



Testimony
Michael J. Mudd, Chief Executive Officer
FutureGen Alliance

Before the
U.S. Senate Committee on Commerce, Science, and Transportation
Subcommittee on Science, Technology, and Innovation

April 9, 2008

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 (CO₂). 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 and is positioned to advance integrated gasification combined cycle (IGCC) and carbon capture and sequestration (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 environmental concerns, and it is clear that Congress intends to develop policies to address this 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, given that 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, and 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 its support of 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, and 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 structuring DOE proposes, it is essential that the Department reaffirms the United States' position as a global leader in near-zero emission coal technology and CCS development by maintaining the position that DOE has stated numerous times prior to its announcement of restructuring: that FutureGen at Mattoon is the top priority program in 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.

- 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 CO₂ capture goals. All emissions and CO₂ 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 CO₂ capture.** It is imperative that DOE maintain the requirement of 90 percent CO₂ capture from the entire facility for the FutureGen program.
- FutureGen at Mattoon is fully integrated and 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.

- Public benefit and information sharing is a hallmark of FutureGen at Mattoon. 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.
- International involvement is essential to the rapid deployment of CCS technologies, and FutureGen at Mattoon is a model that provides international involvement at an unprecedented level. Thirteen companies with operations on six continents are participating as members of the Alliance. Climate technologies must be globally acceptable 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.
- FutureGen at Mattoon provides a platform for testing advanced technologies, which accelerates technology development and saves the taxpayer money. 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 CO₂, 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, H₂ and CO₂ separation, H₂ 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

All major, global energy infrastructure projects are being impacted by rapidly rising commodity and equipment costs. FutureGen at Mattoon is no exception. Other IGCC and CCS projects also are no exception. However, FutureGen at Mattoon's unique financing structure mitigates taxpayer exposure. The Alliance has pledged approximately \$400 million dollars to the program, will return 100 percent of the estimated \$300 million in plant revenues back to the program, and will direct 100 percent of post-program electricity revenues to public benefit R&D. After the program is complete, if the plant is ever sold, the Alliance has advised the DOE that it would be eligible for partial to full repayment. Industry financial contributors will never receive a single dollar of financial return. This represents an unprecedented level of commitment by the Alliance

membership to a public/private partnership. The Alliance is willing to make this commitment because this investment is squarely in the interest of both the nation and the world.

With respect to the commercial status of IGCC without CCS, while there are some IGCC plants being planned, the marketplace is still in its infancy. Only one IGCC without CCS is under construction and that plant received substantial government subsidies and required a major increase in electricity rates for it to proceed. Of the other IGCC plants in the planning stage, very few have been able to secure full financing and/or regulatory approval. The high cost of new power plants coupled with the difficulty in getting either bank financing or regulatory approval has resulted in the cancellation of many coal plants. Further, taking a broader look at coal-related plants of all technologies, according to *Source Watch*, in 2007 alone, 59 proposed plants were cancelled, abandoned, or put on hold, and of those plants remaining, few are IGCC's with real prospects of being built. The challenges in the marketplace, even when CCS is not considered, are clear. The addition of CCS with 90% capture fundamentally changes the underlying IGCC plant configuration—it is not a simple addition, it adds significant additional cost and complexity.

Thus, it is an appropriate role for the federal government to take on the challenge of building the world's first IGCC with 90% CCS. In the current marketplace environment, on its own, the technology simply will not come forward. With the continued funding from the U.S. DOE, FutureGen will have a high probability of proceeding.

DOE's Proposed Restructuring

The Alliance believes that it is in the national interest to *complement* FutureGen at Mattoon with additional projects in a variety of engineered applications and a variety of geologic formations. However, complementary projects must not come at the expense or delay of the number one priority, FutureGen at Mattoon. Further, it is doubtful that real projects with CCS technology that capture 90 percent of the CO₂ and sequester the CO₂ in geologic formations can be brought to fruition absent the trailblazing of 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 in the RFI (i.e., a proposed on-line date of 2015) 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 my 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:

- 2009+: project selection and cooperative agreement negotiation
 - 2012: completion of preliminary design, environmental impact assessment and record of decision
 - 2013: completion of detailed design and procurement of major technology components
 - 2017: completion of construction
 - 2018: initial operation
 - 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* CO₂ emissions from the *entire* plant would fall short of what is needed to rapidly develop near-zero 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.

 - Increased appropriations will be required to offset federal taxation. DOE is proposing moving away from its partnership with the nonprofit Alliance to providing federal funds for a for-profit entity. While it is appropriate for DOE to work with for-profit and nonprofit entities, the precedent in the Clean Coal Power Initiative is that DOE grants awarded to for-profit entities can be subject to taxation by the IRS, if determined to be income. Thus, whereas 100 percent of the funding going to FutureGen at Mattoon goes to on-the-ground technology and operations, under DOE's new program, DOE will need increased appropriations if it intends to make the same ultimate on-the-ground investment in technology and operations. This could result in either: 1) hundreds of millions of dollars of

additional appropriations to offset taxes or 2) a major dilution of DOE's program investment through taxation.

- DOE appropriately retained the 90% capture goal in its RFI and must do so in any awarded projects. The FutureGen program has identified 90 percent CO₂ capture as an important requirement to advance CCS technology. This level of CO₂ 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 100 percent 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 sequestering 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 demonstration 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.