

H.R. 6258, THE CARBON CAPTURE AND STORAGE EARLY DEPLOYMENT ACT

HEARING BEFORE THE SUBCOMMITTEE ON ENERGY AND AIR QUALITY OF THE COMMITTEE ON ENERGY AND COMMERCE HOUSE OF REPRESENTATIVES ONE HUNDRED TENTH CONGRESS

SECOND SESSION

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H.R. 6258, THE CARBON CAPTURE AND STORAGE EARLY DEPLOYMENT ACT

THURSDAY, JULY 10, 2008

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON ENERGY AND AIR QUALITY,
COMMITTEE ON ENERGY AND COMMERCE,
Washington, DC.

The subcommittee met, pursuant to call, at 10:05 a.m., in room 2123 of the Rayburn House Office Building, Hon. Rick Boucher (chairman) presiding.

Members present: Representatives Boucher, Butterfield, Barrow, Markey, Doyle, Harman, Inslee, Baldwin, Matheson, Matsui, Dingell (ex officio), Upton, Whitfield, Shimkus, Myrick, Blackburn, and Barton (ex officio).

Staff present: Bruce Harris, Laura Vaught, Ben Hengst, Chris Treanor, Rachel Bleshman, Alex Haurek, Erin Bzymek, David McCarthy, Amanda Mertens-Campbell, Andrea Spring, and Garrett Golding.

OPENING STATEMENT OF HON. RICK BOUCHER, A REPRESENTATIVE IN CONGRESS FROM THE COMMONWEALTH OF VIRGINIA

Mr. BOUCHER. The subcommittee will come to order.

Our hearing this morning focuses on H.R. 6258, the Carbon Capture and Storage Early Deployment Act, which I introduced in June along with a bipartisan group of members of this committee. I want to acknowledge and thank our colleagues, Mr. Upton, the Ranking Member of this subcommittee, Mr. Barton, the Ranking Member of the full Commerce Committee, Mr. Doyle, Mr. Matheson, Mr. Shimkus, Mr. Whitfield, Mr. Hill, Mr. Towns, and Mr. Terry for their patronage of the measure.

The bill creates a non-governmental fund operating under the auspices of the widely respected Electric Power Research Institute for the purpose of accelerating the early deployment of carbon dioxide capture and storage technologies. It is a response to recommendations from a broad range of individuals and groups including the Advanced Coal Technology Working Group that Congress create a Carbon Capture and Storage Early Deployment Fund. The Advanced Coal Technology Working Group, to which I previously referred, an advisory committee to the Environmental Protection Agency, is comprised of a broad cross-section of energy and environmental stakeholders and their support of this measure is particularly noteworthy. Its final report issued in January of this year unanimously recommended the early creation of a CCS de-

ployment fund and this legislation is in part a response to that recommendation.

Carbon capture and storage is a two-step process for reducing greenhouse gas emissions by capturing and injecting underground the carbon dioxide that is emitted through the combustion of fossil fuels including petroleum, natural gas, and coal. It will have its most prominent application in the electric utility sector where 72 percent of the Nation's electric power is generated through fossil fuel use. Fifty-one percent of electricity is coal-fired, 20 percent is reliant on natural gas, and 1.6 percent on petroleum. Given our extensive reliance on fossil fuels and the current unavailability of sufficient alternatives to replace them, their continued use is essential to our long-term economic security. The bill before the Committee addresses this clear need by enabling facilities that use fossil fuels to continue to do so when a mandatory progress to reduce greenhouse gas emissions becomes law, and it is this committee's intention to produce that mandatory control measure.

Under its terms, power plants and industrial emitters of greenhouse gases will be required to lessen their CO₂ emissions in accordance with a schedule that is set in the statute. As CO₂ constraints become ever more severe, emitters will turn to CCS methods in order to meet the CO₂ reduction schedule while continuing to use the fuels upon which they are reliant and for which in the foreseeable future there will be little in the way of affordable alternatives. The CCS Early Deployment Fund therefore is a necessary first step for the passage and implementation of a cap-and-trade program to address the challenge of climate change.

When mandatory CO₂ controls go into effect, greenhouse gas reduction requirements will begin in the early years. It is important that between the time when the first controls apply and the time when CCS becomes widely available, the reduction requirements be such that they can be achieved by fossil fuel-based emitters without the necessity that they abandon their existing fuel use. In those early years, prior to the general availability of CCS, coal users in particular would achieve CO₂ reductions through approaches such as achieving new efficiencies, making offsetting investments and activities such as forest protection and expansion and the shift to no-till agriculture by farmers as well as by purchasing emission allowances from other emitters. As soon as CCS technologies are forecast to be generally available, the CO₂ reduction requirements will become ever more stringent since the larger reductions can then be achieved by fossil fuel users without abandoning their fuel choice. Therefore, the sooner CCS technologies are made available, the sooner the more significant CO₂ reductions can be required under a cap-and-trade schedule.

The bill before the Committee will accelerate the time when CCS becomes generally available. While there are some commercial CCS projects in operation today, they are small in scale and they are used for enhancing oil recovery. Further research, development and demonstration projects are necessary for the permanent storage underground of large quantities of CO₂ in storage media of various kinds in widely dispersed geographic locations around the Nation. There are simply not enough oil fields to meet the national need for large-scale CO₂ storage.

In order to accelerate the deployment of CCS technologies, the Carbon Capture and Storage Early Deployment Act authorizes the establishment of a Carbon Storage Research Corporation. The Nation's fossil fuel-based electricity distribution utilities would be authorized to hold a referendum for the creation of the corporation. If the referendum results in approval by representatives of two-thirds of the fossil fuel-based electricity delivered to retail consumers, the corporation will be established. It will assess fees on distribution utilities for all fossil fuel-based electricity that is delivered to retail customers. The assessment will be applied to electricity generated from coal, natural gas, and oil and will reflect the relative CO₂ emission rates for each fuel. The assessment will total approximately \$1 billion annually and the legislation specifies that distribution utilities will be allowed to recover the costs of that fee from retail customers resulting in roughly a \$10 to \$12 annual increase in residential electricity rates. That sum can be viewed as a modest investment today by these electricity users in their long-term ability to continue to purchase low-cost electricity.

I would like to thank my colleagues on both sides of the aisle for working with us as we structure the legislation and I look forward to our continued work together as we process it through this committee and through the full House. The Carbon Capture and Storage Early Deployment Act enjoys bipartisan, industry, and labor support and will enable the continued use of our Nation's most inexpensive and abundant resources for fuel generation when a mandatory greenhouse gas emissions reduction program is implemented for this country.

Today's witnesses will provide valuable testimony regarding the legislation including some very productive comments on ways that it can be strengthened as the bill moves through the legislative process. I welcome their testimony and thank them for being with us this morning.

[H.R. 6258 follows:]



110TH CONGRESS
2D SESSION

H. R. 6258

To accelerate the development and early deployment of systems for the capture and storage of carbon dioxide emissions from fossil fuel electric generation facilities, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

JUNE 12, 2008

Mr. BOUCHER (for himself, Mr. UPTON, Mr. MURTHA, Mr. BARTON of Texas, Mr. RAHALL, Mr. WHITFIELD of Kentucky, Mr. COSTELLO, Mr. SHIMKUS, Mr. MATHESON, Mr. DOYLE, Mr. HOLDEN, Mr. ELLSWORTH, Mr. HILL, Mr. WILSON of Ohio, and Ms. PRYCE of Ohio) introduced the following bill; which was referred to the Committee on Energy and Commerce, and in addition to the Committee on Science and Technology, for a period to be subsequently determined by the Speaker, in each case for consideration of such provisions as fall within the jurisdiction of the committee concerned

A BILL

To accelerate the development and early deployment of systems for the capture and storage of carbon dioxide emissions from fossil fuel electric generation facilities, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the “Carbon Capture and
5 Storage Early Deployment Act”.

1 **SEC. 2. DEFINITIONS.**

2 (1) SECRETARY.—The term “Secretary” means
3 the Secretary of Energy.

4 (2) DISTRIBUTION UTILITY.—The term “dis-
5 tribution utility” means an electric utility that has
6 a legal, regulatory, or contractual obligation to de-
7 liver electricity directly to retail consumers.

8 (3) ELECTRIC UTILITY.—The term “electric
9 utility” has the meaning provided by section 3(22)
10 of the Federal Power Act (16 U.S.C. 796(22)).

11 (4) FOSSIL FUEL-BASED ELECTRICITY.—The
12 term “fossil fuel-based electricity” means electricity
13 that is produced from the combustion of fossil fuels.

14 (5) FOSSIL FUEL.—The term “fossil fuel”
15 means coal, petroleum, natural gas or any derivative
16 of coal, petroleum, or natural gas.

17 (6) CORPORATION.—The term “Corporation”
18 means the Carbon Storage Research Corporation es-
19 tablished in accordance with this Act.

20 (7) QUALIFIED INDUSTRY ORGANIZATION.—The
21 term “qualified industry organization” means any
22 association or group of owners or operators of dis-
23 tribution utilities delivering fossil fuel-based elec-
24 tricity who collectively represent at least 20 percent
25 of the volume of fossil fuel-based electricity delivered

1 by distribution utilities to consumers in the United
2 States.

3 **SEC. 3. CARBON STORAGE RESEARCH CORPORATION.**

4 (a) ESTABLISHMENT.—Qualified industry organiza-
5 tions may conduct, at their own expense, a referendum
6 among the owners or operators of distribution utilities de-
7 livering fossil fuel-based electricity for the creation of a
8 Carbon Storage Research Corporation. Such referendum
9 shall be conducted by an independent auditing firm agreed
10 to by the qualified industry organizations. Voting rights
11 in such referendum shall be based on the quantity of fossil
12 fuel-based electricity delivered to consumers in the pre-
13 vious calendar year or other representative period. Upon
14 approval of those persons representing two-thirds of the
15 total quantity of fossil fuel-based electricity delivered to
16 retail consumers, the Corporation shall be established. All
17 distribution utilities voting in the referendum shall certify
18 to the independent auditing firm the quantity of fossil
19 fuel-based electricity represented by their vote.

20 (b) TERMINATION.—The Corporation shall be au-
21 thorized to collect assessments and conduct operations
22 pursuant to this Act for a 10-year period from the date
23 6 months after the date of enactment of this Act. After
24 such 10-year period, the Corporation is no longer author-
25 ized to collect assessments and shall be dissolved on the

1 date 15 years after such date of enactment, unless the
2 period is extended by an Act of Congress.

3 (e) GOVERNANCE.—The Corporation shall operate as
4 a division or affiliate of the Electric Power Research Insti-
5 tute (EPRI) and be managed by a Board of not more than
6 12 members responsible for its operations, including com-
7 pliance with this Act. The Institute, working in consulta-
8 tion with industry organizations representing investor-
9 owned utilities, utilities owned by a Federal or State agen-
10 cy or municipality, and rural electric cooperatives, shall
11 appoint the Board. The Board shall include at least one
12 representative of each of the following:

13 (1) Investor-owned utilities.

14 (2) Utilities owned by a Federal or State agen-
15 cy or a municipality.

16 (3) Rural electric cooperatives.

17 (4) Fossil fuel producers.

18 (d) COMPENSATION.—Corporation Board members
19 shall receive no compensation for their services, nor shall
20 Corporation Board members be reimbursed for expenses
21 relating to their service.

22 (e) TERMS.—Corporation Board members shall serve
23 terms of 4 years and may serve not more than 2 full con-
24 secutive terms. Members filling unexpired terms may serve
25 not more than a total of 8 consecutive years. Former

1 members of the Corporation Board may be reappointed
2 to the Corporation Board if they have not been members
3 for a period of 2 years. Initial appointments to the Cor-
4 poration Board shall be for terms of 1, 2, 3, and 4 years,
5 staggered to provide for the selection of 3 members each
6 year.

7 (f) STATUS OF CORPORATION.—The Corporation
8 shall not be considered to be an agency, department, or
9 instrumentality of the United States, and no officer or di-
10 rector or employee of the Corporation shall be considered
11 to be an officer or employee of the United States Govern-
12 ment, for purposes of title 5 or title 31 of the United
13 States Code, or for any other purpose, and no funds of
14 the Corporation shall be treated as public money for pur-
15 poses of chapter 33 of title 31, United States Code, or
16 for any other purpose.

17 **SEC. 4. FUNCTIONS AND ADMINISTRATION OF THE COR-**
18 **PORATION.**

19 (a) IN GENERAL.—Except as provided in subsection
20 (d), the Corporation shall use all funds derived from as-
21 sessments under section 5 to issue grants and contracts
22 to private, academic, and governmental entities with the
23 purpose of accelerating the commercial demonstration or
24 availability of carbon dioxide capture and storage tech-
25 nologies and methods, including technologies which cap-

1 ture and store, or capture and convert, carbon dioxide.
2 Grants and awards shall be made on a competitive basis
3 reflecting best overall value and prospect for achieving the
4 purposes of this Act. Board Members shall not participate
5 in making grants or awards to entities with whom they
6 are affiliated. The Corporation may use such funds to pur-
7 chase carbon dioxide through reverse auctions or other ac-
8 quisition methods, when needed to conduct tests of carbon
9 dioxide storage sites, in the case of established projects
10 that are storing carbon dioxide emissions or for other pur-
11 poses consistent with the purposes of this Act. The Cor-
12 poration shall support large-scale demonstrations of car-
13 bon capture and Storage technologies capable of advanc-
14 ing the technologies to commercial readiness. Pilot-scale
15 and similar small-scale projects are not eligible for support
16 by the Corporation. Supported projects should encompass
17 a range of different coal and other fossil fuel varieties,
18 be geographically diverse, involve diverse storage media,
19 and employ capture and storage, or capture and conver-
20 sion, technologies potentially suitable either for new or for
21 retrofit applications. The Board shall also establish poli-
22 cies regarding the ownership of intellectual property devel-
23 oped as a result of Corporation grants and other forms
24 of technology support. Such policies shall encourage indi-
25 vidual ingenuity and invention.

1 (b) RELATIONSHIP TO DEPARTMENT OF ENERGY
2 AND ACADEMIC ORGANIZATIONS.—The Board may ap-
3 prove grants or contracts to support programs or projects
4 under the auspices of the Department of Energy or its
5 affiliated national laboratories and other fossil energy re-
6 search entities, including the Regional Carbon Sequestra-
7 tion Partnerships, where such support promises to accel-
8 erate the commercial development and demonstration of
9 carbon capture and storage, or carbon capture and conver-
10 sion, technologies. Grant and contract support also may
11 be provided to projects or programs managed by academic
12 organizations or consortia, where such support promises
13 to accelerate the commercial development and demonstra-
14 tion of carbon capture and storage technologies.

15 (c) ADMINISTRATION.—The members of the Board of
16 Directors of the Corporation shall elect a Chairman and
17 other officers as necessary, may establish committees and
18 subcommittees of the Corporation, and shall adopt rules
19 and bylaws for the conduct of business and the implemen-
20 tation of this Act. The Corporation Board shall consult
21 with the Electric Power Research Institute Advisory Coun-
22 cil and the Secretary and the Director of the Department's
23 National Energy Technology Laboratory to obtain advice
24 and recommendations on plans, programs, project selec-
25 tion criteria, and projects to be funded by the Corporation.

1 The Board shall appoint an Executive Director and pro-
2 fessional support staff who may be employees of the Elec-
3 tric Power Research Institute.

4 (d) ADMINISTRATIVE EXPENSES.—Up to 5 percent
5 of the funds collected in any fiscal year under section 5
6 may be used for the administrative expenses of operating
7 the Corporation (not including costs incurred in the deter-
8 mination and collection of the assessments pursuant to
9 section 5).

