CLEAN COAL TECHNOLOGY

The Clean Coal Technology Program

Lessons Learned

U.S. Department of Energy

Assistant Secretary for Fossil Energy

Office of Clean Coal Technology

July 1994

Contents

Table of Contents

List of Appendices

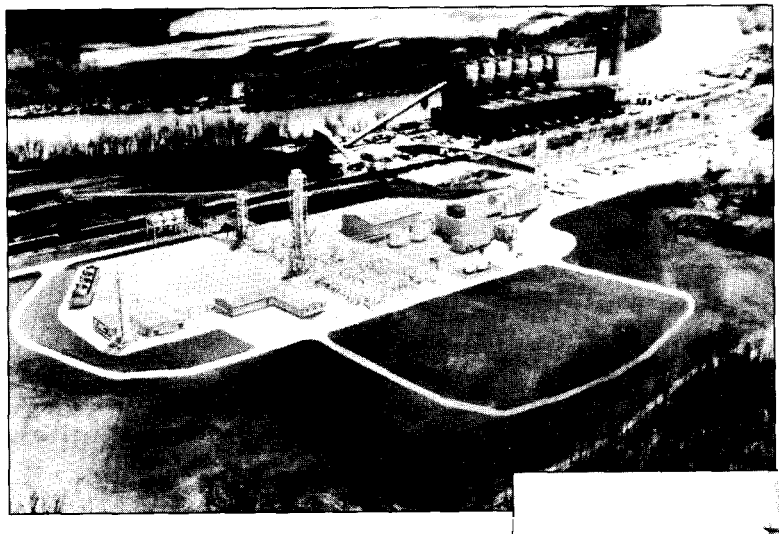
List of Exhibits

Preface

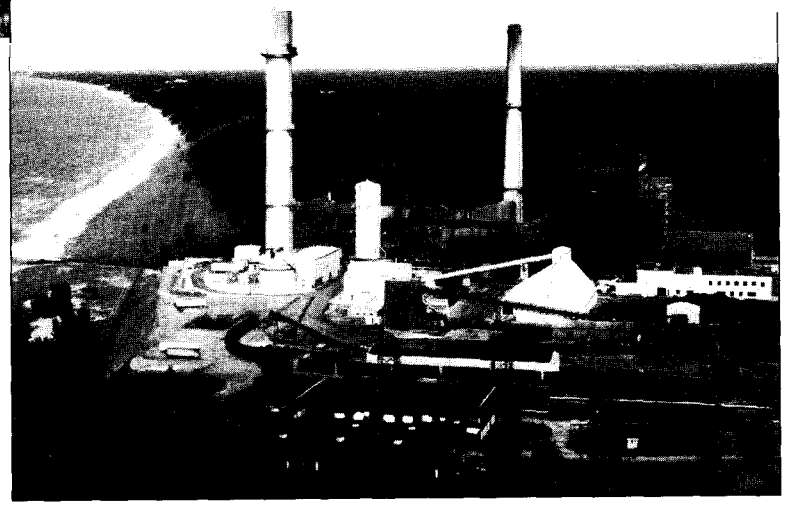
The Clean Coal Technology Demonstration Program is a unique, cost-shared, technology development effort supported jointly by the U.S. Department of Energy and the private sector. In its implementation, many precedent setting actions were taken and a sense of mutual responsibility for the end product was developed. The program's success to date is a tribute to the innovations used by both the public and private sectors to overcome procedural issues, create new managment systems and controls, and move toward accomplishing shared objectives.

The result of these efforts has been the creation of a model program for government/ industry cooperation in technology development. This "lessons learned document represents an effort to share the knowledge acquired over the course of the program through the completion of the five planned solicitations. Its preparation was based on the belief that it is of mutual advantage to the government and private sector to identify those factors thought to contribute to the program's success as well as to point out where pitfalls were encountered and corrective actions taken.

To ensure that the document incorporated the private sector's perspective, project participants (i.e., cooperating organizations other than the federal government) were asked to review and comment on a draft of the report. Responses were received from many of the industrial participants leading demonstration projects funded under the program as well as from participating utilities and state offices. Their comments and additional insights have been incorporated into the body of the report. Further, portions of these responses which address particularly important points have been extracted and used as quotes in the margins of this report.



The Wabash River Coal Gasification Repowering Project in West Terre Haute, IN, will demonstrate utility repowering using a two-stage, oxygen-blown IGCC system. When operational in late 1995, it will be the largest single-train IGCC plant in the United States. This artist's conception shows details of the gasification facility and the gas turbine building with stack.



PureAir **on the Lake, L. P., is demonstrating an advanced wet limestone scrubber process which is treating all flue gee from two boilers (528 MWe total) at Northern Indiana Public Service Company's Bailly Generating Station. Pure Air will continue to own and operate the facility and clean the plant's flue gee under contract to the utility for 17 years after the project is completed.**

Lessons Learned from the CCT Program

Introduction

The Clean Coal Technology (CCT) Program is a unique partnership between the federal government and industry that has as its primary goal the successful introduction of new clean coal utilization technologies into the energy marketplace. With its roots in the acid rain debate of the 1980s, the program is on the verge of meeting its early objective of broadening the range of technological solutions available to eliminate acid rain concerns associated with coal use. Moreover, the program has evolved and has been expanded to address the need for new, high-efficiency power-generating technologies that will allow coal to continue to be a major fuel option well into the 21st century.

Begun in 1985 and expanded in 1987 consistent with the recommendation of the U.S. and Canadian Special Envoys on Acid Rain, the program has been implemented through a series of five nationwide competitive solicitations conducted over a period of 9 years, as shown in Exhibit 1. Each solicitation has been associated with specific government funding and program objectives. After five solicitations, the CCT Program comprises a total of 45 projects located in 21 states with a capital investment value of nearly $7 billion. DOE's share of the total project costs is about $2.37 billion, or approximately 34 percent of the total. The project's industrial participants (i.e., the non-DOE participants) are providing the remainder-nearly $4.60 billion, or approximately 66 percent of the total estimated cost.

Clean coal technologies being demonstrated under the CCT Program are establishing a technology base that will enable the nation to meet more stringent energy and environmental goals. Most of the demonstrations are being conducted at commercial scale, in actual user environments, and under circumstances typical of commercial operations. These features allow the potential of the technologies to be evaluated in their

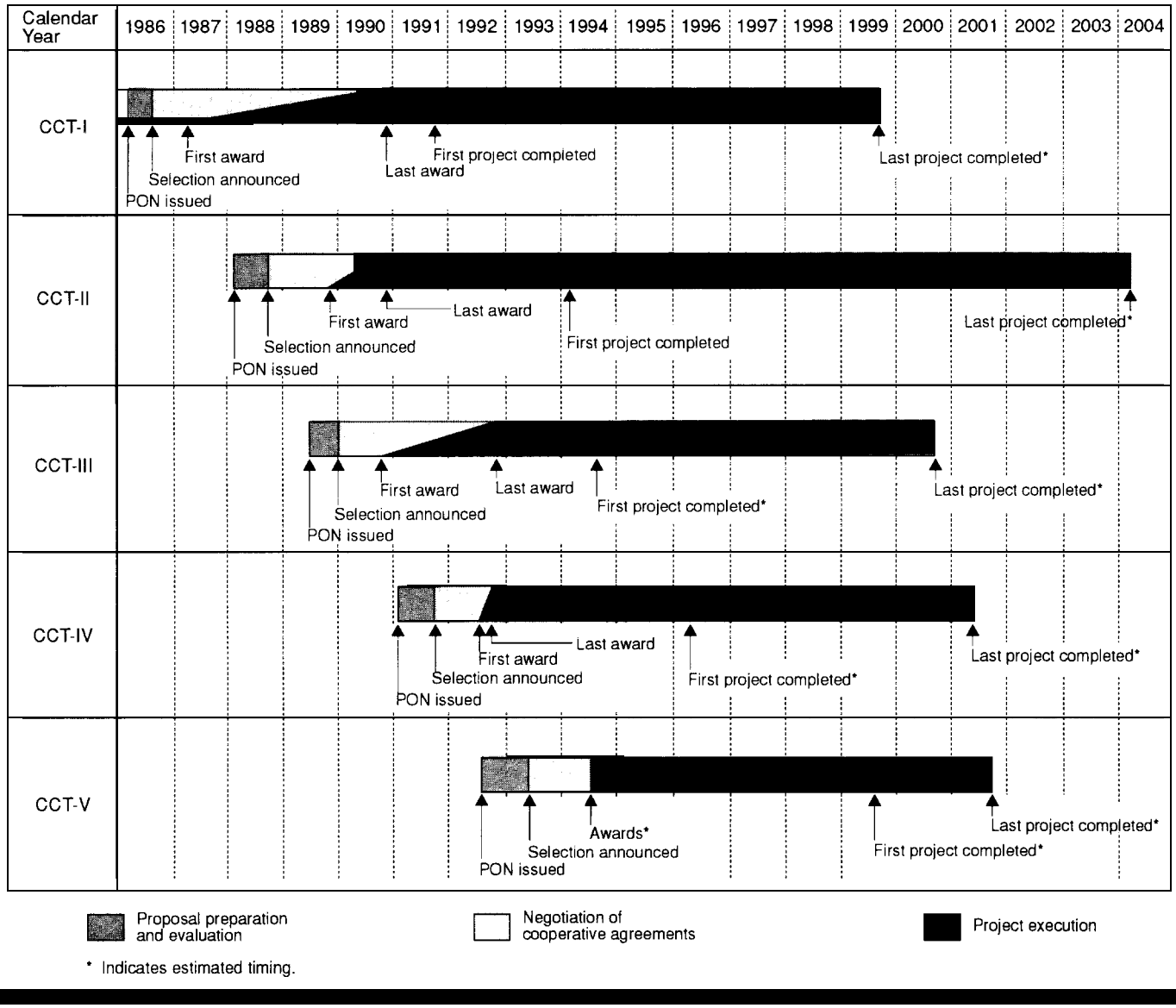
intended commercial applications. Each application addresses one of the following four market sectors:

- Advanced electric power generation
- Environmental control devices
- Coal processing for clean fuels
- Industrial applications

Exhibit 2 shows, for each solicitation, the number of projects in the program which address each of these market sectors. Exhibit 3 indicates the high degree of cost-sharing by industrial participants in projects applicable to the four market sectors.

Given its programmatic success, the CCT Program should serve as a model for other government programs aimed at introducing new technologies into the commercial marketplace. Development of the program's procedures initially

Exhibit 1
CCT Program Schedule



"On very large projects, it is extremely important to industry that the government's financial commitment be stable. There is a strong desire by industry to have up-front financial commitment from the government so as to ensure that the project funding does not become depleted through the yearly federal budgeting process."

—Industrial participant

benefitted from the lessons learned in previous programs, such as the pilot-plant and demonstration projects of the 1970s and the Synthetic Fuels Corporation (SFC). In addition, the program has been able to evolve and accommodate to a changing political and economic environment.

The purpose of this report is fourfold

- Explain the CCT Program as a model for successful joint govemment/industry partnership for selecting and demonstrating technologies that have promise for adaptation to the energy marketplace
- Set forth the process by which the program has been implemented and the changes that have been made to improve that process
- Outline efforts employed to inform potential users and other interested parties about the technologies being developed
- Examine some of the questions which must be considered in determining if the CCT Program model can be applied to other programs

Principles of the CCT Program

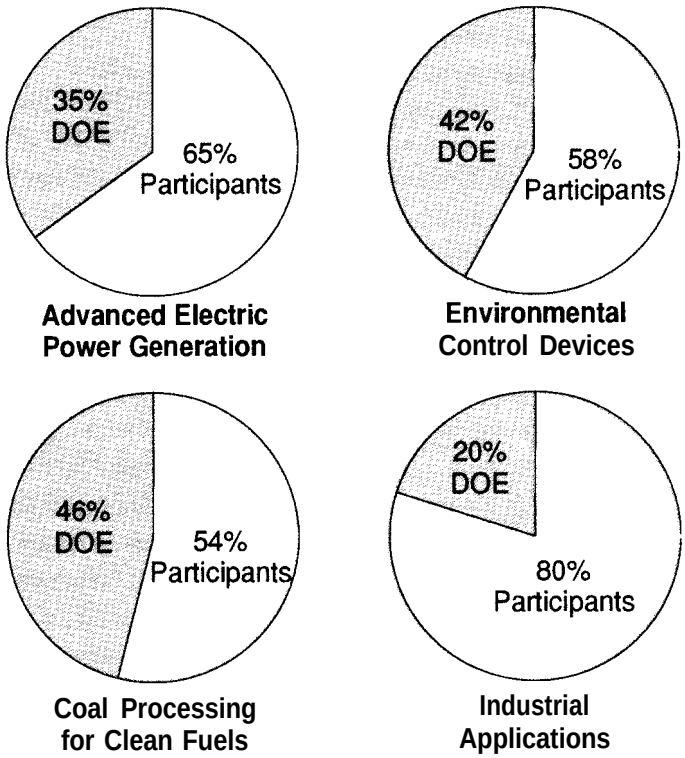
The principles of the CCT Program have evolved from many of the experiences-both positive and negative of the earlier DOE demonstration projects and the SFC. The CCT Program principles are as follows

- *A strong and stable financial commitment for the life of the projects.* Full funding for the government's share of selected projects was appropriated by Congress at the outset of each solicitation. This has alleviated uncertainty associated with the government's yearly budget cycle which plagued the earlier demonstration projects. To date, Congress has made funds available for five solicitations. This up-front commitment has been vital to getting industry's response in terms of the quantity and quality of proposals received and the overall achievement of 66 percent cost-sharing.

Exhibit 2
Number of CCT Projects by Solicitation and Market Sector

Solicitation	Advanced Electric Power Generation	Environmental Control Devices	Coal Processing for Clean Fuels	Industrial Applications	Total[1]
CCT-I	3	2	2	1	8
CCT-II	2	8	0	2	12
CCT-III	3	7	2	1	13
CCT-IV	3	2	1	1	7
CCT-V	4	0	0	1	5
Total	15	19	5	6	45

Exhibit 3
CCT Program Cost-Sharing



- *Multiple solicitations spread over a number of years enable the program to address a broad range of national needs with a portfolio of evolving technologies.* Mowing time between solicitations enabled Congress to set the basic goals of the program to meet changing national needs, provided DOE with the opportunity to adjust program implementation processes based on lessons learned in prior solicitations, and provided industry the opportunity to develop better projects and more confidently propose evolving innovative technologies.

- *Demonstrations are conducted at commercial scale in actual user environments.* At this scale, the *performance* potential of technologies can be judged meaningfully in their intended commercial application. Typically, the clean coal technology is constructed as a commercial facility or may be installed at an existing facility and subjected to the conditions typical of commercial operation.

- *The technical agenda is determined by industry, not government.* DOE opted to use financial assistance as the procurement vehicle for the CCT Program. This allowed DOE to solicit proposals within broad programmatic areas. Industry defined the specific projects, not the government. DOE selected the projects based on those that best met the evaluation criteria.

o *The cooperative agreement is the instrument used to administer the financial assistance. The cooperative* agreement mechanism was selected in lieu of the grant because it allowed the degree of government involvement necessary in a program with the scope and magnitude of the CCT Program.

. *The respective roles of government and industry are clearly defined in the CCT Program. The* industrial participant is responsible for managing the project while the government oversees the project through aggressive monitoring. The government plays a major role in developing the solicitation and in negotiating and structuring the cooperative agreements. Subsequent to the signing of the agreement, industry clearly has the responsibility for technical management of the project. Continued government support is assured as long as the project continues in accordance with the terms of the initial cooperative agreement. The agreement identifies key decision points in the project at which mutually agreed-upon progress and performance goals are expected to be met.

. *Cost-sharing is required through all project phases. The* criteria on allowable and unallowable costs were clearly set forth in the solicitation document. These criteria established that the required minimum 50 percent cost-shine must be tangible and directly related to the demonstration project, with no credit given for prior work. The cost-sharing requirement has been applied to costs "as incurred' during each phase of activity, rather than to the end cost. Given the degree of risk associated with a demonstration effort, 50 percent cost-sharing has enabled industrial participants to obtain financing without compromising the private sector's normal investment-screening processes. Requiring cost-sharing throughout the project also has ensured industry's commitment to fulfilling project objectives.

· *Allowance for cost growth provides an important check-and-balance feature to the program.* Statutory provisions allow for additional financial assistance beyond the original agreement in an amount up to 25 percent of DOE's original contribution. Such financial assistance, if provided, must be cost-shared by the industrial participant at no less than the cost-share ratio of the original cooperative agreement. This statutory provision recognizes the risk involved in first-of-a-kind demonstrations by allowing for cost growth. At the same time, it recognizes the need for the industrial participant's commitment to share cost growth and limits the government's exposure.

· *Real property rights are retained by industry* Title to all real property rights vest with the industrial participant. Because of the level of cost-sharing, the industrial participant can also retain the intellectual property rights.

· *Technology developed is made available on a nondiscriminatory basis to all U.S. companies that seek, under reasonable terms and conditions, to use the technology.* While a technology owner is not forced to divulge its know-how to a competitor, the technology cannot be withheld from a potential domestic user. If a technology owner does not comply with these conditions, the government reserves the right to intervene and ensure that the U.S. market demand for the technology is met.

- *A financial obligation to repay the government funds is required of the successful industrial participant. The* repayment obligation occurs only upon the successful commercialization of the technology. It is limited to the government's cost-share and can be paid over a 20-year period following the end of the demonstration.
- *Environmental standards are imposed at both the program and project levels.* In addition to federal, state, and local permitting processes, two mechanisms are used to address the environmental aspects of the projects-compliance with the National Environmental Policy Act (NEPA) and development and implementation of environmental monitoring plans (EMPs). NEPA assures that the potential environmental consequences of a proposed federal action are considered before major funding is committed to a project. EMPs complement the NEPA process by validating NEPA assessments, applying monitoring when questions arise, and evaluating mitigation measures.

Building on Past Lessons

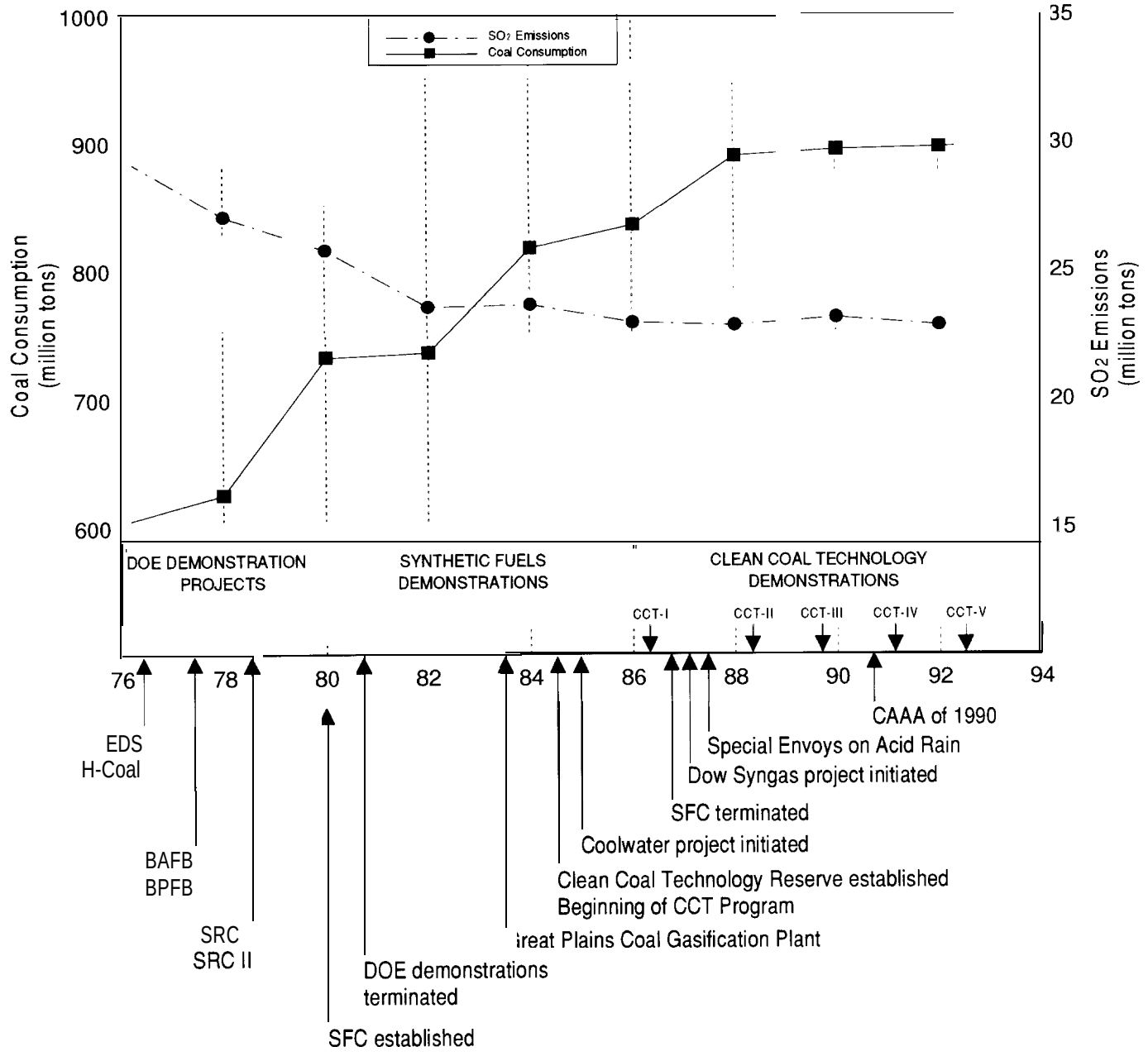
Nearly 20 years have passed since DOE started a series of demonstration projects in the 1970s which evolved through the SFC in the first half of the 1980s to the CCT Program solicitations which were completed in 1994. During that period, coal use in the United States increased from about 600 million to over 900 million tons per year. The period saw a reduction of SO_z emissions from nearly 30 million tons per year in 1976 to approximately 23 million tons per year in 1993. This history is shown in Exhibit 4. Coal use is expected to increase to nearly 1.1 billion tons per year in 2010, while the Clean Air Act Amendments (CAAA) of 1990 establishes an $S0_2$ emissions cap of only about 16 million tons per year.

