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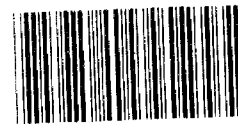
Testimony

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Views on DOE's Clean Coal
Technology Program

Statement of
John W. Sprague, Associate Director
Resources, Community, and Economic
Development Division

Before the
Subcommittee on Energy and Power
Committee on Energy and Commerce
House of Representatives



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Mr. Chairman and Members of the Subcommittee:

We appreciate the opportunity to present our views on the Department of Energy's (DOE) Clean Coal Technology (CCT) program and issues affecting the program. At the Chairman's request, we reviewed (1) the implementation and status of the program, (2) the relationship between the program and recommendations of the U.S.-Canadian envoys' report on acid rain, and (3) the potential effect that pending acid rain control legislation could have on the program. Our work is still ongoing and, therefore, the views we express today are preliminary and subject to change.

In summary,

- DOE has funded seven projects for the first phase, or round one, of the program and is negotiating with sponsors to fund four other projects. The seven projects will receive \$227.5 million in federal assistance and \$529.8 million from nonfederal sources. DOE had problems in finalizing cooperative agreements for five of the projects because the sponsors had difficulties in completing financial and other business arrangements. Sponsors also objected to federal cost recovery provisions and providing technical design and operational data, which caused negotiation problems. While some useful changes were made for the second round of the program, DOE may have similar problems in negotiating future agreements.

- In accordance with the U.S.-Canadian envoys' report on controlling acid rain, DOE plans to place more emphasis on funding emission reduction technologies in round two. However, DOE and the Environmental Protection Agency (EPA) disagree on the types of technologies that will result in near-term emission reductions on existing coal-burning

facilities, as called for in the envoys' report. DOE and EPA need to resolve their differences on this matter.

- The Congress is considering many bills to reduce emissions by varying amounts and time frames. While we are not expressing an opinion on any specific bill, the Congress should decide what the CCT program's role is in reducing emissions to control acid rain.

Before I discuss these areas further, let me provide some background on the program.

THE CLEAN COAL TECHNOLOGY PROGRAM

The CCT program is a cost-shared demonstration program designed to encourage the commercialization of emerging clean coal technologies by providing federal financial assistance of up to 50 percent of the project costs. In 1985 the Congress made available \$400 million from the Clean Coal Technology Reserve for round one of the program. In February 1986, DOE solicited cost-shared proposals for the construction and operation of projects that would demonstrate the feasibility and commercial application of a broad slate of emerging clean coal technologies. After evaluating 51 proposals, DOE selected 9 projects in July 1986 to receive a total of about \$362 million in CCT program funds.

In January 1986, special U.S. and Canadian envoys issued a joint report (referred to as "the envoys' report") which contained several recommendations aimed at reducing the environmental problems associated with U.S., Canadian, and transboundary acid rain. Sulfur dioxide and nitrogen oxide emissions associated with coal combustion contribute to the formation of acid rain. The report recommended that the U.S. government implement a 5-year, \$5 billion commercial demonstration program in which the federal government would provide up to half, or about \$2.5 billion, of the

funding to advance the types of technologies that would be needed for any future acid rain control program. The Innovative Clean Coal Technology program, or round two of the CCT program, grew out of the President's commitment on March 18, 1987, to request the full amount of the federal share of funding recommended by the envoys' report.

DOE, in a 1987 report to the Congress on the CCT program, stated that round two of the program would be directed at seeking new means of employing emerging clean coal technologies with the objective of reducing sulfur dioxide and/or nitrogen oxide emissions. DOE also stated an additional objective of improving the economics of using coal and seeking means of converting coal into forms that could allow its use as a cost-effective substitute for oil and natural gas. For round two of the program, the Congress appropriated a total of \$575 million for fiscal years 1988-89. DOE has proposed an additional \$1.5 billion in program funds for fiscal years 1990 through 1992.

STATUS OF THE CCT PROGRAM

As of May 31, 1988, cooperative agreements totaling \$227.5 million in federal financial assistance and \$529.8 million in nonfederal financing had been finalized for seven projects. Two of the original nine projects were withdrawn because the sponsors could not formalize project financing or third-party agreements. The withdrawn projects were replaced with four others from an alternate list of eligible projects. DOE and the project sponsors have not finalized cooperative agreements for any of the replacement projects, but DOE expects to finalize those agreements by December 1988.