10 (e) BUDGET.—Before August 1 each year, the Cor-
11 poration shall publish for public review and comment a
12 budget plan for the next calendar year, including the prob-
13 able costs of all programs, projects, and contracts and a
14 recommended rate of assessment sufficient to cover such
15 costs. The Secretary may recommend programs and activi-
16 ties the Secretary considers appropriate.

17 (f) RECORDS; AUDITS.—The Corporation shall keep
18 minutes, books, and records that clearly reflect all of the
19 acts and transactions of the Corporation and make public
20 such information. The books of the Corporation shall be
21 audited by a certified public accountant at least once each
22 fiscal year and at such other times as the Corporation may
23 designate. Copies of each audit shall be provided to the
24 Congress, all members of the Corporation, all qualified in-
25 dustry organizations, and to other members of the indus-

1 try upon request. If the audit determines that the Cor-
2 poration's practices fail to meet generally accepted ac-
3 counting principles the assessment collection authority of
4 the Corporation under section 5 shall be suspended until
5 a certified public accountant renders a subsequent opinion
6 that the failure has been corrected.

7 (g) PUBLIC ACCESS.—(1) The Corporation Board's
8 meetings shall be open to the public and shall occur after
9 at least 30 days advance public notice. Meetings of the
10 Board of Directors may be closed to the public where the
11 agenda of such meetings includes only confidential matters
12 pertaining to project selection, the award of grants or con-
13 tracts, personnel matter, or the receipt of legal advice.

14 (2) The minutes of all meetings of the Corporation
15 shall be made available to and readily accessible by the
16 public.

17 (h) ANNUAL REPORT.—Each year the Corporation
18 shall prepare and make publicly available a report which
19 includes an identification and description of all programs
20 and projects undertaken by the Corporation during the
21 previous year as well as those planned for the coming year.
22 The report shall also detail the allocation or planned allo-
23 cation of Corporation resources for each such program
24 and project.

1 **SEC. 5. ASSESSMENTS.**

2 (a) AMOUNT.—(1) In all calendar years following its
 3 establishment, the Corporation shall collect an assessment
 4 on distribution utilities for all fossil fuel-based electricity
 5 delivered directly to retail consumers. The assessments
 6 shall reflect the relative carbon dioxide emission rates of
 7 different fossil fuel-based electricity, and initially shall be
 8 not less than the following amounts for coal, natural gas,
 9 and oil:

Fuel type:	Rate of assessment per kilowatt hour:
Coal	\$0.00043
Natural Gas	\$0.00022
Oil	\$0.00032

10 (2) The Corporation is authorized to adjust the as-
 11 sessments on fossil fuel-based electricity to reflect changes
 12 in the expected quantities of such electricity from different
 13 fuel types, such that the assessments generate not less
 14 than \$1.0 billion and not more than \$1.1 billion annually.
 15 The Corporation is authorized to supplement assessments
 16 through additional financial commitments.

17 (b) INVESTMENT OF FUNDS.—Pending disbursement
 18 pursuant to a program, plan, or project, the Corporation
 19 may invest funds collected through assessments under this
 20 section, and any other funds received by the Corporation,
 21 only in obligations of the United States or any agency
 22 thereof, in general obligations of any State or any political
 23 subdivision thereof, in any interest-bearing account or cer-

1 tificate of deposit of a bank that is a member of the Fed-
2 eral Reserve System, or in obligations fully guaranteed as
3 to principal and interest by the United States.

4 (c) REVERSION OF UNUSED FUNDS.—If the Cor-
5 poration does not disburse, dedicate or assign 75 percent
6 or more of the available proceeds of the assessed fees in
7 any calendar year 7 or more years following its establish-
8 ment, due to an absence of qualified projects or similar
9 circumstances, it shall reimburse the remaining undedicat-
10 ed or unassigned balance of such fees, less administrative
11 and other expenses authorized by this Act, to the distribu-
12 tion utilities upon which such fees were assessed, in pro-
13 portion to their collected assessments.

14 **SEC. 6. COMPLIANCE WITH CORPORATION ASSESSMENTS.**

15 The Corporation may bring an action in the appro-
16 priate court of the United States to compel compliance
17 with an assessment levied by the Corporation under this
18 Act. A successful action for compliance under this section
19 may also require payment by the defendant of the costs
20 incurred by the Corporation in bringing such action.

21 **SEC. 7. MIDCOURSE REVIEW.**

22 Not later than 5 years following establishment of the
23 Corporation, the Comptroller General of the United States
24 shall prepare an analysis, and report to Congress, assess-
25 ing the Corporation's activities, including project selection

1 and methods of disbursement of assessed fees, impacts on
2 the prospects for commercialization of carbon capture and
3 storage technologies, and adequacy of funding. The report
4 shall also make such recommendations as may be appropriate in each of these areas. The Corporation shall reimburse the Government Accountability Office for the costs
5 associated with performing this midcourse review.

8 **SEC. 8. RECOVERY OF COSTS.**

9 (a) IN GENERAL.—All costs that are incurred by a
10 distribution utility to comply with the requirements of this
11 Act shall be deemed necessary and reasonable costs and
12 shall be fully and contemporaneously recoverable in all jurisdictions. A distribution utility whose transmission, delivery, or sales of electric energy are subject to any form
13 of rate regulation shall not be denied the opportunity to
14 recover the full amount of the costs associated with complying with this Act, notwithstanding any other law, regulation, rule, administrative order, or any agreement, including any settlement agreement, between the distribution utility and any regulatory authority, including any
15 State regulatory authority, or any other party.

22 (b) RATEPAYER REBATES.—Regulatory authorities
23 that approve cost recovery pursuant to section 8(a) may
24 order rebates to ratepayers to the extent that distribution

1 utilities are reimbursed undedicated or unassigned bal-
2 ances pursuant to section 5(c).

3 **SEC. 9. LOBBYING RESTRICTIONS.**

4 No funds collected by the Corporation shall be used
5 in any manner for influencing legislation or elections, ex-
6 cept that the Corporation may recommend to the Sec-
7 retary and the Congress changes in this Act or other stat-
8 utes that would further the purposes of this Act.

9 **SEC. 10. DAVIS-BACON COMPLIANCE.**

10 The Corporation shall ensure that entities receiving
11 grants, contracts, or other financial support from the Cor-
12 poration for the project activities authorized by this Act
13 are in compliance with the Davis-Bacon Act (40 U.S.C.
14 276a—276a-5).

○

Mr. BOUCHER. At this time I recognize the ranking member of the subcommittee and original cosponsor of the measure, the gentleman from Michigan, Mr. Upton.

OPENING STATEMENT OF HON. FRED UPTON, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MICHIGAN

Mr. UPTON. Well, thank you, Mr. Chairman. I certainly want to thank you for holding this hearing this morning on the Carbon Capture and Storage Early Deployment Act. This is bipartisan legislation, as you noted, and is evidence that the Republicans and Democrats indeed can work together towards commonsense solutions to effectively combat climate change, solutions that will both protect jobs and keep energy costs down. I appreciate your willingness to work with members on our side to draft this very important legislation and we certainly look forward to more bipartisan cooperation on these important issues down the road.

I see this legislation not as a first step but rather as a building block on what we have already done to cut greenhouse gas emissions. The bill is yet another component of a no-regrets approach to tackle the problem of climate change while simultaneously be mindful of our economy and domestic energy security. Along with advancing a renaissance in nuclear power, if you combine this legislation with what we have already done on lighting standards, CAFE, appliance standards, building standards, and others, we are talking about major emission reductions without cap-and-trade.

Energy prices drive our economy. As the price of gasoline has skyrocketed due in part to policies that limit access to American energy resources, it is absolutely critical that electricity rates do not follow suit. For decades, opponents of American-made energy have fought to block domestic oil production, and as a result, we import nearly 70 percent of our oil and prices reach new highs almost every day. The new target is coal, America's most affordable and abundant energy resource, and if we block American coal like we blocked American oil, our electricity rates will soon match and exceed what we are paying for gasoline. Working American families cannot afford such irrational policies. It is imperative that we continue to take advantage of our Nation's vast coal reserves which have the promise to produce clean and affordable power for generations. In our quest to reduce greenhouse gas emissions and protect the environment, we must promote exciting new clean coal technologies that will not only keep costs down for consumers but also foster new jobs in a strong economy. These technologies exhibit great promise and encouraging advancements in carbon capture will be able to responsibly fortify our Nation's energy supply with American-made energy and protect the pocketbooks of our Nation's consumers as well.

An added benefit of CCS is that it can be and currently is being conducted for enhanced oil recovery. According to a DOE assessment conducted in 10 known domestic oil basins, not the entire United States, an estimated 89 billion barrels of additional oil could be technically recoverable by applying this state-of-the-art CO₂ technology. This is truly, I think, a win-win. Let us be honest: Our constituents are interested in what we are doing in Congress to address record oil prices and enhance our overall energy secu-

rity. Global warming is lower on that list yet the legislation we have examined prior to this hearing would not only send energy prices higher but also make the United States less energy secure. This legislation, I think, will protect the environment as well as our economy.

There are members of this committee who have introduced legislation that would block any new coal-fired power plant without CCS. My colleagues who are serious about reducing emissions while keeping energy affordable, I would ask them to join us in cosponsoring this legislation that we are discussing today. Surprisingly, none of the 15 cosponsors of that bill have cosponsored this bill, which would ensure CCS becomes available. By ensuring carbon capture and storage, we won't need to set arbitrary mandates that will send electricity rates through the roof and American jobs overseas. By using the legislative approach in this bill, we can avoid a costly cap-and-trade regime that will have no impact on emissions from the developing world. Instead, we will advance CCS technology that will create U.S. jobs and provide the opportunity to export. U.S. energy security will be strengthened and we will be able to help China and India obtain clean and affordable energy and working Americans will be better off. I would urge my colleagues to cosponsor the legislation.

I again thank you for having this hearing today and I would yield back.

Mr. BOUCHER. Thank you very much, Mr. Upton.

The gentleman from Pennsylvania, Mr. Doyle, is recognized for 3 minutes.

OPENING STATEMENT OF HON. MIKE DOYLE, A REPRESENTATIVE IN CONGRESS FROM THE COMMONWEALTH OF PENNSYLVANIA

Mr. DOYLE. Thank you, Mr. Chairman.

I would like to begin my remarks by welcoming a constituent who has traveled here to Washington to share his expertise with us. Dr. Edward Rubin is a professor at Carnegie Mellon University in Pittsburgh. He has done extensive work on carbon capture and sequestration and we are all looking forward to his insights as we try to facilitate the rollout of these critical technologies.

As Congress moves forward to develop climate change legislation, it is critical that we ensure that our energy portfolio is as diverse as possible as we attempt to address the dual concerns of global warming and energy independence. We must develop new alternatives like solar, wind, and hydropower but we must also work to ensure that we are able to use the fuels that currently power our country in the most environmentally sustainable way possible.

Today, Mr. Chairman, over 50 percent of the United States and over 60 percent of the world is powered by coal. Pennsylvania alone has a 250-year supply of this cheap resource. However, despite its ample supply and cheap price tag, the burning of coal as we use it today must be improved if we are ever going to address the threat of global warming. Over the past several decades, various improvements have been made on carbon capture and sequestration technologies. These technologies, which allow for carbon to be removed from our smokestacks and instead injected back into the

ground, are not new. They have been in use for years in places such as Texas in order to achieve enhanced oil recovery. However, these technologies have not been used at the scale which will be required if we are going to remove carbon from our industrial transportation or utility sectors. Simply stated, the time is now for Congress to act to encourage CCS advancement and deployment.

For this reason, I am pleased to join Chairman Boucher and Ranking Member Barton in cosponsoring the Carbon Capture and Storage Early Deployment Act. While I have a few concerns with the bill, especially as it pertains to what role the National Energy Technology Lab may have in the program, I am strongly supportive of this committee's efforts. I look forward to working closely with Chairman Boucher to improve this bill so that the final product we bring to the floor will be as effective as possible in facilitating the wide-scale demonstration of carbon capture and storage technologies.

Mr. Chairman, I applaud you for your efforts here. I will continue to do all I can to ensure that this Nation continues to move forward with our energy policies. I yield back the balance of my time.

Mr. BOUCHER. Thank you very much, Mr. Doyle, and I very much appreciate your copatronage of this measure and strong support for it and the contributions you made to its construction.

The gentleman from Kentucky, Mr. Whitfield, is recognized for 3 minutes.

OPENING STATEMENT OF HON. ED WHITFIELD, A REPRESENTATIVE IN CONGRESS FROM THE COMMONWEALTH OF KENTUCKY

Mr. WHITFIELD. Mr. Chairman, thank you. I also want to commend you for introducing the Carbon Capture and Storage Early Deployment Act, which is vitally important to the economics and environmental health of this country.

We recognize that there has been a lot of talk by a lot of different groups about the importance of developing carbon capture and sequestration projections and to develop them, and yet I think that in Dr. Rubin's testimony, he pointed out, which I think is a fact, that not a single large-scale CCS project at a coal plant anywhere in the world is in place today, and as you well know, our government canceled its FutureGen project in Illinois just 3 or 4 months ago because the cost had escalated from \$850 million to \$1.8 billion. So this legislation is vitally important. It may not be in its perfect form but that is the reason we have hearings, to have experts like this group of witnesses to help us look at ways to improve this bill, and so we welcome their expertise and advice. I might also say that it is my understanding in the United States that from electricity we are producing about 1.5 billion tons of carbon dioxide a year and this bill, it is my understanding, will provide about \$1 billion a year to help develop the project which is vitally important. Coal is our most abundant resource. It does give us the best opportunity to be competitive with other nations around the world for economic development and maintaining relatively low energy costs although obviously carbon dioxide capture will be quite expensive. We know that.

But I look forward to working with you, Mr. Chairman, and others as we continue our efforts in this area.

Mr. BOUCHER. Thank you very much, Mr. Whitfield.

The gentleman from Michigan, the chairman of the full committee, Mr. Dingell, is recognized for 5 minutes.

OPENING STATEMENT OF HON. JOHN D. DINGELL, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MICHIGAN

The CHAIRMAN. Mr. Chairman, first of all, thank you for holding this hearing. It is most important, and I want to commend you not only for that but for the exemplary work that you continue to do on the issue of climate change and on your leadership as chairman of this valuable subcommittee. I want to welcome the witnesses and thank them for their testimony, which I know will be of great value.

Throughout many of the climate change hearings that have been held by this subcommittee over the past few months, a number of key things have emerged but none more central than the following: combating global climate change will require that we make deep cuts in our greenhouse gas emissions even as we meet our future energy demands. The United States currently generates more than 50 percent of its electricity through the use of coal, a fuel that must continue to be a part of our energy mix, and I intend that that shall be so. For that to be possible, however, in a carbon-constrained world, a robust carbon capture and sequestration program is necessary on a scale that does not exist today. A survey of current carbon capture and sequestration, or CCS, technologies reveals that constituent elements of an overall strategy are not yet fully integrated or fully understood.

First, several promising capture technologies have been demonstrated on a small scale but have yet to be deployed at the commercial level because of concerns about costs and energy penalties. Second, liquid CO₂ is transported in pipelines today but building the additional infrastructure necessary for a national CCS pipeline program represents a unique set of challenges. Finally, CO₂ has been sequestered underground for decades during enhanced oil recovery and this is a valuable use for this resource but not on the massive scale needed for continued use of coal as a fuel source in a carbon-constrained environment. Clearly, a comprehensive strategy with an adequate and appropriate source of revenue is needed.

