



United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-245575

April 3, 1992



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The Honorable Mike Synar
Chairman, Environment, Energy,
and Natural Resources Subcommittee
Committee on Government Operations
House of Representatives

Dear Mr. Chairman:

As requested in your February 11, 1992, letter, we have reviewed the Department of Energy's (DOE) response to our report entitled Fossil Fuels: Improvements Needed in DOE's Clean Coal Technology Program (GAO/RCED-92-17, Oct. 30, 1991). This letter contains our views on DOE's response.

Our report discusses the status of the Clean Coal Technology Program and points out that 15 of the ongoing funded projects had experienced cost increases, delays, and/or reductions in scope and that 13 other projects had withdrawn from the program. It discusses the reasons for such problems and cites the amount of DOE's investment in withdrawn projects. Our report also points out that DOE selected some projects that are demonstrating technologies that might have been commercialized without federal assistance or might have limited potential for widespread use, and other projects that have proved not to be economically viable. In addition, our report points out that DOE had made several changes in its policy for recouping its investment that make such recoupment less likely and notes that DOE had not established uniform procedures for independently assessing demonstration results.

In general, DOE believes that we have not correctly characterized the status of the Clean Coal Technology Program. DOE also believes that our report does not portray the larger picture of the program's successes, and in its conclusion, DOE lists what it believes are significant successes. After carefully reviewing DOE's response, we believe that we have correctly characterized the program's status. Our report does not focus on the

GAO/RCED-92-143R DOE's Clean Coal Technology Program

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program's achievements to date because it is still relatively early in the program and most results are interim in nature. The first four sections of this letter present our analysis of DOE's major points concerning the information on the program's status contained in chapter 2 of our report.

With respect to our five recommendations aimed at improving the Clean Coal Technology Program, DOE disagrees with one, agrees with or is taking action on two others, and believes its current procedures are sufficient to meet the intent of the remaining two. After reviewing DOE's comments, we continue to believe that all five recommendations are needed. The last five sections of this letter present our analysis of DOE's response to the information, conclusions, and recommendations contained in chapters 3 and 4 of our report.

PROJECTS' COST INCREASES, DELAYS,
AND/OR REDUCTIONS IN SCOPE

In discussing the status of projects, we indicate on page 14 of our report that almost half (15 of 32 projects with cooperative agreements) had exceeded their expected costs, fallen behind their scheduled milestones, and/or scaled back the scope of their demonstration. We discuss the extent to which projects had experienced such problems and the reasons why. DOE indicates in its response that this information needs to be put in the proper perspective. DOE points out that industrial cost-sharing participants have funded 91.5 percent of the cost increases, with DOE funding only 8.5 percent. In a related comment, DOE also states that the summary table on page 14 of our report is misleading because it shows the total cost increase for each project that had an increase without showing how much of the increase DOE is funding. In addition, DOE points out that its share of cost increases represents only about 1 percent of the total value of all projects that have increased in cost and only 0.15 percent of DOE's total funds committed to all projects to date. Finally, DOE indicates that cost growth and schedule changes are normally encountered in such first-of-a-kind demonstration projects and that the Congress recognized this when it authorized DOE to pay a share of cost increases.

Our report clearly states on page 15, immediately following our summary table, that the industrial participants agreed to absorb about \$28.9 million of the \$31.6 million in

projected cost increases for the six projects that experienced overall cost growth. Although our report does not cite the percentage of cost increases borne by DOE and the industrial participants, we believe the numbers presented make clear that the industrial participants covered the vast majority of the increases. Furthermore, our report specifically points out that most of the cost growth occurred in one project in which the industrial participant agreed to pay the entire projected \$26 million increase. For the other five projects with overall cost increases, our report points out that DOE provided about \$2.7 million and the sponsors about \$2.9 million.

Concerning the comparison by DOE between its share of cost increases and its total funds committed for all projects currently in the program, we believe it is important to point out that the program is relatively young. Of the approximately \$1.8 billion in total estimated program costs, only 15 percent had been spent as of December 31, 1991. As we point out on page 15 of our report, DOE officials we interviewed believe that additional cost increases are likely as more projects move into the construction and demonstration phases, which tend to be the most costly phases.

