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Second Annual Clean Coal Technology Conference

September 7-9, 1993
Atlanta, Georgia

Proceedings

**Volume 2
September 9, 1993**



Co-sponsored by:
United States Department of Energy and
Southern States Energy Board

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Objective

This Conference, co-sponsored by the U.S. Department of Energy (U.S. DOE) and the Southern States Energy Board (SSEB), seeks to examine the status and role of the Clean Coal Technology Demonstration Program (CCTDP) and its projects. The Program will be reviewed within the larger context of environmental needs, sustained economic growth, world markets, user performance requirements and supplier commercialization activities. This will be accomplished through in-depth review and discussion of factors affecting domestic and international markets for clean coal technology, the environmental considerations in commercial deployment, the current status of projects, and the timing and effectiveness of transfer of data from these projects to potential users, suppliers, financing entities, regulators, the interested environmental community and the public.

Table of Contents

Volume 1

September 8, 1993

Plenary Session 1

*Moderator: Jack S. Siegel, Acting Assistant Secretary for Fossil Energy,
U.S. Department of Energy* 1

*Opening Greeting: Kenneth J. Nemeth, Executive Director, Southern States Energy Board/
Welcoming Remarks: Lee Conn, Vice President, Power Generation, Georgia Power Company* 3

*The Domestic and International Environmental Role for Clean Coal Technologies.
William White, Deputy Secretary, U.S. Department of Energy* 5

*Utility Market Perspective for the Economy and Jobs to 2010.
Kurt Yeager, Senior Vice President, Technical Operations, Electric Power
Research Institute* 9

*Regulatory Climate for Clean Coal Technology into the Next Century.
Lynn Shishido-Topel, Commissioner, Illinois Commerce Commission* 29

*Coal Producer's Perspective—Clean Coal Technology Program.
Flynt Kennedy, Vice President, Research & Development, CONSOL, Inc.* 39

*Planting the CEED for Success.
John Paul, Southeastern Regional Director, The Center for Energy
Economic Development* 51

Luncheon

*Introduction: Jack S. Siegel, Acting Assistant Secretary for Fossil Energy,
U.S. Department of Energy* 69

*Coal: Fuel of Choice, Fuel of Necessity.
Michael K. Reilly, Chairman, National Coal Association; Chairman & CEO,
Zeigler Coal Holding Company* 71

Clean Coal Technology Markets Session

*Panel Chair: Herbert Wheary, Chairman, Utility Advisory Committee, Southern
States Energy Board* 83

*Evolution of Domestic Utility Market Structure into the 21st Century.
George T. Preston, Vice President, Generation & Storage, Electric Power
Research Institute* 85

*Opportunities in International Deployment of CCTs.
Barry K. Worthington, Executive Director, United States Energy Association* 93

*Integrated Resource Planning: Its Impact on Supply-Side Options.
Steven A. Fluevog, Project Engineer, Systems Planning, Georgia Power Company* 95

*IPP Perspective.
P. Chrisman Iribe, Senior Vice President, Environmental and Regulatory Affairs,
U.S. Generating Company* 97

*Foreign Markets and a Case Study of International Deployment of CCTs.
Roger Naill, Vice President, Applied Energy Services, Inc.* 101

*A Case Study: The Commercial Deployment of Pure Air's Clean Coal Technology.
Paul Ashline, Vice President, Business Development, Pure Air* 111

<i>Impact of Federal Energy Policy on Utility Planning.</i> Ray Billups , Manager, Industry Structure Issues, Governmental Affairs, Southern Company Services, Inc.	125
---	-----

Session 1: NO_x Control Technologies

<i>Introduction and Objective of NO_x Control Technology Demonstrations.</i> Co-Chairs: Arthur L. Baldwin , Pittsburgh Energy Technology Center / U.S. Department of Energy; William E. Fernald , Office of Clean Coal Technology /U.S. Department of Energy	127
<i>Performance and Operating Results from the Demonstration of Advanced Combustion Techniques for Wall-Fired Boilers.</i> John N. Sorge , Southern Company Services, Inc.	129
<i>Measurement of Air Toxic Emissions from a Coal-Fired Boiler Equipped with a Tangentially Fired Low NO_x Combustion System.</i> Edward B. Dismukes , Principal Chemist, Southern Research Institute	147
<i>Results of Babcock & Wilcox's Clean Coal Technology Combustion Modification Projects: Coal Reburning for Cyclone Boiler NO_x Control and Low-NO_x Cell™ Burner Demonstrations.</i> Tony Yagiela , The Babcock & Wilcox Company	169
<i>Gas Reburning and Low-NO_x Burners on a Wall-Fired Boiler.</i> Henry M. Moser , Energy and Environmental Research Corporation	205
<i>Demonstration of Selective Catalytic Reduction Technology for the Control of Nitrogen Oxide Emission from High-Sulfur, Coal-Fired Boilers.</i> Scott Hinton , Gulf Power Company	227
<i>Design Methodology for a Micronized Coal Reburn System Using Modeling.</i> Tom Kosvic , Radian Corporation	243

Session 2: Advanced Electric Power Generation Systems

<i>Introduction and Objective of Advanced Electric Power Generation Systems Demonstrations.</i> Co-Chairs: Larry K. Carpenter , Morgantown Energy Technology Center / U.S. Department of Energy; George Lynch , Office of Clean Coal Technology /U.S. Department of Energy	271
<i>York County Energy Partners ACFB Demonstration Project Status.</i> Shouou-I Wang , Air Products and Chemicals, Inc.	273
<i>DMEC-I Pressurized Circulating Fluidized Bed Demonstration Project.</i> Gary E. Kruempel , Midwest Power	291
<i>American Electric Power Pressurized Fluidized Bed Combustion Technology Status.</i> Mario Marrocco , American Electric Power Service Corporation	301

Session 3: SO₂ Control Technologies

<i>Introduction and Objective of SO₂ Control Technology Demonstrations.</i> Co-Chairs: Thomas A. Sarkus , Pittsburgh Energy Technology Center / U.S. Department of Energy; Lawrence Saroff , Office of Clean Coal Technology /U.S. Department of Energy	317
<i>Demonstration of Bechtel's Confined Zone Dispersion Process at Pennsylvania Electric Company's Seward Station: Project Status.</i> Joseph J. Batista, Jr. , Pennsylvania Electric Company	319

<i>Project Update: Advanced FGD Design for Northern Indiana Public Service Company's Bailly Generating Station.</i> John Henderson, Pure Air	339
<i>The Clean Coal Technology Program: 10 MWe Demonstration of Gas Suspension Absorption for Flue Gas Desulfurization.</i> Frank E. Hsu, Airpol, Inc.	357
<i>LIFAC Sorbent Injection for Flue Gas Desulfurization.</i> Juhani Viiala, Tampella Power Corporation	379
<i>Chiyoda Thoroughbred 121 Innovative Clean Coal Technology Demonstration Project Initial Testing Results.</i> David P. Burford, Southern Company Services, Inc.	393

Session 4: Industrial Applications

<i>Introduction and Objective of Industrial Applications Demonstrations.</i> Co-Chairs: James U. Watts, Pittsburgh Energy Technology Center/ U.S. Department of Energy; Douglas Archer, Office of Clean Coal Technology/ U.S. Department of Energy	407
<i>Industrial Pollution Control: 1993 Performance Update of the Recovery Scrubber.</i> John McDowell, Pittsburgh Energy Technology Center/ U.S. Department of Energy	409
<i>Status of the Demonstration of Pulse Combustion in Steam Gasification.</i> K. Durai-Swamy, ThermoChem, Inc.	423
<i>Blast Furnace Granular Coal Injection.</i> Daniel Kwasnoski, Bethlehem Steel Corporation	449
<i>Status of Coal Tech's Air-Cooled Slagging Combustor.</i> Bert Zauderer, Coal Tech Corporation	467

Table of Contents

Volume 2

September 9, 1993

Clean Coal Technology Deployment/Technology Transfer/Outreach Session

<i>Panel Chair: Ben Yamagata, Executive Director, Clean Coal Technology Coalition</i>	483
<i>Coal and Public Perceptions.</i>	
Robert Porter , Director, Office of Communications, Fossil Energy, U.S. Department of Energy	485
<i>EPRI Outreach Program Approach and Accomplishments.</i>	
Stuart M. Dalton , Program Manager, SO ₂ Control Program, Environment Division, Electric Power Research Institute	497
<i>CCT Deployment Considerations.</i>	
Ben Yamagata , Executive Director, Clean Coal Technology Coalition	509
<i>Bridging the Gap Between CCT Demonstration and Commercialization: The Use of Regulatory Incentives.</i>	
David W. South , Economist/Program Manager, Argonne National Laboratory	519
<i>Implementing Section 1332, Energy Policy Act of 1992.</i>	
Ted Atwood , Office of Clean Coal Technology/U.S. Department of Energy	521
International Forum	535

Session 5: Coal Combustion/Coal Processing

<i>Introduction and Objective of Advanced Coal Combustion and Coal Processing Demonstrations.</i>	
Co-Chairs: Robert M. Kornosky , Pittsburgh Energy Technology Center/ U.S. Department of Energy; Douglas M. Jewell , Morgantown Energy Technology Center/U.S. Department of Energy	537
<i>Rosebud SynCoal Partnership: Advanced Coal Conversion Process Demonstration Project.</i>	
Ray W. Sheldon , Rosebud SynCoal Partnership	539
<i>Start up and Operation of the ENCOAL Mild Coal Gasification Project.</i>	
James P. Frederick , ENCOAL Corporation	553
<i>The Coal Quality Expert: A Focus on Slagging and Fouling.</i>	
Richard Borio , ABB Combustion Engineering	587
<i>Self-Scrubbing Coal™: An Integrated Approach to Clean Air.</i>	
Robin L. Godfrey , Custom Coals International	617
<i>The Healy Clean Coal Project: Design Verification Tests.</i>	
Shiva Ubhayakar , TRW	631

Session 6: Advanced Electric Power Generation Systems

<i>Introduction. Co-Chairs: R. Daniel Brdar</i> , Morgantown Energy Technology Center/U.S. Department of Energy; Larry M. Joseph , Office of Clean Coal Technology/U.S. Department of Energy		665
<i>IGCC Demonstration Project Status: Combustion Engineering IGCC Repowering Project.</i>		
Robert Glamuzina and Lawrence J. Peletz , ABB Combustion Engineering Systems	667	

<i>Piñon Pine IGCC Project Status - August 1993.</i> E. Brent Higginbotham , Sierra Pacific Power Company	691
<i>The Wabash River Coal Gasification Repowering Project: Program Update.</i> Phil Amick , Destec Engineering, Inc.	707
<i>Tampa Electric Company: Integrated Gasification Combined-Cycle System.</i> Donald E. Pless , TECO Power Services Corporation	717
<i>Clean Coal Power at Toms Creek.</i> Michael Schmid , TAMCO Power Partners	733

Session 7: Combined NO_x/SO₂ Control Technologies

<i>Introduction and Objective of Combined NO_x/SO₂ Control Technology Demonstrations.</i> Co-Chairs: Richard A. Hargis , Pittsburgh Energy Technology Center/ U.S. Department of Energy; Gerard G. Elia , Pittsburgh Energy Technology Center/U.S. Department of Energy	753
<i>Enhancing the Use of Coal by Gas Reburning and Sorbent Injection.</i> James C. Opatry , Energy and Environmental Research Corporation	755
<i>SO_x-NO_x-Rox-Box™ Demonstration Project Review.</i> Kevin Redinger , The Babcock & Wilcox Company	777
<i>Performance Results from the 35 MW SNOX Demonstration at Ohio Edison's Niles Station.</i> Don Borio , ABB Environmental Systems	799
<i>Preliminary Performance and Operating Results from the Integrated Dry NO_x/SO₂ Emissions Control System.</i> Terry Hunt , Public Service Company of Colorado	821
<i>The NOXSO Combined SO₂/NO_x Removal Flue Gas Cleanup System Commercial Demonstration.</i> James B. Black , NOXSO Corporation	839
<i>The Milliken Station Clean Coal Demonstration Project: There's More To It Than Concrete and Steel.</i> Clayton M. Ellis , New York State Electric & Gas Corporation	861