Many of the features or principles being implemented in the CCT Program are the result of identifying and eliminating the obstacles or barriers to success encountered in the earlier programs. Similarly, other features of the CCT Program are updated derivations or successful features of the earlier efforts.

The following are some of the major barriers encountered by earlier programs which the CCT Program has had to overcome

- In general, the procurement mechanism used by earlier programs was a contract (as opposed to the cooperative agreement used in the CCT Program). Congtracts required, among other things, compliance with rigid acquisition regulations, a strong government role in project management and decision making, and retention of intellectual property rights by the government. This lack of flexibility stifled or delayed attainment of project objectives.
- Project funding was subject to the uncertainties of the government's yearly budget and appropriation cycle; that is, the government's contribution had to be voted yearly, in what proved to be relatively small increments, and could be eliminated at any time. This uncertainty of future funding made it quite difficult to obtain meaningful commitment and cost-sharing from industry.
- Cost-sharing was negotiated into the contracts. However, the level of cost-

Exhibit 4
Coal and Synthetic Fuels Demonstration History



▲ - Indicates start of project

▼ - Indicates issuance of PON

DOE Demonstration Projects:

BAFB - Bubbling Atmospheric Fluidized-bed Pilot/Demonstration
BPFB - Bubbling Pressurized Fluidized-bed Pilot
EDS - Exxon Donor Solvent Pilot
H-Coal - Liquefaction Pilot/Demonstration
SRC I, II - Solvent Refined Coal Pilot/Demonstration

sharing was relatively low when compared to the CCT Program and the terms for allowances and credits proved to be too flexible.

The following are some of the successful features of earlier programs which the CCT Program has sought to incorporate:

- An early success in government/ industry cooperation was realized in the Exxon Donor Solvent Liquefaction Project. This pilot-plant project was funded under a 50/50 cost-shared cooperative agreement. Exxon retained intellectual property rights and was responsible for day-to-day project management. The government was an equity partner, sharing in revenues and exercising its management authority through several management committees.
- The Synthetic Fuels Corporation, established under the Energy Security Act (Public Law 96-294, enacted June 30, 1980), was to provide financial assistance to the private sector for development and demonstration of synthetic fuels technologies, with industry maintaining ownership of the technology. Although the SFC had a variety of financial incentives available to stimulate the construction and operation of new facilities by industry, only loan and price guarantees were used.
- Building upon DOE's experience in the Great Plains Coal Gasification Project, the SFC implemented the environmental monitoring plan (EMP) originally required by the Energy Security Act. The EMP was a comprehensive document dealing with both regulated emissions and those not regulated but having potentially adverse impacts on health or the environment.

Synthetic Fuels Corporation

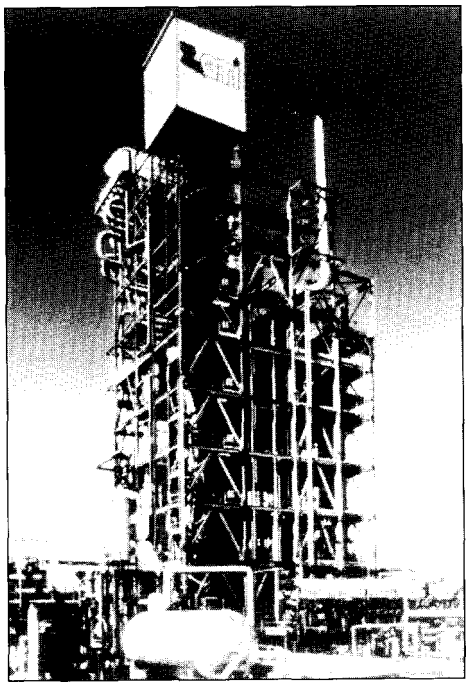
The U.S. Synthetic Fuels Corporation (SFC), a government corporation, was created by Congress under the Energy Securityi Act of 1980 to reduce the U.S. vulnerability to disruptions of crude oil imports. This was to be accomplished by encouraging the private sector to build and operate synthetic fuels production facilities that would utilize abundant domestic energy resources, primarily coal and oil shale. The strategy was for SFC to be primarily a financier of pioneer commercial-and near-commercial-scale facilities. A number of financial incentives were available to the SFC but the only ones used were loan and price guarantees.

Originally the goal of the SFC was to achieve production capacities of 500,000 barrels per day by 1987 and 2 million barrels per day by 1992. The cost of this capacity was estimated to be approximately $88 billion. But by 1985 the energy outlook had changed dramatically and much had been learned about synthetic fuels technology and economics. With the decline in oil prices, stabilization of world oil supply, and the short-term supply buffer afforded by the Strategic Petroleum Reserve (SPR), the need for production capacity gave way to the need to improve the economics of synthetic fuels production and to improve the environmental and operational performance of the technologies. As a result, a few pioneer projects went forward; these contributed to the experience base for solving problems which inevitably arise when using innovative technology. Two projects provided valuable data and experience for the future Clean Coal Technology Program-the Coolwater and the Dow syngas projects.

Coolwater was a 100-MWe generating station using the Texaco coal gasification process and Ute General Electric combined-cycle unit. Commercial operation began in June 1984 and continued through January 1989. The SFC provided a price guarantee of $120 million to the project. The project verified low SO_2, NO_x and particulate emissions; feedstock flexibility and economic and technical feasibility of gasification combined-cycle. The Tampa Electric integrated gasification combined-cycle project in the CCT Program builds upon the Coolwater experience.

The Dow Syngas Coal Gasification Project was a 2,200-ton-per-day, 161-MWe plant using low-rank highly reactive coal. The SFC provided $620 million in price guarantees to the project. The project started operation in April 1987. In 1989, Dow formed Destec Energy, Inc., to operate the plant. Destec continues to operate the plant to support technology enhancements that are to be demonstrated in the CCT Program's Wabash River Coal Gasification Repowering Project.

In 1985, Congress observed the retreat of private-sector plans for the production of synthetic fuels for a number reasons, including lower than anticipated costs of petroleum fuels, high cost of technology, and difficulty in raising capital during periods of high interest rates. Public Law 99-190, Department of Ute Interior and Related Agencies Appropriations Act for Fiscal Year 1986, abolished the SFC and transferred project management to the Treasury Department. Public Law 98-473, Joint Resolution Making Continuing Appropriations for Fiscal Year 1985 and Other Purposes, provided $750 million from the Energy Security Reserve to be deposited in a separate account in the U.S. Treasury entitled The Clean Coal Technology Reserve.



Des ec 60 MW eq as
es ed em LA
as ed es
Wa as as
ep

Experience has shown the EMP to be an extremely effective means of documenting environmental performance.

Public Involvement

From the onset of the CCT Program, communication with and participation by the public have been major sources of information used in setting direction, determining content, establishing objectives, resolving issues, and establishing priorities. This dialogue, pursued on a continuing basis through a wide range of activities, has had three major compnents:

- Inviting statements of interest prior to formal solicitation
- Presolicitation public meetings and workshops
- Support from interested organizations and advisory groups

Prior to the release of the first and second solicitations, the level of public interest in a demonstration program was established by means of special informational solicitations. In response to Section 321 of the Joint Resolution Making Continuing Appropriations for Fiscal Year 1985 and Other Purposes (Public Law 98-473), the private sector was solicited for statements of interest in and proposals for projects employing emerging clean coal technologies. The submissions were analyzed and a report was prepared for Congress that assessed the potential usefulness of each emerging clean coal technology and identified the extent to which federal incentives, including financial assistance, would accelerate the commercial availability of these technologies.

A total of 175 responses, with project values totaling over $8 billion, were received, these responses identified 12 major types of advanced technologies as being representative of industry's interests. This first informational solicitation proved to be a valuable means of learning what coal-related industries perceived to be needed in a clean coal technology demonstration program. In addition, the solicitation provided a source of interesting ideas that were of value in planning DOE's coal research and development program.

Following the first informational solicitation and the associated program opportunity notice (PON) soliciting CCT-I demonstration projects for cost-sharing, Congress directed DOE to determine the level of public interest in a second opportunity to propose projects for government cofunding. In response to the Department of the Interior and Related Agencies Appropriations Act for Fiscal Year 1987 (Public Law 99-500), DOE solicited statements of interest in and informational proposals for projects employing emerging clean coal technologies capable of retrofitting, repowering, or modernizing existing facilities. In addition, these projects were required to meet the cost-sharing criteria established in Public Law 99-190 which limited DOE's funding to not more than 50 percent of the total cost of the project and required cost-sharing by industrial participants in each of the design, construction, and operating phases of the proposed project.

In response to this second informational solicitation, 139 responses were received, describing projects with a total estimated value in excess of $5 billion. Once again, the strong public response confirmed the willingness of the private sector (e.g., utilities, manufacturers, vendors, and coal producers) to participate in a cost-shared effort to develop technologies that they believed held potential as a commercial

product. The results of the solicitation were seen as strong support of a second request for clean coal technology demonstration projects, and the second PON (CCT-II) was released, projects selected, and a new series of development efforts initiated.

In addition to informational solicitations, public meetings and workshops proved to be effective avenues for public involvement. Prior to the preparation of each PON for the CCT Program, DOE held public meetings to elicit views, comments, and recommendations on any and all aspects of each impending solicitation to balance the proposers' needs with CCT Program goals and objectives.

For each solicitation, there were a number of specific issues and concerns about which DOE was particularly interested in receiving public comments. In addition, the public was afforded the opportunity to introduce new or different topics for discussion. Moreover, small discussion groups were formed at the meetings to provide the maximum opportunity for the expression of opinions and exchange of ideas. To date, a total of 11 public meetings have been held throughout the United States, each in a different major city.

Public meetings, which have focused on specific and, in most cases, geographically dominated issues, have been successful in solving specific problems. These meetings also served to establish a sense of cooperation and partnership in which the public- and private-sector participants jointly addressed problems and seek mutually satisfactory solutions.

The public meetings have provided the opportunity for communication, expression of opinions, and joint participation in setting the program objectives and requirements---and, in doing so, have created mutual ownership of the program.

The active participation of several key organizations and their memberships have provided access to the wide-ranging opinions, needs, goals, and objectives of coal producers and consumers, equipment vendors, electric utilities, independent power producers, heavy industry, and others. Close contact with groups such as the Innovative Control Technology Advisory Panel, National Coal Council, National Coal Association, and the Clean Coal Coalition has enabled the CCT Program to benefit from recommendations, proposed changes, views on programmatic content, and suggested redirection of effort. The exchange of ideas, the results of studies performed, and the continuing dialogue with these groups has created programmatic flexibility and the ability to make the program responsive to the representatives of the user sector-the group that will commercialize the technologies being developed.

Solicitation Development

The success of the CCT Program to date is attributable, in part, to lessons learned from prior experiences and early involvement of the private sector in shaping the program. Equally important, DOE has been able to learn from its own experiences during the program's implementation and has been able to make improvements. An extremely important feature of the CCT Program is that it has been implemented in a series of procurement actions, spread over a number of years. Allowing time between solicitations has made it possible to meet changing national needs, to make adjustments in program implementation, and to allow time for the private sector to

"The fact that the CCT Program was spread over a number of years also was important to industry because it allowed the new, evolving technologies the opportunity to participate in the later rounds. "

-Industrial Participant

develop projects. At the end of each solicitation, Congress has been willing to provide flexibility, as needed, to smooth operations. And internally, DOE has used the time between solicitations to adjust its documentation and procedures to better achieve program goals.

The program opportunity notice, or PON, has been one of the primary mechanisms used to capture and embody lessons learned from each prior solicitation. Each PON has incorporated a model cooperative agreement that clarifies what is expected of proposers by incorporating relevant government regulations and provisions. Most companies submitting proposals have had little experience working with government in cooperative programs. The model cooperative agreement has helped such companies understand what the program involves. Without such a model, negotiations would have been prolonged, and small businesses and others unfamiliar with government procurement would have been at a disadvantage. An important element of the model cooperative agreement has been the ability to include changes that reflect the resolution of issues encountered in negotiating previous agreements.

Solicitation development has involved the following key features:

- After each solicitation, those responsible for its development, along with those who evaluated proposals and negotiated agreements, have contributed lessons learned for inclusion in a document subsequently used by the next solicitation development team. This document also has provided a basis for identifying changes requiring congressional action.
- Congress has initiated each solicitation by including both funding and programmatic and procedural guidance in an appropriations act.
- The DOE Program office has established a PON Drafting Committee made up of program personnel from DOE headquarters and each energy technology center (ETC) as well as representatives from DOE's legal and procurement directorates.
- The PON Drafting Committee has prepared a set of issue papers, including a series of options to be posed to the public for comment. Two to three regional public meetings were subsequently convened to solicit public input.
- The PON Drafting Committee has formed the core of a Source Evaluation Board which actually drafts the PON. Public comments have been formally solicited on the draft PON before being issued in final form.

CCT-V Solicitation-Chronology of Events

The following events were involved in the CCT-V solicitation:

Public Meeting-Cheyenne, Wyoming	October 30,1991
Public Meeting-Louisville, Kentucky	November 12,1991
Public Law 102-154 enacted	November 13,1991
Designation of PON Drafting Committee	November 20,1991
Source Selection Official designated	January 22,1992
Federal Register notice for draft PON published	April 6,1992
Commerce Business Daily notice for draft PON published	April 6,1992
Draft PON issued for public comment	April 20,1992
End of public comment period	May 15,1992
Final PON issued	July *6,1992*
Preproposal conference	August 6,1992
Preproposal conference proceedings issued	August 14,1992
Source Evaluation Board established	August 28,1992
Additional questions and answers issued	November 16,1992
Closing date for receipt of proposals	December 7,1992
Issuance of public abstracts	December 8,1992
Selection of proposals	May 6,1993

Fundamental changes have been made in each PON and its attendant model cooperative agreement. These changes, which are outlined in the following sections, have been aimed at significantly enhancing the program's effectiveness.

Evaluation Criteria

A factor critical to the program's success has been its ability to put forth clear, succinct criteria against which proposals are evaluated. Potential proposers want to be able to ascertain whether or not it is worthwhile to propose and, if so, how to structure a fully responsive proposal. Preparation of a demonstration project proposal requires a major investment of resources. Therefore, industry wants to have a clear understanding of what is required to have a chance of winning.

Early clean coal technology solicitations adopted the traditional comparative and descriptive method of indicating the relative importance of criteria (e.g., criterion A is twice as important as criterion B). The push for clarity, however, eventually prompted a change to quantitative criteria. Each technical criterion was assigned a percentage weight so that all criteria together totaled 100 percent.

The greatest change in the focus of the criteria, however, has been in the weight assigned to financing. Financial factors accounted for less than 5 percent of the overall proposal scorn in the first solicitation and were increased to roughly 10 percent in the second PON. Continued problems with projects being withdrawn due to inadequate financial commitment led to an increase in the weight of the financial factor to 25 percent. Incorporated in the measure of the strength of the financing was the degree of the industrial participant's commitment to the project, as evidenced by the amount invested in the project by those standing to gain from commercializing the technology. Since increasing the importance of financing, the number of premature project terminations has fallen markedly.

The reasonableness of the cost estimate set forth in the proposal was considered only as a tie breaker in the first four solicitations. However, this factor became an evaluation criterion in the fifth PON. This change was made in recognition of the link between sound cost estimates and stable financing as well as to reduce the potential for cost growth (which has occurred with some frequency in earlier projects).

Financing of Projects

A key contributor to delays in negotiation of projects selected in the first solicitation was the requirement that firm financing for the entire project must be provided up front as a condition for entering into the cooperative agreement. This proved to be burdensome for most projects, given their stage of development at the time they were proposed. A significant effort is required before a project can be defined well enough to attract construction and operation funding from a financial institution. It proved to be infeasible to expect this level of project definition at the time of proposal submission- or even during the preaward period for large projects.

Subsequent solicitations addressed the matter by requiring the participant to demonstrate that firm financing is available for the first budget period and to have a definitive plan for financing the balance of the project. The first budget period has been used to define the project, and obtain firm financing for the balance of the project. By the third solicitation, this approach became explicit with the specification of a formal project definition phase that has specific activities and

expectations. With this approach, both parties (i.e., DOE and the industrial participant) are protected by making sure that sufficient information is in place before committing to major financial exposure. A key condition for proceeding to the next budget period is that the participant must have secured financing for the balance of the project.

Preaward Cost-Sharing

Preaward activities include clarifying issues in the proposal validating and further refining the statement of work, cost, and schedule; defining business arrangements; and negotiating the cooperative agreement. Also, in many cases, the gathering of environmental data begins during the preaward period to ensure that the NEPA process is satisfied without delaying project schedules.

In the first solicitation, lengthy delays in negotiation were encountered for many reasons, including the need to resolve issues pertaining to financial commitments, intellectual property, repayment, and indemnification. To alleviate some negotiations problems, subsequent solicitations have allowed government cost-sharing in some of the activities that occur between selection and award. Allowable costs are shared in the same ratio as the cost-sharing for the entire project and are reimbursed only upon DOE's signing of the cooperative agreement. Preaward cost-sharing is allowable for the following:

- Costs incurred in the preparation of material requested by DOE for the negotiation of the cooperative agreement
- Costs incurred to acquire and deliver the environmental information generated by the proposer for use in the site-specific NEPA process

More importantly, subsequent PONs have included a section which addresses the postelection, preaward process and delineates what is expected of the industrial participant.

Intellectual Property

An important negotiations objective has been to strike a balance between the need to protect the public interest and the need to protect a participant's intellectual property and, thus, its competitive position.

The approach taken in the CCT Program has been, first, to define a technology envelope (i.e., the section of the plant processing equipment and/or technology embodied by the demonstration project). The next step has been to obtain a commitment from the industrial participant to commercialize the technology to be demonstrated in the envelope. The description of this process, contained in the "rights in technical data" clause, was developed during negotiations of projects selected in the first solicitation. Among other things, this clause requires the industrial participant to commit to active] y commercializing the technology and/or licensing the technology under reasonable terms and conditions. To accomplish this objective, language specific to the technology is crafted to ensure that the commitment extends to upgraded versions as the technology is refined in the commercialization process and placed in a variety of applications.

The elements of the technology to be treated as confidential are then negotiated along with the treatment of data resulting from the demonstration, the free dissemination of which could compromise the technology owner's proprietary position. It was the negotiation of the boundaries of the sensitive demonstration data (i.e., data relating to equivalent within the technology envelope) that

represented a particular challenge through the third solicitation. Protection of sensitive data, even under financial assistance instruments, was new ground. In fact, the only way the government could protect these data was not to take possession. Before the fourth solicitation, legislation requested by the program was enacted, which allowed certain sensitive data to be protected for up to 5 years after the end of the demonstmtion operating period.

The program has been well served by defining a technology envelope which incorporates the innovative elements of the project while limiting the project elements subject to repayment.

Repayment

The repayment provisions of the first solicitation tapped the demonstration project's revenue stream. However, the loss of this revenue made it difficult for the private sector to finance projects, especially large ones. Investors did not favor projects when a percentage of the revenues went to the government before the investor could achieve an adequate rate of return. In retrospect, taxing the technology too early placed it at a competitive disadvantage and was counter to the program's commercialization goals.

In the second solicitation, repayment was limited to revenues realized from the future commercialization of the demonstrated technology. The government was to share 2 percent of gross equipment sales and 3 percent of royalties realized through the use of the technology subsequent to the completion of the demonstration project. While this approach was considered more representative of business practices, it became clear that 2 percent of gross equipment sales was overly restrictive. Again, negotiations were delayed as financially equivalent alternative repayment plans were developed. (Consideration of alternative recoupment plans was allowed.)

The repayment provisions in the third solicitation were adjusted to be 1/2 percent of equipment sales and 5 percent of royalties. Grace periods of limited length were authorized on a project-by-project basis. In addition, the participant was allowed to seek a waiver from the Secretary of Energy on repayment if the participant believed that repayment would result in competitive disadvantage in either the domestic or international marketplace. In contrast, demonstration project revenues, considered a repayment source in the first solicitation, were allowed as a source of project financing in the third through fifth solicitations.

Also, beginning with the third solicitation, the repayment agreement was separated from the basic cooperative agreement. Repayment provisions engage after the demonstration is over and last for 20 years. It was deemed imprudent and administratively expensive to hold the basic cooperative agreement open for that length of time.

Following the third solicitation, Congress settled the outstanding issues on repayment by directing that the repayment provisions set forth in the third solicitation must be used in subsequent PONs.

The experience of the CCT Program has shown that in determining the appropriate approach to repayment, consideration must be given to the stage of technology development and the government's role at that stage. At the demonstration stage, there is still a significant amount of risk, and a major effort remains to be performed before commercialization can be achieved. The appropriate government role at this stage is much the same as that of an industry partner-sharing risk in the demonstration exercising restraint during

"Industry must be able to retain real and intellctual property rights for at least five years beyond the completion of any demonstration period. If this is not the case, then there is less incentive by industry to move forward with any demonstration phase."

—Industrial participant

initial market penetration to keep the technology competitive, and sharing profits as commercial success is achieved.

In the Energy Policy Act of 1992, Section 1301 directs DOE tore-examine repayment and provide suggested approaches. The results of the study performed in response to that directive is contained in Appendix A.

Indemnification

A difficult aspect of the negotiations for the first solicitation was the participant's (or parent organization's) acceptance of the indemnification provisions in the PON. Two improvements have been made in this area. First, the CCT Program does not expect the participant to indemnify the government for its own actions. Second, the PON includes notification that if DOE determines that the participant does not have adequate resources to execute the cooperative agreement, then performance warranties would be sought from the parent organization. This has occurred when the participant has been a joint venture or partnership. If the participant does not have the financial assets to indemnify the government, insurance has to be obtained.

