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STATUS OF DOE-FUNDED CLEAN
COAL TECHNOLOGY PROJECTS

STATEMENT OF
KEITH O. FULTZ
DIRECTOR, ENERGY ISSUES
RESOURCES, COMMUNITY, AND ECONOMIC
DEVELOPMENT DIVISION

BEFORE THE
SUBCOMMITTEE ON ENERGY AND POWER
COMMITTEE ON ENERGY AND COMMERCE
HOUSE OF REPRESENTATIVES



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Mr. Chairman and Members of the Subcommittee:

We are pleased to be here today to discuss the status of the nine demonstration projects that the Department of Energy (DOE) has funded under the first round of the Clean Coal Technology (CCT) program. The status of these projects as of December 31, 1988, was discussed in our March 29, 1989, report to the Chairman on the CCT program,¹ which was released today. For this hearing, we have obtained updated information as of March 15, 1989, on the status of the projects. The status of six projects has changed since December 31, 1988.

In summary, seven of the nine funded clean coal technology projects were not progressing as planned, but DOE does not know yet what the effect will be on their estimated completion dates and DOE's share of total project costs. Specifically,

- The seven projects were experiencing coordination, equipment, and financing problems that caused delays in completing project phases, cost overruns, and proposed project modifications.

¹Fossil Fuels: Commercializing Clean Coal Technologies (GAO/RCED-89-80, Mar. 29, 1989).

- Two other projects that were funded in late 1988 to replace withdrawn project proposals were on schedule and were not experiencing cost increases.

- It is too early to tell whether the projects' delays will affect the timing of the commercial availability of the clean coal technologies and, therefore, the role these technologies can play within the time frames for emissions reductions of any acid rain control legislation the Congress may enact.

BACKGROUND

Before I proceed, let me provide some background on the CCT program. The CCT program is a cost-shared demonstration program designed to encourage the commercialization of emerging clean coal technologies by providing federal funding of up to 50 percent of a demonstration project's cost. Industry and other nonfederal sources provide the balance of project financing.

DOE has conducted two solicitations for demonstration project proposals and is planning its third solicitation by May 1989. The Congress has appropriated \$400 million for the first solicitation, \$575 million for the second, and \$575 million for the third, for a total of \$1.55 billion.

Selection of Projects

In February 1986, under round one of the program, DOE solicited cost-shared proposals for projects that would demonstrate the feasibility and commercial application of a broad slate of emerging technologies. In July 1986, after evaluating 51 proposals, DOE selected 9 projects for funding and a list of several others to serve as replacement projects in the event that cooperative agreements could not be negotiated with project sponsors. Two of the nine projects were withdrawn and replaced with four other projects. One of the replacement projects was also withdrawn and replaced with three more projects. As of March 15, 1989, DOE had funded nine projects, including two replacement projects, and was in the process of negotiating cooperative agreements with sponsors of the other four replacement projects.

Six cooperative agreements for the nine funded projects were signed during 1987, in early 1988 for the seventh project, and in late 1988 for the two replacement projects. The nine projects were originally expected to cost about \$861 million, consisting of about \$271 million in federal assistance (31.5 percent) and about \$590 million in nonfederal financing (68.5 percent). (Attachment I lists the funded projects, their sponsors, and their originally estimated costs.)

Project Phases

Each project consists of three major phases for which DOE can provide funding: (1) project design and permitting, (2) construction and startup, and (3) operation (demonstration). During the first phase, the preliminary and detailed project designs are completed and environmental and construction permits and licenses to build and operate the project are obtained. During the second phase, the site is prepared, equipment is obtained, the project is constructed, and its operational system is tested. Projects may have an overlap between the first two phases to avoid delays. During the demonstration phase, the project is operated and operational data are collected, analyzed, and reported.

As of March 15, 1989, five projects (four original and one replacement) were in the design and permitting phase, one project was concurrently in design and construction, and three projects (two original and one replacement) were in the demonstration phase.

GAO Work

To obtain current information on the status of the projects through March 15, 1989, we reviewed DOE project files and interviewed DOE's Pittsburgh and Morgantown Energy Technology Centers' program officials who monitor the funded projects. We did not contact the projects' sponsors. The objectives, scope, and

methodology of our work up until December 31, 1989, are included in our March 29, 1989, report.