Luncheon

<i>Introduction: C. Lowell Miller</i> , Associate Deputy Assistant Secretary for Clean Coal Technology, U.S. Department of Energy	873
<i>What Clean Coal Brings to the International Market.</i> David C. Crikelair , Vice President, Texaco, Inc.	875

Plenary Session 2 - Emerging Issues/Environmental

<i>Moderator: C. Lowell Miller</i> , Associate Deputy Assistant Secretary for Clean Coal Technology, U.S. Department of Energy	877
<i>Compliance Strategies - Impact on Clean Coal Deployment.</i> Stephen D. Jenkins , Manager, Advanced Technology, TECO Power Services Corporation	879
<i>Defining Utility Trace Substance Emissions and Risks.</i> Ian M. Torrens , Director, Environmental Control Systems, Electric Power Research Institute	881

NO_x Control Accomplishments and Future Challenges For Coal-Fired Boilers.
David Eskinazi, Manager, Air Quality Control Projects, Electric Power Research
Institute 897

State Externality Trends.
Joseph Van den Berg, Director, Technical Services, Edison Electric Institute 911

Clean Coal Technologies and Global Climate Change.
Robert Long, Chairman, Global Climate Coalition 961

Regulatory Issues That May Affect the Future Development of Clean Coal Technologies.
Craig S. Harrison, Esq., Utility Air Regulatory Group, Hunton & Williams 969

Appendix A

List of Attendees A-1

Appendix B

Conference Schedule B-1

Clean Coal Technology Deployment/Technology Transfer/Outreach Session

Panel Chair:
Ben Yamagata,
Executive Director,
Clean Coal Technology Coalition

COAL AND PUBLIC PERCEPTIONS

Remarks by

Robert C. Porter
Director of Communications
Office of Fossil Energy
U.S. Department of Energy

to the

2nd Annual Clean Coal Technology Conference

in

Atlanta, Georgia

September 9, 1993

I was scheduled to discuss the Department's clean coal outreach efforts. But perhaps -- rather than describing newsletters, publications, and things you can see for yourself -- it may be more useful for me to do some stage setting about why clean coal technology outreach must be an integral part of your role in coal's future.

I think -- as we spend our time at this conference hearing status reports about technologies -- it is important that we understand the significance of these advances not just in terms of hardware...but in terms of public perception.

And let me tell you right up front, I am a strong believer in four basic premises:

- (1) That coal is fundamentally important to this nation's future;
- (2) That, despite premise number 1, coal's future is by no means assured...and that for the last 10 years, coal has been losing ground...maybe following in the footsteps of nuclear power in the attitudes of the public;
- (3) That coal's future hinges on the public understanding and accepting the benefits of the technologies we are discussing at this conference. In my mind, public acceptance of coal hinges -- almost solely -- on the public's acceptance of advanced clean coal technology....

... not what happens in energy policy,
... not what makes sense economically,
... not what happens in world events.

But whether influential, local citizens understand and accept clean coal technology.

I think public survey data -- some of which I'll reference here this morning -- shows one very clear message: that it isn't coal's abundance, its relatively favorable economics, its domestic security, or even its impact on jobs that molds public opinion. It's the possibilities and potential for clean coal technology.

America's unique penchant for innovation, and America's continuing confidence in its scientists and engineers to solve seemingly intractable problems...that is the key selling point for coal. Everything else, in the long run, is secondary.

And Premise #4:

- (4) That public acceptance of clean coal technology is not going to be achieved through a nationwide advertising program run by the Federal government or even by the private sector. It is going to be gained at the grassroots level...one community at a time...one plant at a time...one referendum at a time.

The Federal government has neither the resources, the staff, nor the mandate to lead the charge in those debates. That is why I'm not sure a recitation of what we are doing in the Federal clean coal outreach program is all that important.

What is important is that the private sector step up to the plate...as individual companies and as individual citizens...perhaps coordinated nationally, certainly drawing upon a common base of nationwide experience...but nonetheless, working one-one-one at the community level...one customer, one civic club, one town meeting at a time.

A year ago, I would have told you that this is where I think the industry...from the production side through the transportation side to the end users...has let coal down...and let it down badly.

Coal producers historically have seemed only interested in mining and selling coal. Despite the herculean efforts of Dick Lawson and the Coal Association, domestic producers seem neither knowledgeable nor particularly interested in clean coal technology. Throughout the Clean Coal Program, it has seemed to us that the interest of the coal producer in this program largely ended at the rail tipple or the loading dock.

Throughout most of the Clean Coal Technology Program, the railroads didn't add much. For the most part, they seemed only interested in hauling coal....moving it from Point A to Point B. Once it got to Point B, whether clean coal technology was being used was someone else's concern.

The utilities seemed almost always to be sent out of the locker room and onto a playing field wondering why there was no one in the stands on their side of the field...no fans... no cheerleaders...not even a first-aid boy.

Now there were some very notable exceptions. In Ohio, Jackie Bird and the Ohio Coal Development Office were a breath of fresh air for clean coal technology. Open houses, educational efforts, and Jackie's own tireless energies have been exemplary...but unfortunately, the Ohio example has largely been the national exception.

And so, those who were in the Clean Coal game found themselves outmanned, outgunned, playing defense, and watching the 4th quarter clock tick away.

Today, however, for reasons I will explain in a moment, I have a slight glimmer of optimism that the coal industry -- the entire industry, or at least a good portion of it -- has recognized that a bad public image creates bad business prospects...for producers, for transporters, for end users. And bad business eventually leads to downsizing, layoffs or bankruptcies.

Coal has a serious public image problem -- how many speakers have you heard begin or end with that revelation? It should come as no surprise to you. And yet, I'm not sure the depth of that image problem is known or accepted by the coal industry.

I've heard some in the industry make this point -- or several variations of it: "The public doesn't like coal, but wait until the lights go out or the Arabs stage another embargo, or they find out that half of their county will have to be covered by windmills to do what a single coal plant will do...then they will come back to coal."

Ladies and gentlemen...it just won't happen.

Public concern about coal runs too deep...and it is important to understand that. Left unchecked, in my opinion, public sentiment will soon reach a point where coal will have to struggle simply to reach the rung of "fuel of last resort" on the public opinion ladder.

It is important for those who deal with coal...who make their livelihood from it...to get below the surface opinions and see the strong, countervailing set of tensions being created in the values of many Americans...the sense of what Americans believe is important.

Only then will you appreciate what coal is up against.

Let's start with those values...what matters most to Americans.

For 20 years, Cambridge Reports -- a polling firm out of Cambridge, Massachusetts -- has been asking the American people what are the most important problems facing the country.

Throughout much of the 1970s and into the early 1980s, energy dominated the response. In 1979, public concern about energy reached its high water mark. 70 percent of Americans polled ranked energy as the top national priority.

Today, even after a Persian Gulf War, energy doesn't even make the list. Less than 1 percent cite energy as a top national priority. Today's concerns are the state of the economy, the state of education (particularly primary and secondary education), crime and drugs, the rising cost of health care, and number five on the list, the environment.

In 1991 -- to give you some idea of how far energy has fallen -- Hart and Teeter Research conducted a poll for *NBC News* and the *Wall Street Journal*. They asked respondents to identify the nation's top three problems from a preselected list of eight. Education, poverty, and crime were the top selections. Environment was on the list.

Energy - despite a Gulf War that had ended a few weeks earlier -- wasn't even among the possible choices.

Americans clearly don't see energy security as a pressing national issue -- certainly not with relatively plentiful supplies and relatively stable prices. Nor, interestingly, do they seem to connect energy supply with economic growth.

Here is where I see a major disconnect in public awareness. There may be a dominating sense of public concern about the economy, about jobs, about improving the standard of living...but there seems to be no linkage in the public's mind between achieving these goals and the necessity of adequate, reliable energy. The two seem to be mutually exclusive.

There is, however, a clear linkage in the public's mind between energy and the environment.

Cambridge Reports, in the polls they have taken in the last 3 years, have reported a very fundamental change in public opinion. Ted Byers, a senior analyst with Cambridge, told a conference of clean coal project information officers last year that the change has been among the most "spectacular" -- his words -- as the polling service has seen.

It is the change in public attitudes toward the environment.

Almost as dramatically as the downfall of energy as a national issue has been the rise of public concern over the quality of the nation's air and water. But as Cambridge is discovering, the change is much more fundamental.

Americans are dramatically more concerned about the environment not just for the sake of scenic beauty but for the sake of their own personal health. Environmental protection in just the last few years has become "environmental self-protection."

Today, concern over air pollution has gone from the aesthetic -- the air is brown and ugly -- to the personal -- the air is brown and ugly and it is hurting me and my children. Poll after poll is showing that environmental consciousness has become more deeply rooted than just concern over the way things look. Environmental impact is now being translated into a direct threat to personal health and well being.

Now consider what this means.

Environmentalism is today much more deep-rooted...much more than just the province of a few fringe groups. Today, 8 million Americans belong to some type of national environmental organization -- the biggest surge of growth coming since 1990. Those 8 million Americans contributed more than \$212 million to environmental causes last year.

Yet, don't make the mistake of equating environmentalism with sign-carrying tree-huggers. A Roper poll asked several hundred Americans if they considered themselves "active participants in the environmental movement." Only 13 percent said yes. The majority stated they were "sympathetic, but not active." Only 3 percent said they were "unsympathetic."

What does this mean?

The way I read these figures is that environmentalism has moved beyond being a cause *celebre* -- something to protest about. Instead, it has become a core value of Americans.

And when they make it this type of core value, they are less likely to trade it off.

In contrast to the 1970s and 80s, public polls say today that concern for the environment, like family economic security, is not a negotiable commodity...even in times of economic uncertainty.

In 1973, 34% of the American public wanted more environmental regulations. In 1990, 54% wanted it...a 20-point increase.

In 1992, by the way, even after passage of the Clean Air Act Amendments, two thirds of Americans believe that "more government regulation will be needed to solve pollution problems."

Now, some of the skeptics may be saying to themselves, "yeah, but once environmental control hits Joe or Jane Blow in the pocketbook, watch the attitude change." Here, the data is a little mixed.

Last year, even as the economy dominated the political agenda, a national poll asked about people's willingness to pay \$50 in extra taxes to solve specific environmental problems.

- o 78% said they would pay if extra taxes if they went to clean water programs.
- o 73% said yes if the funds went to clean up air pollution.
- o 71% said yes if the funds went to solar and wind power research.
- o 61% said yes if the problem was the greenhouse effect.
- o 59% said yes to help stop acid rain.

During the Clean Air Act debate, Cambridge asked the public if they supported cutting sulfur dioxide emissions in half by the year 2000 even if their electric bills went up by 10 to 15 percent. 74 percent said yes.

Another 1990 survey asked "Now suppose the price you pay for fossil fuels like coal, oil and natural gas had to go up to prevent global warming from having serious consequences, what is the maximum additional monthly cost you would be willing to pay?"

Nearly 30% pegged the range between \$5 to \$15 a month more. 28 percent said more than \$15 a month. Only 15% said they would be willing to pay nothing more.

The message: Americans seem willing -- within limits -- to put a price on environmental protection and to pay that price.

Now what does all this mean for coal and coal technology?

First, coal.

Americans seem to have two sides when it comes to coal. On one hand, the American public recognizes that coal play a role in meeting the nation's energy needs and even predict that it will play a greater role in the future.

Cambridge Reports found that three out of four Americans acknowledge that coal-fired power plants are a significant contributor to the nation's electric power supply. Three out of five predict coal-fired power plants will play at least an equally important role in the future.

That's the good news.

The bad news is that the American public prefers coal not be used.

In 1978, 55% of Americans supported the increased use of domestic coal. In 1991, that figure had declined to 39 percent. And when asked about more coal in their community, the number supporting coal drops to 27 percent.