Today the Committee will examine one such idea put forward by its chairman with bipartisan support. The CCS legislation introduced by you, Mr. Chairman, closely follows the recommendations of the Advanced Coal Technology Work Group, an advisory panel to EPA. It could also help facilitate a comprehensive CCS deployment strategy in time to make the emission reductions that scientists have determined are needed to prevent further damage to this planet.

Mr. Chairman, again I commend you for holding this hearing, it is most timely, and I praise you for presenting a bold solution to this challenge. I look forward to learning more about the issue from our witnesses today, and I thank you for your courtesy.

[The prepared statement of Mr. Dingell follows:]

PREPARED STATEMENT OF HON. JOHN D. DINGELL

Mr. Chairman, thank you for holding this important hearing and for the exemplary work you continue to do on the issue of climate change. I welcome our witnesses and thank them for their valuable testimony.

Throughout the many climate change hearings held by this subcommittee over the last few months, several key themes have emerged, but none more central than the following: combating global climate change will require that we make deep cuts in our greenhouse gas emissions even as we meet our future energy demands.

The United States currently generates more than 50 percent of its electricity through the use of coal, a fuel that must continue to be part of our energy mix. For that to be possible in a carbon-constrained world, a robust carbon capture and sequestration (CCS) deployment program is necessary on a scale that does not exist today.

A survey of the current state of CCS technologies will reveal the constituent elements of an overall strategy that is not yet fully integrated. First, several promising capture technologies have been demonstrated on a small scale but have yet to be deployed at the commercial level because of concerns about costs and energy penalties. Second, liquid CO₂ is transported in pipelines today, but building the additional infrastructure necessary for a national CCS pipeline program presents a unique set of challenges. Finally, CO₂ has been sequestered underground for decades during enhanced oil recovery, but not on the massive scale needed for the continued use of coal as a fuel source in a carbon-constrained environment. Clearly, a comprehensive strategy with an appropriate source of revenue is needed.

Today the Subcommittee will examine one such idea, put forward by its Chairman with bipartisan support. The CCS legislation introduced by Mr. Boucher closely follows the recommendations of the Advanced Coal Technology Work Group, an advisory panel to the EPA. It could help facilitate a comprehensive CCS deployment strategy in time to make the emissions reductions that scientists have determined are needed to prevent further damage to the planet.

Mr. Chairman, I commend you for holding this timely hearing and for presenting a bold solution to this challenge. I look forward to learning more about this issue from our witnesses today.

Mr. BOUCHER. Thank you very much, Mr. Dingell.

The gentleman from Illinois, Mr. Shimkus, is recognized for 3 minutes.

OPENING STATEMENT OF HON. JOHN SHIMKUS, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF ILLINOIS

Mr. SHIMKUS. Thank you, Mr. Chairman, and I am proud to be an original cosponsor of this bill. Thanks for your hard work.

The United States is basically electricity independent. We can't say that about liquid fuels in this country and that is really the current major debate we are having on the floor about trying to decrease our reliance on imported crude oil, but for electricity, we are basically independent, and when we are producing electricity and we are doing it independently, that is American jobs, both in our coal mines and in our coal-fired generation plants, and that has to remain. Fifty percent of all electricity that we generate today comes from coal. That is one of the concerns I have with the current House leadership. We may do a lot of work here, but based upon a Hill brief on June 25, Bush-backed energy funds stalled by Frank and Pelosi, citing concerns by House Speaker Pelosi that the International Clean Technology Fund backed by the Bush Administration might be used to build coal-burning power plants. House Financial Services Committee Chairman Barney Frank postponed a markup on the bill on Tuesday. So that is why it is very courageous of you, Mr. Chairman, to work with us to bring a bill that ensures a place for coal in the generation of electricity in this coun-

try and the future, and for that you should be applauded and that is why we are in support.

We also support all the above. We want to encourage with wind and solar and renewables. But just to keep up with electricity demand, by 2030 we are going to need 747 new coal-fired plants, 52 new nuclear power plants, 2,000 new electric generators, and also add 13,000 new megawatts of renewable power. China is building a new coal-fired power plant every 2 weeks. In fact, there was a great announcement in my district, Mr. Chairman. I had a coal mine that was closing. It is now reopening to sell Illinois coal to China, just making a point that I would rather have that coal be used cleanly in this country to create low-cost power to keep manufacturing jobs in this country.

So I thank you for holding this hearing. It is very important that we do something and not nothing, and we move to deploy technology now so that we are prepared to debate the other options that we have to debate in the succeeding Congress, and I yield back my time.

Mr. BOUCHER. Thank you, Mr. Shimkus, and thank you for your copatronage of the measure as well.

The gentlelady from California, Ms. Matsui, is recognized for 3 minutes.

OPENING STATEMENT OF HON. DORIS MATSUI, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Ms. MATSUI. Thank you, Mr. Chairman, and I am very pleased to be here today, and thank you for calling this important hearing. I would also like to thank today's panelists for joining us to discuss the important subject of carbon capture and storage. I look forward to hearing all of your expert opinions.

This committee heard only 2 weeks ago about the urgent repercussions that we will face if we do not seriously address the issue of climate change. We have also heard about the daunting scope of that task. To tackle this enormous challenge, we must have all the available resources at our disposal. This is why I am encouraged that we are looking into a wide variety of technologies to help us confront global warming from solar to biomass to wind and today, carbon storage. This committee needs to fully investigate what is available and what solutions will best reverse this troubling course we are heading down. Fossil fuels currently meet the vast majority of our energy needs so we will not be able to abandon them immediately. However, we know that burning these fossil fuels produces the carbon dioxide at the heart of the climate problem. We must begin to take steps to reduce the amount of energy we use, reduce the amount of fossil fuels we burn, and to reduce the amount of carbon dioxide those fuels emit. More research is critically important in improving and perfecting the technologies we will need.

Carbon capture and storage holds great promise for reducing our emissions of greenhouse gases. It could afford us the time we need to reduce our dependence on fossil fuels without destroying our planet in the process and show other countries the leadership that is direly needed on this issue. However, we must use any new technology safely and effectively, and carbon capture remains to be fully tested.

My home State of California has so many environmental issues, from contaminated groundwater to severe smog, so I want to ensure that any new technologies we use do not adversely affect the health of our population. While we must embrace new technologies, we cannot do so at the expense of clean water, clean air, and our health. As a mother and grandmother, I am constantly reminded of the importance of leaving a safe, livable, and sustainable planet to future generations. That is why I am so pleased with the active and constructive efforts this committee has been taking and I look forward to learning more about the issue of carbon capture and storage.

Mr. Chairman, I thank you for your leadership and your commitment to these issues, and I yield back the balance of my time.

Mr. BOUCHER. Thank you very much, Ms. Matsui.

The gentleman from Texas, Mr. Barton, the ranking member of the full committee, is recognized for 5 minutes.

**OPENING STATEMENT OF HON. JOE BARTON, A
REPRESENTATIVE IN CONGRESS FROM THE STATE OF TEXAS**

Mr. BARTON. Thank you, Mr. Chairman. I appreciate having an opportunity to be an original sponsor of this legislation.

It may surprise some people, but I do believe that we need to develop the technology to capture and storage or capture and convert CO₂ regardless of the outcome of the global warming debate. I am a believer in efficiency and technology advance, and if we can use this vehicle to have the United States of America and our private and public institutions develop such technology, it can't be anything but a good thing for the world community. So my guess is that this is the only bill that might actually become law this year. We are still engaged in a very vigorous debate about the overall global warming issue but in the middle of this, your leadership, Chairman Boucher, along with Mr. Whitfield and Mr. Shimkus, is pointing a pathway forward that all members regardless of their position or party affiliation can work together to do something that is good for the country.

The bill before us sets up a corporation that the stakeholders, based on their size and their operations, participate in. It sets up an assessment fee schedule to assess the consumers of electricity in this country a small fee, similar to what we did on the nuclear waste fund 30 years ago approximately, and use that money to develop the technologies that would capture and storage or capture and convert, and I think the word "convert" is very important because it appears to me that conversion technology may be much more cost-effective than storage technology. So in any event, this is a small step forward. It would not have happened if it hadn't been for your leadership, Chairman Boucher, and it would also not have happened if Mr. Whitfield and Mr. Shimkus hadn't worked hard, and Mr. Upton, to put this bill together.

So I hope we have a good hearing today. I want to commend our witnesses, most of whom I know personally, for being here, and hopefully this will result in a markup and a bill going to the floor that can be supported and sent to the other body. I have a formal statement I will submit for the record, but again, I am proud to be

a sponsor and I look forward to perfecting the bill in open markup and moving it the floor.

Mr. BOUCHER. Mr. Barton, thank you very much and I truly appreciate your copatronage and the many contributions you made to constructing this measure as it was being discussed in its early stages.

The gentleman from Massachusetts, Mr. Markey, is recognized for 3 minutes.

OPENING STATEMENT OF HON. EDWARD J. MARKEY, A REPRESENTATIVE IN CONGRESS FROM THE COMMONWEALTH OF MASSACHUSETTS

Mr. MARKEY. Thank you, Mr. Chairman, and I thank you for convening this hearing to talk about solutions to climate change and for the excellent panel which you have put together.

I believe that with successful carbon capture and storage coal can be an important part of our energy future. For that reason, I support funding for carbon capture and storage as part of a comprehensive strategy to combat global warming. But I do have reservations about a piecemeal approach and whether that is an effective way to achieve our shared goals of cutting global warming pollution and growing our economy. We need to provide a level playing field for all clean energy technologies to compete and we need assurances that our investments will curb global warming pollution. The best way to do this is through economy-wide climate legislation with mandatory emission cuts. Such legislation can fund investments in CCS, renewable energy and other clean technologies while guaranteeing environmental results and protecting American consumers.

This bill raises a number of concerns. The bill imposes a \$1-billion-per-year tax increase on Americans for 10 years but provides no guaranteed environmental benefit. Now, some of my friends across the aisle who last month complained that global warming bills will impose higher costs on consumers are now sponsoring this \$10 billion tax increase. That is fine, but it is a different storyline than we heard just a month ago. Second, I believe that we should advance CCS by reforming and expanding the Department of Energy's existing programs, which are subject to congressional oversight. Instead, this bill takes \$10 billion in taxpayers' money and hands it over as a blank check to a new private corporation run by industry representatives. It allows that corporation to spend this \$10 billion however it wants with no benchmarks for success, no review of costs, no public participation and no government oversight whatsoever. I am not aware of any precedent for such a program. CCS does have to be a big part of our future if we are going to solve the problem of the relationship between coal and global warming.

I look forward to working with Chairman Boucher, Chairman Dingell, Ranking Members Upton and Barton on this legislation but I think it should be part of a comprehensive approach. I thank the gentleman.

Mr. BOUCHER. Thank you very much, Mr. Markey.

The gentlelady from Tennessee, Ms. Blackburn, is recognized for 3 minutes.

OPENING STATEMENT OF HON. MARSHA BLACKBURN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF TENNESSEE

Ms. BLACKBURN. Thank you, Mr. Chairman. I appreciate your good work and for holding the hearing today. I appreciate the work of the ranking member and I want to thank all of our witnesses who are here today.

I am one of those that still has some pretty serious concerns about Congress mandating this technology and then spending lots of taxpayer money on developing it. First, the liability and environmental hazards are issues that I think still need to be addressed and currently scientists in Utah are preparing to inject millions of tons of CO₂ into the ground and they state that carbon sequestration is low risk and safe but they can't guarantee that for the long term, and then if you have a natural disaster and it is released into the groundwater or oil and gas reserves, then who pays for the release and the contamination and the responsibilities there. There is another issue that is of concern to us, and there is research out of Columbia University that indicates the possibility is real, and since carbon sequestration is likely to be located near cities, that it could cause damage in case of earthquakes and it could be an inducer of earthquakes, and Memphis is in my district and of course that is near the New Madrid fault, and if industries in that area have to use carbon sequestration, then the concerns with something that would precipitate an earthquake certainly are very valid concerns in that fault zone.

Another issue is how fast carbon sequestration technology can be developed and how its costs will be borne by the marketplace, and Mr. Chairman, I have got a New York Times study that talks about this, and rather than quoting from it, I would like to ask unanimous consent to place the New York Times article on those reports in the record with my statement.

Mr. BOUCHER. Without objection.

[The information appears at the conclusion of the hearing.]

Ms. BLACKBURN. Thank you, Mr. Chairman.

One of the most optimistic projections we have is that some of this technology would be available by 2030, still a long way away, that we are also seeing that this can lead to raising electricity rates. Of course, we know that is going to be borne by the American consumer, and if this country decides to cap greenhouse emissions, Congress must avoid picking winners and losers. There is available technology to capture CO₂ and convert it to fuel for transportation and electric power generation. Those deserve our consideration and deserve a review.

I thank you for the hearing, and I am looking forward to our witnesses and I yield back the balance of my time.

Mr. BOUCHER. Thank you very much, Ms. Blackburn.

The gentlelady from Wisconsin, Ms. Baldwin, is recognized for 3 minutes.

OPENING STATEMENT OF HON. TAMMY BALDWIN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF WISCONSIN

Ms. BALDWIN. Thank you, Mr. Chairman. I appreciate your holding this hearing and I know that a lot of your time and hard work has gone into crafting the language of the Carbon Capture and Storage Early Deployment Act, and for that I am very appreciative.

It has already been established that climate change is real and that it poses serious threats to our economy, our environment, and our national security and clearly it is time for us to act to address this growing crisis. One of the ways that we can begin to lessen the effects of climate change is through investments in research and development of carbon capture and storage technology. A carbon capture and storage program is key to addressing our reliance on coal to produce electricity while finding a method for disposing of its harmful emissions.

In Wisconsin we have begun to examine carbon capture technology. We Energy's Pleasant Prairie power plant located in Kenosha, Wisconsin, launched a \$10 million pilot project earlier this year to capture a portion of the CO₂ produced as coal is burned. The plant is the first of its kind in the United States and has the potential to capture 90 percent of the CO₂ it emits from 1 percent of the flue gas that they are currently capturing, but as we all know, the problem is what to do with the CO₂ once it has been captured and certainly we need more research into this issue.

While I appreciate the work that has gone into crafting the Carbon Capture and Storage Early Deployment Act, I do have a couple of concerns. First, as I believe some of our witnesses will point out, I am concerned that the funds being collected coming from our ratepayers are solely being used to back industry for carbon capture and storage but not also investments in renewable energy and energy efficiency, and I am concerned about the added costs that will be placed on all ratepayers, perhaps without State regulatory oversight. Finally, I have some questions about exactly how the funds will be used. For instance, will they apply to research into transportation of CO₂ and will they be used for research into liability issues? My concerns essentially stem from the knowledge that among other States, Wisconsin appears to lack the geological formations necessary for storage. As a result, we will likely need to transport CO₂ by a pipeline system to oil and gas fields, coal seams, and deep saline aquifers found in the Illinois basin.

Mr. Chairman, I agree that a large financial investment in carbon capture and storage technology is necessary to make its full-scale deployment a reality. I appreciate your holding this hearing today to examine your bill and the larger issues at hand, and I look forward to hearing from our panel of witnesses today.

Thank you, Mr. Chairman. I yield back.

Mr. BOUCHER. Thank you very much, Ms. Baldwin, for those thoughtful remarks.

The gentleman from Washington State, Mr. Inslee, is recognized for 3 minutes.