PROJECT DELAYS AND COST INCREASES

Now I would like to discuss the status of the nine funded projects as of March 15, 1989, including slippages in completing project phases, cost increases, and proposed modifications. As I mentioned, the two recently funded replacement projects were on schedule and not experiencing cost overruns.

DOE had amended the agreements for two of the seven originally selected projects to extend the completion dates by 3-1/2 and 7 months. DOE had not established revised completion dates for the other five projects that were behind schedule, but indicated that one of the projects would slip by 3 to 4 months. However, DOE had extended the design phase completion date for three of the other four projects by 7 to 15-1/2 months, and the fourth project's design phase was 3 months behind schedule. The seven projects were experiencing delays because of coordination, equipment, and financing problems. These delays and problems contributed to cost overruns for six projects and proposed project modifications for three projects, as discussed below.

- Two projects' agreements have been modified to reflect increased total project costs that will be borne by the sponsors.

- Four projects' funds have been transferred from later phases of the projects to cover cost overruns in the earlier phases without an increase in total project costs.

- Two projects' sponsors have proposed project restructuring to control costs. The sponsor of another project has proposed changing the project location and third party arrangements in order for the project to proceed, which could also reduce costs.

Sponsors of four of the projects have projected total cost increases of about \$70 million, or 26 percent. Although DOE has the discretion under Public Law 99-190 to share in funding project cost increases, its cooperative agreement for each project states that it has no obligation to fund any cost increases. Further, two agreements specifically state that the sponsor will be responsible for funding any cost increases. As of March 15, 1989, DOE had not increased its total funding for any project.

(Attachment II provides a comparison of the originally scheduled and revised completion dates for the funded projects.

Attachment III describes the changes in project status between December 31, 1988, and March 15, 1989.)

Next, I will discuss the reasons for the projects' slippages and related cost impacts.

COORDINATION PROBLEMS

Five projects were not progressing according to their original schedules mainly because of coordination problems in dealing with vendors, government organizations, and utilities. The specific situation differed among the projects but included problems in scheduling equipment deliveries or construction, meeting federal environmental requirements or obtaining state environmental permits, coordinating multiple participating utilities, and reaching an agreement with a utility to purchase generated power. I will now provide more specific information on these five projects.

Tidd Pressurized Fluidized-bed

Combustor Project

DOE had amended the agreement to extend the completion date for this project by 7 months from March 1993 to October 1993. The slippage occurred because the sponsor, after signing the cooperative agreement, waited for DOE to sign the agreement before

finalizing an order with an equipment vendor. As a result, the sponsor lost its position in the vendor's production schedule, which delayed delivery and installation of the equipment by about 7 months and increased the project's estimated cost by \$2.5 million (from \$167.5 million to \$170 million). In addition, the sponsor had projected a \$10.2 million cost overrun because of inflation and firmer cost estimates. Under this project's agreement, the sponsor is responsible for all cost overruns.

Limestone Injection

Multistage Burner Project

DOE officials expect the completion date for this project to slip by 3 to 4 months from December 1990 to March or April 1991, but have not changed the agreement to reflect a revised date. This project is an extension of an Environmental Protection Agency (EPA)-funded project, which used one type of coal and sorbent (an agent which neutralizes sulfur dioxide emissions) to test a process for controlling sulfur dioxide and nitrogen oxide emissions during combustion. The DOE-funded project is to test this process using a variety of medium- and high-sulfur coals and sorbents. Construction of equipment and startup of the demonstration was delayed by about 6 months because testing of the EPA-funded project took longer than anticipated. The demonstration phase began in March 1989.

This project was originally estimated to cost about \$19 million. DOE modified the agreement in January 1989 to transfer about \$550,000 (including about \$420,000 of the sponsor's funds and about \$130,000 of DOE's funds) from the project's demonstration phase to its design phase. DOE officials told us in March 1989 that they anticipated an additional cost overrun of up to \$250,000 for the project's design and construction phases, but they said it was too early to determine whether the project's total costs would increase. DOE is not obligated to participate in project cost overruns.