Once a year Cambridge asks people what they think the nation's major source of energy will be in 25 years. Last year, 40 percent pointed to solar, while 31 percent -- interestingly -- said nuclear power. Only 3 percent said coal. And when Cambridge asked for their preference 25 years down the road, 58 percent said solar. Less than 1/2 of 1 percent opted for coal.

What are coal's strengths and problems?

Its strengths are cost and domestic security.

But far outweighing these are its problems -- air emissions first, mine safety a distant second.

As you might expect, acid rain dominated the air quality agenda in the 1980s, but also as you might expect, polls show that global warming is now supplanting acid rain as the most frequently cited environmental problem facing the nation.

Americans point to auto emissions as the primary cause of global warming, but air pollution from coal and other fossil fuel plants isn't far behind in second place.

And four out of five Americans believe the U.S. should take steps to prevent global warming even if other countries do not. And the majority continues to hold this view even when the prospects are raised of higher taxes and

placing U.S. businesses at a competitive disadvantage. In fact, two out of five respondents believe the U.S. should independently take steps to deal with global warming even if cost them their jobs.

That is how deep seated environmental concern has become as a core American value.

Now let's turn to what I believe is coal's last great hope - clean coal technology.

Here, there is public optimism for coal. But again, there is an upside and a downside.

Only a quarter of the population, according to Cambridge Reports, has heard about the efforts to develop clean coal technologies. That figure, unfortunately, has not changed much since 1989. Only one in five Americans believe the coal and electric utility industries have spent significant amounts of money on developing clean coal technologies.

Yet, two out of three Americans, when asked about the potential for new technologies for coal, are convinced that a concerted effort to develop and deploy clean coal technologies would improve the quality of the environment.

Americans seem to have an intrinsic faith in American ingenuity to solve conflicting problems. And even in light of the bad rap that American technology has gotten recently -- 3-Mile Island, Challenger, Hubble, a lost satellite to Mars -- Americans still hold out hope that its scientists and engineers, properly focused, can solve the environmental problems associated with coal.

The only major reservation is the fear that clean coal technologies will raise energy costs...but as we've seen, there appears to be some sentiment for moderate increases in costs if there is direct evidence that a cleaner environment will be the result.

So what does this mean for an outreach program for coal?

- (1) First and foremost, it must focus squarely on the public's overriding concern about the environment.

An outreach campaign rooted solely in coal's abundance, or as a counter to foreign sources of energy, or an instrument of national security is a campaign that will fall on deaf ears.

Ten years ago, Americans might have substituted domestic energy for decreased dependence on foreign energy, but today that tradeoff is much less likely.

Environmental concern is driving energy development attitudes. A coal outreach program must deal with environmental issues first...or the public will never hear anything else. And technology -- better technology, cleaner technology -- is what the public is pinning its hopes on.

- (2) Second, it is easy to say that Americans' fear of coal is fear rooted in misunderstanding.

Most Americans don't know where their personal electricity comes from. Coal plays a role, but they are surprised to hear the figure "56% of the nation's electricity comes from coal."

But it would be a serious mistake to think that the problems are entirely ones of lack of accurate facts. There is a question of performance. Americans have a love-hate relationship with their power company.

A 1989 Roper poll found that 92% of a national sample identified the "electric power industry" as either "absolutely essential" or "very important" to the country.

That same poll showed that "the electric company" ranked 4th in terms of excellence of service from a list of 12 types of services -- that included supermarkets, doctors, banks phone companies, department stores, credit card companies, mail order companies, and so on.

A 1990 poll asked "Which public utility in your area provides the best service?" 29% identified the electric utility, 19 points higher than the telephone company. Every other utility -- including, by the way, the gas company -- ranked lower.

Yet, Americans are convinced that the electric company cares very little about the environment and very little about their health and safety. As I said earlier, just one in five Americans believe the industry has spent a lot of money on developing clean coal technologies.

I know that I've given you a lot of facts and figures for so early in the morning, but I wanted to impress upon you one key fact:

That public concerns affecting coal and coal technology are so deep-rooted and systemic that they must be addressed at the grassroots level.

There is a certain allure to a nationwide television campaign -- following the footsteps of the gas industry, for example. But the challenge confronting coal is far different and much more difficult.

Contrary to gas, the coal industry must first reverse an overwhelming negative perception. It must build confidence in its commitment to the environment, to the health and safety of this and future generations.

The government -- even if we had the resources -- can't do that. We can produce information -- and we have done a lot of that in the last five years:

- o Nearly 100,000 copies of a primer on clean coal technologies distributed;
- o More than a quarter of a million copies of our "Dinosaurs and Power Plants" grade school educational package...and the demand is overwhelming our ability to deliver;
- o A new publication defining our strategic goals not only for clean coal demonstrations, but also for our R&D program...but produced in a graphic form that certainly breaks the mold of a typical government program plan. It's primary purpose: to visually attract readers who may not otherwise pick up a typical government publication;
- o Attempts such as the exhibits you see outside to reach non-traditional audiences who are, nonetheless, key decisionmakers.

But none of these activities conveys the fundamentally important message to the American people that those of you who produce coal, who make the equipment to burn it, and who extract electricity and energy from it are committed to this new environmental ethic.

That is something you must communicate clearly in simple ways -- with simple actions -- that consumers see and understand. The issue is largely one of trust.

There is a kind of dog-eat-dog attitude that has largely gotten coal into the fix it is in today...that has divided the coal industry and has contributed to lack of public trust and an increase in public suspicion about both the industry and the technology.

A year ago, I saw almost nothing that gave me much hope that would change. Today, I have changed my opinion. I see a glimmer of hope.

The coal industry - led by railroads, producers and others -- have come together to create the Center for Energy and Economic Development. With one major mission, to provide accurate information about coal.

The importance of this organization:

First, it is a coalition. The entire coal industry is beginning to unite. CEED is largely the outgrowth not of coal producers but of a railroad - CSX - who realized that its economic fortunes were tied inextricably to the fortunes of coal. When the Tallahassee clean coal project went under because of public pressure, CSX lost a major entre into a new, growing market. All of a sudden, it realized it, too, was part of the coal industry, and it too had a stake in reversing coal's bad public image.

Second, CEED is not going to be swayed by the allure of a glossy, national campaign. It is committed to working at the grassroots -- in areas where key decisions regarding coal are on the near-term horizon.

Third, CEED reflects the recognition that Government is not the only answer or maybe not even a major part of the answer to effective public outreach.

Government can provide public accountability for the tax dollars we have invested in coal and clean coal technology. We can announce results -- successes and failures. But it must be industry that builds the base of public confidence and trust that must exist between the public and those who produce, transport, and use coal.

Fundamentally, therefore, that is your responsibility and how successful you are, in my opinion, will determine coal's future in this country.



Electric Power
Research Institute

Leadership in Science and Technology

EPRI OUTREACH PROGRAM APPROACH AND ACCOMPLISHMENTS

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Atlanta, Georgia

EPRI OUTREACH PROGRAM APPROACH AND ACCOMPLISHMENTS

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Founded in 1972, EPRI conducts Research and Development activities on behalf of the Electric Utility industry in a wide range of activities. Since we are funded by over 700 member utilities, the challenge of delivery of that information to members is significant. Our outreach program is tailored to the industry, and uses traditional means such as printed media, as well as electronic media of all types. More and more the term delivery means working with the membership, to reduce the risk in early application of advanced technology. EPRI's participation in the DOE Clean Coal Technology program is reflective of that type of project, and represents a good example of participation in collaborative R&D. This paper supplements the Panel discussion on Clean Coal Technology Deployment/Technology Transfer/Outreach.

EPRI'S MISSION

The mission of EPRI has evolved from its inception in 1972, with much stronger emphasis now on application of the technology. It is insufficient to just develop the technology and publish a detailed technical report. Utility technical people are like most business people today, beset not by too little information, but by too much. Sorting out what makes sense for their companies in an industry that is seeing increasing change and competition is harder than ever. EPRI has revised its mission statement to reflect these changing needs. Our mission:

The mission of the Electric Power Research Institute is to discover, develop, and deliver science and technology for the benefit of member utilities, their customers, and society. (Emphasis added)

The term delivery was specifically added to recognize the need to do more than to invent a "better mousetrap". Much more emphasis has been placed on getting the technology used and that has, in turn, lead to a closer relationship with our customers, the electric utilities. Increasingly, this means EPRI involvement in application of the technology.

THE DELIVERY VEHICLES

Our mandate is to find the most effective vehicles to deliver the information developed in EPRI's research. We use the traditional research reports, seminars, symposia, and technical papers, but increasingly we are developing new means to accomplish this end. These include: computer programs, electronic network services, videoconferencing, application projects, loaned employees, and application centers with hotline services.

COMPUTER PROGRAMS

Over \$135 Million of EPRI research now results in computer software as a major product or the only product of research. This is not mass consumer-oriented software that provides calculation tools, but specialty software of all types, some of which requires significant training before the user is allowed to obtain the program. Several examples of this include Clean Air Technology (CAT) Workstation, FGDPRISM™ (Flue Gas Desulfurization Process Integration and Simulation Model), NOxPERT™ and FGDCOST™, all different types of software designed to transfer key information. Both FGDPRISM™ and NOxPERT™ are examples of software that consolidates a very large and diverse research program extending over many years, and provides a tool that facilitates use of the information. They represent different types of programs. CAT Workstation is a strategic planning tool designed to help develop or review compliance strategies. FGDPRISM™ is a first principles model of FGD system chemistry, that simulates the process, in order to avoid problems experienced in the early designs, and to improve operation, and NOxPERT is an expert system to optimize utility system NOx reduction strategies.

The CAT Workstation is designed to assist utilities in evaluating and updating compliance plans for SO₂ control. One of the major issues facing electric utilities worldwide is how to evaluate choices among different environmental control strategies or Clean Coal Technologies. The choice can be as "simple" as whether to scrub or switch, but in truth it is rarely simple. Today, dispatch, financing, emission allowance use and other decisions make multi-plant system compliance planning complex. Ideally, all possible scenarios would be evaluated and the optimum economic solution consistent with environmental constraints would be chosen. However, this can be an expensive effort due to the large number of options that have to be considered even for a moderate sized utility. This can literally run into trillions of cases when all options for compliance and systemwide changes are considered. EPRI has developed the CAT Workstation to assist U.S. utilities in performing these calculations on a multiple-unit-scenario basis.

The CAT Workstation allows any technology to be evaluated, with users creating detailed configurations of units, technologies, and fuels as needed. Many power plant units and strategies can be evaluated at once, with all necessary dependencies taken into account. Changes over time are factored into all

evaluations, including economic parameters, unit capacity factors, and emission constraints. The output of this workstation includes a list of technology-fuel combinations ranked by cost for specific units by time period, along with the number of allowances to buy or sell in each period.

The CAT workstation has an easy-to-use graphical user interface and allows users to access many of our other programs to support the strategic planning process with specific studies. For example, CAT can help screen FGD technologies, and then use FGDCOST input to develop site specific cost estimates and refine the decisions.

FGDPRISM™ is a process simulation model for wet limestone and magnesium-enhanced lime FGD systems. The program models desulfurization systems as a series of independent unit operations connected by process streams. For each unit operation, the model uses equilibrium, mass transfer, and thermodynamic principles to simulate the chemical reactions in that module and the resulting performance. The model is extremely useful in allowing utilities to investigate process or equipment modifications on existing FGD systems without the need for extensive, time-consuming full-scale tests. Also, the model can be used to evaluate or design new FGD systems. The model is complex and requires training prior to use, but it has proved powerful in numerous utility site applications. We are cooperating with DOE as part of the cooperative High Efficiency testing of utility sites to have FGDPRISM™ calibrated against utility sites so that it can be used to evaluate and predict performance of upgrade options at each site. It has proven successful commercially with licenses to designers of over 2/3 of the FGD Systems built worldwide, as well as a number of A/E and consulting firms. It is even being adapted for international use by utilities with PowerGen in the UK and Imatron Voima Oy (IVO) in Finland, each having licensed the program. We see this as an example of packaging the results of an immense R&D area with well over \$10M and 10 years of fundamental R&D, and creating a delivery vehicle that allows it to be used.