OPENING STATEMENT OF HON. JAY INSLEE, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF WASHINGTON

Mr. INSLEE. Thank you, and I too want to add my appreciation of the chair of moving a research and development effort forward, and he has been most gracious working on this and I have been talking to the chair about a couple other issues that might dovetail if this bill advances, and I appreciate him getting the Congress to focus on R&D. But I do, with some of my colleagues, have some questions and I think the most fundamental one I have as I was listening to my colleagues from the other side of the aisle, who have expressed objections to a cap-and-trade system, and I started thinking about this. Even if we do this and if this is successful—and I support R&D for carbon capture and sequestration—I think it is appropriate as one of the very large smorgasbord of technologies that we hope will work. But if we do this and we spend several billion dollars perfecting a carbon sequestration technology for coal, but if we never adopt a cap-and-trade system and there is never any price on carbon, nobody will ever use this wonderful technology, and it is a little bit difficult to justify the expenditure of billions of dollars of taxpayers' money for technology that some of the supporters will effectuate policies that will assure that it will never be utilized. I remember talking to President Bush about this when he was gracious enough to come to our retreat last year. He was also pushing CCS research. I said this is great stuff but it will just sit on the shelf and never be used unless there is some price on carbon and a CO₂ cap. In a word, I think that we need to address these issues together.

I may also add that if we do a cap-and-trade system with an auction, the revenue source from this research will come from the polluting industries, not from the consumers. Now, there is a pass-through to consumers, as we know, but I suspect given a choice, our constituents would prefer an auction system where the polluting industries contribute to the resource base to pay for this. It is better than a surtax right onto the consumer's bill.

So I hope that at some point we will address these things together. I share my colleagues' concern that if we are going to do a big R&D program, it by necessity has to include all of the technologies involved including wind that DOE 3 weeks ago concluded could provide 20 percent of our electricity, and if are you watching CNN, you are seeing T. Boone Pickens running ads saying we can do 20 percent of our system and more through wind, solar thermal, solar photovoltaics, enhanced geothermal, and the whole 9 yards. So I think we have some more work to do on this, but again, I want to thank the chair for his leadership on this. Thank you.

Mr. BOUCHER. Well, thank you very much, Mr. Inslee, and we look forward to working with you also as we refine this measure and hopefully we will earn your support. Let me just say for my part, I certainly agree that we need to have a mandatory control on carbon dioxide emissions and that will be a necessary second step that will be taken as soon as is possible.

The gentleman from Utah, Mr. Matheson, is recognized for 3 minutes.

**OPENING STATEMENT OF HON. JIM MATHESON, A
REPRESENTATIVE IN CONGRESS FROM THE STATE OF UTAH**

Mr. MATHESON. Well, thank you, Mr. Chairman, for your leadership on this issue.

I am pleased to be a cosponsor of H.R. 6258. I believe that one of the current challenges to implementing the cap-and-trade system to address climate change is a lack of readily available technology for carbon capture and sequestration among other innovations we need to see. While I recognize that carbon is already being captured and used in some circumstances in the enhanced oil recovery process, there are clearly significant challenges regarding the deployment of full-scale commercial carbon capture and sequestration. I am also concerned we don't know enough right now about the long-term implications of storing all the carbon that we would need to house in a carbon-constrained future. Geological variations across our Nation, for instance, present significant challenges to storage. If that is the case, we need to be thinking about what to do with carbon emissions in parts of the country where storage isn't as viable. Developing these technologies will be necessary for the United States to meet long-term CO₂ reduction targets, and I believe we should start this intensive research and development process sooner rather than later. However, I also caution that this type of program must remain accountable and I believe that as written, the bill might benefit from stronger standards for ensuring that the public's money is being well spent on truly promising projects.

One of the questions that I hope we answer today is, how can Congress ensure that the public funds are used for projects that would not otherwise receive private-sector funding? How do we encourage the development of breakthroughs and novel ideas instead of just subsidizing the easy projects that would probably be funded by the private sector alone? I am also concerned about ensuring that this program is seed money for future technology development efforts. I think what we are doing today should be part of a larger technology development strategy. This program should not be duplicative nor should it become a fund for pet projects. I see H.R. 6258 as an opportunity to jump-start a necessary component of addressing climate change.

And finally, I believe we should resolve issues such as the question of who would control or own patent rights to the technologies developed via this fund. This is particularly important if trust fund money is matched or exceeded by private-sector funding in key projects.

Those are some issues I would like to see addressed if we could. Thanks, Mr. Chairman. I will yield back my time.

Mr. BOUCHER. Thank you very much, Mr. Matheson.

The gentleman from North Carolina, Mr. Butterfield, is recognized for 3 minutes.

OPENING STATEMENT OF HON. G.K. BUTTERFIELD, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NORTH CAROLINA

Mr. BUTTERFIELD. Thank you very much, Mr. Chairman. First, let me apologize for being late. I just left a meeting and was un-

avoidably detained, but thank you very much for convening this hearing today and thank you for your leadership on this issue.

Mr. Chairman, despite what I view as irrefutable evidence, there remains skepticism and doubt regarding the need for immediate action on climate change legislation and this will continue to delay us from our task of generating policies that will signal the public and private world alike that a greener future is indeed inevitable. Despite this, we can take meaningful steps to ramp up technological innovation and deployment such as the bill that we are considering today. Further, the authors of this legislation wisely understand that creating a greener future will require transition from our current energy infrastructure to the next. Coal, which is abundant and inexpensive in our country, must be a part of that transition. Coal is responsible for over half of the electricity generated in the United States, and is especially critical to the Southeast. It is prolific in its utility and carbon capture and storage will provide a useful tool in transitioning coal into a greener fuel stock for years to come. It is therefore imperative that we encourage its development as well as its proliferation at a commercial level as soon as possible.

I applaud my colleagues on both sides of the aisle for their bipartisan support. I hope that we can see this type of collegiality as we continue to address the important issue of climate change policy. It will require an attitude of compromise from all of us. I especially want to welcome all of our witnesses today and extend a special welcome to my fellow North Carolinian, James Kerr, who is a Commissioner with our Utilities Commission in North Carolina. Jim was born in Goldsboro, which is in my congressional district, and I am pleased that he has taken the time to join us today to offer his testimony on this legislation.

Thank you, Mr. Chairman. I yield back.

Mr. BOUCHER. Thank you very much, Mr. Butterfield.

The gentleman from Georgia, Mr. Barrow, is recognized for 3 minutes.

Mr. BARROW. I thank the chair. I too want to apologize for being late, but as the chairman may know, I am bouncing back and forth between two hearings. The Committee on Agriculture is meeting on excessive speculation in the oil and natural gas markets, which is a timely subject, and I haven't yet mastered the art of bilocation, but I am working on it, Mr. Chairman.

I waive an opening. Thank you, sir.

Mr. BOUCHER. Or teleportation. Thank you, Mr. Barrow. We will add 3 minutes to your time for questioning our witnesses today since you waived an opening statement.

That completes the opening statements of the members present, and at this time we welcome our panel of witnesses, and I want to thank each of them for their carefully prepared and thoughtful testimony. We welcome this morning Mr. Michael Morris, the President, the Chairman and the Chief Executive Officer of American Electric Power; Dr. Steven Specker, the President and Chief Executive Officer of the Electric Power Research Institute; Mr. Eugene Trisko, Counsel to the United Mine Workers of America; Dr. Edward Rubin, the Alumni Professor of Environmental Engineering and Science at the Carnegie Mellon University in Pittsburgh;

Mr. James Kerr, Commissioner of the North Carolina Utilities Commission; and Mr. Michael Goo, a former counsel to this committee, who is the Legislative Director for Climate at the National Resources Defense Counsel.

Without objection, all of your prepared written statements will be made a part of the record. We would welcome your oral summaries and ask that they kept to approximately 5 minutes.

Mr. Morris, we will begin with you.

**STATEMENT OF MICHAEL G. MORRIS, CHAIRMAN, PRESIDENT,
AND CHIEF OPERATING OFFICER, AMERICAN ELECTRIC
POWER**

Mr. MORRIS. Thank you very much, Mr. Chairman. It is an honor to be here again to speak to this subcommittee, particularly on a subject as important as this and seeing the bipartisan nature of it that you and Ranking Member Upton brought to this very important piece of legislation is impressive, to say the least.

Having heard some of the comments of your colleagues on the panel, however, I continue to be concerned about the likelihood of us taking this most important first step. All of these issues cannot be handled in a single piece of legislation and the unknowns about what a single piece of legislation might yield for the country surely ought to be in the back of our minds. All we have to do is think of biofuels in a larger sense.

So if we take this piece and think it through in a logical way, you have heard from me before and many of my colleagues testify to this committee and the larger committee, both here and in the Senate, on the unavailability of the technology today allowing coal to continue and the critical source or electrical generation in this country. You don't need to look very much further than our own shores to see what happens to an economy when it runs out of baseload power generation. South Africa's economy has been affected in all of 2008. China's economy with a story today in the Wall Street Journal is being affected now with a lack of baseload power generation. And it is clear that these kinds of challenges are not that are off for this country if we don't get about addressing the issue of allowing coal to play near and long-term. The availability of this carbon capture and storage technology will allow coal to continue to play, and I don't know that I heard from any of your colleagues any opposition to that because it is just plain true. This country is 50 percent electrically fueled by coal. The world, in fact, is 50 percent electrified by coal, and that will continue no matter what we do in the halls of this Congress. So seeing the bipartisan nature and the support of what you put together is really quite impressive and we thank you for that.

Does the bill have some points that could be addressed? I am sure that it does but I thank my colleagues from the United Mine Workers Association, the International Brotherhood of Electrical Workers and the utilities who have volunteered to come forward and employ this kind of an approach. I think this is a logical way for us to go about doing it, and with all respect, and I mean this from the bottom of my heart, but as a participant in this democracy, keeping the money out of the hands of the administrative arm of the Federal Government is one way to ensure that something

happens, and that is why you are seeing so much strong support for this bill as it comes forward. This is not tax money. This is a fee on top of the electric rate that my 5.1 million customers pay and that quite honestly the many millions of customers, the 300 million-plus customers in this country pay intended to address this very important issue in a very realistic way.

As I have said before, this is not the Clean Air Act Amendments of 1980 and 1990 where technology was available; we didn't want to do it. We as an industry, I surely standing here on behalf of American Electric Power and our 20,000-plus people and our 5 million customers are saying we would love to do this, please let us. Pass this enabling legislation, handle this very first piece so that we can bring you demonstrations that show carbon capture and storage is a viable technology because coal has to play in this endeavor as we go forward. The Congresswoman from Wisconsin points to the We Energy project that we are all part of, my company and many of my colleagues. It is the very first and important step and it is a pure research project that is being directed by EPRI, the Electric Power Research Institute, which Steve will surely speak on behalf of and will do so better than I will now, is a great organization to do that work. The concept and the construct of how this corporation will come together to allow these projects to come forward is exactly what we need to do. It is pinpointed toward carbon capture and storage. It not ought be pinpointed at solar and wind and efficiency. We all believe in that and we are all working on that. But you have created with your colleagues a very workable piece of legislation that will help us address this issue.

We can't solve whether we should go forward with carbon capture and storage in a much larger bill of a cap-and-trade program. That is a debate for another day. This is not a means in any way, shape, or form to not have that debate and not see that legislation passed, but all of that will be folly if we don't know if this technology works. So I think for one time in my career, we have the cart and the horse in the appropriate alignment and we should go forward and pass this, get it to the floor, get a companion piece like this out of the Senate and have a piece of legislation that says to the world, to both candidates for the presidential election this November, America is ready to lead, and in fact, this piece of legislation will allow us to do that.

I thank you very much for your creative activity and your steadfast support of the concept of let us do something. Thank you, sir.

[The prepared statement of Mr. Morris follows:]

**Summary of Testimony of Michael G. Morris, Chairman, President, and CEO
American Electric Power before the House Subcommittee on Energy and Air Quality**

American Electric Power (AEP) is one of America's largest electricity generators, serving 5+ million consumers in 11 states. Although AEP utilizes diverse generation – coal, nuclear, hydroelectric, gas, oil and wind – notably, it is America's largest coal-fired electricity generator. We believe that mandatory cap-and-trade climate legislation can be designed that is compatible with AEP's commitment to provide reliable, reasonably priced electricity to our customers. AEP is one of a handful of companies that have publicly endorsed actual cap-and-trade legislation. We also recognize that Chairman Boucher's Carbon Capture and Storage Early Deployment Act (H.R.6258) is both complementary and essential, but is not a replacement for, mandatory climate change legislation. We commend his initiative, and this specific bill – which we strongly support.

AEP sees great promise in carbon capture and storage (CCS) technology because it will enable our nation's most abundant domestic energy resources – coal – to be used in an even more environmentally beneficial manner than it is today. We also see great promise in cap-and-trade; and we commend Congress for resisting outdated command and control performance standards, which are incompatible with the advantages of a gradual, economy-wide, market-based system that includes effective cost containment and free allowances to the electric sector based upon historic emissions. We also see the need for demonstration/deployment incentives for CCS and other advanced technologies, and use of domestic and international offset credits that are accurately quantified and verified. Finally, legislation must include a provision to encourage rapidly developing countries to also promptly curb their greenhouse gas emissions.

All pending climate bills in Congress, to meet stabilization targets, call for greenhouse gas emissions reductions of 60 to 80% by 2050. Achieving this will require major technological advances to capture and store CO₂ from the burning of coal, which is America's and much of the developing world's most abundant energy source. CCS should not be required through mandatory climate change legislation unless demonstrated to be effective and its costs have dropped to enable widespread commercial availability. Much needs to be done before the large deployment of CCS can occur. AEP is aggressively exploring the viability of CCS technology in several first-of-a-kind commercial projects. AEP is an industry leader in developing and deploying new technologies – from the first high voltage transmission lines to new supercritical and ultra-supercritical powers plants. The costs of such innovations are, by necessity, high.

H.R. 6258 is absolutely essential to prove CCS and other promising technologies in time for an aggressive, mandatory, cap-and-trade program. Regulated utilities need the approval of public utility commissions (PUCs) to include power and technology costs in electric rates. Generally, PUCs only approve costs that are necessary and prudent or in compliance with applicable federal and state requirements. While states may fund limited R&D projects, PUCs generally approve additional costs for environmental controls only when specifically required by statute or regulation. This represents the ultimate "chicken-and-the-egg" climate change paradox. AEP believes that we will face a mandatory federal cap on our emissions, and that this will be enacted into law during the next decade. Many would consider it imprudent to build to build new electric generating plants with anything other than state-of-the-art and advanced technology today in order to assure the achievement of the ambitious GHG emission reduction goals for 2050. We are still operating plants that were built during the Eisenhower, Kennedy and Johnson administrations, and plants built today will be operating during the term of the President who sits in the Oval Office in the 2050s. Thus, utilities and PUCs alike face significant obstacles when constructing advanced technology to meet environmental requirements that are certain to be enacted into law, but that has not yet occurred. Despite this conundrum, AEP proposed to construct an IGCC plant to serve our West Virginia and Virginia customers, since IGCC works more effectively to reduce CO₂ emissions through future CCS applications. Although West Virginia approved, Virginia did not. Despite this outcome, I am hopeful that a means can be found to move forward. We must take the long view, and recognize that some form of cap-and-trade legislation will become law.

This hearing is focusing on potential solutions to this dilemma. Despite early success in clean coal initiatives, the viability of appropriations has been undermined with a succession of appropriations deferrals, delays and reductions, and appropriations are not likely to be of the magnitude required for CCS. The broad remedy to these circumstances is a guaranteed source of funding through a small wires charge. That is the solution proposed in H.R. 6258. The demonstration projects envisioned by this bill are essential to an important public policy goal and must be started as soon as possible. H.R. 6258 represents a new, breakthrough approach to fix our broken system for funding development of advanced environmental technology. America needs H.R. 6258 now – well before actual enactment of any climate legislation. H.R. 6258 presents a vital opportunity to fix the rate recovery system for early deployment of CCS.