Gas Reburning/Sorbent Injection Project

DOE had extended the design phase completion date for this project by 1 year from October 1988 to October 1989 for the sponsor to satisfy federal environmental requirements, resolve coordination problems with three participating utilities, and reevaluate the project's structure to reduce costs. This project was to demonstrate the retrofit of the technology on three types of coal-fired boilers owned by the utilities. According to DOE, some of the environmental requirements have been met, but the sponsor had deferred design work and was preparing a formal proposal, which will discuss the sponsor's recommendations and revised milestones for restructuring the project to reduce costs. DOE expected to receive this proposal in April 1989.

This project was expected to cost about \$30 million, but the sponsor had projected a \$13 million to \$15 million cost increase on the basis of firmer design cost estimates. DOE had modified the agreement to transfer about \$1.2 million from the project's demonstration phase to its design phase. DOE and the sponsor shared equally in this transfer of project funds.

Advanced Coal Gasification Combined
Cycle Power Generation Project

The project's design phase had been extended by 9 months from July 1988 to April 1989 because the sponsors were unable to formalize an agreement with an electric utility company to buy the power generated by the project. This agreement was needed before DOE would permit the project to proceed from the preliminary engineering and analysis phase into the preliminary design and permitting phase, which was to have begun in July 1988.

DOE had modified the project agreement twice to transfer a total of \$800,000 from the project's detailed design phase to its preliminary engineering and analysis phase. The transferred funds were equally divided between DOE and the sponsors. The sponsors have requested DOE's approval to restructure the project by repowering an existing power plant in New York, rather than designing, building, and operating a new power plant in Pennsylvania (as initially planned). They estimated that this

modification would reduce total project costs by about 25 percent (from \$244 million to about \$190 million). DOE expected to receive additional information from the sponsors in April 1989 for evaluating their proposal.

Prototype Commercial Coal/Oil

Coprocessing Project

The final design phase for this project was at least 3 months behind schedule because of the sponsor's slow start and regulatory and economic problems. The project was to produce liquid fuels from coal and oil to sell on the open market to refineries for transportation use. The sponsor was having difficulty obtaining environmental permits for the project site. Also, the estimated costs of distributing the produced fuels had increased significantly, thereby affecting the project's economic viability.

In November 1988, DOE officials had estimated that the project's completion date would slip by about 13 months from December 1994 to January 1996. Since then, for economic reasons, the sponsor proposed finding a utility to host the project and use the produced fuel for generating electricity. DOE requested the sponsor to submit a formal proposal for restructuring the project (with revised project milestone schedules, cost estimates, and third-party agreements) by June 1989. DOE said that it could not establish a revised completion date until it reviews the sponsor's

restructuring proposal. The original estimated project cost was about \$226 million.

EQUIPMENT PROBLEMS

One project was experiencing equipment operating problems, which were preventing the project from achieving its operational goal.

Advanced Cyclone Combustor Project

This project was in the demonstration phase and was experiencing equipment operating problems. DOE had modified the agreement to extend the project's completion date by 3-1/2 months from March to June 1989. According to DOE, problems in feeding coal to the boiler and ash buildup in the combustor have resulted in some modifications to the project's design and prevented the sponsor from achieving the project's demonstration goal of burning one ton of coal per hour.

This project was originally estimated to cost about \$786,000. In the fall of 1987, DOE modified the agreement to transfer about \$38,000 from the project's demonstration phase to its construction phase to cover cost overruns. In February 1989, the sponsor requested additional DOE funding of about \$100,000 to extend the project's demonstration by an additional 6 months beyond June 1989.

This extension would add about \$200,000 to the project's demonstration phase and total cost. DOE was reviewing the sponsor's proposal.

FINANCING PROBLEMS

The sponsor of one project was having problems securing private financing to build and operate the project.

Underground Coal Gasification Project

This project was experiencing financing problems. DOE had amended the agreement four times to extend the design phase completion date by 15-1/2 months from April 1988 to July 1989, and the start of construction was already 1 year behind schedule. The sponsor cannot start the construction phase until it secures adequate private financing to build and operate the project.

Private financing for this project was contingent on the Congress extending a nonconventional fuels production investment tax credit, which was subsequently signed into law in November 1988. However, according to a DOE official, the project's financiers do not believe that the project will be able to produce fuel in time for the sponsor to qualify for the tax credit, which could affect the project's economic viability and the sponsor's ability to repay the financiers. DOE does not plan to revise the

project's estimated completion date until adequate financing is provided.