Of the seven projects now under cooperative agreements, one was scheduled for completion in early 1989, two were to be completed in late 1990, one in late 1991, one in early 1993, one in

late 1993, and one in late 1994. As of May 31, 1988, three of the projects were on schedule, but the completion dates had been slightly delayed for the remaining four. Additional information on round one projects is presented in attachment I to my statement.

DOE issued the solicitation notice for round two project proposals on February 22, 1988, and received 54 proposals by the cut-off date of May 23, 1988. DOE expects to make its selections by October 30, 1988.

Project Negotiation Problems

DOE officials planned to sign cooperative agreements with sponsors of the initially selected projects by April 1987, but only two agreements were finalized by that date. Delayed by negotiation difficulties, the other five agreements were finalized between June 1987 and January 1988.

According to DOE officials, project participants' difficulties in finalizing financial and other business arrangements caused major delays in completing and signing cooperative agreements and significantly contributed to the withdrawal of two of the originally selected projects. The cooperative agreements for the four projects that DOE rated as having "good" or "better" financial plans were completed in less time than the five other projects with lower ratings. Cooperative agreements for the latter five projects either took longer than 500 days to finalize or the project sponsors withdrew from the process. DOE officials initially planned to take about 247 days to finalize the agreements.

For round one, DOE established the policy that the government should recoup its investment in clean coal projects within 20 years after commercialization of individual projects. Recoupment was to come primarily from (1) the net revenues generated from project operations and (2) the revenues accruing from the commercial sale,

lease, manufacture, licensing, or use of the demonstrated technology.

DOE officials stated that the recoupment provisions were not very well received by private-sector sponsors. The provisions created negotiation problems, which delayed the formalizing of one cooperative agreement and were a factor in the sponsor's withdrawal of another project. According to the project selection committee chairman, project sponsors generally did not want to be legally bound to repay the government if the demonstrated technology was ultimately commercialized, although sponsors of the seven projects ultimately agreed to this provision.

According to DOE, technical data rights determinations also caused some delays in formalizing cooperative agreements. DOE patent counsels in DOE headquarters and at the Oak Ridge Operations Office stated that although the participants were able to withhold technical data developed prior to the agreement from public disclosure, the participants were concerned that technical data resulting from the project would be subject to public disclosure.

According to a DOE patent counsel who assisted in the negotiations, resolution of technical data rights was important to the formalization of all five of the cooperative agreements he worked on. In addition, a DOE official noted that in the case of one withdrawn project, the inability of the parties to resolve technical data rights was a major cause for negotiation delays before the sponsors finally withdrew their proposal.

Programmatic Changes in Round Two

Several major changes were made between the solicitations for round one and round two of the CCT program.

- Presidential direction shifted the focus of the program from a broad approach of funding varied technologies that could increase the use of coal while minimizing environmental impacts to a more focused objective of placing more emphasis on funding technologies that can achieve significant emissions reductions from existing coal-burning facilities.
- Statutory provisions expanded the program's cost-sharing provisions and time frames for selection. Some pre-award costs related to the preparation of material requested by DOE can be reimbursed to the sponsors for round two proposals. In addition, the length of time allowed for proposal submission and selection has been extended to 90 days and 160 days, respectively.
- Office of Management and Budget recommendations prompted DOE to more precisely define recoupment provisions. Changes to the recoupment plan include adjusting the recoverable amount for inflation, specifying a federal share of 3 percent of the royalties arising from licensing, and specifying a 2-percent share for the government of gross sales revenues generated by the sale of equipment manufactured as a result of commercialization.
- Lessons DOE learned during round one elevated the importance of financing and led to the establishment of mutually agreed upon negotiation milestones prior to award. In round one, DOE placed little weight on financing criteria and required participants to have their financial commitments in place for the entire project at the time of financial award. For round two, in recognition of the difficulty of securing all financing at the project's inception, DOE is giving significantly increased emphasis to financing criteria in its evaluation and selection

process. DOE will only require in-place financial commitments through a project's preliminary design phase. In addition, DOE and the project sponsor will mutually establish a schedule for negotiation which will include specific milestones.

- In response to the concerns of environmentalists, DOE plans to include an environmental analysis in its pre-award report to the Congress. The analysis would describe the potential environmental changes that may be produced regionally and nationally by the year 2010 if demonstration technologies are commercialized.