Other Changes and Refinements

Several other changes and refinements that have been made to the CCT Program are listed below:

- Over time, all key provisions, including financial assistance conditions referenced in 10 CFR 600, have been brought forward into the "schedule of articles" because this section receives more attention by proposers. Doing so has helped in communicating the government's position and expectations.
- The withdrawal provisions have evolved from a situation where either party had the right to unilaterally withdraw at the end of a phase or budget period to simply deferring to the decision-making process embodied in the continuation application. Under current provisions, the government does not have a right to withdraw if the participant has performed as agreed in the prior phase or budget period. The mechanism for the participant to withdraw is simply not to submit a continuation application (see section on the postaward process). Participants also have the right to withdraw due to acts of God or the government.
- The requirement for phases (design, construction, and operation) to correspond to budget periods was dropped after the second solicitation in favor of controlling the cooperative agreements solely by budget periods that reflect the participant's decision-making process.
- The amount of technical and cost information required in proposals to address the expected commercial embodiment of the demonstration has been reduced. This was done in recognition that the industrial participant could not reasonably be expected to see beyond the conceptual stage at the time of proposal. Pushing for data that lacked a sound foundation added to proposal preparation time and cost without benefiting the reviewer.
- Although not a part of the solicitation, a Secretarial directive issued in December 1989 requiring negotiations to be completed within 1 year of selection (see section on preaward process) has had a positive impact on the participant's interest and participation in the PON development process as well as on overall program effectiveness.

"[Significant improvements have been made in [the idemnification] provisions. However it must be stressed that participants still have concerns. . . particularly in the area of environmental indemnifactions. In our opinion, most future demonstrations of power-related clean coal projects will be performed by partnerships (not by large corporations like electric utilities) which will seek bank financing for a large percentage of the non-government funding. These partnerships will structure the financing such that the project assets, not the parent company balance sheets, are pledged to the lenders. Therefore, the partnership will also resist the idea of making parent company guarantees to to government. The government needs to realize this fundamental shift in the way current day projects will likely be structured and find ways to accomodate that."

—Independent power producer

. The mechanism of multiple solicitations spread out over a number of years has proved to be entirely appropriate for the program. The use of multiple solicitations has allowed for a learning process and incorporation of lessons learned into the next solicitation so that the program has been continually improved. If a single solicitation or a long-running solicitation had been used instead, fairness considerations would not have allowed the process to be modified. Sequential solicitations also allowed for modifying objectives to meet the nation's changing needs.

Evaluation and Selection

The prime consideration in evaluating and selecting projects has been to determine those proposals that offered the greatest likelihood of successfully demonstrating and, subsequently, commercializing clean coal technologies. The Source Selection Official (SS0) selects the proposals for negotiation taking into account the evaluation criteria, relevant program policy factors, and other considerations as described in the PON. The SS0 is supported by a Source Evaluation Board (SEB) made up of a mix of CCT Program personnel from DOE's energy technology centers (ETCS) and headquarter; environmental, safety, and health organization; prcurement directorate; and legal counsel (not a voting member).

Evaluation teams support the SEB and are organized to address technical, commercialization, environmental, and cost and finance issues. Evaluation team personnel (numbering anywhere from 80 to 100 people) are drawn from government organizations. The bulk of technical personnel are CCT Program staff at the ETCs and headquarters. At times personnel also are drawn from federal agencies other than DOE, such as the U.S. Environmental Protection Agency and the U.S. Rural Electrification Administration. Additionally, there is limited use of personnel from DOE's national laboratories in addressing environmental issues.

The technical teams are formed according to technology (e.g., gasification, fluidized-bed combustion; coal beneficiation, $S0_2$ control, and NO_x control). The structure of the teams has depended on the specific PON and the type and quantity of proposals submitted.

The SEB and attendant technical teams perform their assignments in a secured area and do so on a full-time, dedicated basis until the task is completed. Information is kept within the confines of the secured area and criminal penalties are associated with the unauthorized use of this information.

The time allotted by Congress for evaluation of proposals was increased from the 90 days allowed in CCT-I to 120 days for CCT-II through CCT-IV and to 150 days for CCT-V. The increase in time required to evaluate proposals is due to the magnitude of information and data submitted in the proposals a direct function of the size and complexity of the projects proposed.

An SEB evaluation plan is developed prior to the receipt of proposals. This plan lays out in detail the procedures to be followed by the SEB in measuring the strengths and weaknesses of each individual proposal. The evaluation process consists of three phases qualification evaluation, preliminary evaluation, and comprehensive evaluation. The qualification evaluation determines if the proposal meets the broad requirements of the PON and thus qualifies as a

legitimate proposal. If all qualification criteria are satisfied, a preliminary evaluation is conducted to determine if the proposal contains sufficient financial, management, technical, cost, and other information to enable a comprehensive evaluation to be performed. Proposals passing the preliminary evaluation undergo a comprehensive evaluation which encompasses a technical evaluation and a cost and finance evaluation. The technical evaluation determines the merits of the proposal with regard to the potential for success of both the demonstration project itself as well as the future commercial application of the demonstrated technology. The technical evaluation results in a numerical score for each proposal against each of the technical evacuation criteria. The cost and finance evaluation determines the reasonableness of the cost estimate for completing the statement of work. This evacuation also verifies the capability and commitment to finance the project. The evacuation results in a numerical score for each proposal against each of the cost and finance criteria.

All proposals are independently evaluated one at a time, against the evaluation criteria contained in the PON, and not compared with other proposal. When the evaluation is completed, a consistency review is conducted to ensure that the evaluation criteria are consistently applied across all proposals.

Once all evacuations are complete, the SS0 makes his decision, relying solely on the evaluations submitted by the SEB and the program policy factors and other considerations, as set forth in the PON. Program policy factors deal with issues outside the proposer's control, such as technical and geographic diversity. Other considerations have included, for example, tie-breaking factors, such as preference to projects in states where the rate-making bodies treat clean coal technologies the same as pollution control projects or technologies.

Decisions to select projects have been made without holding clarification sessions with the proposers. The steps needed for the clarification process - establishing a competitive range of proposals, holding a large number of sessions, allowing time for proposers to modify proposals, and reevaluating the proposals-would have greatly increased the amount of time needed to make selections. Both industry and government have considered this unacceptable. To compensate, extra measures have been taken in writing the PONs to define clearly the information requested, the form in which it is to be submitted, and the rationale for its request. Preproposal conferences have been held shortly after issuing the PONs to provide additional clarification.

Moreover, debriefing sessions have been held for unsuccessful proposers at the conclusion of each solicitation. For a proposal which failed to satisfy the qualification criteria or the preliminary evaluation, the procurement member of the SEB has notified the disqualified proposer in a timely manner with a 'brief rationale for the proposal being eliminated from further consideration. Each proposer whose proposal was evaluated in the comprehensive evaluation, but not selected for award, has been provided the opportunity to meet with the SEB members to review the proposal's strengths and weaknesses as measured against the evaluation criteria contained in the PON. The debriefing does not reveal the competitors' relative merits or technical standing nor does it reveal the evaluation scoring. The session provides the proposer an opportunity to understand more clearly how the criteria were used in the evaluation process and how the proposer can improve its proposal in future solicitations.

Preaward Process

The preaward process includes postselection information gathering, or fact-finding, and negotiations that culminate in the award of a cooperative agreement. One of the first steps after selection is for the SEB officials to brief the DOE negotiating teams on the projects selected, their strengths and weaknesses, and areas that represent potential problems or require clarification. Copies of the winning proposals are turned over to the negotiation teams prior to the briefings. Under the decentralized Fossil Energy organization, fact-finding and cooperative agreement negotiations are conducted by personnel at the ETCs.

After CCT-II, the technical, environmental, commercialization, cost, and financial information requested by the PON for inclusion into the proposal was scaled back from the detail necessary for negotiating a cooperative agreement to a level sufficient for project selection. The positive impact has been to (1) reduce the cost of proposal preparation by shifting the development of detailed project information to the preaward phase, (2) simplify proposal evaluations, and (3) reduce the time required to evaluate proposals.

During fact-finding, the proposer of the selected project proposal prepares more detailed technical, environmental, financial, cost, procurement, and management data and information which serve as the basis for negotiating a cooperative agreement. Fact-finding culminates in a prenegotiation plan which identifies critical technical and business negotiation issues arising from proposal evaluation and/or fact-finding. Further, the plan describes the government's position on these issues.

Negotiation then proceeds to arrive at contract language for the cooperative agreement and the repayment agreement which is acceptable to the proposer and the government. Upon completion of negotiation, a postnegotiation memorandum, which reports the results of the negotiation, is prepared.

The final step in the preaward process is the preparation and submittal of the *Comprehensive Report to Congress* on the proposed project. In establishing the program, Congress required that a report on each project be submitted and that the report lie before Congress for 30 session-days before the cooperative agreement may be signed by the government. Before the comprehensive report can be submitted to Congress, the proposer must have signed the cooperative agreement.

The NEPA process is initiated by the industrial participant which develops a detailed, self-contained environmental information volume (EIV) describing the environmental aspects and expected impacts of the project. The participant is not obligated to proceed with the EIV without a signed cooperative agreement; however, the proposer is advised to consider carefully the effort and schedule required to prepare the EIV in order to minimize the risk of project delay. The scope and content of the EIV are described in an appendix to the PON.

Even though fact-finding and negotiations are conducted by the ETCs, there are several decision points that trigger review and approval by head-quarters officials, including those in the program, procurement, legal, and environment, safety, and health offices. Headquarter must approve the prenegotiation plan, the postnegotiation memorandum, and major aspects of the cooperative agreement. Once the cooperative agreement is approved, the comprehensive report becomes its

"We believe that absent this directive [SEN-14-89], to complete negotiations within 12 months, that [our utility] would have been precluded from continuing due to potentially interminable delays. Industry has a need to reach resolution on these projects in a timely fashion—this directive is a commendable action to ensure decisions, one way or the other, [within] a time certain."

- Participating utility

surrogate document and focus of attention as the project is submitted by the Secretary for congressional consideration.

During the early solicitations, substantial delays were encountered in the headquarters' review and approval process. These delays were due primarily to fragmented and sequential reviews as a consequence of the particular priorities and workloads of the various offices. Given the number of reviews and offices involved, several months were required to secure the necessary approvals for a project.

The solution has been a Secretarial commitment to streamline the process and to back that commitment with a novel approach designed to achieve the objective. Secretary of Energy Notice 14-89 (SEN-14-89) issued December 15, 1989, instituted the following:

- An Executive Board composed of the heads of the program, procurement, legal, and environment safety, and health offices; chaired by the program office (Assistant Secretary for Fossil Energy); and charged as follows
  - Ensure that ongoing negotiations are complete by a specific date
  - Ensure that negotiations and the DOE approval process are completed within 1 year from the date of selection for subsequent solicitations
  - Ensure that NEPA compliance activities are completed so that project schedules are not delayed
- A Clean Coal Technology Review Panel that assists the board and acts as its implementing arm. This panel is made up of senior staff from each of the involved DOE headquarters organizations. Chaired by a program office staff member, the panel is delegated the authority and responsibility to carry out the day-to-day review, approval, and coordination required to complete preaward activities. The Executive Board is responsible for assuring that adequate and appropriate resources are made available to staff each review panel and is also responsible for final approval of the cooperative agreements, signified by approving the comprehensive report and submitting it for transmittal to Congress.

The use of the Executive Board and Review Panel has been an overwhelming success in reducing the amount of time needed for headquarters' review and approval. This success is due to the Secretarial level of commitment in establishing these bodies, the delegation of authority to senior staff to carry out the process, and the resultant team outlook. The Review Panel has been particularly effective in providing timely responses to the ETC negotiating teams and resolving issues arising from these very complex government/industry negotiations. As the process has evolved, so has the teamwork between headquarters and the ETCs as well as the effectiveness of the documentation in responding to senior management needs. As a result, review time has been reduced from months to days. (A copy of SEN-14-89 and charters of the Executive Board and Review Panel are provided in Appendix B.)

Postaward Process

Projects are managed by the participant and are not government-directed. However, DOE must be in a position to ensure that project goals are being met and public funds are used properly. As a result, the government role in project execution is to monitor project activities, give technical advice, assess progress by periodically

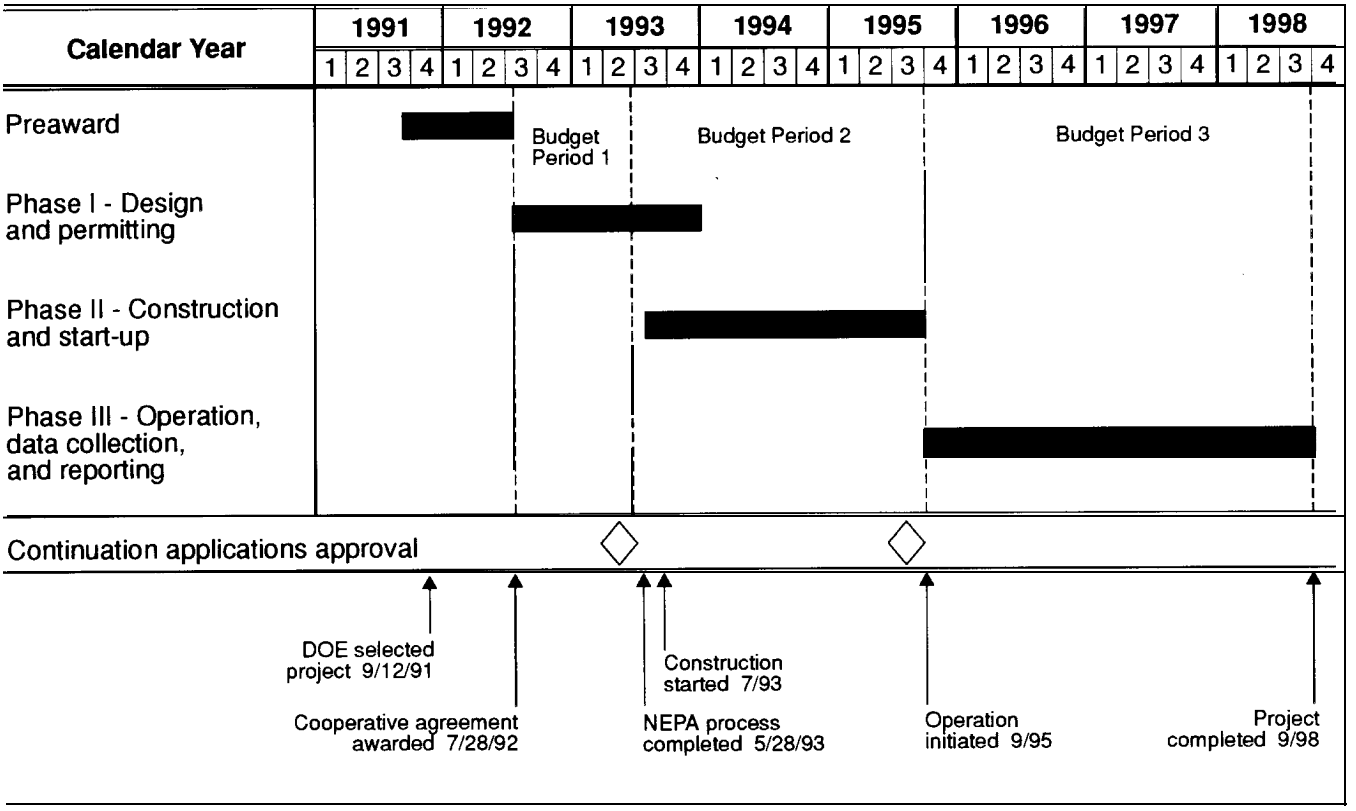
reviewing project performance with the participant, and participate in decision making at major project milestones. DOE's role in the decision-making process is delineated in the cooperative agreement and centers on key decision points.

These key decision points are negotiated into each cooperative agreement. Budget periods are, by definition, the time between decision points and funds are obligated by budget period. Every project is subdivided into several budget periods, each of which (except for the last) ends with a decision point. The exact number of budget periods is determined on a case-by-case basis during negotiation. Budget periods might or might not coincide with project phases (i.e., design, construction, and operation); the temporal relationship between the budget periods and project phases of a ' given project is determined primarily by the participant. Exhibit 5 is an example of the project implementation, or execution, process and shows the relationship between budget periods and project phases for atypical project.

If a participant wishes to continue the project into the next budget period, the participant submits a continuation application no later than 60 days before the end of the current budget period. If the participant does not wish to continue the project, then it does not submit a continuation application. The continuation application contains several elements:

.*The project evaluation report* describes in detail the actual progress and

Exhibit 5
Typical Project Schedule



accomplishments made by the participant during the budget period as compared to the criteria set forth in the DOE-approved project evaluation plan for that budget period.

- The *project evaluation plan* details the expected progress for the next budget period and contains more detail than, but is consistent with, the statement of work in the cooperative agreement. The plan identifies and describes the criteria by which the technical and economic feasibility of the project are to be evaluated, based on the participant's accomplishments during the budget period. The DOE-approved plan is used by the participant in preparing the evaluation report and by DOE in reviewing the report and deciding whether or not to approve the continuation application.

- A *detailed budget* by project phase for the next budget period, including the proposed value of each in-kind contribution and an estimate of unobligated balances.

There are additional requirements for the first continuation application. Before the end of the first budget period, the participant must complete the project definition activities identified in the statement of work, as appropriate. The project evaluation report for this budget period must contain an updated project management plan; the technical, schedule, and cost baselines for all future project work to be performed during each subsequent budget period; and all information requested by DOE to satisfy its obligations under NEPA. Before approval of the first continuation application, the participant must deliver to DOE signed commitments for any financing required to meet the participant's total cost-sharing obligation under the cooperative agreement.

The responsible ETC conduct an indepth analysis of the participant's submittal. The participant's performance, as set forth in the project evaluation report, is measured against the plan. Performance and cost data are examined and assessments are made as to impacts on project and program objectives. The ETC staff attempt to resolve any issues identified. The ETC subsequently submits its evaluation and recommendations to the Assistant Secretary for Fossil Energy.

In its review, headquarters focuses on changes to cost and schedule baselines (particularly if increases in DOE funding are being requested) and the programmatic consequences. Requests for additional financial assistance are reviewed in depth with the ETC. The resultant findings and associated recommendations are then forwarded for approval or disapproval to the Assistant Secretary for Fossil Energy.

DOE approves or disapproves a timely continuation application no later than 30 days before the expiration of the budget period under way. If the criteria in the approved project evaluation plan are met and appropriated funds are available for the project, DOE will approve the continuation application.

In short, the participant makes a basic "go/no go" decision at each decision point. If the project is progressing in accordance with mutually agreed-upon criteria, the government will concur with a participant's "go" decision. If, however, the project is not progressing as expected (or it is the first decision point), then the government assumes a greater role in the decision-making process.

When major project changes (e.g., site, participant, or core technology) are proposed, whether through the continuation application or during the course of a budget period, the approval process may include the Executive Board and Review Panel (as outlined in Appendix C).

Participants are required to provide monthly, quarterly, and annual progress and financial status reports. The monthly report is relied upon most by the program office for project tracking. The report summarizes project status, accomplishments, planned and actual costs on a cumulative basis, problems or issues, and plans for the next month. This information, along with changes resulting from continuation applications and project change proposals, is used to update monthly two management information systems

- *Project Notebook. This* project-level document provides a series of one-page data sheets listing key statistics and project features, a schematic, a milestone schedule, summary of changes to project baselines, status and accomplishments, items of internal interest, breakdown of cost by budget period and phase, and planned versus actual expenditures.
- *Program Status Summary Book. This* program-level document provides a one-page chart that shows the status of each project (i.e., negotiation. design, construction, or operation); a one-page graphic representation of project schedules grouped by solicitation and by market application; program financial status including obligations and expenditures (to date and projected) by solicitation, project, and market application; analysis of reserve requirements for potential cost growth; NEPA status; and crosscuts on the projects by location, congressional district, key events, and other factors.

These documents serve as a ready reference for senior management, and the updating process is used to identify impending issues.

Budget and Financial Management

The budget and financial management activities for the CCT Program are substantially different from most programs managed by DOE and reflect the unique characteristics and requirements of the program.

The most significant difference is that the entire $2,747,595,000 federal budget for the program was appropriated by Congress in five legislative actions between 1986 and 1989. From this total appropriated amount, DOE covered its adminstrative costs ($110,527,000 through the end of FY 1994) and its commitment to the Small Business Innovative Research Program and the Small Business Technology Transfer Program ($38,176,000). The remainder ($2,598,892,000) is available for DOE to meet its contractual commitment for the 45 projects in the program.

Financial Terms

Budget Authority. This is the legal authorization created by legislation (i.e., an appropriations act) that permits the federal government to disburse funds.

Commitment. Within the context of the CCT Program, a commitment is established when DOE selects a project for negotiation. The commitment amount is equal to DOES share of the project costs contained in the approved cooperative agreement and the amount of funds needed for projects in negotiation.

Obligation. The negotiated cooperative agreement for each project establishes budget periods. The cooperative agreement defines the tasks to be performed in each budget period. An obligation occurs in the beginning of each budget period and establishes the incremental amount of federal funds available to the participant for budget period tasks.

Cost. A request for payment submitted by the project participant to the federal government for reimbursement of tasks performed under the terms of the cooperative agreement is considered a cost.

Expenditures. Expenditures represent payment amounts to the project participant from checks drawn upon the U.S. Treasury. Expenditures directly affect the governments cash flow.