DOE modified the project's agreement three times to reflect cost increases of about \$43 million (\$1.9 million for design, \$42 million for construction, and \$500,000 less for the demonstration phase). These modifications, which increased the project's estimated total costs from \$70.1 million to about \$113 million, were necessary because the project was redesigned to gasify more coal. The sponsor is required under the agreement to finance all cost overruns, but DOE has transferred about \$500,000 of its funds from the project's construction phase to its design phase.

IMPACT ON COMMERCIAL AVAILABILITY OF
DEMONSTRATION PROJECT TECHNOLOGIES

I would now like to comment on the relationship of the CCT program and acid rain control legislation. The 101st Congress will likely deliberate the need to enact acid rain control legislation requiring reductions in sulfur dioxide and nitrogen oxide emissions levels from coal-fired power plants within prescribed time frames. On February 9, 1989, President Bush told the Congress that he would request full funding for the CCT program and would introduce legislation for a more effective Clean Air Act, which will include a plan to reduce by a specific time the emissions that cause acid rain.

The CCT program can play an important role in reducing emissions from coal-fired power plants. Enactment of acid rain control legislation that prescribes stringent deadlines and/or reduced levels of emissions to control acid rain could affect the program's potential effectiveness by diverting investment from emerging clean coal technologies into available conventional technologies such as scrubbers. On the other hand, enactment of legislation that allows for the development of emerging technologies while also requiring some near term emissions reductions through conventional technologies could encourage commercialization of more efficient, cleaner emerging technologies.

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In summary, seven of the nine funded clean coal technology projects are behind schedule, but DOE does not know yet what the effect will be on the projects' estimated completion dates and costs, or whether this slippage will affect the timing of the commercial availability of the clean coal technologies. It is too early to tell whether the projects' delays will affect the timing of the commercial availability of the clean coal technologies and, therefore, the role these technologies can play within the time frames for emissions reductions of any acid rain control legislation the Congress may enact. However, we believe that a major issue is the effect that potential acid rain control legislation could have on the CCT program.

The Congress will be debating whether acid rain-causing emissions can be reduced in the near term without impeding the development and commercialization of clean coal technologies. Included in this debate will be the proposed legislation the new administration plans to submit to the Congress to revise the Clean Air Act. Accordingly, we believe that the Secretary of Energy should work closely with the Administrator of the Environmental Protection Agency to ensure that the proposed legislation that is submitted for congressional consideration appropriately links compliance dates for emissions reductions with the expected commercial availability of emerging clean coal technologies.

This concludes my prepared statement. We would be pleased to respond to any questions you or Members of the Subcommittee may have.

FUNDED ROUND-ONE CLEAN COAL TECHNOLOGY
DEMONSTRATION PROJECTS, SPONSORS, AND ESTIMATED COSTS

Dollars in millions

<u>Project</u>	<u>Sponsor</u>	<u>Project costs^a</u>	
		<u>DOE</u>	<u>Sponsor</u>
Advanced cyclone combustor	Coal Tech Corp.	\$ 0.4	\$ 0.4
Underground coal gasification	Energy International, Inc.	11.8	58.3
Limestone injection multistage burner	The Babcock and Wilcox Co.	7.6	11.8
Gas reburning/sorbent injection	Energy and Environmental Research Corp.	15.0	15.0
Tidd pressurized fluidized-bed combustor	Ohio Power Co. ^b	60.2	107.3
Advanced coal gasification combined cycle power generation project ^c	The M. W. Kellogg Co. and Bechtel Development Co.	87.5	156.3
Prototype commercial coal/oil coprocessing project	Ohio Ontario Clean Fuels, Inc.	45.0	180.7
Circulating fluidized-bed combustor ^d	Colorado-Ute Electric Association, Inc.	19.9	34.2
Advanced slagging combustor ^d	TRW, Inc.	<u>23.5</u>	<u>25.5</u>
	Total	<u>\$270.9</u>	<u>\$589.5</u>

^aEstimated costs when cooperative agreements were completed.

^bOhio Power Company is a subsidiary of American Electric Power.

^cCalled the Appalachian IGCC demonstration project.

^dReplacement project.