With respect to DOE's last point, we draw no conclusions in the report about whether the cost increases, delays, or reductions in scope are to be expected or are unacceptable. Such a determination would require technical analysis that was beyond the scope of our review. Our objective, as stated on page 11 of our report, was to determine whether projects were experiencing such problems and the reasons why. To provide balance, however, we point out on page 13 of our report that about half of the ongoing funded projects are progressing on schedule and within cost estimates. We also note in our report that DOE has the authority to pay for a share of cost increases, but, as DOE states in its response, it is not obligated to do so.

PROGRESS IN MEETING PERFORMANCE OBJECTIVES

On page 18 of our report, we point out that most projects have not reached the demonstration phase and that it is, therefore, too early to tell whether they will meet their performance objectives. According to DOE, we stated that after about 6 years, only one project had submitted a final report. DOE argues that this level of progress should not

be surprising given that the average duration of clean coal projects to date has been 6-1/2 years from their selection to their completion of operations and submission of a final report.

Our report does not make the statement that DOE attributes to us, nor do we imply that more progress should have been made. In fact, we explain in a heading on page 18 of our report that "It Is Too Early to Determine Whether Most Projects Will Meet Their Performance Objectives." We point out that an assessment of performance will have to await the completion of projects and DOE's review of their reports. We state that as of September 1991, three projects had completed operations, one of these had submitted a final report, and the reports on the other two were being developed. We also state that project managers for the three completed projects said the projects generally accomplished what they set out to do, even though none of them fully completed their testing plans.

In its response, DOE also notes that there are several mechanisms, in addition to final project reports, for disseminating information on technology demonstrations. DOE states that project participants submit quarterly and annual reports, which are publicly available, and that the large majority of participants have taken an active role in technical conferences, presenting papers and status briefings to potential users and vendors of the technologies. Also, DOE publishes news releases, a quarterly newsletter, and an annual update report on the program. We agree that these can be important ways to keep the public and potential users of the technologies aware of the program's activities.

PROJECTS WITHDRAWN
FROM THE PROGRAM

As part of our discussion of projects' status, we include the number of projects that were withdrawn from the program and the reasons why (see pp. 18-20 of our report). DOE states in its response that all of the 13 withdrawals were from the first two rounds of the program (9 from round one and 4 from round two). DOE points out that only 5 of the 13 withdrawals occurred after the cooperative agreements were awarded and that it spent no funds on the other 8 withdrawn projects. DOE also states that lessons have been learned from the early rounds of the program and that few,

if any, withdrawals or terminations are expected in subsequent rounds.

We believe page 18 of our report adequately covers when projects were withdrawn and whether they were funded. We specifically state that all 13 withdrawals involved projects selected in the first two rounds. We also specifically state that 8 of the 13 projects were withdrawn during preaward discussions without completing cooperative agreements and, therefore, were not funded. Furthermore, our report states that the other five projects completed cooperative agreements. We say that four round-one projects were withdrawn in the design phase and a round-two project was withdrawn in the construction phase.

We agree that DOE has made improvements on the basis of the lessons learned from the early rounds and discuss these improvements in our report. For example, on page 27, we recognize that DOE has given more emphasis and weight to the financing for projects in evaluating and ranking round-three and -four proposals and is allowing sponsors and other participants more time after completing the cooperative agreement to better define the project, develop more realistic cost estimates, and obtain firm financial commitments. Also, on page 31 of our report, we discuss how DOE strengthened its procedures for reviewing and approving proposed changes in projects' scope and requests for additional funding to cover cost increases. However, we believe it is too early to predict how many projects will be withdrawn from the program in the future. Our report points out that as of September 1991, only 6 of the 12 round-three projects had progressed into the construction phase, and none was in the demonstration phase. No round-four projects have completed cooperative agreements. DOE has not yet solicited projects for round five.

DOE'S FUNDS SPENT ON
WITHDRAWN PROJECTS

On page 18 of our report, we present the amount of funds that DOE invested in the five funded projects that were withdrawn from the program. Our report also discusses the reasons that DOE continued to fund some of them, even after they were in apparent trouble. DOE emphasizes in its response that the \$21.2 million expended on these five projects represented only about 1 percent of the total funds it has committed to date in the program and that the

industrial participants in these projects spent as much as or more than it did. DOE describes the circumstances leading to the withdrawals and says that it maintained its commitment to these projects while all reasonable avenues for resolving problems were examined and that it negotiated terminations when all viable options were exhausted. DOE adds that it was able to arrange for all appropriate deliverables on these projects--designs, economic analyses, environmental studies, etc.--to be turned over to the government so that the industry, as a whole, would benefit from the lessons learned. DOE also states that for one of these projects, our report does not point out that the withdrawal was due to an Environmental Protection Agency (EPA) decision that could require the participating utility to meet costly environmental requirements, and that DOE received a report on the preliminary engineering studies for the project.