Exhibit 6
Annual CCT Program Funding, by Appropriations and Subprogram Budgets (Dollars in Thousands)

Fiscal Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Total
Adjusted Appropriations[a]												
P.L. 99-190	99,400	149,100	149,100									397,600
P.L. 100-202			50,000	190,000	135,000	199,997						574,997
P.L. 101-446					419,000	155,998						574,998
P.L. 101-121[b]						35,000	315,000	0	100,000	100,000	50,000	600,000
P.L. 101-121[b]							100,000	0	125,000	275,000	100,000	600,000
Total	99,400	149,100	199,100	190,000	554,000	390,995	415,000	0	225,000	375,000	150,000	2,747,595
Subprogram Budgets												
CCT-I Projects	96,685	145,273	145,273									387,231
CCT-II Projects			31,094	173,800	133,313	197,497						535,704
CCT-III Projects					391,496	154,048						545,544
CCT-IV Projects						9,875	311,063	0	98,450	97,900	45,799	563,087
CCT-V Projects							74,062	0	123,063	269,225	100,976	567,326
Projects Subtotal	96,685	145,273	176,367	173,800	524,809	361,420	385,125	0	221,513	367,125	146,775	2,598,892
Program Direction	1,491	1,988	20,500	14,000	22,548	25,000	25,000					110,527
Fossil Energy Subtotal	98,176	147,261	196,867	187,800	547,357	386,420	410,125	0	221,513	367,125	146,775	2,709,419
SBIR[c]	1,224	1,839	2,233	2,200	6,643	4,575	4,875	0	3,375	7,500	3,000	37,464
SBTT[d]									112	375	225	712
DOE Total	99,400	149,100	199,100	190,000	554,000	390,995	415,000	0	225,000	375,000	150,000	2,747,595

[a] Shown are appropriations as reflected in current legislation, less amounts sequestered under the Gramm-Rudman-Hollings Deficit Reduction Act.

[b] P.L. 101-121 was revised by P.L. 101-512, 102-154, 102-381, and 103-138.

[c] Small Business Innovative Research Program

[d] Small Business Technology Transfer Program

Although all funds necessary to implement the entire CCT Program were appropriated by Congress prior to FY 1990, the legislation directed that these 'funds be made available (or apportioned) to DOE on a time-phased basis. Exhibit 6 depicts the apportionment of funds to DOE from FY 1986 through FY 1996 when the final increment of funding is scheduled to become available to DOE, in accordance with current legislation. (It should be noted that a number of Administration budget proposals for FY 1995 and FY 1996 could change the apportionment of funds if enacted.)

The fact that Congress appropriated the entire government share of the program funds in advance rather than on an annual basis, as is the case for most DOE programs, eliminated the budget and funding uncertainty for the project participant. This up-front commitment has been extremely important in industry's response in terms of the quantity and quality of proposals received and the overall 66 percent cost-sharing achieved. In the absence of such a commitment, it is doubtful that the requisite private financing and regulatory approvals for the projects would have been obtained. The

almost $4.6 billion of non-DOE funds have come from a wide variety of sources, as shown in Exhibit 7. The diversity of financial sources illustrates the complexity of the projects and the broad base of support that the CCT Program has attracted over the years.

Contribution of almost $200 million by five states is notable. These contributions to projects are totally separate from the DOE share in that both the state and DOE funds flow to the project directly. In effect, this eliminates any "administrative" costs which may occur if the DOE funds flowed through the state to the industrial participant. The involvement of the states does not change the responsibility of the industrial participant for technical management of the project. Further, several projects have funding from multiple participants. This "consortium" nature of project participation and the financial exposure of multiple private entities is an indication of two important factors: (1) confidence in the technology and its eventual commercial deployment and (2) commitment to making the project a success.

This broadly based participation most likely would not have occurred without the government providing the strong, stable financial commitment through the life of the program. From the DOE standpoint, the up-front commitment has allowed the program managers to focus on program implementation activities rather than devoting a significant portion of their time to budget formulation and justification activities.

The full government cost-share is considered committed to each project upon selection for negotiation. However, DOE obligates funds for the project in increments. Most projects are subdivided into several time and funding intervals, or budget periods. The number of budget periods is determined during negotiations and is incorporated into the cooperative

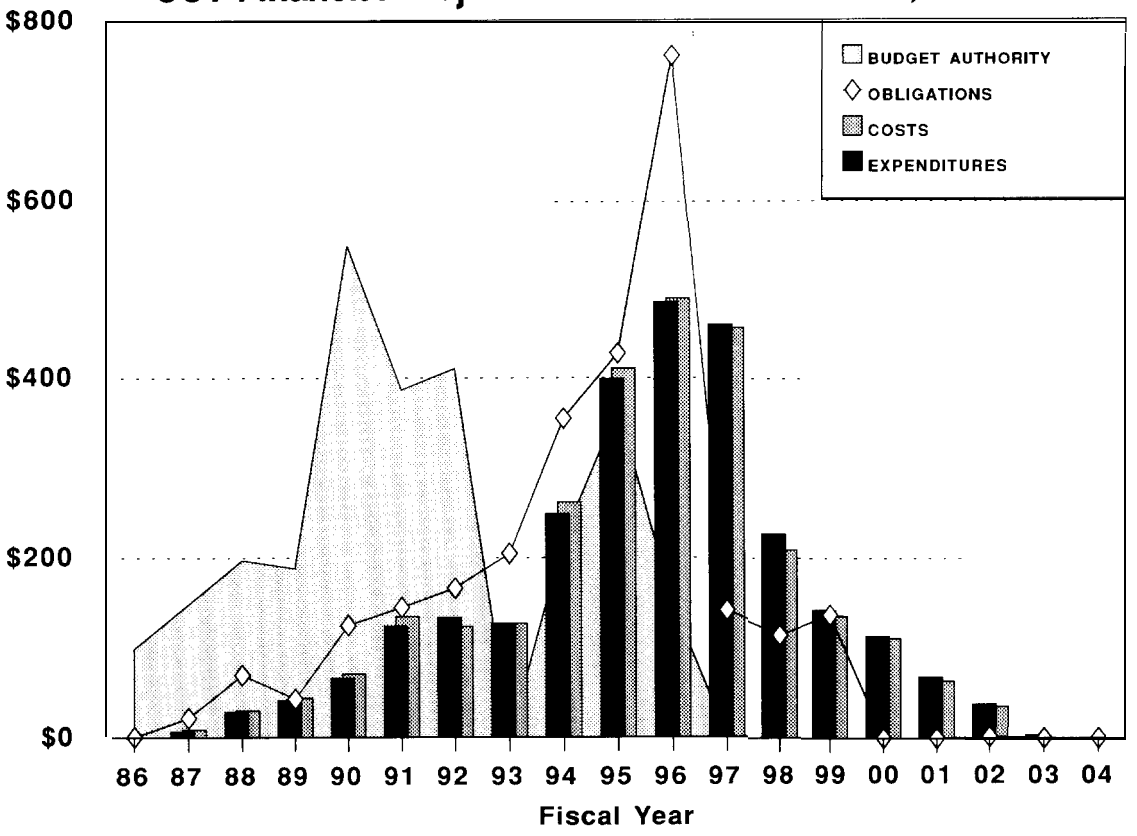
"Almost all of these projects have multiple participants . . . The more private entities involved in a project (whether contributing hard cash, in-kind, or expertise), the better. The [degree to which] private industry is interested and participates is a strong indication of the technology's ultimate commercial viability. The extent to which private industry is exposed in the project.. . is an indication of. . . its overall confidence in the technology and market potential. and that it will. . . try hard to make the process work."

—Participating state office

Exhibit 7
CCT Project Funding Sources

Source	Amount Contributed (Dollars in Thousands)	Percent
Non-DOE participants		
Investor-owned utilities	2,774,756	40
Nonutility generators	603,501	9
Technology owners	**443,139**	6
Industry	292,758	4
State agencies	191,463	3
Municipal utilities	108,955	2
Equipment vendors	84,274	1
Research and development organizations	40,525	<1
Cooperative utilities	34,167	<1
Project developers	7,317	<1
Tennessee Valley Authority	6,562	<1
Other	10,411	
Total Non-DOE	4,597,828	66
Total DOE	2,368,608	34
Total CCT Program	6,966,436	100

Exhibit 8
CCT Financial Projections as of December 31, 1993



"[T]he states have played a significant role in CCT development, and their interaction with U.S. DOE, the [participant], and the. . . 'consortium' of project participants should. . . be acknowledged. . . . [I]t works to the advantage of not only the federal government, but to the state, and the project as well Both the state and federal governments benefit when one leverages the other's funding."

—Participating state office

agreement. These budget periods are separated by key decision points at which decisions are made as to whether or not to continue the project. For continuing projects, DOE obligates sufficient funds at the beginning of each budget period to cover the government's cost-share for that period.

Establishing budget periods in the cooperative agreements makes it possible to measure financial performance of the project and to predict the financial profile with much greater precision than with most DOE programs. The overall financial profile for the CCT Program is presented in Exhibit 8. The profile shows actual performance for FY 1986 through FY 1993 and DOE estimates for FY 1994 through program completion. Procedures and computer models have been developed to support program financial management and allow for summary program and individual project financial profiles to be monitored and updated monthly and/or modified as a result of a change to the cooperative agreement. Staff at DOE, the Office of Management and Budget, and the congressional appropriations committees routinely use the CCT Program forecasts.

In establishing the CCT Program, Congress permitted the government, in a limited way, to share in cost increases that occur as a project proceeds. This additional government funding was capped at 25 percent of the government's share of the total project cost at the time of the original award. This shared risk for

project cost increases serves as a strong incentive for the participant to control costs effectively.

Although Congress has permitted limited government sharing of cost increases, no separate "overrun pool" has been appropriated. Increases in the government's contribution have been decided on a case-by-case basis and are only granted subject to availability of funds. Such funds become available from (1) projects that have been selected but failed to obtain award of a cooperative agreement, (2) projects that have been terminated before completion, or (3) projects in which the actual expenditures of funds have been lower than anticipated at the time of award. DOE has developed the following decision philosophy for use in managing these funds as they become available:

- No project overrun will be considered for funding (1) in the event that the participant made definitive statements in its prior representations to DOE that it would unequivocally provide additional funds in the event of a shortfall and (2) such representations were material to the DOE selection decision.
- DOE will consider cost-shining an overrun involving the demonstration of a technology that has a positive potential for market penetration.
- DOE will consider cost growths as they occur and fund them (1) to the extent that funds are currently available in the management reserve pool, (2) so long as the cost growths are consistent with PON requirements (i.e., not more than 25 percent of the original DOE funding for the project), and (3) to the degree that they meet specific evaluation criteria.

Granting or rejecting a request for DOE cost-sharing of an overrun is based on detailed consideration of a number of criteria, including programmatic, contractual, technical, environmental, commercial, financial, cost, and market factors. DOE's philosophy for sharing in cost increases is presented in the *Comprehensive Report to Congress: Clean Coal Technology Program - Completing the Mission,* which was published in May 1994.

NEPA Compliance

The following provision in Section 102 of the National Environmental Policy Act (NEPA) explains the act's applicability to the CCT Program:

> [A]ll agencies of the Federal Government shall—
> . . . (C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official—
>
> i. the environmental impact of the proposed action,
> ii. any adverse environmental effects which cannot be avoided should the proposal be implemented,
> In. alternatives to the proposed action,
> iv. the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
> v. any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.
>
> . (E) study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources.

A three-step strategy for compliance with NEPA has been developed for the program:

1. Preparation of programmatic environmental impact assessments (PEIA) and a programmatic environmental impact statement (PEIS)

"[S]trong and stable fianciul commitment by the government through the life of the project. . . this is a critical point . . . . Absent the commitments made, it is clear that [we] would not have embarked on this project. In fact, during our state hearings on the project, this was a key point of discussion."
—Participating utility

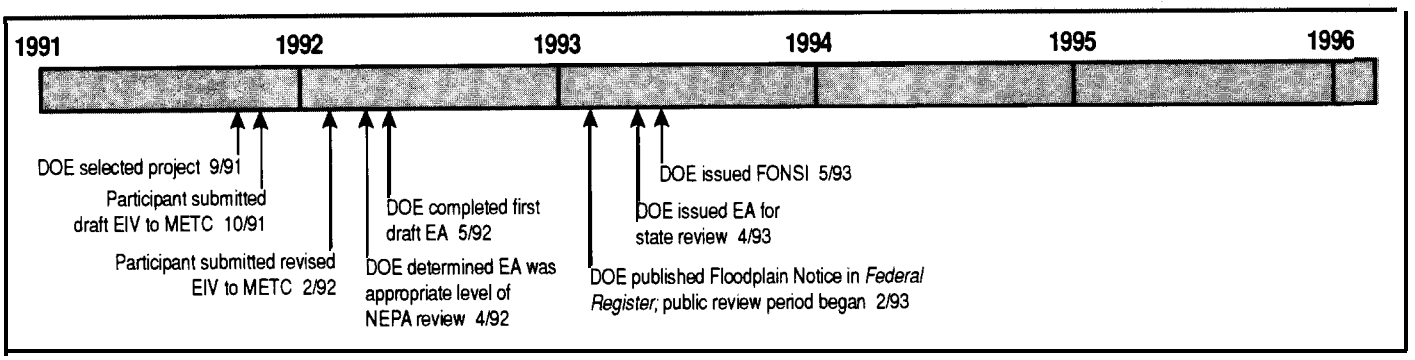
2. Preparation of preelection, project-specific environmental reviews

3. Preparation of postselection, site-specfic NEPA compliance documentation (see Wabash River Environmental Assessment and Healy Environmental Impact Statement examples below)

Two PEIAs have been prepared, one for each of the first two solicitations. Each PEIA contains an evaluation of the environmental consequences of the program including the effects of the commercialization of clean coal technologies on air and water quality and solid waste disposal. A PEIS was prepared prior to the third solicitation. It addresses the environmental consequences of widespread commercial deployment by the private sector, for 2010, of successful demonstrations of 22 generic clean coal technologies. The final PEIS was made available to the Source Evaluation Board and the Source Selection Official prior to their recommending or making decisions on specific proposals submitted in response to the third through fifth solicitations.

In preelection, project-specific environmental reviews, the environmental, health, safety, and socioeconomic aspects of each proposed demonstration project are evaluated. Reviews are provided to the Source Selection Official for consideration in the project selection process. As part of the comprehensive evaluation prior to selecting projects, the strengths and weaknesses of each proposal were compared with the environmental evaluation criteria. To the maximum

Wabash River Environmental Assessment



An EA was prepared for the Wabash River Coal Gasification Repowering Project to satisfy the **NEPA process. The project involves repowering one of six units** at PSI Energy's Wabash River Generating Station in West Terre Haute, Indiana A 262-MWe (net) IGCC system will replace the existing 99-MWe unit.

Key events in the **Wasbash River NEPA** process are highlighted in the time line. The NEPA process was completed approximately 20 months after DOE announced the project's selection.

The EA included the following findings:

1. There would be limited impacts to air quality . . . none of the pollutants emitted would be found in concentrations that would adversely affect public health or welfare.
2. Water requirements . . . could be met utilizing existing sources.
3. No historic or archaeological resources, floodplains or wetlands, unique terrestrial and aquatic ecosystems, or threatened and endangered species would be adversely affected.

The Finding of No Significant Impact (FONSI), stated:

Based on the analysis in the EA, DOE has determined that the proposed action is not a major federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act. Therefore, the preparation of an Environmental Impact Statement is not required, and the Department is issuing this FONSI..

extent possible, alternative sites and/or processes reasonably available to the proposer, the environmental impacts of each proposal, and practical mitigating measures are considered. Also a list of permits necessary to implement the project is prepared.

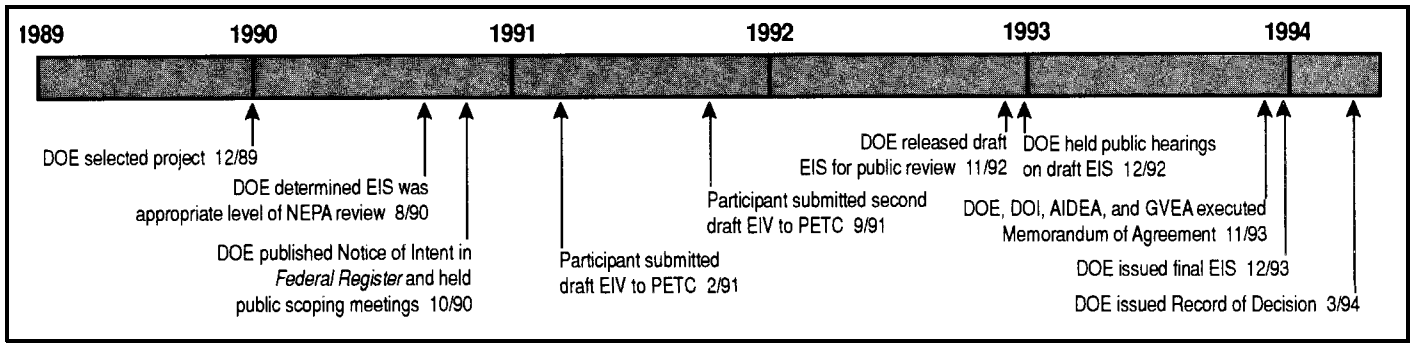
Site-specific NEPA compliance documentation is prepared for each project selected. Upon selection, project participants are required to prepare and submit additional environmental information. This detailed site- and project-specific information is used, along with information independently gathered by DOE, as the basis for NEPA documents which are prepared, considered, and published in full conformance with the Council on Environmental Quality's NEPA regulations and DOE's regulations for NEPA compliance.

The CCT Program has used several types of NEPA compliance documents, including the following:

- *Categorical Exclusion* (CX)—Defined ***in*** DOE's NEPA regulations as a class of actions that do not individually or cumulatively have a significant effect on the human environment.
- *Memorandum-to-File* (MTF)-Intended for circumstances when the expected impacts of the proposed action are clearly insignificant, yet the action has not been Specified as a categorical exclusion from NEPA documentation.

Timely completion of the NEPA process is critical to the success of the projects in the CCT Program. Coordination between the various areas at [DOE] is invaluable to ensuring that NEPA is completed both accurately and timely."
-Industrial participant

Healy Environmental Impact Statement



An EIS was prepared for the Healy Clean Coal Project to satisfy the **NEPA process. The project** involves constructing a nominal 50-MWe facility adjacent to Golden Valley Electric Association's 25-MWe Healy Unit #1 in Alaska. The new unit will demonstrate an advanced entrained combustor and spray dryer absorber with sorbent recycle.

Key events in the Healy NEPA process are highlighted in the time line. The NEPA process was completed 51 months after DOE announced the projects selection.

Four U.S. agencies cooperated with DOE in the development of the EIS: National Park Service (U.S. Department of the Interior), U.S. Environmental Protection Agency (Region X), U.S. Army Corps of Engineers, and Rural Electrification Administration (U.S. Department of Agriculture).

To address concerns regarding potential environmental impacts to the nearby Denali National **Park and Preserve, DOE, the** U.S. **Department of the Interior (DOI), Golden Valley Electric Association (GVEA), and the** Alaska Industrial Development and Export Authority (AIDEA) entered into a multifaceted agreement to implement a broad range of environmental protection measures. The combined emissions from the two units should be only slightly greater than those currently emitted from Unit #1 alone while providing three times the original power level. The agreement also provided that the total site emissions can be reduced even further than initially provided in order to protect the park.

'We agree wholeheartedly with the . . . need to streamline the NEPA process. NEPA-related delays area supremely important concern for participants."

—Independent power producer

(The MTF was discontinued in September 1990 by Secretarial directive.)

- *Environmental Assessment (EA)—Used* to determine if a proposed action requires preparation of an environmental impact statement (EIS), aid the agency's compliance with NEPA when no EIS is necessary, and facilitate preparation of an EIS when one is needed. If the agency determines on the basis of the EA that an EIS is not necessary, a finding of no significant impact (FONSI) is issued.
- *Environmental Impact Statement* (ELS)—Used to inform decision makers and the public of all potential environmental impacts and reasonable alternatives that would mitigate or minimize adverse impacts or enhance the quality of the human environment.

By year-end 1993, the CCT Program had completed 1 CX, 17 MTFs, 13 EAs, and 1 EIS at the project level.

The CCT Program's experiences with the NEPA process has led to a deeper appreciation for the time and effort required to comply and complete the process successfully. As a result, each PON has encouraged participants to start the NEPA process and prepare the environmental information volume as early as possible to avoid project delays. More significantly, starting with the CCT-II solicitation, DOE has been allowed to share with the participant costs incurred between selection and award in order to acquire and deliver the environmental information necessary to satisfy the requirements of the site-specific NEPA process.

Commitment to Commercial Realization

The CCT Program has been committed to commercial realization since its inception. The significant environmental, efficiency and economic benefits of the technologies being demonstrated in the program will be realized only if those technologies achieve widespread commercial success. The importance attached to commercial realization of clean coal technologies is highlighted in Senate Report 99-82 which contains recommendations for project evaluation criteria "The project must demonstrate commercial feasibility of the technology or process and be of commercial scale or of such size as to permit rapid commercial scale-up."

The commitment to commercial realization recognizes the complementary but distinctive roles of the technology owner and the government. It is the technology owner's role to retain and use the information and experience gained during the demonstration and to promote the utilization of the technology in the domestic and international marketplace. The detailed technical, economic, and environmental data and experience gained during the demonstration is vital to efforts to commercialize the technology. The government's role is to capture, assess, and transfer sufficient technical economic, and environmental information to a broad spectrum of the private sector and international community to allow potential commercial users to confidently screen the technologies and to identify those meeting operational requirements. The importance of commercial realization is evidenced by the requirement in the PON and the cooperative agreement that the project

participant must commercialize successfully demonstrated technology.

