustion-based unit.[4] The unit size of pulverized coal units vary widely and if the goal of the proposed program is to provide incentives for commercial scale projects then some other indicia besides megawatts per unit plant power train needs to be employed. In addition, CO_2 capture at this early stage of CCS development will involve capturing the CO_2 from a slip-stream of the flue gases and the criteria that 90 percent of total CO_2 emissions from the unit be captured is also not appropriate.

b. RECOMMENDATION TO MODIFY THE PROPOSED PROGRAM

CCS projects utilizing combustion technology (i.e., flue gas scrubbing or oxygen-fired combustion technology) should be made specifically eligible for the proposed program. It is recommended, however, that there be a separate, parallel program established for CCS projects utilizing combustion technology. The criteria for CCS projects on gasification-based systems versus combustion-based systems are significantly different and trying to integrate into one program eligibility for two different technology paths is likely to cause confusion and controversy.

Second, the megawatt size criteria and the percent of CO_2 capture criteria must be modified to account for the varying unit sizes of commercially-installed coal combustion systems. In addition, early CO_2 capture systems installed on combustion-based units will be applied to portions of the flue gas stream and the 90 percent capture requirement on the entire flue gas stream is not appropriate. Combustion systems utilizing CO_2 capture systems (oxy-combustion or scrubbers), should be validated at 75 percent to 90 percent capture efficiency and approximately one million metric tons per year of CO_2 captured. This goal would be realized at a single plant (oxy-combustion) or a single commercial scale train (i.e., scrubber) operating on a slip-stream of the total flue gas.

3. REQUIREMENT TO CAPTURE 90 PERCENT OF $CO_2$2 AND STORE ONE MILLION TONS ANNUALLY

a. DESCRIPTION OF THE PROBLEM

Recent studies[5] have concluded that the costs to capture 90 percent of CO_2 from an IGCC rise dramatically once more than 65 percent is captured. On combustion systems, capture (oxy-combustion or scrubbers), costs appear to be minimized near

[4] It is assumed that the reference to 300 MW with respect to an IGCC is gross, not net, capacity. The program should clearly state that parasitic power used for CO_2 compression, etc., impacts on the gasifier or gasification train due to elevation or rank of coal used in the project are factors that will not negatively impact the calculation of the 300 MW size.

[5] See: S. Gadde, J. White of WorleyParsons and R. Herbanek, J. Shah of ConocoPhillips: "CO_2 Capture: Impacts on IGCC Plant Performance in a High Elevation Application using Western Sub-Bituminous Coal" at Gasification Technologies Conference, San Francisco, October 15–17, 2007.

85 percent capture, either from the entire plant (oxy-combustion) or a single train (scrubbers).[6,7]

Requiring 90 percent capture will dramatically increase the costs to the government (if the DOE provides financing for the incremental cost of the CCS system) and could dissuade participation by industry where the risk—and costs—will be judged too great. While the 90 percent requirement is an appropriate goal for the FutureGen project given the emphasis upon technology demonstration and maturation, nothing is gained by requiring a generating unit that is planned and constructed to provide competitive electric power to meet a 90 percent criterion when the goal should be to gain commercial experience by capturing some portion of the CO_2. At this stage of CCS technology development there is no compelling reason to require a commercial-sized power plant to assume any added risk, let alone increased costs, of a 90 percent capture system.

The RFI specifically states: ". . . the revised approach will place emphasis on gaining early commercial experience validating clean coal technologies through multiple demonstrations of CCS technology in commercially-operated . . . electric power plants." Given the immature state of experience in using capture technology integrated with an IGCC, for example, CURC believes it is much more prudent to simply encourage the installation of CCS technology on a unit that will be commercially-operated rather than dictate the level of capture. Industry should be free to determine what level of capture of CO_2 makes the greatest sense from both a cost and acceptable risk exposure perspective. Ultimately, as experience is gained and cost and reliability are demonstrated, it is assumed that the marketplace will demand and technology providers will supply the most cost effective and efficient systems. This demand likely will result in technology offerings capable of providing greater and greater percentages of CO_2 capture over time. At a minimum, if a level of capture is imposed in order to qualify for the program, then it is strongly urged that some minimum level of capture (not the maximum level of capture) be set against which the DOE might judge the best project(s) to be selected.

b. RECOMMENDATION TO MODIFY THE PROPOSED PROGRAM

The owner/operators of commercial scale electric generation projects who are willing to install CCS systems onto their projects that will cost hundreds of millions, if not billions, of dollars, should not be restricted to the 90 percent capture requirement that is otherwise germane only to a technology demonstration project (i.e., FutureGen). The goal is the installation of CCS technology at commercial scale. The CURC recommends that no percentage requirement be prescribed in order to qualify for the program but if the DOE determines that a percent requirement is desirable then such requirement should constitute a minimum and be expressed in terms of a "goal" with an expressed statement that the Department will give added weight or preference if a proposer intends to achieve a greater percentage.

4. THE NEED FOR CERTAINTY WITH RESPECT TO LONG-TERM LIABILITY

a. DESCRIPTION OF THE PROBLEM

The Department makes no mention in describing the proposed program of the current lack of a regulatory structure that is required to transport, inject and permanently store the captured CO_2. This is a vitally important element of any forthcoming CCS project. The experience of the FutureGen project as well as the ongoing projects within the regional sequestration partnerships is ample evidence of the complexity surrounding particularly the matters of injection, pore space ownership and short-term and long-term liability associated with CO_2 storage. These mat-

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[6] See: Rao and Rubin, 2006 and DOE–NETL 401/120106.

[7] Two issues drive concerns regarding 90 percent capture on the combustion based plant. First, pulverized coal power plants are built to customer needs and one size does not fit all such needs. Economies of scale for pulverized coal units has led to units well over 500 MW in the U.S. and globally. Therefore, to build 90 percent first of kind CO_2 capture into a new PC would require multiple modules of a post combustion capture technology . . . essentially having to duplicate a demonstration multiple times on the same new power plant . . . clearly an inefficient use of incentives. Second, the quantity of CO_2 produced by high capture on full plant output results in quantities of CO_2 which will likely exceed the scale of first of kind sequestration demonstrations, making siting and integration of sequestration a much larger problem. Oxyfiring does not face the same CO_2 percent capture issues.

For large generating units, e.g., over 400 MW capacity, 65 percent capture even if judged technically feasible, will recover well over one million tons per year of CO_2 (a 1000 MW unit would capture 6–7 million TPY). The state of knowledge of storage technology in geologic formations is not sufficient at this point to address this volume of gas in a storage project. The purpose of advancing storage technology would be better served by having more locations evaluated with less CO_2 injection, as long as the injection quantity is substantial (e.g., 500,000 TPY).

ters are being addressed through Federal, State and local government's affirmative intervention. First-of-a-kind commercial-scale CCS projects, like those anticipated by the proposed program, will require similar assistance.

The establishment of a permanent regulatory regime has yet to be addressed. The absence of such a regulatory structure creates an unacceptable degree of risk and uncertainty which means that no action to undertake CCS projects will likely take place. In the interim, CCS projects implemented on commercial-scale power generation projects cannot await the years necessary to consider, debate and structure a permanent set of regulations and practices to address the storage of CO_2. Answers to questions about transporting CO_2, ownership of the storage reservoirs, injection of the CO_2 and liability issues attendant to the near-term and then long-term storage of the CO_2 must be addressed at the outset of the process when a CCS project is planned. The DOE, and various agencies of the Federal Government, have major roles to play in this process. More importantly, with respect to those projects that may participate in the program now under consideration, the DOE, and the Federal Government in general, must recognize that these early projects will require separate attention and unique consideration.

b. RECOMMENDATION TO MODIFY THE PROPOSED PROGRAM

The FutureGen project is clear evidence of the enormous complexity facing any project seeking to install CCS technology and store CO_2 in a deep saline reservoir. It cannot be assumed, as the RFI suggests, that potential project sponsors will chose to site commercial-scale electric generation plants within reasonable proximity of the four sites considered by the FutureGen Industrial Alliance just to participate in this program. If as DOE suggests this program is being initiated to support industry activity now underway then the prospect of financial incentives alone will not be sufficient. To reduce the time required to identify potential storage sites, characterize such sites, obtain Federal and State and local government commitments related to long-term liability issues, conduct the necessary NEPA reviews and environmental impact statements, etc., all of which has been accomplished by the FutureGen project and requiring five and more years to complete will require a substantial commitment by government. The DOE must acknowledge this challenge in the final solicitation for projects and define specifically how the government intends to assist in addressing these various issues.

With respect to projects that are selected to participate in this program it is strongly recommended that the Federal Government commit to assume long-term liability for monitoring, safety, etc., of the stored CO_2. Without an assurance of this nature and in the absence of an existing regulatory regime that specifically addresses this issue it is not likely that owners/operators of commercial scale electricity projects will get involved. The CURC will be pleased to work with the DOE to suggest other specific actions that the Department or other federal agencies will need to take in order to address the challenges identified herein.

CONCLUSIONS:

In order to initiate the proposed program and insure industry participation it is strongly recommended that the DOE incorporate the recommendations made in this submittal. The need to develop carbon capture and storage technology if greenhouse gas regulation is enacted is not disputed. It will require the combined resources of industry and governments at all levels working in partnerships to accomplish rapid introduction of CCS technology. The CURC will be pleased to work with the Department in structuring this important program.

BIOGRAPHY FOR BEN YAMAGATA

Ben Yamagata is Executive Director of the Coal Utilization Research Council (CURC) and has worked in that capacity since 1998. CURL is an ad-hoc industry group, composed of a diverse array of State, university and business interests. CURL members work together to promote coal utilization research and development and to build collaborative, effective partnerships between the various sectors of the coal industry and government to commercialize new coal technologies.

Through his work, Mr. Yamagata has formed strategic relationships with numerous coal-based utilities, coal companies, the U.S. Department of Energy as well as equipment manufacturers that provide technology and equipment to the power generation industry. These relationships include: Air Products and Chemicals, American Electric Power, Arch Coal, Inc., CONSOL Energy, Inc., Duke Energy Services, FutureGen Alliance, General Electric Company, Kennecott Energy Company/Rio

Tinto, Peabody Energy, Shell U.S. Gas & Power, Siemens Power Generation, Wisconsin Energy Corporation, Xcel Energy and many more.

Additionally, Mr. Yamagata has been a partner in the Washington D.C. law firm of Van Ness Feldman since 1979. Ben encompasses federal and State legislative and administrative issues in the areas of energy, environment, natural resources, and transportation-related matters. His special expertise includes representation before the legislative and executive branches of the Federal Government with particular emphasis on government incentives and other mechanisms for the development, demonstration and commercial deployment of new technologies.

Prior to entering private practice, Mr. Yamagata was employed as Counsel and Staff Director to the Subcommittee on Energy Research and Development of the Senate Committee on Energy and Natural Resources.

Mr. Yamagata received his B.A. from Harvard College in 1969, and his J.D. from the George Washington University National Law Center in 1972. Mr. Yamagata is admitted to practice in the District of Columbia. He is a member of the American Bar Association and the District of Columbia Bar.

Chairman LAMPSON. Thank you, Mr. Yamagata.

Mr. Phillips.

STATEMENT OF MR. JEFFREY N. PHILLIPS, PROGRAM MANAGER, ADVANCED COAL GENERATION, THE ELECTRIC POWER RESEARCH INSTITUTE (EPRI)

Mr. PHILLIPS. Good afternoon, Chairman Lampson, Ranking Member Inglis and the other Members of the Subcommittee. I would like to thank you for inviting me to speak on behalf of our institute. Even though I have an engineering degree from Stanford in California and I now live in North Carolina, I would like to point out that I grew up in Congressman Hall's district and I understand he is under the weather today but I am sure if he was here, he would agree with me as would the former Speaker, Sam Rayburn, for whom this building is named, that the best people come from the 4th district of Texas.

Regarding FutureGen, I would like to just make a couple of key points that are covered in detail in my written testimony. First, FutureGen would be a very important step in demonstrating carbon capture and storage from a coal power plant but it is only one piece of what should be in a comprehensive RD&D. That is a research, development and demonstration program. And unfortunately, many of those other pieces are missing. Now, why do we need a lot of pieces in a comprehensive RD&D program? EPRI has previously provided economic analysis that shows the value of a full portfolio approach to solving the challenge of climate change, and in fact, that was the lead article in our latest journal, and basically what it comes down to is that the more options we have for generating electricity with a low CO_2 footprint, the cheaper that electricity will be.

Now, there are three generic ways to capture CO_2 from coal power plants, what we call pre-combustion capture, with an IGCC, which is what FutureGen seeks to demonstrate; post-combustion capture, where you add a CO_2 capture process onto a conventional polarized coal plant, and burning the coal in pure oxygen, what we call oxy-combustion, which produces an exhaust concentrated in CO_2. Now, none of those three ways are sufficiently developed to the point that anyone can say for sure what their ultimate cost will be or how well they will perform. Consequently, we ought to have an RD&D program for all three. As I said last year before a Senate

committee, there is no silver bullet for controlling CO_2 emissions. What we should be aiming for is silver buckshot.

The second point I want to make is that the cost of building coal power plants and really all types of infrastructure projects has risen significantly over the past three years. This is a consequence of an increase in global demand for energy-related infrastructure, which has driven up the costs of materials and made engineers a hot commodity, and when was the last time you heard somebody say that engineers were hot? Now, I have my American Society of Mechanical Engineers pin on today and I know that Mr. Yamagata is very envious, but anyway, my point is that these cost increases need to be taken into account when setting the budgets for demonstration projects.

Finally, let me note that EPRI and our members recognize that we cannot and should not rely on the Federal Government to do all the heavy lifting in developing and demonstrating advanced electricity technologies. To that end, EPRI has identified a number of demonstration projects that target critical steps on a path to achieving our full portfolio. Among these are two projects for demonstrating different post-combustion capture technologies, a project to demonstrate IGCC operation with various levels of CO_2 capture, a high-efficiency pulverized coal plant with state-of-the art emission controls and integrated CO_2 capture that we call UltraGen, and demonstration of a key enabling technology to lower the cost of oxygen production for both IGCC and oxy-combustion plants. Last week EPRI's board of directors approved moving forward with these projects, which are designed to complement ongoing private-sector and government activities. Each will require a consortium of companies and will draw both private-sector and government funding as appropriate for each. These initial demonstration projects are steps along the road to a commercial-scale operation of future advanced coal plants, and with the collaboration of others in both the public and private sector, EPRI is already making plans for future, larger-scale demonstrations of these technologies.

This concludes my testimony. EPRI appreciates the opportunity to testify on this important topic, and I will be happy to answer any questions you may have.

[The prepared statement of Mr. Phillips follows:]

PREPARED STATEMENT OF JEFFREY N. PHILLIPS

Thank you, Chairman Lampson, Ranking Member Inglis, and Members of the Subcommittee. I am Jeffrey Phillips, Program Manager, Advanced Coal Generation for the Electric Power Research Institute (EPRI). EPRI conducts research and development on technology, operations and the environment for the global electric power industry. As an independent, non-profit Institute, EPRI brings together its members, scientists and engineers, along with experts from academia, industry and other centers of research to:

- collaborate in solving challenges in electricity generation, delivery and use;
- provide technological, policy and economic analyses to drive long-range research and development planning; and
- support multi-discipline research in emerging technologies and issues.

EPRI's members represent more than 90 percent of the electricity generated in the United States, and international participation extends to 40 countries. EPRI has major offices and laboratories in Palo Alto, California; Charlotte, North Carolina; Knoxville, Tennessee, and Lenox, Massachusetts.

EPRI appreciates the opportunity to provide testimony to the Subcommittee for the hearing entitled, "*The Department of Energy's FutureGen Program*."

The Role of the FutureGen program in a comprehensive federal research and development effort to develop and deploy carbon capture and sequestration technologies.

The FutureGen Industrial Alliance and the Department of Energy (DOE) were intending to build a first-of-its-kind, near-zero emissions coal-fed integrated gasification combined cycle (IGCC) power plant integrated with CO_2 capture and storage (CCS) The project aimed at storing CO_2 in a representative geologic formation at a rate of at least one million metric tons per year, beginning in 2013.

A general description of IGCC plants and the role of IGCC with CCS as part of a strategy to develop and deploy a full portfolio of advanced coal with CCS technologies were included in testimony recently provided by John Novak of EPRI before the Senate Science, Technology and Innovation Subcommittee of the Committee on Commerce, Science, and Transportation. A copy of that testimony is included in Appendix A to this testimony for your reference.

EPRI stresses that no single advanced coal generating technology (or any generating technology) has clear-cut economic advantages across the range of U.S. applications. The best strategy for meeting future electricity needs in an economic and environmentally sustainable way lies in developing multiple technologies from which power producers (and their regulators) can choose the one best suited to local conditions and preferences. EPRI strongly recommends that policies reflect a portfolio approach that enables commercial incorporation of CCS into multiple advanced coal power technologies.

Through the development and deployment of advanced coal plants with integrated CO_2 capture and storage (CCS) technologies, coal power can become part of the solution to satisfying both our energy needs and our global climate change concerns. However, a sustained RD&D program at heightened levels of investment and the resolution of legal and regulatory unknowns for long-term geologic CO_2 storage will be required to achieve the promise of advanced coal with CCS technologies. The members of EPRI's *CoalFleet for Tomorrow*® program—a research collaborative comprising more than 60 organizations representing U.S. utilities, international power generators, equipment suppliers, government research organizations, coal and oil companies, and a railroad—see crucial roles for both industry and governments worldwide in aggressively pursuing collaborative RD&D over the next 20+ years to create a full portfolio of commercially self-sustaining, competitive advanced coal power generation and CCS technologies. Elements of the CoalFleet RD&D program were included in testimony recently provided by John Novak of EPRI before the Senate Science, Technology and Innovation Subcommittee of the Committee on Commerce, Science, and Transportation, included in Appendix A.

The key to proving CCS capability is the demonstration of CCS at large-scale (on the order of 100,000 to one million tons CO_2/year) for IGCC, for pulverized coal (PC) and for oxy-combustion, with storage in a variety of geologies. We must start immediately if we are to meet the CoalFleet goals of demonstrating a full portfolio of advanced coal with CCS technologies by 2025.

EPRI's assessment of the proposed restructured FutureGen program and the program's potential to complement other federal research and development efforts on carbon capture and sequestration technologies including the Clean Coal Power Initiative (CCPI) and the Carbon Sequestration Partnership Program (CSPP).

In January of this year, DOE announced a restructured approach to the FutureGen project. Previously, the FutureGen Industrial Alliance and DOE were intending to build a first-of-its-kind, near-zero emissions coal-fed IGCC power plant integrated with CCS. The commencement of full-scale operations was targeted for 2013. The project aimed at storing CO_2 in a representative geologic formation at a rate of at least one million metric tons per year. DOE had committed to spend $1.1 billion in support of the project while the FutureGen Industrial Alliance had agreed to contribute $400 million.

Under its revised approach, DOE will offer to pay the additional cost of capturing CO_2 at multiple IGCC plants. Each plant would capture and store at least one million tons of CO_2 per year. DOE's goal is to have the plants in operation between 2015 and 2016.

The original FutureGen concept was meant to serve as a "living laboratory" for testing advanced technologies that offered the promise of clean environmental performance at a reduced cost and increased reliability. The original FutureGen con-

cept, as shown in Figure 1 was to have the flexibility to conduct full-scale and slip-stream tests of such scalable advanced technologies as:

- Membrane processes to replace cryogenic separation for oxygen production
- An advanced transport reactor side-stream with 30 percent of the capacity of the main gasifier
- Advanced membrane and solvent processes for H_2 and CO_2 separation
- A raw gas shift reactor that reduces the upstream clean-up requirements
- Ultra-low-NO_X combustors that can be used with high-hydrogen synthesis gas
- A fuel cell hybrid combined cycle pilot
- Smart dynamic plant controls including a CO_2 management system

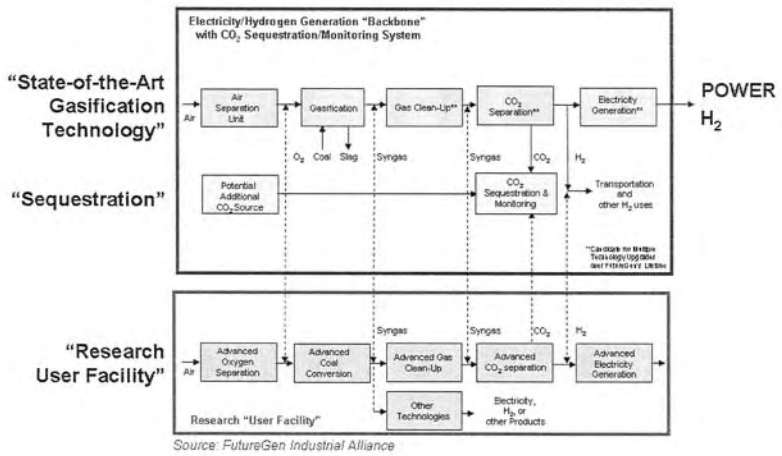


Figure 1 – FutureGen technology platforms

While the revised DOE FutureGen concept will meet the original goal of having a CCS test of at least one million tons of CO_2 per year (albeit two to three years later than the original target according to DOE), the other original goal of also hosting the development of several advanced technologies for decreasing plant costs appears to have been dropped.

EPRI has responded to DOE's Request for Information (RFI) on the revised FutureGen concept. We asked for clarification on what aspects of the costs of including CO_2 capture and storage (CCS) would be covered, and we gave our estimate of what the total costs would be for including CCS on one train of a two-train 600 MW IGCC. We also highlighted the other major RD&D activities that are needed for improving the efficiency and cost of IGCC technologies with CO_2 capture (see Figure 2). In addition, we asked whether non-IGCC coal power plants that capture at least one million tons of CO_2 per year could qualify for funding under the revised FutureGen concept. For example, would the incremental CCS costs of a project such as our proposed UltraGen advanced SCPC plant with post-combustion capture and geological storage of CO_2 be eligible for DOE support under the restructured FutureGen concept. I have included this response, which was submitted by our Vice President for Environment and Generation, Bryan Hannegan, as Appendix B to this testimony for your reference.

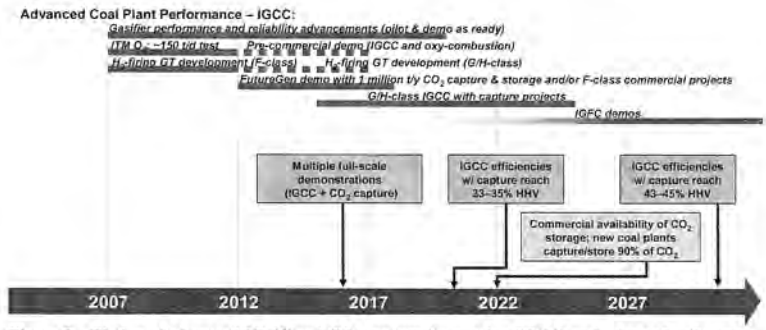


Figure 2 – Timing of advanced IGCC and CO_2 capture integration RD&D activities and milestones

I would like to elaborate on the cost of adding CO_2 capture to IGCC. EPRI's CoalFleet for Tomorrow® program has been tracking the costs of various types of coal-based power plants, and we have seen a remarkable increase in these costs over the past two years. Figure 3 provides an overview of various indices that could be used to track the inflation of construction projects. It can be seen that while the GDP Deflator index, which reflects inflation in the entire U.S. economy, rose less than 15 percent between 2000 and 2006, all of the construction cost indices rose at least 20 percent and in several cases reached 30 percent over that same period. Even more striking is the rapid increase seen in the Handy-Whitman Electricity Utility Construction Index and the IHS–CERA Downstream Construction Index (DCCI) since 2006. My colleagues believe the DCCI is most representative of IGCC and CO_2 capture cost trends because IGCC and CO_2 capture equipment is similar to equipment used in the "downstream" oil and gas industry (i.e., refining and petrochemicals).

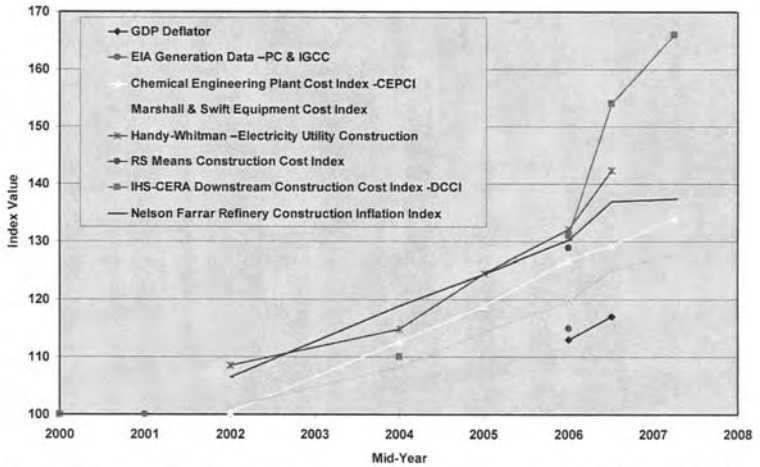


Figure 3 – Inflation indices for construction projects – all indices are set to 100 in the year 2000.

It is clear that the cost for coal power projects (and really all types of infrastructure construction projects) is increasing more rapidly than general inflation. In our response to the FutureGen RFI, Dr. Hannegan has provided EPRI's current estimate for the cost of adding CO_2 capture to one train of a two-train IGCC which has a combined power output capacity of 630 MW (before capture is added). Such a system would be capable of capturing up to 1.6 million tons of CO_2 per year. The de-

tails can be found in the Appendix to my testimony, but the results are summarized in Table 1.

Table 1 – Estimated Costs of Adding CO_2 Capture to an IGCC (one 315 MW train)

Cost of CO_2 Capture Equipment	$80-100 million
Cost of CO_2 pipeline and storage wells	$100 million
Cost of maintenance on added equipment	$6.3 million/yr
Cost of lost power production	$18.2 million/yr
Total cost for a 10 year demonstration	$425-445 million

Using the upper end of the estimate in Table 1, DOE's proposed total budget of $1.3 billion would be slightly less than what would be required for three such projects (approximately $1.335 billion). However, DOE's proposed budget is on an "as spent" basis where inflation is included. EPRI's estimate is based on 2007 dollars and does not reflect potential future escalation. If costs between 2008 and 2015 increase at the same rate as they have between 2000 and 2007, one could expect as much as a 66 percent increase in costs. That would escalate EPRI's per project total to approximately $706–739 million, and the DOE total budget of $1.3 billion would not be sufficient to support even two projects unless the demonstration time period was decreased.

Potential to Complement the Clean Coal Power Initiative (CCPI) and the Carbon Sequestration Partnership Program (CSPP).

As noted earlier, EPRI believes a comprehensive CCS RD&D program must encourage the commercialization of multiple technologies beyond just IGCC with CCS. The CCPI program could serve as a complement to the FutureGen program by subsidizing the demonstration costs of non-IGCC projects. However, the funding level of the CCPI has been inadequate to support a robust demonstration program. The Administration's budget request for FY 2009 is $85 million. EPRI's estimate of the incremental cost for one 200 MW scale post combustion CCS demonstration is $340 million and this total does not include the cost of a CO_2 pipeline or the injection wells.[1]

In addition, there are opportunities for decreasing the cost of IGCC plants outside of the CO_2 capture technology equipment which would benefit from a demonstration program. Since the restructured FutureGen program does not appear to support such demonstrations, they would have to compete with the non-IGCC projects for the sparse CCPI dollars.

Since the restructured FutureGen program delays the implementation of a large-scale (>1 million tons of CO_2/yr.) CCS project integrated with an IGCC, it is more important than ever that the CSPP implement multiple large-scale CCS projects in a variety of geologic formations by the 2012 timeframe when the original FutureGen was scheduled to start. While the CSPP sequestration projects will not be able to use CO_2 captured from coal plants1, such tests will help us address the legal issues (permitting and liability) of CO_2 sequestration while also increasing our experience with predicting and monitoring the location of underground CO_2 plumes and building public confidence in the concept of deep geologic storage.

To be effective in proving the concept, the large-scale sequestration projects in the CSPP should inject on the order of 100,000 to one million tons or more of CO_2 for at least three years. Monitoring of the underground location of the CO_2 to verify computer simulations will take another three to five years after injection has stopped. Consequently, in order to have large-scale sequestration proven in multiple U.S. geologies by 2020, it is necessary to have the injections begin by 2012.

[1] It would not be cost-effective for a power plant to build CO_2 capture equipment and then sell the CO_2 for a CSPP test for only 2–3 years—the per ton cost of the CO_2 would be higher than other options. In addition, it would be difficult to construct such a large system by 2012 unless design and permitting activities such as those already conducted by the FutureGen Industrial Alliance had already taken place by today.

Appendix A

TESTIMONY

Hearing of the Science, Technology and Innovation Subcommittee of the Committee on Commerce, Science, and Transportation

United States Senate

JOHN NOVAK
EXECUTIVE DIRECTOR, FEDERAL AND INDUSTRY ACTIVITIES
ENVIRONMENT AND GENERATION
THE ELECTRIC POWER RESEARCH INSTITUTE

APRIL 9, 2008

Introduction

Thank you, Mr. Chairman, Ranking Member Ensign, and Members of the Subcommittee. I am John Novak, Executive Director of Federal and Industry Activities for the Environment and Generation Sectors of the Electric Power Research Institute (EPRI). EPRI conducts research and development on technology, operations and the environment for the global electric power industry. As an independent, non-profit Institute, EPRI brings together its members, scientists and engineers, along with experts from academia, industry and other centers of research to:

- collaborate in solving challenges in electricity generation, delivery and use;
- provide technological, policy and economic analyses to drive long-range research and development planning; and
- support multi-discipline research in emerging technologies and issues.

EPRI's members represent more than 90 percent of the electricity generated in the United States, and international participation extends to 40 countries. EPRI has major offices and laboratories in Palo Alto, California; Charlotte, North Carolina; Knoxville, Tennessee, and Lenox, Massachusetts.

EPRI appreciates the opportunity to provide testimony to the Subcommittee on the topic of integrated gasification combined cycle (IGCC) technologies and the need for large scale IGCC demonstration projects that feature CO_2 capture and sequestration.

Integrated Gasification Combined Cycle (IGCC)

In integrated gasification combined cycle plants, coal or petroleum coke is partially oxidized with oxygen to CO and hydrogen, the impurities cleansed in an acid gas removal process and the clean gas (called "syngas") burned in a combined cycle to produce electricity. The energy use in the cycle is integrated between the gasification section and the power block, hence the name.

There are only six IGCC plants in the world operating on coal. These operating units also use petroleum coke or blends due to its lower price. One, the Vresova IGCC based in the Czech Republic (Lurgi-type gasifier) is 350 MW. The others are each about 250 MW. The two in the United States are Wabash (ConocoPhillips gasifier) and Polk (GE gasifier) in Indiana and Florida. Two additional IGCCs in Europe are Buggenum Netherlands and Puertollano Spain (both variations on the Shell gasifier). A new IGCC started operation this year at Nakoso, Japan (MHI gasifier). Chemical plants around the world have accumulated a 100-year experience base operating coal-based gasification units and related gas cleanup processes. The most advanced of these units are similar to the front end of a modern IGCC facility. Similarly, several decades of experience firing natural gas and petroleum distillate have established a high level of maturity for the basic combined cycle generating technology.

IGCC technology is still relatively new and needs more commercial installations. Based on the limited data available, today's IGCC plants are available 5–7 percent fewer hours per year than conventional pulverized coal (PC) plants. While it is likely that IGCC will "catch up" with PC, the initial learning curve on all IGCCs to date has been slow. Better designs, models, incorporation of lessons learned would all help. On-going RD&D continues to provide significant advances in the base tech-

nologies, as well as in the suite of technologies used to integrate them into an IGCC generating facility.

The emissions of air pollutants and greenhouse gases from an IGCC are less than a conventional pulverized coal plant (though latest designs make this difference smaller). The IGCC design uses less water than a conventional coal plant since a great deal of power comes from the gas turbine. The pre-cleaning of primary pollutants prior to combustion in the gas turbine allows possible later capture of CO_2 from a concentrated high-pressure gas requiring relatively low energy use.

IGCC plants (like PC plants) do not capture CO_2 without substantial plant modifications, energy losses, and investments in additional process equipment. No one is currently capturing CO_2 at full scale from IGCC plants that generate electricity from coal. CO_2 separation processes suitable for IGCC plants are used commercially in the oil and gas and chemical industries at a scale close to that ultimately needed, but their application requires the addition of more processing equipment to an IGCC plant and the deployment of gas turbines that can burn nearly pure hydrogen.

The electricity cost premium for including CO_2 capture in IGCC plants, along with drying, compression, transportation, and storage, is about 40–50 percent. Although this is a lower cost increase in percentage terms than that for conventional PC plants, IGCC plants initially cost more than PC plants. Thus, the bottom-line cost to consumers for power from IGCC plants with capture using today's technology is likely to be comparable to that for PC plants with capture (the actual relative competitiveness depends on coal moisture content and other factors as described below). However, the magnitude of these impacts could likely be reduced substantially through aggressive investments in R&D.