We agree with DOE's point that the amount of federal funds spent on withdrawn projects is small relative to the total federal funds committed to date to the entire program, or, for that matter, to the total funds that DOE originally committed to just the withdrawn projects. However, as stated above, it is still relatively early in the program with respect to expenditures, and any subsequent withdrawals of more mature projects could involve much more substantial funds. In our report, we do not identify or cite all of the reports or analyses that DOE obtained from the withdrawn projects. Identifying and reviewing the usefulness of such information was beyond the scope of our review. To provide balance, however, we do point out on page 30 of our report that for the withdrawn project representing the largest federal investment, DOE received a report on the design phase and that a DOE official believed the report would be useful to a third-round project demonstrating the same technology on a larger scale or to anyone interested in the technology. With respect to the project affected by EPA's decision, we point out on page 19 of our report that the utility that planned to provide an existing plant for the demonstration withdrew because of concern that it might have to meet more stringent environmental regulations if the technology was installed at its plant.

SOME TECHNOLOGIES MIGHT HAVE BEEN
COMMERCIALIZED WITHOUT FEDERAL AID

Our report cites three projects in which the technologies involved either have been demonstrated in other countries, are already commercially available, or have been already demonstrated individually or in some combinations. We conclude in our report that some of the technologies DOE selected may have been commercialized without federal funding. We recommended that DOE include as a factor in project selection decisions an assessment of whether the technology to be demonstrated is likely to be commercialized without federal assistance and avoid selecting technologies that could advance in the marketplace without federal funds. (See pp. 21-23 and 28-29 of our report.)

In its response, DOE says that our conclusion is impossible to either substantiate or refute. DOE also indicates that even if technologies are progressing toward commercialization, a purpose of the Clean Coal Technology Program is to accelerate commercialization and that the commercial application of a technology overseas does not necessarily make it commercially viable in the United States, where the types of coal, boiler designs, operating conditions, and other factors may be different. In addition, DOE points out that the projects we cite were selected before the Clean Air Act Amendments of 1990 were enacted and that while it could be argued that the new regulations might lead to the commercialization of some technologies, it could also be argued that DOE's involvement improved the likelihood that such technologies would be developed in time to help industry respond to the new market need. In responding to our recommendation, DOE contends there is no realistic way to predict whether a technology will be commercialized without federal assistance.

We acknowledge and point out in our report that a purpose of the program is to accelerate the commercialization of technologies. We also point out that DOE officials believed that technologies in use elsewhere needed to be demonstrated using U.S. coal and equipment, and we state that the evidence suggesting the technologies would be commercialized in this country is not conclusive. Our report also acknowledges that further demonstration of such technologies may be warranted. Finally, our report recognizes that the projects we cite were selected before

the new clean air regulatory requirements were enacted, although we also point out that similar requirements were under consideration at the time the selections were made. (See pp. 21-24 of our report.)

What we question is whether funding demonstrations of technologies that are already advancing or likely to advance in the marketplace is necessarily the best use of limited federal funds. We explain in our report that all projects passing minimum eligibility requirements are evaluated and ranked for selection and that the availability of federal funds could be a substantial incentive for sponsors who intend to demonstrate their technology on their own to submit their projects for consideration. We also point out that DOE makes no attempt to assess which technologies are likely to progress without federal assistance. We disagree with DOE that such assessments are unrealistic. We believe that DOE can and should assess the likely extent to which the market, regulatory climate, and other factors will advance a technology without federal funding. While such an assessment may not be precise, it could be an extension of the current weighting of various evaluation criteria and the judgments made about the technical readiness and commercialization potential of a technology, which are a significant part of DOE's process for ranking and selecting projects. At a minimum, we believe such assessments could be useful in distinguishing between closely competing projects.

With respect to two specific steel industry projects we cite as examples of technologies that had been tested overseas, DOE states that one of the technologies had been tested on a smaller scale than in the U.S. project and that the four primary components of the other technology had been tested individually but not in an integrated fashion. Our report presents this information.