Testimony of
Michael G. Morris
Chairman, President, and Chief Executive Officer
American Electric Power
Before the House Energy and Commerce
Subcommittee on Energy and Air Quality
July 10, 2008

Good morning Mr. Chairman and distinguished members of the Subcommittee on Energy and Air Quality of the House Committee on Energy and Commerce.

Thank you for inviting me here today. Thank you for this opportunity to offer the views of American Electric Power (AEP) on H.R. 6258, the Carbon Capture and Storage Early Deployment Act.

My name is Mike Morris, and I am the Chairman, President, and Chief Executive Officer of American Electric Power (AEP). Headquartered in Columbus, Ohio, we are one of the nation's largest electricity generators – owning nearly 38,000 megawatts of generating capacity -- and serve more than five million retail customers in 11 states in the Midwest and south central regions of our nation. AEP's generating fleet employs diverse sources of fuel – including coal, nuclear, hydroelectric, natural gas, and wind power. But of particular importance for the Subcommittee members here today, AEP uses more coal than any other electricity generator in the Western hemisphere, and is an industry leader in developing advanced technology. We support H.R. 6528 because of our strong interest in carbon capture and storage (CCS) technology as an important mitigation option for reducing greenhouse gas emissions,

while continuing to support the generation of electricity from our nation's most abundant domestic energy resource – coal – in an environmentally beneficial manner.

AEP Support for Federal Climate Legislation

Over the past decade, AEP has implemented a broad portfolio of voluntary actions to reduce, avoid or offset greenhouse gas (GHG) emissions. These actions include participation as a founding member the Chicago Climate Exchange through which AEP has made legally binding commitments to achieve a 6% reduction in our 1998-2000 GHG emission levels by 2010. AEP expects to achieve 46 million metric tons of GHG emission reductions through measures – just to name a few – that improve efficiency of our power plants, manage forests and agricultural lands for carbon sequestration, implement energy conservation and efficiency measures, and deploy renewable energy and clean power projects. In addition, we continue to invest in new clean coal technology plants and demonstration projects that will enable AEP and our industry to meet the challenge of significantly reducing GHG emissions over the long term. These undertakings include efforts to demonstrate and deploy new advanced coal technologies and the application of CCS technologies.

However, our commitment to addressing climate change does not end there. AEP also is committed to working with you to pass mandatory cap-and-trade federal legislation that is well thought-out, achievable, and reasonable. A well-designed federal regulatory program will allow AEP to obtain recovery of our costs for the commercialization and deployment of advanced technology to reduce our greenhouse gas emissions. We believe legislation can be crafted in a manner that does not impede AEP's ability to provide reliable, reasonably priced electricity to support the economic well-being of our customers, and includes mechanisms that foster international participation and avoid creating inequities and competitive issues that would otherwise harm the U.S. economy.

AEP is one of a small handful of companies that have publicly endorsed mandatory cap-and-trade legislation, as introduced in the Congress, to reduce greenhouse gas emissions across the U.S. economy. AEP supports reasonable legislation, and is not calling for an indefinite delay until advanced technology such as CCS is developed. However, as the requirements become more stringent and we move beyond the ability of current technology to deliver those reductions, it is essential that requirements for deeper reductions coincide with the commercialization of advanced technology. Although the technologies for effective CCS from coal-fired facilities are developing, they are not yet commercially prepared to meet America's sustained production needs, and cannot be artificially accelerated through unrealistic reduction mandates. For these reasons, we do not believe that applying performance standards on new sources is compatible with our needs or the needs of our customers, regulators, and the nation. Such standards have the potential to eviscerate the economic efficiencies of a cap-and-trade program and would significantly undermine the essential genius of this proven least-cost concept. Rather, AEP strongly supports federal policies for accelerating development of CCS technologies, like H.R. 6258, that are complementary, but not intended to be a replacement for a federal cap-and-trade program.

A sound national policy for reducing GHG emissions, based on a cap-and-trade type approach, should include the following design elements:

- The cap should apply to all sectors of the economy and cover all greenhouse gases.
- A comprehensive cap-and-trade framework should be used to maximize flexibility and minimize the costs of the program.
- The reduction levels should be gradually phased in over time to reflect the lead-time necessary for demonstrating and deploying new low-and zero-emitting technologies on a broad commercial

scale. Setting reasonable and achievable emissions caps is critical to ensure that the power industry can still provide reliable and affordable electricity and ensure continued economic competitiveness for U.S. workers and industries.

- An effective cost containment mechanism related to the price of allowances to ensure the U.S. is not harmed by a transition to a carbon-constrained economy. Such a mechanism assures that consumers will not be excessively burdened, especially as environmental markets are developing.
- An appropriate allocation of allowances, at no cost, to the electric power sector in order to blunt otherwise inevitable electricity price spikes to customers. Allowances should be allocated based on historic emissions without cost to the electric power sector. At most, only a small number of the allowances (less than five percent) should be distributed through auctions or set-asides for general public benefit purposes. Cost-of-service utilities must pass through the benefit of such an allowance allocation to their retail and industrial customers. This approach is essential to minimize the cost burden to retail consumers, to safeguard competitiveness of U.S. industries, and to avoid harm to the U.S. economy. If, however, allowances are distributed primarily through an auction, electric utilities will directly pass through the cost of allowances that they are required to buy through an auction, thus significantly increasing costs to consumers. For this reason, the auction requirement in many bills is the most costly provision in that legislation.
- Adequate federal incentives to support the demonstration and deployment of CCS and other advanced technologies for reducing greenhouse gas emissions from existing and new generating capacity. Given the enormity of this technology challenge, federal incentives for the electric power sector must be substantial and should include the distribution of bonus allowances and auction revenues to further the rapid deployment of such advanced technologies.
- Full use of domestic and international offset credits in addition to the allowances allocated under the emission cap, so long as those offsets are accurately quantified and properly verified.

How these and other aspects of the program are crafted is also critical for ensuring the design of a cost-effective federal program that will not impose disproportionate or excessive costs on consumers, or particular regions of the country.

Finally, it is essential that federal climate change legislation includes a provision to encourage rapidly developing countries to also curb their greenhouse gas emissions. This matter has profound ramifications for our global environment, and huge consequences for our national economy. As I have previously testified before this subcommittee, this long-standing concern inspired my friend, Mr. Edwin D. Hill, International President of the International Brotherhood of Electrical Workers (IBEW), and I to develop what we believe to be an effective policy response to the international aspects of federal climate change legislation.

Why is Development of Advanced Technology Necessary?

This Subcommittee, and the Congress, is increasingly focused on issues related to climate change, and how we can address the challenge posed by global warming. AEP is at the forefront of this issue. While AEP has done much and will do much more, to voluntarily mitigate GHG emissions from its existing sources, we – as noted above – support reasonable and achievable mandatory cap-and-trade legislation.

Changing consumer behavior by buying efficient appliances and cars, by driving less, and other similar steps, is helping to reduce the growth of GHG emissions. However, these steps will never be enough to significantly reduce CO₂ emissions that result from the use of fossil fuels. Such incremental steps, while important, will never be sufficient to stabilize greenhouse gas concentrations in the atmosphere at a level that is believed to be capable of preventing dangerous human-induced interference with the climate system, as called for in the U.S.-approved U.N. Framework Convention on Climate Change (Rio agreement). All of the pending climate bills in the Congress, to meet stabilization targets,

call for a reduction in greenhouse gas emissions by 60 to 80 percent by 2050. As you know, stabilization will require that other countries also take significant steps to reduce their greenhouse gas emissions.

To achieve that end, we need major technological advances to effectively capture and store CO₂, particularly from the burning of coal. Coal is the most abundant energy source in America, with 250 years of reserves at current consumption rates. The same is true for developing nations like China and India, who are even more dependent on their domestic coal reserves. What are the other alternatives if CCS is not commercially available in time to meet aggressive climate targets? Current coal-fired electricity production would have to be replaced with nuclear and natural gas. However, it must be understood that natural gas, although roughly 50 percent of the CO₂ emissions from coal, still represents a significant carbon footprint. Natural gas generation alone will not meet the aggressive climate targets. Increased use of natural gas for electricity production has even more serious repercussions for the chemical and agriculture sectors, which utilize natural gas as a feedstock. The Congress and indeed all Americans must begin to recognize the gigantic undertaking and significant sacrifices that this enterprise -- the development of CCS and advanced technology to burn coal -- is likely to require.

Significantly, today's costs of new clean-coal technologies with carbon capture and storage are much more expensive than current coal-fired technologies. For example, carbon capture and storage using current monoethanolamine (MEA) technology is expected to increase the cost of electricity from a new conventional pulverized coal fired power plant by about 60 to 90 percent. Even the newer chilled ammonia carbon capture technology we plan to deploy on a commercial sized scale by 2012 at one of our existing coal-fired units will result in significantly higher costs of electricity.

Additionally the MEA technology has limitations under existing plant retrofit conditions. The capture of CO₂ emissions requires a large volume of steam to regenerate the amine used for the CO₂

process. Preliminary design reviews at several existing pulverized coal units indicates that steam from the power generation cycle can be used to regenerate the amine necessary to capture only about 50 percent of the CO₂, without a large detrimental effect on the steam cycle.

It is only through the steady and judicious advancement of these applications during the course of the next decade that we can start to address these technical challenges and bring these costs down, in order to avoid substantial electricity rate shocks and undue harm to the U.S. economy.

CCS cannot be deployed until it has been demonstrated to be effective and the costs have significantly dropped so that it becomes commercially available and deployable on a widespread basis. Until that threshold is met, it would be technologically unrealistic and economically unacceptable to require the widespread installation of carbon capture equipment. The use of deep saline geologic formations as primary long-term CO₂ storage locations has not yet been sufficiently demonstrated. There are no national standards for permitting such storage reservoirs; there are no widely accepted monitoring protocols; and the tools to effectively manage the risks and potential liabilities are currently unavailable.

Outstanding technical questions for CO₂ storage include: What is the optimal number of injection wells? What is the injection well lifespan? What is the recommended proximity between injection wells? What measurement, monitoring, and verification of storage in geologic formations are needed? What is the time frame of post-injection monitoring? Answers to these questions are largely site-specific due to the natural variability of geologic conditions such as target formation capacity and caprock integrity. Much work needs to be done to ensure that the potential large and rapid scale-up in CCS deployment will be successful.

Underscoring these realities, industrial insurance companies point to this lack of scientific data on CO₂ storage as one reason they are disinclined to insure early projects. In a nutshell, the institutional infrastructure to support CO₂ storage does not yet exist and will require time to develop. In addition, application of today's CO₂ capture technology would significantly increase the cost of an Integrated Gasification Combined Cycle (IGCC) or a new efficient pulverized coal plant, calling into serious question the likelihood of regulatory approval for the costs of such a plant by state regulators. Further, recent studies sponsored by the Electric Power Research Institute (EPRI) suggest that application of today's MEA-based CO₂ capture technology would increase the cost of electricity from an IGCC plant by 40 to 50 percent, and boost the cost of electricity from a conventional pulverized coal plant by 60 to 90 percent, which would again jeopardize state regulatory approval for the costs of such plants.

Despite these uncertainties, I believe that we must aggressively explore the viability of CCS technology in several first-of-a-kind commercial projects. AEP is committed to help lead the way, and to show how this can be done.

AEP's Technology Development

Over the last 100 years, AEP has been an industry leader in developing and deploying new technologies beginning with the first extra high voltage transmission lines at 345 kilovolt (kV) and 765kV, to new and more efficient coal power plants starting with the large central station power plant, progressing to supercritical and ultra-supercritical powers plants. We are continuing that today. We have deployed 14 selective catalytic reactors (SCRs) for reducing NO_x, and 10 Flue Gas Desulphurization units for reducing SO₂ and other air pollutants, with others currently under construction, and we are a leader in developing and deploying mercury capture and monitoring technology. In addition, we continue to invest in new clean coal technology plants and demonstration projects that will enable AEP and our

industry to meet the challenge of significantly reducing GHG emissions in future years. AEP continues its efforts to build two new generating plants using IGCC technology in Ohio and West Virginia, as well as highly efficient new generating plants using the most advanced (ultra-supercritical) pulverized coal combustion technology in Arkansas in 2006. IGCC technology, for example, integrates two proven processes – coal gasification and combined cycle power generation – to convert coal into electricity at least as efficiently and cleanly as the most advanced coal combustion-based power plant today. Not only is it cleaner and more efficient than today's installed power plants, but IGCC has the potential to be retrofitted in the future for carbon capture at a lower capital cost and with less of an energy penalty than traditional coal combustion-based power plant technologies. However, the integration of these technologies along with the use of a hydrogen combustion turbine must still be fully developed and demonstrated before widespread deployment. Our IGCC plants will incorporate a CO₂ storage feasibility study and will reserve space to capture and compress CO₂ for sequestration.

The cost of constructing these plants will be high, resulting in a cost of generated electricity that would be 20 to 30 percent greater than that from traditional combustion technology. As more IGCC plants are built, the costs of construction are expected to come into line with the cost of PC plants. Unfortunately, as explained below, our experience with IGCC has underscored the need for a funding mechanism to develop advanced technology. We are also working to advance carbon capture and storage technology.

AEP's Major Initiative to Reduce GHG Emissions through CCS

In March 2007, AEP announced several major new initiatives to reduce AEP's GHG emissions and to advance the commercial application of carbon capture and storage technology and Oxy-coal combustion. Our company has been advancing technology for the electric utility industry for more than

100 years. Technology development needs are often cited as an excuse for inaction. We see these needs as opportunities for action.

AEP has signed a contract with Alstom, a worldwide leader in equipment and services for power generation, for post-combustion carbon capture technology using Alstom's chilled ammonia system. It will be installed at our 1300-megawatt Mountaineer Plant in New Haven, West Virginia as a 20-megawatt electric commercial performance verification project by late 2009. Once installed, this project is projected to capture and store up to 150,000 metric tons of CO₂ per year. We will store the CO₂ emissions in an existing deep saline aquifer using an injection well at the Mountaineer site that AEP had previously developed in conjunction with the Department of Energy (DOE) and Battelle. Working with Battelle and with continued DOE support, we will use this injection well and develop others to store and further study CO₂ injection into deep geological formations.

Following the completion of commercial verification at Mountaineer, AEP plans to install Alstom's system on a commercial scale at one of our power plants in the AEP system. This is more likely in the West where the CO₂ captured can be used for enhanced oil recovery.

AEP hopes to begin commercial operation very soon – in the 2012 time frame. As explained below, H.R. 6258 is absolutely essential if AEP and other electric utilities are to move forward with CCS in that time frame. Such a federal policy is what is required if we are to get started and prove CCS technology, and have it commercially available, in the likely time frame of the implementation of mandatory cap-and-trade legislation.

Funding the Development of Costly Advanced Technology

Regulated utilities are required to obtain the approval of public utility commissions (PUCs) to include the cost of power plants and similar technology projects in electricity rates. While the legal standards governing PUCs vary from state to state, they generally require that PUCs only approve the cost of such plants, and an increase in electricity rates, to the degree that is necessary and prudent to ensure adequate electricity supplies and the transmission and delivery of power in compliance with all other applicable federal and state requirements. While states may fund discrete, limited research and development projects, state PUCs generally approve additional costs for environmental controls when these controls are specifically required by state or federal statutes or regulations.

Utilities therefore face significant obstacles with regards to funding the construction of advanced technology to meet future environmental regulations before those standards are known. This represents the ultimate “chicken-and-the-egg” climate change paradox. AEP believes that we will face a mandatory federal cap on our emissions, and that this will be enacted into law during the next decade. Current proposed legislation calls for huge reductions in GHG emission levels, in the range of 60 to 80 percent by that same time frame. Many would consider it imprudent to build to build new electric generating plants with anything other than state-of-the-art and advanced technology today in order to assure the achievement of these ambitious GHG emission reduction goals. Any power plant constructed today will have a lifetime of at least 50 years. We are still operating plants that were built during the Eisenhower, Kennedy and Johnson administrations, and plants built today will be operating during the term of the President who sits in the Oval Office in the 2050s.