FGDCOST™ is a spreadsheet cost estimating model that planners and engineers can use to quickly obtain estimates of site-specific flue gas desulfurization (FGD) system costs. The model uses internally stored design information to enable users to readily estimate capital, O&M, and total levelized costs for both new and retrofit applications. The model computes costs by using site-specific data entered by the user and default values for the selected FGD process. User inputs revolve around economic criteria, boiler/coal characteristics, site conditions, and adjustments for retrofit difficulty.

Sensitivity analyses can be performed for variations in utility economic and design criteria, as well as site-related alternatives. Users will ultimately be able to download current cost information through the EPRINET™ Software Library for any of 28 FGD technologies. The new model released in August 1991, takes the place of RETROFGD, a computerized FGD cost estimating code released by EPRI in 1987. Several of the SO₂ Control technologies being tested under the DOE

Clean Coal program are included in the software, and users can incorporate the lessons learned during the demonstrations into their case studies.

The FGDCOST™ model gets around the technology transfer issue of the report not being tailored to the specific case. Generic cost estimates are published in our standard format, but the question always becomes how much will it cost for my situation. FGDCOST™ allows the customization needed to fit the site specific requirements, financial assumptions, size, sulfur content, load factor, etc.

NOxPERT™ is a model for screening NOx control technologies. Based on the best available correlations of NOx with fuel, boiler/burner type, and other combustion parameters, NOxPERT™ can be used to estimate NOx emissions for individual boilers, plants, and utility systems; identify the best combination of combustion NOx controls to meet emission reduction targets; and estimate the cost of NOx reduction retrofits. With a modest amount of baseline data, NOxPERT™ can provide emissions and cost estimates for boilers larger than 100 MW with +/-25% accuracy (and for smaller boilers with greater uncertainty).

Utility users can tailor NOxPERT™ to meet their individual needs by specifying the level of analytical detail and preferred emissions control strategy. For example, with minimal inputs, NOxPERT™ can estimate "as is" NOx emissions for initial emissions inventories. Users can then conduct preliminary assessments of NOx reduction options and costs using basic boiler design and operating data along with correlations relating NOx output to average parameters for each boiler class. These assessments can be refined by entering more detailed boiler design, operating, and cost data. The model can use any one of three NOx reduction scenarios when evaluating NOx compliance strategies: (1) the greatest NOx reduction option regardless of cost; (2) the least-cost option that meets a specified reduction level for an individual boiler; or (3) the least-cost options that meet a specified reduction level for all boilers in a utility system or pollution control district.

The systems being tested under DOE's Clean Coal Technology demonstrations are incorporated in the NOxPERT™ software, and updated results from the demonstrations should be able to be rapidly incorporated into the program.

These are but a few of the computer codes directly related to clean coal technology, but EPRI has developed data bases, expert systems, simulation models, and many analytical tools to provide the basis for application of research results.

ELECTRONIC NETWORK SERVICES.

EPRINET™ is an electronic network developed and implemented over the past several years by EPRI. It contains a variety of information and messaging services. The existing version of EPRINET™ has many information services available to users including messaging, news, resource catalogs, special interest

forums, file transfer services, a calendar of events, and directory. Version 2.0 is about to be introduced which is a state of the art system using new technologies to help EPRI and our customers be more productive. It will eliminate the dependence on mainframe computing and run as a set of client applications on each desktop environment (Windows or Mac) on a wide area network with services provided by multiple UNIX servers.

The value to the user is direct access both to EPRI expertise through electronic messaging and to the many resources available from EPRI.

One new use of EPRINET™ is PowerServe, a technology network developed by EPRI's Generation & Storage Division. PowerServe is a wide-area information service providing member utilities quick access to EPRI's growing list of advanced technology services being developed at regional centers throughout the U.S. PowerServe will supplement the basic services being provided by EPRINET. As EPRI moves toward a more regional focus to better serve its customers, PowerServe will offer expanded access to products and research results from its centers in manageable, task-oriented chunks. A consistent, easy-to-use graphical user interface that features on-line assistance and minimal training will help users understand and use existing products and will provide information about new products. PowerServe can reduce the delay, risk, and cost associated with the commercial introduction of advanced technologies at both existing and new power plants by quickly locating and applying the appropriate information and products.

In its pilot release, PowerServe will help fossil plant design, engineering, operations and control staff locate, interpret, and then apply the full measure of EPRI's technology and expertise in power plant engineering, operation, and maintenance. Later releases of PowerServe will provide a fully decentralized system of support and technology transfer services intended to serve a broad range of member utility personnel.

PowerServe will allow application programs resident on a variety of servers to be run by the utility user without the limitations of having to have the proper microcomputer setup, or making sure the software is current. For fast changing information or databases, it will provide instant updates. It can give access to real time information. This may well become a major conduit for EPRI to deliver information in the future.

VIDEOCONFERENCING.

EPRI has installed videoconferencing centers in a number of our offices, test facilities and application centers. Videoconferencing for our overseas affiliates and cofunders provides a way to replace some of the travel involved in long distance technology transfer. Videoconferencing at the computer terminal is also being explored using new technology that is under development. We have used videoconferencing with numerous utilities to provide topical updates, advice prior to selecting emission control processes, and provide up to date reviews of ongoing projects prior to issuance of the final report.

APPLICATION PROJECTS.

Our Tailored Collaboration (TC) program is a means to match specific utility R&D needs with EPRI's program. For up to 25% of a member's EPRI dues, the member can have specific R&D done by EPRI provided it matches the amount of dues used, by added cofunding. This halves the cost to the utility of research it would otherwise have to do outside EPRI. Projects in the NO_x, particulate, and SO₂ control areas are funded by TC. Many of the projects represent extensions of EPRI tools and information, but seek to answer the question, ..."how can these address my problem"? By this means, we reduce the risk and help with the engineering and design decisions, as well as help avoid or solve problems in the initial installation. In turn, the extensions to applicability of these tools provide helpful information to EPRI's other member utilities.

APPLICATION CENTERS WITH HOTLINE SERVICES.

In 1991, EPRI's Customer Systems Division established a new applications assistance center known as the Customer Assistance Center. Based on this successful model, the Environment Division has established an Environmental Assistance Center (EAC) in Dallas Texas. The EAC staff includes a hotline specialist, who has general familiarity with Environment Division results and resources, as well as technical staff to help in answering detailed questions, training, and jump starts. The commitment is to respond within 48 hours to any inquiry, and to follow up to determine if the request was satisfied with the information provided, and how the information was used.

Three services are offered through the EAC - Technical information via telephone, jump starts, and training and seminars. The technical information via telephone is accessed using a hot line answered during business hours, with a database used for tracking and follow-up. If our people on-site are unable to answer the questions, EPRI specialists will follow up. Jump starts are for more elaborate problems, where on-site assistance is required to solve the problem, often by applying EPRI results. An EPRI employee visits the site and works with utility staff to determine the best way to apply the R&D results. We then use a

pre-qualified group of EPRI contractors with a quick contracting mechanism to get the people on the job immediately. Training and seminars are typically conducted in small groups, often using special computer training facilities.

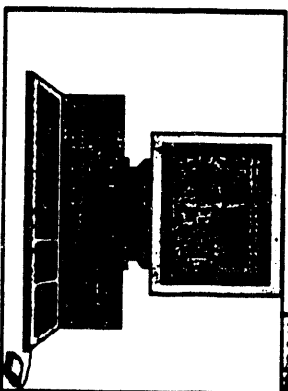
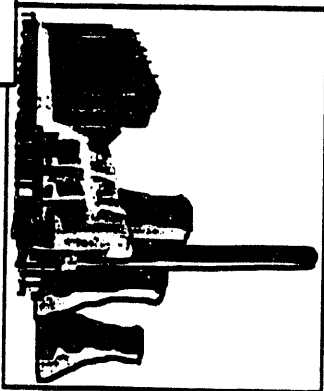
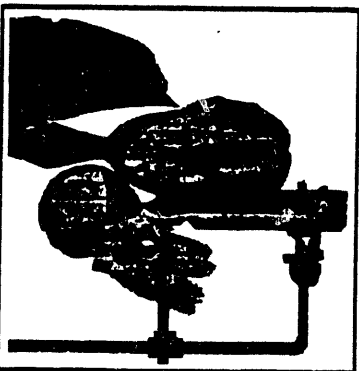
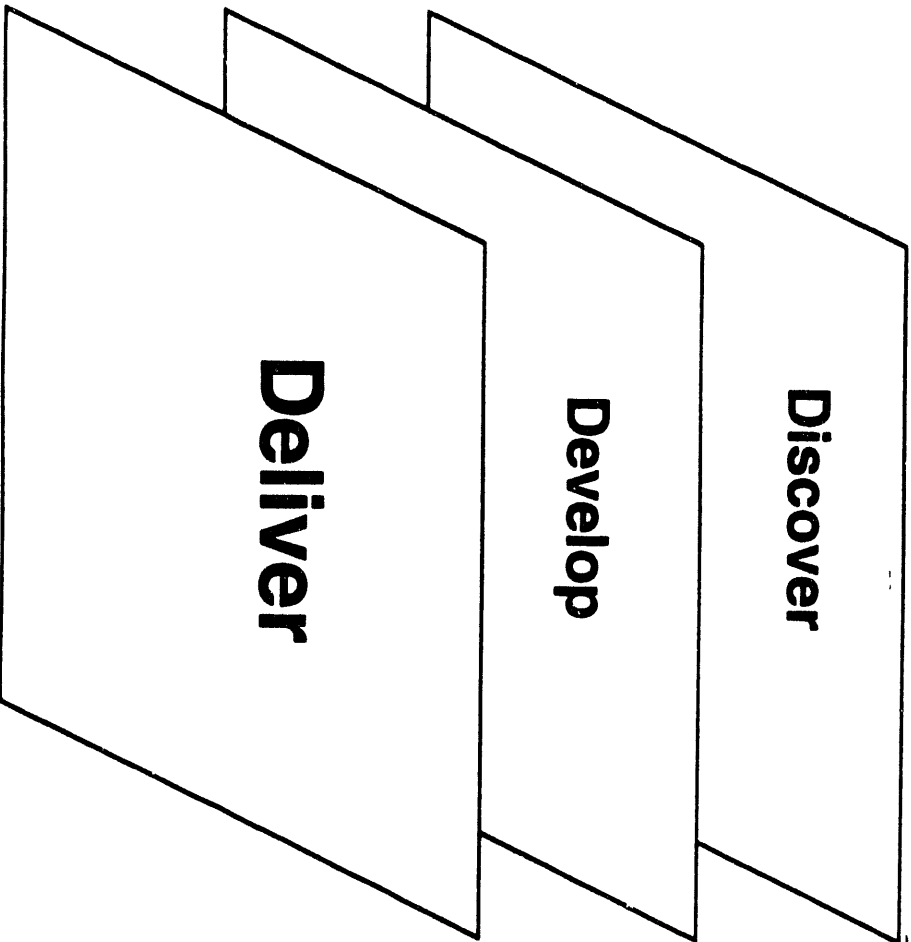
LOANED EMPLOYEES

Our policy has been to encourage loaned employees from members and affiliates as a direct means to encourage technology transfer. This has proved very valuable for both EPRI, which gains manpower and a direct input from the utility, and to the member, who gains direct experience in relevant research and development. The typical term is 1-2 years, with some terms shorter than this in order to accommodate special needs. The benefit to the loaned employee is that assignments offer rapid introduction to specific technologies, as well as the opportunity to establish close technology transfer links to EPRI staff, contractors, and technology suppliers.