With respect to a project we cite as an example of a project demonstrating a combination of technologies that had been tested separately in the United States and are commercially available, DOE states that the entire system has not been adequately tested or offered for sale commercially in the United States. Our report points out that DOE officials said that additional tests are needed to provide long-term operating data and that past demonstrations have provided only short-term data. We also state, however, that the owner of the technologies believes

they have been sufficiently demonstrated and currently offers them for sale in the United States and overseas. This information was provided by an official of the company that owns the technologies.

SOME PROJECTS SHOW LITTLE
PROMISE FOR WIDESPREAD USE

Our report points out that some technologies in the program have limited potential to reduce nationwide emissions of pollutants, may not be widely used because of a limited number of potential users, or are not expected to reduce pollutants by as much as existing technologies. We recommended that before selecting a project, DOE determine that the potential market for the proposed technology is large enough to warrant demonstrating the commercial application of the technology with federal funds. (See pp. 23-25 and 28-29 of our report.)

While DOE agrees that some technologies may have limited potential for reducing nationwide emissions, it indicates that such technologies are important to the potential industries using them to comply with clean air regulatory requirements. DOE disagrees with the examples we cite as having a limited potential market or limited number of users and points out that industry is providing more than 50 percent of the funds for such projects, thus demonstrating its commitment. According to DOE, the marketplace will make the decisions on what technology options are best, and past experience indicates that we are likely to see a broad mix of technologies commercialized to satisfy the needs of a diverse market. DOE states that the goal of our recommendation is being achieved by current procedures.

For one of the examples we cite as having a limited market--the project demonstrating selective catalytic reduction--DOE's response provides additional information indicating that environmental requirements under development may require the use of this technology despite its comparatively high cost over less effective alternatives. After verifying this information, we agree that the technology may have more potential for widespread use than we originally stated. We believe, however, as indicated on page 25 of our report, that potential patent infringement problems related to this technology may still need to be resolved.

We also cite as an example a steel industry project in which the technology to be demonstrated could be used on only 24 blast furnaces in the United States, and only 12 are actually expected to use it. DOE acknowledged in its evaluation of this project that the technology's potential market and potential to reduce nationwide emissions are limited, but states in its response to our report that the Congress encouraged DOE to solicit projects involving nonutility industrial users of coal. DOE added that the 12 largest blast furnaces produce almost half of all the hot metal used in domestic steel production. We believe it is important to note that a primary objective of round three, from which this project was selected, was the nationwide reduction of emissions from the use of coal. At the same time, we agree that legislation governing round three also encouraged DOE to solicit projects involving nonutility industrial users of coal. Consequently, we believe that this is a case in which competing objectives may be at odds with each other and that DOE may have been attempting to strike a balance.

We continue to question, however, whether funding other technologies with limited potential to reduce emissions is the most effective use of limited federal funds. For example, we cite in our report two projects in which DOE's evaluation indicated that the technologies to be demonstrated were expected to reduce sulfur dioxide emissions by 50 percent at the projects' sites. In comparison, conventional scrubber technology can reduce such emissions by 90 percent. DOE argues that the technologies to be demonstrated are lower-cost alternatives that will likely play an important role in meeting clean air regulatory requirements, particularly when used in combination with more effective technologies or with low-sulfur coal. DOE adds that industry's willingness to fund such technologies demonstrates their importance. We acknowledge DOE's argument in our report, but we believe that if such technologies are cost-effective they will likely advance in the marketplace without federal assistance. Also, it is important to note that industry must comply with clean air regulatory requirements with or without federal assistance. Industry's willingness to fund demonstration projects does not necessarily mean they are the best prospects for federal assistance. We continue to believe that DOE should evaluate the potential incremental benefits of investing federal funds in individual projects and select those with the largest potential payoff.

ECONOMIC VIABILITY OF SOME PROJECTS
WAS QUESTIONED WHEN THEY WERE SELECTED

We reported that DOE questioned the economic viability and financing of three projects but selected them anyway. All three projects subsequently experienced financial difficulties and were withdrawn from the program. DOE invested a total of about \$8.7 million in two of the projects and no funds in the third. We recommended that DOE make projects ineligible for selection if their financing or economic viability is in doubt. (See pp. 26-29 of our report.) In its response, DOE says that the three projects we cited were selected early in the program. DOE also says that it recognized the inherent risks, but also the high potential payoff, and that it minimized the federal investment until the financial problems were resolved. DOE points out that since selecting these projects, it has increased the weight given to considerations about financial viability and taken other actions that will make inadequate financing of selected projects much less a problem now than in the early rounds of the program. According to DOE, these actions meet the intent of our recommendation.