The CO_2 capture cost premiums listed above vary in real-world applications, depending on available coals and their physical-chemical properties, desired plant size, the CO_2 capture process and its degree of integration with other plant processes, plant elevation, the value of plant co-products, and other factors. Nonetheless, IGCC with CO_2 capture generally shows an economic advantage in studies based on low-moisture bituminous coals. For coals with high moisture and low heating value, such as sub-bituminous and lignite coals, an EPRI study shows PC with CO_2 capture being competitive with or having an advantage over IGCC.[2] EPRI stresses that no single advanced coal generating technology (or any generating technology) has clear-cut economic advantages across the range of U.S. applications. The best strategy for meeting future electricity needs in an economic and environmentally sustainable way lies in developing multiple technologies from which power producers (and their regulators) can choose the one best suited to local conditions and preferences. EPRI strongly recommends that policies reflect a portfolio approach that enables commercial incorporation of CCS into multiple advanced coal power technologies.

The key to proving CCS capability is the demonstration of CCS at large-scale (on the order of one million tons CO_2/year) for both pre- and post-combustion capture with storage in a variety of geologies. Large combined capture and storage demonstrations should be encouraged in different regions and with different coals and technologies.

Advanced Coal Generation with CO_2 Capture and Storage

Through the development and deployment of advanced coal plants with integrated CO_2 capture and storage (CCS) technologies, coal power can become part of the solution to satisfying both our energy needs and our global climate change concerns. However, a sustained RD&D program at heightened levels of investment and the resolution of legal and regulatory unknowns for long-term geologic CO_2 storage will be required to achieve the promise of advanced coal with CCS technologies. The members of EPRI's *CoalFleet for Tomorrow*® program—a research collaborative comprising more than 60 organizations representing U.S. utilities, international power generators, equipment suppliers, government research organizations, coal and oil companies, and a railroad—see crucial roles for both industry and governments worldwide in aggressively pursuing collaborative RD&D over the next 20+ years to create a full portfolio of commercially self-sustaining, competitive advanced coal power generation and CCS technologies.

Key Points:

- Advanced coal power plant technologies with integrated CO_2 capture and storage (CCS) will be crucial to lowering U.S. electric power sector CO_2 emissions. They will also be crucial to substantially lowering global CO_2 emissions.

[2] Feasibility Study for an Integrated Gasification Combined Cycle Facility at a Texas Site, EPRI report 1014510, October 2006.

- The availability of advanced coal power and integrated CCS and other technologies could dramatically reduce the projected increases in the cost of wholesale electricity under a carbon cap.
- It is important to avoid choosing between coal technology options. We should foster a full portfolio of technologies.
- While there are well-proven methods for capturing CO_2 resulting from coal gasification, no IGCC plant captures CO_2. IGCC technology is still relatively new and in need of more commercial installations.
- PC technology is already well proven commercially in the power industry, although potential for significant improvement exists; the need is for demonstration of post combustion capture at a commercial and affordable scale.
- There will inevitably be additional costs associated with CCS. EPRI's latest estimates suggest that the levelized cost of electricity (COE) from new coal plants (IGCC or supercritical PC) designed for capture, compression, transportation and storage of the CO_2 will be 40–80 percent higher than the COE of a conventional supercritical PC (SCPC) plant.
- EPRI's technical assessment work indicates that the preferred technology and the additional cost of electricity for CCS will depend on the coal type, location and the technology employed. Without CCS, SCPC has an advantage over IGCC. However, the additional CCS cost is generally lower with IGCC than for SCPC.
- Some studies show an advantage for IGCC with CCS with bituminous coal. With lignite coal, SCPC with CCS is generally preferred. With sub-bituminous coal, SCPC with CCS and IGCC with CCS appear to show similar costs.
- Our initial work with post-combustion CO_2 capture technologies suggests we can potentially reduce the current estimated 30 percent energy penalty associated with CCS to about 15 percent over the longer-term. Improvements in IGCC plants offer a comparable potential for reducing the cost and energy penalty as well.
- The key to proving CCS capability is the demonstration of CCS at large-scale (i.e., on the order of one million tons CO_2/year) for both pre- and post-combustion capture and oxy-combustion with storage in a variety of geologies. Large combined capture and storage demonstrations should be encouraged in different regions and with different coals and technologies.
- EPRI's *CoalFleet for Tomorrow®* program has identified the RD&D pathways to demonstrate, by 2025, a full portfolio of economically attractive, commercial-scale advanced coal power and integrated CCS technologies suitable for use with the broad range of U.S. coal types. EPRI is currently developing collaborations to develop and demonstrate a series of IGCC and post combustion capture processes to improve the cost and energy use of integrated gasification plus capture and post combustion technologies. Some technologies will be ready for some fuels sooner, but the economic benefits of competition are not achieved until the full portfolio is developed.
- The identified RD&D is estimated to cost $8 billion between now and 2017 and $17 billion cumulatively by 2025, and we need to begin immediately to ensure that these climate change solution technologies will be fully tested at scale by 2025.
- Major non-technical barriers associated with CO_2 storage need to be addressed before CCS can become a commercial reality, including resolution of regulatory and long-term liability uncertainties.

The Role of Advanced Coal Generation with CO_2 Capture and Storage in a Carbon-Constrained Future

Coal currently provides over half of the electricity used in the United States, and most forecasts of future energy use in the United States show that coal will continue to have a dominant share in our electric power generation for the foreseeable future. Coal is a stably priced, affordable, domestic fuel that can be used in an environmentally responsible manner. Through development of advanced pollution control technologies and sensible regulatory programs, emissions of criteria air pollutants from new coal-fired power plants have been reduced by more than 90 percent over the past three decades. And by displacing otherwise needed imports of natural gas or fuel oil, coal helps address America's energy security and reduces our trade deficit with respect to energy.

EPRI's "Electricity Technology in a Carbon-Constrained Future" study suggests that it is technically feasible to reduce U.S. electric sector CO_2 emissions by 25–30 percent relative to current emissions by 2030 while meeting the increased demand for electricity. The study showed that the largest single contributor to emissions reduction would come from the integration of CCS technologies with advanced coal-based power plants coming on-line after 2020.

Economic analyses of scenarios to achieve the study's emission reduction goals show that in 2050, a U.S. electricity generation mix based on a full portfolio of technologies, including advanced coal technologies with integrated CCS and advanced light water nuclear reactors, results in wholesale electricity prices at less than half of the wholesale electricity price for a generation mix without advanced coal/CCS and nuclear power. In the case with advanced coal/CCS and nuclear power, the cost to the U.S. economy of a CO_2 emissions reduction policy is $1 trillion less than in the case without advanced coal/CCS and nuclear power, with a much stronger manufacturing sector. Both of these analyses are documented in the 2007 EPRI Summer Seminar Discussion paper, "*The Power to Reduce CO_2 Emissions—the Full Portfolio,*" available at *http://epri-reports.org/DiscussionPaper2007.pdf*

Accelerating RD&D on Advanced Coal Technologies with CO_2 Capture and Storage-Investment and Time Requirements

The portfolio aspect of advanced coal with integrated CCS technologies must be emphasized because no single advanced coal technology (or any generating technology) has clear-cut economic advantages across the range of U.S. applications. The best strategy for meeting future electricity needs while addressing climate change concerns and minimizing economic disruption lies in developing a *full portfolio* of technologies from which power producers (and their regulators) can choose the option best suited to local conditions and preferences and provide power at the lowest cost to the customer. Toward this end, four major technology efforts related to CO_2 emissions reduction from coal-based power systems must be undertaken:

1. Increased efficiency and reliability of IGCC power plants
2. Increased thermodynamic efficiency of PC power plants
3. Improved technologies for capture of CO_2 from coal combustion- and gasification-based power plants
4. Reliable, acceptable technologies for long-term storage of captured CO_2

Identification of mechanisms to share RD&D financial and technical risks and to address legal and regulatory uncertainties must take place as well.

In short, a comprehensive recognition of all the factors needed to hasten deployment of competitive, commercial advanced coal and integrated CO_2 capture and storage technologies—and implementation of realistic, pragmatic plans to overcome barriers—is the key to meeting the challenge to supply affordable, environmentally responsible energy in a carbon-constrained world.

A typical path to develop a technology to commercial maturity consists of moving from the conceptual stage to laboratory testing, to small pilot-scale tests, to larger-scale tests, to multiple full-scale demonstrations, and finally to deployment in full-scale commercial operations. For capital-intensive technologies such as advanced coal power systems, each stage can take years or even a decade to complete, and each sequential stage entails increasing levels of investment. As depicted in Figure 1, several key advanced coal power and CCS technologies are now in (or approaching) an "adolescent" stage of development. This is a time of particular vulnerability in the technology development cycle, as it is common for the expected costs of full-scale application to be higher than earlier estimates when less was known about scale-up and application challenges. Public agency and private funders can become disillusioned with a technology development effort at this point, but as long as fundamental technology performance results continue to meet expectations, and a path to cost reduction is clear, perseverance by project sponsors in maintaining momentum is crucial.

Unexpectedly high costs at the mid-stage of technology development have historically come down following market introduction, experience gained from "learning-by-doing," realization of economies of scale in design and production as order volumes rise, and removal of contingencies covering uncertainties and first-of-a-kind costs. An International Energy Agency study led by Carnegie Mellon University (CMU) observed this pattern of cost-reduction-over-time for power plant environmental controls, and CMU predicts a similar reduction in the cost of power plant

CO_2 capture technologies as the cumulative installed capacity grows.[3] EPRI concurs with their expectations of experience-based cost reductions and believes that RD&D on specifically identified technology refinements can lead to greater cost reductions sooner in the deployment phase.

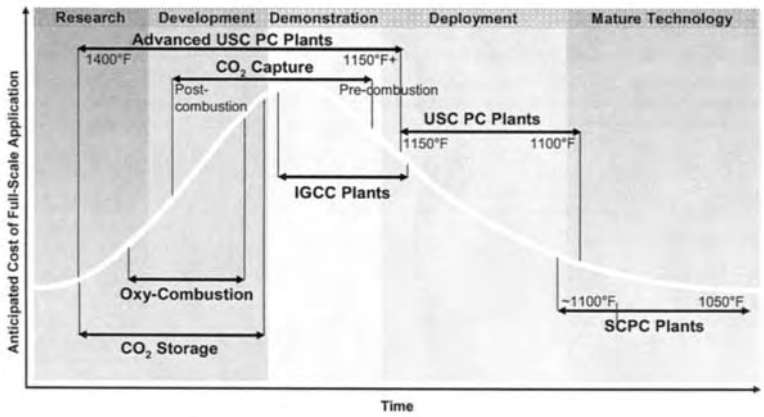
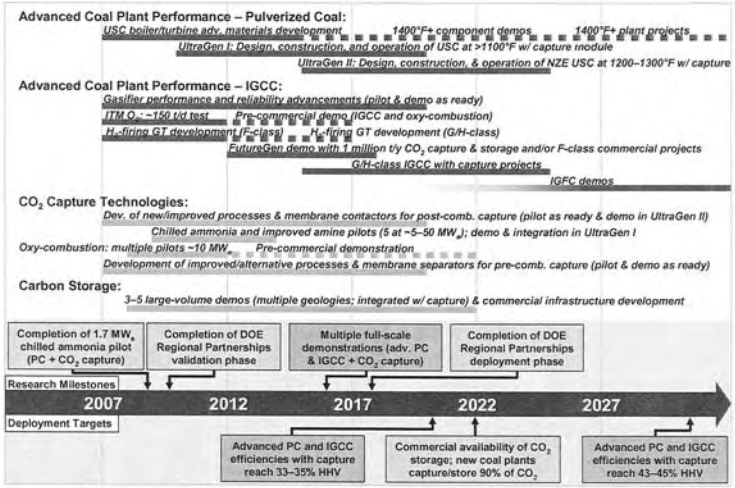


Figure 1 – Model of the development status of major advanced coal and CO_2 capture and storage technologies (temperatures shown for pulverized coal technologies are turbine inlet steam temperatures)

Of the coal-based power generating and carbon sequestration technologies shown in Figure 1, only SCPC technology has reached commercial maturity. It is crucial that other technologies in the portfolio—namely ultra-supercritical (USC) PC, IGCC, CO_2 capture (pre-combustion, post-combustion, and oxy-combustion), and CO_2 storage—be given sufficient support to reach the stage of declining constant dollar costs before society's requirements for greenhouse gas reductions compel their application in large numbers.

Figure 2 depicts the major activities in each of the four technology areas that must take place to achieve a robust set of integral advanced coal/CCS solutions. Please note that UltraGen III is not included in Figure 2 but the schedule for "Design, construction & operation of NZE USC PC at up to 1400°F w/capture" is expected to commence around 2020. Important, but not shown in the figure, are the interactions between RD&D activities. For example, the ion transport membrane (ITM) oxygen supply technology shown under IGCC may also be able to be applied to oxy-combustion PC units. Further, while the individual goals related to efficiency, CO_2 capture, and CO_2 storage present major challenges, significant challenges also arise from complex interactions that occur when CO_2 capture processes are integrated with gasification- and combustion-based power plant processes.

[3] IEA Greenhouse Gas R&D Programme (IEA GHG), "Estimating Future Trends in the Cost of CO_2 Capture Technologies," 2006/5, January 2006.



Source: The Power to Reduce CO_2 Emissions – the Full Portfolio," http://epri-reports.org/DiscussionPaper2007.pdf

Figure 2 – Timing of advanced coal power system and CO_2 capture and storage RD&D activities and milestones

Reducing CO_2 **Emissions Through Improved Coal Power Plant Efficiency—A Key Companion to CCS that Lowers Cost and Energy Requirements**

Improved thermodynamic efficiency reduces CO_2 emissions by reducing the amount of fuel required to generate a given amount of electricity. A two percentage point gain in efficiency provides a reduction in fuel consumption of roughly five percent and a similar reduction in flue gas and CO_2 output. Because the size and cost of CO_2 capture equipment is determined by the volume of flue gas to be treated, higher power block efficiency reduces the capital and energy requirements for CCS. Depending on the technology used, improved efficiency can also provide similar reductions in criteria air pollutants, hazardous air pollutants, and water consumption.

A typical base-loaded 500 MW (net) coal plant emits about three million metric tons of CO_2 per year. Individual plant emissions vary considerably given differences in plant steam cycle, coal type, capacity factor, and operating regimes. For a given fuel, however, a new supercritical PC unit built today might produce 5–10 percent less CO_2 per megawatt-hour (MWh) than the existing fleet average for that coal type.

With an aggressive RD&D program on efficiency improvement, new USC PC plants could reduce CO_2 emissions per MWh by up to 25 percent relative to the existing fleet average. Significant efficiency gains are also possible for IGCC plants by employing advanced gas turbines and through more energy-efficient oxygen plants and synthesis (fuel) gas cleanup technologies.

EPRI and the Coal Utilization Research Council (CURC), in consultation with DOE, have identified a challenging but achievable set of milestones for improvements in the efficiency, cost, and emissions of PC and coal-based IGCC plants. The EPRI–CURC Roadmap projects an overall improvement in the thermal efficiency of state-of-the-art generating technology from 38–41 percent in 2010 to 44–49 percent by 2025 (on a higher heating value [HHV] basis; see Table 1). As Table 1 indicates, power-block efficiency gains (i.e., without capture systems) will be offset by the energy required for CO_2 capture, but as noted, they are important in reducing the overall cost of CCS. Coupled with opportunities for major improvements in the energy efficiency of CO_2 capture processes per se, aggressive pursuit of the EPRI–CURC RD&D program offers the prospect of coal power plants *with* CO_2 capture in 2025 that have net efficiencies meeting or exceeding current-day power plants without CO_2 capture.

It is also important to note that the numeric ranges in Table 1 are not simply a reflection of uncertainty, but rather they underscore an important point about differences among U.S. coals. The natural variations in moisture and ash content and

combustion characteristics between coals have a significant impact on attainable efficiency. An advanced coal plant firing Wyoming and Montana's Powder River Basin (PRB) coal, for example, would likely have an HHV efficiency two percentage points lower than the efficiency of a comparable plant firing Appalachian bituminous coals. Equally advanced plants firing lignite would likely have efficiencies two percentage points lower than their counterparts firing PRB. Any government incentive program with an efficiency-based qualification criterion should recognize these inherent differences in the attainable efficiencies for plants using different ranks of coal.

Table 1 – Efficiency Milestones in EPRI-CURC Roadmap

	2010	2015	2020	2025
PC & IGCC Systems *(Without CO_2 Capture)*	38–41% HHV	39–43% HHV	42–46% HHV	44–49% HHV
PC & IGCC Systems *(With CO_2 Capture*)*	31–32% HHV	31–35% HHV	33–39% HHV	39–46% HHV

**Efficiency values reflect impact of 90% CO_2 capture, but not compression or transportation.*

New Plant Efficiency Improvements—IGCC

Although IGCC is not yet a mature technology for coal-fired power plants, chemical plants around the world have accumulated a 100-year experience base operating coal-based gasification units and related gas cleanup processes. The most advanced of these units are similar to the front end of a modern IGCC facility. Similarly, several decades of experience firing natural gas and petroleum distillate have established a high level of maturity for the basic combined cycle generating technology. Nonetheless, on-going RD&D continues to provide significant advances in the base technologies, as well as in the suite of technologies used to integrate them into an IGCC generating facility.

Efficiency gains in currently proposed IGCC plants will come from the use of new "FB-class" gas turbines, which will provide an overall plant efficiency gain of about 0.6 percentage point (relative to IGCC units with FA-class models, such as Tampa Electric's Polk Power Station). This corresponds to a decrease in the rate of CO_2 emissions per MWh of about 1.5 percent. Alternatively, this means 1.5 percent less fuel is required per MWh of output, and thus the required size of pre-combustion water-gas shift and CO_2 separation equipment would be slightly smaller.

Figure 3 depicts the anticipated timeframe for further developments identified by EPRI's *CoalFleet for Tomorrow®* program that promise a succession of significant improvements in IGCC unit efficiency. Key technology advances under development include:

- larger capacity gasifiers (often via higher operating pressures that boost throughput without a commensurate increase in vessel size)
- integration of new gasifiers with larger, more efficient G- and H-class gas turbines
- use of ion transport membrane or other more energy-efficient technologies in oxygen plants
- warm synthesis gas cleanup and membrane separation processes for CO_2 capture that reduce energy losses in these areas
- recycle of liquefied CO_2 to replace water in gasifier feed slurry (reducing heat loss to water evaporation)
- hybrid combined cycles using fuel cells to achieve generating efficiencies exceeding those of conventional combined cycle technology

Improvements in gasifier reliability and in control systems also contribute to improved annual average efficiency by minimizing the number and duration of startups and shutdowns.

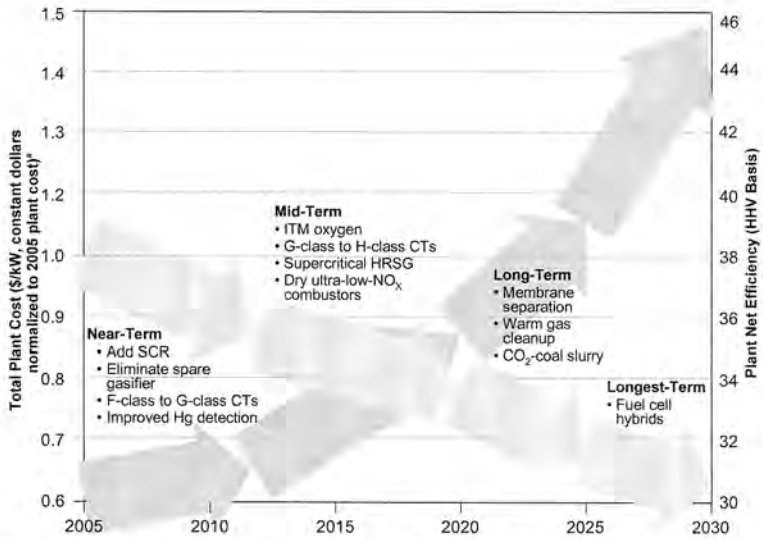


Figure 3 – RD&D path for capital cost reduction (falling arrows) and efficiency improvement (rising arrows) for IGCC power plants with 90% CO_2 capture

* *For a slurry-fed gasifier designed for 90% unit availability and 90% pre-combustion CO_2 capture using Pittsburgh #8 bituminous coal; cost normalization using Chemical Engineering Plant Cost Index or equivalent. A similar trend is observed in analyses of dry-fed gasifiers using Power River Basin subbituminous coal, although the absolute values vary somewhat from those shown.*

Counteracting Gas Turbine Output Loss at High Elevations. IGCC plants designed for application in high-elevation locations must account for the natural reduction in gas turbine power output that occurs where the air is thin. This phenomenon is rooted in the fundamental volumetric flow limitation of a gas turbine, and can reduce power output by up to 15 percent at an elevation of 5000 feet (relative to a comparable plant at sea level). EPRI is exploring measures to counteract this power loss, including inlet air chilling (a technique used at natural gas power plants to mitigate the power loss that comes from thinning of the air on a hot day) and use of supplemental burners between the gas turbine and steam turbine to boost the plant's steam turbine section generating capacity.

Larger, Higher Firing Temperature Gas Turbines. For plants coming on-line around 2015, the larger size G-class gas turbines, which operate at higher firing temperatures (relative to F-class machines) can improve efficiency by one to two percentage points while also decreasing capital cost per kW capacity. The H-class gas turbines coming on-line in the same timeframe, which also feature higher firing temperatures as well as steam-based internal cooling of hot turbine components, will provide a further increase in efficiency and capacity.

Ion Transport Membrane-Based Oxygen Plants. Most gasifiers used in IGCC plants require a large quantity of high-pressure, high purity oxygen, which is typically generated on site with an expensive and energy-intensive cryogenic process. The ITM process allows the oxygen in high-temperature air to pass through a membrane while preventing passage of non-oxygen atoms. According to developers, an ITM-based oxygen plant consumes 35–60 percent less power and costs 35 percent less than a cryogenic plant. DOE has been supporting development of this technology. EPRI is performing a due diligence assessment of this technology in advance of potential participation in technology scale-up efforts and is planning to solicit an industry consortium to support development.

Supercritical Heat Recovery Steam Generators. In IGCC plants, hot exhaust gas exiting the gas turbine is ducted into a heat exchanger known as a heat recovery steam generator (HRSG) to transfer energy into water-filled tubes producing steam to drive a steam turbine. This combination of a gas turbine and steam tur-

bine power cycles produces electricity more efficiently than either a gas turbine or steam turbine alone. As with conventional steam power plants, the efficiency of the steam cycle in a combined cycle plant increases when turbine inlet steam temperature and pressure are increased. The higher exhaust temperatures of G- and H-class gas turbines offer the potential for adoption of more efficient supercritical steam cycles. Materials for use in a supercritical HRSG are generally established, and thus should not pose a barrier to technology implementation once G- and H-class gas turbines become the standard for IGCC designs.

Synthesis Gas Cleaning at Higher Temperatures. The acid gas recovery (AGR) processes currently used to remove sulfur compounds from synthesis gas require that the gas and solvent be cooled to about 100°F, thereby causing a loss in efficiency. Further costs and efficiency loss are inherent in the process equipment and auxiliary steam required to recover the sulfur compounds from the solvent and convert them to usable products. Several DOE-sponsored RD&D efforts aim to reduce the energy losses and costs imposed by this recovery process. These technologies (described below) could be ready—with adequate RD&D support—by 2020:

- The Selective Catalytic Oxidation of Hydrogen Sulfide process eliminates the Claus and Tail Gas Treating units, along with the traditional solvent-based AGR contactor, regenerator, and heat exchangers, by directly converting hydrogen sulfide (H_2S) to elemental sulfur. The process allows for a higher operating temperature of approximately 300°F, which eliminates part of the low-temperature gas cooling train. The anticipated benefit is a net capital cost reduction of about $60/kW along with an efficiency gain of about 0.8 percentage point.
- The RTI/Eastman High-Temperature Desulfurization System uses a regenerable dry zinc oxide sorbent in a dual loop transport reactor system to convert H_2S and COS to H_2O, CO_2, and SO_2. Tests at Eastman Chemical Company have shown sulfur species removal rates above 99.9 percent, with 10 ppm output versus 8000+ ppm input sulfur, using operating temperatures of 800–1000°F. This process is also being tested for its ability to provide a high-pressure CO_2 byproduct. The anticipated benefit for IGCC, compared with using a standard oil-industry process for sulfur removal, is a net capital cost reduction of $60–$90 per kW, a thermal efficiency gain of two to four percent for the gasification process, and a slight reduction in operating cost. Tests are also under way for a multi-contaminant removal processes that can be integrated with the transport desulfurization system at temperatures above 480°F.

Liquid CO_2-Coal Slurrying for Gasification of Low-Rank Coals. Future IGCC plants with CCS may recycle some of the recovered liquid CO_2 to replace water as the slurrying medium for the coal feed. This is expected to increase gasification efficiency for all coals, but particularly for sub-bituminous coal and lignite, which have naturally high moisture contents. The liquid CO_2 has a lower heat of vaporization than water and is able to carry more coal per unit mass of fluid. The liquid CO_2-coal slurry will flash almost immediately upon entering the gasifier, providing good dispersion of the coal particles and potentially yielding the higher performance of a dry-fed gasifier with the simplicity of a slurry-fed system.

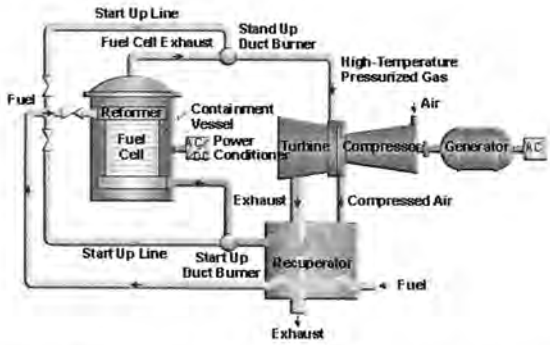
Traditionally, slurry-fed gasification technologies have a cost advantage over conventional dry-fed fuel handling systems, but they suffer a large performance penalty when used with coals containing a large fraction of water and ash. EPRI identified CO_2 coal slurrying as an innovative fuel preparation concept 20 years ago, when IGCC technology was in its infancy. At that time, however, the cost of producing liquid CO_2 was too high to justify the improved thermodynamic performance. Requirements for CCS change that, as it will substantially reduce the incremental cost of producing a liquid CO_2 stream.

To date, CO_2-coal slurrying has only been demonstrated at pilot scale and has yet to be assessed in feeding coal to a gasifier, so the estimated performance benefits remain to be confirmed. It will first be necessary, however, to update previous studies to quantify the potential benefit of liquid CO_2 slurries with IGCC plants designed for CO_2 capture. If the predicted benefit is economically advantageous, a significant amount of scale-up and demonstration work would be required to qualify this technology for commercial use.

Fuel Cells and IGCC. No matter how far gasification and turbine technologies advance, IGCC power plant efficiency will never progress beyond the inherent thermodynamic limits of the gas turbine and steam turbine power cycles (along with lower limits imposed by available materials technology). Several IGCC-fuel cell hybrid

power plant concepts (IGFC) aim to provide a path to coal-based power generation with net efficiencies that exceed those of conventional combined cycle generation.

Along with its high thermal efficiency, the fuel cell hybrid cycle reduces the energy consumption for CO_2 capture. The anode section of the fuel cell produces a stream that is highly concentrated in CO_2. After removal of water, this stream can be compressed for sequestration. The concentrated CO_2 stream is produced without having to include a water-gas shift reactor in the process (see Figure 4). This further improves the thermal efficiency and decreases capital cost. IGFC power systems are a long-term solution, however, and are unlikely to see full-scale demonstration until about 2030.



Source: U.S. Department of Energy; http://www.netl.doe.gov/technologies/coalpower/fuelcells/hybrids.html

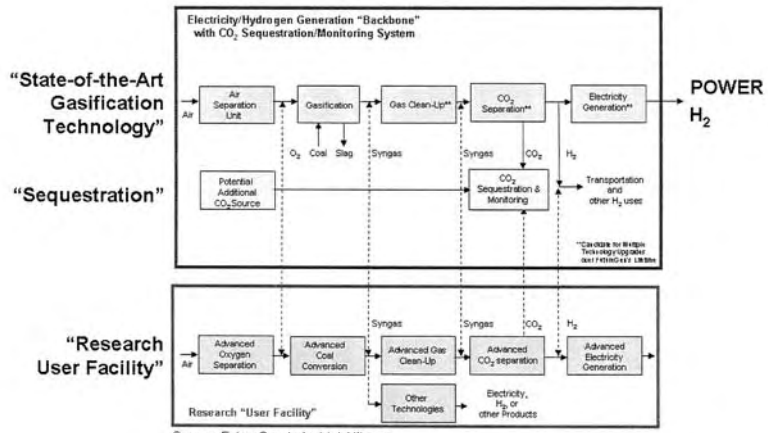
Figure 4 – Schematic of fuel cell-turbine hybrid

The Changing Role of FutureGen. In January of this year, DOE announced a restructured approach to the FutureGen project. Previously, the FutureGen Industrial Alliance and DOE were intending to build a first-of-its-kind, near-zero emissions coal-fed IGCC power plant integrated with CCS. The commencement of full-scale operations was targeted for 2013. The project aimed at storing CO_2 in a representative geologic formation at a rate of at least one million metric tons per year. DOE had committed to spend $1.1 billion in support of the project while the FutureGen Industrial Alliance had agreed to contribute $400 million.

Under its revised approach, DOE will offer to pay the additional cost of capturing CO_2 at multiple IGCC plants. Each plant would capture and store at least one million tons of CO_2 per year. DOE's goal is to have the plants in operation between 2015 and 2016.

The original FutureGen concept was meant to serve as a "living laboratory" for testing advanced technologies that offered the promise of clean environmental performance at a reduced cost and increased reliability. The original FutureGen concept, as shown in Figure 5 was to have the flexibility to conduct full-scale and slipstream tests of such scalable advanced technologies as:

- Membrane processes to replace cryogenic separation for oxygen production
- An advanced transport reactor side-stream with 30 percent of the capacity of the main gasifier
- Advanced membrane and solvent processes for H_2 and CO_2 separation
- A raw gas shift reactor that reduces the upstream clean-up requirements
- Ultra-low-NO_X combustors that can be used with high-hydrogen synthesis gas
- A fuel cell hybrid combined cycle pilot
- Smart dynamic plant controls including a CO_2 management system



Source: FutureGen Industrial Alliance

While the revised DOE FutureGen concept will meet the original goal of having a CCS test of at least one million tons of CO_2 per year (albeit two to three years later than the original target), the other original goal of also hosting the development of several advanced technologies for decreasing plant costs appears to have been dropped.

EPRI has responded to DOE's RFI on the revised FutureGen concept. We asked for clarification on what aspects of the costs of including CO_2 capture and storage (CCS) would be covered, and we gave our estimate of what the total costs would be for including CCS on one train of a two-train 600 MW IGCC. We also highlighted the other major RD&D activities that are needed for improving the efficiency and cost of IGCC technologies with CO_2 capture (see Figure 6). In addition, we asked whether non-IGCC coal power plants which capture at least one million tons of CO_2 per year could qualify for funding under the revised FutureGen concept. For example, would the incremental CCS costs of a project such as our proposed UltraGen advanced SCPC plant with post-combustion capture and geological storage of CO_2 be eligible for DOE support under the restructured FutureGen concept.

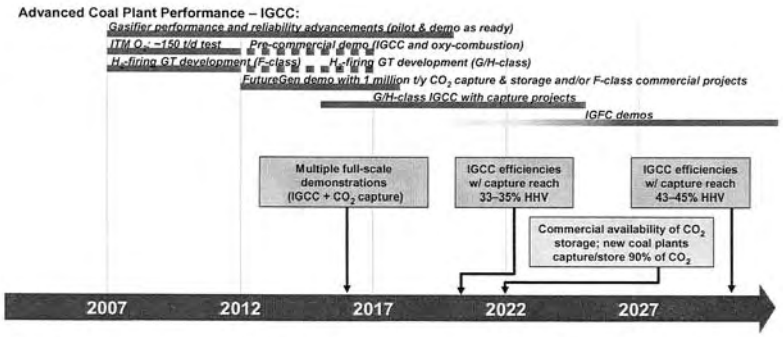


Figure 6 – Timing of advanced IGCC and CO_2 capture integration RD&D activities and milestones

New Plant Efficiency Improvements—Advanced Pulverized Coal

Pulverized-coal power plants have long been a primary source of reliable and affordable power in the United States and around the world. The advanced level of maturity of the technology, along with basic thermodynamic principles, suggests that significant efficiency gains can most readily be realized by increasing the oper-

ating temperatures and pressures of the steam cycle. Such increases, in turn, can be achieved only if there is adequate development of suitable materials and new boiler and steam turbine designs that allow use of higher steam temperatures and pressures.

Current state-of-the-art plants use supercritical main steam conditions (i.e., temperature and pressure above the "critical point" where the liquid and vapor phases of water are indistinguishable). SCPC plants typically have main steam conditions up to 1100°F. The term "ultra-supercritical" is used to describe plants with main steam temperatures in excess of 1100°F and potentially as high as 1400°F.

Achieving higher steam temperatures and higher efficiency will require the development of new corrosion-resistant, high-temperature nickel alloys for use in the boiler and steam turbine. In the United States, these challenges are being address by the Ultra-Supercritical Materials Consortium, a DOE R&D program involving Energy Industries of Ohio, EPRI, the Ohio Coal Development Office, and numerous equipment suppliers. EPRI provides technical management for the consortium. Results are applicable to all ranks of coal. As noted, higher power block efficiencies translate to lower costs for post-combustion CO_2 capture equipment.