On the other hand, state PUCs generally base their decisions on existing federal laws, rather than a projection of possible emission caps or other control requirements under future but not yet enacted federal

legislation. State PUCs are therefore hesitant, if not unwilling, to approve of the construction of more expensive IGCC plants, let alone CCS.

This poses a huge dilemma for both utilities as well as state regulatory agencies. Any increase in rates must be based on what is prudent and necessary to meet current and projected demand based on existing state and federal environmental requirements. Yet we can all agree the likelihood of mandatory federal GHG emission caps is high in just the next few years, and such legislation will very likely be enacted into law by 2015.

The other issue facing both state PUCs and utilities is that a utility that chooses to build an early commercial scale project to demonstrate and prove advanced technology must pay a high premium for being among the first to deploy advanced coal technologies such as IGCC and CCS. However, the utility and its customers do not directly benefit from the financial return created by the sale of the next and cheaper generation of the same technology. Those benefits flow to the developer of the technology. The shareholders of the developer will likely benefit from the future sales -- after the utility, the state PUC and utility customers paid higher rates for the construction of the first generation of the technology.

What should a utility do? Should we wait, and not build anything for the next 5 to 10 years, until federal mandates are in place? That would likely be considered imprudent as we look at future load growth and increasing demand for electricity during the next decade. AEP's solution to this dilemma was to propose to construct an IGCC plant that would serve our customers in West Virginia and Virginia, and another for our customers in Ohio. The deployment of these IGCC facilities is intended to provide the platform for then reducing CO₂ emissions through future CCS applications

What should a PUC do when reviewing a requested increase in rates for the construction costs of such a plant? While the West Virginia Public Service Commission approved the project, the Virginia State Corporation Commission (SCC) ruled that the AEP proposal was neither "reasonable" nor "prudent." It explained that because the capital costs for the IGCC plant would be much higher than reported costs for other traditional coal-fired power plants alternative, lower-cost capacity should be pursued.

AEP was deeply disappointed by the decision of the Virginia SCC. AEP believes that IGCC power generation technology is the best way to meet the growing demands of our customers in our eastern service territory and to ensure future energy supplies by allowing us to continue to use abundant eastern bituminous coal supplies with less environmental impact. AEP continues to investigate other options and is hopeful that a means can be found to move forward with this IGCC plant, as well as our proposed IGCC in Ohio.

What is the lesson to be learned from our experience? In part it is that the current regulatory system, in many states, may not allow for rate recovery for full scale generation plants using advanced technology. State PUCs, such as the Virginia SCC, are already operating under the constraints of rapidly rising energy and commodity prices. PUCs must balance what is reasonable and prudent in light of their mandate to ensure affordable and adequate electricity supplies, against existing federal statutes and environmental requirements.

Fixing the System – Guaranteeing the Funding and Development of Technology

This hearing is focusing on potential solutions to this chicken-and-egg dilemma on the federal level. Allow me to first comment on several alternatives that have historically not fully met the test of advancing the development of technology.

With regards to the development of advanced technology, the main focus of the DOE has been on funding research, development and deployment through the various clean coal programs, such as the Clean Coal Power Initiative (CCPI) or projects such as FutureGen. The clean coal programs have successfully contributed to the development of advanced technology over the last 30 years. On the other hand, the early successes depended in part on the use of “advance appropriations” where billions of dollars were appropriated in advance and then provided a guarantee to pay for the development and construction of advanced technology. However, in the modern period of budget deficits and a high level of fiscal uncertainty from one year to the next, let alone from one administration to the next, new advanced appropriations have fallen by the wayside and therefore are not a political option – and certainly not at the same level of funding or magnitude. Today, even when funds are appropriated, they are often deferred or delayed from one year to the next. Developers of technology, and utilities, are increasingly reluctant to count on the appropriations process as a guaranteed source of funding for these necessarily very expensive, multi-year projects. The decision by DOE to no longer fund FutureGen vividly underscores this concern.

The remedy to unreliable annual appropriations is a guaranteed source of funding through a wires charge – a small charge that is added to each utility bill. In the longer term, this small wires charge will save our ratepayers billions of dollars by ensuring faster deployment of CCS, rather than having to rely on more costly strategies to reduce CO2 emissions. That is the solution proposed in H.R. 6258, the Carbon

Capture and Storage Early Deployment Act. Critical to the success of this undertaking in a timely manner is an assurance of cost recovery by utilities of the funds contributed to the Corporation.

I understand that state utility commissions have legitimate concerns that the Corporation uses these funds properly. From my perspective today, this is best accomplished by having a transparent process for the Corporation's research and funding decisions, with the participation of the National Association of Regulatory Utility Commissioners (NARUC). Going forward, we must work together to find a suitable solution to these concerns. In the end, however, the RD&D activities envisioned by this bill are essential to accomplishing an important national public policy goal and need to get started as soon as possible. If these activities are to be undertaken, cost recovery is extremely important. This is all that Section 8 of the bill attempts to accomplish by providing certainty to utilities that they will be able to recover through rates the funds that they contribute to the Corporation. I look forward to working with NARUC and others to address these challenges.

AEP applauds the leadership demonstrated by Chairman Boucher in introducing this important legislation that represents a new, breakthrough approach to fix our broken system for funding the development of advanced technology. I also commend those who have joined as cosponsors, many of whom are from districts served by AEP, and some of whom are members of the Subcommittee and present today -- Mr. Upton, Mr. Murtha, Mr. Barton, Mr. Rahall, Mr. Whitfield, Mr. Costello, Mr. Shimkus, Mr. Matheson, Mr. Doyle, Mr. Holden, Mr. Ellsworth, Mr. Hill, Ms. Wilson, Mr. Towns, and Ms. Pryce.

AEP strongly supports the Carbon Capture and Storage Early Deployment Act introduced by Chairman Boucher. This bill creates a critically important bridge to the future, by providing for funding for CCS for the next 10 to 15 years. The early commercial demonstration of CCS technology is essential

if coal is to remain economically viable under mandatory carbon reduction constraints. But more is at stake than just the future of coal. Coal powers the American economy, and maintaining America's future standard of living therefore depends on proving the technical and economic feasibility of CCS.

Climate legislation likely will include various funding mechanisms for CCS. But this legislation may not be enacted for at least two or three years, and the promulgation of regulations for a domestic cap-and-trade program could take an additional three to five years. Therefore, we may be at least 8 to 10 years away from a guaranteed funding source for CCS as part of climate change legislation.

America can't wait that long. We need to get started now to develop and prove CCS. The Carbon Capture and Storage Early Deployment Act provides the means to do so. It utilizes a very small charge added to the bills of consumers who benefit from electricity generated from fossil fuels. The charge amounts to only about \$5 to \$10 per year for the average household. But it will raise about \$1 billion annually over the next 10 years to jump-start the deployment of CCS.

AEP also commends the United Mineworkers of America (UMWA) and the International Brotherhood of Electrical Workers (IBEW) for their development of this very important legislation in collaboration with Mr. Boucher. AEP, the IBEW and the UMWA share a commitment to building the bridge to the future for coal-fired electricity, both through this important bill and by the enactment of cost-effective and achievable climate legislation.

H.R. 6258 is not the solution for the entire challenge posed by climate change. It is not a replacement for mandatory cap-and-trade legislation. As I explained above, AEP supports mandatory climate change legislation that would establish a reasonable and achievable cap for greenhouse gases, and

also reduce costs through the use of various market mechanisms. H.R. 6258 does not cap or limit emissions. That is not the goal or legislative intent of this bill.

The Carbon Capture and Storage Early Deployment Act provides an essential bridge to the future, and a means to guarantee funding for the development of CCS in the early years, so it can be demonstrated and proven to work, to protect the environment, and to be safe to the areas in which it is deployed. Chairman Boucher and the cosponsors have provided an important public service for their constituents and for the nation, for the reality is that CCS is not just necessary – it is essential. Without CCS it will be impossible to burn coal and reach the cap levels posed in most legislation from 2020 through 2050 and beyond for the remainder of the century. That is not only true in our own country, it is the case for the rest of the world as well since nations like China and India possess huge coal reserves and are already rapidly expanding their existing fleet of coal plants.

In closing, it is also important to note that H.R. 6258 solves only part of the climate and technology puzzle for utilities, by providing initial funding for early deployment of CCS technologies. It does not address the need to construct IGCC plants and other advanced technology to burn coal. CCS has the potential to operate in an efficient and cost effective manner when used in conjunction with the cleaner emission gas of IGCC. IGCC and CCS represent the natural pairing of two technologies – IGCC to use coal, and CCS to capture and store the CO₂. Other CCS technologies also need to be developed for use with other combustion technologies, both at new and existing generating units.

Chairman Boucher's bill represents an absolutely critical step forward for advancing CCS technologies. However, this step is part of broader set of reforms that are necessary to fix our funding system for electric utilities. Chairman Boucher has wisely decided to not try to solve all problems, or

claim that his bill is the solution to the entire climate change issue. That will have to wait until reasonable and achievable cap and trade legislation is enacted by the Congress.

AEP looks forward to working with Chairman Boucher and others to fix the rate recovery system so that it is not a disincentive for early development and deployment of CCS technology.

Mr. BOUCHER. Thank you very much, Mr. Morris.
Dr. Rubin.

**STATEMENT OF EDWARD S. RUBIN, THE ALUMNI PROFESSOR
OF ENVIRONMENTAL ENGINEERING AND SCIENCE, CAR-
NEGIE MELLON UNIVERSITY**

Mr. RUBIN. Mr. Chairman, thank you very much for the opportunity to appear here today. My name is Ed Rubin. I am a schoolteacher from western Pennsylvania where I am a professor in the Department of Engineering and Public Policy at Carnegie Mellon University. My teaching and research focus on problems of energy and the environment, especially issues related to coal use, environmental technologies, and climate change.

Over about the past 3 years, I have also worked in a consulting role with the Pew Center on Global Climate Change to look at alternative policies for accelerating the deployment of CO₂ capture and storage, or CCS. That work appears to have influenced the bill we are discussing here today and I very much appreciate your invitation to comment on it. So first let me say that I was extremely pleased to see this bill introduced with bipartisan support following the Senate's failure last month to tackle the issue of climate policy. It is clear that progress on that issue will require considerably more time no matter who the next President is. The great virtue of H.R. 6258 is that it can still allow our country to make urgently needed progress this year on a technology that will be critical to whatever climate policy ultimately emerges in the future.

So today I have three simple points to make. The first is that CO₂ capture and storage is a critical technology for bridging the Nation's energy and environmental objectives. It is the only way we know to reconcile the realities and importance of coal use with the need to dramatically reduce CO₂ emissions linked to climate change. Therefore, we should not delay demonstrating its application in the electric power sector, which is the largest source of CO₂ in the United States today.

My second point is that several full-scale projects are needed urgently to ensure that CCS can be used safely, effectively and reliably in power plant applications. This need for full-scale demonstrations is widely recognized but funding for such projects has not yet been forthcoming. My estimate is that the full cost of building a CO₂ capture and storage system at a nominal 400-megawatt power plant and operating it for 5 years is somewhere between \$700 million and \$1 billion per project. As best I have been able to tell, there is today not a single large-scale CCS project at a coal-fired power plant anywhere in the world with the full financing needed to proceed at that scale. And so in the absence of a strong policy mandate, H.R. 6258 would overcome this obstacle in a very creative and efficient way by spreading the cost of demonstrations over a broad set of stakeholders, all of whom will benefit from the outcome of these projects. Ultimately, all consumers of fossil fuel electricity would bear the cost under this bill. But my estimate is that the cost to an average residential customer will be no more than a penny a day per household, or about \$3 to \$5 a year. That is an even smaller amount than the Committee's estimate of \$10

to \$12 a year, which in fact I believe is in error and I have provided details of that to the committee staff.

My third point is that several changes to the current draft bill are needed to make it both more effective and more acceptable. In my written testimony, I have outlined six specific changes I would recommend. Most important, I think, is the need to define more explicitly and more narrowly the mission of the corporation established by this bill. In a nutshell, that mission should be to accelerate the deployment of CCS by financing and overseeing the management of critically selected CCS projects at new and existing power plants, typically at a scale of several hundred megawatts each.

Given that mission, I would strongly urge that the language in section 4(b) of the bill be deleted. That language muddles and diffuses the purpose of this bill. It would put the corporation in the same business as a variety of other organizations whose mission is to support and carry out research and development, principally the Department of Energy and the Electric Power Research Institute. Unquestionably, R&D is critical but it should not be the mission of this corporation. Thus, I would also suggest that the word "research" be dropped from the proposed name of the corporation. Instead, following the title of the bill, it should be called something like the Carbon Capture and Storage Deployment Corporation, or more simply, the CCS Deployment Corporation.

Finally, I would recommend that the composition of the board of directors of the corporation be modified to include representatives of other key stakeholder groups. This is necessary, I think, both to broaden the expertise and perspectives of the board and also to strengthen its external credibility and public trust. While most board members should be drawn from electric power organizations, I believe at least two members should be drawn from non-utility industries and at least two from public organizations. For example, non-utility industrial members might be drawn from segments of the oil and gas industry, which today has the most experience and expertise in CCS operations. The public members should include at least one government representative such as from the Department of Energy and one non-governmental member such as from an environmental NGO or even an academic organization.

With these modifications, I believe H.R. 6258, if enacted this year, will indeed be a critical piece of legislation that will greatly facilitate future progress on climate policy, energy policy, and the reduction of CO₂ emissions and so I am happy to offer my penny a day in support of this bill. I have brought along some extra pennies in case anybody else at the table would like to join me.

Thank you, Mr. Chairman, for your attention.

[The prepared statement of Mr. Rubin follows:]

**Testimony of Edward S. Rubin to the
Subcommittee on Energy and Air Quality
Committee on Energy and Commerce
U.S. House of Representatives**

**Legislative Hearing on H.R. 6258
The Carbon Capture and Storage Early Deployment Act**

**Washington, DC
July 10, 2008**

Mr. Chairman, thank you for the opportunity to testify today. My name is Ed Rubin. I am a professor in the Department of Engineering & Public Policy, and the Department of Mechanical Engineering at Carnegie Mellon University, and I was the founding director of the university's Center for Energy and Environmental Studies, and later, the Environmental Institute. Over nearly four decades, my university teaching and research have focused on problems of energy and the environment, especially issues related to coal use, air quality and climate change. For the past nine years this work has focused heavily on studies of carbon sequestration. Several years ago I also served as a Lead Author and a coordinator of the "Special Report on Carbon Dioxide Capture and Storage" undertaken by the Intergovernmental Panel on Climate Change (IPCC). Attachment 1 provides additional biographical information requested by the Committee.

For the past three years I have been working in a consulting role with the Pew Center on Global Climate Change to look at alternative policies for accelerating the deployment of CCS. As part of that work, I completed late last year a report recommending the establishment of a CCS Trust Fund to pay the full cost of ten or more full-scale demonstrations of CCS technologies at coal-based power plants in different parts of the country. The Trust Fund would raise one billion dollars a year from a small fee on fossil fuel power generation, mainly coal-burning plants.

Earlier drafts of that report, and a companion study of cost estimates and program scope, were widely circulated and presented to a broad group of stakeholder organizations, including all those here today. That work appears to have influenced the bill currently under discussion, which, I suspect, is why I was invited here to testify.