The five PONs contain requirements for the project proposals to include a discussion of the commercialization plans and approaches to be used by the participant. The proposer must discuss the following:

- The critical factors required to achieve commercial deployment, such as financing, licensing, engineering, manufacturing, and marketing
- A timetable identifying major commercialization goals and schedule for completion
- Additional requirements for demonstration of the technology at other operational scales as well as significant planned parallel efforts to the demonstration project which may affect the commercialization approach or schedule
- The priority placed by senior management on accomplishing the commercialization effort and how the project fits into the various corporate business, marketing, or energy utilization strategies

The cooperative agreement contains three mechanisms to ensure that demonstrated technology can be replicated by responsible firms while protecting the proprietary commercial position of the technology owner:

- The commercialization clause requires the technology owner to meet U.S. market demand for the technology on a nondiscrimination basis. Further, this clause "flows down" from the project participant to the project team members and contractor.
- The clauses concerning rights to technical data deal with the treatment of data developed jointly in the project as well as data brought into the project.
- The patent clause affords protection for new inventions developed in the project.

Since the beginning of the program in 1985, there have been a number of activities aimed at developing an understanding of the commercial market for the technologies and enhancing the entry into the commercial marketplace. As part of the response to the recommendations of the Special Envoys on Acid Rain, the President directed the Secretary of Energy in April 1987 to establish a panel to advise him on innovative clean coal technology activities. This panel was entitled the Innovative Control Technology Advisory Panel (ICTAP). As part of its activities, the state and federal incentive subcommittee of ICTAP prepared a report on the actions that states could take to provide incentives for demonstrating and deploying clean coal technology. The report identified a number of financial, regulatory, and environmental obstacles to demonstration of clean coal technologies and their eventual commercial success and determined that demonstration and deployment should be managed through both state and federal incentives.

In the same timeframe, the Vice President's Task Force on Regulatory Relief (later referred to as the Presidential Task Force on Regulatory Relief) was established. Among other things, the task force was asked to examine incentives and disincentives to the commercial realization of new clean coal technologies and other cost-effective emissions reduction measures that might be inhibited by various federal, state, and local regulations. An outgrowth of this activity was the recommendation that preference be given to projects located in states that offer certain regulatory incentives to encourage such technologies.

"It appears to us that the biggest remaining hurdle to the absolute success of this program lies in the area of deployment. . . . We continue to be concerned that this final step, which presently falls on the private sector will be stifled by the economic and risk factors associated with commercial deployment of new technologies. We feel that a major lesson learned from this program is that deployment of new technologies will require the same type of government participation which was provided in the development and demonstration phase of the program."

—Participating utility

This recommendation was accepted and became part of the project selection considerations beginning with the second solicitation.

The framers of the CAAA of 1990 recognized the environmental benefits of widespread commercial deployment of clean coal technologies. A provision in the act allows a 4-year extension (to December 31, 2003) to comply with the requirements of Title IV if one or more units are repowered with a qualifying clean coal technology.

An effort has been under way to gain greater understanding of the potential domestic market for clean coal technologies and the organizations and factors that will influence what and when facilities get built as well as the technologies that are used. DOE has a team conducting a series of executive seminars with the CCT Program's key stakeholders. These seminars focus on the power generation market and include discussions with leaders in the utility, independent power, regulatory, and financial communities. In these meetings, DOE seeks insights of management and planners whose views and decisions will shape the future use of clean coal technologies in power generation.

Additionally, a series of regional studies are under way with the purpose of gaining a better understanding of the markets for clean coal technologies and the regional and state factors that have a bearing on commercial deployment. Regions selected for study account for most of the U.S. coal-fired generating capacity. Detailed data and information have been compiled on regional and state energy use, coal use and resources, and electric power generation; state government agencies (including public utility commissions), regulations, legislation, and policies that could have a bearing on clean coal technology commercial realization; and coal-using investor-owned, rural cooperative, and municipal electric utilities which are potential users of clean coal technologies. Information and data are analyzed for insights into environmental compliance strategies, capacity planning, and other issues facing the utility and state stakeholders.

Internationally, efforts are under way to define market opportunities to promote U.S. technology and to support U.S. project development work in energy markets. International activities have concentrated on providing technical support to the U.S. trade agencies, organizing trade missions, developing financial and market analysis in response to Section 1331 of the Energy Policy Act of 1992, and developing an international technology transfer program as directed by Section 1332 of that act.

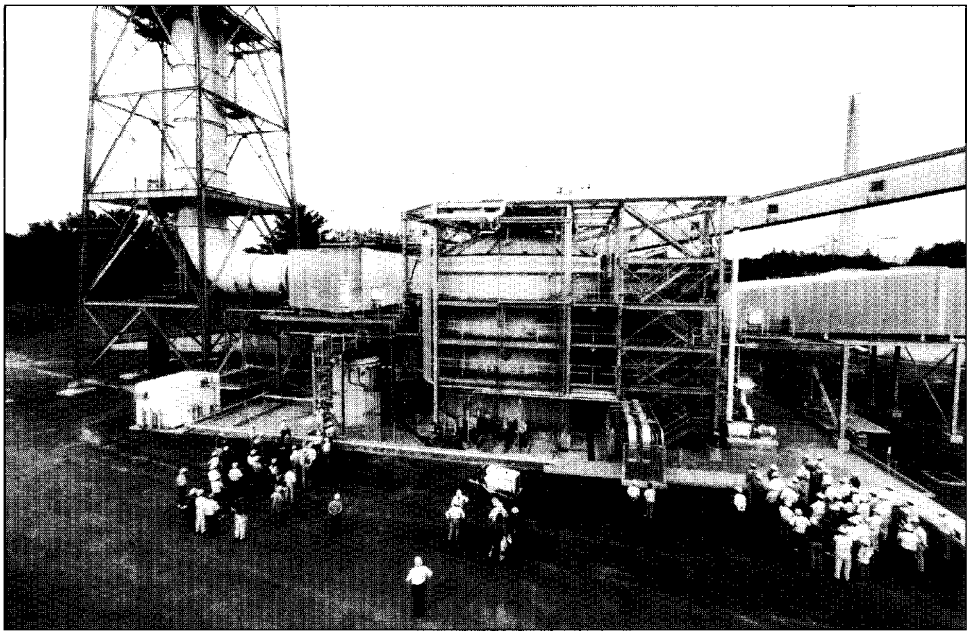
As an outgrowth of ICTAP's *Report to the Secretary of Energy Concerning Commercialization Incentives,* a clean coal technology outreach program has been established. The purpose of this program is to provide an understanding that clean coal technologies can increase the efficiency of coal use and enhance environmental quality at competitive costs. Further, the outreach program underscores the commitment to commercial realization of the technologies. Specific objectives of the outreach program include the following:

- Achieving public and government awareness of advanced coal-using technologies as viable energy options
- Providing potential technology users with information that is timely and relevant to their decision-making process
- Providing policymakers and regulators with information about the advantages of clean coal technologies
- Increasing the confidence of financial institutions that these technologies are viable options

The outreach activities conducted by DOE have been directed toward reaching targeted audiences, including users and vendors of the technology, regulators, public educators, environmental organizations, and export markets. DOE's outreach program has been implemented through the following mechanisms: publications, annual clean coal technology conferences, presentations and exhibits, and international trade missions. Additionally, project participants have been holding open houses, providing tours of demonstration facilities, and publicizing projects through groundbreaking ceremonies. They also have been presenting technical papers at professional and industry conferences to report progress to potential users.

DOE has been disseminating information through the distribution of published material about the program and the projects. These reports include the annual *Program Update; Comprehensive Reports to Congress* for each solicitation and for each successfully negotiated project; *The New Coal Era; the* quarterly newsletter, *Clean Coal Today;* topical reports highlighting project- or technology-specific events and technical, environmental, economic, and operational results; and proceedings from annual clean coal technology conferences. (See Appendix D for a description of program publications and reports.)

This collection of reports has served the program well by providing a balanced presentation of general information and data. The annual *Program Update* has proven to be very useful both inside and outside the govemment; it is designed to satisfy the diverse needs of program stakeholders as well as meet a congressional requirement. The newsletter has worked well as a bridge for reporting progress achieved between annual updates and as a vehicle for reporting details about specific projects. The *Annual Clean Coal Technology Conference Proceedings,* in addition to capturing discussions on issues, provides a yearly snapshot of each project's progress with some degree of technical depth. *The New Coal Era is an* excellent outreach document for nontechnical readers. The *Comprehensive Reports to Congress are* effective mechanisms to convey pertinent programmatic and project-specific information to Congress. *Clean Coal Technology-The Investment Pays Off* highlights a number of commercial successes achieved even though the program is only at its midpoint.



Southern Company Services, Inc. conducted tours of the 100-MWe CT-121 advanced flue gas desulfurization facility at Georgia Power's Plant Yates for attendees of the Second Annual Clean Coal Technology Conference.

Technical reports are prepared both in response to reporting requirements of cooperative agreements and to fulfill the government's responsibility to provide information to the public- and private-sector audiences involved in commercial deployment of clean coal technologies. These reports represent the substantive technical, economic, environmental, and operational performance coming from the demonstration and are the basis for evaluating technologies and their potential for commercial use.

Beyond the program publications and contractually required reports, additional data assessments are deemed necessary to

assist industry in determining the technology options most suitable to site-specific conditions and performance specifications. Activities in progess or in formulation include post-project assessments, cost and performance characterization, and technological analyses.

Prepared upon completion of a project, the post-project assessment report gives DOE's independent and objective assessment of the demonstrated technology, the relative 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. It is a relatively brief synopsis and critique that attempts to normalize the results (e.g., apply common economic assumptions for all the projects).

The request most often made of the CCT Program is to provide a single performance measure, usually cost, to characterize the technologies. This can be done by establishing a common set of conditions and performance specifications and deriving cost-of-electricity or dollar-per-ton-of-pollutant-~moved for each technology. However, this approach fails to recognize the tremendous impact that site-specific considerations have on economics and, in fact, on whether a technology option is viable at all. Depending on the auxiliary systems and space limitations, some technologies simply cannot be applied at particular sites. Plant size, age, and solid waste management are also major factors to be considered. In summary, there is a diverse set of site-specific parameters driving the economics of installation and operation of clean coal technologies.

To deal with the diversity aspects and provide summary-level representations of technology performance, an effort is being undertaken to establish a data set for the technologies that will effectively characterize cost and performance. This will be done generically as well as on a technology-specific basis. The approach is to provide the following:

- A brief description of the technology and its intended application
- The range of costs (e.g., capital and operating) and the parameters that drive the costs (graphical representation)
- Environmental performance measures such as $S0_2$ and NO, control, solid waste volumes and compositions, and air toxic considerations
- Measures of efficiency for power generation technologies (mitigation of greenhouse gas emissions)
- Special features relevant to the technology's application

Care must be taken not to compromise the participant's marketing efforts by leaving out information critical to a particular market niche. Moreover, because each technology and application is unique, direct comparisons of the technologies are inappropriate.

Risk Premium

The demonstration project is an important step along the learning curve but in itself is not the jump to full commercial status. Although successful demonstrations significantly reduce the technical and financial risk of follow-on commercial applications, they do not completely eliminate the risk. Inherently, demonstration facilities include redundancy and overdesign to offset uncertainties associated with novel equipment and to deal with the challenge of first time scaleup to the demonstration size. Further, even the most successful demonstration plants typically have only a few years of operating experience before commercial replication occurs.

For several CCT demonstration projects, the government cost-share reduced the "risk premium" enough to make these projects least-cost options. For example, the Wabash River project in Indiana, the Healy project in Alaska, and the Tampa Electric project in Florida, among others, received regulatory approval after going through the respective utility's integrated resource planning process as the least cost option.

Finally, options are being examined that would take advantage of existing computer-based systems that utilities use to assess compliance options for existing plants and expansion options for their systems. Packaging project data so that they can be imported into these systems will allow the potential users to evaluate the technologies in the context of the full set of site-specific parameters.

In summary, as the CCT Program completes its transition from the selection and acquisition of projects to analysis of results and subsequent commercial realization, much will be learned about the role that DOE, as a partner in the clean coal technology demonstrations, can play and the spectific strategies and approaches that will enhance commercial realization. The ultimate success of the program will be measured by the effectiveness that the industry/govemment partnership has in the successful commercial realization of the demonstrated technologies.

Program Success

The CCT Program has been very successful to date. The number of complex, capital-intensive projects put in place is unprecedented, as is the high degree of cost-sharing achieved. Moreover, the private sector's response to the five solicitations has been excellent; a total of 211 proposals have been received. Given progress to date, it appears that most of the 45 projects in the program will be completed successfully. In fact, several projects have already produced commercial sales, both domestically and abroad.

The results-oriented nature of the program and direct economic and environmental payoffs have gained broad support for the program. The government, serving as a risk-sharing partner, has leveraged an unparalleled magnitude of industry funding for these first-of-a-kind demonstrations. The majority of the projects involve demonstrations at fully commercial scale, providing the opportunity for the participants to leave the technologies in place and continue operation as part of their strategy to comply with the CAAA of 1990. The program has proven to be an excellent mechanism for merging public- and private-sector interests to protect the environment, reduce the cost of environmental compliance, create jobs, and position U.S.-based business to compete successfully in the international marketplace.

Of the CCT Program's 45 projects, 9 have successfully completed operations and fulfilled all reporting requirements or are preparing the final project documentation. The results of these projects are summarized in Exhibit 9 below. An additional 14 projects are in operation, 2 are in construction, 15 are in design and project definition, and 5 CCT-V projects are in negotiation. Details on the programmatic aspects of success are provided from a market perspective in the following sections.

Advanced Electric Power Generation

Fifteen projects, with a total estimated cost to completion of over $4.7 billion are demonstrating advanced electric power generation technologies. These technologies are characterized by high thermal efficiency, very low SO_2 and NO_x emissions, reduced CO_2 emissions and solid waste problems, and enhanced economics. The technologies are also quite flexible and will process a very wide range of coal-based fuels. In repowering situations, station capacity can be increased up to 150 percent. The CCT projects in this market category represent approximately 1200 MWe of new generating capacity and 800 MWe of

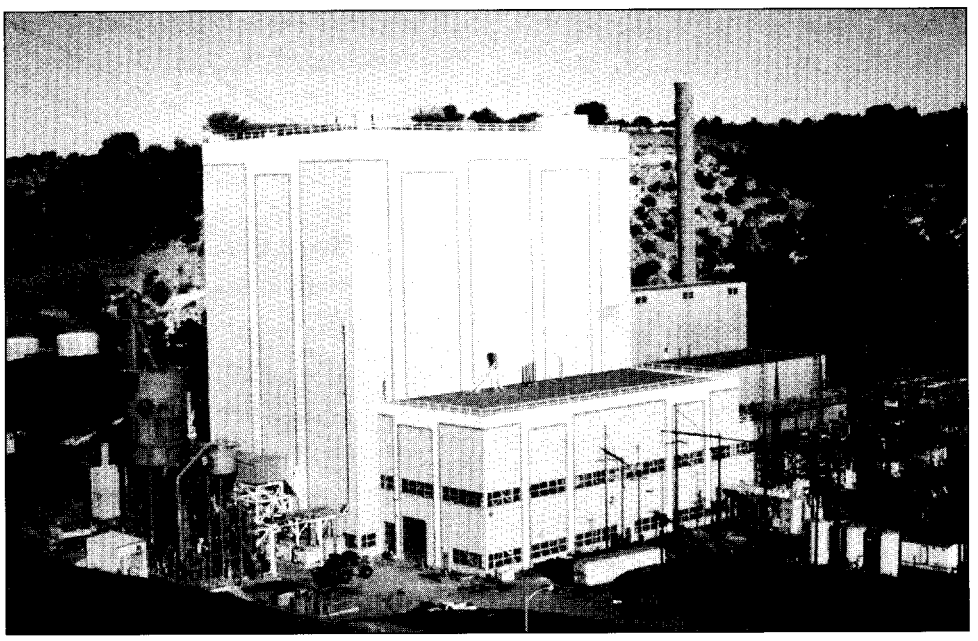
repowered capacity. The bulk of the advanced electric power generation projects will not have operating data until the latter half of the 1990s. However, discussions with utilities and analyses of utility integrated resource plans and other forecasts indicate that this schedule is compatible with most utility expansion plans. Major baseload capacity increases are projected to begin about 2005 and extend well beyond 2010, requiring decisions on available options to take place beginning around the year 2000. For those considering repowering of existing facilities to meet the stringent year 2000 Phase II emissions requirements under the CAAA of 1990, sufficient information should be available on most technology options to assist the decision-making process.

Exhibit 9
Summary of Results of Completed Projects

Project and Sponsor	Environmental Results	Capital Cost
Demonstration of Coal Reburning for Cyclone Boiler NO_x Control (The Babcock & Wilcox Company)	NO_x reductions of 52% using bituminous coal and 62% using subbituminous coal at full load (110 MWe), ranging to 36% and 53% respectively at 60 MWe	Ranges from $64/kW at 100 MWe to $40/kW at 600 MWe
Full-Scale Demonstration of Low-NO_x Cell™ Burner Retrofit (The Babcock & Wilcox Company)	NO_x reductions of 54–58% using bituminous coal at full load (605 MWe); 48% at 350 MWe	$5.50–8.00/kW at 500 MWe
180-MWe Demonstration of Advanced Tangentially Fired Combustion Techniques for Reduction of NO_x Emissions from Coal-Fired Boilers (Southern Company Services, Inc.)	NO_x reductions of up to 48% at full load (180 MWe) for low-NO_x concentric firing system including both separated over-fire air and close-coupled over-fire air	Not available
Confined Zone Dispersion Flue Gas Desulfurization Demonstration (Bechtel Corporation)	SO_2 reduction of 50% (1.5–2.5% sulfur bituminous coal)	Less than $30/kW at 500 MWe
SOx-NOx-Rox-Box™ Flue Gas Cleanup Demonstration (The Babcock & Wilcox Company)	SO_2 reductions of 80–90% using 3.4% sulfur bituminous coal, depending on sorbent and conditions; 90% NO_x reduction Particulate removal of 99.89%	$260/kW at 250 MWe
Cement Kiln Flue Gas Recovery Scrubber (Passamaquoddy Tribe)	SO_2 reduction of 90–95% (3% sulfur bituminous coal); 98% maximum reduction	$25/ton of annual cement capacity
Nucla CFB Demonstration Project (Tri-State Generation and Transmission Association, Inc.)	SO_2 reduction of 70–95% (up to 1.8% sulfur coal), depending on Ca/S ratio NO_x emissions average 0.18 lb/million Btu	Approximately $1,123/net kW (repower cost)
LIMB Demonstration Project Extension and Coolside Demonstration (The Babcock & Wilcox Company)	SO_2 reductions: LIMB—61% (3.8% sulfur coal; ligno lime) Coolside—70% (hydrated lime)	LIMB—$31–102/kW Coolside—$69–160/kW
Advanced Cyclone Combustor with Internal Sulfur, Nitrogen, and Ash Control (Coal Tech Corporation)	SO_2 reduction of over 80% with sorbent injection; 58% maximum with limestone injection NO_x emissions of 160–184 ppm (75% reduction) Slag/sorbent retention of 55–90% in combustor; inert slag	Not available

To date, major programmatic achievements in this market category include the following:

- As a result of the Nucla CFB Demonstration Project, which completed operations in 1991 and final project documentation in 1992, Pyropower Corporation (the technology supplier) was able to save almost 3 years in establishing a commercial line of atmospheric circulating fluidized-bed (ACFB) units. Although the demonstration unit was the largest unit at the time at 110 MWe, Pyropower's commercial units are now sold under warranty in sizes ranging up to 400 MWe.
- The first U.S. application of pressurized fluidized bubbling-bed combustion (PFBC) at utility scale (70 MWe) has accumulated approximately 5,500 hours of highly successful operation on coal. The Tidd PFBC Demonstration Project has completed more than 3 years of pioneering work, leading to the establishment of a sound database. As work at the Tidd PFBC unit in Ohio nears completion, a circulating-bed (PCFB) version nears construction at the Des Moines Energy Center in Iowa so that this alternate approach can be evaluated.
- Six different approaches to the highly efficient and environmentally clean integrated gasification combined-cycle (IGCC) technology are in various stages in the path toward full-scale commercialization. The projects cover abroad spectrum of gasifier types, coal feedstocks, gas cleanup systems, and operating conditions to satisfy various market situations. Construction has begun at the Wabash River Coal Gasification Repowering Project (262 MWe) in Indiana.



As a result of the 110-MWe Nucla project in Colorado, Pyropower Corporation was able to save almost 3 years in establishing a commercial line of ACFB unite. Pyropower's commercial units are now sold under warranty in sizes ranging up to 400 MWe.

Environmental Control Devices

The environmental control devices category includes the largest number of projects, 19. Their total value is nearly $687 million. General characteristics of the technologies include application for retrofit of existing facilities or new electric generation plants, high emissions-reduction efficiency, reduced capital costs through the use of innovative designs, and mitigated or eliminated solid waste management problems. The projects represent approximately 1,700 MWe of NO_x emissions control, 770 MWe of SO_2 control, and 765 MWe of combined SO_2/NO_x control. Additionally, 14 of the projects m implementing hazardous air pollutant monitoring regimes.

Six projects have been successfully completed. Another 10 projects are operational, 1 is in construction, and 2 are in advanced stages of design.