CONCLUSIONS

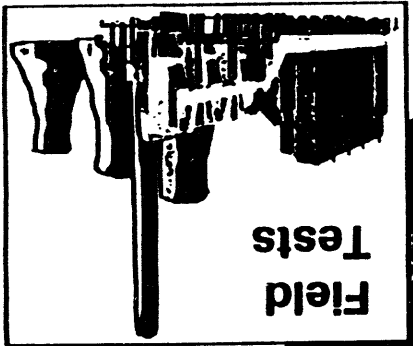
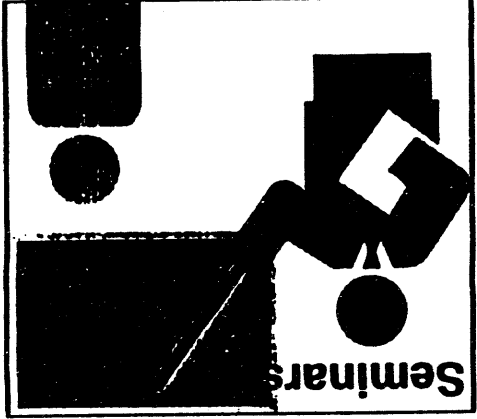
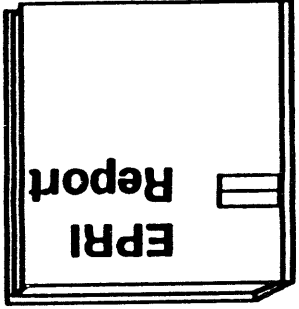
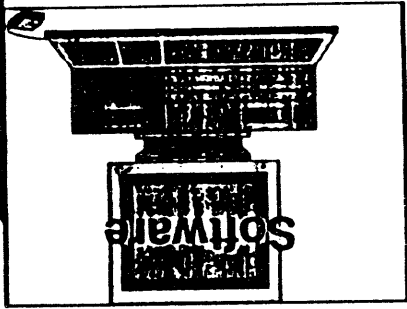
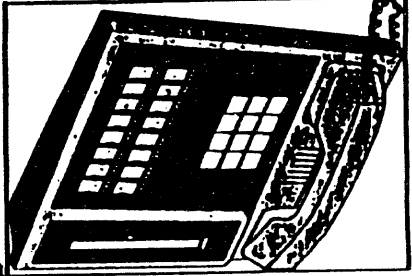
EPRI recognizes that the job is not complete until the technology is used and useful to the customer. We are adding many vehicles to deliver the information and spending more of our time and resources to complete this task. As we move to a more sophisticated technology, the tools to do this are also getting more sophisticated. We believe our outreach program gives us a good connection with our members, and a good foundation for the future, as we reach out towards new customers for our information at home and overseas.

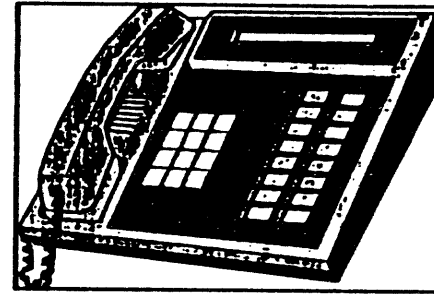
EPRI's Mission



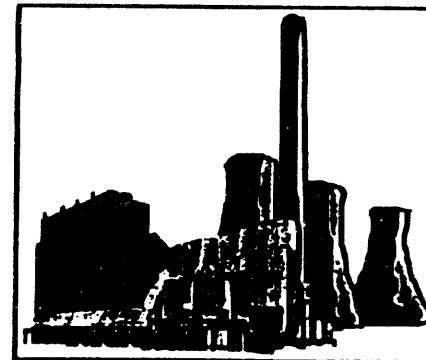
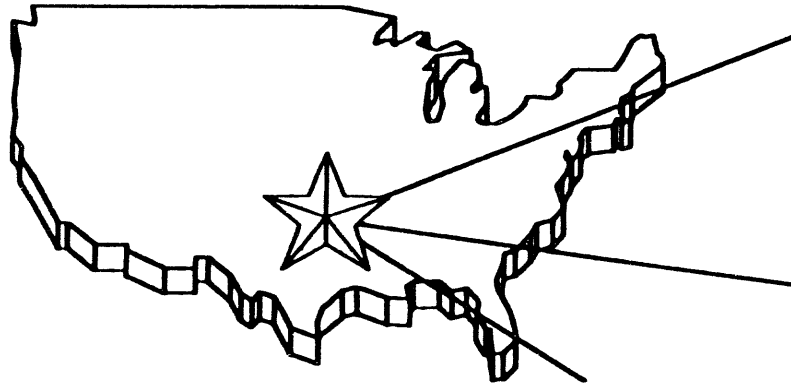
EPRI TECHNOLOGY TRANSFER

EPRI NET

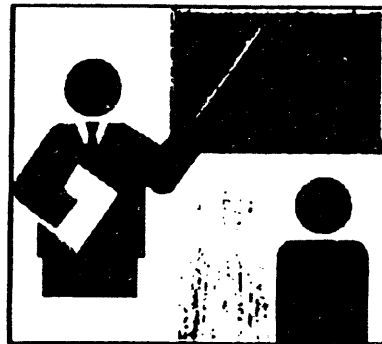




**Technical Information
Telephone Assistance**



Jump Starts



Training & Seminars

**REMARKS BY BEN YAMAGATA
EXECUTIVE DIRECTOR OF THE CLEAN COAL TECHNOLOGY COALITION
SECOND ANNUAL DOE CLEAN COAL TECHNOLOGY CONFERENCE
SEPTEMBER 9, 1993**

We have asked the American taxpayer to provide more than \$2.7 billion to the clean coal technology demonstration program. Industry is likely to provide well over \$4.0 billion. What do we get from this expenditure of public and private funds? Hopefully, we get more, **much more**, than simply several scores of "successfully demonstrated" technologies.

Yesterday, Secretary White challenged this audience to step ahead of the trend; to take risks and to **deploy** these "successfully demonstrated" technologies. Otherwise, as the Secretary noted and as we know, the technologies will be "shelved" and not widely used. Well, how do we best insure deployment? What are those "deployment" considerations and, more importantly, what are the impediments to deployment?

The policy wonks, the political pundits, and the various custodians of the federal purse have argued, and will argue, that the role of government stops when the technology is "demonstrated." And, at that point in the process, it is argued, the government will step aside to let the marketplace work. Well, I'm not certain that will happen; in the case of successfully demonstrated technologies. Part of this Administration's "reinventing government" should include a recognition that the clean coal partnership between government and industry that got us here -- that is producing successfully demonstrated technologies -- ought to be continued until such time as the market might truly make its assessment about the technical and economic merit of these technologies.

Let's do some policy wonking of our own. What about adopting this policy: The role of government appropriately stops when the expenditure of public funds starts to provide a return to the taxpayer and/or when the marketplace evidences a willingness and an ability -- in the case of successfully demonstrated technologies -- to pursue the technologies into commercialization without further government involvement. This does not mean that government should simply pump additional funds into a technology's development. It does mean that government should carefully examine the remaining impediments to a technology's widespread use and, where appropriate, provide such further incentives to industry to enable the best assessment of whether or not the technically better technology, e.g. the one for superior in environmental performance and energy conversion, should be adopted. Clearly, if government stops at the demonstration phase and the technology is shelved, the taxpayer gets no return on the investment. Risk-taking certainly exists beyond the demonstration phase, the question to be asked is whether industry is willing, or able, to take those risks alone, or alternatively, whether government should be asked to further partner in the risk-taking-in order to make the technology a real option for the market place.

I would like to focus my comments on "deployment considerations" by asserting that in the case of commercializing clean coal technologies government's involvement should not stop at the demonstration gate.

I'll discuss two areas in this regard: first, the need -- now -- for the domestic DOE CCT Program to focus on the domestic deployment of demonstrated technologies, and second, the need to recognize that to participate in the phenomenal growth of international power markets through use of clean coal or advanced coal technologies an

aggressive partnering between our government and industry to demonstrate technologies abroad will be required.

The Clean Coal Technology Coalition's (CCTC) primary mission has been to promote the development and use of CCTs. We are strong advocates for the DOE CCT Program and applaud the Department's and industry's success at developing many coal-based technologies. By current design, the DOE program is said to go no further than the initial demonstration of a technology. Since our inception in 1986, the Coalition has advocated the need to pursue a partnership with government in which more than one demonstration of the same or similar technology is supported by the clean coal program. Only in this way can we assure widespread acceptance of any given technology. There exists a gap (call it a "risk gap") between CCTs that have been successfully demonstrated (and presumably available for commercial use) and their widespread commercial use. We have developed a technology matrix in which we try to picture the developmental status of a variety of clean coal technologies. We'll be happy to provide that information to you.

While still too early to pass judgment, it appears that while success is being achieved in demonstrating advanced coal technologies, the market place -- for several reasons -- is not, indeed may have no plans, to adopt these technologies.

As many of you know, the United States Congress has directed the Department of Energy to examine and report by May of 1994 upon the need to conduct another solicitation of the clean coal program. Also, anticipating that a great deal of funds for previously selected projects might become available, the Congress expects the Department to provide suggestions regarding the use of those funds. I suspect that I do

not need to tell you that the budget knives are sharp and cutting, nor do I need to report that many other groups are gathering, watching and waiting to make their case for using those funds for other purposes. It is in this climate that the Coalition, in March of this year, created an advisory group from its membership to formulate a Coalition position on the advisability of pursuing a Round VI and to seek industry recommendations of the best use of any unobligated funds that might remain from the previous five rounds of selections.

After considering several options for the program, it became rapidly apparent that our recommendation would be to focus on the goal of deployment; that step before widespread use -- government to partner with industry to fill the gap I spoke of earlier.

The Coalition's advisory group completed its recommendation to the Coalition at the end of August. Currently, our full membership, as well as the Coalition's Executive Committee, are reviewing this proposal and we will have a set of recommendations to be made to the DOE by the end of this month. I would like to use this opportunity to talk about the Coalition's recommendation as it very specifically relates to our members' views regarding a means by which we might insure successful deployment of demonstrated clean coal technologies.

The first task undertaken by the advisory group was to determine what might hinder CCTs from enjoying widespread acceptance in the commercial sector. Clearly, some technologies are not yet ready for large-scale commercial application. However, for those that are, the question is why aren't power producers opting to use these technologies. The higher first-of-a-kind costs of these technologies, coupled with the significant risk that is associated with the use of any new technology, presents the most

significant impediment to deployment of CCTs. Utilities, a large segment of the potential power producing sector, are faced with a heavily-regulated environment which prevents them from accepting the level of risk and higher costs associated with initial introduction of a commercial CCT unit, especially in light of non-utility generators who are poised to provide new capacity based on mature, low cost natural gas or pulverized coal-fired operation. This problem is exacerbated by the limited capacity additions currently being undertaken by least-cost planning requirements, and by those Clean Air Act provisions which encourage decisions not predicated upon the use of new technology application.

One approach to this problem is to change the existing regulatory environment for power producers to encourage, rather than prohibit, the assumption of increased risk and cost of CCTs which are environmentally preferable to conventional technologies, and in many cases more efficient. David South, in his presentation today, will discuss changes to the regulatory structure and therefore I will not focus on this area. Further, the advisory group chose not to address regulatory reform in its recommendation to the Coalition due to the significant time delay and difficulties associated with the process of getting each state commission to change existing regulations. The Coalition, however, is supportive of regulatory reform and is seeking to lend its support to viable reform efforts.

What beyond regulatory reform may be viable?

The Coalition supports the concept of an enhanced CCT Program with the objective of moving previously demonstrated CCTs into widespread commercial use by reducing the financial risk assumed by those who opt to use CCTs which are not yet in

general commercial use. This enhanced program would continue to be industry cost-shared, with industry assuming an even greater financial exposure as these technologies move close to commercialization. Federal funding would provide a minimum cost-share and would come from the unobligated funds from Rounds 1-5 of the CCT Program.