Generally, we believe that most of the changes are useful and should help alleviate some of the negotiation difficulties and attendant delays experienced during round one of the program. In addition, the objective has been more narrowly focused by virtue of DOE's plan to use criteria consistent with recommendations in the envoys' report and place emphasis on funding technologies that can lead to reduced sulfur and nitrogen oxide emissions from existing coal-burning facilities.

However, on the basis of our review of public comments regarding the solicitation and our discussions with cognizant public officials, it appears that problems related to technical data rights and participant dissatisfaction with, and objection to, recoupment provisions will continue to cause negotiation difficulties. Although DOE has attempted to address these issues, solutions to these problems are not yet apparent.

As part of its pre-award report to the Congress, DOE plans to include an analysis describing the maximum potential change in principal air emissions, water effluents, and solid wastes that could be produced based on commercial application of the demonstrated technology. However, DOE's current plan only calls

for a general environmental discussion of the generic technology to be used for the project, and does not call for a specific discussion of the environmental impact of the particular project to be demonstrated.

In this regard, a Senate committee report on fiscal year 1987 appropriations stated that DOE should obtain project-specific data from the sponsors. The Congress would be better informed in reviewing a proposed project if specific data, including environmental impact data, were also included in DOE's report on the project. The inclusion of specific project data, in addition to the generic data, should not result in significant additional costs because DOE has already been requested to obtain this type of information from project sponsors.

CONSISTENCY WITH ENVOYS'
REPORT RECOMMENDATIONS

The envoys' report contained several recommendations aimed at reducing acid rain. The report recommended that the program give special consideration to retrofit technologies that could be applied to existing facilities that currently use high-sulfur coal so that some "near term" emissions reduction and acid rain abatement could be achieved.

Although there was no statutory requirement for round one to conform to recommendations of the envoys' report, considerable disagreement exists regarding the extent to which DOE's implementation of the CCT program has been consistent with recommendations of the envoys' report. A key factor in the debate centers around the retrofittability of specific projects.

DOE applies a broader definition of what constitutes a retrofittable application than does EPA. DOE has taken the view that the demonstrated technology will meet the envoys' definition

of being retrofittable if it can make use of existing plant equipment such as the steam turbine. Accordingly, a project could be classified as a retrofit application even though the existing boiler was not utilized or the boiler required extensive modification. EPA's interpretation is based on the extent to which a demonstrated technology is retrofittable on existing coal boilers at minimal cost. EPA's definition is not limited to scrubbers, however, and can include other retrofittable technologies such as slagging combustors and sorbent injection processes.

Retrofittability determinations can influence program direction and focus. To illustrate, using DOE's classification of retrofit projects, we calculated that about \$171 million for five projects, or approximately 75 percent of the federal financial assistance provided under round one of the program, was consistent with the envoys' recommendations regarding retrofittability. However, using EPA's retrofittability assessment, we calculated that only about \$23 million for three projects, or about 10 percent of the financial assistance, was consistent with the envoys' retrofit recommendations.

DOE and EPA need to resolve their differences on what constitutes retrofit technologies because the controversy will likely take on greater significance for round two projects. The second round is more directly related to recommendations of the envoys' report.

IMPACT OF PENDING LEGISLATION ON DOE'S CLEAN COAL TECHNOLOGY PROGRAM

The Congress has been debating whether acid rain-causing emissions can be reduced in the near term without impeding the development and commercialization of clean coal technologies. One key issue on which the debate centers is the need, and proper time, to mandate reduction controls in conjunction with amending the

Clean Air Act, which regulates emissions of sulfur dioxide and nitrogen oxides. In order to obtain a balanced perspective about acid rain control and clean coal technologies, we met with environmental groups such as the Natural Resources Defense Council and Greenpeace, and supporters of the CCT program such as utility groups and the Electric Power Research Institute (EPRI).

The following topics discuss (1) acid rain control bills and how they relate to the CCT program, (2) the commercial availability of emerging technologies, (3) possible approaches for linking the commercial availability of clean coal technologies with emission reductions and compliance schedules contained in the bills, and (4) the question of whether the CCT program should be directly related to acid rain control legislation.

Acid Rain Bills and the CCT Program

We identified 19 acid rain control bills that have been introduced since January 1987. Most would amend the Clean Air Act by requiring reductions of sulfur dioxide and nitrogen oxide emissions. Attachment II details key provisions of pending legislation regarding acid rain control.