COMPARISON OF THE ORIGINALLY SCHEDULED AND REVISED
COMPLETION DATES FOR FUNDED PROJECTS

	<u>Scheduled completion date at time of agreement</u>	<u>Projected completion date as of March 15, 1989</u>
Advanced cyclone combustor	March 1989	June 1989 ^a
Underground coal gasification	March 1991	Unknown
Limestone injection multistage burner	December 1990	March or April 1991 ^b
Gas reburning/sorbent injection	December 1991	Unknown
Tidd pressurized fluidized- bed combustor	March 1993	October 1993
Advanced coal gasification combined cycle power generation project	October 1993	Unknown
Prototype commercial coal/ oil coprocessing project	December 1994	Unknown ^c
Circulating fluidized- bed combustor ^d	August 1990	August 1990
Advanced slagging combustor ^d	September 1991	September 1991

^aDOE was reviewing the sponsor's request to extend the project to December 1989.

^bDOE estimated that the completion date would slip to March or April 1991, but had not revised the agreement.

^cThe sponsor was preparing a proposal for restructuring this project, which will include revised milestone and completion dates, cost estimates, and third-party agreements.

^dReplacement project.

CHANGES IN PROJECT STATUS
BETWEEN DECEMBER 31, 1988, AND MARCH 15, 1989

ADVANCED CYCLONE COMBUSTOR

The agreement was modified to formally extend the project's completion date to June 1989 because of equipment operating problems. The sponsor has requested an additional 6-month extension to December 31, 1989, which would add \$200,000 to the project's cost. Under the agreement, DOE, at its discretion, could fund up to \$100,000 of the expected cost overrun.

UNDERGROUND COAL GASIFICATION

The project's design completion date was extended (for the fourth time and a total of 15-1/2 months) to July 31, 1989, because the sponsor has been unable to obtain private financing to build and operate the project.

LIMESTONE INJECTION MULTISTAGE BURNER

DOE estimated that the project's completion would slip by 3 to 4 months (to March or April 1991) because the project's demonstration phase began later than expected, but DOE has not modified the agreement to reflect a revised date. In January 1989,

DOE transferred about \$550,000 (including about \$130,000 of its funds) from the construction phase to the design phase. Since then, DOE officials have projected an additional cost overrun of up to \$250,000 for the design and construction phases. The demonstration phase began in March.

GAS REBURNING/SORBENT INJECTION

In March 1989, DOE transferred about \$1.2 million (including \$600,000 of its funds) from the project's demonstration phase to its design phase and extended the design phase by 1 year to October 1989 for the sponsor to satisfy federal environmental requirements, resolve coordination issues with participating utilities, and reevaluate the project's structure. DOE expected to receive a formal proposal from the sponsor in April for restructuring the project to reduce costs.

TIDD PRESSURIZED FLUIDIZED-BED COMBUSTOR

This project was proceeding in accordance with its revised estimated completion date of October 1993. According to DOE, the sponsor has projected a 6 percent (\$10.2 million) cost overrun due to inflation and firmer cost estimates. Under the project's agreement, the sponsor is responsible for all cost overruns.

ADVANCED COAL GASIFICATION COMBINED CYCLE

In February 1989, DOE extended the project's preliminary engineering and analysis phase (for the third time and a total of 9 months) to April 22, 1989, because the sponsors were unable to formalize an agreement with a utility to buy the power that would be generated by the project. DOE had transferred \$800,000 (including \$400,000 of its funds) from the project's detailed design phase to its preliminary engineering and analysis phase in 1988. In order for the project to proceed, the sponsors have proposed relocating and restructuring the project (by using an existing plant rather than building one), which could also reduce costs. DOE has requested additional information for evaluating the sponsors' restructuring proposal.

PROTOTYPE COMMERCIAL COAL/OIL COPROCESSING

In November 1988, DOE officials had estimated that this project's completion could slip by about 13 months to January 1996 because the sponsor was having difficulty obtaining environmental permits. Since then, for economic reasons, the sponsor has proposed restructuring the project and changing the location, marketing strategy for produced fuels, and project participants to control costs. DOE has requested the sponsor to submit a formal restructuring proposal (with revised project milestone schedules,

cost estimates, and third-party agreements) by June 1989. DOE officials said they could not estimate when this project would be completed until they review the proposal.

CIRCULATING FLUIDIZED-BED COMBUSTOR

This project was in the demonstration phase and has had some equipment operating problems that were corrected. According to DOE, the project was proceeding on schedule and within original cost estimates.

ADVANCED SLAGGING COMBUSTOR

This project was in the design stage and proceeding on schedule.