The enhanced CCT Program would be market driven, allowing the consumer (industry) to select the technologies that would be pursued under the program. This would help ensure that only those technologies which have a reasonable chance for market penetration would continue to receive federal support. The Coalition is not advocating a "cookie cutter" demonstration program which encourages repeated iterations of a specific technology. Rather, what we are aiming at is to commercially demonstrate those technologies that display some form of innovation or evolution from a past demonstration.

The enhanced (deployment driven) CCT Program, as we envision it, would only address the incremental cost associated with CCTs relative to conventional coal processes. By using a formula to calculate the cost differential between a traditional coal combustion power generation plant and a CCT plant, taking into account such variables as capacity factor heat rate and some O&M costs, the DOE could reasonably estimate the financial support necessary to make a power producer "neutral" to selecting the clean coal technology over a conventional nature technology.

This kind of mechanism provides a built in protection system. As only those technologies which are cost competitive as measured on a levelized kwh basis will be selected for deployment efforts, any bidder with too high a proposal cost would not likely be selected for the program. Likewise, bidders anxious to participate in the program

who underestimate costs would receive only the predetermined increment -- therefore having to make up the difference themselves.

The CCTC strongly recommends that the DOE CCT Program needs to now be focused on deployment. At the same time, we also strongly support research and development of CCTs at the DOE, which we proposed to be carried out through the general Fossil Energy Budget. However, because the current CCT program is the only national program that supports major industry development of clean coal technologies, continuing this work in some way through the clean coal program is critical to improvements to CCTs. In other words, the recommendation the Coalition hopes to make would envelop and accommodate technology enhancements to existing demonstrations. Put another way, any R&D not directly associated with enhancing deployment of previously demonstrated technologies, either inside or outside the current CCT program would be outside the scope of the enhanced program I have outlined.

While modifying the DOE CCT Program has been the focus of the CCTC advisory group, Coalition members are aware that the large markets for CCTs are not at home, but in the international market. For this reason, the Coalition has strongly supported congressional appropriations to implement The Innovative Clean Coal Technology Transfer Program (Section 1332 Energy Policy Act). Ted Atwood will be speaking later about the DOE's strategy for implementing this program, but I think it is important to note that this program has the potential to be a link between the domestic CCT Program, and deployment of U.S. technologies in new markets in developing nations and countries with economies in transition. By placing U.S. technologies in other

nations, in showcase demonstrations, you are taking an important step toward reducing the perceived risk of these technologies.

Let me spend a moment re-reviewing these overseas markets.

Worldwide demand for power is expected to expand at rapid rates through the year 2010 so that, by the end of the next decade, world consumption of energy is projected to grow by almost 40%. Not surprisingly, energy consumption will grow most rapidly in the developing countries, possibly twice as fast as the developed countries.

As the worldwide demand for power expands, the international demand for coal and coal combustion technologies is also expected to grow at a rapid rate. According to the world bank, approximately 45% of the additional power supplied to less developed nations between 1990 and 2000 is expected to be generated by coal. China, the country with the highest expected growth in power generating capacity, will rely primarily upon coal. China has proven reserves of more than 950 billion tons and estimated reserves of 4 trillion tons. If these estimates prove correct, that's enough coal to last for several hundred years. India, expected to have the second largest new power generation needs in the world, will also rely heavily upon coal use - currently, India has approximately 68 million tons of recoverable coal reserves. Many countries around the world with domestic coal resources are planning to increase the use of their reserves to satisfy growing energy needs. Coal provides an abundant, secure and economic resource for these countries and increased coal consumption, along with growing environmental pressures world wide, will work together to increase demand for cct's throughout the world.

According to the Department of Energy, the potential cct market for new facilities, retrofit installations and follow-on work outside of the U.S. from 1992-2010 is projected to be between \$270 billion and \$750 billion. This represents a potential \$23.4 billion per year market. Thanks in large part to the DOE clean coal demonstration program, the U.S. has a strong and internationally competitive cct industry and is well positioned to participate in the growing worldwide markets. If U.S. suppliers are able to capture a significant market share for cct's, a great opportunity exists for our country to reduce our balance of trade and create high-value domestic jobs while furthering our national commitment to the protection of the world environment. There are also benefits to coal-consuming countries using clean coal technologies, including increasing their economic efficiency, mitigating environmental impacts and greater energy security as worldwide resources of coal exceed those of oil and gas and, unlike those of oil, are not geographically concentrated.

As Deputy Secretary White noted yesterday, the risk of damage to the environment will increase as a result of rapidly growing energy consumption in developing countries. The good news is that as these countries industrialize and increase their dependence on fossil fuels, the need will emerge to reduce environmental impacts of energy production, generation, and use by deploying the best available technology. The challenge, however, will be to encourage developing countries to implement "cleaner" advanced technologies at a time when most host country governments are most concerned with providing cheap, abundant electricity and have little regard for emission control. How can we skip a generation of technologies and enable adoption and use of the most modern technologies?

More narrowly defined, this challenge for the u.S. Focuses on 2 critical issues to ensure that a "foothold" is created in this enormous market for u.S. Companies. 1) How does the u.S. Demonstrate to developing countries that u.S. Suppliers offer some of the most advanced and efficient clean coal technologies available in the world today, thereby encouraging these countries to seek out business with u.S. Manufacturers? And 2) how do we as a nation, both the government and the private sector, help developing countries to finance the incremental cost of deploying advanced technologies such as cct's, thereby giving these less developed countries with serious capital constraints the incentive, and means, to implement cct's?

In order to meet this important challenge, I believe, that a stronger partnership must be forged between industry and government to facilitate the export of u.S. Cct's. Establishment of such a cooperative relationship would allow U.S. Cct manufacturers to effectively utilize federal export promotion programs in order to meet the financing needs required by advanced technology systems even before we can think about these technologies being widely used abroad. I believe that industry and government should share the burden of demonstrating first generation technologies in developing countries, giving these countries the opportunity to significantly increase their level of understanding and trust in the viability of better, but more expensive technology. At a minimum this means that government and industry ought to pursue demonstrations thru the implementation of section 1332 - which Ted Atwood will speak to shortly.

**BRIDGING THE GAP BETWEEN
CCT DEMONSTRATION AND
COMMERCIALIZATION: THE USE OF
REGULATORY INCENTIVES**

**David W. South
Economist/Program Manager
Argonne National Laboratory**

**(The comments of Mr. South were not
available at the time of publication.)**

**IMPLEMENTING SECTION 1332,
ENERGY POLICY ACT OF 1992**

**Ted Atwood
Office of Clean Coal Technology/
U.S. Department of Energy**

DRAFT (8/31/93)
APPROACH FOR FOSSIL ENERGY
TECHNOLOGY TRANSFER PROGRAMS

BACKGROUND

Sections 1332 Clean Coal Technology, and 1608 Environmental Technology of the Energy Policy Act of 1992 (EPACT) describe two technology Transfer Programs for creating jobs and reducing the trade deficit for the United States, through providing financial assistance for projects to improve energy efficiency and reduce environmental emissions including "Greenhouse Gases." These projects are to be located in countries which are supported by the Agency for International Development (AID) or in countries with an economy in transition from a non-market to a market economy. The legislation requires a very similar approach for the two programs. Working with AID the DOE is to: 1) complete in 150 days an agreement with the appropriate US agencies for conducting the program in the host countries; 2) issue in 240 days a list of potential projects; 3) within one year issue a solicitation and 4) within 120 days after receipt of proposals make selection. In addition, the programs are to develop a procedure for providing financial assistance to projects applying for solicitations in other countries.

After an initial consultation with U.S. Treasury, Export-Import Bank, Overseas Private Investment Corp.(OPIC), and AID concerning Organization for Economic Cooperative Development rules for export credits, and the most appropriate means of financing projects under the Transfer Programs, it became apparent that, in addition to providing financing for projects through DOE programs, a more efficient, economical and prudent approach to implementing a transfer program would involve the financing of projects through organizations already experienced in the development of overseas investments. In order to accomplish this, the following program approach, should be considered.

PROPOSED APPROACH

Implementation of the Transfer Program created by EPACT would consist of a twofold approach to serve two different objectives.

"Showcase" Demonstrations

One objective would be to demonstrate a few advanced "showcase" technologies in key market areas. This would involve demonstrations of advanced technologies (for the purpose of this program advanced technologies are defined as having been demonstrated in the U.S., but have not achieved commercial replication in the U.S.) that both the U.S. Government, U.S. industry and the host countries industrial sector believe to have considerable future replication potential. However due to some of the first-of-a-kind aspects of utilizing the advance technology in the host country and the associated performance risk, the commercial means of financing may not be readily available for these projects. By DOE having a program to provide financial assistance up to 50% (the cost share could

be structured to achieve an acceptable rate of return) of the projected eligible capital and operating costs through cooperative agreements with repayment provisions, the selected "showcase" technologies could be demonstrated for evaluation by potential foreign and U.S. users. The features of this approach for marketing advanced technologies to developing countries includes providing a source of financing not obtainable through the commercial markets, distribution of risk among multiple funding sources, expediting the demonstration through a program involving a single government agency, developing a foundation overseas for market acceptance of future U.S. technologies through participation in the demonstration, and generating goodwill through investing in the development of technologies to satisfy the future needs of the host country. In order to increase U.S. sales abroad, more is involved than just offering the better "mouse trap" and project financing. It is important to demonstrate a willingness to invest in the future of your customer.

Export of Commercial Technology

The second approach would be designed to achieve an objective of resolving near term energy and associated environmental problems in foreign countries through the use of U.S. technology. Through this program technology that is commercial in the U.S., but not in the host country, could become more readily available through DOE sponsoring project definition activities (these could include sufficient engineering and design to support an adequate cost estimate for financing, developing supply and sales agreements, defining risks and approaches to mitigate risks) sufficient to obtain financing through the Export-Import Bank, OPIC, World Bank or commercial sources of financing. This program would encourage the export of commercially available U.S. equipment for meeting the current and near term needs of the eligible nations (as defined in secs. 1332 and 1608) and by doing so help to reduce the U.S. trade deficit and create high skilled U.S. jobs.

The program could be implemented through designating funding to the Export-Import Bank specifically for the financing of projects using the eligible technologies defined by secs. 1332 and 1608. Funds could also be designated to OPIC for providing insurance to projects in the Technology Transfer Program. DOE would provide funds for conceptual designs and definition for projects utilizing eligible technologies. The DOE funds would be cost shared up to fifty percent with U.S. industry for investigating and defining projects in eligible countries. Where appropriate these studies could be conducted in conjunction with the Trade Development Agency (TDA) or AID. DOE could serve as the focal point and lead coordinator among the federal agencies to ensure a smooth transition from the definition phase to the ultimate financing organization. Prior to initiating a study it would be determined that the project represents a development priority for the host country, financing for the project is likely if the study results are attractive and the potential for U.S. exports for subsequent projects is significant. Based on the results of these studies the industrial participant could elect to seek financing from the funds "ear marked" at the other agencies or any other source. Projects with sufficient definition could proceed directly to the Export-Import Bank for financing. The DOE would provide the Export-Import Bank

with the technical experts for evaluating investments and would participate in the monitoring of the technical progress during project implementation.

A small fund could also be earmarked at TDA for feasibility studies for the eligible technologies and for training of host country technical, government and business personnel. TDA provides grants to the host country for conducting very preliminary low cost feasibility studies to determine if the idea merits future investment. These studies may not provide sufficient definition for financing or project control. The definition activities that would be cost shared by DOE would provide this information and would be more costly than the feasibility study, therefore requiring cost sharing to demonstrate commitment by the U.S. firm and host country. Investment in front end definition for projects repeatedly pays off in the long term through reduced technical and business uncertainty resulting in less potential for cost overruns.

There are considerable advantages to structuring the program to use the existing expertise of organizations well versed in overseas financing and the OECD regulations. The DOE does not have the expertise required for international finance nor does the DOE procurement system easily accommodate the issuing of loans and loan guarantees. Financing done through DOE would be very limited in the ability to leverage the government funds and DOE would not have the financing flexibility of the other agencies. Traditionally the Export-Import Bank funds are leveraged twenty-to-one, thus a \$600 million fund at the bank could finance over \$12 billion of projects when considering the equity invested. Using the Bank and OPIC for financing will provide greater flexibility through having more mechanisms of financing available. The World Bank Global Environmental Fund could also be a source of financing for the projects.