It is expected that a USC PC plant operating at about 1300°F will be built during the next seven to ten years, following the demonstration and commercial availability of advanced materials from these programs. This plant would achieve an efficiency (before installation of CO_2 capture equipment) of about 45 percent (HHV) on bituminous coal, compared with 39 percent for a current state-of-the-art plant, and would reduce CO_2 production per net MWh by about 15 percent.

Ultimately, nickel-base alloys are expected to enable stream temperatures in the neighborhood of 1400°F and pre-capture generating efficiencies up to 47 percent HHV with bituminous coal. This approximately 10 percentage point improvement over the efficiency of a new subcritical pulverized-coal plant would equate to a decrease of about 25 percent in CO_2 and other emissions per MWh. The resulting saving in the cost of subsequently installed CO_2 capture equipment is substantial.

Figure 7 illustrates a timeline developed by EPRI's *CoalFleet for Tomorrow®* program to establish efficiency improvement and cost reduction goals for USC PC plants with CO_2 capture.

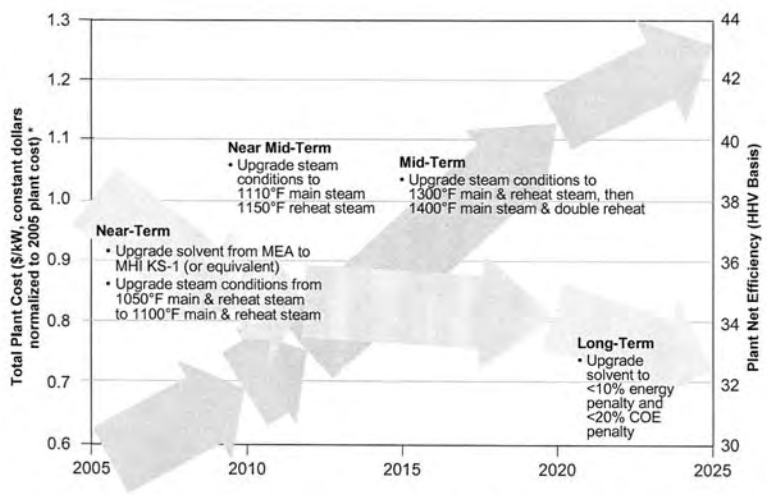


Figure 7 – RD&D path for capital cost reduction (falling arrows) and efficiency improvement (rising arrows) for PC power plants with 90% CO_2 capture

** For a unit designed for 90% unit availability and 90% post-combustion CO_2 capture firing a Pittsburgh #8 bituminous coal; cost normalization using Chemical Engineering Plant Cost Index or equivalent. A similar trend is observed in analyses of PC units with CCS using other U.S. coals, although the efficiency values are up to two percentage points lower for units firing subbituminous coal such as Powder River Basin and up to four percentage points lower for units firing lignite.*

UltraGen Ultra-supercritical (USC) Pulverized Coal (PC) Commercial Projects. EPRI and industry representatives have proposed a program to support commercial projects that demonstrate advanced PC and CCS technologies. The vi-

sion entails construction of two (or more) commercially operated USC PC power plants that combine state-of-the-art pollution controls, ultra-supercritical steam power cycles, and innovative CO_2 capture technologies.

The UltraGen I plant will use the best of today's proven ferritic steels in high-temperature boiler and steam turbine components, while UltraGen II will be the first plant in the United States to feature nickel-based alloys and is designed for steam temperatures up to 1300°F. UltraGen III will be designed for steam temperatures up to 1400°F using materials currently under development by the DOE boiler and steam turbine materials program.

UltraGen I will demonstrate CO_2 capture modules that separate about one million tons CO_2/yr. using the best-established technology. This system will be about six times the size of the largest CO_2 capture system operating on a coal-fired boiler today, and will be integrated into the thermal cycle of the boiler to minimize parasitic loads and capacity loss. UltraGen II will at least double the size of the UltraGen I CO_2 capture system, and may demonstrate a new class of chemical solvent if one of the emerging low-regeneration-energy processes has reached a sufficient stage of development. UltraGen III is expected to capture up to 90 percent of the CO_2, 3.5 times more than for UltraGen I All three plants will demonstrate ultra-low emissions, and dry and compress the captured CO_2 to demonstrate long-term geologic storage and/or use in enhanced oil or gas recovery operations. Figure 8 depicts the proposed key features of UltraGen I, II, and III.

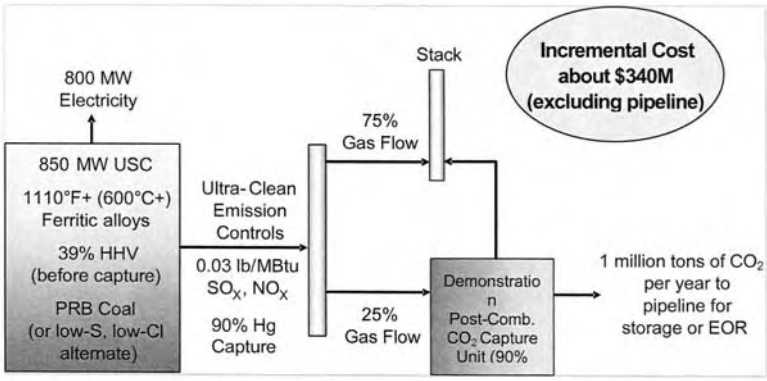


Figure 8 – Key parameters for UltraGen I, assuming a subbituminous feed coal such as Powder River Basin

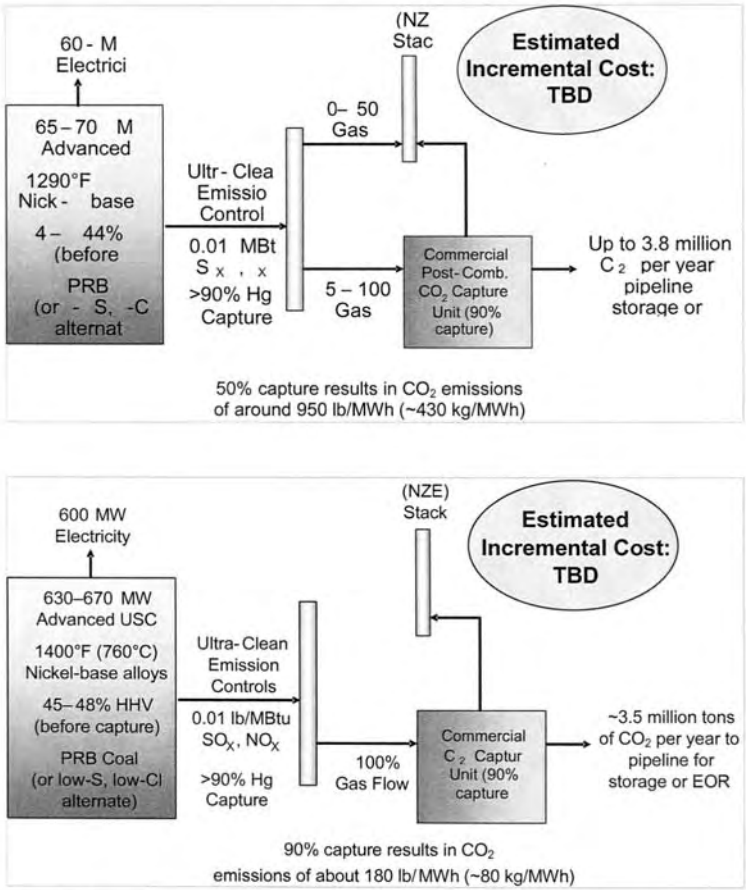


Figure 8 – Key parameters for UltraGen II (upper schematic) and UltraGen III (lower schematic), assuming a subbituminous feed coal such as Powder River Basin

To provide a platform for testing and developing emerging PC and CCS technologies, the UltraGen program will allow for technology trials at existing sites as well as at the sites of new projects. Unlike FutureGen, EPRI expects the UltraGen projects will be commercially dispatched by electricity grid operators. If the FutureGen concept could accommodate post combustion capture the differential cost of UltraGen CCS could be part of the full portfolio of projects. The differential cost to the host company for demonstrating these improved features are envisioned to be offset by any available tax credits (or other incentives) and by funds raised through an industry-led consortium formed by EPRI.

The UltraGen projects represent the type of "giant step" collaborative efforts that need to be taken to advance integrated PC/CCS technology to the next phase of evolution and assure competitiveness in a carbon-constrained world. Because of the time and expense for each "design and build" iteration for coal power plants (three to five years not counting the permitting process and ~$2 billion), there is no room for hesitation in terms of commitment to advanced technology validation and demonstration projects. EPRI is currently discussing the UltraGen project concept with

several firms in the US and internationally, and plans to develop a consortium to support demonstration of the technology.

The UltraGen projects will resolve technical and economic barriers to the deployment of USC PC and CCS technology by providing a shared-risk vehicle for testing and validating high-temperature materials, components, and designs in plants also providing superior environmental performance.

Figure 9 summarizes EPRI's recommended major RD&D activities for improving the efficiency and cost of USC PC technologies with CO_2 capture. Please note that UltraGen III is not included in Figure 9 but the schedule for "Design, construction & operation of NZE USC PC at up to 1400°F w/capture" is expected to commence around 2020.

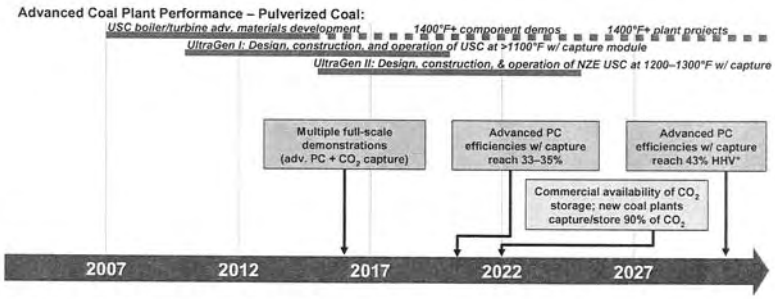


Figure 9 – Timing of advanced PC and CO_2 capture integration RD&D activities and milestones

Efficiency Improvement and CCS Retrofits for the Existing PC Fleet. It would be economically advantageous to operate the many reliable subcritical PC units in the U.S. fleet well into the future. Premature replacement of these units or mandatory retrofit of these units for CO_2 capture en masse would be economically prohibitive. Their flexibility for load following and provision of support services to ensure grid stability makes them highly valuable. With equipment upgrades, many of these units can realize modest efficiency gains, which, when accumulated across the existing generating fleet could make a sizable reduction in CO_2 emissions. For some existing plants, retrofit of CCS will make sense, but specific plant design features, space limitations, and economic and regulatory considerations must be carefully analyzed to determine whether retrofit-for-capture is feasible.

These upgrades depend on the equipment configuration and operating parameters of a particular plant and may include:

- turbine blading and steam path upgrades
- turbine control valve upgrades for more efficient regulation of steam
- cooling tower and condenser upgrades to reduce circulating water temperature, steam turbine exhaust back-pressure, and auxiliary power consumption
- cooling tower heat transfer media upgrades
- condenser optimization to maximize heat transfer and minimize condenser temperature
- condenser air leakage prevention/detection
- variable speed drive technology for pump and fan motors to reduce power consumption
- air heater upgrades to increase heat recovery and reduce leakage
- advanced control systems incorporating neural nets to optimize temperature, pressure, and flow rates of fuel, air, flue gas, steam, and water
- optimization of water blow-down and blow-down energy recovery
- optimization of attemperator design, control, and operating scenarios
- sootblower optimization via "intelligent" soot-blower system use
- coal drying (for plants using lignite and sub-bituminous coals)

Coal Drying for Increased Generating Efficiency. Boilers designed for high-moisture lignite have traditionally employed higher feed rates (lb/hr) to account for the large latent heat load to evaporate fuel moisture. An innovative concept developed by Great River Energy (GRE) and Lehigh University uses low-grade heat recovered from within the plant to dry incoming fuel to the boiler, thereby boosting plant efficiency and output. [In contrast, traditional thermal drying processes are complex and require high-grade heat to remove moisture from the coal.] Specifically, the GRE approach uses steam condenser and boiler exhaust heat exchangers to heat air and water fed to a fluidized-bed coal dryer upstream of the plant pulverizers. Based on successful tests with a pilot-scale dryer and more than a year of continuous operation with a prototype dryer at its Coal Creek station, GRE (with U.S. Department of Energy support and EPRI technical consultation) is now building a full suite of dryers for Unit 2 (i.e., a commercial-scale demonstration). In addition to the efficiency and CO_2 emission reduction benefits from reducing the lignite feed moisture content by about 25 percent, the plant's air emissions will be reduced as well.[4] Application of this technology is not limited to PC units firing lignite. EPRI believes it may find application in PC units firing sub-bituminous coal and in IGCC units with dry-fed gasifiers using low-rank coals.

Improving CO_2 Capture Technologies

CCS entails pre-combustion or post-combustion CO_2 capture technologies, CO_2 drying and compression (and sometimes further removal of impurities), and the transportation of separated CO_2 to locations where it can be stored away from the atmosphere for centuries or longer.

Albeit at considerable cost, CO_2 capture technologies can be integrated into all coal-based power plant technologies. For both new plants and retrofits, there is a tremendous need (and opportunity) to reduce the energy required to remove CO_2 from fuel gas or flue gas. Figure 10 shows a selection of the key technology developments and test programs needed to achieve commercial CO_2 capture technologies for advanced coal combustion- and gasification-based power plants at a progressively shrinking constant-dollar levelized cost-of-electricity premium. Specifically, the target is a premium of about $6/MWh in 2025 (relative to plants at that time without capture) compared with an estimated 2010 cost premium of perhaps $40/MWh (not counting the cost of transportation and storage). Such a goal poses substantial engineering challenges and will require major investments in RD&D to roughly halve the currently large energy requirements (operating costs) associated with CO_2 solvent regeneration. Achieving this goal will allow power producers to meet the public demand for stable electricity prices while reducing CO_2 emissions to address climate change concerns.

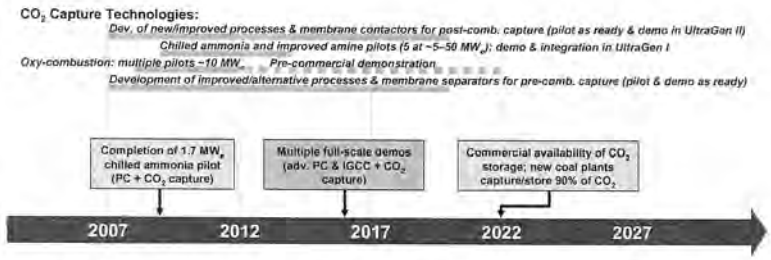


Figure 10 – Timing of CO_2 capture technology development RD&D activities and milestones

Pre-Combustion CO_2 Capture (IGCC)

IGCC technology allows for CO_2 capture to take place via an added fuel gas processing step at elevated pressure, rather than at the atmospheric pressure of post-combustion flue gas, permitting capital savings through smaller equipment sizes as well as lower operating costs.

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[4] C. Bullinger, M. Ness, and N. Sarunac, "One Year of Operating Experience with Prototype Fluidized Bed Coal Dryer at Coal Creek Generating Station," 32nd International Technical Conference on Coal Utilization and Fuel Systems, Clearwater, FL, June 10–15, 2007.

Currently available technologies for such pre-combustion CO_2 removal use a chemical and/or physical solvent that selectively absorbs CO_2 and other "acid gases," such as hydrogen sulfide. Application of this technology requires that the CO in synthesis gas (the principal component) first be "shifted" to CO_2 and hydrogen via a catalytic reaction with water. The CO_2 in the shifted synthesis gas is then removed via contact with the solvent in an absorber column, leaving a hydrogen-rich synthesis gas for combustion in the gas turbine. The CO_2 is released from the solvent in a regeneration process that typically reduces pressure and/or increases temperature.

Chemical plants currently employ such a process commercially using methyl diethanolamine (MDEA) as a chemical solvent or the Selexol and Rectisol processes, which rely on physical solvents. Physical solvents are generally preferred when extremely high (>99.8 percent) sulfur species removal is required. Although the required scale-up for IGCC power plant applications is less than that needed for scale-up of post-combustion CO_2 capture processes for PC plants, considerable engineering challenges remain and work on optimal integration with IGCC cycle processes has just begun.

The impact of current pre-combustion CO_2 removal processes on IGCC plant thermal efficiency and capital cost is significant. In particular, the water-gas shift reaction reduces the heating value of synthesis gas fed to the gas turbine. Because the gasifier outlet ratios of CO to methane to H_2 are different for each gasifier technology, the relative impact of the water-gas shift reactor process also varies. In general, however, it can be on the order of a 10 percent fuel energy reduction. Heat regeneration of solvents further reduces the steam available for power generation. Other solvents, which are depressurized to release captured CO_2, must be re-pressurized for reuse. Cooling water consumption is increased for solvents needing cooling after regeneration and for pre-cooling and interstage cooling during compression of separated CO_2 to a supercritical state for transportation and storage. Heat integration with other IGCC cycle processes to minimize these energy impacts is complex and is currently the subject of considerable RD&D by EPRI and others.

Membrane CO_2 Separation. Technology for separating CO_2 from shifted synthesis gas (or flue gas from PC plants) offers the promise of lower auxiliary power consumption but is currently only at the laboratory stage of development. Several organizations are pursuing different approaches to membrane-based applications. In general, however, CO_2 recovery on the low-pressure side of a selective membrane can take place at a higher pressure than is now possible with solvent processes, reducing the subsequent power demand for compressing CO_2 to a supercritical state. Membrane-based processes can also eliminate steam and power consumption for regenerating and pumping solvent, respectively, but they require power to create the pressure difference between the source gas and CO_2-rich sides. If membrane technology can be developed at scale to meet performance goals, it could enable up to a 50 percent reduction in capital cost and auxiliary power requirements relative to current CO_2 capture and compression technology.

Post-Combustion CO_2 Capture (PC and Circulating Fluidized-Bed (CFB) Plants)

The post-combustion CO_2 capture processes being discussed for power plant boilers in the near-term draw upon commercial experience with amine solvent separation at much smaller scale in the food, beverage and chemical industries, including three U.S. applications of CO_2 capture from coal-fired boilers.

These processes contact flue gas with an amine solvent in an absorber column (much like a wet SO_2 scrubber) where the CO_2 chemically reacts with the solvent. The CO_2-rich liquid mixture then passes to a stripper column where it is heated to change the chemical equilibrium point, releasing the CO_2. The "regenerated" solvent is then recirculated back to the absorber column, while the released CO_2 may be further processed before compression to a supercritical state for efficient transportation to a storage location.

After drying, the CO_2 released from the regenerator is relatively pure. However, successful CO_2 removal requires very low levels of SO_2 and NO_2 entering the CO_2 absorber, as these species also react with the solvent, requiring removal of the degraded solvent and replacement with fresh feed. Thus, high-efficiency SO_2 and NO_X control systems are essential to minimizing solvent consumption costs for post-combustion CO_2 capture; currently the approach to achieving such ultra-low SO_2 concentrations is to add a polishing scrubber, a costly venture. Extensive RD&D is in progress to improve the solvent and system designs for power boiler applications and to develop better solvents with greater absorption capacity, less energy demand for regeneration, and greater ability to accommodate flue gas contaminants.

At present, monoethanolamine (MEA) is the "default" solvent for post-combustion CO_2 capture studies and small-scale field applications. Processes based on improved amines, such as Fluor's Econamine FG Plus and Mitsubishi Heavy Industries' KS–1, await demonstration at power boiler scale and on coal-derived flue gas. The potential for improving amine-based processes appears significant. For example, a recent study based on KS–1 suggests that its impact on net power output for a supercritical PC unit would be 19 percent and its impact on the levelized cost-of-electricity would be 44 percent, whereas earlier studies based on sub-optimal MEA applications yielded output penalties approaching 30 percent and cost-of-electricity penalties of up to 65 percent.

Accordingly, amine-based engineered solvents are the subject of numerous ongoing efforts to improve performance in power boiler post-combustion capture applications. Along with modifications to the chemical properties of the sorbents, these efforts are addressing the physical structure of the absorber and regenerator equipment, examining membrane contactors and other modifications to improve gas-liquid contact and/or heat transfer, and optimizing thermal integration with steam turbine and balance-of-plant systems. Although the challenge is daunting, the payoff is potentially massive, as these solutions may be applicable not only to new plants, but to retrofits where sufficient plot space is available at the back end of the plant.

Finally, as discussed earlier, deploying USC PC technology to increase efficiency and lower uncontrolled CO_2 per MWh can further reduce the cost impact of post-combustion CO_2 capture.

Ammonia-Based Processes. Post-combustion CO_2 capture using ammonia-based solvents offers the promise of significantly lower solvent regeneration requirements relative to MEA. In the "chilled ammonia" process owned by ALSTOM and currently under development and testing by ALSTOM and EPRI, respectively, CO_2 is absorbed in a solution of ammonium carbonate, at low temperature and atmospheric pressure.

Compared with amines, ammonium carbonate has over twice the CO_2 absorption capacity and requires less than half the heat to regenerate. Further, regeneration can be performed under higher pressure than amines, so the released CO_2 is already partially pressurized. Therefore, less energy is subsequently required for compression to a supercritical state for transportation to an injection location. Developers have estimated that the parasitic power loss from a full-scale supercritical PC plant using chilled ammonia CO_2 capture could be as low as 15 percent, with an associated cost-of-electricity penalty of just 25 percent. Part of the reduction in power loss comes from the use of low quality heat to regenerate ammonia and reduce the quantity of steam required for regeneration. Following successful experiments at 0.25 MWe scale, ALSTOM and a consortium of EPRI members built a 1.7 MWe pilot unit to test the chilled ammonia process on a flue gas slip-stream at We Energies' Pleasant Prairie Power Plant. Testing at this site began in late March 2008 and will continue for about one year. The American Electric Power Co. (AEP) has announced plans to test a scaled-up design (100,000 tons CO_2/yr., equivalent to about 20 MWe), incorporating the lessons learned on the 1.7 MWe unit, at its Mountaineer station in West Virginia, with start-up scheduled for late 2009. AEP intends to capture, inject, and monitor for two-to-five years and, thereafter, continue monitoring CO_2 location in the underground reservoir for another several years. EPRI plans to develop a consortium to support this Mountaineer CO_2 Capture testing.

Other "multi-pollutant" control system developers are also exploring ammonia-based processes for CO_2 removal. For example, Powerspan and NRG Energy, Inc. announced plans in November 2007 to demonstrate a 125 MWe design of Powerspan's ECO_2 system at the Parish station in Texas starting up in 2012, and last month Basin Electric announced its selection of Powerspan to provide a similar size ECO_2 system for its Antelope Valley station in North Dakota, also with a 2012 start-up goal.

Other Processes. EPRI has identified over 40 potential CO_2 separation processes that are being developed by various firms or institutes. They include absorption systems (typically solvent-based similar to the amine and ammonia processes discussed above), adsorbed (attachment of the CO_2 to a solid that is then regenerated and reused), membranes, and biological systems. Funding comes from a variety of sources, primarily DOE or internal funds, but the funding is neither sufficient or well-enough coordinated to advance the most promising technologies at the speed needed to achieve the goals of high CO_2 capture at societally-acceptable cost and energy drain. EPRI is working with the Southern Co. to select and demonstrate one of these processes at the 20+MWe scale, with the collected CO_2 injected into a local underground saline reservoir. The capture portion of this project will be funded mostly by Southern Co., its process supplier, and a collaborative of electricity gen-

eration companies assembled by EPRI. The storage portion will be funded largely by DOE under Phase 3 of its Regional Carbon Sequestration Partnership, with co-funding from the private sector. Start-up of the capture unit and compression/transport/injection system is projected for late 2010. Southern Co. and its teammates intend to capture, inject, and monitor for about four years and, thereafter, continue monitoring CO_2 location in the underground reservoir for another several years.

Oxy-Fuel Combustion Boilers

Fuel combustion in a blend of oxygen and recycled flue gas rather than in air (known as oxy-fuel combustion, oxy-coal combustion, or oxy-combustion) is gaining interest as a viable CO_2 capture alternative for PC and CFB plants. The process is applicable to virtually all fossil-fueled boiler types and is a candidate for retrofits as well as new power plants.

Firing coal with high-purity oxygen alone would result in too high of a flame temperature, which would increase slagging, fouling, and corrosion problems, so the oxygen is diluted by mixing it with a slip-stream of recycled flue gas. As a result, the flue gas downstream of the recycle slip-stream take-off consists primarily of CO_2 and water vapor (although it also contains small amounts of nitrogen, oxygen, and criteria pollutants). After the water is condensed, the CO_2-rich gas is compressed and purified to remove contaminants and prepare the CO_2 for transportation and storage.

Oxy-combustion boilers have been studied in laboratory-scale and small pilot units of up to three MWt. Two larger pilot units, at ~10 MWe, are now under construction by Babcock & Wilcox (B&W) and Vattenfall. An Australian-Japanese project team is pursuing a 30 MWe repowering project in Australia. These larger tests will allow verification of mathematical models and provide engineering data useful for designing pre-commercial systems.

CO_2 Transport and Geologic Storage

Application of CO_2 capture technologies implies that there will be secure and economical forms of long-term storage that can assure CO_2 will be kept out of the atmosphere. Natural underground CO_2 reservoirs in Colorado, Utah, and other western states testify to the effectiveness of long-term geologic CO_2 storage. CO_2 is also found in natural gas reservoirs, where it has resided for millions of years. Thus, evidence suggests that similarly sealed geologic formations will be ideal for storing CO_2 for millennia or longer.

The most developed approach for large-scale CO_2 storage is injection into depleted or partially depleted oil and gas reservoirs and similar geologically sealed "saline formations" (porous rocks filled with brine that is impractical for desalination). Partially depleted oil reservoirs provide the potential added benefit of enhanced oil recovery (EOR). [EOR is used in mature fields to recover additional oil after standard extraction methods have been used. When CO_2 is injected for EOR, it causes residual oil to swell and become less viscous, allowing some to flow to production wells, thus extending the field's productive life.] By providing a commercial market for CO_2 captured from industrial sources, EOR may help the economics of CCS projects where it is applicable, and in some cases might reduce regulatory and liability uncertainties. Although less developed than EOR, researchers are exploring the effectiveness of CO_2 injection for enhancing production from depleted natural gas fields (particularly in compartmentalized formations where pressure has dropped) and from deep methane-bearing coal seams. DOE and the International Energy Agency are among the sponsors of such efforts. However, at the scale that CCS needs to be deployed to help achieve atmospheric CO_2 stabilization at an acceptable level, EPRI believes that the primary economic driver for CCS will be the value of carbon that results from a future climate policy.

Geologic sequestration as a CCS strategy is currently being demonstrated in several RD&D projects around the world. The three largest projects (which are non-power)—Statoil's Sleipner Saline Aquifer CO_2 Storage project in the North Sea off of Norway; the Weyburn Project in Saskatchewan, Canada; and the In Salah Project in Algeria—each sequester about one million metric tons of CO_2 per year, which matches the output of one base-loaded 150–200 MW coal-fired power plant. With 17 collective operating years of experience, these projects have thus far demonstrated that CO_2 storage in deep geologic formations can be carried out safely and reliably. Statoil estimates that Norwegian greenhouse gas emissions would have risen incre-

mentally by three percent if the CO_2 from the Sleipner project had been vented rather than sequestered.[5]

Table 2 lists a selection of current and planned CO_2 storage projects as of early 2007. Update to Table 2: The DF–1 Miller project has been put on hold and may be canceled, so no CO_2 capture is expected by 2010. The DF–Carson project may not start up by 2011 as planned. DOE has indicated that it plans to revise the FutureGen project so CO_2 storage will not take place until after 2012. In October 2007, the DOE awarded the first three large scale carbon sequestration projects in the United States. The Plains Carbon Dioxide Reduction Partnership, Southeast Regional Carbon Sequestration Partnership, and Southwest Regional Partnership for Carbon Sequestration, will conduct large volume tests for the storage of one million or more tons of CO_2 in deep saline reservoirs in the U.S.

Table 2 – Select Existing and Planned CO_2 Storage Projects as of Early 2007

PROJECT	CO_2 SOURCE	COUNTRY	START	Anticipated amount injected by:		
				2006	2010	2015
Sleipner	Gas. Proc.	Norway	1996	9 MT	13 MT	18 MT
Weyburn	Coal	Canada	2000	5 MT	12 MT	17 MT
In Salah	Gas. Proc.	Algeria	2004	2 MT	7 MT	12 MT
Snohvit	Gas. Proc.	Norway	2007	0	2 MT	5 MT
Gorgon	Gas. Proc.	Australia	2010	0	0	12 MT
DF-1 Miller	Gas	U.K.	2009	0	1 MT	8 MT
DF-2 Carson	Pet Coke	U.S.	2011	0	0	16 MT
Draugen	Gas	Norway	2012	0	0	7 MT
FutureGen	Coal	U.S.	2012	0	0	2 MT
Monash	Coal	Australia	NA	0	0	NA
SaskPower	Coal	Canada	NA	0	0	NA
Ketzin/CO_2 STORE	NA	Germany	2007	0	50 KT	50 KT
Otway	Natural	Australia	2007	0	100 KT	100 KT
TOTALS				**16 MT**	**35 MT**	**99 MT**

Source: Sally M. Benson (Stanford University GCEP), "Can CO_2 Capture and Storage in Deep Geological Formations Make Coal-Fired Electricity Generation Climate Friendly?" Presentation at Emerging Energy Technologies Summit, UC Santa Barbara, California, February 9, 2007. [Note: Statoil has subsequently suspended plans for the Draugen project and announced a study of CO_2 capture at a gas-fired power plant at Tjeldbergodden. BP and Rio Tinto have announced the coal-based "DF-3" project in Australia.]

Enhanced Oil Recovery. Experience relevant to CCS comes from the oil industry, where CO_2 injection technology and modeling of its subsurface behavior have a proven record of accomplishment. EOR has been conducted successfully for 35 years in the Permian Basin fields of west Texas and Oklahoma. Regulatory oversight and community acceptance of injection operations for EOR seem well established.

Although the purpose of EOR heretofore has not been to sequester CO_2, the practice can be adapted to include large-volume residual CO_2 storage. This approach is being demonstrated in the Weyburn-Midale CO_2 monitoring projects in Saskatchewan, Canada. The Weyburn project uses captured and dried CO_2 from the Dakota Gasification Company's Great Plains synfuels plant near Beulah, North Dakota. The CO_2 is transported via a 200-mile pipeline constructed of standard carbon steel.

[5] *http://www.co2captureandstorage.info/project*.specific.php?project.id=26

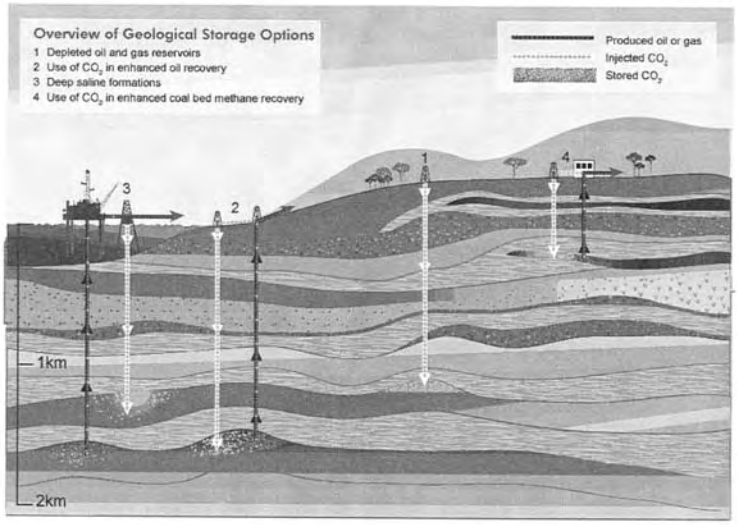
Over the life of the project, the net CO_2 storage is estimated at 20 million metric tons, while an additional 130 million barrels of oil will be produced.

Although EOR might help the economics of early CCS projects in oil-patch areas, EOR sites are ultimately too few and too geographically isolated to accommodate much of the CO_2 from widespread industrial CO_2 capture operations. In contrast, saline formations are available in many—but not all—U.S. locations.

CCS in the United States

A DOE-sponsored R&D program, the "Regional Carbon Sequestration Partnerships," is engaged in mapping U.S. geologic formations suitable for CO_2 storage. Evaluations by these Regional Partnerships and others suggest that enough geologic storage capacity exists in the U.S. to hold many centuries' production of CO_2 from coal-based power plants and other large point sources.

The Regional Partnerships are also conducting pilot-scale CO_2 injection validation tests across the country in differing geologic formations, including saline formations, deep unmineable coal seams, and older oil and gas reservoirs. Figure 11 illustrates some of these options. These tests, as well as most commercial applications for long-term storage, will use CO_2 compressed for volumetric efficiency to a liquid-like "supercritical" state; thus, virtually all CO_2 storage will take place in formations at least a half-mile deep, where the risk of leakage to shallower groundwater aquifers or to the surface is usually very low.