The enactment of legislation that prescribes new deadlines and/or emission targets for controlling acid rain could affect the potential effectiveness of DOE's CCT program. For example, if legislative compliance deadlines are established to take effect before funded technologies are commercially available or if emission-reduction target levels are higher than they can attain, utilities may likely switch to low-sulfur coal, clean coal prior to combustion, or use scrubbers. Many CCT program supporters believe that utilities that incur the cost to comply with newly mandated emission reduction levels through investment in conventional technology, such as scrubbers, on existing plants would not subsequently expend additional resources to acquire newly

emerged clean coal technologies for those same plants. Therefore, potential benefits of the CCT program could be unrealized.

Also, the scheduled demonstration completion dates for the seven funded projects range from early 1989 to late 1994. The legislative compliance dates of some pending legislation are as soon as the early 1990s. Therefore, some of these technologies may not even have been successfully demonstrated by the emission reduction compliance dates contained in some pending acid rain legislation.

In addition, even after the completion of the demonstration period for funded projects, an uncertain amount of time is required to bring the technologies to the point of commercialization. As noted in a recent EPRI study, none of the round one CCT program technologies is "on the market" today in the sense of being a mature technology with several units installed or ordered for commercial operation, and with well-defined cost, performance, and risk profiles. Further, when these technologies are commercially available, their deployment would involve cost decisions, and construction and public utility commission licensing could take several years.

Commercial Availability

EPRI has estimated that for technologies similar to those being demonstrated under round one, the commercial availability dates range from 1992 to 2000, with most of the technologies potentially available in the mid-1990s. That time frame is consistent with the compliance date contained in many pending legislative proposals. However, EPRI pointed out that several demonstrations of each technology, as well as regulatory, financial, and other factors, will be involved in the overall process of commercializing these new technologies. EPRI's

preliminary estimates of the commercial availability dates of various clean coal technologies are shown in attachment III.

DOE officials at the energy technology centers which are managing round one projects estimated that the first commercial application for six of the seven round one technologies for which agreements have been signed will occur from 1992 to 1995, and the seventh by the year 2000. (See attachment IV.) They cautioned, however, that these estimates are best-case scenarios. These estimates do not appear to leave much room for such things as regulatory or financing problems that may occur. In addition, according to DOE officials, these estimates do not take into account the conservative nature of most utilities in deciding on major capital expenditures.

Legislative Approaches to Acid Rain Control

It may be advantageous to link the commercial availability of clean coal technologies with acid rain legislation. The Congress may, therefore, want to consider an approach that accommodates the concerns of both environmentalists and clean coal technology proponents. The Congress might, for example, establish compliance deadlines and emission reduction levels that allow for significant near-term reductions in emissions but are not so stringent as to deter the use of clean coal technologies aimed at the same goal.

One strategy that has been suggested to accommodate both sets of objectives is a phased-in approach whereby states or utilities would reduce their emissions in stages. An example of this approach is reflected in H.R. 2666, which would require an estimated 10-million-ton reduction in sulfur dioxide in two phases--the first phase by 1993, and the second by 1997. Nitrogen oxide reductions from stationary sources would be reduced by 2 million tons by 1997, with the remaining 2-million-ton reduction requirement to be achieved by mobile sources.

Proponents of this approach contend that costly decisions about the use of emerging technologies can be deferred until the success of these technologies is more certain. At the same time, small environmental benefits can be achieved earlier and continue to accrue incrementally. Critics, on the other hand, contend that the phased-in approach does not address the urgency with which the acid rain problem should be addressed. They further contend that there is significant potential for large-scale negative socioeconomic impacts on the high-sulfur coal mining industry because coal switching (from high- to low-sulfur coals) would probably be a primary means by which the smaller, near-term emission reductions would be achieved.

Another strategy included in H.R. 4331 would extend compliance deadlines for utilities that choose to use a developing technology to meet their emissions reduction target. This bill would authorize states to extend for up to 2 years the date by which utilities using clean coal technologies must meet emission reduction requirements. Under this approach, those utilities choosing to use existing technologies would have to start reducing emissions early. This provision is intended to satisfy the concerns of those who favor immediate acid rain controls. At the same time, it could also allow DOE to achieve its goal of clean coal technology commercialization by providing other utilities an incentive to use the technologies.