Whatever its origins, I was extremely pleased to see this bill introduced with bi-partisan support following the Senate's failure last month to tackle the issue of U.S. climate policy. It was clear from the Senate actions that the issue of climate change policy remains contentious and will take time to resolve, no matter who is the next president. The virtue of H.R. 6258 is that it can still allow our country to make urgently needed progress—this year—on a technology critical to whatever climate policy ultimately emerges in the future. It will also send a strong signal to other countries, especially China and India, that we are serious about developing ways to deal with the greenhouse gas emissions from coal use.

So today I have three simple points to make.

The **first** is that CO₂ capture and storage is a critical technology for bridging our energy and environmental objectives. It is the only way we know to reconcile the realities and importance of coal use with the need to substantially reduce CO₂ emissions linked to climate change. Therefore we should not delay demonstrating its potential for commercial use in the electric utility industry, which is the largest source of U.S. CO₂ emissions.

Point 2 is that several full-scale demonstrations of CCS are needed **urgently** to ensure that it can indeed be used as a safe, effective and reliable technology that can allow continued use of coal for power generation with little or no CO₂ emissions. The need for such demonstrations is universally recognized; but funding for such projects has not been forthcoming.

My estimate is that the full cost of building a CCS system at a 400 MW power plant, and operating it for five years, is between \$700 million and \$1 billion. Despite a lot of talk, and some serious commitments by a number of countries, there is today not a single large-scale CCS project at a coal plant anywhere in the world that has the full financing needed to proceed, as best I can tell. In the absence of policy mandates, industry is waiting for more government support, governments are waiting for more industry support, and the result to date has been little progress on full-scale demonstrations.

H.R. 6258 would overcome this obstacle by providing the full funding needed to demonstrate different CCS technologies using different coals in different geological settings. It would do this in a creative and efficient way by spreading the cost over a broad set of stakeholders who will benefit from the outcome of these projects. Ultimately, all residential, commercial and industrial consumers of fossil fuel electricity would bear these costs; but my estimate is that the cost to an average U.S. residential customer will be no more than about **a penny a day per household**—or about \$3 to \$5 per year—an even smaller amount than the Committee’s estimate of \$10-\$12/yr (which I believe is in error; details have been provided to the Committee staff).

Point 3 is that several changes to the current draft of the bill are needed to make it more effective and acceptable.

(a) Most important is the need to define more explicitly, and more narrowly, the mission of the Corporation established by the bill. That mission should be to:

- Identify the types of large-scale projects that are most critically needed to demonstrate and evaluate the effectiveness, cost, reliability and safety of CO₂ capture and storage for use in commercial electric power generation, within the next decade and beyond;
- Award grants and contracts that provide the full incremental cost of CCS for priority large-scale projects that are evaluated and selected on a competitive basis (with encouragement, but not a requirement, for industrial cost-sharing);
- Closely monitor the management and progress of selected projects, and report that progress to Congress and the public on a regular basis; and,
- Establish policies regarding the ownership of intellectual property developed as a result of Corporation support (a provision already in the current bill).

(b) Given this mission, I strongly urge that the language in Section 4(b) of the bill, entitled “Relationship to Department of Energy and Academic Organizations,” be **deleted**. That language muddles and diffuses the purpose of this bill. It puts the Corporation in the same business as the Department of Energy (DOE), the Electric Power Research Institute (EPRI), and other organizations whose mission is to support and carry out research and development (R&D).

R&D should not be part of the mission of the Corporation established under this bill. Its purpose should be to accelerate CCS deployment by financing and overseeing the management of large-scale CCS projects at new and existing power plants. These projects should employ technologies that already have advanced through research and development, including technologies used commercially in smaller-scale operations, which are now ready for scale-up and demonstration in full-scale in electric utility applications—typically a scale of several hundred megawatts.

To be sure, the work of the Corporation must draw upon, and be coordinated with, the activities and programs of other organizations whose R&D mission is to develop and advance new technology. In conjunction with other programs, the Corporation would provide a much-needed catalyst to accelerate the commercial availability of CCS technologies. But the Corporation itself should not be in the business of directly funding academic organizations or other fossil energy research entities, as called for in the current bill. Such organizations do not build and operate 500 MW power plants. They are not in a position to deploy and commercialize CCS technologies at a large scale. They will likely play an important role as subcontractors who provide critical support and expertise for CCS projects funded by the Corporation. But the entities directly funded by the Corporation should be only those able to build and operate the full-scale utility projects deemed necessary to advance the commercial availability of CO₂ capture and storage as a means of reducing CO₂ emissions.

(c) Apropos of the above, the name of the Corporation should be changed to reflect the title and purpose of this bill. The word “Research” should be purged from the name of the Corporation since research is not its mission. Rather, it should be called something like, The Carbon Capture and Storage Deployment Corporation; or more simply, The CCS Deployment Corporation.

(d) The composition of the Board of Directors of the Corporation also should be modified to include representatives of other key stakeholder groups. While most board members should be drawn from electric power organizations, plus a representative of fossil fuel producers as proposed, at least two members of the Board should be drawn from other industries and two from public organizations. For example, the two non-utility industrial members might be drawn from segments of the oil and gas industry, which today has the most experience and expertise in CCS operations. The two public members should include one government representative, such

as from the Department of Energy or a relevant state agency, and one non-governmental member, such as from an environmental NGO or an academic organization. These four non-utility members provide the greater breadth of expertise and perspective needed to strengthen the Board's external credibility and public trust. Public members of the Board also should be eligible for reimbursement of travel expenses associated with Board functions.

(e) In the area of accountability, the requirement in Section 7 for a "midcourse review" by the Government Accountability Office (GAO) could be further strengthened by instead naming the National Research Council (the operating arm of the National Academies) as the group to perform the review and analysis of the Corporation's activities by no later than its fifth year of operation. Because of the importance and visibility of the Corporation's activities, I believe an independent (non-governmental) organization with the stature of the National Academies would better serve the needs of Congress and the public in overseeing the activities of the Corporation.

(f) Finally, regarding definitions, it would be helpful to define the term "retail consumers" which appears in Section 2 and elsewhere in the bill. In particular, it should be made clear that this term includes commercial and industrial consumers of fossil fuel electricity, not just residential consumers. The text in Section 4, page 6, lines 4-9 authorizing the Corporation to purchase carbon dioxide when needed also should be clarified. It is not clear under what circumstances, or for what purpose, the Corporation itself—rather than one its contractors or grantees—would purchase CO₂.

With the modifications outlined above I believe H.R.6258 will prove to be a landmark piece of legislation that will greatly facilitate, and not obstruct or delay, future progress on climate policy. I would be happy to offer my support for such legislation and urge that it be enacted promptly.

Again, my thanks to the Committee for the opportunity to comment on H.R. 6258. I have also attached two documents that elaborate on the organizational and funding approaches taken in this bill, and the reasons its passage is urgently needed.

Sincerely,

Prof. Edward S. Rubin
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Carnegie Mellon University
Pittsburgh, PA 15213
Tel: 412 268 5897
Email: rubin@cmu.edu

Attachments:

1. E.S. Rubin biographical sketch.
2. Rubin, E.S., "A Trust Fund Approach for Accelerating the Demonstration and Adoption of CCS," Presentation to the Expert Meeting on Financing Carbon Capture and Storage Projects New York, NY, May 28, 2008. Organized by the International Energy Agency Clean Coal Centre.
3. Pena, N. and E.S. Rubin, *A Trust Fund Approach to Accelerating Deployment of CCS: Options and Considerations*, Coal Initiative Reports, White Paper Series, Pew Center on Global Climate Change, Arlington, VA , January 2008.

A Trust Fund Approach for Accelerating the Demonstration and Adoption of CCS

Edward S. Rubin
Department of Engineering and Public Policy
Carnegie Mellon University
Pittsburgh, Pennsylvania

Presentation to the
Expert Meeting on Financing Carbon Capture and Storage Projects
New York, NY
May 28, 2008

Outline of Talk

- The need for full-scale CCS deployment
- Why the urgency?
- Options for accelerating CCS deployment
- A CCS Trust Fund approach
- Where do we go from here?

Premise

- Coal-based power plants will continue to provide the major share of electricity demand for decades to come
- Large reductions in CO₂ emissions from such plants are urgently needed to address global climate change
- Only CCS has promise to enable significant continued use of coal while addressing global climate change

E.S. Rubin, Carnegie Mellon

*The need for full-scale
CCS deployment*

E.S. Rubin, Carnegie Mellon

3

The Bad News

CCS Project Cancellations, 2007–2008

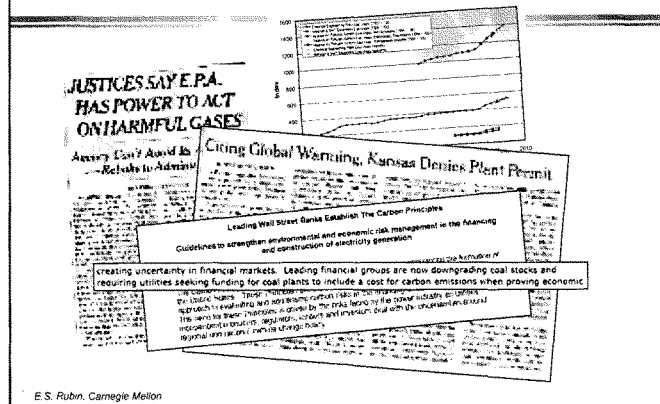
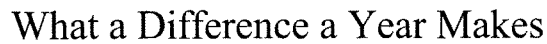
Project	Location	Technology	CCS Type	Developers
FutureGen	USA	275 MW coal IGCC	Pre-/ Aquifer	FG Alliance, DOE
Clean Coal	Canada	450 MW lignite PC	Oxy-/ Geol.	SaskPower + others
Peterhead	UK	475 MW gas IGCC	Pre-/ EOR	BP, SSE
Halten	Norway	860 MW gas NGCC	Post-/ EOR	Statoil, Shell

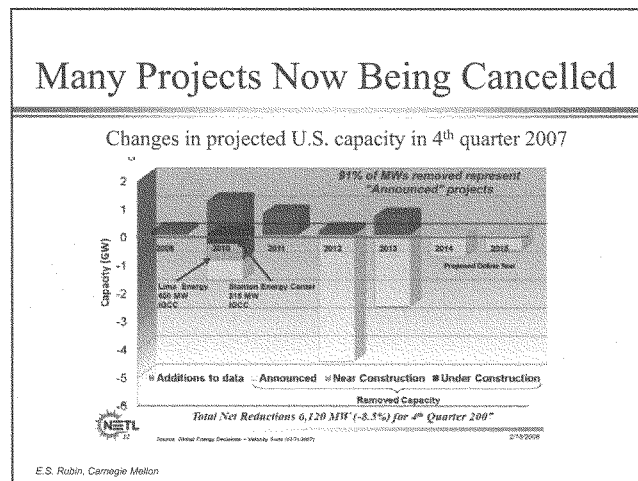
*No certainty that currently proposed projects
will be fully funded and completed as planned*

E.S. Rubin, Carnegie Mellon

Why the urgency?

E.S. Rubin, Carnegie Mellon





The U.S. Outlook

- It will be very difficult—and perhaps impossible—to undertake large new coal-fired power projects that do not include CO₂ capture and sequestration
- Reserve margins soon will be compromised in several parts of the country if no new plants built

So ...

- *Learning sooner rather than later what CCS **really costs**, and how well it **really works** in full-size utility applications, is an urgent priority !*

E.S. Rubin, Carnegie Mellon

*How can we accelerate funding
of large-scale CCS projects?*

E.S. Rubin, Carnegie Mellon

Options for Accelerating CCS

- Expand traditional “technology policy” options (e.g., tax credits, subsidies, etc.)
(as in Energy Policy Act, USDOE CCTI program, etc.)
- Set new regulations requiring CCS (e.g., generator CO₂ performance standards)
(as in California CO₂ stds, NSPS for major pollutants, etc.)
- Adopt sufficiently stringency cap and trade program w/ CCS bonus allowances and/or a tech. fund (e.g., from auction of allowances)
(as in Lieberman-Warner bill and others.)
- Establish a CCS Trust Fund with fees used to pay full added cost of early CCS projects
(proposed here; under consideration by Congress and EPA)

— Focus of this study is on the Trust Fund option —

E.S. Rubin, Carnegie Mellon

Why a Trust Fund ?

E.S. Rubin, Carnegie Mellon

Advantages of a CCS Trust Fund

- Can raise large amounts of money via small fees on the use of coal for power generation
(historical gov't. incentives are insufficient and not reliable)
- Not coupled to stringent CO₂ reduction mandate
— can start rapidly with well-defined revenues
(accelerates learning and significantly reduces future costs)
- Can ensure that funds will benefit payees
(all coal-based entities benefit, making fees more tolerable)
- Can ensure reliable multi-year funding stream
(avoids annual appropriation process by imposing fees not taxes)
- Managed by independent (or quasi-public) entity
(can employ private-sector standards for contracting and hiring)

E.S. Rubin, Carnegie Mellon

Examples of U.S. Trust Funds

- *The Highway Trust Fund*. Created to finance interstate highway system; supported by automotive fuel taxes
- *Abandoned Mine Reclamation Fund*. Projects administered through the U.S. Department of Interior Office of Surface Mining
- *Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources*. Fund managed by a consortium of stakeholders (called RPSEA) under DOE oversight
- *Tobacco Master Settlement Agreement*. Payments and outlays managed by a private entity (National Association of Attorneys General)
- *The Propane Education and Research Council*. A privately administered fund created to support industry R&D and outreach

E.S. Rubin, Carnegie Mellon

Lessons Learned from Past Programs

- Self-financing is necessary for costly programs
- Clear objectives must be established, and fees should terminate once objectives are reached
- Avoid the annual federal appropriations process (to ensure reliability of funding; impose fees not taxes)
- Use an independent or quasi-public entity (allows private-sector contracting and hiring standards)

E.S. Rubin, Carnegie Mellon

How Would It Work for CCS ?

- A CCS Trust Fund would be established to pay the full incremental costs of installing and operating CCS systems at a selected number of coal-based plants
- Costs would be supported by a fee on coal-based (or other types of) electricity generation or fuel use
- The Fund would be managed by an independent (quasi-public) group that would select, fund and manage appropriate projects to meet program goals
- Results and experience would be shared widely
- The Fund would terminate after a fixed period of time

E.S. Rubin, Carnegie Mellon

Proposed Program Elements

- CO₂ Sources:
 - Commercial power generation units (~ 400 MW_{net})
 - Optional storage-only projects at large industrial sources with high-purity CO₂ vents (e.g., ethanol plants, ammonia and fertilizer plants, natural gas processing plants, etc.)
- Incremental costs to be covered:
 - Capital costs to install capture equipment
 - Reimburse loss of net generation capacity
 - Additional plant O&M costs (~5 years)
 - CO₂ transport and injection costs (~5 years)

E.S. Rubin, Carnegie Mellon

What Would It Cost?