Source: Peter Cook, CO_2CRC, in Intergovernmental Panel on Climate Change, Special Report "Carbon Dioxide Capture and Storage," http://www.ipcc.ch/pub/reports.htm

Figure 11 – Illustration of potential geological CO_2 storage site types

After successful completion of pilot-scale CO_2 storage validation tests, the Partnerships will undertake large-volume storage tests, injecting quantities of ~1 million metric tons of CO_2 or more over a several year period, along with post-injection monitoring to track the absorption of the CO_2 in the target formation(s) and to check for potential leakage.

The EPRI–CURC Roadmap identifies the need for several large-scale integrated demonstrations of CO_2 capture and storage. This assessment was echoed by MIT in its recent *Future of Coal* report, which calls for three to five U.S. demonstrations of about one million metric tons of CO_2 per year and about 10 worldwide.[6] These demonstrations could be the critical path item in commercialization of CCS tech-

[6] *http://web.mit.edu/coal/The*.Future.of.Coal.pdf

nology. In addition, EPRI has identified 10 key topics[7] where further technical and/or policy development is needed before CCS can become fully commercial:

- Caprock integrity
- Injectivity and storage capacity
- CO_2 trapping mechanisms
- CO_2 leakage and permanence
- CO_2 and mineral interactions
- Reliable, low-cost monitoring systems
- Quick response and mitigation and remediation procedures
- Protection of potable water
- Mineral rights
- Long-term liability

Figure 12 shows that EPRI's recommended large-scale integrated CO_2 capture and storage demonstrations is temporally consistent with the Regional Partnerships' "Phase III" large-volume CO_2 storage test program. EPRI believes that many of the storage demonstrations should use CO_2 that comes from coal-fired boilers to address any uncertainties that may exist about the impact of coal-derived CO_2 on its behavior in underground formations.

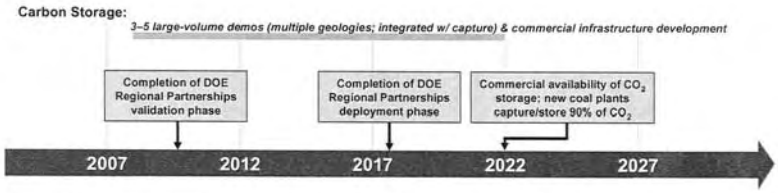


Figure 12 – Timing of CO_2 storage technology RD&D activities and milestones

CO_2 Transportation

Mapping of the distribution of potentially suitable CO_2 storage formations across the country, as part of the research by the Regional Partnerships, shows that some areas have ample storage capacity while others appear to have little or none. Thus, implementing CO_2 capture at some power plants may require pipeline transportation for several hundred miles to suitable injection locations, possibly in other states. Although this adds cost, it should not represent a technical hurdle because long-distance, interstate CO_2 pipelines have been used commercially in oil field EOR applications. Economic considerations dictate that the purity requirements of coal-derived CO_2 be established so that the least-cost pipeline and compressor materials can be used at each application. From an infrastructure perspective, EPRI expects that early commercial CCS projects will take place at coal-based power plants near sequestration sites or an existing CO_2 pipeline. As the number of projects increases, regional CO_2 pipeline networks connecting multiple industrial sources and storage sites will be needed.

Policy-Related Long-Term CO_2 Storage Issues

Beyond developing the technological aspects of CCS, public policy needs to address issues such as CO_2 storage site permitting, long-term monitoring requirements, and post-closure liability. CCS represents an emerging industry, and the jurisdictional roles among federal and state agencies for regulations and their relationship to private carbon credit markets operating under federal oversight has yet to be determined.

Currently, efforts are under way in some states to establish regulatory frameworks for long-term geologic CO_2 storage. Additionally, stakeholder organizations such as the Interstate Oil and Gas Compact Commission (IOGCC) are developing their own suggested regulatory recommendations for states drafting legislation and regulatory procedures for CO_2 injection and storage operations.[8] Other stakeholders,

[7] EPRI, Overview of Geological Storage of CO_2, Report ID 1012798
[8] *http://www.iogcc.state.ok.us/PDFS/CarbonCaptureandStorageReportandSummary.pdf*

such as environmental groups, are also offering policy recommendations. EPRI expects this field to become very active soon.

A state-by-state approach to sequestration may not be adequate because some geologic formations, which are ideal for storing CO_2, underlie multiple states. At the federal level, the U.S. EPA published a first-of-its-kind guidance (UICPG #83) on March 1, 2007, for permitting underground injection of CO_2.[9] This guidance offers flexibility for pilot projects evaluating the practice of CCS, while leaving unresolved the requirements that could apply to future large-scale CCS projects.

Long-Term CO_2 Storage Liability Issues

Long-term liability for injected CO_2 will need to be assigned before CCS can become fully commercial. Because CCS activities will be undertaken to serve the public good, as determined by government policy, and will be implemented in response to anticipated or actual government-imposed limits on CO_2 emissions, a number of policy analysts have suggested that the entities performing these activities should be granted a measure of long-term risk reduction assuming adherence to proper procedures during the storage site injection operations and closure phases.

RD&D Investment for Advanced Coal and CCS Technologies

Developing the suite of technologies needed to achieve competitive advanced coal and CCS technologies will require a sustained major investment in RD&D. As shown in Table 3, EPRI estimates that an expenditure of approximately $8 billion will be required in the 10-year period from 2008–17. The MIT *Future of Coal* report estimates the funding need at up to $800–$850 million per year, which approaches the EPRI value. Further, EPRI expects that an RD&D investment of roughly $17 billion will be required over the next 25 years.

Investment in earlier years may be weighted toward IGCC, as this technology is less developed and will require more RD&D investment to reach the desired level of commercial viability. As interim progress and future needs cannot be adequately forecast at this time, the years after 2023 do not distinguish between IGCC and PC.

Table 3 – RD&D Funding Needs for Advanced Coal Power Generation Technologies with CO_2 Capture

	2008–12	2013–17	2018–22	2023–27	2028–32
Total Estimated RD&D Funding Needs *(Public + Private Sectors)*	$830M/yr	$800M/yr	$800M/yr	$620M/yr	$400M/yr
Advanced Combustion, CO_2 Capture	25%	25%	40%	80%	80%
Integrated Gasification Combined Cycle (IGCC), CO_2 Capture	50%	50%	40%		
CO_2 Storage	25%	25%	20%	20%	20%

By any measure, these estimated RD&D investments are substantial. EPRI and the members of the *CoalFleet for Tomorrow®* program, by promoting collaborative ventures among industry stakeholders and governments, believe that the costs of developing critical-path technologies for advanced coal and CCS can be shouldered by multiple participants. EPRI believes that government policy and incentives will also play a key role in fostering CCS technologies through early RD&D stages to achieve widespread, economically feasible deployment capable of achieving major reductions in U.S. CO_2 emissions.

[9] *http://www.epa.gov/safewater/uic/pdfs/guide*.uic.carbonsequestration.final-03-07.pdf

APPENDIX B

COMMENTS ON REVISED FUTUREGEN

BRYAN HANNEGAN, VICE PRESIDENT, ENVIRONMENT AND GENERATION
THE ELECTRIC POWER RESEARCH INSTITUTE (EPRI)
3420 HILLVIEW AVENUE
PALO ALTO , CALIFORNIA 94303

The Electric Power Research Institute, Inc., a tax exempt, non-profit, 501(c)(3) collaborative research and development organization with principal locations in Palo Alto, California, Charlotte, North Carolina, and Knoxville, Tennessee ("EPRI") appreciates the opportunity to provide input and comments on the Department of Energy's plan to restructure FutureGen.

EPRI's comments address the following:

- Clarifying questions on the restructured FutureGen plan.
- Design changes and cost estimates for the addition of CO_2 Capture and Storage (CCS) to a single train of a two-train Integrated Gasification Combined Cycle (IGCC) plant not previously designed for CCS.
- Accelerating Research Development and Demonstration (RD&D) on Advanced Coal Technologies with CO_2 Capture and Storage—Investment and Time Requirements.
- Comments on whether the revised FutureGen approach should allow for advanced coal technology systems, other than IGCC, which also would meet the performance requirements.

Clarifying Questions on the DOE RFI

According to the RFI, DOE will contribute not more than the incremental cost associated with CCS technology for the single power train.

The additional costs for adding CCS to an IGCC plant include:

- Capital costs to cover the process modifications necessary for 90 percent CO_2 capture
- Operations and maintenance (O&M) costs for the additional units
- Lost revenue from power sales due to the additional auxiliary power use for capture and CO_2 compression
- Capital costs for CO_2 pipeline and CO_2 injection for sequestration
- Possible capital and O&M if pipeline length requires recompression
- O&M costs for pipeline transportation, sequestration and monitoring.

Clarifying Questions:

1. Is it the intent of DOE to cover a) the extra capital costs b) the extra O&M costs c) the lost power cost d) the pipeline, monitoring and sequestration costs (including pipeline compression power costs)?
2. Over what period of operation (how many years) will DOE cover the CCS costs?
3. Some IGCC projects are under consideration for the co-production of other chemicals or fuels (Synthetic Natural Gas, Methanol, Coal to Liquids, etc.—often referred to as polygeneration). Will DOE consider the support of CCS at such polygeneration projects under this restructured initiative?

Design Changes for the Addition of CCS to a single train of a two-train IGCC plant not previously designed for CCS.

IGCC Design changes for 90 percent CO_2 Capture. The main changes in design for capture are the addition of shift reactors and a CO_2 removal process.

The shift reaction $CO + H_2O = CO_2 + H_2$ is exothermic. This results in a reduction in the chemical energy in the syngas so that it now is insufficient to fully load the gas turbine. Additional coal would need to be processed to provide enough syngas to fully load the gas turbine. The percentage increase will depend on the gasification process. Dry coal-fed processes will require a somewhat greater increase than slurry-fed processes because the CO content of the syngas is higher. (The estimated increased coal feed in the referenced papers are in the range 2–9 percent).

The following changes would be required if the plant is to be able to fully load the gas turbine:

- More coal handling and feed system capacity
- A larger Air Separation Unit (ASU) to provide the additional oxygen (perhaps an additional Main Air Compressor (MAC)); see Note 1.
- A larger gasifier to handle more coal and oxygen
- Larger gas cleanup and piping to handle the increased syngas flow

An alternative is to accept the lower output from the originally sized plant. This would mean an additional loss of net power of approximately the same 2–9 percent, depending on the technology.

The addition of the shift reactor increases the volume of the dry gas flow to the Acid Gas Removal (AGR) H_2S removal system by 40–60 percent, depending on the gasification process. If the original design used a physical solvent (e.g., Selexol) for H_2S removal, then either a new parallel absorber column will be needed to accommodate the additional flow of syngas from the shift reactors or a completely new absorber designed for the full flow must be added. In all cases a new CO_2 absorber/stripper system must be added.

The addition of 90 percent capture to a train will require the following changes:

- Replacement of COS/HCN hydrolysis reactor with two stages of sour shift reaction
- Additions to syngas cooling train for the shift reactors
- Additions to, or replacements of, the AGR used for H_2S removal to accommodate the increased dry syngas flow
- Addition of a new absorber/stripper system to recover CO_2 as a separate by-product
- Upgrade of the demineralizer water treatment and storage system
- Addition of intermediate pressure steam for water-gas shift reaction (in some cases)
- Modifications to the gas turbine combustion system to accommodate the combustion of hydrogen-rich gas, possibly including more addition of diluent nitrogen or moisture (steam)
- Heat Recovery Steam Generator Low Pressure superheater modifications
- Addition of CO_2 drying and compression to 2000 psig (138 barg).
- Possible adjustments to the CO_2 composition (e.g., H_2S content) depending on the pipeline quality requirements.

Note 1. For many of the designs without capture, ~30–40 percent of the air supply for the ASU is extracted from the gas turbine compressor. If the turbine supplier indicates no air can be extracted when firing hydrogen in the gas turbine, another air compressor would be needed to fully supply the ASU when capture is added.

Additional Costs for adding CCS to IGCC. The additional costs for adding CCS to an IGCC plant include:

- Capital costs to cover the process modifications listed above necessary for 90 percent CO_2 capture
- Operations and maintenance (O&M) costs for the additional listed units
- Lost revenue from power sales due to the additional auxiliary power usage for capture and CO_2 compression
- Capital costs for CO_2 pipeline and CO_2 injection for sequestration
- Possible capital and O&M if pipeline length requires recompression
- O&M costs for pipeline transportation, sequestration and monitoring

References: The following publicly available references can be used to obtain more information describing the processes and design changes involved in the addition of CCS to IGCC designs and estimates of the additional costs:

DOE/NETL–2007/1281 "Cost and Performance Baseline for Fossil Energy Plants" Revision 1, August 2007.

"Preliminary Economics of SCPC & IGCC with CO_2 Capture & Storage." N. Holt (EPRI) presented at the 2nd IGCC & XtL Conference, Freiberg, Saxony, Germany, May 9–10, 2007.

"Phased Construction of IGCC Plants for CO_2 Capture—Effect of Pre-Investment" December 2003. EPRI Report #1004537. Available from EPRI public domain website and DOE/NETL Fossil Energy website.

"Potential for Improvement in Gasification Combined Cycle Power Generation with CO_2 Capture" by Foster Wheeler for the IEA GHG program April 2003. Available from the IEA GHG website.

Cost estimates for the Addition of CCS to a single train of a two-train IGCC plant

Duke Energy's Edwardsport IGCC Plant will be about 750 MW *gross* or 375 *gross* MW/train. 90 percent capture on one train yields approximately 1.6 million tons per year CO_2 for sequestration and reduces net MW output by about 40 MW from 630 to 590 MW.

The extra capital for capture on one train is an estimated $80–$100 million but may be more if it is a retrofit.

Extra O&M is estimated at approximately $1.5/MWh or $6.3 million/year. For 10 years the additional O&M would be an estimated $63 million.

Replacing the 40 MW lost power at $65/MWh equals $18.2 million per year. For 10 years the power replacement cost would be $182 million.

Pipeline costs obviously depend on location. If 100 miles of pipeline are required to get the CO_2 to the storage site, at a cost of $1 million/mile the pipeline cost would be $100 million. Actual pipeline costs will vary with terrain, throughput, etc.

Both DOE NETL and EPRI have estimated the incremental cost of adding CCS to an IGCC plant at about 30 $/MWh. These estimates are based on 20- and 30-year plant lives, respectively. If the capital is to be paid off in a shorter time, these estimates will rise. The Department of Energy is interested in funding multiple demonstrations of CCS technology at a commercial scale of at least 300 gross MW per unit plant power train. 300 MW at $30/MWh at 80 percent CF for 10 years results in a cost of $630 million. If it is the intent to pay for one project for its life of 20 years, the cost would be $1.26 billion and DOE's $1.3 billion would fund only one project. Therefore, the intended funding period for DOE support is a key consideration.

Accelerating RD&D on Advanced Coal Technologies with CO_2 Capture and Storage

Through the development and deployment of advanced coal plants with integrated CO_2 capture and storage (CCS) technologies, coal power can become part of the solution to satisfying both our energy needs and our global climate change concerns. However, a sustained RD&D program at heightened levels of investment and the resolution of legal and regulatory unknowns for long-term geologic CO_2 storage will be required to achieve the promise of advanced coal with CCS technologies. Through research obtained in EPRI's *CoalFleet for Tomorrow®* program—a research collaborative comprising more than 60 organizations from five continents representing U.S. utilities, international power generators, equipment suppliers, government research organizations, coal and oil companies, and a railroad—EPRI sees crucial roles for both industry and governments worldwide in aggressively pursuing collaborative RD&D over the next 20-plus years to create a full portfolio of commercially self-sustaining, competitive advanced coal power generation and CCS technologies.

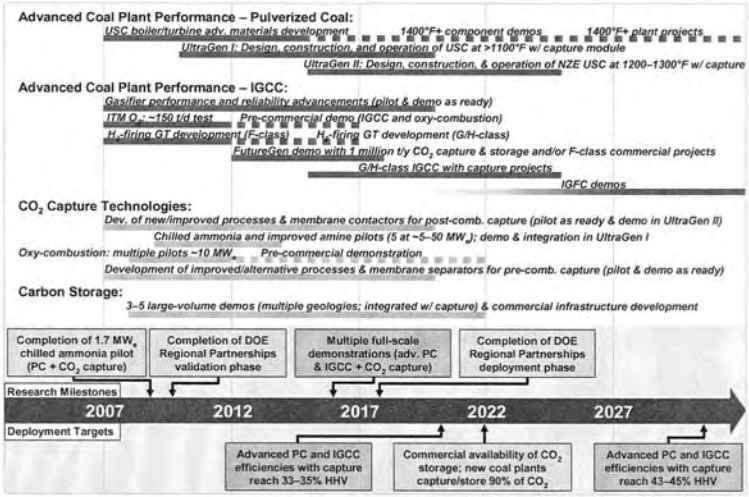
The portfolio aspect of advanced coal with integrated CCS technologies must be emphasized because no single advanced coal technology (or any generating technology) has clear-cut economic advantages across the range of U.S. applications. The best strategy for meeting future electricity needs while addressing climate change concerns and minimizing economic disruption lies in developing a *full portfolio* of technologies from which power producers (and their regulators) can choose the option best suited to local conditions and preferences, and provide power at the lowest cost to the customer. Toward this end, four major technology efforts related to CO_2 emissions reduction from coal-based power systems must be undertaken:

5. Increased efficiency and reliability of integrated gasification combined cycle (IGCC) power plants
6. Increased thermodynamic efficiency of pulverized-coal (PC) power plants
7. Improved technologies for capture of CO_2 from coal combustion- and gasification-based power plants
8. Reliable, acceptable technologies for long-term storage of captured CO_2.

Identification of mechanisms to share RD&D financial and technical risks and to address legal and regulatory uncertainties must take place as well.

In short, a comprehensive recognition of all the factors needed to hasten deployment of competitive, commercial advanced coal and integrated CO_2 capture and storage technologies—and implementation of realistic, pragmatic plans to overcome barriers—is the key to supplying affordable, environmentally responsible energy in a carbon-constrained world.

Figure 1 is an illustration from EPRI's report entitled, "The Power to Reduce CO_2 Emissions—the Full Portfolio" (available at *www.epri.com*), which depicts the major activities in each of the four technology areas which must take place to achieve a robust set of integral advanced coal/CCS solutions. Important but not shown in the figure are the interactions between RD&D activities. For example, the ion transport membrane (ITM) oxygen supply technology shown under IGCC also can be applied to oxy-combustion PC units. Further, while the individual goals related to efficiency, CO_2 capture, and CO_2 storage present major challenges, significant challenges also arise from complex interactions that occur when CO_2 capture processes are integrated with gasification- and combustion-based power plant processes.



Source: "The Power to Reduce CO2 Emissions – the Full Portfolio," http://epri-reports.org/DiscussionPaper2007.pdf

Figure 1 – Timing of advanced coal power system and CO_2 capture and storage RD&D activities and milestones

RD&D Investment for Advanced Coal and CCS Technologies

Developing the suite of technologies needed to achieve competitive advanced coal and CCS technologies will require a sustained major investment in RD&D. As shown in Table 1, EPRI estimates an expenditure of approximately $8 billion will be required in the 10-year period from 2008–17. The MIT *Future of Coal* report estimates the funding need at up to $800–$850 million per year, which approaches the EPRI value. Further, EPRI expects that an RD&D investment of roughly $17 billion will be required over the next 25 years.

Investment in earlier years may be weighted toward IGCC, as this technology is less developed and will require more RD&D investment to reach the desired level of commercial viability. As interim progress and future needs cannot be adequately forecast at this time, the years after 2023 do not distinguish between IGCC and PC.

Table 1 – RD&D Funding Needs for Advanced Coal Power Generation Technologies with CO_2 Capture

	2008–12	2013–17	2018–22	2023–27	2028–32
Total Estimated RD&D Funding Needs *(Public + Private Sectors)*	$830M/yr	$800M/yr	$800M/yr	$620M/yr	$400M/yr
Advanced Combustion, CO_2 Capture	25%	25%	40%	80%	80%
Integrated Gasification Combined Cycle (IGCC), CO_2 Capture	50%	50%	40%		
CO_2 Storage	25%	25%	20%	20%	20%

By any measure, these estimated RD&D investments are substantial. EPRI believes that by promoting collaborative ventures among industry stakeholders and governments, the costs of developing critical-path technologies for advanced coal and CCS can be shouldered by multiple participants. EPRI also believes government policy and incentives also will play a key role in fostering CCS technologies through early RD&D stages to achieve widespread, economically feasible deployment capable of achieving major reductions in U.S. CO_2 emissions.

Comments on whether the revised FutureGen approach should allow for advanced coal technology systems, other than IGCC, which also would meet the performance requirements

As stated previously, the portfolio aspect of advanced coal with integrated CCS technologies must be emphasized because no single advanced coal technology (or any generating technology) has clear-cut economic advantages across the range of U.S. applications. EPRI and industry representatives have proposed a program to support commercial projects which demonstrate advanced PC and CCS technologies. The vision entails construction of two (or more) commercially operated USC PC power plants which combine state-of-the-art pollution controls, ultra-supercritical steam power cycles, and innovative CO_2 capture technologies. The projects described below would meet the restructured FutureGen performance requirements:

UltraGen UltraSupercritical (USC) Pulverized Coal (PC) Commercial Projects.

The UltraGen I plant will use the best of today's proven ferritic steels in high-temperature boiler and steam turbine components, while UltraGen II will be the first plant in the United States to feature nickel-based alloys able to withstand the higher temperatures of advanced ultra-supercritical steam conditions.

UltraGen I will demonstrate CO_2 capture modules which separate about one million tons CO_2/yr. using the best established technology. This system will be about six times the size of the largest CO_2 capture system operating today (and that unit does not process flue gas from a coal-fired boiler). UltraGen II will treble the size of the UltraGen I CO_2 capture system, and may demonstrate a new class of chemical solvent if one of the emerging low-regeneration-energy processes has reached a sufficient stage of development. Equally, provided the technology is available, UltraGen II could be an oxy-combustion boiler. Both plants will demonstrate ultra-low emissions and will utilize control technologies identified by the DOE emission control programs. Both UltraGen demonstration plants will dry and compress the captured CO_2 for long-term geologic storage and/or use in enhanced oil or gas recovery operations.

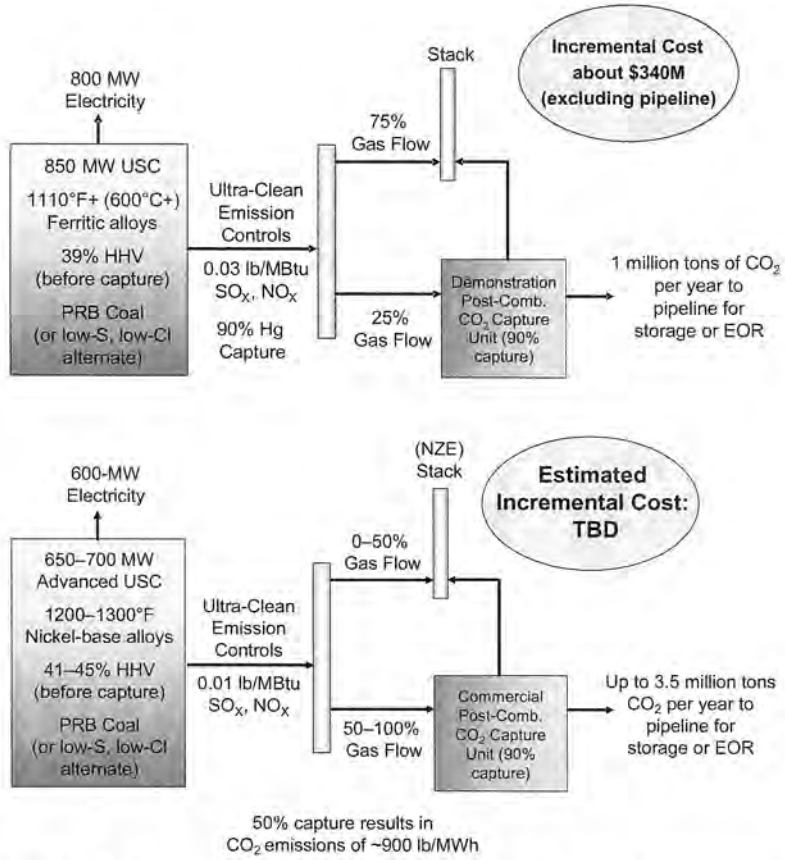


Figure 2 – Key parameters for UltraGen I (upper schematic) and UltraGen II (lower schematic), assuming a subbituminous feed coal such as Powder River Basin

The final project in the series is UltraGen III, which will operate with main steam temperatures up to 1400°F and, with boiler system design improvements, has the potential to achieve generating efficiencies of up to 50 percent. This project will use materials qualified in the DOE's current boiler and steam turbine materials program. The UltraGen Initiative identifies the need for a test facility, ComTes–1400, to test materials and components in support of UltraGen III. Such a test facility is proposed within the DOE materials program and EPRI encourages its implementation.

To provide a platform for testing and developing emerging PC and CCS technologies, the UltraGen program will allow for technology trials at existing sites as well as at the sites of new projects. Like the plan for the restructured FutureGen, EPRI expects the UltraGen projects will be commercially dispatched by electricity grid operators. The differential cost to the host company for demonstrating these improved features are envisioned to be offset by any available DOE demonstration funds, tax credits (or other incentives) and by funds raised through an industry-led consortium formed by EPRI.

The UltraGen projects represent the type of "giant step" collaborative efforts that need to be taken to advance integrated PC/CCS technology to the next phase of evolution and assure competitiveness in a carbon-constrained world. Because of the time and expense for each "design and build" iteration for coal power plants (three to five years, not counting the permitting process, and ~$2 billion), there is no room

for hesitation in terms of commitment to advanced technology validation and demonstration projects.

The UltraGen projects will resolve technical and economic barriers to the deployment of USC PC and CCS technology by providing a shared-risk vehicle for testing and validating high-temperature materials, components, and designs in plants also providing superior environmental performance.

DISCUSSION

Chairman LAMPSON. Thank you, Mr. Phillips, and we thank the panel. At this point we will go into our first round of questions and I will recognize myself for five minutes.

CARBON CAPTURE REQUIREMENT

I will start by making two statements and then asking a question. Mr. Yamagata, you stated in your testimony that the requirement to capture 90 percent carbon is overly restrictive as a requirement for the new FutureGen program, and Mr. Thompson, you state in your testimony that the 90 percent carbon capture requirement is important. Which one is it? Help me to understand your two different opinions on this. Do we need the new FutureGen and the original FutureGen policy strategy going forward?

Mr. YAMAGATA. Well, thank you, Mr. Chairman, and actually there is no contradiction here. FutureGen is going to get us 90 percent, which is our ultimate goal, and so we need to keep moving in that direction, but the restructured program that the Department is talking about, which is to attach, if you will, carbon capture equipment onto presumably commercial-scale projects today, means that we are going to have to at least, unless they change the restructured program, in order to qualify with a commercial-size power generation facility today and install a 90 percent capture system on that facility. I said technically we can do that if we are willing to pay anywhere from 60 to 90 percent cost increase in the cost of electricity today. So, what we have to start doing if we are going to do this kind of a program, as I said, we agree with the Department that we should get started with deploying this type of technology but what we need to do is crawl, walk, run. We are not ready to run with commercial-size facilities at 90 percent capture. We are ready to start crawling with commercial-sized facilities and something significantly less in the form of capturing the CO_2 at this point in time.

Chairman LAMPSON. Mr. Thompson?

Mr. THOMPSON. I would agree. I would add that the original concept of FutureGen to get this 90 percent capture, it did envision this rather complex integration of many different technologies that by pieces existed but integrating them so that together most efficiently trying to get that one percent-type gains that Dr. Yamagata talked about, you integrate all of that, that is what you need to get 90 percent. To take what I believe my fellow peer utility companies will put into the ground today as commercial utility plant, generating plant, and then try to get to 90 percent, it is very, very difficult, cost prohibitive and you really, I don't think——

Chairman LAMPSON. Why do you all think that DOE thinks that we can run then at this point? Either one of you, anybody.

Mr. THOMPSON. I would say that we have not seen any of the requests for information responses so I really can't comment on what type of responses they have gotten. Our input that we did put forward to the Department of Energy suggested this dilemma that is out there.

Chairman LAMPSON. Any comment on my question of why they think we can run?

Mr. YAMAGATA. I am not certain other than in the context, Mr. Chairman, of how FutureGen was originally proposed. It was proposed as a living laboratory and a large-scale commercial demonstration in which they would try to achieve a 90 percent capture. So—to your question of the 90 percent. So as much as anything, it is a very laudable objective and one which we need to accomplish and could be accomplished presumably with FutureGen. I mean, taking that notion, however, and putting it into the context of a restructured program, that is what I question because if we are going to take and ask commercial-scale facilities to install capture equipment and achieve a 90 percent capture now is something that I suspect very few utilities that are running commercial operations are going to be much interested in unless the government is willing to pay for the entire thing, notwithstanding the risk issues, liability issues, et cetera.

WILL INTELLECTUAL PROPERTY RIGHTS REDUCE INDUSTRY BENEFITS?

Chairman LAMPSON. I only have about 20 seconds left. DOE's new proposal focuses on commercial rather than demonstration projects. Mr. Thompson, will protection of intellectual property rights for commercial projects reduce the full benefit that the industry as a whole will receive from this government partnership?

Mr. THOMPSON. I am sorry. What IP——

Chairman LAMPSON. Will protection of intellectual property rights for commercial projects reduce the full benefit that the industry as a whole will receive from the partnership?

Mr. THOMPSON. I am sorry. I didn't understand the first time but now I do. I am sorry. Absolutely, it has that potential to be very limiting. The manufacturers, the commercial players, the utilities that would do this will certainly be looking to protect what they can. I would obviously hope from a taxpayer point of view that the Department of Energy would work with those players to allow as much IP freedom as could be made but I do believe that there will be limitations and that of course is why in the original construct of FutureGen we have gone to the other end of the spectrum where everything will be fully open, because if you don't do it that way, you are going to have restrictions.

Chairman LAMPSON. Thank you very much.

Mr. Inglis, I recognize you for five minutes.

Mr. INGLIS. Thank you, Mr. Chairman.

CARBON CAPTURE AND SEQUESTRATION RESEARCH AND DEVELOPMENT

Mr. Yamagata, you mentioned the cutting edge of carbon capture and sequestration. I was just wondering what the research that

had been done or planned to be done at FutureGen, what is—maybe you can describe, what is the cutting edge of carbon capture and sequestration?

Mr. YAMAGATA. I will defer a bit to Dr. Phillips here as well, Congressman, but the—what we know today with various kinds of energy production platforms, for example, integrated gasification combined cycle, which is the platform that would be utilized in FutureGen, depending on how much equipment we might be able to put into that facility, we can start capturing anywhere from 20 percent of the CO_2 in the system all the way up to 90, probably 90 plus. So, it has a lot to do with the amount of equipment that is put into that type of a system. In the case of a combustion-based system, which Dr. Phillips mentioned, similar to a scrubber, which is what we do today with SO2, for example, we know how to do that probably but we have this mass of air flow coming out of the back of the system, and to try and capture the CO_2 in that mass of air flow, which can be done today, but it is exceedingly expensive. But when we talk about cutting edge then, the point I was referring to, and I am not sure if that is the same point that the Secretary was referring to, is cutting edge for a commercial-based system is to step back and not try to do all of that with current technology right now. We can do 90 percent on, say, 20 percent of the slip-stream off of a combustion-based system, just smaller. That is my crawl analogy. We can do the same thing with IGCC by not trying to capture 90 percent but we could capture maybe 40 or 50 percent, and the difference—one difference, of course, as I said earlier, is, when you listen to the Department at this point, it is 90 percent. It is not 20 percent, it is not 30 percent or 40 percent. It is 90 percent. And my contention at least is, we don't need to go there yet. There is no reason why we in this kind of an atmosphere, if you will, we have to reach for that kind of a gold standard at this early date.

Mr. INGLIS. Mr. Phillips, maybe you want to comment about that as well. Help me understand the differences between those approaches.

Mr. PHILLIPS. Well, you know, if you think about pre-combustion capture of CO_2, really everything about it has been proven except the operation of the turbine on high hydrogen fuel. I am going to be going to a plant in Kansas in two days where they have a coal—actually it is petroleum coke being gasified. They go through the water gas shift reaction that would be in the FutureGen project. They use Selexal to pull out the CO_2 and they make ammonia-based fertilizer. It is one of the few ammonia fertilizer plants still in operation in the United States because all the rest were running on natural gas and they can't compete. So the technology up to the point of the gas turbine really has been proven, not quite at the scale that we want to use at FutureGen but near that size. What hasn't been proven is firing a gas turbine on a very high purity hydrogen fuel. Hydrogen burns great. There is no doubt about that. We are not worried about that. What we are worried about is that it may burn too well and it may burn up the blades, or it may burn very hot and create a lot of nitrogen oxide, which could put you out of compliance with your emission requirements. So if you are a commercial-scale plant, I mean a commercial plant that is doing

this to make money, you are going to say whoa, I am not going to take that much risk. It is enough of a risk just with all the price increases and everything to build any type of plant these days. I am not going to take something that hasn't been proven. And so what might—you might see, what we are proposing in one of our demonstration projects I just mentioned, is to take a smaller amount of CO_2 out and still leave a fuel that is not so pure in hydrogen that there is real concerns that we won't be able to operate stably. What would happen at FutureGen now is to push it right to the edge. And the other thing I should mention is that FutureGen wasn't just going to demonstrate turbines. They were going to bring in new technology like this oxygen production technology called ion transfer membrane, which could reduce the costs of oxygen by maybe a third and so this could help drive down the cost of operations and ultimately lower the cost of electricity.