Additional Guidance for the CCT Program

DOE is conducting the CCT program under broad statutory provisions which allow it to use wide discretion. The Congress may want to consider whether DOE needs additional congressional guidance on how the program should be implemented.

The CCT program is being conducted under the Energy Reorganization Act of 1974 and the Federal Nonnuclear Energy Research and Development Act of 1974. Since 1985, when the program was initiated, Senate and House appropriations committees have provided some direction through various appropriations actions.

Senate Report 98-578, which accompanied the act establishing the Clean Coal Technology Reserve account, stated that the proposed CCT program would support the goals of improving process efficiency, reducing capital costs, and enhancing environmental performance of various fossil energy technologies. A 1987 Senate appropriations committee report (Senate Report 100-165) stated that the purpose of the CCT program is to seek to accelerate the development of emerging clean coal technologies. Also, a House committee report on fiscal year 1987 appropriations (House Report 99-714) stated that not enough of the CCT program round one projects addressed emissions problems associated with existing power plants and expressed hesitancy in funding additional projects of the types funded in round one.

The broadly stated statutory provisions allow DOE to use wide discretion in implementing the CCT program for purposes other than emission reduction, such as improving process efficiency and reducing capital costs of fossil energy technologies. If the Congress wants the CCT program to be part of an acid rain control program, the Congress may want to include the program in acid rain control legislation. In any event, if acid rain control legislation is enacted without including the CCT program, DOE should review its program implementation to ensure that it is consistent with the goals and objectives of an acid rain control program established by the Congress.

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In summary, DOE has taken action to solve some problems experienced in round one of the CCT program, but others still remain. The major issue, however, is whether emerging clean coal technologies will be commercially available to achieve emission reductions or other requirements within the time frames established in any acid rain legislation the Congress may enact. While we are not expressing judgment on any of the pending bills, the Congress should take into consideration the potential role that emerging technologies funded under the CCT program can play in reducing emissions to control acid rain.

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

Round One Technology Demonstration Projects, Project Sponsors, and Estimated Project Cost Shares

<u>Project</u>	<u>Sponsor</u>	<u>Project Costs^a</u>	
		<u>DOE</u>	<u>Sponsor</u>
		(millions)	
Advanced cyclone combustor	Coal Tech Corp.	\$ 0.4	\$ 0.4
Pressurized fluidized bed	American Electric Power Service Corp.	60.2	107.3
Limestone injection multistage burner	Babcock and Wilcox Company	7.6	11.8
Gas reburning and sorbent injection	Energy and Environment Research Corp.	15.0	15.0
Prototype commercial coal/oil coprocessing plant	Ohio Ontario Clean Fuels, Inc.	45.0	180.7
Underground coal gasification	Energy International, Inc.	11.8	58.3
Advanced integrated combined cycle power generation plant	The M.W. Kellogg Company	<u>87.5</u>	<u>156.3</u>
	Total	<u>\$227.5</u>	<u>\$529.8</u>