In the international market the financing flexibility and terms maybe more important for equipment sales and services than the merits of the technology being offered. To achieve the objectives of the Technology Transfer Program defined by the Energy Policy Act, there is considerable merit to implementing the program through a marriage of the DOE technical expertise and the financial and business expertise of the agencies created for assisting overseas projects. By structuring the program as described, industry would continue to work with the same organizations as it has in the past for seeking overseas financing.

Applicable Projects and Technologies

Both approaches would be applicable to projects in the host countries where the U.S. firm has an equity interest in the project, this could include grassroots, retrofit or repowering projects. Where appropriate government financing could be packaged for the entire project, for the incremental cost for the portion of the project applicable to energy efficiency or environmental controls, or just for the differential cost of using U.S. technology rather than the conventional technology generic to the host country.

Under sec 1332 the project should use U.S. clean coal technology, and where appropriate U.S. coal resources, in meeting the applicable energy

and environmental requirements of the host country. Under sec. 1608 the project should use a U.S. technology that substantially reduces environmental pollutants, including greenhouse gases, in meeting the applicable energy and environmental requirements of the host country.

Solicitation Structure

There are three basic ways to structure the solicitations for projects under the program 1) one step process, 2) two step process or 3) a program rule. The one step process is exactly the same as the solicitations for the clean coal program. A proposal is submitted and by a certain date selections are made. Usually this approach does not allow for discussions between the proposer and the government prior to selection.

The two step selection process would reduce the proposals to a competitive range and discussions would be conducted with these proposers. This should result in a better selection through gaining a more accurate understanding of the validity of the information contained in the proposals. The winning proposals would be selected from those in the competitive range. By narrowing the field of selection prior to discussions, the two step process would not be significantly longer than the single step process.

If the solicitation were for the showcase demonstrations a variation of the two step process could be used. Proposals could be selected for definition activities followed by a second selection prior to detailed design and construction. This would allow the selection of more projects for definition than there is funding for construction. Since these are demonstrations, there is uncertainty as to the continued viability or attractiveness of the project as the definition activities proceed. By over selecting and having a second screening prior to funding detailed design and construction there is a higher probability of successful demonstrations resulting in future sales of equipment and services.

The third method is called a program rule, this is an open ended solicitation. Over a period of time proposals are submitted and reviewed based upon in the priority of when received. The open period for submittal could be up to two years. The program rule has not been widely used in the Department. Another difficulty, especially in a political environment, is the pacing of the selections to prevent the entire funding from being awarded to just early submittals.

Staged Solicitations

Considering the experience gained under the Clean Coal Program it might be appropriate to have multiple sequential solicitations. The subsequent solicitations in the Clean Coal Program profited from the learning experience of the prior solicitations resulting in considerable improvements in each round. A prudent approach to successfully implementing the program is to limit the initial solicitation to a few key countries with attractive markets for U.S. technology, that have a practical approach to a free market economy as well as an attractive business climate and acceptable political risks.

After gaining the experience of the first solicitation then issue subsequent solicitations encompassing more countries or dedicated to different countries. Initially the solicitation maybe targeted to projects located in one or two countries in eastern Europe and Asia.

Limited Funding

If the funding is significantly less than authorized (\$1.2 billion) by 1332 and 1608 (less than \$100 million) the most useful program approach maybe to limit the government funds to project definition activities or financing the differential cost of using U.S. technology, or incremental cost of pollution control for smaller projects. The funding of definition activities would reduce the front end costs of project development for industry while enabling activities to proceed that are necessary to obtain the financing of the project through other government programs, World Bank or commercial institutions. The DOE could assist in coordinating with the ultimate project funding agency to ensure the most appropriate actives are being pursued during the definition phase.

Schedule

A schedule of activities for the development and issuing of a solicitation by early Fy 1995 is attached.

Schedule for Innovative Technology

Transfer Program (EPA Act secs. 1211, 1332, & 1608)

Activity	FY93					FY94					FY95			
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	
MOU with AID	(Awaiting S-1 Approval)													
Interagency Agreement AID	████████████████████													
Develop working relationship with TDA, EXIM BANK & OPIC	████████████████████													
Define Eligible Technology for 1608 & issue list	████████████████████													
Define EE/FE roles for 1608	████████████████████													
Target Markets/Project Lists														
Market Analysis	████████████████████													
Selection Criteria	████████████████████													
Develop Project List Mechanism	████████████████████													
Develop Project List						████████████████████								
Financing Mechanism														
Survey Industry/Trade Groups	████████████████████													
Survey other Agencies	████████████████████													
Consult CORECT, COEECT & CCT Subgroup						████████████████████								
Develop Mechanism with AID						████████████████████								
Public Meeting (Optional)	████████████████████													
Solicitation														
Evaluate Options	████████████████████													
Determine NEPA Applicability & incorporate into Solicitation	████████████████████					████████████████████								
Develop Solicitation with AID, EXIM Bank						████████████████████								
Issue Draft for Public Review											████████			
Public Meeting (Optional)						████████████████████								
Issue Solicitation											████████████████████			
EE/FE Report to Congress											████████████████████			

██████████ Denotes Statutory deadline

coal technology transfer program to carry out the purposes described in subsection (b). Within 150 days after the date of enactment of this Act, the Secretary and the Administrator of the Agency for International Development shall enter into a written agreement to carry out this section. The agreement shall establish a procedure for resolving any disputes between the Secretary and the Administrator regarding the implementation of specific projects. With respect to countries not assisted by the Agency for International Development, the Secretary may enter into agreements with other appropriate United States agencies. If the Secretary and the Administrator, or the Secretary and an agency described in the previous sentence, are unable to reach an agreement, each shall send a memorandum to the President outlining an appropriate agreement. Within 90 days after receipt of either memorandum, the President shall determine which version of the agreement shall be in effect. Any agreement entered into under this subsection shall be provided to the appropriate committees of the Congress and made available to the public.

(b) **PURPOSES OF THE PROGRAM.**—The purposes of the technology transfer program under this section are to—

(1) reduce the United States balance of trade deficit through the export of United States energy technologies and technological expertise;

(2) retain and create manufacturing and related service jobs in the United States;

(3) encourage the export of United States technologies, including services related thereto, to those countries that have a need for developmentally sound facilities to provide energy derived from coal resources;

(4) develop markets for United States technologies and, where appropriate, United States coal resources to be utilized in meeting the energy and environmental requirements of foreign countries;

(5) better ensure that United States participation in energy-related projects in foreign countries includes participation by United States firms as well as utilization of United States technologies that have been developed or demonstrated in the United States through publicly or privately funded demonstration programs;

(6) provide for the accelerated deployment of United States technologies that will serve to introduce into foreign countries United States technologies intended to use coal resources in a more efficient, cost-effective, and environmentally acceptable manner;

(7) serve to ensure the introduction of United States firms and expertise in foreign countries;

(8) provide financial assistance by the Federal Government to foster greater participation by United States firms in the financing, ownership, design, construction, or operation of clean coal technology projects in foreign countries;

(9) assist foreign countries in meeting their energy needs through the use of coal in an environmentally acceptable manner, consistent with sustainable development policies; and

(10) assist United States firms, especially firms that are in competition with firms in foreign countries, to obtain opportunities to transfer technologies to, or undertake projects in, foreign countries.

SEC. 1332. INNOVATIVE CLEAN COAL TECHNOLOGY TRANSFER PROGRAM. 42 USC 13362

(a) **ESTABLISHMENT OF PROGRAM.**—The Secretary, through the Agency for International Development, and in consultation with the other members of the CCT Subgroup, shall establish a clean

(c) **IDENTIFICATION.**—Pursuant to the agreements required by subsection (a), the Secretary, through the Agency for International Development, and after consultation with the CCT Subgroup, United States firms, and representatives from foreign countries, shall develop mechanisms to identify potential energy projects in host countries, and shall identify a list of such projects within 240 days after the date of enactment of this Act, and periodically thereafter.

(d) **FINANCIAL MECHANISMS.**—(1) Pursuant to the agreements under subsection (a), the Secretary, through the Agency for International Development, shall—

(A) establish appropriate financial mechanisms to increase the participation of United States firms in energy projects utilizing United States clean coal technologies, and services related thereto, in developing countries and countries making the transition from nonmarket to market economies;

(B) utilize available financial assistance authorized by this section to counterbalance assistance provided by foreign governments to non-United States firms; and

(C) provide financial assistance to support projects, including—

(i) financing the incremental costs of a clean coal technology project attributable only to expenditures to prevent or abate emissions;

(ii) providing the difference between the costs of a conventional energy project in the host country and a comparable project that would utilize a clean coal technology capable of achieving greater efficiency of energy products and improved environmental emissions compared to such conventional project; and

(iii) such other forms of financial assistance as the Secretary, through the Agency for International Development, considers appropriate.

(2) The financial assistance authorized by this section may be—

(A) provided in combination with other forms of financial assistance, including non-United States funding that is available to the project; and

(B) utilized to assist United States firms to develop innovative financing packages for clean coal technology projects that seek to utilize other financial assistance programs available through other Federal agencies.

(3) United States obligations under the Arrangement on Guidelines for Officially Supported Export Credits established through the Organization for Economic Cooperation and Development shall be applicable to this section.

(e) **SOLICITATIONS FOR PROJECT PROPOSALS.**—(1) Pursuant to the agreements under subsection (a), the Secretary, through the Agency for International Development, within one year after the date of enactment of this Act, and subsequently as appropriate thereafter, shall solicit proposals from United States firms for the design, construction, testing, and operation of the project or projects identified under subsection (c) which propose to utilize a United States technology. Each solicitation under this section shall establish a closing date for receipt of proposals.

(2) The solicitation under this subsection shall, to the extent appropriate, be modeled after the RFP No. DE-PS01-90FE62271

Clean Coal Technology IV as administered by the Department of Energy.

(3) Any solicitation made under this subsection shall include the following requirements:

(A) The United States firm that submits a proposal in response to the solicitation shall have an equity interest in the proposed project.

(B) The project shall utilize a United States clean coal technology, including services related thereto, and, where appropriate, United States coal resources, in meeting the applicable energy and environmental requirements of the host country.

(C) Proposals for projects shall be submitted by and undertaken with a United States firm, although a joint venture or other teaming arrangement with a non-United States manufacturer or other non-United States entity is permissible.

(f) **ASSISTANCE TO UNITED STATES FIRMS.**—Pursuant to the agreements under subsection (a), the Secretary, through the Agency for International Development, and in consultation with the CCT Subgroup, shall establish a procedure to provide financial assistance to United States firms under this section for a project identified under subsection (c) where solicitations for the project are being conducted by the host country or by a multilateral lending institution.

(g) **OTHER PROGRAM REQUIREMENTS.**—Pursuant to the agreements under subsection (a), the Secretary, through the Agency for International Development, and in consultation with the CCT Subgroup, shall—

(1) establish eligibility criteria for countries that will host projects;

(2) periodically review the energy needs of such countries and export opportunities for United States firms for the development of projects in such countries;

(3) consult with government officials in host countries and, as appropriate, with representatives of utilities or other entities in host countries, to determine interest in and support for potential projects; and

(4) determine whether each project selected under this section is developmentally sound, as determined under the criteria developed by the Development Assistance Committee of the Organization for Economic Cooperation and Development.

(h) **SELECTION OF PROJECTS.**—(1) Pursuant to the agreements under subsection (a), the Secretary, through the Agency for International Development, shall, not later than 120 days after receipt of proposals in response to a solicitation under subsection (e), select one or more proposals under this section.