Mr. INGLIS. Thank you, Mr. Chairman.

COST OF THE FUTUREGEN PROGRAM

Mr. COSTELLO. [Presiding] The Chair thanks the gentleman.

Mr. Thompson, let me ask you, the FutureGen project, the projected cost for the site at Mattoon, what is the cost projected to be?

Mr. THOMPSON. Of the capital costs for the project, it was $1.1 billion, I believe, so it is the 74 percent of approximately 1.5 in capital. There is $300 million of operating so that is in addition.

Mr. COSTELLO. There is a point that I think needs to be clarified, and let me ask you if I am correct. The figure $1.8 billion that was talked about here in the testimony today, actually adjusted for inflation, really goes through the year 2017. Is that correct?

Mr. THOMPSON. Yes, that is correct.

Mr. COSTELLO. The costs Secretary Albright indicated that he was concerned about costs going beyond $1.8 billion but actually it is adjusted for inflation through 2017. Is that correct?

Mr. THOMPSON. Yes, that is correct. It obviously has a certain set of inflation rates on the commodities but that is correct, it goes through that time period.

Mr. COSTELLO. How does the cost of DOE's reconstructed or restructured plan compare to the costs of FutureGen?

Mr. THOMPSON. Well, it is difficult to compare everything exactly apples and apples, too many apples and oranges here, but looking at their cost projections that we have been able to see or cost estimates, I believe they are trying to look at $1.3 billion for three projects and over—I am sorry, I forget the exact figure but a number of years. Trying to then take that and make an exact comparison to the FutureGen at Mattoon project is quite difficult. However, I would say as an industry executive trying to assume that costs for a carbon sequestration project on the tail end of a commercial plant is going to be far less or avoid all of these cost escalations and so on, that is not practical. When someone is going to look at looking at that addition when they do price in their projects, I believe they will be quite expensive, reflecting the same things that the FutureGen at Mattoon has tried to reflect in its cost estimates.

CREDIBILITY LOSS WITH FUTUREGEN PARTNERS

Mr. COSTELLO. You heard Mr. Albright testify, and he made the comment that either in his judgment or the Department's judgment that we have not lost momentum by pulling the plug on FutureGen and moving in this direction. You heard my comment, and my comment was that I disagreed. I think we have lost momentum. I think we send a terrible signal by this action to the private sector and to potential partners in any future project not only here in the United States but internationally. I wonder if you might comment on momentum. Would you agree with Mr. Albright's assessment that we have not lost momentum or credibility or are you concerned that we have lost momentum and credibility with our partners here in the United States and abroad?

Mr. THOMPSON. I would not agree with the comment that the Secretary made about not losing momentum. I believe that momentum in this whole field of technology development for carbon capture from the utility sector has been struck a blow by this series of events. Just reflecting on cost as we have talked about with the Department of Energy throughout last year and into the beginning of this year, we are looking at, based on the way things are going, $10 million a month of additional costs by each month of delay. So that is not momentum per se but it is certainly cost, and to have then, to the other part of your question, the circumstances work out as they have and the dialogue being what it has been, there have—in my opinion as the chair of the FutureGen Alliance—there have been damages or negative effects to industry participants and other country perspectives of dealing with the United States and the Department of Energy and industry in this country on these types of projects. Maintaining the Alliance, which has several of its 13 members internationally based and trying to describe to them what we see happening through the process of last year and into this year, it is very difficult to explain that, and to keep their interest has not been easy.

However, I would want to close on what I said in my remarks earlier. The Alliance is still completely together. All 13 members are still a part of the Alliance and we are willing and want to move forward with the project. We will have lost time obviously from December but that is something the Alliance wants and is willing to do.

MORE ON COST SHARING

Mr. COSTELLO. You heard me, Mr. Thompson, refer to the January 24th letter that Michael Mudd signed directed to the Acting Principal Deputy Assistant Secretary and I will read it again into the record a paragraph from the Alliance letter to the Deputy Assistant Secretary. It says, "I also want to reaffirm that the Alliance has agreed to boost its cost share for costs above $1.8 billion from 26 percent to 50 percent, which we believe was of paramount importance to the Department. Further, we offered to repay the Federal Government's 50 percent share with post-project revenues, which would otherwise not go to the Department." Is that an accurate statement of your offer, the Alliance's offer to the Department of Energy?

Mr. THOMPSON. Yes, it is. The board, for example, has had discussions on all that before that letter was sent so it is accurate.

Mr. COSTELLO. So the Alliance, if you received a call from the Secretary today and said we want to go back and negotiate, this is what you are willing to do in spite of the fact that there is an agreement, a binding agreement between the Alliance and the Department of Energy to increase your cost share from 26 percent to 50 percent and that you would pick up, offer to repay the Federal Government's 50 percent share of post-project revenues. Is that correct?

Mr. THOMPSON. Yes, that is correct. I would add in conjunction though with what the Secretary or Undersecretary said earlier this morning, there are some other terms that are important, and one of the terms that we wanted to do with the Department is to make sure that cost control, risk control items were in there as well, which we provided some of that information to the Department earlier. So as a package, the answer to your question is yes, we would clearly go back and work with the Department on those terms.

INCREASED INFLATION DUE TO PROJECT DELAYS

Mr. COSTELLO. A final question and not only for you but for all of the witnesses. I have concerns, and you heard me express them, the Department is saying that with the restructured approach that they believe that we are looking at a time frame of going online with one of the projects or maybe all of them in the year 2016 or 2017. If my memory serves me correctly, FutureGen was supposed to be online by 2012. Is that correct?

Mr. THOMPSON. Yes, it is.

Mr. COSTELLO. So if in fact the Department's estimate is correct, and I fail to see how they can make an accurate projection at this early stage, let us say it is 2016 or 2017, we are going to lose anywhere from a minimum of three and probably five years down the line before any one of these projects can go online. Is that correct?

Mr. THOMPSON. I believe that is a fair opinion and statement.

Mr. COSTELLO. Given the fact that we have seen materials, building materials and labor increase over the last five years, five-plus years, wouldn't it be reasonable to assume that we are going to see increased costs in fuel, building materials and labor costs between now and the time that this project can go online in 2016 or 2017, best case scenario?

Mr. THOMPSON. Yes, I believe that the cost increases that we have seen to date in inflation rates and so on, that all of that would be continuing and all of the evidence that I have as an industry participant, that that all would continue to apply through that time period to any other effort.

Mr. COSTELLO. My assumption is, if that the Department of Energy felt that for some reason even though it was in the agreement, the $1.7 billion figure was in the agreement, apparently they did not accurately build in factors that would increase the cost, the cost of building materials and other things. I would assume that if they did not do that accurately on FutureGen, I would question if the figure that they are using now for the restructured projects would be accurate. Let me ask you, I am going to ask all three witnesses to comment and then I will ask the Ranking Member if he has fur-

ther questions. Anything that you would like to add for the record before we close the hearing? First, Mr. Thompson, we will go from you to the other two witnesses.

Mr. THOMPSON. I would simply like to repeat the unwavering commitment that the Alliance has because of the belief in the project, in the technologies that are out there to integrate all of them and bring this to a worldwide participation fruition that doesn't have delay, that does get 90 percent capture, does demonstrate sequestration capabilities on this operating scale of a utility practice, that is very important and that is why the Alliance is committed to try to make this work. Thank you.

Mr. COSTELLO. Mr. Yamagata.

Mr. YAMAGATA. Thank you. Let me just say again that in reference to your comments about losing momentum that you made earlier, which I thought was very appropriate, but I would ask you to think about the need in this country to accelerate everything, not just losing the momentum here. In the other body, as you well know, there is talk about a cap-and-trade program and time frames of 2012 and 2020 when rather precipitous reductions in the amount of CO_2, particularly from stationary sources, is going to be upon us, however that comes out. If we are talking about two or three projects to capture some amount of CO_2 off of power plants in this country in the 2016 time frame, we are fooling ourselves in thinking that we are going to be able to use technology effectively to deal with this issue. We need to speed things up. FutureGen helps us move beyond what we know today. At the same time, the restructured program that the Department is talking about needs to be accelerated so that we can use what we know today and get some stuff in the ground and it is not two or three projects in 2016 or 2017. We need to accelerate this whole effort with the financial resources that we can bring to bear.

Mr. COSTELLO. Thank you.

Mr. Phillips.

Mr. PHILLIPS. Yes, thank you, and I am sorry, Mr. Costello, you moved places on me. I think I may have referred to you as the chairman before. I would like to point out that for anyone that is trying to build an electric power plant, the two entities that you really have to get behind you are the people that are going to finance it and the people that are going to insure it, and there is one thing that both those organizations abhor and that is uncertainty, and unfortunately right now when it comes to coal power, that is the only thing we have is uncertainty. We have got uncertainty over what the regulations are going to be regarding CO_2 going into the future and we have got uncertainty over the technology for capturing and storing CO_2. We don't know how well it will work and we don't know how much it will cost, and anything that you and your committee can do to help reduce that uncertainty will greatly help the electric power industry. Thank you.

Mr. COSTELLO. Thank you. The Chair now recognizes the Ranking Member, Mr. Inglis, for any further questions or comments.

Mr. INGLIS. No further questions.

Mr. COSTELLO. First let me thank all of the witnesses for appearing before the Subcommittee this morning. Under the rules of the Committee, the record will be held open for two weeks for Members

to submit additional statements and any additional questions that they may have for witnesses.

With that, again we thank you for appearing here today and the Subcommittee stands adjourned.

[Whereupon, at 12:55 p.m., the Subcommittee was adjourned.]

Appendix:

ADDITIONAL MATERIAL FOR THE RECORD

Exhibit #1

Department of Energy
Washington, DC 20585

April 11, 2008

The Honorable Nick Lampson
Chairman
Subcommittee on Energy and Environment
Committee on Science and Technology
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

Transmitted herewith is the Department's initial production of documents in response to the Subcommittee's April 2, 2008 letter to the Secretary requesting material relating to FutureGen that were prepared for the Secretary or involved the Secretary's review or participation. Many of the documents being provided to the Subcommittee today contain information that is protected by the attorney-client privilege or other legal privileges and the Department respectfully requests that the Subcommittee consult the Department before releasing or disclosing any of the documents being provided to the Subcommittee today, or the information contained therein.

We have not produced a number of responsive documents that, while associated with some Secretarial involvement, also implicate executive branch prerogatives. We are willing to work with the Subcommittee in an effort to accommodate the Subcommittee's legislative needs in a manner that respects the interests of both the executive and legislative branches.

The Department is continuing to collect and review documents that may be responsive to your request and will produce any additional responsive document to the Subcommittee as promptly as possible.

If you have any questions, please contact me or Ms. Lisa Epifani, Assistant Secretary for Congressional and Intergovernmental Affairs, at (202) 586-5450.

Sincerely,

Eric J. Fygi
Deputy General Counsel

Enclosures

cc: The Honorable Bob Inglis
Ranking Member
Subcommittee on Energy and Environment

BART GORDON, TENNESSEE
CHAIRMAN

RALPH M. HALL, TEXAS
RANKING MEMBER

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY
SUITE 2320 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515-6301
(202) 225-6375
TTY: (202) 226-4410

April 2, 2008

The Honorable Samuel W. Bodman
Secretary of Energy
U.S. Department of Energy
Washington, DC 20585

Dear Secretary Bodman:

The Subcommittee is interested in learning how the Department came to so abruptly change direction on how to proceed with the FutureGen project. In fact, it looks as if the project has been fundamentally abandoned in favor of a new, unauthorized approach for which no money has been appropriated.

The program was announced as a major initiative of the Administration and your Department has supported the program for the past five years. As recently as November 30, 2007, you assured interested parties that the Department was moving forward expeditiously with this project and on track to make a final decision about the site for the facility by the end of the year. So it was with some confusion that we learned at the end of January of your decision to terminate the Department's participation in this project.

Because of the Committee's jurisdiction over all non-military research and development and our specific concerns about the implications of the decision to abandon the FutureGen program on the achievement of our goal to develop and deploy carbon capture and sequestration technologies, we desire to review this decision.

Under the authority assigned the Committee in House Rules X and XI, I ask that you produce to the Subcommittee complete records (see attachment) of all materials relating to FutureGen that were prepared for you or involved your review or participation. These include e-mails, briefing memoranda, decision memoranda, notes for letters, phone calls or other communications of whatever form, draft correspondence, final correspondence, and all other materials, of whatever description, relating to FutureGen and involving your office from November 1, 2007 until the present.

Please provide these materials no later than COB on Friday, April 11, 2008. You may contact Dr. Jean Fruci (202-225-6375), staff director, Subcommittee on Energy and Environment, or Dr. Dan Pearson (202-225-6375), Committee staff, to arrange for the delivery of these materials or if you have any questions. Please provide two copies of these materials (one for the Majority and one for the Minority). The materials for the Majority should be delivered to Rayburn 2319. The materials for the Minority should be delivered to Ford 394.

Sincerely,

NICK LAMPSON
Chairman
Subcommittee on Energy and Environment

Attachment

Exhibit #2a

United States Department of Energy
Washington, D.C. 20585

Final

MEETING MEMORANDUM

To:	**Secretary Bodman**
From:	Lisa Epifani, Assistant Secretary
Office:	Office of Congressional and Intergovernmental Affairs
Direct Number:	(202) 586-4967 **Home Number:** (202) 321-4234
Cell Number:	(202) 834-8646
Meeting:	Sen. Richard Durbin (D-IL)
Location:	Secretary's Office (phone call)
Meeting Date:	December 13, 2007 **Time:** 8:45 am-9:00 am

Requested by:
Senator Durbin

Outside Attendees:
None

Background:
On December 11, the Office of Congressional & Intergovernmental Affairs contacted members of the Illinois and Texas Congressional delegations, as well as interested Committee staff, to notify them that DOE had sent a letter to the FutureGen Alliance regarding the Record of Decision ("ROD") for the FutureGen project and the Alliance's plans for a site selection announcement. The ROD will identify the site or sites that DOE finds acceptable from a NEPA standpoint. After ROD issuance, the Alliance may select the host-site.

Under applicable regulations, the earliest possible date that DOE could approve the ROD would be December 17, the same date that the Alliance has planned its site selection announcement. DOE will not be prepared to release the ROD on that date, and the Alliance cannot make a site selection prior to release of the ROD. Please see attached copies of the Alliance letter to Under Secretary Albright dated December 6, and DOE's December 11 response.

Senator Durbin's staff asked whether the delay in issuing the ROD would be a matter of "days, weeks, or months?" We indicated that the Department is continuing to work on the ROD but that we cannot commit to a certain date when the ROD will be released.

Senator Durbin is likely to ask you about the timing of release of the ROD. He will also ask you whether or not DOE still intends to proceed with the FutureGen project. Please see the attached December 9 news article in which Senator Durbin warned his Illinois constituents that FutureGen may be scrapped due to the cost escalation.

Is there a statutory deadline setting when DOE must issue the ROD?
The ROD may not be release prior to December 17. There is no statutory or regulatory deadline that requires the ROD to be released by a certain date.

Who are the Members of the FutureGen Alliance?

American Electric Power Service Corporation, Anglo American Services (UK) Limited, BHP Billiton Energy Coal, Inc., China Huaneng Group, CONSOL Energy Inc., E.ON U.S. LLC, Foundation Coal Corporation, PPL Energy Services Group, LLC, Peabody Energy Corporation, Rio Tinto Energy America Services, Southern Company Services, Inc., Xstrata Coal Pty Limited, and Luminant.

What are the past and current cost projections for the FutureGen project?
DOE's original internal project cost estimate was $950 million priced in 2004 constant dollars. The current total cost estimate, derived from Alliance conceptual design work during Budget Period 0, is $1,757,232,310 in as-spent dollars with the DOE cost share of $1,300,352,230 and the Alliance share of $456,880,000. An updated project cost-estimate is required at the end of the current Budget Period 1.

Why have costs increased?

Escalation in critical areas has far exceeded those originally predicted by DOE and Industry indices in 2004. These include:

- Increased detailed design cost
- Increased labor cost
- Increased raw materials cost (e.g., steel, copper, etc.), and
- Increased costs of fabrication and construction.

How much money has DOE invested in the project to date?

DOE has obligated $39,109,230 and has spent approximately $13 million.

How much money has the Alliance invested in the project to date?

The Alliance has committed to $13,741,080 and has spent approximately $5 million.

What activities has DOE commenced or completed on FutureGen?

- The Alliance completed a conceptual design and cost estimate for the Project during Budget Period 0. The Alliance is currently working on the preliminary engineering design, equipment specification and procurements, and host-site selection activities. Site specific activities will occur after issuance of DOE's NEPA ROD.

- DOE's Environmental Impact Statement is complete and published. The ROD is under internal review. Site selection cannot occur until after the ROD is issued.

- DOE has negotiated and awarded a full scope cooperative agreement that is divided into 6 phases (called budget periods). See table below. DOE has the right to discontinue the project at the completion of each budget period. Currently, the project is in the middle of Budget Period 1.

Budget Period No.	Budget Period Dates	Government Share (74%)	Recipient Share (26%)	Total
BP-0	12/02/05 – 01/31/07	$ 7,602,770	$ 2,671,243	$ 10,274,013
BP-1	02/01/07 – 06/15/08	$ 31,506,460	$ 11,069,837	$ 42,576,297
BP-2	06/16/08 – 03/31/09	$ 74,898,000	$ 26,315,000	$ 101,213,000*
BP-3	04/01/09 – 11/30/12	$ 895,999,000	$ 314,810,000	$ 1,210,809,000*
BP-4	12/01/12 – 11/30/15	$ 273,816,000	$ 96,206,000	$ 370,022,000*
BP-5	12/01/15 – 11/30/17	$ 16,530,000	$ 5,808,000	$ 22,338,000*
TEPC		$1,300,352,230	$ 456,880,080	$ 1,757,232,310

DOE Staff Attending: Epifani

Open to Press: [ ] Yes [X] No

SENATOR RICHARD J. DURBIN (D-IL)
Telephone Number: (202) 224-2152
Room Number: 309 Hart

Senate: since 1997
Next Election: 2008
Born: November 21, 1944 in East St. Louis, Illinois
Home: Springfield
Education: Georgetown University, B.S.F.S. 1966 (international affairs and economics), J.D. 1969
Profession: Attorney
Religion: Roman Catholic
Family: Wife, Loretta Schaefer Durbin; three children

COMMITTEES: (110th Congress)
Committee on Appropriations
Subcommittees: Agriculture, Rural Development, Food and Drug Administration, and Related Agencies; Defense; Financial Services and General Government (Chairman); Labor, Health and Human Services, Education, and Related Agencies; Legislative Branch; State, Foreign Operations and Related Programs; Transportation, Housing and Urban Development, and Related Agencies
Committee on the Judiciary
Subcommittees: The Constitution, Civil Rights and Property Rights; Crime and Drugs; Human Rights and the Law (Chairman); Immigration, Border Security and Citizenship; Terrorism, Technology and Homeland Security
Committee on Rules and Administration

POLITICAL HIGHLIGHTS

Democratic nominee for Illinois Senate, 1976; Democratic nominee for Lieutenant Governor, 1978; U.S. House, 1983-1997.

DOE FACILITIES IN SENATOR DURBIN'S STATE

- The **Chicago Operations Office** is responsible for providing business, technical, and administrative support to the Office of Science complex and other Department of Energy offices. The FY 2007 budget is $629.1 million. The **Argonne Site Office** manages the Department of Energy's management and operating contract for the Argonne National Laboratory (ANL) and provides oversight of ANL's operational and management performance. The FY 2007 budget is nearly $6.2 million.

- The **Argonne National Laboratory**, chartered in 1946 as the nation's first national laboratory, is operated by the University of Chicago for the U.S. Department of Energy's Office of Science. Argonne is managed and operated at various levels by a number of key groups, including a Board of Governors and the Argonne Directorate. The laboratory conducts applied research and engineering development in nuclear fission and other energy technologies, and it performs scientific research in basic physical and life sciences. The FY 2007 budget for the Argonne National Laboratory is $387.7 million.

- The **Fermi Site Office** manages the Department of Energy's prime contract with Universities Research Association, Inc., for the management and operation of the **Fermi National Accelerator Laboratory** (FNAL) in Batavia, Illinois. The laboratory conducts research in high energy physics to study the basic structure of matter. The FY 2007 budget for the site office and laboratory is $2.3 million and nearly $323.9 million respectively.

  In April 1994, the Collider Detector at FNAL presented the first direct experimental evidence for the top quark, a subatomic particle that is the last undiscovered quark of the six predicted by current scientific theory.

- The **New Brunswick Laboratory** (Argonne) serves as a technical extension of the Office of Safeguards and Security in the areas of nuclear material control and accountability, maintaining a laboratory for measurements and standards. The FY 2007 budget is nearly $8.5 million.

- Environmental Management Facilities and Sites

  Fermi National Accelerator Laboratory (Batavia)
  Argonne National Laboratory (Lemont)

- Legacy Management Facilities and Sites

  Granite City Steel Site (Granite City)
  Madison Site (Madison)
  Site A/Plot M Decommissioned Reactor (Willow Springs)

- The Department of Energy estimates it will spend nearly $893.8 million in Illinois in FY 2007; including nearly $694.7 million for science and $74.5 million for energy supply and conservation.

Revised 4/3/08

Date posted online: Sunday, December 09, 2007

Durbin: Watch FutureGen costs

Senator likens it to Super Collider, scrapped due to ballooning budget

BY MIKE RIOPELL
Lee News Service

SPRINGFIELD | As two Illinois towns count the days to see if the federal government will build an experimental power plant there, federal officials are expressing concern that the FutureGen project's price tag could jeopardize the project's future.

The proposed plant would be funded through a combination of tax dollars and energy company money at an estimated cost of nearly $1.8 billion.

Tuscola and Mattoon in east central Illinois are finalists to host FutureGen along with two towns in Texas. It would use coal to create electricity, but then send pollutants underground.

But U.S. Sen. Dick Durbin, an Illinois Democrat and second-ranking member of the Senate, said watching the project's cost will be key.

He said this week that he didn't want to see FutureGen go the way of the proposed Superconducting Super Collider. The massive federal project was planned in the late 1980s and slated to be built in Texas.

The particle accelerator was billed as a key scientific project. Construction began, but under a ballooning budget, Congress cancelled the project in 1993.

"I don't want that to happen again," Durbin said.

FutureGen's price tag is now slated at $1.8 billion -- or roughly twice what it was when first announced. A FutureGen spokesman said $300 million of that should come back from selling the electricity the project creates.

Durbin said that in going forward with the project, it'll be important not to overburden federal taxpayers.

A group of private companies known as the FutureGen Alliance will pay for a significant portion of the project.

"The extent of their participation will really decide if this project is economically feasible," Durbin said.

Another company, Luminant, joined the group this week, perhaps further dividing the expense among them.

Energy company officials have said they're motivated to see FutureGen through. Its proposed technology has been billed as a potential boon to the coal industry, which has suffered in recent years under more strict environmental standards for power plants.

So a plant that could burn coal and create almost no pollution could seem ideal.

U.S. Rep. John Shimkus, R-Collinsville, said that if FutureGen is eventually slated for Illinois, the congressional delegation will have to fight hard for money every year to keep it going.

He said it's difficult to predict how easy that will be, because new members of Congress and a different president might not be as attached to the project as current officials. FutureGen was originally an initiative of President Bush.

"Every Congress is a new, living, breathing thing," Shimkus said.

"We still have challenges," he added.

-- Mike Riopell can be reached at mike.riopell@lee.net or (217) 789-0865.

Exhibit #2b

United States Department of Energy
Washington, D.C. 20585

draft

MEETING MEMORANDUM

To: Secretary Bodman

From: Lisa Epifani, Assistant Secretary
Office: Office of Congressional and Intergovernmental Affairs
Direct Number: (202) 586-4967 **Home Number:** (202) 321-4234
Cell Number: (202) 834-8646

Meeting: Sen. Richard Durbin (D-IL)
Location: Secretary's Office (phone call)
Meeting Date: December 12, 2007 **Time:** TBD

Requested by:
Senator Durbin

Outside Attendees:
None

Background:
On December 11, the Office of Congressional & Intergovernmental Affairs contacted members of the Illinois and Texas Congressional delegations, as well as interested Committee staff, to notify them that DOE had sent a letter to the FutureGen Alliance regarding the Record of Decision ("ROD") for the FutureGen project and the Alliance's plans for a site selection announcement. The ROD is a key component in the Alliance's site selection and the Alliance cannot move forward without the ROD release.

Under applicable regulations, the earliest possible date that DOE could approve the ROD would be December 18, the same date that the Alliance has planned its site selection announcement; DOE will not be prepared to release the ROD on that date. Please see attached copies of the Alliance letter to Under Secretary Albright dated December 6, and DOE's December 11 response.

Senator Durbin's staff asked whether the delay in issuing the ROD would be a matter of "days, weeks, or months?" We indicated that the Department is continuing to work on the ROD but that we cannot commit to a certain date when the ROD will be released.

Senator Durbin is likely to ask you about the timing of release of the ROD. He will also ask you whether or not DOE still intends to proceed with the FutureGen project. Please see the

attached December 9 news article in which Senator Durbin warned his Illinois constituents that FutureGen may be scrapped due to the cost escalation.

Following is additional information on Futuregen for your reference:

Is there a statutory deadline setting when DOE must issue the ROD?
There is no statutory deadline on the ROD, per NETL lawyers and GC NEPA office.

Who are the Members of the FutureGen Alliance?

American Electric Power Service Corporation, Anglo American Services (UK) Limited, BHP Billiton Energy Coal, Inc., China Huaneng Group, CONSOL Energy Inc., E.ON U.S. LLC, Foundation Coal Corporation, PPL Energy Services Group, LLC, Peabody Energy Corporation, Rio Tinto Energy America Services, Southern Company Services, Inc., Xstrata Coal Pty Limited, and Lumiant.

What are the past and current cost projections for the FutureGen project?

- Initial Total Project Cost Estimate: $950 Million in Constant 2004 Dollars (74% Government/24% Industry Cost Share)
- Total estimated cost of the project now $1.7 billion through 2016, offset by about $300 million in anticipated power revenue.
- The DOE portion of the net total project cost is expected to be slightly over $1 billion and the Alliance share is expected to be just under $400 million under the current agreement.

Why have costs increased?

- 38 percent rise in utility plant materials in recent years and;
- Increases in the range of 25 percent for common building materials, construction, and labor in the regional locales of candidate sites; and
- Utility plant materials such as steam pipe and steel distribution pipe have risen 66 percent and 119 percent respectively.

How much money has DOE invested in the project to date?

- $9,037,436 DOE Share through June 2007

How much money has the Alliance invested in the project to date?

- $3,175,315 Alliance Share through June 2007

What activities has DOE commenced or completed on FutureGen?

The FutureGen Project is comprised of six budget periods with continuation into each subsequent budget period contingent upon the approval of a continuation application. The first budget period (Budget Period 0) was completed under a Limited Scope Cooperative Agreement that provided an opportunity to examine the feasibility of the project. The current Budget Period 1 of the Full Scope Cooperative Agreement will cover the remainder of the National Environmental Policy Act (NEPA) process, site selection, detailed characterization of the selected site, and preliminary design work.

If more than one site is approved by DOE in the ROD, the host site would be selected by the Alliance. After the host site is selected, the Alliance would conduct additional site characterization studies, prepare a site-specific design, and obtain relevant environmental, utility, and operational permits for the project.

DOE Staff Attending: Epifani

Open to Press: [ ] Yes [X] No

Exhibit #3

Talking Points for
Secretary call to Chairman Dorgan re FutureGen Hearing

- I understand you are interested in holding a FutureGen hearing in which I would serve as a witness.
- I am certainly willing to make my self available to the Committee to talk about this issue, but do want to express some concerns I have about a FutureGen hearing and set appropriate expectations.
- As you are aware, we restructured the program for two reasons: the cost growth in the project; and the changing market needs since the program was originally designed. Nothing new will be brought forth on that decision.
- We issued a Request for Information on the new program in January. Comments were due March 3rd and there was quite a bit of positive response from industry (approximately 48 comment letters were submitted).
- The DOE program staff are busy reviewing these expressions of interest and determining the next steps.
- I am concerned that if a Congressional hearing is held now, it will only focus on the old program just at the time when industry and some in Congress are starting to look seriously at our new approach which we believe can accelerate carbon capture & storage for a more controlled cost.
- I think DOE will be in a better position by May to provide more refined and more useful information to the Committee about our draft solicitation and plans for next steps.
- I know your staff has been very cooperative in working with my staff. An April 23rd date was proposed and I appreciate that, but I think that we could have a much more interesting and valuable hearing if it was timed closer to when DOE

was releasing a Draft Solicitation on the restructured FutureGen. As I said, I expect that to be in May.

Internal Question re Reprogramming

Although there is no statutory requirement we do a reprogramming, Eric Fygi has indicated that a reprogramming request is likely necessary based on precedent and Committee guidelines. If, however, the Committees were amenable to something other than a reprogramming request, we might be able to complete the restructuring through a notification letter. So far, it is not clear what the Committees want. If DOE were to seek a reprogramming, we would expect the Illinois delegation to urge to Approps Members to oppose the request.

CI thoughts for consideration

Chairman Dorgan will likely allow Senator Durbin to speak on a separate panel at the hearing.

Chairman Dorgan does not seem to be holding this hearing at anyone's request; he made a snap decision (his staff were surprised) and announcement that he wanted S-1 for a FutureGen hearing soon.

Chairman Dorgan's reaction to this call is unpredictable. While he may want to be accommodating, Approps mark up efforts take place in May and he will want to have this hearing done.

Chairman Dorgan may also point out that he has refrained (unlike the House Approps) from asking you to testify before his Committee.

If DOE wants to include a NETL expert on the panel with the Secretary, CI is confident that Chairman Dorgan would accept that.

Exhibit #4

United States Department of Energy
Washington, D.C. 20585

FINAL

MEETING MEMORANDUM

To: Secretary Bodman

From: Lisa Epifani, Assistant Secretary
Office: Office of Congressional and Intergovernmental Affairs
Direct Number: (202) 586-4967 **Home Number:** (202) 321-4234
Cell Number: (202) 280-9020
Bement

Meeting: Representative Tim Johnson (R-IL)

Location: Secretary's office (phone call)
Meeting Date: November 2, 2007 **Time:** 4:00 PM – 4:30 PM

Requested by:
Representative Johnson (1) TJ: EIS - next week to publish / ROD

Outside Attendees:
None (2) Sequestration Partnerships.

LP

Background:
required to OMB.
Representative Johnson has requested to speak with you regarding FutureGen. Both of the potential Illinois sites are located in his district, in Tuscola and Mattoon. He is likely to ask you if DOE and the FutureGen Alliance remain on track to select a site in the near future.

You may wish to have a similar conversation with Representative Johnson as you had with Senator Durbin last Friday. Below are some talking points for your use:

- I am extremely concerned about the cost escalation of this project, which has gone from roughly $900 million to $1.8 billion and we haven't even broken ground yet.
- DOE is paying 74% of the cost right now, and the Alliance is only paying 26%. This arrangement is no longer sustainable given the recent escalation in project costs.
- We want the Alliance to pick up a greater share of the cost over-runs.
- Under Secretary Bud Albright is leading our negotiations.

- Any assistance you can provide in informing the Alliance that DOE is extremely serious about altering the cost-share would be much appreciated.

The FutureGen Alliance is holding a Board meeting November 1 and 2 to discuss these and other issues. We will provide you an update on any developments prior to your call with Representative Johnson.

Attached for your reference is a copy of the October 25 letter to you from the FutureGen Alliance.

DOE Staff Attending: Lisa Epifani or Eric Nicoll

Open to Press: [ ] Yes [X] No

REPRESENTATIVE TIMOTHY V. JOHNSON (R IL-15)
Telephone Number: (202) 225-2371
Room Number: 1207 Longworth

House: since 2001
Born: July 23, 1946 in Champaign, Illinois
Home: Urbana
Education: U.S. Military Academy, attended 1964; University of Illinois, B.A. 1969, J.D. 1972
Profession: Lawyer, realtor
Religion: Assemblies of God
Family: Divorced; nine children

COMMITTEES: (110th Congress)
Committee on Agriculture
Subcommittees: General Farm Commodities and Risk Management
Committee on Transportation and Infrastructure
Subcommittees: Highways and Transit; Railroads, Pipelines and Hazardous Materials

POLITICAL HIGHLIGHTS

Urbana City Council, 1971-1975; Illinois House, 1977-2000.

DOE FACILITIES IN REPRESENTATIVE JOHNSON'S DISTRICT

- There are no DOE facilities in Representative Johnson's Congressional District.
- The Department of Energy estimates it will spend nearly $893.8 million in Illinois in FY 2007; including nearly $694.7 million for science and $74.5 million for energy supply and conservation.