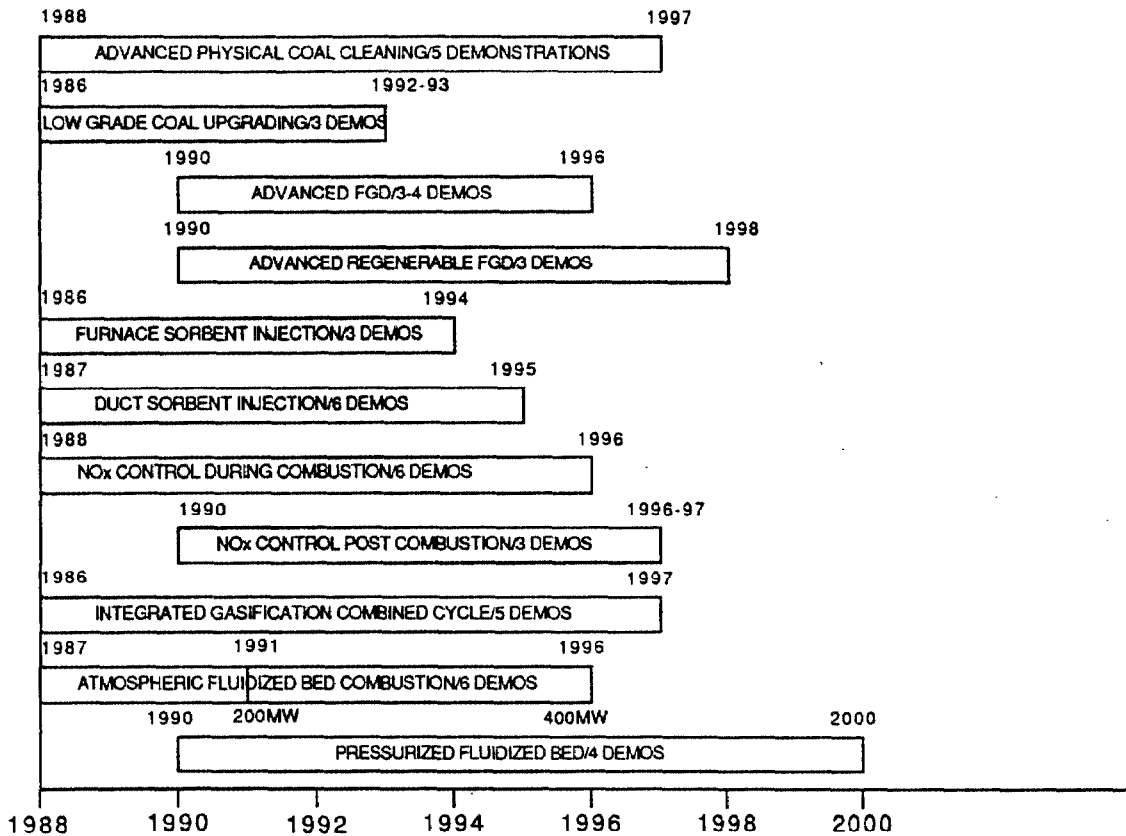
^aAt the time that cooperative agreements were finalized.

ACID-RAIN-CONTROL BILLS PROPOSED SINCE JANUARY 1987

Number	Sponsor	Reduction Requirement		Emphasis (if other than reduction requirement)
		Sulfur Dioxide (SO ₂)	Nitrogen Oxides (NO _x)	
HR 1664	Solomon	18 mil tons below 1980 levels over eastern US in 2 phases—half by early 1991 and remainder by 1996	not required but can be substituted for SO ₂ reductions on 2:1 ratio	
HR 1679	Cheney	18 mil tons below 1980 levels over eastern US in 2 phases—half by early 1993 and remainder by end of 1997	not required	
HR 2133	Walgren	N/A	N/A	prohibits sources in one state from interfering with another states' attainment of air quality
HR 2355	Scheuer	N/A	N/A	authorizes research on acid rain
HR 2399	de La Garza	N/A	N/A	establishes 18-year program to document threat from acid rain
HR 2423	Torres	N/A	N/A	requires new stationary sources of air pollution located in attainment areas to periodically reduce emissions
HR 2497	Gregg	N/A	N/A	amends the Internal Revenue code to impose excise tax on SO ₂ and NO _x emissions
HR 2498	Gregg	N/A	N/A	similar to HR 2497 but additionally authorizes an acid rain control program and requires studies of effectiveness of tax in reducing pollution
HR 2666	Sikorski	18 mil tons below 1980 levels nationwide in 2 phases—half by 1993 and the balance by 1997	4 mil tons by 1997	
HR 3632	Kemp	18 mil tons in 2 phases—1994 and 1999	3 mil tons by 1999	
HR 4331	Cooper	18 mil tons below 1980 levels nationwide phased in by 2004	3 mil tons below 1980 levels nationwide phased in by 2004	
S 95	Kerry	12 mil tons below 1980 levels over contiguous states in 2 phases—seven/twelfths by 1992 and the balance by 1995	3 mil tons by 1995 over contiguous states	
S 388	Stafford	no specific reduction required but strategy would result in 12-million-ton reduction below 1980 levels nationwide during the early mid-1990s	no specific reduction required but strategy would result in some NO _x reductions by 1995	
S 316	Proxmire	18 mil tons over US in 2 phases—1993 and 1997	3 mil tons over eastern US states by 1997	
S 321	Mitchell	12 mil tons below 1980 levels by 1996 over 50 states	4 mil tons below 1980 levels by 1996 over 50 states	
S 796	Durenberger	N/A	N/A	requires EPA to establish new standards for SO ₂ and NO _x