Three of the NO_x control projects have completed testing. The utility sector requires answers now on how to solve the problems of NO_x emissions control, and the CCT program and project participants are in the process of responding. Six NO_x control technologies covering the full

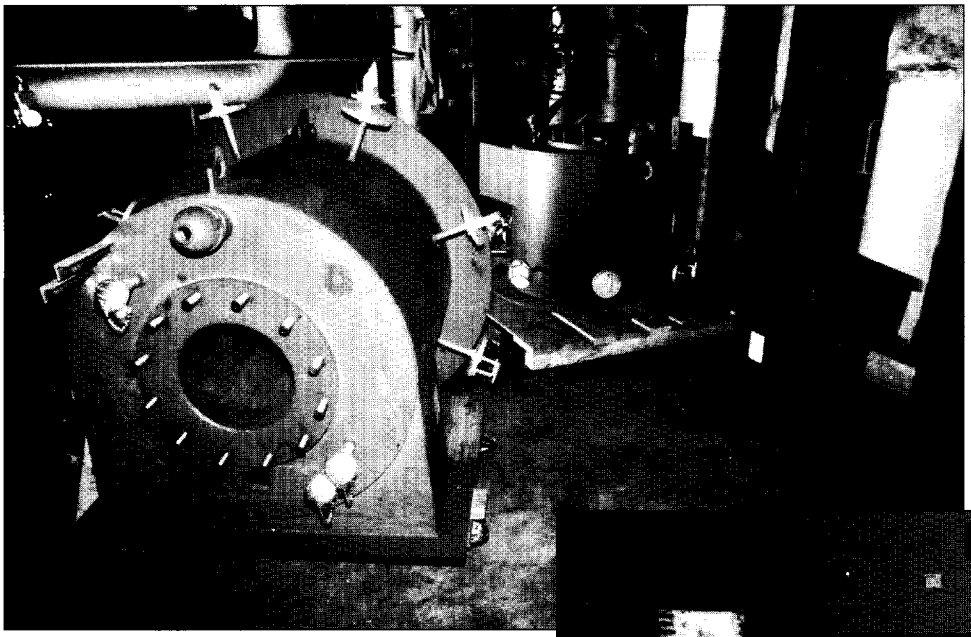
range of boiler types have concluded operation or are in the latter stages of operation. Three of these systems have been adopted for commercial application by the demonstration project host utility. Also, the first commercial sale of Low-NO_x Cell™ burners has taken place. Major accomplishments include the following:

- The Babcock & Wilcox Company's coal-rebuming technology, demonstrated at Wisconsin Power and Light Company's Nelson Dewey Station, has exceeded expectations with more than 50 percent NO_x reduction on a 100-MWe cyclone boiler. Further, with the coal-rebuming system, the boiler can be switched to low-sulfur subbituminous coal without being derated, as is normally required when switching a cyclone boiler to subbituminous coal. Thus the coal-reburning system even permits the un-derated unit to meet CAAA of 1990 requirements for SO_2 reduction without employing add-on sulfur emissions control technology. Wisconsin Power and Light has retained the coal-rebuming system for commercial use in the Nelson Dewey Station boiler.
- The Babcock & Wilcox Company's Low-NO_x Cell™ burner has been developed specifically for high-NOx-emitting, difficult-to-control cell burners which today account for nearly 26,000 MWe of U.S. electric generating capacity. Tests of the Low-NO_x Cell™ burner at Dayton Power& Light Company's J.M. Stuart Plant show that the technology can reduce NOx emissions by approximately 55 percent. Based on these results, The Babcock& Wilcox Company will install the technology on two commercial boilers totaling more than 1,100 MWe. The first commercial sale of two Low-NOx Cell™ burners was to Allegheny Power System for installation at its Hatfield's Ferry Station near Masontown, Pennsylvania.
- Southern Company Services, Inc., has demonstrated the capability to reduce NO_x by up to 48 percent in Gulf Power Company's tangentially fired boiler located at Plant Lansing Smith, using ABB Combustion Engineering's low-NO_x concentric firing system. This NOx control technology has potential application to the nearly 600 tangentially fired pulverized coal units in the United States.

Most of the SO_2 control projects will have documented their operating experience by 1995. Sources indicate that the January 1, 1995, SO_2 emission reduction targets for Phase I of the CAAA of 1990 will be met largely by fuel switching. However, there are numerous low-capital-cost SO_2 control options for older, smaller boilers available as a result of the program, and it appears that there may be a significant export market for these technologies. The program has also made available a number of technologies

Data for Decisions

Another important use of the technical and environmental data resulting from the projects is to establish a sound basis for making policy and regulatory decisions by all levels of government. For example, Southern Company Services has successfully demonstrated ABB Combustion Engineering's low-NO_x firing system in a tangentially fired boiler in Gulf Power Company's Plant Lansing Smith in Lynn Haven, Florida. In a sister project at Georgia Power Company's Plant Hammond, Southern Company Services is demonstrating Foster Wheeler's low-NO_x burner with over-fire air in a wall-fired boiler. The test results from these two CCT Program demonstrations were used by the U.S. Environmental Protection Agency (EPA) to develop CAAA of 1990 regulations for NOx control. Further, the hazardous air pollutant data collected under DOES CCT Program and the Coal Research and Development Program are being shared with EPA so that the agency will have the best available data for use in formulating air toxics control regulations under Title Ill of the CAAA of **1990.**



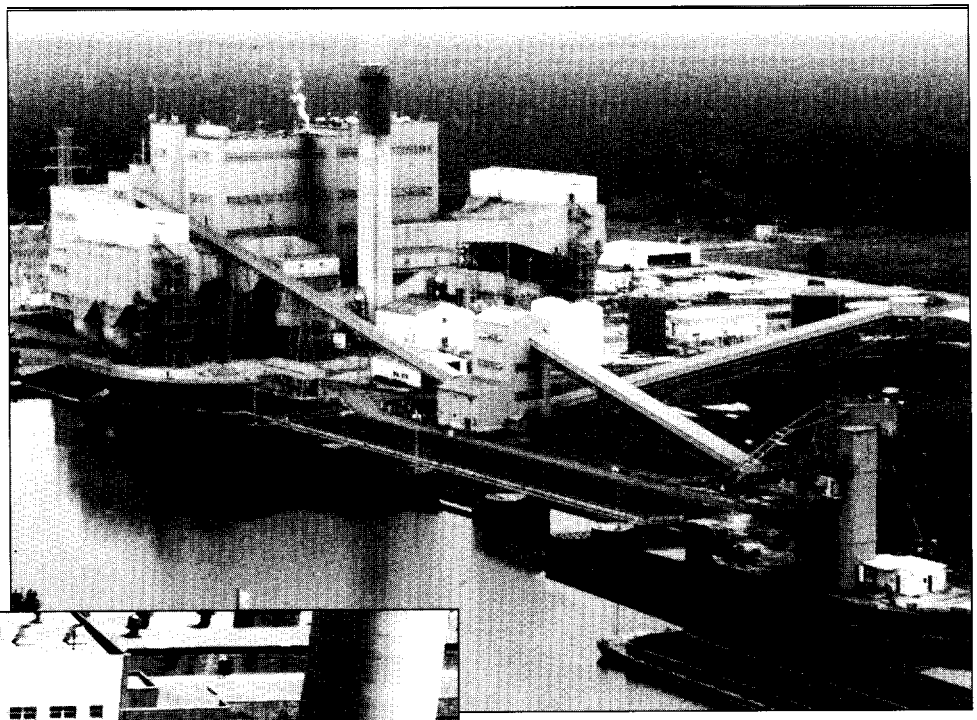
Wisconsin Power and Light is retaining, for commercial use, the Babcock & Wilcox coal-reburning system demonstrated at Nelson Dewey Station. The burners, which successfully completed over 2,000 hours of operation, achieved NO_x reductions of over 50%.

for the more stringent Phase II SO_2 limits which will require solutions of a more technological nature. Pure Air and CT-121 advanced flue gas desulfurization (AFGD) technologies are routinely achieving over 95 percent capture of SO_2 and producing wallboard-grade gypsum as a by-product instead of solid waste for disposal. Further accomplishments include the following:

- Even though the demonstration is still in progress, Pure Air has succeeded in making two commercial sales. Northern Indiana Public Service Company, host utility for the demonstration, has arranged for Pure Air to continue to operate the AFGD system and control SO_2 emissions from Bailly Generating Station for 17 years after the demonstration project is completed. In early 1994, Florida Power & Light Company announced it has selected Pure Air's AFGD technology to control SO_2 emissions from its 1,600-MWe Manatee Power Plant. Pure Air will employ the same own-and-operate concept at the Florida AFGD facility that it pioneered at the Indiana facility.

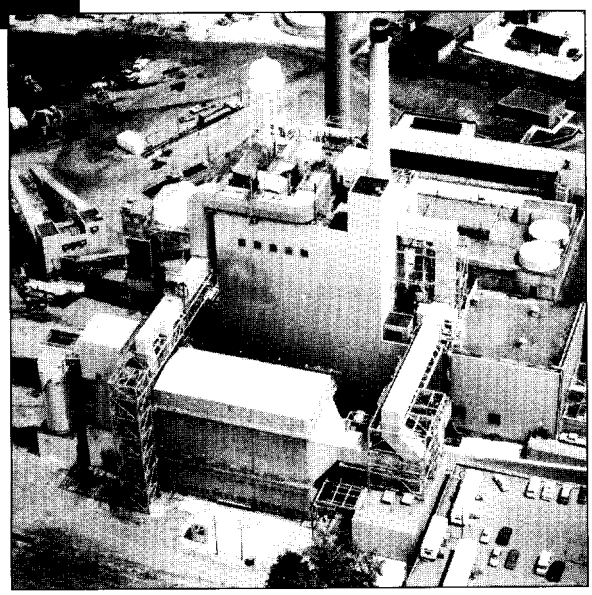
AirPol, Inc., has completed operational testing of its gas suspension absorption (GSA) system. In a 4-week continuous run, the GSA demonstration unit consistently achieved 90-91 percent SO_2 removal. The system is cheaper than wet scrubbers of comparable size and is particularly well suited for small- and medium-sized boilers. The city of Hamilton, Ohio, has contracted with AirPol to install the GSA system on a city-owned, 50-MWe boiler. This move is intended to allow the boiler to bum high-sulfur Ohio coals, while meeting tighter state and federal SO_2 limits.

Babcock & Wilcox's Low-NOx Cell™ burner has been successfully demonstrated at Dayton Power & Light's 605-MWe J.M. Stuart Plant in Aberdeen, OH. In its first commercial sale, Babcock &Wilcox will install the burners in Allegheny Power System's Hatfield's Ferry Station near Masontown, PA.



Southern Company Services demonstrated 48% NO_x reduction in a 180-MWe tangentially fired boiler at Plant Lansing Smith in Lynn Haven, FL.

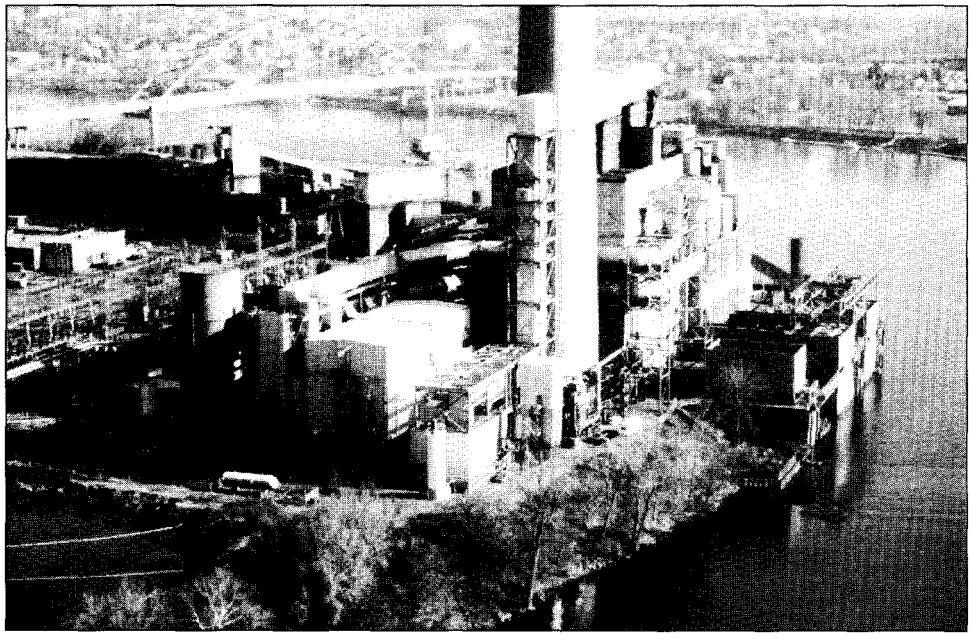
Bechtel demonstrated confined zone dispersion flue gas desulfurization at Pennsylvania Electric's Seward Station near Seward, PA.



Babcock & Wilcox demonstrated LIMB and Coolside processes at the 105-MWe unit of Ohio Edison's Edgewater Station.

- The Babcock & Wilcox Company has completed its demonstration of LIMB and Coolside technologies at Ohio Edison Company's Edgewater Station in Lorain, Ohio. The LIMB, or limestone injection multistage burner, process achieved 61 percent SO_2 removal efficiency while burning 3.8 percent sulfur coal and using a ligno lime sorbent. These results were achieved at a total capital cost estimated to range from $31 to $102 per kilowatt. The Coolside process involving in-duct sorbent injection achieved 70 percent SO_2 removal efficiency at capital costs estimated to range from $69 to $160 per kilowatt.

- The Bechtel Corporation has completed the demonstration of the confined zone dispersion flue gas desulfurization process. The results show that SO, emissions can be reduced by up to 50 percent at a total capital cost estimated to range from $38 per kilowatt for a 500-MWe plant to $62 per kilowatt for a 150-MWe plant. However, follow-on demonstration is required to fully commercialize this technology. The target market is to retrofit existing boilers, regardless of type, age, size, type of coal burned, or the coal's sulfur content.



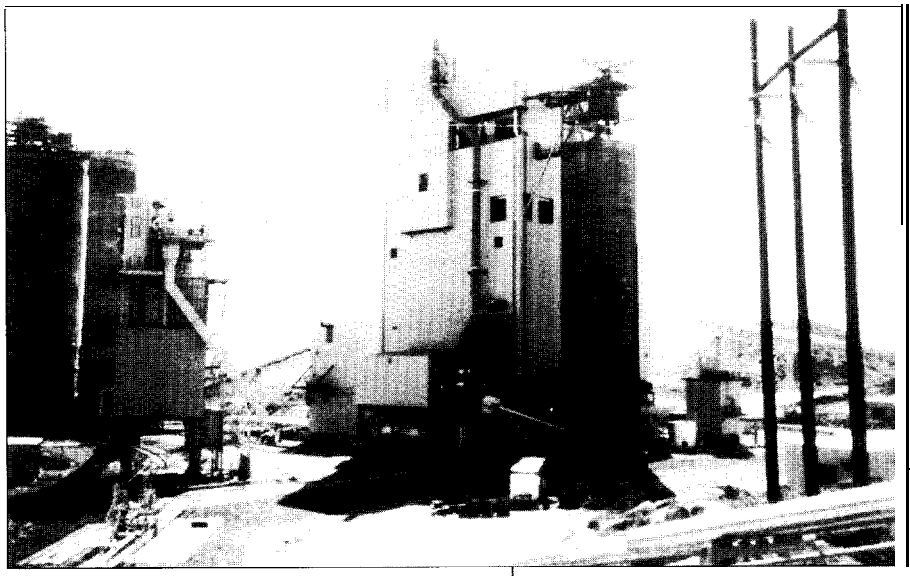
Ohio Edison's R.E. Burger Plant in Dilles Bottom, OH, is the site of Babcock & Wilcox's completed SN R B™ demonstration. The project operated for about 2,300 hours, achieving 80-90% SO_2 removal and 90% NO_x reduction.

Several combined SO_2/NO_x control systems are exceeding design goals. Successes include the following:

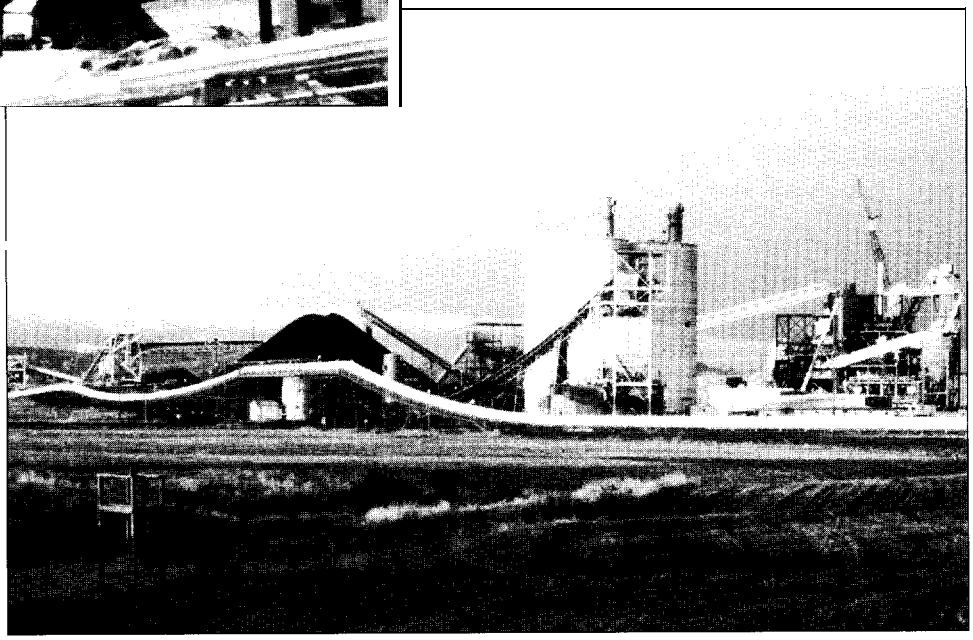
- The SNOX™ technology is routinely achieving 96 percent SO_2 reduction and 94 percent NO_x reduction while producing 93 percent pure sulfuric acid for sale and generating no solid waste. Ohio Edison Company is maintaining the ABB Environmental Systems'

New Business Concepts

Not only have commercial successes been realized from demonstrated technologies, but innovative business concepts have also been developed. The CCT Program's Pure Air on the Lake, L. P., advanced flue gas desulfurization project (AFGD) is an example. Pure Air on the Lake expects to specialize in pollution control activities which relieve electric utilities of the ownership and operation of AFGD units. Under the arrangement with Northern Indiana Public Service Company, the Pure Air limited partnership will continue to operate the AFGD unit as a contracted service at the Baiily Station for 17 years after the 3-year demonstration. The Bailly Generating Station with the AFGD unit became the first power plant on the CAAA of 1990 list of Phase I affected units to meet the SO_2 standards using flue gas desulfurization.



Commercial contracts are in place for 30,000 tons of solid product and 135,000 barrels of liquid product produced from the ENCOAL mild gasification plant located near Gillette, WY.



The Rosebud SynCoal Partnership is demonstrating advanced thermal coal-drying coupled with physical cleaning technology at a 68-ton/hr facility in Montana and has agreed to prepare an engineering study for a commercial plant that would serve a North Dakota utility.

SNOX™ system at its Niles Station on a permanent basis. The utility is making the technology a key part of its CAAA of 1990 compliance strategy.

.The Babcock& Wilcox Company's SOx-NOx-Rox-Box™ (SNRB™ technology was demonstrated at Ohio Edison Company's R.E. Burger Plant in Dines Bottom, Ohio. The SNRB™ technology controls SO_2, NOx and particulate. The technology has exceeded its demonstration performance goals by achieving 80-90 percent SO, removal efficiency, 90 percent reduction in NO_x, and more than 99 percent particulate removal efficiency. The SNRB™ offers the potential for lower capital and operating costs and smaller space requirements than a combination of conventional control technologies.

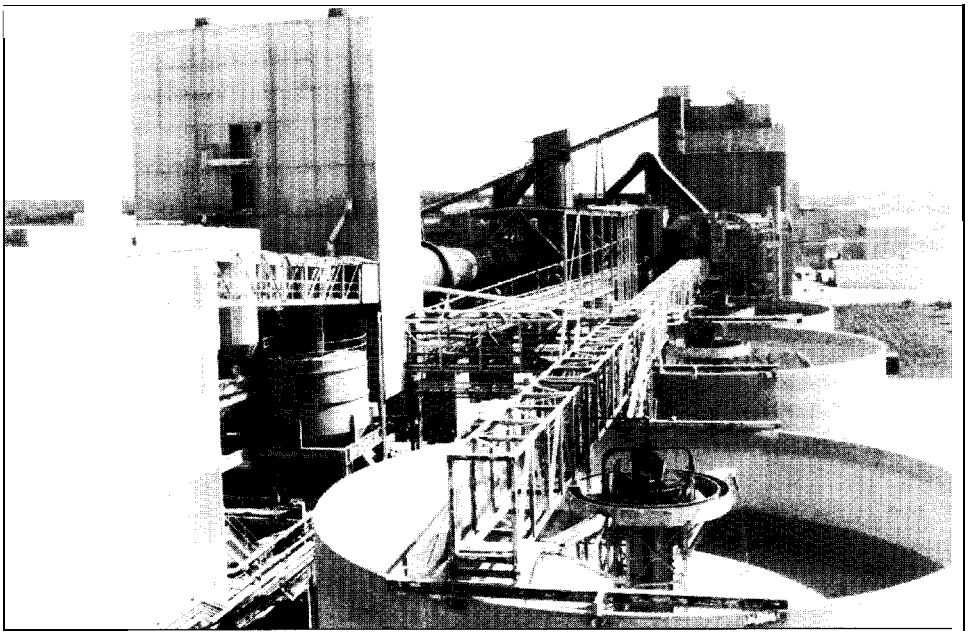
Coal Processing for Clean Fuels

There are five projects in the coal processing for clean fuels category; their combined value is nearly $467 million. Three of the technologies are characterized by production of high-energy-density solid compliance fuels for utility or industrial boilers, with or without the coproduction of coal-derived liquids for use as chemical or transportation fuel feedstocks. A fourth project will demonstrate a new synthesis

technology for methanol, with or without coproduction of electricity. The fifth project involves development of software and demonstration of an expert system to predict operating performance of coals not previously burned at the facility in question. A commercial sale of the Coal Quality Expert "Acid Rain Advisor" software package developed during the project was made in 1993. This expert system will be available for analyzing fuel switching scenarios for Phase I compliance.