Revised 11/1/07

Exhibit #5

FutureGen Congressional Call Script
12.17.07

- We are calling you today to make you aware of some challenges and potential opportunities related to the FutureGen project.
- As you know, DOE is committed to ensuring that coal, which is and will remain critical in our energy mix, can be used in the cleanest manner.
- The FutureGen program was designed pursue a near zero emission coal-fired power plant.
- The original concept envisioned a 275 MW plant that would serve as a laboratory for the development and demonstration of carbon capture and storage ("CCS") technology.
- The current FutureGen structure is financially unsustainable. DOE has tried to restructure the project to ensure a more equitable allocation of the projects costs.
    - Specifically, DOE asked the Alliance, as manager of this FutureGen project, to signal its commitment to the project by sharing equally the responsibility for cost overruns beyond the current estimated project cost of $1.76 billion.
    - Under DOE's proposal, DOE would bear $1.3 billion of the first $1.76 billion in cost, and fifty percent of cost increases above that; the Alliance members would pay $0.457 billion of the first $1.76 billion cost, and fifty percent of amounts above that.
    - The Alliance rejected the offer. Instead, they unilaterally announced that they would make a site selection announcement despite DOE's request that they not do so.
- The market has indicated that it is willing to pursue integrated gasification combined cycle (IGCC), but one of the barriers to that pursuit has been the need to prove that CCS works.
- Therefore, DOE has decided it is necessary to revise the original FutureGen concept and pursue an approach that will accelerate commercial scale application of CCS technology.
- DOE intends focus FutureGen in a way that will allow competitive solicitation to support the application of CCS at multiple IGCC plants.
- The Department believes that refocusing FutureGen on integrating IGCC and CCS technology at a commercial scale will mitigate some of the regulatory uncertainty that has recently befallen the power industry *(as evidenced by the numerous IGCC cancellations in states like Arkansas, Washington, and Florida)*.
- Additionally, by focusing on integrating CCS, we can better limit the government's financial risk by offering a finite sum to be competitively bid on by private industry potentially for multiple projects.
- Again, I want to repeat that the goals of the FutureGen program remain the same – achieving a cleaner use of coal.
- We work with you and your staff, as well as industry, to make sure that the FutureGen approach DOE would like to pursue provides a faster path to commercial reality and could lead to more carbon being sequestered in a more cost effective manner.

Obama 12/17/07

4:30 PM

Member/Senator Calls by Secretary Bodman, Deputy Secretary Sell and Under Secretary Albright

Member	Number	Caller	Staffer CI to call
Senator Richard Durbin	202-224-2152	Bodman	Pat Souders 202-224-2152 ✓
Senator Byron Dorgan	202-224-2551	Clay	Franz Wuerfmannsdobler 202-224-8119 7 pm
Senator Jeff Bingaman	202-224-5521	Clay	Bob Simon 202-224-4971 ✓ Staff ~~7pm~~
Senator Pete Domenici	202-224-6621	Clay	Frank Macchiarola 202-224-1004 7pm
Governor Rick Perry	512-463-7210	Clay	Donna Nelson 512-463-1774 7pm
Senator John Cornyn	202-224-2934	Bud	Spencer Chambers Beth Jafari 202-224-7805 ✓ Staff
Senator Kay Bailey Hutchison	202-224-5922	Bud	Jamie Moore 202-224-5922
Congressman Roy Blunt	202-225-6536	Bud	Mike Ference 202-226-3555 ✓ Member
Congressman Joe Barton	202-225-2022	Bud	David McCarthy 202-225-5659 ✓ Member
(1) Congressman Pete Visclosky	202-225-2461	Bud	Terry Tyborowski 202-225-3421 ✓ Staff
(5) Congressman David Hobson	202-225-4324	Bud	Kevin Cook 202-225-3481 VM
(1) Congressman John Shimkus	202-225-5271	Bud	Ryan Tracy 202-225-5271
(2) Congressman Tim Johnson	202-225-2371	Bud	Bobby Frederick 202-225-2371 ✓ STAFF
(3) Congressman Jerry Costello	202-225-5661	Bud	David Gillies 202-225-5661
Congressman Michael Conaway	202-225-3605	Bud	Scott Graves 202-225-3605 ✓ Member
Congressman Rick Boucher	202-225-3861	Bud	Laura Vaught 202-225-3861 VM

Governor Rod Blagojevich	312-814-8868	Bud	Steve Frenkel 312-814-3303

5:00 PM
Tier 2 - Key Congressional Staff calls by DOE CI staff.

Staffer	Number	Caller	NOTES
Senate Energy and Natural Resources			
Allyson Anderson (Maj)	202-224-7143		
Mike Carr (Maj)	202-224-8164		
Colin Hayes (Min)	202-224-4797		
Staffer	**Number**	**Caller**	**NOTES**
Congressman Ralph Hall			
Elizabeth Stack	202-226-9783		
Congressman Nick Lampson			
Bobby Zafarina	202-225-5951		
Congressman Bob Inglis			
Garth VanMeter	202-226-6922		
Congressman Bart Gordon			
Christopher King	202-225-8844		
House Energy and Commerce			
Sue Sheridan (Maj)	202-225-6573		
Senate Energy and Water Development Appropriations			
Doug Clapp (Maj)	202-224-8119		
Scott O'Malia (Min)	202-224-7260		
House Energy and Water Development Appropriations			
Dixon Butler (Maj)	202-225-3421		
Scott Burinson (Maj)	202-225-3421		
Senate Leadership			
Chris Miller (Reid)	202-224-3542		
Jessica Leonard (Durbin)	202-224-2152		
Libby Jarvis (McConnell)	202-224-3135		
Jack Norris (Lott)	202-224-2215		

House Leadership			
Amy Fuerstenau (Pelosi)	202-225-0100		
Mary Frances Repko (Hoyer)	202-225-3130		
Jay Cranford (Boehner)	202-225-4000		

12/14

Future Gen Rollout
*** DRAFT SUBJECT TO CHANGE ***

Tier 1 Member/Senator calls beginning Monday, 12-17-07:

Senator Durbin – S1
Senator Dorgan – S2
Senator Domenici – S2
Governor Perry – S2
Congressman Barton – Bud
Congressman Visclosky – Bud
Congressman Hobson – Bud
Congressman Shimkus – Bud
Governor Blagojevich – Bud
Congressman Johnson—Bud
Congressman Costello—Bud
Congressman Conaway—Bud
Senator Cornyn—Bud or S2
Senator Hutchison—Bud or S2

Obama schedule
9 a.m. Hill calls start
11:30 advisory
12:15 release
1:00 press conf/sc

Tier 2 staff calls beginning Monday 12-17-07:

Senate Energy and Natural Resources staff
- Bob Simon – 202-224-4971 (SENR main line)
- Allyson Anderson - 202-224-7143 (direct)
- Mike Carr – 202-224-8164 (direct)
- Frank Macchiarola – 202-224-1004 (direct)
- Colin Hayes – 202-224-4797 (direct)

House Energy and Commerce staff
- David McCarthy – 202-225-5659 (direct)
- Sue Sheridan – 202-225-6573 (direct)

Senate Energy and Water Development Appropriations staff
- Doug Clapp – 202-224-8119 (SEWD Majority line)
- Scott O'Malia – 202-224-7260 (SEWD Minority line)
- Franz Wuerfmannsdobler – 202-224-8119 (SEWD Majority line)

House Energy and Water Development Appropriations staff

Future Gen Rollout
*** DRAFT SUBJECT TO CHANGE ***

- Kevin Cook – 202-225-3481 (HEWD Minority line)
- Dixon Butler – 202-225-3421(HEWD Majority line)
- Scott Burinson - 202-225-3421(HEWD Majority line)
- Terry Tyborowski – 202-225-3421(HEWD Majority line)

Senate Leadership

- Reid – Chris Miller – 202-224-3542 (office main line)
- Durbin – Jessica Leonard – 202-224-2152 (office main line)
- McConnell – Libby Jarvis – 202-224-3135 (office main line)
- Lott – Jack Norris - 202-224-2215 (direct)

House Leadership

- Pelosi – Amy Fuerstenau – 202-225-0100 (office main line)
- Hoyer – Mary Frances Repko – 202-225-3130 (office main line)
- Boehner – Jay Cranford 202-225-4000 (office main line)
- Blunt – Mike Ference – 202-226-3555 (direct)

Affected Delegations and Congressional Contacts-

	FUTUREGEN AFFECTED DELEGATIONS			
IL	Senator Barack Obama	Staff call	202-224-2854	pete_rouse@obama.senate.gov Todd_atkinson@obama.senate.gov
	Dennis Hastert	Staff call	202-225-2976	chris.sarlev@mail.house.gov Bill.koetz_le2@mail.house.gov
	Tim Johnson	Staff call	202-225-2371	Robert.frederick@mail.house.gov
	Jerry Weller	Staff call	202-225-3635	Eric.grev@mail.house.gov
	Ray LaHood	Staff Call	202-225-6201	Patrick.carroll@mail.house.gov
	Jerry Costello	Staff call	202-225-5661	david.gillies@mail.house.gov Jeanne.morrissey@mail.house.gov
	Judy Biggert	Staff call	202-225-3515	paul.doticette@mail.house.gov
	Melissa Bean	Staff email		sam.hodas@mail.house.gov
	Danny Davis	Staff email		charles.brown@mail.house.gov
	Rahm Emanuel	Staff email		luis.jimenez@mail.house.gov
	Luis Gutierrez	Staff email		greg.staff@mail.house.gov
	Phil Hare	Staff email		janna.bergquist@mail.house.gov
	Jessie Jackson Jr.	Staff email		megan.o.moore@mail.house.gov
	Mark Steven Kirk	Staff email		andria.hoffman@mail.house.gov
	Dan Lipinski	Staff email		chris.lyons@mail.house.gov
	Don Manzullo	Staff email		nathan.mcgrath@mail.house.gov
	Peter Roskam	Staff email		david.mork@mail.house.gov
	Bobby Rush	Staff email		johnm@mail.house.gov
	Jane Schakowsky	Staff email		isaac.brown@mail.house.gov
TX	Senator Kay Bailey Hutchison	Staff call	202-224-5922	Brian_knapp@hutchison.senate.gov

Future Gen Rollout
***** DRAFT SUBJECT TO CHANGE *****

			Jamie_moore@hutchison.senate.gov
Senator John Cornyn	Staff call	202-224-2934	Spencer_chambers@cornyn.senate.gov
Chet Edwards	Staff call	202-225-6105	Stoney.burke@mail.house.gov
Michael Conaway	Staff call	202-225-3605	scott.graves@mail.house.gov
Jeb Hensarling	Staff call	202-225-3484	Kyle.jackson@mail.house.gov
Kevin Brady	Staff call	202-225-4901	kimberly.thompson@mail.house.gov
Randy Neugebauer	Staff call	202-225-4005	dan.hilton@mail.house.gov
Charles A. Gonzalez	Staff call	202-225-3236	leo.munoz@mail.house.gov
Lamar Smith	Staff call	202-225-4236	mark.sanchez@mail.house.gov
Ciro Rodriguez	Staff call	202-225-4511	Rene.munoz@mail.house.gov
Michael Burgess	Staff call	202-225-7772	matt.johnson@mail.house.gov
Nick Lampson	Staff call	202-225-5951	dan.easley@mail.house.gov
Michael Burgess	Staff email		matt.johnson@mail.house.gov
John Carter	Staff email		chris.alsup@mail.house.gov
Henry Cuellar	Staff email		jonathan.pawow@mail.house.gov
John Culberson	Staff email		alicia.lee@mail.house.gov
Louie Gohmert	Staff email		drew.kent@mail.house.gov
Kay Granger	Staff email		rachel.carter@mail.house.gov
Gene Green	Staff email		john.jones@mail.house.gov
Hinjosa	Staff email		andrew.jones@mail.house.gov
Al Green	Staff email		oscar.ramirez@mail.house.gov
Sheila Jackson-Lee	Staff email		yohannes.tsehai@mail.house.gov
Eddie Bernice Johnson	Staff email		joy.purser@mail.house.gov
Kenny Marchant	Staff email		ryan.flood@mail.house.gov
Michael McCaul	Staff email		alex.manning@mail.house.gov
Solomon Ortiz	Staff email		patricia.villarreal@mail.house.gov
Ron Paul	Staff email		norman.singleton@mail.house.gov
Ted Poe	Staff email		nicole.schouten@mail.house.gov
Sylvestre Reyes	Staff email		peter.ambler@mail.house.gov
Sam Johnson	Staff email		curt.beaulieu@mail.house.gov
Pete Sessions	Staff email		robert.hillert@mail.house.gov
Mac Thornberry	Staff email		kate.williamson@mail.house.gov
SENATORS EXPRESSING FUTUREGEN INTEREST			
Jeff Sessions	Staff email		james_walner@sessions.senate.gov rick_dearborn@sessions.senate.gov
Blanche Lincoln	Staff email		jim_stowers@lincoln.senate.gov todd_wooten@lincoln.senate.gov
Mark Pryor	Staff email		stephen_lehrman@pryor.senate.gov
Mel Martinez	Staff email		Brydon_Ross@martinez.senate.gov michael_zehr@martinez.senate.gov
Bill Nelson	Staff email		susie_perez-quinn@billnelson.senate.gov
Saxby Chambliss	Staff email		camila_knowles@chambliss.senate.gov steve_rebillot@chambliss.senate.gov
Johnny Isakson	Staff email		chris_carr@isakson.senate.gov Michael_Quiello@isakson.senate.gov
Evan Bayh	Staff email		chris_murray@bayh.senate.gov tom_sugar@bayh.senate.gov
Richard Lugar	Staff email		Aaron_whitesel@lugar.senate.gov steve_koerner@Lugar.senate.gov

Future Gen Rollout
***** DRAFT SUBJECT TO CHANGE *****

	Jim Bunning	Staff email		bill_beaver@bunning.senate.gov kim_dean@bunning.senate.gov
	Mitch McConnell	Staff email		allison_thompson@mcconnell.senate.gov scott_raab@mcconnell.senate.gov
	Mary Landrieu	Staff email		Thomas_Michels@Landrieu.senate.gov
	David Vitter	Staff email		garret_graves@vitter.senate.gov Suzanne_Gillen@Vitter.senate.gov
	Ben Cardin	Staff email		gray_maxwell@cardin.senate.gov
	Barbara Mikulski	Staff email		ulka_patel@mikulski.senate.gov brigid_kolish@mikulski.senate.gov
	Carl Levin	Staff email		MaryLouise_Wagner@Levin.senate.gov
	Debbie Stabenow	Staff email		chris_adamo@stabenow.senate.gov Amanda_renteria@stabenow.senate.gov
	Thad Cochran	Staff email		emily_brunini@cochran.senate.gov Blake_Thompson@cochran.senate.gov ta_hawks@Cochran.Senate.gov
	Trent Lott	Staff email		jack_norris@lott.senate.gov Kelly_Mixon@lott.senate.gov
	Richard Burr	Staff email		Jonathan_Pierpan@Burr.senate.gov
	Elizabeth Dole	Staff email		arjun_mody@dole.senate.gov Casey_Murphy@Dole.senate.gov
	Sherrod Brown	Staff email		doug_babcock@brown.senate.gov
	George Voinovich	Staff email		lauri_hettinger@voinovich.senate.gov
	Bob Casey	Staff email		kasey_gillette@casey.senate.gov
	Arlen Specter	Staff email		marybeth_laverghetta@specter.senate.gov
	Lamar Alexander	Staff email		Jessica_holliday@alexander.senate.gov
	Bob Corker	Staff email		ashley_palmer@corker.senate.gov paul_palagyi@corker.senate.gov
	Russ Feingold	Staff email		kelly_reed@feingold.senate.gov paul_weinberger@feingold.senate.gov
	Herb Kohl	Staff email		brian_heindl@kohl.senate.gov
	Robert Byrd	Staff email		paul_gay@byrd.senate.gov
	Jay Rockefeller	Staff email		ellen_doneski@rockefeller.senate.gov john_richards@rockefeller.senate.gov
	John Barraso	Staff email		don_richards@barrasso.senate.gov
	Mike Enzi	Staff email		Chris_Tomassi@enzi.senate.gov randi_reid@enzi.senate.gov
	John Kerry	Staff email		Heather_Zichal@Kerry.senate.gov
	Edward Kennedy	Staff email		ron_carlton@help.senate.gov
	FUTURE GEN KEY COMMITTEE STAFF			
	Senate Energy & Natural Resources			
	Kellie Donnelly	Staff email		kellie_donnelly@energy.senate.gov
	Jonathan Epstein	Staff email		jonathan_epstein@energy.senate.gov
	Deborah Estes	Staff email		Deborah_estes@energy.senate.gov
	Leon Lowery	Staff email		leon_lowery@energy.senate.gov
	Kathryn Clay	Staff email		Kathryn_clay@energy.senate.gov
	House Science and Technology			
	Christopher King	Staff email		Christopher.king@mail.house.gov

Future Gen Rollout
***** DRAFT SUBJECT TO CHANGE *****

	Michelle Dallafior	Staff email		michelle.dallafior@mail.house.gov
	Elizabeth Stack	Staff email		Elizabeth.stack@mail.house.gov
	House Natural Resources			
	Deborah Lanzone	Staff email		Deborah.lanzone@mail.house.gov
	Maryam Sabbaghian	Staff email		maryam.sabbaghian@mail.house.gov
	Keil Weaver	Staff email		keil.weaver@mail.house.gov
	Steve Lanich	Staff email		steve.lanich@mail.house.gov
	Steve Feldgus	Staff email		Steve.feldgus@mail.house.gov
	Senate Environment and Public Works			
	Erick Olson	Staff email		erick_olson@epw.senate.gov
	Andrew Wheeler	Staff email		andrew_wheeler@eps.senate.gov
	House Energy & Commerce			
	Kurt Bilas	Staff email		kurt.bilas@mail.house.gov
	Bruce Harris	Staff email		bruce.harris@mail.house.gov

Exhibit #6

Schwartz, Doug

From:	Epifani, Lisa
Sent:	Tuesday, January 29, 2008 8:10 AM
To:	Ingols, Adam; Getto, Ben; Kupfer, Jeffrey; Nicoll, Eric; Shiller, Scott; Barnett, Megan; Ruggiero, Julie; Beck, Andrew; Slutz, James; Schwartz, Doug; Egger, Mary; Sell, Clay
Cc:	Stwarka, Michael
Subject:	FG Rollout Materials and TPs and SC materials
Attachments:	Rollout TPs Jan 29 v7.doc; 1.29.08 Rollout Plan.doc; CEO CALL SCRIPT 1.29.08.doc; Durbin TPs for S1.doc 1.28.08.doc; SC 08 Omnibus Impacts.pdf; 0608 Scientific Employment.xls

FutureGen Materials

1. TPs for S-1
2. Rollout Plan - logistics
3. CEO Script - supplied by Adam

Rollout TPs Jan 29 v7.doc (38 ...
1.29.08 Rollout Plan.doc (274 ...
CEO CALL SCRIPT 1.29.08.doc (3...

SCIENCE Materials

Durbin TPs for S1.doc 1.28.08....

SC 08 Omnibus Impacts.pdf (76 ...

0608 Scientific Employment.xls...

Lisa E. Epifani
Assistant Secretary
Congressional and Intergovernmental Affairs
United States Department of Energy
Tel: 202.586.5450
Fax: 202.586.4891
lisa.epifani@hq.doe.gov

FutureGen Talking Points

- It is unfortunate that the FutureGen Alliance has put all of us in this situation. Given cost escalations and continued efforts to negotiate, we explicitly asked the Alliance **NOT** to move forward with their site selection announcement.
- We have been in negotiations with the Alliance for more than six months, and they have failed to agree to our proposed terms and failed to provide any other acceptable solutions.
- I do not want this project to become another Superconducting Super Collider, in which the Government invested large sums of money, and then later canceled the project.
- **We will not be issuing the Record of Decision (ROD) on the existing FutureGen project.**
- On Wednesday, DOE will announce our intention to restructure FutureGen in a way that increases and accelerates the commercial viability of the clean coal technologies of Integrated Gasification Combined Cycle and Carbon Capture and Storage (IGCC-CCS).
- The restructured approach proposes multiple commercial-scale demonstration clean coal power plants of at least 300 Megawatt (MW) all of which will capture and safely sequester at least an estimated one million metric tons each of CO2 annually. The Department proposes to fund the CCS portion of those plants.
- This restructured FutureGen approach is based on a few key factors:
  1) Need to demonstrate commercial viability of CCS at scale as soon as possible.
  2) Need to control costs.
  3) Need to respond to regulatory uncertainty and political obstacles preventing new coal plants from being built.
- This restructured approach will capitalize on private sector innovation and marketplace pressures to control costs, expedite construction, successfully demonstrate, and spur greater use of commercial scale IGCC with CCS technology.
- Along with the announcement, DOE will issue a Request for Information (RFI) and soon plans to issue a competitive solicitation to fund multiple, commercial-scale demonstrations that would utilize carbon capture and storage (CCS) technology integrated with market-ready IGCC coal power plants.
- **We are hopeful that the industry participants will consider the Mattoon site to have advantages in this new program, due to the fact that a great deal of environmental work has already been done there.**
- The Administration remains strongly committed to coal, and we will be releasing this week a preview of the FY 2009 budget request that will show a major increase in funding for our coal programs. Any perceived loss of the R&D aspect of the original FutureGen construct will be made up for by a significant increase in our targeted clean coal R&D budget for FY09.

DOE staff strongly recommends we move on the announcement Wednesday. Press coverage of DOE's plan will start as soon as this meeting ends. If, however, the Illinois Members strongly press for a delay in the announcement for political reasons (*e.g.*, to prepare their constituents – not more time to deal with the Alliance), the following talking point is suggested:

- We are willing to delay an announcement until later this week given these difficult political considerations, but we cannot delay beyond this week. The newly restructured program will be reflected in the FY 2009 budget that will be released on Monday.

FutureGen Rollout

Tuesday 1/29

10:30am
Bodman Meeting w/ IL Delegation

Senator Richard Durbin	202-224-2152	Bodman	Pat Souders 202-224-2152
Congressman John Shimkus	202-225-5271	Albright	Ryan Tracy 202-225-5271
Congressman Tim Johnson	202-225-2371	Albright	Bobby Frederick 202-225-2371
Congressman Jerry Costello	202-225-5661	Albright	David Gillies 202-225-5661

10:30am call Obama's energy staffer

After IL Meeting [11:30am] –Bodman calls IL Governor

Governor Rod Blagojevich	312-814-8868	Bodman	Steve Frenkel 312-814-3303

After IL Meeting [11:30am] – Lisa will call Doug/DOE scheduler to decide on CEO calls

Company	DOE POC	Number
AEP Mike Morris	Bodman	
Southern David Ratcliffe	Bodman	
Peabody Greg Boyce	Albright	
FutureGen Alliance Paul Thompson	Albright	
FutureGen Alliance Mike Mudd	Slutz	
Angelo American Cynthia Carrol	Slutz	
BHP Billiton Charles Goodyear	Slutz	
China Huaneng Group Li Xiaopeng	Slutz	

CONSOL J. Brett Harvey	Slutz	
E.On Victor Staffieri	Slutz	
Foundation Coal James Robert	Slutz	
PPL James Miller	Slutz	
Rio Tinto Preston Chiaro	Slutz	
Xstrata Michael Davis	Slutz	
Luminant	Slutz	

After IL Meeting [11:30am]
Member/Senator Calls by Secretary Bodman, Deputy Secretary Sell and Under Secretary Albright to alert Members of the announcement

FUTUREGEN MEMBER AND SENATOR CALLS			
Member	**Number**	**Caller**	**Staffer** CI staff to call staffer
Senator Byron Dorgan	202-224-2551	Sell	Franz Wuerfmannsdobler 202-224-8119
Senator Jeff Bingaman	202-224-5521	Bodman	Bob Simon 202-224-4971
Senator Pete Domenici	202-224-6621	Sell	Frank Macchiarola 202-224-1004
Congressman Joe Barton	202-225-2022	Albright	David McCarthy 202-225-5659
Congressman Pete Visclosky	202-225-2461	Albright	Terry Tyborowski 202-225-3421
Congressman David Hobson	202-225-4324	Albright	Kevin Cook 202-225-3481
Congressman Roy Blunt	202-225-6536	Bodman	Mike Ference 202-226-3555
Congressman Rick Boucher	202-225-3861	Albright	Laura Vaught 202-225-3861

Wednesday 1.30
Announce Coal Budget and FutureGen restructure

9:30AM - Email Alliance Company Members and stakeholders invitation for to 12:30 Meeting with Bud
10:00AM PA to issue Media Advisory

10:30AM - Embargoed Press Release and materials sent to Tier 1 and Tier 2

11:00AM - Press Release issued

11:00AM –CI emails to Tier 3
11:00AM - Letter faxed to the Alliance and International Partners and Jim Slutz to email International Partners
11:00AM - Request for Information (RFI) issued and posted on the FE/FutureGen website
11:30AM - Press call or conference

12:30– DOE meeting with Alliance Members and stakeholders

Tier 1 –Key Congressional Staff and most engaged IL delegation (contacted 1.29).
Tier 2 –Tier 1 Staff + additional Key Congressional Staff and IL and TX Delegation
Tier 3 –Members who have expressed interest in FG and additional Congressional Staff

Post 01.30.08
Individual briefings scheduled upon request

10:30AM

Tier 1 and Tier 2 - Key Congressional Staff and Affected delegation.
Embargoed emails by DOE CI staff will include:

- Letter to Alliance
- Press Release
- Fact Sheets

FUTUREGEN KEY CONGRESSIONAL STAFF		
Staffer	**Email**	NOTES
Tier 1		
Senate Energy and Natural Resources		
Allyson Anderson (Maj)	allyson_anderson@energy.senate.gov	
Mike Carr (Maj)	michael_carr@energy.senate.gov	
Colin Hayes (Min)	Colin_Hayes@energy.senate.gov	
Staffer	**Email**	NOTES
Congressman Ralph Hall		
Elizabeth Stack	Elizabeth.Stack@mail.house.gov	
Congressman Nick Lampson		
Bobby Zafarina	Bobbyz@mail.house.gov	
Congressman Bob Inglis		
Garth VanMeter	Garth.VanMeter@mail.house.gov	
Congressman Bart Gordon		
Christopher King	Christopher.King@mail.house.gov	
House Energy and Commerce		
Sue Sheridan (Maj)	sue.sheridan@mail.house.gov	
David McCarthy	david.mccarthy@mail.house.gov	
Senate Energy and Water Development Appropriations		
Doug Clapp (Maj)	Doug_Clapp@appro.senate.gov	
Scott O'Malia (Min)	Scott_O'Malia@appro.senate.gov	
House Energy and Water Development Appropriations		
Dixon Butler (Maj)	Dixon.Butler@mail.house.gov	
Scott Burinson (Maj)	Scott.Burinson@mail.house.gov	
Senate Leadership		
Chris Miller (Reid)	Chris_Miller@reid.senate.gov	
Jessica Leonard (Durbin)	Jessican_Leonard@durbin.senate.gov	
Libby Jarvis (McConnell)	Libby_Jarvis@mcconnell.senate.gov	
House Leadership		
Amy Fuerstenau (Pelosi)	Amy.Fuerstenau@mail.house.gov	
Mary Frances Repko (Hoyer)	MaryFrances.Repko@mail.house.gov	
Jay Cranford (Boehner)	jay.cranford@mail.house.gov	

FUTUREGEN AFFECTED DELEGATIONS		
IL	Senator Barack Obama	pete_rouse@obama.senate.gov Todd_atkinson@obama.senate.gov
	Dennis Hastert	chris.sarley@mail.house.gov Bill.koetzzle2@mail.house.gov
	Jerry Weller	Eric.grey@mail.house.gov
	Ray LaHood	Patrick.carroll@mail.house.gov
	Judy Biggert	paul.doucette@mail.house.gov
	Melissa Bean	sam.hodas@mail.house.gov
	Danny Davis	charles.brown@mail.house.gov
	Rahm Emanuel	luis.jimenez@mail.house.gov
	Luis Gutierrez	greg.staff@mail.house.gov
	Phil Hare	janna.bergquist@mail.house.gov
	Jessie Jackson Jr.	megan.o.moore@mail.house.gov
	Mark Steven Kirk	andria.hoffman@mail.house.gov
	Dan Lipinski	chris.lyons@mail.house.gov
	Don Manzullo	nathan.mcgrath@mail.house.gov
	Bobby Rush	johnm@mail.house.gov
	Jane Schakowsky	isaac.brown@mail.house.gov
TX	Chet Edwards	Stoney.burke@mail.house.gov
	Jeb Hensarling	Kyle.jackson@mail.house.gov
	Kevin Brady	kimberly.thompson@mail.house.gov
	Randy Neugebauer	dan.hilton@mail.house.gov
	Charles A. Gonzalez	leo.munoz@mail.house.gov
	Lamar Smith	mark.sanchez@mail.house.gov
	Ciro Rodriguez	Rene.munoz@mail.house.gov
	Michael Burgess	matt.johnson@mail.house.gov
	Nick Lampson	dan.easley@mail.house.gov
	Michael Burgess	matt.johnson@mail.house.gov
	John Carter	chris.alsup@mail.house.gov
	Henry Cuellar	jonathan.pawow@mail.house.gov
	John Culberson	alicia.lee@mail.house.gov
	Louie Gohmert	drew.kent@mail.house.gov
	Kay Granger	rachel.carter@mail.house.gov
	Gene Green	john.jones@mail.house.gov
	Ruben Hinjosa	andrew.jones@mail.house.gov
	Al Green	oscar.ramirez@mail.house.gov
	Sheila Jackson-Lee	yohannes.tsehai@mail.house.gov
	Kenny Marchant	ryan.flood@mail.house.gov
	Michael McCaul	alex.manning@mail.house.gov
	Solomon Ortiz	patricia.villarreal@mail.house.gov
	Ron Paul	norman.singleton@mail.house.gov
	Ted Poe	nicole.schouten@mail.house.gov
	Sylvestre Reyes	peter.ambler@mail.house.gov
	Sam Johnson	curt.beaulieu@mail.house.gov
	Pete Sessions	robert.hillert@mail.house.gov
	Mac Thornberry	kate.williamson@mail.house.gov

	Mike Conaway	Scott.graves@mail.house.gov

11:00AM

Tier 3– Members that expressed FG interest and additional Congressional staff. Emails by DOE CI staff will include:

- Letter to Alliance
- Press Release
- Fact Sheets

SENATORS EXPRESSING FUTUREGEN INTEREST		
	Jeff Sessions	james_walner@sessions.senate.gov rick_dearborn@sessions.senate.gov
	Blanche Lincoln	jim_stowers@lincoln.senate.gov todd_wooten@lincoln.senate.gov
	Mark Pryor	stephen_lehrman@pryor.senate.gov
	Mel Martinez	Brydon_Ross@martinez.senate.gov michael_zehr@martinez.senate.gov
	Bill Nelson	susie_perez-quinn@billnelson.senate.gov
	Saxby Chambliss	camila_knowles@chambliss.senate.gov steve_rebillot@chambliss.senate.gov
	Johnny Isakson	chris_carr@isakson.senate.gov Michael_Quiello@isakson.senate.gov
	Evan Bayh	chris_murray@bayh.senate.gov tom_sugar@bayh.senate.gov
	Richard Lugar	Aaron_whitesel@lugar.senate.gov steve_koerner@Lugar.senate.gov
	Jim Bunning	bill_beaver@bunning.senate.gov kim_dean@bunning.senate.gov
	Mitch McConnell	allison_thompson@mcconnell.senate.gov scott_raab@mcconnell.senate.gov
	Mary Landrieu	Thomas_Michels@Landrieu.senate.gov
	David Vitter	garret_graves@vitter.senate.gov Suzanne_Gillen@Vitter.senate.gov
	Ben Cardin	gray_maxwell@cardin.senate.gov
	Barbara Mikulski	ulka_patel@mikulski.senate.gov brigid_kolish@mikulski.senate.gov
	Carl Levin	MaryLouise_Wagner@Levin.senate.gov
	Debbie Stabenow	chris_adamo@stabenow.senate.gov Amanda_renteria@stabenow.senate.gov
	Thad Cochran	emily_brunini@cochran.senate.gov Blake_Thompson@cochran.senate.gov ta_hawks@Cochran.Senate.gov
	Larry Craig	Corey_McDaniel@craig.senate.gov
	Elizabeth Dole	arjun_modv@dole.senate.gov Casey_Murphy@Dole.senate.gov
	Sherrod Brown	doug_babcock@brown.senate.gov
	George Voinovich	lauri_hettinger@voinovich.senate.gov

	Bob Casey	kasey_gillette@casey.senate.gov
	Arlen Specter	marybeth_laverghetta@specter.senate.gov
	Lamar Alexander	Jessica_holliday@alexander.senate.gov
	Bob Corker	ashley_palmer@corker.senate.gov paul_palagyi@corker.senate.gov
	Russ Feingold	kelly_reed@feingold.senate.gov paul_weinberger@feingold.senate.gov
	Herb Kohl	brian_heindl@kohl.senate.gov
	Robert Byrd	paul_gay@byrd.senate.gov
	Jay Rockefeller	ellen_doneski@rockefeller.senate.gov john_richards@rockefeller.senate.gov
	John Barraso	don_richards@barrasso.senate.gov
	Mike Enzi	Chris_Tomassi@enzi.senate.gov randi_reid@enzi.senate.gov
	John Kerry	Heather_Zichal@Kerry.senate.gov
	Edward Kennedy	ron_carlton@help.senate.gov
	Richard Burr	Jonathan_Pierpan@Burr.senate.gov
	FUTURE GEN INTERESTED COMMITTEE STAFF	
	Senate Energy & Natural Resources	
	Kellie Donnelly	kellie_donnelly@energy.senate.gov
	Jonathan Epstein	jonathan_epstein@energy.senate.gov
	Deborah Estes	Deborah_estes@energy.senate.gov
	Leon Lowery	leon_lowery@energy.senate.gov
	Kathryn Clay	Kathryn_clay@energy.senate.gov
	House Science and Technology	
	Christopher King	Christopher.king@mail.house.gov
	Michelle Dallafior	michelle.dallafior@mail.house.gov
	House Natural Resources	
	Deborah Lanzone	Deborah.lanzone@mail.house.gov
	Maryam Sabbaghian	maryam.sabbaghian@mail.house.gov
	Keil Weaver	keil.weaver@mail.house.gov
	Steve Lanich	steve.lanich@mail.house.gov
	Steve Feldgus	Steve.feldgus@mail.house.gov
	Senate Environment and Public Works	
	Erick Olson	erick_olson@epw.senate.gov
	Andrew Wheeler	andrew_wheeler@eps.senate.gov
	House Energy & Commerce	
	Kurt Bilas	kurt.bilas@mail.house.gov
	Bruce Harris	bruce.harris@mail.house.gov

FutureGen Talking Points

- I'm calling to inform you of two decisions being made by the Department of Energy.
- As you know, Departmental officials have been engaged with FutureGen Alliance representatives for several months now in an attempt to restructure our current agreement to address the Department's serious concerns over the substantial escalation of projected costs.
- The Alliance has refused to agree to our proposed terms and failed to provide any other acceptable solutions.
- As such, I want to inform you that we will not issue the Record of Decision (ROD) on the existing FutureGen project which would have allowed the Alliance to proceed with site-specific expenditures.
- Additionally, tomorrow we will announce our intention to restructure the FutureGen project.
- The restructured approach proposes multiple commercial-scale demonstration clean coal power plants of at least 300 Megawatt (MW) all of which will capture and safely sequester at least an estimated one million metric tons each of CO2 annually. The Department proposes to fund the CCS portion of those plants.
- This restructured FutureGen approach is based on a few key factors:

  1) We believe it is of paramount importance to demonstrate the commercial viability of carbon capture and sequestration technology (at scale) in as quickly a timeframe as possible.
  2) We believe that the current government share of the FutureGen cost estimate (appx. $1.3 billion) is better spent on a directed and more focused effort to demonstrate CCS on the commercial grid, rather than trying to satisfy all constituencies by combining incongruous facets in a single facility.
  3) Given the recent regulatory challenges facing the industry (i.e. IGCC cancellations in FL, WA, and elsewhere), we deemed it imperative to identify a way to address the regulatory uncertainty and political obstacles preventing new coal plants from being built.