<u>Number</u>	<u>Sponsor</u>	<u>Reduction Requirement</u>		<u>Emphasis (if other than reduction requirement)</u>
		<u>Sulfur Dioxide (SO2)</u>	<u>Nitrogen Oxides (NOx)</u>	
S 911	Durenberger	N/A	N/A	implements recommendations of Special Envoys to authorize a program deploying clean coal technologies and to reduce transboundary air pollution
S 1123	Durenberger	12 mil tons nationwide below 1980 levels in 2 phases—by 1994 and 1997	4 mil tons nationwide below 1980 levels in 2 phases—by 1994 and 1997	
S 1894	Mitchell	12 mil tons nationwide below 1980 levels in 3 phases—5 mil by 1993, 5 mil by 1998, and 2 mil by 2000	4 mil tons nationwide by 1996	

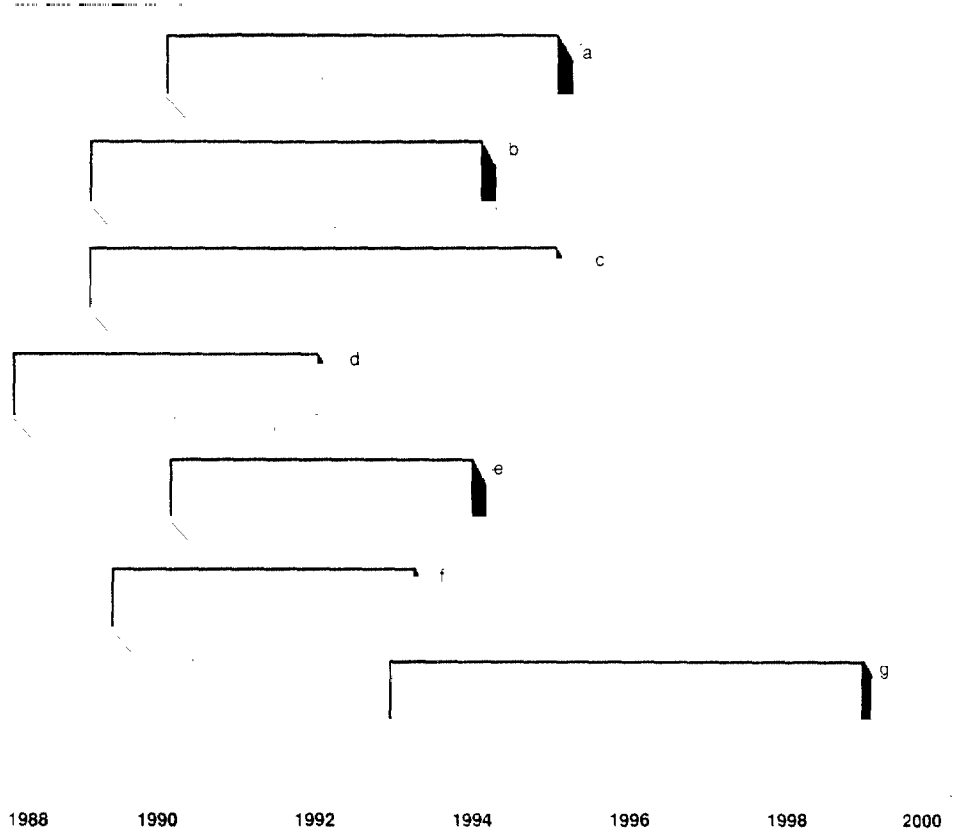
ESTIMATED COMMERCIAL AVAILABILITY DATES OF CLEAN COAL TECHNOLOGIES



START DATE LINE = FIRST COMMERCIAL DEMONSTRATION PLANT ORDER
END DATE LINE = AVAILABLE FOR COMMERCIAL USE

Source: Electric Power Research Institute

Estimated Timelines for First Commercial Applications of DOE CCT Projects



- ¹ Underground Coal Gasification: Energy International, Inc.
- ² Pressurized Fluidized Bed Combustor: American Electric Power Corp.
- ³ Fluidized Bed Gasification: M.W. Kellogg Co.
- ⁴ Slagging Combustor: Coal Tech Corp.
- ⁵ Gas Reburning and Sorbent Injection: Energy and Environment Corp.
- ⁶ Limestone Injection Multi-stage Burner: Babcock and Wilcox
- ⁷ Coal-Oil Coprocessing Liquefaction: Ohio Ontario Clean Fuels, Inc.

Start Date Line—Commercial User Decision to Use Technology
 End Date Line—Initial Commercial Operation

Source: DOE Technology Centers

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