The fuels production projects with more extended schedules should have sufficient data for evaluation of Phase I compliance and definitely can be considered for Phase II compliance scenarios. Potential utility and industrial customers are participating in these projects by conducting test bums of the fuels and evaluating the solid and liquid products. Major achievements are as follows

- The ENCOAL Corporation, through its low-rank coal upgrading project, has commercial contracts in place for two products resulting from the demonstration. A Wisconsin utility will buy 30,000 tons of the solid product and TEXPAR Energy, Inc., of Waukesha, Wisconsin, will buy up to 135,000 barrels of the liquid fuel. Further, seven railroad tank cars of liquids have been shipped, including four to the Great Plains Synfuels Plant in Beulah, North Dakota, where the liquid has been successfully combusted in conventional industrial boilers.
- Rosebud SynCoal Partnership has signed a letter of intent with Minnkota Power Cooperative, Inc., a North Dakota utility, to prepare a $2-million engineering study to examine the merits of scaling up the advanced coal conversion process to an $80-million commercial plant. If the study results are positive, the commercial plant, to be located next to Minnkota's Milton R. Young Power Station near Center, North Dakota, could be on-line by 1996.



The Passamaquoddy Tribe successfully demonstrated a scrubbing system for coal-burning cement kilns. The process achieved 90-92% removal efficiency and is now a permanent part of the Dragon Products'470-000-ton/yr cement plant in Thomaston, ME.

Industrial Applications

There are six projects in the industrial applications category, with a combined value of over $1.1 billion. Projects encompass the steel industry, cement industry, and industrial boiler applications.

Dealing with coke oven emissions is a key concern of the steel industry. An early project under the program, aimed at controlling coke oven gas emissions, was stymied by an unrelated shutdown of the coke ovens. Another project to substitute coal for at least 40 percent of the coke has proceeded into construction. A third project aimed at eliminating the need for coke is in negotiation.

The Passamaquoddy Tribe has successfully completed its demonstration of a flue gas recovery system on a 1,450-ton-per-day cement plant in Thomaston, Maine. The system was able to (1) achieve 90-95 percent SO2 reduction, (2) produce fertilizer, (3) convert the kiln waste to cement feedstock, and (4) eliminate all waste streams. The system has become a

permanent part of the **cement** plant. This technology is applicable to over 250 U.S. **cement kiln** installations which emit approximately 230,000 tons per year of SO2. It may also have broader applications in paper production and municipal waste incineration in the United States and abroad.

Summary and Conclusions

The CCT Program has proven to be an effective means by which government can work cooperatively with the private sector in developing and introducing new technologies into the commercial marketplace to address societal needs. Program implementation has been based on the principle that the private sector, not the government, must be the driving force in judging what has market potential, conducting the requisite technology development, and introducing the product into the marketplace. History has shown the government to be ineffectual in its attempts to perform these functions. In shaping the CCT Program, a balance has been sought between the private sector's commercial interests and the government's responsibility for protecting the public's interests and pursuing national goals.

In determining where the CCT Program has broader application, the following questions should be considered

- Is the objective to place a product in the commercial marketplace? If so, private-sector cooperation is essential. But if, for example, the client is the U.S. government, as is often the case with defense programs, the concept does not apply. Where the government is the client, it should set the technical agenda and introduce the product into its system.
- Has the technology evolved to the stage where the private sector is willing to fund at least 50 percent of the project cost? If not, many of the elements of the CCT Program cannot be applied. The magnitude of the government's fiduciary responsibilities at greater than 50 percent of cost-sharing does not permit the degree of freedom in technical project management afforded under the CCT Program. Furthermore, retention of real and intellectual property by the participant may not be warranted.
- Is the project large enough and complex enough to justify negotiating and implementing a cooperative agreement? Small projects (hundreds of thousands of dollars rather than millions) with well defined activities may not warrant the substantial government involvement associated with cooperative agreements; grants may be more appropriate.

A sound foundation has been established for application of the CCT Program principles to other programs with the development of the tools for execution, namely, the PON, model cooperative agreement, control documents, NEPA compliance approach, and attendant procedures. Some of the provisions cannot be adopted verbatim by other programs as a matter of course, such as those dealing with property, allowable/unallowable costs, and protection of contract data. These provisions are rooted in legislation directed to the CCT Program and may not be wholly consistent with existing DOE procurement policy. However, the precepts are transferable, and it is expected that potential users of concepts underlying the CCT Program will have to mold them to their particular program.

The importance of the body of expertise developed over the course of the program in negotiating and implementing these complex projects should not be diminished. Although difficult to document and quantify, the experience developed in dealing with these complex business arrangements is a significant asset that has contributed greatly to program success- an asset that can be shared with other DOE or government programs.

The successful implementation of the CCT Program has been a direct result of (1) the government making an up-front financial commitment to projects, (2) using a series of solicitations over a number of years, (3) examining the program implementation process and PON objectives between solicitations to meet changing national needs and program goals, and (4) establishing and adhering to a set of principles to guide the program.

The technologies are operated at sufficient scale and in actual user environments to assess commercial performance potential. Costs are shared by the public and private sectors throughout the project on each dollar expended. The level of cost-sharing by the private sector warrants their driving the technical agenda, managing the project, and retaining real and intellectual property. The government, in turn, monitors progress, sets performance criteria to be met at key project decision points, commits the participant to commercializing the technology, and requires repayment up to the government's investment if the technology is successfully marketed. There are built-in checks and balances to ensure the industry and government roles are appropriate and that the government serves as a risk-sharing partner without impeding industry from utilizing its experience and getting the technology into commercial use.

Appendix A

Repayment

The Requirements of the Energy Policy Act of 1992

The Energy Policy Act of 1992 (the "Act") states in Title XIII, Subtitle A, Sec. 1301(b)(3)(A) & (B):

(A) Not later than 180 days after the date of enactment of this Act, the Secretary shall establish procedures and criteria for the recoupment of the Federal share of each cost shared demonstration and commercial application project authorized pursuant to this subtitle. Such recoupment shall occur within a reasonable period of time following the date of completion of such project, but not later than 20 years following such date, taking into account the effect of recoupment on—

(i) the commercial competitiveness of the entity carrying out the project

(ii) the profitability of the project and

(iii) the commercial viability of the coal-based technology utilized.

(B) The Secretary may at any time waive or defer all or some portion of the recoupment required as necessary for the commercial viability of the project.

Interpretation

The Act states procedures and criteria shall be established for the recoupment of the Federal share (this would include DOE plus any other federal funding) of each cost shared demonstration and commercial application project authorized pursuant to this subtitle. Recoupment would be applicable to a project which is both a demonstration and commercial application. A logical interpretation of commercial applications would be a project that continues to operate after government assistance ends. Projects consisting of slip stream tests, or which fail to achieve economic or technical viability, and do not continue to operate would not be subject to recoupment.

Recoupment pertains to projects authorized pursuant to Subtitle A; this does not include additional Clean Coal solicitations which fall under Sec. 1321 of Subtitle B or the Clean Coal Export Promotion which falls under Sec. 1332 of Subtitle C. Recoupment would apply to:

Sec. 1302	Coal fired Diesel Engines
sec. 1303	Clean Coal, Waste-to-Energy
sec. 1304	Non-fuel Use of Coal

Sec. 1305	Coal Refinery Program
sec. 1306	Coal-bed Methane Recovery
sec. 1307	Metallurgical Coal Development
Sec. 1308	Utilization of Coal Wastes
sec. 1309	Underground Coal Gasification
sec. 1311	MHD
Sec. 1312	Oil Substitution through Coal Liquefaction

The recoupment is to occur within a reasonable period following the date of completion of the project, but not later than twenty years following such date. It is assumed that "completion of the project" means the end of the demonstration period, not the end of the commercial application.

Any recoupment criteria or procedures must consider the effect of recoupment on commercial competitiveness of the entity carrying out the project. An interpretation of "commercial competitiveness of the entity" could include the ability of the entity (if the entity is the technology owner) to proceed with commercialization (profit making sales) of the technology and achieve an ROI commensurate with the industry and the risk. Therefore, if recoupment obligations are too demanding, especially in the early years of the technology sales, then cash flows and profitability may not be satisfactory for the entity to remain in business or licensing fees and costs may be too high for the technology to remain competitive with alternatives.

Recoupment criteria must also consider the "profitability of the project." Based upon the cost of money and an acceptable return on shareholders equity for the industry, the ROE for the project must achieve a certain level, commensurate with the risk of investing in first-of-a-kind technology. If the recoupment obligation should be sufficiently onerous to cause repeated periods of negative cash flow for the project, especially in the early years when design basis on line capacity has not been fully achieved, then the project may be terminated.

The "commercial viability of the coal-based technology" is to be considered when developing recoupment criteria. If recoupment places too much demand on the revenues generated through licensing and sales of the technology then the competitiveness may be hindered. Fees are based on some percentage of savings enjoyed through the use of the developed technology versus an alternative, if too high of a demand is placed on these revenues than sales could diminish.

Recoupment Logic

The government has enacted legislation to develop programs for certain technologies (listed above) for research, development, demonstration and commercial applications. This means a determination has been made that for the reasons of environmental protection, national security, comparative advantage in world trade or continued quality of life for its citizens it is necessary that these technologies be developed. Once having determined the national need for these technologies, will industry invest the resources to pursue the appropriate development activities? The main driving force behind industry investment is a determination of economic need or attractive economic performance for the technologies

within the next five years. If this determination cannot be made then government funding will be required. Government assistance is necessary when the development program is too expensive or too high of risk for one company to invest, or even possibly a group of companies to invest. Examples of this are MHD, coal refinery or coal liquefaction. Government assistance is required when market projections for economic success for the developing technology are long term (probably greater than five years). If government has determined a national need for a technology development program, for which industry is not projecting near term economic success, then government must provide a catalyst through providing financial assistance.

What is important to the success of a government sponsored technology development program is the selection of the best technology options (determined by the criteria of the program). The willingness of the participating industrial sponsor to repay should not be as important a consideration when evaluating potential demonstration projects. It is always easy to make non-binding commitments for the future based on non-verifiable assumptions. A far more important factor is the willingness of an industrial sponsor to cost share the development of the technology. Having industrial cost sharing confirms industry interest, keeps the government objective regarding selection of technologies for development, and ensures an industrial entity is in business to commercialize the technology for the future. From the fiscal standpoint it is better to maximize industrial cost share, which represent near term expenditures, than to obtain a promise of future repayment contingent upon commercial replication or continued competitive performance.

There may be technologies that need to be developed for environmental reasons (e.g., cleanup of waste dumps or disposal of certain wastes); however, the market potential for these technologies could be limited. In these situations it may not be possible for the government to recoup its investment through payments related to the implementation of the technology. Government may still enjoy net positive benefits through cost savings in health and civic welfare. Increased employment, increased exports, environmental benefits, reduced health costs and national security should have higher priority than direct recoupment through future operations or sales of the technology.

Another factor to consider when developing recoupment criteria is possible lost tax revenue to the government. Since recoupment is not a principle payment on a loan, but is more akin to as a license fee, then recoupment payments may be expensed resulting in reduced tax liabilities. In theory approximately 35-45% (including state taxes) of funds paid to DOE as recoupment would have been paid to the IRS.

Recoupment Procedures and Criteria

The basic premise behind recoupment for the programs to be instituted under Subtitle A is that since the government is acting as a catalyst to initiate these technologies, the business should be allowed to develop and become competitive prior to repaying the government. Therefore, the recoupment criteria should allow a level profitability to be achieved consistent with the industry norm and the risk of the venture. Once having achieved an acceptable level of profitability, then the industrial sponsor should be willing to share its time good fortune with its U.S. Government investor. This can be done through allowing a negotiated level of cash flow prior to initiating recoupment. Cash flow can be defined in different ways, depending upon the source, that avoid the necessity of auditing a companies' books.

The recoupment plan should look to revenues from: the demonstration project, if there is subsequent commercial operation; future equipment sales, license fees and royalties for

foreign and domestic sales; and disposal of the demonstration facility. Examples as to how cash flow could be defined for each of these sources are shown below:

- *Demonstration/Commercial Facility.* Based upon projected economic performance, set a threshold of manufactured units of product. This threshold would be calculated based on the ROI acceptable to the industry. An acceptable ROI would be negotiated based on historical performance in the industry and the risk involved in the project. Once the production threshold is accomplished, a negotiated percentage of future revenues would be paid to the government.

  Another way to structure recoupment would be to set a threshold cash flow using the criteria in the above paragraph and when this has been achieved, pay a percentage of the net cash flow as recoupment. Net cash flow would be calculated by subtracting operating costs at the end of the demonstration period (escalated) from the actual revenues. This would minimize auditing requirements.

- *Retrofit or No Marketable Product.* Recoupment would be calculated as a percentage (negotiated) of the cost savings of the demonstration technology versus the alternative technology which achieves the same operating performance. This cost savings could either be calculated based upon the projected costs prior to demonstration or on the actual costs determined as the result of demonstration. The cost savings could be calculated on a per unit processed basis and then a unit threshold set based con the ROI. When the threshold is reached, the recoupment would be a percentage of future savings per unit processed.

- *Equipment Sales/License Fees and Royalties.* Negotiate a grace period to provide sufficient sales to get the business rolling. If the technology owner is a small business, then paying a percentage of the revenues in the early stages of business development could be a burden to the company. Even if it is not a small business, if the technology represents a profit/loss center of a larger company a recoupment requirement early on could distort performance. The market projections would be reviewed by the government and a determination would be made as to the need for a grace period beyond the completion of the demonstration project and initiation of recoupment payments.

  The grace period would be negotiated using an analysis of the market projections and the minimal cash flow to sustain continued operation. A grace period could be defined as a set period of time, after a certain level of revenue or cash flow was achieved, or after a certain number of equipment units were sold. Recoupment would be a percentage of sales and license fees after the grace period ends. The same formula as the Clean Coal Program may be appropriate. Trying to negotiate a different percentage for each technology may be impractical since the information would eventually become public. Therefore, a set percentage may be the fairest approach.

  Definition of the demonstration technology envelope eligible for recoupment is the key to how onerous repayment would be for this source of revenue. The definition of the envelope is completely dependent on the technology and the demonstration. As a minimum the technology envelope should include the fret-of-a-kind aspects of the demonstration, how these are integrated with conventional technology and the application of the technology. In some situations the envelope may include

conventional technology which is being used in a new application. Reasonable judgment must be used in developing the envelope, otherwise it could be too narrow in scope. For instance, the demonstration may be for a certain application, but may have also opened or advanced the market for other applications of the technology. One way to measure the reasonableness of the scope of the technology envelope is to compare it with the scope of the proprietary data claims of the industrial sponsor.

To encourage the domestic manufacture of equipment, all, or some fraction, of the amount to be paid to the government based on equipment sales could be waived for the portion of the equipment manufactured in the U.S. and credited towards an organization's repayment obligation.

- *Disposal of Demonstration Facility.* Share with the government on a prorated basis any revenue from the sale or disposal of the demonstration facility.
- *Alternative Source. The* government should be allowed to consider an alternative source of revenue for recoupment if proposed by the industrial sponsor and if it is projected to be equal to the projected amount of repayment resulting from the sources above. An example of an alternative source would be investment by the industrial sponsor in a deep discounted bond payable to the government and equal in real dollars to the projected recoupment from the sources above.

Recoupment Period

As defined by Sec. 1301(b)(3)(A) the recoupment period should be confined to up to twenty years after the demonstration period.

Recoupment and Foreign Ownership

If DOE initiates a demonstration program using a foreign technology (to be defined at a later date, consistent with U.S. trade policy), the same recoupment requirements would apply as to U.S. owned technology. DOE has the option to not select the foreign technology for demonstration.

If on the other hand, the U.S. technology owner should, after selection, sell the technology to a foreign entity (to be defined at a later date consistent with U.S. trade policy), then the recoupment obligation should revert to that of a loan with a set schedule of payments with interest.

Recoupment and Sunk Costs

If the demonstration technology was developed through a far more significant government investment than industrial investment, the industrial sunk costs, prior to demonstration, should not be considered in the ROI analysis.

If the demonstration technology was developed through a far more significant industrial investment than government investment, the industrial sunk costs, net of tax effect (estimated) should be considered in the ROI analysis.

Recoupment Cap

The maximum amount to be recouped by the government would be limited to the government's investment in the demonstration/commercial application project exclusive of R&D sunk costs and in-house government activities (e.g., NEPA, program management). The recoupment cap should be based on real, not nominal dollars.

Reporting Requirements

Reporting of the pertinent information for monitoring and auditing the recoupment process should be submitted no more frequently than quarterly and no less frequently than annually.

Secretary Waiver or Modification of Recoupment Agreements

The Secretary may waive the requirements of recoupment under Sec. 1301(b)(3)(B) of Subtitle A. The three criteria in Sec. 1301(b)(3)(A) would alleviate the obligation of payment of any remaining government investment at the end of the recoupment period or that a negotiated recoupment plan would have to project full repayment of the government.

If a recoupment agreement is to be modified or amended, the test, which is applied to government contracts and assistance agreements, of the modification being equal or better for the government than the original agreement should not apply. The criteria for approving a modification or granting a waiver should be defined by Sec. 1301(b)(A)(i), (ii) & (iii).

Appendix B

SEN-14-89 and Charters of the Executive Board and Review Panel

SUBJECT: CLEAN COAL TECHNOLOGY DEMONSTRATION PROGRAM IMPLEMENTATION ARRANGEMENTS

OATE: **12-15-89**

The purpose of this directive is to establish the organizational and management arrangements necessary to streamline the administrative review and approval process for government implementation of clean coal technology projects.

The Clean Coal Technology Demonstration Program (CCT) is an integral part of the Nation's overall effort to improve environmental quality, protect the economy from escalating energy costs, and ensure that coal continues to play a significant part in the balanced mix of energy sources available to our Nation as we enter the 21st century. It is, therefore, essential that the projects selected for demonstration under this Program be implemented on an expedited basis.

Accordingly, I have established the following management objectives for the CCT Program.

- **Within one year after projects are selected under CCT-III, CCT-IV, and CCT-V, negotiations shall be completed, participants' execution of the cooperative agreements shall be obtained, and the comprehensive reports shall be provided to Congress.**
- **By July 31, 1990, for those projects selected under CCT-I and CCT-II that have not yet completed the pm-award process, negotiations shall be completed, participants' execution of the cooperative agreements shall be obtained, and the comprehensive reports shall be provided to Congress.**
- **Projects are to be managed after award to ensure project objectives and schedules are being achieved.**
- **Project NEPA compliance activities are to be accomplished to ensure that project schedules are not unnecessarily delayed by the NEPA review and approval process.**

In order to ensure that these objectives are met, I have established the Clean Coal Technology Executive Board (Executive Board) which is directly responsible for managing the administrative review and approval process for project implementation. This includes pre-award activities, as well as any post-award activities that are necessary to insure the CCT projects remain on schedule so that the award objectives of the CCT program are obtained.

DISTRIBUTION:
ALL DEPARTMENTAL ELEMENTS

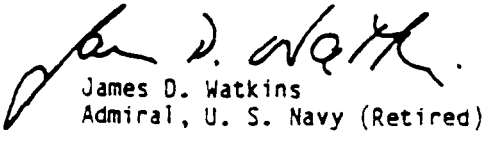
INITIATED BY:
OFFICE OF THE SECRETARY

The Executive Board is composed of the Assistant Secretaries for Fossil Energy (FE-1), Environment, Safety, and Health (EH-1), Management and Administration (MA-1), and the General Counsel (GC-1). Each Board member may designate an alternate, with full signature authority. To ensure timely availability of the Board to expedite the review and approval process, Board meetings must be attended by the Board member or his/her designated alternate. The Assistant Secretary for Fossil Energy (ASFE) chairs the Executive Board, and is authorized to convene it as often as circumstances warrant. The Executive Board is responsible to me for achieving the objectives outlined above, overseeing regress. and resolving issues, as necessary, to keep the CCT Program moving on schedule. The Executive Board will monitor progress on each project against an agreed-to-schedule and will report to me on the status of all the projects on a regular basis.

I have directed the ASFE to organize a Clean Coal Technology Review Panel(s) (Review Panel(s)) for each project composed of senior staff members from MA, GC, and FE. The Review Panel(s) will be responsible for the day-to-day review, approval, and coordination of actions required to complete all Headquarter's activities for the pre-award period as well as any post-award activities, as assigned by the ASFE. The Executive Board is responsible for assuring that adequate and appropriate resources are made available to staff the Review Panel(s).

This directive does not change the current line responsibilities of the Assistant Secretaries for Fossil Energy. The Assistant Secretary for Fossil Energy, however, requires timely assistance and support from other DOE Headquarters elements in order to accomplish the CCT Program objectives set forth in this directive. Accordingly, I have established these new organizational arrangements and management procedures to assure that the appropriate authority and accountability exists to expedite implementation of CCT projects.

I expect both the Executive Board and the Review Panel(s) to be operational before project selections for CCT-III are announced.



James D. Watkins
Admiral, U. S. Navy (Retired)

Functions and Operating Procedures
Clean Coal Technology Executive Board

BACKGROUND

On December 15, 1989, the Secretary of Energy issued a directive to streamline the review and approval process of DOE administrative activities for clean coal technology projects. In order to accomplish this, the Secretary established a Clean Coal Technology Executive Board to be chaired by the Assistant Secretary for Fossil Energy (FE-1). The other members consist of the Assistant Secretaries for Management and Administration (MA-1), Environment, Safety and Health (EH-1), and the General Counsel (GC-1). The Secretary also directed FE-1 to organize a Clean Coal Technology Review Panel with responsibility for day-to-day working level actions of the involved DOE HQ organizations. The purpose of this document is to describe the functions and operating procedures of the Executive Board and its relationship to the Review Panel(s).

EXECUTIVE BOARD AUTHORITY

The Executive Board authority is derived from a Secretarial Directive that requires the Board to take all necessary administrative steps to streamline the HQ review process for implementation of Clean Coal Technology projects.

SOURCE SELECTION OFFICIAL (SSO) AUTHORITY

The SSO retains all authority delegated to him by the Under Secretary as described in that delegation for the selection of clean coal projects. The SSO will remain the final authority to approve any project change(s) between selection and award that would potentially alter the outcome of the selection process.