- This restructured approach will capitalize on private sector innovation and marketplace pressures to control costs, expedite construction, successfully demonstrate, and spur greater use of commercial scale IGCC with CCS technology.
- The announcement will be formalized via tomorrow's release of a Request for Information (RFI). After we assess the industry's reaction and calculation to the feasibility and potential costs of the new project, we will issue a competitive solicitation to fund multiple, commercial-scale demonstrations.
- This is only part of the Administration's strong commitment to coal. Tomorrow we will also release a preview of the FY 2009 budget request that will show a major increase in funding for our coal programs.
- Any perceived loss of the R&D aspect of the original FutureGen construct will be made up for by a significant increase in our targeted clean coal R&D budget for FY09.
- I recognize that this change in direction for FutureGen is not what we anticipated happening when we all signed-up to the agreement four years ago. But I am confident that we share the same ultimate goal – utilizing our nation's most abundant natural resource in a cost-effective,

environmentally sensitive, and politically feasible manner…and I believe we accomplish that with our new approach.

- I hope you will participate in the RFI and I look forward to continuing to work with you on this and other important energy issues.

FutureGen Talking Points

- It is unfortunate that the FutureGen Alliance has put all of us in this situation. Given cost escalations and continued efforts to negotiate, we explicitly asked the Alliance **NOT** to move forward with their site selection announcement.
- We have been in negotiations with the Alliance for more than six months, and they have failed to agree to our proposed terms and failed to provide any other viable solutions.
- I do not want this project to become another Superconducting Super Collider, in which the Government invested large sums of money, and then later canceled the project.
- We will not be issuing the Record of Decision (ROD) on the existing FutureGen project.
- On Wednesday, DOE will announce our intention to restructure FutureGen in a way that accelerates the commercial use of near-zero emissions clean coal technologies.
- FutureGen's restructured approach proposes multiple 300-600 Megawatt (MW) commercial-scale demonstration clean coal power plants that will operate as demonstration facilities – as opposed to a single, 275 MW R&D facility - each producing electricity and capturing and safely sequestering at least an estimated one million metric tons each of CO2 annually.
- This restructured approach increases the use of clean coal technologies to produce baseload electricity and will help spur greater commercial use of cutting-edge IGCC-CCS technology.
- The restructured approach is also consistent with recommendations in the recent Massachusetts Institute of Technology study, "The Future of Coal," which indicated that "the main purpose of the [FutureGen] project should demonstrate commercial viability of coal-based power generation with CCS."
- Along with the announcement, DOE will issue a Request for Industry (RFI) Information and soon plans to issue a competitive solicitation to fund multiple, commercial-scale demonstrations that would utilize carbon capture and sequestration (CCS) technology integrated with market-ready Integrated Gasification Combined Cycle (IGCC) coal power plants.
- We are hopeful that the Mattoon site will have some advantages in this new program due to the fact that a great deal of environmental work has already been done.
- The Administration remains strongly committed to coal, and we will be releasing this week a preview of the FY 2009 budget request that will show a major increase in funding for our coal programs.

DOE staff strongly recommends we move on the announcement Wednesday. Press coverage of DOE's plan will start as soon as this meeting ends. If, however, the Illinois Members strongly press for a delay in the announcement for political reasons (*e.g.*, to prepare their constituents – not more time to deal with the Alliance), the following talking point is suggested:

- I would be willing to delay the announcement, if I truly thought that a different outcome could be reached. We have tried to work with the Alliance for months without adequate progress. The newly restructured program will be reflected in the FY 2009 budget that will be released on Monday so we can only delay until later this week.

FutureGen Rollout

Tuesday 1/29

10:30am
Bodman Meeting w/ IL Delegation

Senator Richard Durbin	202-224-2152	Bodman	Pat Souders 202-224-2152
Congressman John Shimkus	202-225-5271	Albright	Ryan Tracy 202-225-5271
Congressman Tim Johnson	202-225-2371	Albright	Bobby Frederick 202-225-2371
Congressman Jerry Costello	202-225-5661	Albright	David Gillies 202-225-5661

10:30am call Obama's energy staffer

After IL Meeting [11:30am] –Bodman calls IL Governor

Governor Rod Blagojevich	312-814-8868	Bodman	Steve Frenkel 312-814-3303

After IL Meeting [11:30am] – Lisa will call Adam/DOE scheduler to decide on CEO calls

Company	DOE POC	Number
AEP Mike Morris	Bodman	
Angelo American Cynthia Carrol	Albright	
BHP Billiton Charles Goodyear	Albright	
China Huaneng Group Li Xiaopeng	Sell	
CONSOL J. Brett Harvey	Sell	
E.On Victor Staffieri	Sell	
Foundation Coal James Robert	Albright	
Peabody Greg Boyce	Albright	

PPL James Miller	Sell	
Rio Tinto Preston Chiaro	Sell	
Southern David Ratcliffe	Bodman	
Xstrata Michael Davis	Albright	
Luminant	Albright	

After IL Meeting [11:30am]
Member/Senator Calls by Secretary Bodman, Deputy Secretary Sell and Under Secretary Albright to alert Members of the announcement

FUTUREGEN MEMBER AND SENATOR CALLS			
Member	**Number**	**Caller**	**Staffer** CI staff to call staffer
Senator Byron Dorgan	202-224-2551	Sell	Franz Wuerfmannsdobler 202-224-8119
Senator Jeff Bingaman	202-224-5521	Bodman	Bob Simon 202-224-4971
Senator Pete Domenici	202-224-6621	Sell	Frank Macchiarola 202-224-1004
Congressman Joe Barton	202-225-2022	Albright	David McCarthy 202-225-5659
Congressman Pete Visclosky	202-225-2461	Albright	Terry Tyborowski 202-225-3421
Congressman David Hobson	202-225-4324	Albright	Kevin Cook 202-225-3481
Congressman Roy Blunt	202-225-6536	Bodman	Mike Ference 202-226-3555
Congressman Rick Boucher	202-225-3861	Albright	Laura Vaught 202-225-3861

Wednesday 1.30
Announce Coal Budget and FutureGen restructure

9:00AM - Email Alliance Company Members and stakeholders invitation for a to 12:30 Meeting with Bud

10:30AM - Embargoed Press Release and materials sent to Tier 1 and Tier 2

11:00AM - Press Release issued
11:00AM –CI emails to Tier 3
11:00AM - Letter faxed to the Alliance and International Partners
11:00AM - Request for Information (RFI) issued and posted on the FE/FutureGen website
11:30AM - Press call or conference

12:30– DOE meeting with Alliance Members and stakeholders

Tier 1 –Key Congressional Staff and most engaged IL delegation.
Tier 2 –Tier 1 Staff + additional Key Congressional Staff and IL and TX Delegation
Tier 3 –Members who have expressed interest in FG and additional Congressional Staff

Post 01.30.08
Individual briefings scheduled upon request

PM

Tier 2 - Key Congressional Staff and Affected delegation. Embargoed emails by DOE CI staff will include:

- Letter to Alliance
- Letter to Partners
- Press Release
- Fact Sheet

FUTUREGEN KEY CONGRESSIONAL STAFF		
Staffer	**Email**	NOTES
Staffers contacted at 11:00am		
Senate Energy and Natural Resources		
Allyson Anderson (Maj)	allyson_anderson@energy.senate.gov	
Mike Carr (Maj)	michael_carr@energy.senate.gov	
Colin Hayes (Min)	Colin_Hayes@energy.senate.gov	
Staffer	**Email**	NOTES
Congressman Ralph Hall		
Elizabeth Stack	Elizabeth.Stack@mail.house.gov	
Congressman Nick Lampson		
Bobby Zafarina	Bobbyz@mail.house.gov	
Congressman Bob Inglis		
Garth VanMeter	Garth.VanMeter@mail.house.gov	
Congressman Bart Gordon		
Christopher King	Christopher.King@mail.house.gov	
House Energy and Commerce		
Sue Sheridan (Maj)	sue.sheridan@mail.house.gov	
David McCarthy	david.mccarthy@mail.house.gov	
Senate Energy and Water Development Appropriations		
Doug Clapp (Maj)	Doug_Clapp@appro.senate.gov	
Scott O'Malia (Min)	Scott_O'Malia@appro.senate.gov	
House Energy and Water Development Appropriations		
Dixon Butler (Maj)	Dixon.Butler@mail.house.gov	
Scott Burinson (Maj)	Scott.Burinson@mail.house.gov	
Senate Leadership		
Chris Miller (Reid)	Chris_Miller@reid.senate.gov	
Jessica Leonard (Durbin)	Jessican_Leonard@durbin.senate.gov	
Libby Jarvis (McConnell)	Libby_Jarvis@mcconnell.senate.gov	
House Leadership		
Amy Fuerstenau (Pelosi)	Amy.Fuerstenau@mail.house.gov	
Mary Frances Repko (Hoyer)	MaryFrances.Repko@mail.house.gov	
Jay Cranford (Boehner)	jay.cranford@mail.house.gov	

FUTUREGEN AFFECTED DELEGATIONS		
IL	Senator Barack Obama	pete_rouse@obama.senate.gov Todd_atkinson@obama.senate.gov
	Dennis Hastert	chris.sarley@mail.house.gov Bill.koetzzle2@mail.house.gov
	Jerry Weller	Eric.grey@mail.house.gov
	Ray LaHood	Patrick.carroll@mail.house.gov
	Judy Biggert	paul.doucette@mail.house.gov
	Melissa Bean	sam.hodas@mail.house.gov
	Danny Davis	charles.brown@mail.house.gov
	Rahm Emanuel	luis.jimenez@mail.house.gov
	Luis Gutierrez	greg.staff@mail.house.gov
	Phil Hare	janna.bergquist@mail.house.gov
	Jessie Jackson Jr.	megan.o.moore@mail.house.gov
	Mark Steven Kirk	andria.hoffman@mail.house.gov
	Dan Lipinski	chris.lyons@mail.house.gov
	Don Manzullo	nathan.mcgrath@mail.house.gov
	Bobby Rush	johnm@mail.house.gov
	Jane Schakowsky	isaac.brown@mail.house.gov
TX	Chet Edwards	Stoney.burke@mail.house.gov
	Jeb Hensarling	Kyle.jackson@mail.house.gov
	Kevin Brady	kimberly.thompson@mail.house.gov
	Randy Neugebauer	dan.hilton@mail.house.gov
	Charles A. Gonzalez	leo.munoz@mail.house.gov
	Lamar Smith	mark.sanchez@mail.house.gov
	Ciro Rodriguez	Rene.munoz@mail.house.gov
	Michael Burgess	matt.johnson@mail.house.gov
	Nick Lampson	dan.easley@mail.house.gov
	Michael Burgess	matt.johnson@mail.house.gov
	John Carter	chris.alsup@mail.house.gov
	Henry Cuellar	jonathan.pawow@mail.house.gov
	John Culberson	alicia.lee@mail.house.gov
	Louie Gohmert	drew.kent@mail.house.gov
	Kay Granger	rachel.carter@mail.house.gov
	Gene Green	john.jones@mail.house.gov
	Ruben Hinjosa	andrew.jones@mail.house.gov
	Al Green	oscar.ramirez@mail.house.gov
	Sheila Jackson-Lee	yohannes.tschai@mail.house.gov
	Kenny Marchant	ryan.flood@mail.house.gov
	Michael McCaul	alex.manning@mail.house.gov
	Solomon Ortiz	patricia.villarreal@mail.house.gov
	Ron Paul	norman.singleton@mail.house.gov
	Ted Poe	nicole.schouten@mail.house.gov
	Sylvestre Reyes	peter.ambler@mail.house.gov
	Sam Johnson	curt.beaulieu@mail.house.gov
	Pete Sessions	robert.hillert@mail.house.gov
	Mac Thornberry	kate.williamson@mail.house.gov

	Mike Conaway	Scott.graves@mail.house.gov

PM

Tier 3– Members that expressed FG interest and additional Congressional staff. Emails by DOE CI staff will include:

- Letter to Alliance
- Letter to Partners
- Press Release
- Fact Sheet

SENATORS EXPRESSING FUTUREGEN INTEREST		
	Jeff Sessions	james_walner@sessions.senate.gov rick_dearborn@sessions.senate.gov
	Blanche Lincoln	jim_stowers@lincoln.senate.gov todd_wooten@lincoln.senate.gov
	Mark Pryor	stephen_lehrman@pryor.senate.gov
	Mel Martinez	Brydon_Ross@martinez.senate.gov michael_zehr@martinez.senate.gov
	Bill Nelson	susie_perez-quinn@billnelson.senate.gov
	Saxby Chambliss	camila_knowles@chambliss.senate.gov steve_rebillot@chambliss.senate.gov
	Johnny Isakson	chris_carr@isakson.senate.gov Michael_Quiello@isakson.senate.gov
	Evan Bayh	chris_murray@bayh.senate.gov tom_sugar@bayh.senate.gov
	Richard Lugar	Aaron_whitesel@lugar.senate.gov steve_koerner@Lugar.senate.gov
	Jim Bunning	bill_beaver@bunning.senate.gov kim_dean@bunning.senate.gov
	Mitch McConnell	allison_thompson@mcconnell.senate.gov scott_raab@mcconnell.senate.gov
	Mary Landrieu	Thomas_Michels@Landrieu.senate.gov
	David Vitter	garret_graves@vitter.senate.gov Suzanne_Gillen@Vitter.senate.gov
	Ben Cardin	gray_maxwell@cardin.senate.gov
	Barbara Mikulski	ulka_patel@mikulski.senate.gov brigid_kolish@mikulski.senate.gov
	Carl Levin	MaryLouise_Wagner@Levin.senate.gov
	Debbie Stabenow	chris_adamo@stabenow.senate.gov Amanda_renteria@stabenow.senate.gov
	Thad Cochran	emily_brunini@cochran.senate.gov Blake_Thompson@cochran.senate.gov ta_hawks@Cochran.Senate.gov
	Larry Craig	Corey_McDaniel@craig.senate.gov
	Elizabeth Dole	arjun_mody@dole.senate.gov Casey_Murphy@Dole.senate.gov

	Sherrod Brown	doug_babcock@brown.senate.gov
	George Voinovich	lauri_hettinger@voinovich.senate.gov
	Bob Casey	kasey_gillette@casey.senate.gov
	Arlen Specter	marybeth_laverghetta@specter.senate.gov
	Lamar Alexander	Jessica_holliday@alexander.senate.gov
	Bob Corker	ashley_palmer@corker.senate.gov paul_palagyi@corker.senate.gov
	Russ Feingold	kelly_reed@feingold.senate.gov paul_weinberger@feingold.senate.gov
	Herb Kohl	brian_heindl@kohl.senate.gov
	Robert Byrd	paul_gay@byrd.senate.gov
	Jay Rockefeller	ellen_doneski@rockefeller.senate.gov john_richards@rockefeller.senate.gov
	John Barraso	don_richards@barrasso.senate.gov
	Mike Enzi	Chris_Tomassi@enzi.senate.gov randi_reid@enzi.senate.gov
	John Kerry	Heather_Zichal@Kerry.senate.gov
	Edward Kennedy	ron_carlton@help.senate.gov
	Richard Burr	Jonathan_Pierpan@Burr.senate.gov
	FUTURE GEN INTERESTED COMMITTEE STAFF	
	Senate Energy & Natural Resources	
	Kellie Donnelly	kellie_donnelly@energy.senate.gov
	Jonathan Epstein	jonathan_epstein@energy.senate.gov
	Deborah Estes	Deborah_estes@energy.senate.gov
	Leon Lowery	leon_lowery@energy.senate.gov
	Kathryn Clay	Kathryn_clay@energy.senate.gov
	House Science and Technology	
	Christopher King	Christopher.king@mail.house.gov
	Michelle Dallafior	michelle.dallafior@mail.house.gov
	House Natural Resources	
	Deborah Lanzone	Deborah.lanzone@mail.house.gov
	Maryam Sabbaghian	maryam.sabbaghian@mail.house.gov
	Keil Weaver	keil.weaver@mail.house.gov
	Steve Lanich	steve.lanich@mail.house.gov
	Steve Feldgus	Steve.feldgus@mail.house.gov
	Senate Environment and Public Works	
	Erick Olson	erick_olson@epw.senate.gov
	Andrew Wheeler	andrew_wheeler@eps.senate.gov
	House Energy & Commerce	
	Kurt Bilas	kurt.bilas@mail.house.gov
	Bruce Harris	bruce.harris@mail.house.gov

Exhibit #7

Nicoll, Eric

From: Nicoll, Eric
Sent: Thursday, January 03, 2008 11:26 AM
To: Nicoll, Eric; Slutz, James; Roy, Charles; Schofield, Emily; Schwartz, Doug; Davis, Michael J; Barnett, Megan
Cc: Tuttle, Robert; Shiller, Scott
Subject: RE: F-Gen QA's

looping in Robert...

From: Nicoll, Eric
Sent: Thursday, January 03, 2008 11:25 AM
To: Slutz, James; Roy, Charles; Schofield, Emily; Schwartz, Doug; Davis, Michael J; Barnett, Megan
Subject: F-Gen QA's

Folks, I asked Robert to help FE with writing the FutureGen QA's. Obviously it is an evolving issue but we can create some Answers that are reflective of the Secretary's thinking on this and give a high-level response to where we are taking the program, and fill in the "plan B" parts when we get closer to the hearings. The good thing is that S1 knows a lot about the issue so he doesn't need extensive Background!

Eric

FUTUREGEN COST IMPACTS

QUESTION:

What impact will the cost escalation of FutureGen have on other coal projects?

Funding Summary
(Dollars in Thousands)

Program/Activity	FY 2007 Operating Plan	FY 2008 Request	FY 2008 Enacted Appropriation	FY 2009 Request
FutureGen	$52,504	$108,000	$74,317	$156,000

ANSWER:

The FutureGen remains a high priority in the Coal Program. To date, the cost increases experienced in the FutureGen project between 2004 and 2007 have not had any impacts on other coal projects. However, as a result of these cost increases, I have directed the Department to develop a new strategy with the overall aim of advancing the goals and objectives of FutureGen through a new approach that limits the Government's financial exposure and leverages its investment across a wider range of Integrated Gasification Combined Cycle (IGCC) projects.

BACKGROUND:

- FutureGen is a Presidential initiative to design, build and operate first-of-a-kind near-zero atmospheric emission coal plants.

- A cooperative agreement to initiate FutureGen was signed by DOE in early December 2005 with the FutureGen Industrial Alliance Inc., a group of coal mining and coal-based utility companies. Cost shares are 74%/ 26% (DOE/Alliance).

- Members of the FutureGen Industrial Alliance include: American Electric Power, Southern Company, Consol Energy, Inc., Rio Tinto Energy America, Peabody Energy, BHP Billiton, Foundation Coal Corp., the China Huaneng Group, Anglo LLC, PPL Corp., E.ON U.S., Luminant and Xstrata.

- The cost increases experienced in the FutureGen project between 2004 and 2007 have been consistent with the increases seen in the construction industry. Several notable construction indices, used to estimate present and future costs, have gone up disproportionably with the trends in previous years. Therefore, despite the fact that there have been no changes in FutureGen's project scope, there have been substantial increases in the cost of the project.

- As a result of these cost increases, the Department is developing a new strategy with the overall aim of advancing the goals and objectives of FutureGen through a new approach

that limits the Government's financial exposure for additional cost increases, and leverages its investment across a wider range of Integrated Gasification Combined Cycle (IGCC) projects.

FUTUREGEN – MIT STUDY ON THE FUTURE OF COAL

QUESTION:

The Massachusetts Institute of Technology's (MIT's) Future of Coal report is critical of DOE's characterization of FutureGen as largely a research project and suggests this ambiguity about research versus demonstration could lead to differing goals among consortium participants. What has DOE done to address this concern?

Funding Summary
(Dollars in Thousands)

Program/Activity	FY 2007 Operating Plan	FY 2008 Request	FY 2008 Enacted Appropriation	FY 2009 Request
FutureGen	$52,504	$108,000	$74,317	$156,000

ANSWER:

The FutureGen goal is clearly stated: to prove the technical feasibility and economic viability of near-zero emission coal based power and hydrogen production, including carbon capture and storage. Recently, DOE has undertaken a new approach to FutureGen with the objective of funding a series of carbon capture and storage (CCS) demonstrations linked to existing commercial operations of integrated gasification combined cycle (IGCC). This new approach will accelerate the deployment of IGCC commercial power plants with CCS to meet a changing electricity market and address a growing near-term interest in the promulgation of carbon dioxide (CO_2) regulations in several states (e.g., Florida, Kansas and California are requiring CCS or the flexibility to add CCS).

Due to the risks inherent in a new concept such as CCS, industry is not likely to take on this research challenge on its own. Therefore, it is appropriate for the Government to assist industry and provide the appropriate cost-shared investment commensurate with the carbon capture and storage system as well as the risks associated with the various research and demonstration elements which will appear in FutureGen plants. Given current funding levels, DOE considers its Clean Coal program, encompassing FutureGen, carbon sequestration program, and other supporting R&D, to be structured to maximize progress towards enabling the continued use of coal to meet growing world energy demand in a carbon-constrained world.

BACKGROUND:

- The MIT report examines the role of coal as an energy source in a carbon constrained world, stating that carbon emissions must be constrained to mitigate global warming. The report advocates a strategy and the measures needed to assure the availability of demonstrated technologies to facilitate achievement of carbon reduction goals.

- The MIT report is based on several premises: that global warming is real; governments should and will take action to mitigate CO_2, and coal will continue to play an indispensable role in meeting global energy supply It also projects that coal use will increase because it is both affordable and abundant.

- The FutureGen program will establish the technical and economic feasibility of producing electricity and hydrogen from coal while capturing and sequestering the carbon dioxide generated in the process. FutureGen plants will be innovative "showcases" of the successful operation of IGCC plants with CCS technology. The aim of this program is to eliminate environmental concerns associated with coal utilization and drive down the cost of CCS.

FUTUREGEN—ILLINOIS SITE
Secretary's Question from Fossil Energy page 41

QUESTION:

What is reaction to this?

ANSWER:

The Illinois delegation including Governor Rod Blagojevich, Sen. Dick Durbin, and Reps. Shimkus, Costello, and Tim Johnson, continue to press the message that Illinois is the perfect site for the facility and call on the Department to work with the FutureGen Alliance to resolve differences over the means to address the increased estimated costs for the project. Governor Blagojevich has reportedly asked other coal-producing states to oppose changes to the FutureGen power plant, and has apparently written to to the governors of Indiana, Kentucky, Michigan, Ohio, Pennsylvania, Wisconsin, West Virginia and Wyoming seeking their support in stopping Federal alterations to the project.

DOE announced the release of the $66.7 million for the Midwest Consortium on the date that the FutureGen Alliance announced the Mattoon site. While the Illinois Delegation appreciated our efforts, it did not reduce their strong opposition to any change to the FutureGen project.

FUTUREGEN—ILLINOIS SITE

QUESTION:

A site has already been chosen in Mattoon, Illinois. Isn't it too late to start trying to change the project now?

ANSWER:

The Department asked the FutureGen Alliance not to move forward with a site selection announcement last December, both orally and in writing. The timetable in the cooperative agreement with the Alliance provided for the issuance of the Department's Record of Decision under the National Environmental Policy Act (NEPA) before the announcement of site selection. The Department has not issued the ROD, and has no immediate plans to do so at this time. Without the ROD, the Alliance is not permitted to expend funds for site specific activities. Thus the Alliance is responsible for negatively affecting the project and creating expectations in the State of Illinois. It is unfortunate that the Alliance proceeded with this announcement despite the Department's repeated urgings not to do so, and while DOE was in discussions with the Alliance about restructuring the FutureGen project and financial arrangement.

Regardless, Illinois will continue to play a leading role in the development of clean coal technologies. While the projects that we will fund through the revised FutureGen program will undergo a competitive process, it is entirely possible that the work already done in Illinois (e.g., geological and environmental studies, and passage by the State of liability legislation) may work to the advantage of Illinois in this competition.

As you know, in December 2007, the Department awarded $66.7 million to the Midwest Geological Sequestration Consortium, which is led by the Illinois State Geological Survey. This Partnership will conduct large volume tests in the Illinois Basin to demonstrate the ability of a geologic formation to safely, permanently, and economically store more than one million tons of carbon dioxide.

Illinois will continue to lead the way in developing the technologies for reducing carbon emissions, and we appreciate the support of the Illinois Congressional delegation in these efforts.

BACKGROUND:

- The Midwest Partnership will demonstrate CO2 storage in the Mount Simon Sandstone Formation, a prolific geologic formation throughout Illinois, Kentucky, Indiana, and portions of Ohio. This formation offers great potential to store more than 100 years of carbon dioxide emissions from major point sources in the region. The partnership will inject one million tons of CO2 into one of the thickest portions of the Mount Simon Formation to test how the heterogeneity of the formation can increase the effectiveness of storage and to demonstrate that the massive seals can contain the CO2 for millennia. The

results of this project will provide the foundation for the future development of CO2 capture and storage opportunities in the region.

Researchers and industry partners will characterize the injection sites and complete modeling, monitoring, and infrastructure assessments needed before CO2 can be injected. MGSC plans to drill a CO2 injection well and then inject about 1,000 tons per day of carbon dioxide into the Mt. Simon sandstone, which is approximately 5,500 feet below the surface. The project will inject CO2 for three years before closing the injection site and monitoring and modeling the injected carbon dioxide to determine the effectiveness of the storage reservoir.

FUTUREGEN – NEW APPROACH

QUESTION:

I know that you have been working to make changes to the FutureGen project. Can you please tell me why, and where you are going with FutureGen?

Funding Summary
(Dollars in Thousands)

Program/Activity	FY 2007 Operating Plan	FY 2008 Request	FY 2008 Enacted Appropriation	FY 2009 Request
FutureGen	$52,504	$108,000	$74,317	$156,000

ANSWER:

The Department remains committed to the original goals of FutureGen. However, due to projected rising construction costs of FutureGen as currently structured, changes in the electricity market, and a growing near-term interest in the promulgation of carbon dioxide (CO_2) regulations, e.g. several states such as Florida, Kansas, and California are requiring carbon capture and storage (CCS) or the flexibility to add CCS, it is necessary to adopt a new strategic approach. This new approach emphasizes early commercial experience with near-zero emission coal plants (Integrated Gasification Combined Cycle Technology (IGCC) with CCS) through a series of demonstrations linked to the commercial operations of IGCC. This newly structured FutureGen would place a reasonable limit on the DOE's cost exposure against potential cost-growth of FutureGen.

Under this new FutureGen approach, DOE proposes to accelerate the deployment of IGCC commercial power plants equipped with CCS technology. While there are remaining concerns about capital cost for IGCC without CCS, the remaining risks are at a level that the industry commonly accepts in making investment decisions on such projects. The major barrier to commercial scale deployment of near-zero emissions coal-fueled power production, which is also the thrust of this new approach, is the need for further development of CCS technology.

BACKGROUND:

- Concerns over past and future cost increases led DOE and the FutureGen Alliance into discussions on ways to limit the possibility of significant cost growth in the project. The Alliance is a group of leading international energy companies that have partnered with DOE on the FutureGen project. Despite several months of discussions, DOE and the FutureGen Alliance could not agree on terms to address these cost concerns. Last fall, we asked the Alliance to agree to a 50-50 cost-share for costs exceeding $1.8 billion, but the Alliance rejected the offer. As a result, the Secretary directed the Department to develop a new strategy with the overall aim of advancing the goals and objectives of FutureGen through a new approach that limits the Government's financial exposure, and

leverages its investment across a wider range of Integrated Gasification Combined Cycle (IGCC) projects.

- The FutureGen project was established with a 76% Government and 24% industry cost share agreement. The estimated cost of the project virtually doubled from the 2004 estimate of $950 million to a current estimate of $1.8 billion. Given future uncertainties, the cost of FutureGen could have gone even higher. Therefore, it is in the public interest to take steps to limit the Government's financial exposure.

- The global heavy construction industry has seen significant growth in the cost of projects because of global demand for plant materials, construction, and labor. Some common utility plant materials such as steam pipe and steel distribution pipe have risen 66 percent and 119 percent respectively since project inception.

- DOE's original internal project cost estimate was $950 million priced in 2004 constant dollars. The current total cost estimate, derived from Alliance conceptual design work during the first Budget Period (BP 0), is $1,757,232,310 in as-spent dollars with the DOE cost share of $1,300,352,230 and the Alliance share of $456,880,000.

- DOE has obligated $39,109,230 and has spent approximately $13 million. The Alliance has committed to $13,741,080 and has spent approximately $5 million.

- The Alliance completed a conceptual design and cost estimate for the Project during Budget Period Zero. The Alliance is currently working on the preliminary engineering design, equipment specification, and procurements. Further site specific activities would occur after issuance of DOE's NEPA Record of Decision (ROD).

- DOE's Environmental Impact Statement for the originally planned FutureGen project has been finalized and published. The Record of Decision (ROD) is still under internal review. Site selection cannot occur until after the ROD is issued. There is no statutory or regulatory deadline that requires the ROD to be released by a certain date.

- DOE has negotiated and awarded a full scope cooperative agreement that is divided into 6 phases (called budget periods). DOE has the right to discontinue the project at the completion of each budget period. Currently, the project is in the middle of Budget Period 1.

- The greatest portion of the cost increases occurred after the 2004 FutureGen Program Plan was submitted to Congress. Accounting for escalation and considering that there has been little change in the project's scope, the current estimate is consistent with other cost escalations in the heavy construction industry, including power plants.

FUTUREGEN—ILLINOIS SITE

QUESTION:

A site has already been chosen in Mattoon, Illinois. Isn't it too late to start trying to change the project now?

ANSWER:

The Department asked the FutureGen Alliance not to move forward with a site selection announcement last December, both orally and in writing. The timetable in the cooperative agreement with the Alliance provided for the issuance of the Department's Record of Decision under the National Environmental Policy Act (NEPA) before the announcement of site selection. The Department has not issued the ROD, and has no immediate plans to do so at this time. Without the ROD, the Alliance is not permitted to expend funds for site specific activities. Thus the Alliance is responsible for negatively affecting the project and creating expectations in the State of Illinois. It is unfortunate that the Alliance proceeded with this announcement despite the Department's repeated urgings not to do so, and while DOE was in discussions with the Alliance about restructuring the FutureGen project and financial arrangement.