(2) In selecting a proposal under this section, the Secretary, through the Agency for International Development, shall consider—

(A) the ability of the United States firm, in cooperation with the host country, to undertake and complete the project;

(B) the degree to which the equipment to be included in the project is designed and manufactured in the United States;

(C) the long-term technical and competitive viability of the United States technology, and services related thereto, and the ability of the United States firm to compete in the develop-

ment of additional energy projects using such technology in the host country and in other foreign countries;

(D) the extent of technical and financial involvement of the host country in the project;

(E) the extent to which the proposed project meets the goals and objectives stated in section 1301(a);

(F) the extent of technical, financial, management, and marketing capabilities of the participants in the project, and the commitment of the participants to completion of a successful project in a manner that will facilitate acceptance of the United States technology for future application; and

(G) such other criteria as may be appropriate.

(3) In selecting among proposed projects, the Secretary shall seek to ensure that, relative to otherwise comparable projects in the host country, a selected project will meet 1 or more of the following criteria:

(A) It will reduce environmental emissions to an extent greater than required by applicable provisions of law.

(B) It will increase the overall efficiency of the utilization of coal, including energy conversion efficiency and, where applicable, production of products derived from coal.

(C) It will be a more cost-effective technological alternative, based on life cycle capital and operating costs per unit of energy produced and, where applicable, costs per unit of product produced.

Priority in selection shall be given to those projects which, in the judgment of the Secretary, best meet one or more of these criteria.

(i) UNITED STATES-ASIA ENVIRONMENTAL PARTNERSHIP.—Activities carried out under this section shall be coordinated with the United States-Asia Environmental Partnership.

(j) BUY AMERICA.—In carrying out this section, the Secretary, through the Agency for International Development, and pursuant to the agreements under subsection (a), shall ensure—

(1) the maximum percentage, but in no case less than 50 percent, of the cost of any equipment furnished in connection with a project authorized under this section shall be attributable to the manufactured United States components of such equipment; and

(2) the maximum participation of United States firms.

In determining whether the cost of United States components equals or exceeds 50 percent, the cost of assembly of such United States components in the host country shall not be considered a part of the cost of such United States component.

(k) REPORTS TO CONGRESS.—The Secretary and the Administrator of the Agency for International Development shall report annually to the Committee on Energy and Natural Resources of the Senate and the appropriate committees of the House of Representatives on the progress being made to introduce clean coal technologies into foreign countries.

(l) DEFINITION.—For purposes of this section, the term "host country" means a foreign country which is—

(1) the participant in or the site of the proposed clean coal technology project; and

(2) either—

(A) classified as a country eligible to participate in development assistance programs of the Agency for Inter-

national Development pursuant to applicable law or regulation; or

(B) a developing country or country with an economy in transition from a nonmarket to a market economy.

(m) AUTHORIZATION FOR PROGRAM.—There are authorized to be appropriated to the Secretary to carry out the program required by this section, \$100,000,000 for each of the fiscal years 1993, 1994, 1995, 1996, 1997, and 1998.

SEC. 1608. INNOVATIVE ENVIRONMENTAL TECHNOLOGY TRANSFER PROGRAM.

(a) **ESTABLISHMENT OF PROGRAM.**—The Secretary, through the Agency for International Development, and in consultation with the interagency working group established under section 256(d) of the Energy Policy and Conservation Act (in this section referred to as the "interagency working group", shall establish a technology transfer program to carry out the purposes described in subsection (b). Within 150 days after the date of the enactment of this Act, the Secretary and the Administrator of the Agency for International Development shall enter into a written agreement to carry out this section. The agreement shall establish a procedure for resolving any disputes between the Secretary and the Administrator regarding the implementation of specific projects. With respect to countries not assisted by the Agency for International Development, the Secretary may enter into agreements with other appropriate Federal agencies. If the Secretary and the Administrator, or the Secretary and an agency described in the previous sentence, are unable to reach an agreement, each shall send a memorandum to the President outlining an appropriate agreement. Within 90 days after receipt of either memorandum, the President shall determine which version of the agreement shall be in effect. Any agreement entered into under this subsection shall be provided to the appropriate committees of the Congress and made available to the public.

(b) **PURPOSES OF THE PROGRAM.**—The purposes of the technology transfer program under this section are to—

(1) reduce the United States balance of trade deficit through the export of United States energy technologies and technological expertise;

(2) retain and create manufacturing and related service jobs in the United States;

(3) encourage the export of United States technologies, including services related thereto, to those countries that have a need for developmentally sound facilities to provide energy derived from technologies that substantially reduce environmental pollutants, including greenhouse gases;

(4) develop markets for United States technologies, including services related thereto, that substantially reduce environmental pollutants, including greenhouse gases, that meet the energy and environmental requirements of foreign countries;

(5) better ensure that United States participation in energy-related projects in foreign countries includes participation by United States firms as well as utilization of United States technologies;

(6) ensure the introduction of United States firms and expertise in foreign countries;

(7) provide financial assistance by the Federal Government to foster greater participation by United States firms in the financing, ownership, design, construction, or operation of technologies or services that substantially reduce environmental pollutants, including greenhouse gases; and

(8) assist United States firms, especially firms that are in competition with firms in foreign countries, to obtain opportuni-

ties to transfer technologies to, or undertake projects in, foreign countries.

(c) **IDENTIFICATION.**—Pursuant to the agreements required by subsection (a), the Secretary, through the Agency for International Development, and after consultation with the interagency working group, United States firms, and representatives from foreign countries, shall develop mechanisms to identify potential energy projects in host countries that substantially reduce environmental pollutants, including greenhouse gases, and shall identify a list of such projects within 240 days after the date of the enactment of this Act, and periodically thereafter.

(d) **FINANCIAL MECHANISMS.**—(1) Pursuant to the agreements under subsection (a), the Secretary, through the Agency for International Development, shall—

(A) establish appropriate financial mechanisms to increase the participation of United States firms in energy projects, and services related thereto, that substantially reduce environmental pollutants, including greenhouse gases in foreign countries;

(B) utilize available financial assistance authorized by this section to counterbalance assistance provided by foreign governments to non-United States firms; and

(C) provide financial assistance to support projects.

(2) The financial assistance authorized by this section may be—

(A) provided in combination with other forms of financial assistance, including non-Federal funding that may be available for the project; and

(B) utilized in conjunction with financial assistance programs available through other Federal agencies.

(3) United States obligations under the Arrangement on Guidelines for Officially Supported Export Credits established through the Organization for Economic Cooperation and Development shall be applicable to this section.

(e) **SOLICITATIONS FOR PROJECT PROPOSALS.**—(1) Pursuant to the agreements under subsection (a), the Secretary, through the Agency for International Development, within one year after the date of the enactment of this Act, and subsequently as appropriate thereafter, shall solicit proposals from United States firms for the design, construction, testing, and operation of the project or projects identified under subsection (c) which propose to utilize a United States technology or service. Each solicitation under this section shall establish a closing date for receipt of proposals.

(2) The solicitation under this subsection shall, to the extent appropriate, be modeled after the RFP No. DE-PS01-90FE62271 Clean Coal Technology IV, as administered by the Department of Energy.

(3) Any solicitation made under this subsection shall include the following requirements:

(A) The United States firm that submits a proposal in response to the solicitation shall have an equity interest in the proposed project.

(B) The project shall utilize a United States technology, including services related thereto, that substantially reduce environmental pollutants, including greenhouse gases, in meeting the applicable energy and environmental requirements of the host country.

(C) Proposals for projects shall be submitted by and undertaken with a United States firm, although a joint venture or other teaming arrangement with a non-United States manufacturer or other non-United States entity is permissible.

(f) ASSISTANCE TO UNITED STATES FIRMS.—Pursuant to the agreements under subsection (a), the Secretary, through the Agency for International Development, and in consultation with the interagency working group, shall establish a procedure to provide financial assistance to United States firms under this section for a project identified under subsection (c) where solicitations for the project are being conducted by the host country or by a multilateral lending institution.

(g) OTHER PROGRAM REQUIREMENTS.—Pursuant to the agreements under subsection (a), the Secretary, through the Agency for International Development, and in consultation with the interagency working group, shall—

(1) establish eligibility criteria for countries that will host projects;

(2) periodically review the energy needs of such countries and export opportunities for United States firms for the development of projects in such countries;

(3) consult with government officials in host countries and, as appropriate, with representatives of utilities or other entities in host countries, to determine interest in and support for potential projects; and

(4) determine whether each project selected under this section is developmentally sound, as determined under the criteria developed by the Development Assistance Committee of the Organization for Economic Cooperation and Development.

(h) ELIGIBLE TECHNOLOGIES.—Not later than 6 months after the date of the enactment of this Act, the Secretary shall prepare a list of eligible technologies and services under this section. In preparing such a list, the Secretary shall consider fuel cell powerplants, aeroderivative gas turbines and catalytic combustion technologies for aeroderivative gas turbines, ocean thermal energy conversion technology, anaerobic digester and storage tanks, and other renewable energy and energy efficiency technologies.

(i) SELECTION OF PROJECTS.—(1) Pursuant to the agreements under subsection (a), the Secretary, through the Agency for International Development, shall, not later than 120 days after receipt of proposals in response to a solicitation under subsection (e), select one or more proposals under this section.

(2) In selecting a proposal under this section, the Secretary, through the Agency for International Development, shall consider—

(A) the ability of the United States firm, in cooperation with the host country, to undertake and complete the project;

(B) the degree to which the equipment to be included in the project is designed and manufactured in the United States;

(C) the long-term technical and competitive viability of the United States technology, and services related thereto, and the ability of the United States firm to compete in the development of additional energy projects using such technology in the host country and in other foreign countries;

(D) the extent of technical and financial involvement of the host country in the project;

(E) the extent to which the proposed project meets the purposes of this section;

(F) the extent of technical, financial, management, and marketing capabilities of the participants in the project, and the commitment of the participants to completion of a successful project in a manner that will facilitate acceptance of the United States technology or service for future application; and

(G) such other criteria as may be appropriate.

(3) In selecting among proposed projects, the Secretary shall seek to ensure that, relative to otherwise comparable projects in the host country, a selected project will meet the following criteria:

(A) It will reduce environmental emissions, including greenhouse gases, to an extent greater than required by applicable provisions of law.

(B) It will be a more cost-effective technological alternative, based on life cycle capital and operating costs per unit of energy produced and, where applicable, costs per unit of product produced.

(C) It will increase the overall efficiency of energy use.

Priority in selection shall be given to those projects which, in the judgment of the Secretary, best meet these criteria.

(j) UNITED STATES-ASIA ENVIRONMENTAL PARTNERSHIP.—Activities carried out under this section shall be coordinated with the United States-Asia Environmental Partnership.

(k) BUY AMERICA.—In carrying out this section, the Secretary, through the Agency for International Development, and pursuant to the agreements under subsection (a), shall ensure—

(1) the maximum percentage, but in no case less than 50 percent, of the cost of any equipment furnished in connection with a project authorized under this section shall be attributable to the manufactured United States components of such equipment; and

(2) the maximum participation of United States firms.

In determining whether the cost of United States components equals or exceeds 50 percent, the cost of assembly of such United States components in the host country shall not be considered a part of the cost of such United States component.

(l) REPORT TO CONGRESS.—The Secretary and the Administrator of the Agency for International Development shall report annually to the Committee on Energy and Natural Resources of the Senate and the appropriate committees of the House of Representatives on the progress being made to introduce innovative energy technologies, and services related thereto, that substantially reduce environmental pollutants, including greenhouse gases, into foreign countries.

(m) DEFINITIONS.—For purposes of this section—

(1) the term "host country" means a foreign country which is—

(A) the participant in or the site of the proposed innovative energy technology project; and

(B) either—

(i) classified as a country eligible to participate in development assistance programs of the Agency for

International Development pursuant to applicable law or regulation; or

(ii) a developing country; and

(2) the term "developing country" includes, but is not limited to, countries in Central and Eastern Europe or in the independent states of the former Soviet Union.

(n) AUTHORIZATION FOR PROGRAM.—There are authorized to be appropriated to the Secretary to carry out the program required by this section, \$100,000,000 for each of the fiscal years 1993, 1994, 1995, 1996, 1997, and 1998.