As we pointed out earlier, we recognize in our report the specific changes DOE has made to minimize this risk and acknowledge that they are a step in the right direction. However, our report also cautions that projects with financing and economic viability problems could still be selected as long as they are ranked for consideration and score well in other factors that are evaluated. In addition, it is important to note that if an industrial participant experiences financial difficulty and withdraws, DOE cannot unilaterally step in and save the project, even if DOE has invested substantial funds. We continue to believe that projects that are found to have serious concerns about economic viability and financing are poor risks for limited federal resources and should be made ineligible for selection until such issues are resolved.

CHANGES TO RECOUPMENT POLICY MAY
DECREASE RECOVERY OF FEDERAL FUNDS

We reported that DOE's policy is to recoup its investment in clean coal demonstration projects by sharing in revenues from the sale or use of successful technologies. However, to encourage greater participation in the program by industry and, in some cases, to respond to congressional

direction, DOE has made a number of changes in the way the recoupment payment is determined and has delayed the period for repayment. Such changes reduce the likelihood that the federal government will recover its investment. We recommended that DOE analyze the effect such changes have had on industry's participation and, on the basis of the results, reevaluate its recoupment policy. (See pp. 32-34 and 36 of our report.) In responding to our report, DOE says that it accepts this recommendation and that it should reevaluate its recoupment policy to determine whether the policy should be strengthened. It points out, however, that appropriation law specifies the recoupment provisions DOE is to use in round five, the next round for selecting projects.

We recognize that congressional direction requires DOE to keep the recoupment provisions for rounds four and five the same as for round three, but we believe an analysis of the effect of the previous changes in the recoupment provisions on industry's participation in the program, as well as an analysis of the overall likelihood of recovering the federal investment in the program, would provide useful information for determining whether the recoupment provisions should be strengthened for any additional rounds. We note that legislation has been proposed to allow DOE to use funds left over from terminated projects to fund an additional round of projects.

DOE NEEDS TO ENSURE THAT PROJECT REPORTS
ACCURATELY PORTRAY DEMONSTRATION RESULTS

Our report explains how important it is for DOE to ensure that final project reports prepared by the industrial participants provide accurate and sufficient data on the design, construction, and operation of projects so that potential users can make informed decisions on whether to use the technologies. We note in our report that DOE has begun to develop uniform procedures for assessing the adequacy of final project reports and for preparing its own evaluation of each project. We recommended that DOE complete this process. (See pp. 35-36 of our report.)

DOE indicates in its response that it agrees with the need to ensure that project reports accurately portray the results of demonstrations. It says that it is establishing a new concept called a "post-project assessment report," which will discuss DOE's independent assessment of a technology, the success of the demonstration in collecting

the needed data for commercialization, and the costs and environmental benefits (or impacts) that can be expected for the commercial version of the technology. The report will be publicly available. When implemented, this procedure should fulfill the objective of our recommendation.

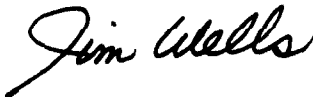
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In the conclusion of its response, DOE implies that our report portrays the Clean Coal Technology Program as falling short of its objectives. DOE argues that rather than falling short of the objectives, the program is achieving significant successes. DOE cites some of the overall benefits that it believes have been achieved under the program and provides examples of the achievements or progress of 10 projects. We did not state or imply that more progress should have been made under the program or with particular demonstration projects. Also, we are not questioning DOE's characterization of program and individual project achievements to date. A review of the program's or projects' achievements was beyond the scope of our work, and given the program's relatively early status, such a review would arguably be premature.

As arranged with your office, we plan no further distribution of this letter until 14 days from its date unless you publicly announce its contents earlier. At that time, we will provide copies to the Secretary of Energy; the Chairmen and Ranking Minority Members of the House Committee on Government Operations, Senate Committee on Governmental Affairs, and House and Senate Committees on Appropriations; the Director, Office of Management and Budget; and other interested parties. We will also make copies available upon request.

Should you need further information, please contact me at (202) 275-1441.

Sincerely yours,



for Victor S. Rezendes
Director, Energy Issues

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