Regardless, Illinois will continue to play a leading role in the development of clean coal technologies. While the projects that we will fund through the revised FutureGen program will undergo a competitive process, it is entirely possible that the work already done in Illinois (e.g., geological and environmental studies, and passage by the State of liability legislation) may work to the advantage of Illinois in this competition.

As you know, in December 2007, the Department awarded $66.7 million to the Midwest Geological Sequestration Consortium, which is led by the Illinois State Geological Survey. This Partnership will conduct large volume tests in the Illinois Basin to demonstrate the ability of a geologic formation to safely, permanently, and economically store more than one million tons of carbon dioxide.

Illinois will continue to lead the way in developing the technologies for reducing carbon emissions, and we appreciate the support of the Illinois Congressional delegation in these efforts.

BACKGROUND:

- The Midwest Partnership will demonstrate CO2 storage in the Mount Simon Sandstone Formation, a prolific geologic formation throughout Illinois, Kentucky, Indiana, and portions of Ohio. This formation offers great potential to store more than 100 years of carbon dioxide emissions from major point sources in the region. The partnership will inject one million tons of CO2 into one of the thickest portions of the Mount Simon Formation to test how the heterogeneity of the formation can increase the effectiveness of storage and to demonstrate that the massive seals can contain the CO2 for millennia. The

results of this project will provide the foundation for the future development of CO2 capture and storage opportunities in the region.

Researchers and industry partners will characterize the injection sites and complete modeling, monitoring, and infrastructure assessments needed before CO2 can be injected. MGSC plans to drill a CO2 injection well and then inject about 1,000 tons per day of carbon dioxide into the Mt. Simon sandstone, which is approximately 5,500 feet below the surface. The project will inject CO2 for three years before closing the injection site and monitoring and modeling the injected carbon dioxide to determine the effectiveness of the storage reservoir.

Exhibit #8

Future ALLIANCE

FutureGen Industrial Alliance, Inc
1001 Pennsylvania Ave NW
6th floor
Washington DC 20004
www.FutureGenAlliance.org

Richard J. Bladd
Chief Executive Officer
614-718-1565

The Honorable Samuel W. Bodman
Secretary of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585

October 25, 2007

RE: FutureGen Initiative

Dear Mr. Secretary:

At the August 2007 meeting of the Board of Directors of the FutureGen Industrial Alliance ("Alliance") your staff communicated a confirmation that the Department of Energy ("DOE") continues to view the FutureGen initiative as a premier project that is critical to addressing the global objectives of energy security, stable economies and climate change. Moreover, it was communicated that you recognize the project is managed by the Alliance effectively, that the Alliance has been responsive to the DOE, and that cost increases are due to escalation, not scope growth. This confirmation was extremely important to the Alliance Board as our Board continues to believe that extraordinary technical progress, and an unprecedented level of global governmental and private sector participation, have positioned the FutureGen project as the world's premier near-zero emission integrated power plant and carbon sequestration project.

Since we last reported progress to the Administration in our June 2007 letter to the President, the global importance of this effort has been highlighted by the Australian government's announcement that it will join DOE in co-funding the project. Australia joins China, India, Japan, and South Korea who also have expressed an interest in co-funding the initiative on the government side. In addition, energy companies in the U.S., Europe, and Asia have expressed a desire to join the initiative on the private sector side. Participation by these new energy companies will position the Alliance to reach its targeted private sector membership of 15 global concerns. The global attraction to FutureGen is its bold vision, its uniqueness, and equally important, its aggressive schedule. None of this would be possible, except through the public-private partnership; first conceived by the Administration, and formed and operated by the Alliance with the full support of the U. S. Government.

The project scope is aligned with the scope that was first submitted in a report to Congress in 2004. The FutureGen plant is being designed to incorporate component technologies developed through DOE's R&D program, and to provide a platform to test future technologies as part of an overall DOE long-term plan to address energy security and climate change. Such a commercial-scale, fully integrated power plant with coal gasification, a hydrogen turbine, targeted 90% CO_2 capture, real-time CO_2 sequestration, and post-injection monitoring does not exist anywhere in the world. Building FutureGen is a major step in proving that fossil fuels can be used with near-zero emissions and gaining technology acceptance from regulators, academia, the public, the financial and insurance industries, and other stakeholders.

Secretary Bodman
October 25, 2007
Page 2

The Alliance remains excited and expects to help DOE meet its commitment to Congress to commence construction in 2009 and be operational before the end of 2012. Avoidance of delays is also critical to control costs which are continuing to escalate for global energy infrastructure projects. The next key step to this effort is the issuance of a record of decision (ROD) to complete the environmental impact statement (EIS) process. This critical milestone – the ROD - enables selection of the final site, and then final engineering, cost estimates, equipment ordering and other steps which spring from that site selection. Public meetings on the EIS were exceptionally positive and the environmental community remains very supportive of this Administration initiative. The expected dates for issuance of the ROD have been moved by DOE from July 2007, to the end of October 2007, and then to the end of November 2007. Despite these delays, the Alliance members have made adjustments and the project schedule can still be met if the ROD is issued before mid-December.

At your request, in recent weeks we have met with your staff to discuss proposed changes to the current Cooperative Agreement which will shift additional risk to the Alliance. Although this request at this time by DOE was not contemplated when the current Cooperative Agreement was signed earlier this year, that dialogue has been productive and I believe we have made suggestions to address all your concerns as explained by your staff. We await your response so we can address these changes with our full Board at its meeting on November 1 and 2.

As the Alliance noted in its update letter to the President in June 2007, with the full support of the Administration, the Alliance expects FutureGen will remain one of the world's most visible advanced energy and climate change mitigation projects as the United States demonstrates its leadership in developing a technology-based solution to reducing CO_2 emissions. We look forward to the issuance of the ROD and your response to our suggestions concerning the proposed changes to the Cooperative Agreement so that we can help the Administration achieve its objectives.

Sincerely,

Michael J. Mudd
Chief Executive Officer
FutureGen Alliance

cc: The Honorable Clay Sell, Deputy Secretary of Energy
The Honorable C.H. "Bud" Albright, Jr., Under Secretary of Energy

Barry Jackson, Assistant to the President for Strategic Initiatives and External Affairs
The Honorable James Connaughton, Chairman, Council on Environmental Quality
The Honorable Jim Nussle, Director, Office of Management and Budget
The Honorable Paula J. Dobriansky, Under Secretary of State
Governor Rod R. Blagojevich, Illinois
Governor Rick Perry, Texas
Director Jack Levin, Illinois Department of Commerce and Economic Opportunity
Chairman Michael Williams, Texas Railroad Commission

Exhibit #9

Future ALLIANCE

Clean Energy for a Secure Future

FutureGen Industrial Alliance, Inc
1001 Pennsylvania Ave NW
6th floor
Washington DC 20004
www.FutureGenAlliance.org

Michael J. Mudd
Chief Executive Officer
614-716-1585

December 6, 2007

The Honorable C.H. "Bud" Albright, Jr
Under Secretary
U. S. Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585

RE: DOE Proposed Amendment to the FutureGen Cooperative Agreement

Dear Mr. Under Secretary:

First, let me extend thanks to you and the entire Department of Energy ("DOE") team for the issuance of the FutureGen Final Environmental Impact Statement (EIS). Completing this major effort allows the final site selection to proceed, as well as site-specific engineering design necessary to complete the current project phase. Despite the six-month delay, we are optimistic that working together we can still meet the 2009 construction start date, as represented by DOE to Congress, and control costs.

At this week's Alliance Board meeting, there was an opportunity to discuss DOE's proposed amendment terms. It appears that DOE's primary objective is to reapportion among the two parties the cost and risk associated with the project. The Board notes that under the terms of the existing Cooperative Agreement, the Alliance has already agreed to negotiate limits to the federal government's investment at the end of the current project phase, and its preference is to proceed under the existing Cooperative Agreement until costs and risks can be properly assessed with input from the upcoming preliminary design report and cost estimate. However, in deference to DOE, the Alliance Board has agreed to discuss the newly proposed terms with the Department, and to discuss the merits of amending the agreement early.

One item of particular concern is that DOE wants the Alliance to accept considerably more financial risk and to do so in the absence of information (i.e., the preliminary design and cost estimate) both parties previously agreed would be a precursor to these discussions. While the Alliance may be willing to absorb increased financial risk, either now or at the end of the current project phase, it will be extremely difficult to do so if the DOE also takes away the tools (financing, vesting of title, revenue management, and mechanisms to control cost) necessary for the Alliance to manage the very risks DOE wishes the Alliance to assume. There is long history of these tools being available under cooperative agreements. When DOE launched FutureGen, part of the initial invitation to participate included a commitment to be more flexible in the use of these tools,not less flexible.

December 6, 2007
Page 2

The attached "Additional Considerations" provide a context around the issues associated with the Alliance's view of DOE's proposed amendment terms.

I want to assure you that the Alliance board is committed to honoring its obligations under the existing Cooperative Agreement, while at the same time discussing DOE's proposed amendment terms in good faith. I feel it is extremely important for all of us to convey positive messages about the project, including that it remains on-track and is fully supported by the Administration and the five nations who have committed to participate in the government steering committee. As we know, stakeholders throughout the world are watching this flagship project, which will address global energy security and climate change concerns, while allowing for stable economies. To this end, it is important that stakeholders do not misinterpret our discussions as a full renegotiation, or that the current contractual agreement is anything less than a "good deal" for DOE and energy consumers throughout the world. We must all plan for continued success and ground breaking in 2009, and this mandates a rapid closure of any open issues. All of this is with a backdrop of the December 2007 meeting of the United Nations Framework Convention on Climate Change in Bali, Indonesia.

Assuming release by DOE of the Record of Decision by December 17th, we plan to hold the final site announcement on December 18th. My suggestion is that we meet as soon after the site announcement as possible to continue discussions.

Sincerely,

Michael J. Mudd
Chief Executive Officer
FutureGen Industrial Alliance

cc: Mr. Barry Jackson, Assistant to the President for Strategic Initiatives and External Affairs
The Honorable James Connaughton, Chairman, Council on Environmental Quality
The Honorable Samuel W. Bodman, Secretary U.S. Department of Energy
The Honorable Clay Sell, Deputy Secretary, U.S. Department of Energy
The Honorable Paula J. Dobriansky, Under Secretary, U.S. Department of State

Attachment

Attachment:
Additional Considerations
Under Secretary Albright
December 6, 2007
Page 1

Background Information

At the time President Bush launched the FutureGen project, industry was challenged to organize a consortium of companies to participate in the project. Administration representatives clearly conveyed that the basis for the business arrangement would be patterned after previous clean coal technology (CCT) cooperative agreements. Also, because of the project scale and the desire to make it a global effort to accelerate the use of the technology, it was indicated that the more restrictive CCT requirements would be removed. Specifically, the DOE represented the following anticipated terms:

- 20 percent non-federal cost-sharing;
- no repayment requirement from the industry partner (Energy Policy Act of 2005 subsequently disallowed any repayment on clean coal projects as a DOE condition for signing a Cooperative Agreement);
- ability to vest ownership of the plant with the industry partner;
- traditional CCT program data protections for the industry partner;
- potential for program income (electricity, CO_2, and byproduct sales) to be shared among project participants proportional to their cost sharing during the four-year project operating program
- 100 percent of post-project revenues to the industry partner, including any proceeds from a sale of the facility after the project; and
- an advanced appropriation of US$300 million toward the project through a programmatic transfer of funds from several cancelled CCT projects. (Typically DOE advance appropriates 100 percent of the funds on a CCT project – a practice the Government Accountability Office has supported. However, in FutureGen's case, DOE determined obtaining Congressional support for 100 percent advanced appropriation was not possible).

It was with this framework in mind that industry formed the Alliance and grew membership. Further, in the interest of ensuring that neither the DOE nor industry were inappropriately accused of "corporate welfare," after much debate, the Alliance was formed as a non-profit 501(c)3 entity. The decision to incorporate as a 501(c)3 entity is unprecedented for a DOE clean coal project cooperative agreement and has the following implications for the Alliance members and DOE:

- unlike DOE, the industry contributors can never share in a single dollar of program income or proceeds from the plant sale if that ever occurs;
- any program income or proceeds from the plant sale realized by the Alliance must be reinvested in public benefit R&D; and
- unlike DOE, the industry contributors do not gain any stake in intellectual property rights.

During the course of negotiating the initial Cooperative Agreement approved in 2005 and the renewed Cooperative Agreement approved earlier in 2007, the Alliance made additional, unique concessions. In our view these make the current FutureGen Cooperative Agreement a fiscally responsible project for DOE and the taxpayer:

- The Alliance boosted its cost-share from 20 percent to 26 percent
- The Alliance agreed to attempt to negotiate a cap of the DOE contribution, subject to escalation and to set industry-based inflation/escalation indices (a common practice in industry) after a preliminary design report and cost estimate were completed (i.e., at the end of Budget Period-1 activities).
- DOE and the Alliance would share in inflation, but the Alliance is 100 percent responsible for costs associated with any scope growth, not mutually agreed to.
- The Alliance agreed to share revenues with DOE pro-rata instead of the typical cooperative agreement whereby the private partner keeps 100 percent of the revenues. The effect of this concession was to have 74 percent of the estimated $300 million in revenues be allocated to reduce DOE's cost share.
- The Alliance agreed to share proceeds from the facility's sale on a pro-rata basis instead of 100 percent being allocated to the Alliance as is typical. This has the net effect of creating the potential for a material repayment of DOE's cost share. To the best of our knowledge, this is unprecedented in the history of CCT projects.
- Contributing Alliance members under the 501(c)(3) structure would not receive any repayment of their contributions from project revenues or a facility sale. Such funds must be directed back to research and development.

The Alliance had already agreed to negotiate limits to DOE's costs, at an appropriate later date.

Under the terms of the existing Cooperative Agreement for Budget Period-1 signed earlier in 2007, the Alliance and DOE had already agreed to negotiate limits to the Federal government's investment subject to escalation. DOE and the Alliance agreed to wait until the end of the current budget period for this discussion, because a product of the ongoing Budget Period-1 is a more detailed site-specific design and cost estimate. This information, which will be available at the end of Budget Period-1, is an appropriate prerequisite to assess both DOE's and the Alliance's project investment requirements and risk. Thus, the preference of the Alliance's Board continues to be to proceed under the existing Cooperative Agreement through the current budget period. However, in deference to DOE, the Alliance has agreed to discuss DOE's proposed revised terms.

The sustainability of the Alliance as a viable organization, and thus the sustainability of the project, requires that any premature amendment to the Cooperative Agreement which places such increased financial risk on the Alliance must not simultaneously eliminate the Alliance's access to risk management tools (i.e., financing, vesting of title, revenue management and other project scope and cost controls). These necessary risk and financial management tools are normally available to the industry partner under traditional CCTprojects, other DOE cooperative agreements, and existing statutes. Moreover, all of these options were contemplated by the Alliance and discussed with DOE during the phases of the project to date.

Attachment:
Additional Considerations
Under Secretary Albright
December 6, 2007
Page 3

Inflation is a reality in building new power plants.

The current worldwide hyper-inflation is having an impact on all energy and infrastructure projects, including nuclear, solar, and ethanol, and FutureGen is not immune from this inflation. However, there can be no doubt that the terms of the existing Cooperative Agreement are remarkably favorable to the taxpayer, especially considering that the industry contributors receive zero financial returns and zero intellectual property returns. Because the Alliance members are absorbing cost increases and not just billing DOE as a contractor, they have every reason to control costs.

Financing a portion of the plant will assist in the commercialization of the technology.

As part of previous cooperative agreements, the private partner financing of some portion of the project is commonplace. Further, federal procurement regulations specifically include provisions for project financing and the handling of interest. The Alliance members have always considered, and discussed with DOE, potential financing. Further, the FutureGen program provides the unique opportunity to involve a consortium of lenders in this first-of-a-kind, fully integrated integrated gasification combined cycle plant with carbon capture and sequestration (CCS). Lender involvement and confidence in the initial facility is an important step to facilitate financing of subsequent projects with CCS throughout the world. Bank financing will be especially important for advancing CCS projects in emerging economies. Thus, a well thought-out financing approach involving international lenders will help accomplish an important goal of the FutureGen program: to increase the level of comfort in such facilities by many important stakeholders, such as lenders, insurers, permitting agencies, and landowners. The participation of a bank consortium lends credibility to these stakeholders. The successful project will also enhance vendor confidence in giving future performance guarantees which do not exist today, but are so critical to subsequent CCS project financing.

With the above points in mind, the Alliance will continue to have discussions with DOE concerning any possible modifications to the Cooperative Agreement, which we realize that both the Secretary and the Alliance Board will need to approve.

Exhibit #10

Department of Energy
Washington, DC 20585

December 11, 2007

Mr. Michael J. Mudd
Chief Executive Officer
FutureGen Industrial Alliance, Inc.
1001 Pennsylvania Ave., NW
6th Floor
Washington, DC 20004

Dear Mr. Mudd:

The Department of Energy is in receipt of your December 6, 2007, letter to Under Secretary Albright.

In light of that letter, we are evaluating what the Department's next actions should be with respect to the Alliance and its FutureGen project. In that regard, we note that your December 6 letter references an assumption that the Department will issue a Record of Decision (ROD) concerning this project "by" December 17, and that the Alliance plans to schedule a site selection announcement for December 18. This was done without any consultation with the Department.

Please note that under applicable regulations, the waiting period following issuance of the FutureGen Final Environmental Impact Statement (EIS) ends on December 17. The Department would need to consider any comments received on the Final EIS prior to issuing a ROD. Therefore, December 18 is the earliest permissible date that the Department could issue a ROD for this project. At this time, we do not anticipate issuing a ROD by that date. Therefore, we would consider it inadvisable for the Alliance to schedule any site selection announcement or media advisory at this time without prior consultation with the Department.

If you have any questions, please contact me at (202) 586-6660.

Sincerely,

James A. Slutz
Acting Principal Deputy Assistant Secretary
Office of Fossil Energy

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Exhibit #11

Department of Energy
Washington, DC 20585

December 6, 2007

MEMORANDUM FOR THE SECRETARY

THROUGH: C. H. ALBRIGHT, JR.
UNDER SECRETARY OF ENERGY

FROM: JAMES A. SLUTZ
ACTING PRINCIPAL DEPUTY ASSISTANT SECRETARY
OFFICE OF FOSSIL ENERGY

SUBJECT: **ACTION:** Sign Response to Letter from Secretary Naimski of the Polish Ministry of Economy regarding Poland's intent to join the FutureGen Initiative.

ISSUE: In response to discussions between staff of the Office of Fossil Energy and the Polish Embassy, the letter from Secretary Naimski expresses Poland's intent to contribute to the FutureGen Project. The letter also identifies the Central Mining Institute in Katowice as the Government of Poland's participant in negotiations of the draft multilateral agreement which will serve as the framework for international collaboration among the U.S. and Foreign Government contributors to the Project. Each contributing foreign government is expected to contribute at least $10 million to the Project. The latest meeting of interested Governments (Australia, China, India, Japan, and Republic of Korea) was held in Seoul, South Korea, October 31- November 1, 2007. The participants agreed to continue their work to finalize the text of the draft agreement via e-mail exchanges.

The proposed reply letter to Secretary Naimski welcomes Poland's expression of interest in joining the FutureGen Project, and requests name, address, and other point of contact information for one or more officials at the Central Mining Institute, so that we can transmit electronically the draft text of the multilateral agreement under consideration, in response to Secretary Naimski's request.

URGENCY: None.

POLICY IMPACT: None.

SENSITIVITIES: None.

RECOMMENDATION: That you sign the attached letter.

ATTACHMENT

CONCURRENCE: General Counsel/ EFygi/12/4/2007 w/Comment
Policy and International/ KHarbert/12/3/2007

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EXEC-2007-012985
12/20/2007 5:00 PM

MINISTRY OF ECONOMY
SECRETARY OF STATE
Piotr Naimski
Government's Plenipotentiary
for Oil and Gas Supply
SPN/87/2007

Warszawa, 31st of October 2007

Mr. Samuel Bodman
Secretary of Energy
U.S. Department of Energy
Washington DC

Dear Secretary,

On behalf of the Government of the Republic of Poland I would like to express our intention to become a contributing member of the FutureGen Project. Therefore I would appreciate if the Central Mining Institute could obtain a draft text agreement of "Agreement for International Collaboration on the FutureGen Project". Central Mining Institute in Katowice has been nominated for negotiation the Agreement from Polish side and will eventually carry on this project in Poland. Would you please address any further correspondence also to this Institute.

I am looking forward hearing from you soon.

Sincerely,

Piotr Naimski

Exhibit #12

Department of Energy
Washington, DC 20585

January 31, 2008

MEMORANDUM FOR THE SECRETARY

THROUGH: C. H. ALBRIGHT, JR.
UNDER SECRETARY OF ENERGY

FROM: JAMES A. SLUTZ
ACTING PRINCIPAL DEPUTY ASSISTANT SECRETARY
OFFICE OF FOSSIL ENERGY

SUBJECT: **ACTION:** Letters to the International Participants of the FutureGen Project

ISSUE: With yesterday's announcement of a restructured FutureGen project, these letters notify the international participants of our announcement and indicate that there will be a shift in their role in the project.

URGENCY: The letters should be sent to the international partners today in order to maintain the relationships with each country.

POLICY IMPACT: This action will impact current Department policy by notifying the international partners of the restructured FutureGen project.

SENSITIVITIES: None.

RECOMMENDATION: That you approve and sign the attached letters.

ATTACHMENTS

CONCURRENCE:

APPROVED:_____

DISAPPROVED:_____

DATE:_____

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EXEC-2008-001245

The Secretary of Energy
Washington, D.C. 20585

February 1, 2008

The Honorable Akira Amari
Minister of Economy, Trade and Industry
3-1 Kasumigaseki, 1-Chrome, Chiyoda-ku
Tokyo, Japan

Dear Minister Amari:

In order to address the twin challenges of energy security and climate change, it is critical that governments and the private sector invest in technological advancements that will accelerate the viability of clean coal technology. As you know, the FutureGen initiative has that objective as its main mission. Since the United States launched the FutureGen initiative in 2003, technology has advanced and the estimated cost of the project being implemented by the FutureGen Alliance has escalated substantially. Given the nature of the undertaking and the extraordinarily steep inflation currently affecting energy projects worldwide, the Department forecasts that project costs will continue to rise in the future, perhaps by substantial amounts.

In consideration of the foregoing, we have concluded that for FutureGen to effectively meet its goal under these new market realities, it is necessary to adopt a broader, strategic approach, one that emphasizes early commercial experience with technologies associated with near-zero emission coal plants through a series of demonstrations linked to the commercial operations of Integrated Gasification Combined Cycle (IGCC) with Carbon Capture and Storage (CCS). The goal of the FutureGen program remains the same: to prove and accelerate commercial deployment of IGCC-CCS technology, at a cost that is sustainable for the United States taxpayer to bear.

This revised approach differs from the original FutureGen which focused on the large-scale integration of advanced research and development technologies in a "living laboratory" setting to be followed by commercial demonstrations and subsequent deployment. The new direction focuses on demonstrating CCS technology at multiple clean coal power plants in the next seven years. This commercial demonstration route will allow for early deployment of nearer term IGCC-CCS technologies along side commercial IGCC operations. The revised approach will address early on the challenges associated with near-zero emissions technologies in coal-fired power plants, including siting issues, and help drive the regulatory frameworks for carbon dioxide transport, injection and storage associated with power generation. More importantly, the new approach will still address the very critical technical feasibility question of IGCC-CCS coal plants.

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The Department of Energy places high value in your government's cooperation to date in our collective efforts to make FutureGen an international showcase for demonstrating advanced clean coal technology with CCS. We remain firmly committed to the overarching goals of FutureGen to accelerate the commercial viability of affordable, reliable energy from near-zero emission coal plants integrated with CCS throughout the world. As we further develop and engage industry on commercial application of low-emission power generation from fossil-fueled power plants, we look forward to continued outreach to Japan and other interested countries concerning our vision to realize FutureGen.

Should you have any questions, please contact Dr. Victor Der, Deputy Assistant Secretary for Clean Coal, at +1 202-586-1650.

Sincerely,

Sam

Samuel W. Bodman

The Secretary of Energy
Washington, D.C. 20585

February 1, 2008

The Honorable Kim Young-ju
Minister of Commerce, Industry
and Energy
3 Joongang-dong
Gwacheon-SI Gyeonggi-do 427-721
Republic of Korea

Dear Minister Kim:

In order to address the twin challenges of energy security and climate change, it is critical that governments and the private sector invest in technological advancements that will accelerate the viability of clean coal technology. As you know, the FutureGen initiative has that objective as its main mission. Since the United States launched the FutureGen initiative in 2003, technology has advanced and the estimated cost of the project being implemented by the FutureGen Alliance has escalated substantially. Given the nature of the undertaking and the extraordinarily steep inflation currently affecting energy projects worldwide, the Department forecasts that project costs will continue to rise in the future, perhaps by substantial amounts.

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The Department of Energy places high value in your government's cooperation to date in our collective efforts to make FutureGen an international showcase for demonstrating advanced clean coal technology with CCS. We acknowledge with particular appreciation the Republic of Korea's financial contribution to the FutureGen initiative, and we stand ready to consult with you on your government's desired disposition of those monies as we chart the course of the revised FutureGen program.

We remain firmly committed to the overarching goals of FutureGen to accelerate the commercial viability of affordable, reliable energy from near-zero emission coal plants integrated with CCS throughout the world. As we further develop and engage industry on commercial application of low-emission power generation from fossil-fueled power plants, we look forward to continued outreach to the Republic of Korea and other interested countries concerning our vision to realize FutureGen.

Should you have any questions, please contact Dr. Victor Der, Deputy Assistant Secretary for Clean Coal, at +1 202-586-1650.

Sincerely,

Samuel W. Bodman

Samuel W. Bodman

The Secretary of Energy
Washington, D.C. 20585

February 1, 2008

The Honorable Sushikumar Shinde
Minister of Power
Government of India
New Delhi – 110-001

Dear Honorable Minister Shinde:

In order to address the twin challenges of energy security and climate change, it is critical that governments and the private sector invest in technological advancements that will accelerate the viability of clean coal technology. As you know, the FutureGen initiative has that objective as its main mission. Since the United States launched the FutureGen initiative in 2003, technology has advanced and the estimated cost of the project being implemented by the FutureGen Alliance has escalated substantially. Given the nature of the undertaking and the extraordinarily steep inflation currently affecting energy projects worldwide, the Department forecasts that project costs will continue to rise in the future, perhaps by substantial amounts.

In consideration of the foregoing, we have concluded that for FutureGen to effectively meet its goal under these new market realities, it is necessary to adopt a broader, strategic approach, one that emphasizes early commercial experience with technologies associated with near-zero emission coal plants through a series of demonstrations linked to the commercial operations of Integrated Gasification Combined Cycle (IGCC) with Carbon Capture and Storage (CCS). The goal of the FutureGen program remains the same: to prove and accelerate commercial deployment of IGCC-CCS technology, at a cost that is sustainable for the United States taxpayer to bear.

This revised approach differs from the original FutureGen which focused on the large-scale integration of advanced research and development technologies in a "living laboratory" setting to be followed by commercial demonstrations and subsequent deployment. The new direction focuses on demonstrating CCS technology at multiple clean coal power plants in the next seven years. This commercial demonstration route will allow for early deployment of nearer term IGCC-CCS technologies along side commercial IGCC operations. We expect the revised approach will address early on the challenges associated with near-zero emissions technologies in coal-fired power plants, including siting issues, and help drive the regulatory frameworks for carbon dioxide transport, injection and storage associated with power generation. More importantly, the new approach will still address the very critical technical feasibility question of IGCC-CCS coal plants.

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The Department of Energy places high value in your government's cooperation to date in our collective efforts to make FutureGen an international showcase for demonstrating advanced clean coal technology with CCS. We acknowledge with particular appreciation India's financial contribution to the FutureGen initiative, and we stand ready to consult with you on your government's desired disposition of those monies as we chart the course of the revised FutureGen program.

We remain firmly committed to the overarching goals of FutureGen to accelerate the commercial viability of affordable, reliable energy from near-zero emission coal plants integrated with CCS throughout the world. As we further develop and engage industry on commercial application of low-emission power generation from fossil-fueled power plants, we look forward to continued outreach to India and other interested countries concerning our vision to realize FutureGen.

Should you have any questions, please contact Dr. Victor Der, Deputy Assistant Secretary for Clean Coal, at +1 202-586-1650.

Sincerely,

Samuel W. Bodman

Samuel W. Bodman

The Secretary of Energy
Washington, D.C. 20585

February 1, 2008

The Honorable Wan Gang
Ministry of Science and Technology
of the People's Republic of China 15B
Fuxing Road
Beijing, 100862
People's Republic of China

Dear Minister Wan:

In order to address the twin challenges of energy security and climate change, it is critical that governments and the private sector invest in technological advancements that will accelerate the viability of clean coal technology. As you know, the FutureGen initiative has that objective as its main mission. Since the United States launched the FutureGen initiative in 2003, technology has advanced and the estimated cost of the project being implemented by the FutureGen Alliance has escalated substantially. Given the nature of the undertaking and the extraordinarily steep inflation currently affecting energy projects worldwide, the Department forecasts that project costs will continue to rise in the future, perhaps by substantial amounts.

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The Department of Energy places high value in your government's cooperation to date in our collective efforts to make FutureGen an international showcase for demonstrating advanced clean coal technology with CCS. We remain firmly committed to the overarching goals of FutureGen to accelerate the commercial viability of affordable, reliable energy from near-zero emission coal plants integrated with CCS throughout the world. As we further develop and engage industry on commercial application of low-emission power generation from fossil-fueled power plants, we look forward to continued outreach to China and other interested countries concerning our vision to realize FutureGen.

Should you have any questions, please contact Dr. Victor Der, Deputy Assistant Secretary for Clean Coal, at +1 202-586-1650.

Sincerely,

Samuel W. Bodman

Samuel W. Bodman

The Secretary of Energy
Washington, D.C. 20585

February 1, 2008

The Honorable Martin Ferguson
Minister of Resources and Energy
Industry House
10 Binara Street
CANBERRA ACT 2601
Australia

Dear Minister Ferguson:

In order to address the twin challenges of energy security and climate change, it is critical that governments and the private sector invest in technological advancements that will accelerate the viability of clean coal technology. As you know, the FutureGen initiative has that objective as its main mission. Since the United States launched the FutureGen initiative in 2003, technology has advanced and the estimated cost of the project being implemented by the FutureGen Alliance has escalated substantially. Given the nature of the undertaking and the extraordinarily steep inflation currently affecting energy projects worldwide, the Department forecasts that project costs will continue to rise in the future, perhaps by substantial amounts.

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The Department of Energy places high value in your government's expression of interest in our efforts to make FutureGen an international showcase for demonstrating advanced clean coal technology with CCS. We remain firmly committed to the overarching goals of FutureGen to accelerate the commercial viability of affordable, reliable energy from near-zero emission coal plants integrated with CCS throughout the world. As we further develop and engage industry on commercial application of low-emission power generation from fossil-fueled power plants, we look forward to continued outreach to Australia and other interested countries concerning our vision to realize FutureGen.

Should you have any questions, please contact Dr. Victor Der, Deputy Assistant Secretary for Clean Coal, at +1 202-586-1650.

Sincerely,

Samuel W. Bodman

Samuel W. Bodman

The Secretary of Energy
Washington, D.C. 20585

February 1, 2008

The Honorable Waldemar Pawlak
Minister of Economy
Ministry of Economy
Pl. Trzech Krzyzy 3/5
00-507 Warsaw
Poland

Dear Minister Pawlak:

In order to address the twin challenges of energy security and climate change, it is critical that governments and the private sector invest in technological advancements that will accelerate the viability of clean coal technology. As you know, the FutureGen initiative has that objective as its main mission. Since the United States launched the FutureGen initiative in 2003, technology has advanced and the estimated cost of the project being implemented by the FutureGen Alliance has escalated substantially. Given the nature of the undertaking and the extraordinarily steep inflation currently affecting energy projects worldwide, the Department forecasts that project costs will continue to rise in the future, perhaps by substantial amounts.

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Should you have any questions, please contact Dr. Victor Der, Deputy Assistant Secretary for Clean Coal, at +1 202-586-1650.

Sincerely,

Samuel W. Bodman

Samuel W. Bodman

The Secretary of Energy
Washington, D.C. 20585

February 1, 2008

The Honorable Åslaug Haga
Minister of Petroleum and Energy
Einar Gerhardsens plass 1 (R4)
Dep, NO- 0033 Oslo
Norway

Dear Minister Haga:

In order to address the twin challenges of energy security and climate change, it is critical that governments and the private sector invest in technological advancements that will accelerate the viability of clean coal technology. As you know, the FutureGen initiative has that objective as its main mission. Since the United States launched the FutureGen initiative in 2003, technology has advanced and the estimated cost of the project being implemented by the FutureGen Alliance has escalated substantially. Given the nature of the undertaking and the extraordinarily steep inflation currently affecting energy projects worldwide, the Department forecasts that project costs will continue to rise in the future, perhaps by substantial amounts.

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Should you have any questions, please contact Dr. Victor Der, Deputy Assistant Secretary for Clean Coal, at +1 202-586-1650.

Sincerely,

Samuel W. Bodman

Samuel W. Bodman