MANAGEMENT AND ADMINISTRATION AUTHORITY

The Assistant Secretary of Management and Administration, as delegated to the Office of Clearance and Support, has the authority to coordinate field recommended Pre-Negotiation Plans, Post-Negotiation Summaries and negotiated Cooperative Agreements, consistent with the findings and recommendations of the Review Panel or Executive Board.

EXECUTIVE BOARD RESPONSIBILITY

The Executive Board is charged with the responsibility to ensure the timely completion of all Department administrative activities that begin following project selection and need to be finalized in order for the cooperative agreement (including the repayment agreement) to be awarded on schedule, and for the Participant to proceed, on schedule, with the demonstration project.

The Executive Board shall direct the resources under its leadership to complete negotiations and project implementation and assist the NEPA process consistent with the schedules established by the Secretarial Directive:

- Within one year after projects are selected under CCT-III, CCT-IV, and CCT-V, negotiations shall be completed, participants' execution of the cooperative agreements shall be obtained, and the comprehensive reports shall be provided to Congress.

- By July 31, 1990, for those projects selected under CCT-I and CCT-II that have not yet completed the pre-award process, negotiations shall be completed, participants' execution of the cooperative agreements shall be obtained, and the comprehensive reports shall be provided to Congress.

- Projects are to be managed after award to ensure project objectives and schedules are being achieved.

- Project NEPA compliance activities are to be accomplished to ensure that project schedules are not unnecessarily delayed by the NEPA review and approval process.

Executive Board members will exercise their individual authorities collectively as a managing body to:

- Provide the necessary staff resources and expertise from each organization to perform HQ Clean Coal administrative tasks in a timely manner.

- Provide policy guidance to the Review Panel(s) and to the ASFE.

- Monitor progress on each project negotiation and implementation against an agreed upon schedule, and report to the Secretary on the overall progress of the CCT Program on a regular basis.

- Resolve issues referred to the Executive Board by the Review Panel(s), or for which FE-1 desires the viewpoint of the Executive Board members.

- Approve and forward to the Secretary Comprehensive Reports to Congress on negotiated projects that have been accepted by the Review Panel and forwarded to the Executive Board by FE-1.

- Provide a final control, where necessary, on the timeliness and quality of documents generated and actions taken by DOE staff to comply with the Clean Coal management objectives, as set forth in the Secretarial Directive.

In addition, the Executive Board will remain cognizant of Clean Coal NEPA requirements and shall support FE-1 as that organization completes NEPA compliance activities. The Executive Board shall also support EH-1 in its responsibility for NEPA compliance oversight. FE-1 and EH-1 are responsible for providing the necessary resources and to show due diligence towards completing NEPA activities under its control on a schedule that is compatible with overall project milestones.

EXECUTIVE BOARD ACCOUNTABILITY

The Executive Board is accountable to the Secretary of Energy to fulfill the administrative objectives as defined by the Secretarial Directive on Clean Coal Technology Project implementation. The Executive Board will implement all further directions provided by the Secretary.

The Executive Board shall meet with the Secretary, on a time schedule consistent with his requirements, to report project pre-award milestone status, status of NEPA activities, and all other matters that would require Secretarial attention.

EXECUTIVE BOARD OPERATIONS

The Executive Board shall convene at the direction of FE-1. The following activities will be accomplished:

- o The Board will review and confirm the composition of the Clean Coal Technology Review Panel(s) as proposed by the Assistant Secretary for Fossil Energy.

- o The Board members will authorize the Review Panel staff to act on behalf of their respective organizations, and to call upon others when necessary, to concur in, approve, or process all necessary pre-award documents leading to project approval.

  - These. documents include Pre- and Post-Negotiation documents, Cooperative Agreements (including repayment agreements), Comprehensive Reports to Congress, and, if required, SS0 Determinations.

  - The Assistant Secretary for Environment Safety and Health, through the Office of NEPA Project Assistance, EH-25, will independently direct staff to meet the NEPA schedule guidelines of the Secretarial Directive. Status of NEPA activities, in relation to project schedules, will be coordinated and presented to the Executive Board.

- o The Board will establish its internal operating procedures and time schedules, which will be based upon the following considerations:

  - The need to adequately communicate the findings of the Board, (for example, by appointing an executive secretary to prepare and distribute meeting minutes.)

  - The need to become conversant with the key aspects of the PONs and any overriding policy issues which may impact decisionmaking.

Following DOE announcement of the Clean Coal projects selected for award under the CCT III PON. the Executive Board will function on a fully operational basis to fulfill its charter as defined by the Secretarial Directive. The following protocols will be in place during Executive Board operations:

EXECUTIVE BOARD ACCOUNTABILITY

The Executive Board is accountable to the Secretary of Energy to fulfill the administrative objectives as defined by the Secretarial Directive on Clean Coal Technology Project implementation. The Executive Board will implement all further directions provided by the Secretary.

The Executive Board shall meet with the Secretary, on a time schedule consistent with his requirements, to report project pre-award milestone status, status of NEPA activities, and all other matters that would require Secretarial attention.

EXECUTIVE BOARD OPERATIONS

The Executive Board shall convene at the direction of FE-1. The following activities will be accomplished:

- o The Board will review and confirm the composition of the Clean Coal Technology Review Panel(s) as proposed by the Assistant Secretary for Fossil Energy.

- o The Board members will authorize the Review Panel staff to act on behalf of their respective organizations, and to call upon others when necessary, to concur in, approve, or process all necessary pre-award documents leading to project approval.

  - These. documents include Pre- and Post-Negotiation documents, Cooperative Agreements (including repayment agreements), Comprehensive Reports to Congress, and, if required, SS0 Determinations.

  - The Assistant Secretary for Environment Safety and Health, through the Office of NEPA Project Assistance, EH-25, will independently direct staff to meet the NEPA schedule guidelines of the Secretarial Directive. Status of NEPA activities, in relation to project schedules, will be coordinated and presented to the Executive Board.

- o The Board will establish its internal operating procedures and time schedules, which will be based upon the following considerations:

  - The need to adequately communicate the findings of the Board, (for example, by appointing an executive secretary to prepare and distribute meeting minutes.)

  - The need to become conversant with the key aspects of the PONs and any overriding policy issues which may impact decisionmaking.

Following DOE announcement of the Clean Coal projects selected for award under the CCT III PON. the Executive Board will function on a fully operational basis to fulfill its charter as defined by the Secretarial Directive. The following protocols will be in place during Executive Board operations:

CHARTER DOCUMENT

Clean Coal Technology Review Panel
Functions and Operating Procedures

Background:

On December 15, 1989, the Secretary issued a directive to streamline the review and approval process of DOE administrative activities for clean coal technology projects. In order to accomplish this, the Secretary established a Clean Coal Technology Executive Board. The Secretary also directed FE-1 to organize a Clean Coal Technology Review Panel(s). The Review Panel(s) will be responsible for the day to day review, approval and coordination of all Headquarters technical, legal and business actions required for each project in negotiation.

The purpose of this document is to describe the functions and operating procedures of the Review Panel and its relationship to the Executive Board, other HQ organizational groups and to the Field negotiating teams.

Review Panel Composition

The Review Panel(s) shall be comprised of directors or senior staff from the Offices of FE-20 (Chair for Panel activities), MA-40, GC-34, and GC-42. Similar representatives shall be provided from GC-11 and EH-25 on an ex *officio* basis. The individual members of the Executive Board will appoint the members of the Review Panel from within its respective organization. Panel members shall have this job function as their highest priority and will participate on the Review Panel on a full time basis, when necessary.

Review Panel Authority:

The Secretarial Directive (SEN-14-89) directed the Assistant Secretary for Fossil Energy (ASFE) to organize a Review Panel(s) to be . . . "responsible for the day-to-day review, approval, and coordination of actions required to complete all Headquarters' activities for the pre-award period as well as any post-award activities, as assigned by the ASFE." The authority to independently accomplish these tasks will be individually delegated to each member of the Review Panel by their respective organizations.

Fossil Energy will chair the Review Panel. The Panel chair is to coordinate the day to day activities of the Panel.

Panel members have authority to bring to closure all pre-award actions.

Interface with the Executive Board:

The Executive Board will make decisions on policy issues **and other matters that are unresolved at the Panel level.** The Board will also exercise its authority to assure that Secretarial directed deadlines are met and that the Review Panel is expeditiously handling each stage in the pre-award review.

Management and Administration Authority:

Authority to sign all approval notifications to the Field centers, consistent with the recommendations of the Review Panel or Executive Board, shall vest in the Procurement member of the Panel.

Review Panel Responsibilities:

The Review Panel is charged with the responsibility to manage the Headquarters review and approval process associated with Field negotiated cooperative agreements and Comprehensive Reports to Congress. Associated actions under Review Panel operations include presentations of policy issues to the Executive Board and communications with the Source Selection Official (SS0) and ASFE. These activities shall be completed on a time schedule consistent with the Secretarial Directive.

The Review Panel will assume the following responsibilities as part of its day to day management duties:

o Manage the day to day review, approval and coordination of all HQ actions required to complete the technical, legal and business aspects of each project in negotiation, in a time frame consistent with milestone schedules approved by the Executive Board. Review and approve all formal pre-award documentation.

o Serve as the single point of contact within Headquarters and between Headquarters and the Field on the coordination and review of project negotiation activities and on the processing of pre-award documents through the Department.

o Provide policy guidance to the Field negotiating teams, based upon the Secretarial Directive, Executive Board guidance, DOE/Fossil Energy policy, PON requirements, financial assistance regulations, and statutes. Provide guidance on what is expected for the pre-award documents submitted to HQ.

o Coordinate pre-award milestone schedules between the Field Centers to arrive at an overall program schedule. Approve individual project pre-award milestone schedules developed in consultation with the Field negotiation teams.

- Hold informal monthly meetings (at the discretion of the Review Panel) with the Field to review the status on pre-award projects and provide guidance, as requested. Hold additional meetings, on an as needed basis, to respond to issues that may arise in the course of the pre-award process.

- Present issues to the Executive Board for cases where deviations from DOE policy, PON requirements, financial assistance regulations, or statutes may be occurring.

- Provide recommendations to the SS0 regarding approval/disapproval of project changes that would have potentially altered the outcome of the selection process.

- Assist with NEPA compliance activities on those projects where the project schedule could be adversely impacted by the NEPA review and approval process. Coordinate and present the status of NEPA activities, in relation to project schedules, to the Executive Board.

- Report to the Executive Board issues that may impact Secretarial deadlines and NEPA compliance or other slippages that may impact planned project schedules.

- Upon Review Panel approval of the Post-negotiation Summary, the Cooperative Agreement (including the repayment agreement), and the Comprehensive Report to Congress, transmit to the Executive Board the Action Memorandum to the Secretary and the Comprehensive Report to Congress for final concurrence by the Board and submission to the Secretary.

- Prepare reports on the status of negotiations for the Board to transmit to the Secretary.

Review Panel Accountability:

The Review Panel is accountable to the Executive Board to fulfill its charter as defined by this document and by further Executive Board delegations. The Review Panel shall report to the Executive Board on a regular basis on project pre-award milestone status, status of NEPA activities, and all other matters that would require Executive Board attention.

The Review **Panel will be formally constituted by Executive Board approval of this document and by the appointment of Panel members.**

Michael R. McElwrath
Acting Assistant Secretary
Fossil Energy

Donna R. Fitzpatrick
Assistant Secretary
Management and Administration

Stephen A. Wakefield
General Counsel

Peter N. 8rush
/Acting Assistant Secretary
Environment. Safety and Health

Appendix C

Procedures for Evaluating and Implementing Major Changes in a CCT Project

A major strength of the Clean Coal Technology Demonstration Program has been its ability to accommodate change while maintaining the integrity of the relevant Program Opportunity Notice (PON) and selection criteria. This has been accomplished by institutionalizing a procedure that applies a predetermined set of criteria to the decision process used to approve or disapprove a proposed change.

As a first step, the proposed change and/or the resulting project is reviewed to determine if either of the following conditions exists:

- It conflicts in any way with the terms and provisions of the relevant solicitation or the basis for selection as set forth in the Source Evaluation Board report and in the selection statement. The basis for approval rests with determining whether the technical integrity of the project is maintained such that it continues to meet the original project objectives and is consistent with program commercialization goals.
- It is, from a business perspective, at least as attractive to the government as the original project.

There are two stages in the implementation of a project when a project change proposal can be submitted. The first is during the fact-finding/negotiation process preceding, but leading to, the execution of a cooperative agreement. The second stage is subsequent to the signing of the cooperative agreement.

Proposals for change received during the preaward stage are processed as follows:

- Each change is examined against the solicitation (PON) evaluation criteria to determine whether or not the revised proposal as a whole would have scored at least as well as the original proposal.
- The proposed business arrangements are examined by legal, procurement, and program office staffs for compliance with the PON.
- The change is also viewed in light of the basis for selection as set forth in the selection statement.
- The findings from the above assessments are submitted to the Source Selection Official (SS0) designated for the solicitation under which the project was selected. The SS0 determines whether or not the project still would have been selected given the proposed changes.

- **If the SS0 renders a positive finding, preaward activities continue toward structuring a** cooperative agreement. The adequacy of the proposed cooperative agreement from a DOE standpoint is ultimately determined by the Assistant Secretary for Fossil Energy (ASFE) utilizing the assessment results of the Review Panel considering programmatic, legal, and procurement issues. The criteria applied in judging the adequacy of a proposed project are those contained in the PON and incorporated within a model cooperative agreement.

o Once the negotiated cooperative agreement is signed by the industrial participant, the proposed project is described in detail in a comprehensive report that is submitted to Congress for its consideration. If no action is taken by Congress within 30 session-days, DOE signs the cooperative agreement.

Proposals for change received subsequent to the execution of the cooperative agreement are processed as follows:

- The set of criteria applied in judging the merit of proposed changes is encompassed in the existing cooperative agreement. The end result of the change must be at least as attractive as the original cooperative agreement. The transaction must be in the best interest of the government. The ability to address changes subsequent to award also provides the government with the flexibility to negotiate, as necessary, more stringent terms or conditions into the amended cooperative agreement; for example, withholding the DOE cost-share until the project meets certain conditions, improving repayment terms, enhancing liability protection, reducing the DOE cost-share, or expanding the work scope.

. The changes are examined in light of potential legal liabilities, i.e., potential challenges to the validity of the solicitation/selection/award process. Considered are questions such as is there evidence that the participant secured a cooperative agreement for the sole purpose of selling the project to others is the project still consistent with the PON and the basis for selection; has the technical objective of the project been compromised is the financing for the project in place.

- As to technical objectives, the impact of the changes on scoring of the proposal by the Source Evaluation Board is examined. This examination essentially deals with the importance placed in the original proposal on specific technology components and their projected economic, efficiency, and environmental benefits. In addition, the adequacy of the proposed approach is examined as to successful completion of design, construction, and operation; and whether or not the resultant data will enable industry to judge the performance potential of the technology at commercial scale.

The CCT Review Panel ensures the adequacy of the assessments outlined above and recommends a course of action to the ASFE. The Secretary of Energy and relevant congressional representatives are advised of the Board's proposed action. If the Review Panel's recommendation is positive and there is no request for further study, the ASFE directs the proposed changes to be implemented.

The success of the process for change is evident in the numerous proposed actions that have been completed for projects in the preaward as well as postaward stage of implementation.

Appendix D

Program and Project Information Sources

The following describes information sources and mechanisms for its distribution presently in place in the CCT Program as well as those that are planned.

Program Publications

The program office publishes several documents that serve to update and educate a broad audience on the Clean Coal Technology Program:

- *The Program Update is an* annual state-of-the-program Report submitted to Congress in the February/March timeframe updating the program through the prior calendar year. It serves as the primary reference document for the program incorporating the history, mission, financial perspective, environmental aspects, commercial deployment activities, major program accomplishments, results of completed projects, fact sheets on each project, and appendixes covering commonly requested crosscutting information and key historical data.
- The *Clean Coal Today* newsletter, published quarterly, highlights key events, features projects at important junctures, summarizes the status of all projects, identifies upcoming events, and lists recent technical publications on the projects.
- *Clean Coal Technology- New Coal Era is* a brochure designed for a bread audience summarizing, in lay terms, what the CCT Program is and why it is important.
- A *Comprehensive Report to Congress is prepared for each solicitation.* It summarizes the genesis from appropriations through selection, the projects proposed, the evaluation process, the selection decision, and environmental considerations.
- A *Comprehensive Report to Congress is* prepared *for each project as* a condition for cooperative agreement award. This report reviews the evaluation and selection process, the technical features of the project and technology, the role that the demonstration plays in commercialization of that particular technology, the market potential, environmental considerations, business arrangements, and project costs and schedule.
- The *Annual Clean Coal Technology Conference Proceedings*, published each fall, captures the presentations and discussions on policy issues impacting the program as well as technical progress reports on each of the projects. The conference is the program's key outreach event that brings together public- and private-sector policy-makers from the United States and overseas, and the technical and planning personnel who decide the commercial future of the technologies.

- *The Programmatic Environmental Impact Statement was* prepared as part of the overall plan for compliance with the National Environmental Policy Act. It addresses the environmental consequences of widespread commercial deployment by the private sector, for 2010, of successful demonstrations of 22 generic clean coal technologies.

Project Information Sources

The following are publicly available documents for each project

- *Annual Technical Report. This* report provides a comprehensive annual update of the work performed under the demonstration, including the results, the underlying data assessments, and the consequences regarding commercialization plans.

- *Preliminary and Final Public Design Reports.* In the preliminary *report,* conceptual design considerations early in the project are translated into process and equipment descriptions and expected performance. The *final report* represents the plant as built, with descriptions of the actual process and equipment, pertinent cost data and definitive performance projections. More specifically, these nonproprietary representations of the demonstration technology include mass and energy balances for the process; process performance requirements and the supporting rationale; equipment capacity, operating and design parameters, and vendor identification; process flow diagrams and drawings depicting plant configuration and equipment layout capital and operating costs.

- *Topical Reports. These are* designed to highlight project events or to capture progress at particular points driven by project-specific considerations. The subject matter is negotiated into the cooperative agreements on a project-by-project basis.

- *Environmental Information Volume.* A comprehensive, site-specific assessment of the baseline air, water, land, and solid waste conditions existing prior to the project and those conditions expected as a result of the project, this report serves as the information source for preparation of NEPA compliance documentation.

- *Project Specific NEPA Document.* A document prepared, considered and published in full conformance with the Council on Environmental Quality's NEPA regulations and DOE's regulations for NEPA Compliance. The CCT Program has used the following NEPA documents: Categorical Exclusion; Memorandum-to-File Environmental Assessment and Environmental Impact Statement.

- *Environmental Monitoring Plan.* This plan sets forth both regulated and unregulated emissions to be measured and where and how the samples will be taken and analyzed. The plan is developed by assessing process stream constituents over the full range of operating parameters; determining what monitoring is required to comply with federal, state, and local statutes; and identifying other emissions that could pose problems. As to the latter, the type of problem and potential mechanisms for causing damage dictate the monitoring program. The objective of the plan is to ensure that there are no outstanding questions regarding environmental performance of the technology as it is considered for commercial applications.

- *Environmental Monitoring Reports. These* reports are published annually and report the results of the sampling and analysis program agreed upon under the environmental monitoring plan.

- *Technology Performance and Economic Evaluation Report. This* report discusses the participant's results of an economic analysis and performance evaluation for the commercial configuration of the demonstrated technology. The report, submitted at the end of the project, reflects the participant's commercial plant design and discusses the participant's experience in operating the technology. The full range of costs are discussed including capital equipment, land, coal, water, electricity, operating costs, project and process contingencies, construction costs, and interest rates assumed.

- *Final Technical Report. This* technical account of the total work performed under the cooperative agreement provides a comprehensive description of the results achieved and the investigations undertaken. It includes an analysis of the technical readiness of the demonstrated technology for marketing and commercialization plans. It includes data, figures, photographs, and references in support of the investigations undertaken and conclusions reached.

Programmatic Reports

- *Post-Project Assessment Report. This* report presents DOE's independent assessment of the demonstrated technology, the success of the demonstration in collecting the needed data for commercial realization, and the costs and environmental benefit (or impacts) that can be expeccted for the commercial version of the technology.

Additionally, it is expected that the program will soon institutionalize other reports as vehicles for distributing operational test data, project assessments, project accomplishments and project performance histories.

Appendix E

Acronyms and Abbreviations

ACFB	atmospheric cumulating fluidized bed
AFGD	advanced flue gas desulfurization
AIDEA	Alaska Industrial Development and Export Authority
CAAA of 1990	Clean Air Act Amendments of 1990
Ca/S	molar ratio of calcium to sulfur
CCT	clean coal technology
CCT Program	Clean Coal Technology Demonstration Program
CFB	circulating fluidized bed
CX	categorical exclusion
DOE	U.S. Department of Energy
EA	environmental assessment
EIS	environmental impact statement
EMP	environmental monitoring plan
EPA	U.S. Environmental Protection Agency
FONSI	finding of no significant impact
FY	fiscal year
IGCC	integrated gasification combined cycle
kW	kilowatt
LIMB	limestone injection multistage burner
METC	Morgantown Energy Technology Center
MTF	memorandum (memoranda)-to-file
MWe	megawatt(s) -electric
NEPA	National Environmental Policy Act
NO_x	nitrogen oxides
PCFB	pressurized circulating fluidized bed
PEIA	programmatic environmental impact assessment
PEIS	programmatic environmental impact statement
PETC	Pittsburgh Energy Technology Center
PFBC	pressurized fluidized-bed combustion
FQN	program opportunity notice
ppm	parts per million (mass)
SBIR	Small Business Innovative Research
SBTT	Small Business Technology Transfer
so,	sulfur dioxide
TVA	Tennessee Valley Authority