- Total incremental cost of building and operating CCS at a 400 MW_{net} plant—including cost of the “energy penalty” (replacement power) plus CO₂ transport and aquifer storage costs for 5 years:

≈ 0.7 to 1.0 billion USD
per project

- Cost of additional projects using existing CO₂ from industrial sources (compression, transport, storage)
≈ 100 million USD per project (based on 2 MtCO₂/yr for 5 yrs)

E.S. Rubin, Carnegie Mellon

Average Initial Cost of Projects

(Millions of 2006 U.S. dollars per ~400 MW plant)

Per Plant Incremental Costs of CCS	Based on New Plants	Based on Plant Retrofits
Capital Costs		
- Capture equipment	\$210	\$250
- Net capacity loss	\$185	\$360
Plant O&M Costs	\$150	\$150
Transport, Storage; Admin.	\$190	\$190
TOTAL (per plant)	\$735	\$950

Source: Kuskraa, 2007

Total costs and fees evaluated for two program levels

E.S. Rubin, Carnegie Mellon

Smaller-Scale Program

- Scope: 10 power plants (different plant types, coals, capture systems, storage sites); +5 industrial sites; ~10-year program
- Objectives
 - Establish true cost and reliability of CCS options
 - Obtain design and integrated CCS operating experience
 - Develop public and regulatory experience with CCS
- Cost
 - \$8-10 billion: \$0.4 to \$0.5 per MWh (~\$1B/yr)
(based on current coal-fired generation and a 10-yr program)
 - Increase for average residential household ≈  per day

E.S. Rubin, Carnegie Mellon

Larger-Scale Program

- Scope: 30 power plants (multiple “generations” of plants and CCS technologies); +10 industrial sites; 10–15 year program
- Additional Objectives
 - Significantly reduce CCS costs and generation losses
 - Build public confidence in technology and regulations
 - Reduce emissions by 100 MtCO₂/yr by end of program
- Cost
 - \$23–30 billion: \$1.2 to \$1.5 per MWh (\$2–3B/yr)
(based on current coal-fired generation and a 10-yr program)
 - Increase for average residential household ≈  per day

E.S. Rubin, Carnegie Mellon

Program Design Issues

- Administrative structure of the Fund
- Who pays the fee?
 - Only coal-fueled units?
 - Only fossil-fuel based generation?
 - All electricity providers/purchasers?
 - Only units with CO₂ above a specified level or rate?
- What mix of projects to support (and when)?
 - Technologies (PC, IGCC; pre-, post, oxyfuel)
 - Plant vintages (new, retrofit, repower)
 - Coal types (bituminous, sub-bituminous, lignite)
 - Sequestration sites & type (aquifers, EOR; regional mix)
- Options for cost-sharing, re-payment, etc.

E.S. Rubin, Carnegie Mellon

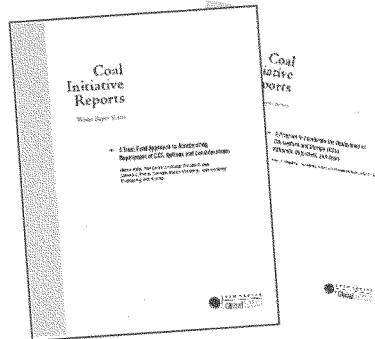
Pew Center Evaluation Criteria

Policy options evaluated based on their:

- Effectiveness in reducing emissions
- Cost and cost-effectiveness
- Familiarity (precedents)
- Equity (regions, firms, technology)
- Ease of implementation
- Timing of implementation
- Linkage to other policies
- Impact on utility coal use

E.S. Rubin, Carnegie Mellon

Details Described in Recent Reports (Available at: www.pewclimate.org)



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Recent Support

- “Congress should immediately create a CCS Early Deployment Fund... The quasi-governmental Fund would ... generate \$1 billion annually [to] cover the additional costs of CCS for at least 5 to 10 full-scale early commercial demonstrations of various technologies [at mainly] coal-based electricity generators.”
– *Recommendation of the USEPA Advanced Coal Technology Work Group (an independent advisory group), January 2008*
- “Reps. Rick Boucher (D-VA), John Murtha (D-PA), and Nick Rahall (D-WV) are drafting legislation that would create a multi-billion dollar fund to encourage the use of CCS technology at power plants. Under the plan, a small fee would be imposed on electricity users and the proceeds would be kept outside of the Congressional appropriations process.”
– *Van Ness Feldman, Washington, DC, April 2008*

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Where do we go from here ?

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Take-Home Messages

- There is an urgent need to demonstrate at large scale a range of integrated CCS technologies at coal-based power plants (>10 projects at >100 MW_e)
- Current government and industry programs do not provide the level of funding that is required
- We need to aggressively pursue additional options to raise roughly \$10–30 billion to support selected and carefully-timed projects over the next 10–15 years
- A CCS Trust Fund supported by fees on electricity generation merits attention as an option for doing this quickly and effectively

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Comments Welcomed

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Coal Initiative Reports

White Paper Series

► **A Trust Fund Approach to Accelerating
Deployment of CCS: Options and Considerations**

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Engineering and Science*

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Abstract

This paper discusses one possible avenue to accelerate deployment of carbon dioxide capture and sequestration (CCS) technologies: use of a special-purpose CCS Trust Fund. Trust funds can be an attractive policy option because, if properly designed, they can raise significant amounts of funds from non-governmental sources and can ensure that those paying into the fund benefit from the program. A CCS Trust Fund financed, for example, through fees on coal-based or fossil fuel-based electricity generation may have a role in reducing CO₂ emissions from power plants because it could:

- Raise funds at the scale needed to support a significant number—e.g., 10 to 30—of commercial-scale CCS projects
- Ensure that the funds raised would be used to demonstrate CCS at commercial scale for a full range of systems applicable to U.S. power plants
- Establish the true costs, reliability, and operability of power plants with CCS
- Utilize private-sector business standards for project selection and management to ensure program cost-effectiveness
- Significantly reduce CCS costs within 10 to 15 years by supporting approximately 30 demonstrations, yielding substantial national economic benefits as CCS becomes widely deployed.

The United States has considerable experience with trust funds. While no single existing fund illustrates all the features that might be desirable for a CCS Trust Fund, lessons from prior U.S. experience can be used to design an effective, efficient mechanism for advancing commercial-scale deployment of CCS. In particular, experience has indicated the importance of financial self-sufficiency, private-sector management standards, insulation from the annual Congressional appropriations process, and termination upon completion of objectives. Carefully crafted enabling legislation and, most likely, use of a quasi-public or private entity to manage a CCS Trust Fund will be needed to incorporate these and other desirable features.

Background

The use of coal to generate electricity in the United States currently results in some 1.9 billion tons of carbon dioxide (CO₂) emissions per year, about a third of total U.S. CO₂ emissions (USEPA 2006). To consider and evaluate policies that could be used to address emissions from coal use in the United States, China and India, the Pew Center on Global Climate Change has undertaken a Coal Initiative. A Consultative Group* composed of stakeholders and experts was formed to assist in this process. For the United States, the focus of the Coal Initiative is on policies to accelerate and support the widespread deployment of CO₂ capture and sequestration (CCS). This is because CCS is the only suite of technologies at, or near, commercial stage that holds promise for reducing CO₂ emissions from large point sources at the scale needed to address climate change (IPCC, 2005). Given this reality and the high costs of CCS systems, the Consultative Group requested the Pew Center to investigate a trust fund approach as one possible mechanism for accelerating CCS deployment at coal-fueled power plants. This paper is the result of that investigation.

The premise of the Coal Initiative, and of this and other papers written under its auspices, is that coal will continue to be a major energy source used to meet electricity demand in the United States, China and India for decades to come. This continued reliance on coal in the United States results from its abundance and relatively low, stable price compared to natural gas; from the hurdles facing a major scale-up in the use of alternatives such as renewable energy for baseload electric power; and from national security concerns favoring use of domestic energy resources. The increasingly urgent need to address climate change and reduce greenhouse gas (GHG) emissions suggests that application of CCS on a wide scale is needed at the earliest possible date. However, there are significant barriers to immediate and widespread deployment including: projected high costs and energy losses; lack of a policy driver or other incentives; lack of experience and proven reliability of CCS technologies in the electric utility industry; lack of a regulatory framework for permitting utility-scale sequestration projects; legal uncertainties related to liability and property rights; the need for agreements and coordination among different companies that may handle different facets of the operation (e.g., utility companies, pipeline operators, and storage site operators); and the need to build public understanding and acceptance of CCS as an option for mitigating climate change.

*Background on the Pew Center Coal Initiative and a list of Consultative Group members can be accessed through [this link](#).

Objectives of a CCS Trust Fund

To address the barriers mentioned above, and thereby support widespread deployment of CCS, a significant number of commercial-scale demonstrations of CCS are needed. Such demonstrations will be sufficiently costly that new sources of funds will be needed. A companion paper (Kuuskraa, 2007) estimates total costs of approximately \$10 billion to \$30 billion over a 10 -15 year period for programs at scales of ten projects and thirty projects, respectively. The requisite sums potentially could be raised in a number of ways: for example, by direct government funding of a large RD&D program; by allowances auctioned under a cap-and-trade program; by a fee on electricity generated, or on coal purchased by utilities; or by sufficiently large tax credits. Except for tax credits, money raised by any of these means could be administered through a trust fund dedicated to early commercial-scale demonstrations of CCS at power plants.

This paper discusses desirable features of a dedicated CCS Trust Fund. A well-designed fund could serve to rapidly, efficiently, and cost-effectively meet two key objectives:

- Demonstrate the viability of key CCS options in commercial utility and industrial applications in the United States, and
- Begin to significantly reduce CCS costs and energy penalties.

If inaugurated in the immediate future, a dedicated CCS Trust Fund that succeeds in demonstrating the viability of CCS technology in utility applications, and in reducing its costs and energy penalties, could be an important adjunct or precursor to other policies needed to address global climate change. For example, although it is widely recognized that deep reductions in CO₂ emissions are required to stabilize atmospheric concentrations of greenhouse gases, it may be problematic to impose stringent CO₂ control requirements (e.g., generator performance standards, retailer mandates, or requirements to sequester CO₂) until the viability of CCS has been proven. Proving CCS requires gaining confidence in the use of CO₂ capture technology in full-scale utility applications; overcoming technological integration challenges; resolving issues related to property rights and long-term liabilities; and development of a U.S. regulatory framework and public acceptance for the safe and effective long-term geological storage of CO₂. Multiple large-scale demonstrations of deep geologic sequestration, including in saline formations, in conjunction with demonstrations of CCS at electric power plants are also needed to resolve these issues. The overriding objective of a CCS Trust Fund is to achieve these outcomes as quickly and economically as possible.

SCOPE AND OBJECTIVES OF THIS PAPER

The following sections of this paper first describe the basic elements of a CCS Trust Fund, then review prior U.S. experience with trust funds. Following this, the trust fund approach is evaluated against a set of criteria that can be used to assess alternative policy approaches to addressing emissions from power plants.

A companion paper ([Kuuskraa, 2007](#)) lays out key characteristics and costs of a proposed CCS deployment program that a CCS Trust Fund would support. That program would cover the incremental costs of deploying CCS at a limited number of commercial-scale coal-fueled power plants. Key program characteristics are technological neutrality (i.e., supporting demonstrations of all key technology-coal-location combinations); careful timing of demonstrations; and supplementing power plant CCS projects with a number of large-scale geological sequestration demonstrations using CO₂ from existing non-utility industrial sources. Other papers in the Pew Center's Coal Initiative examine other U.S. federal policy options; options available to states; and appropriate actions in India and China. Other Pew Center initiatives focus on options for reducing GHG emissions in other sectors.

Basics of a CCS Trust Fund

The essence of a trust fund is to ensure that money is dispersed only for the purposes, and under the conditions, established for the fund. By providing guarantees on how funds will be used, a trust fund increases the chances of attaining specified goals and garnering needed support.

There are several critical differences between private and public-sector trust funds, including who owns the assets and how income and outlays can be modified. If fees are imposed by federal legislation, the revenue becomes government money, which has important implications for trust fund design. In the case of most federally-controlled trusts, the government owns the trust's income and assets and can unilaterally alter fund purposes and amounts entering or leaving the fund (White House, 2008). An alternative is for the federal legislation to establish rules under which fees can be imposed by the private sector. In this case since the revenues would not be government money, they could be handled by a non-governmental entity with federal oversight. In order for a CCS Trust Fund to operate effectively and efficiently, it would be important to avoid altering its purposes or curtailing any planned expenditures. Four key issues that determine whether a federally-established fund will operate in this way are discussed below. Other aspects of effective, efficient trust fund operation are discussed in subsequent sections.

TYPES OF FEDERALLY-ESTABLISHED FUNDS

Government funds in which money is earmarked for a specific purpose or to finance a specific program include special funds, trust funds, revolving funds, and deposit funds. Only in the case of deposit funds does the government act as a private fund trustee, making no decisions about the amount entering the fund or expenditures. In the case of special funds and most trust funds, money must be appropriated by Congress before it can be spent, thus exposing expenditures to the annual appropriations process. This is problematic because this process can restrict expenditures or divert money to purposes other than those originally intended. Revolving funds are used to conduct "continuing cycles of business-like activity" (White House, 2008). The advantage of revolving funds is that money received is automatically available for expenditure. A few special-purpose trust funds have been set up as revolving funds. With appropriate enabling legislation it might be possible to set up a CCS Trust Fund as a revolving fund.

EXPENDITURE CLASSIFICATIONS

Some expenditures of federal money are discretionary while others are mandatory. Mandatory spending programs include Medicare and veterans' pension payments. Expenditures are treated as mandatory when authorizing language entitles a specified class of beneficiaries to receive payment or otherwise obligates the federal government to make payments (GAO, 2005). The details of enabling legislative language would determine whether spending from a CCS Trust Fund (unless it qualified as a revolving fund) was discretionary or mandatory.

TYPES OF REVENUES

Revenues for a fund are classified as voluntary contributions, taxes, or fees. If money for a CCS Trust Fund were raised through voluntary contributions or self-imposed mandatory contributions resulting from an industry-wide referendum (as in being done by the coal industry in Australia and by the propane industry in the United States), the fund could operate independently of the federal budget processes. On the other hand, if revenues are generated by taxes, the proceeds would be deposited in the U.S. Treasury, expenditures from which are generally subject to the Congressional appropriations process. However, if a fee (rather than a tax) is imposed through federal legislation, the resulting proceeds may not have to be deposited in the U.S. Treasury. If proceeds are received and disbursed by a non-federal entity, they need not be subject to the annual Congressional appropriations process.

AFFILIATION OF THE OPERATING ENTITY

The entity designated to receive and disperse revenues could be (or be part of) a federal agency, a quasi-public organization, or a private entity. Quasi-public and private entities may offer important advantages, such as:

- Direct control by, and transparency to, stakeholders and independent experts
- Freedom to hire and retain the most qualified people
- Insulation from Congressional pressures
- Certainty in dispersing funds on a timely basis
- Ability to use private-sector best practices in decision-making.

To the extent that operating a fund through a federal agency impedes realizing these advantages, semi-independence would be an important factor for achieving cost-effectiveness and success of a CCS Trust Fund.

Existing Trust Funds: Examples and Lessons Learned

A number of federal trust funds were reviewed (see Appendix) to derive lessons useful for the design of a dedicated fund for CCS projects at U.S. power plants. Some of these federal trust funds have operated at the relevant scales and have served similar purposes. They have been successful in raising money to implement large-scale infrastructure upgrade programs, including infrastructure to address environmental problems.

Two trust funds that illustrate alternative funding and operational entity approaches which are particularly relevant to the design of a CCS Trust Fund are the Highway Trust Fund and the Propane Education & Research Council Fund. The 1956 Highway Revenue Act authorized a 13-year program to build the U.S. interstate highway system. The Act increased existing gasoline taxes and imposed new ones, while simultaneously creating the Highway Trust Fund to receive and disperse the monies collected. This approach succeeded in building a national highway system where previous approaches had achieved only very limited success (Jackson, 2006). Expenditures from the Highway Trust Fund were subject to annual appropriations acts and over time revenues were directed to a variety of other purposes. In addition, Congressional expenditure limits, imposed at times to address federal budget deficits, resulted in higher overall costs for funded highway projects and eroded overall program cost-effectiveness (Jackson, 2006; Hezir, 2007).

The more recent Propane Education and Research Act of 1996 represented a very different approach: it enabled a fund that operates outside of the federal budget process while subject to federal oversight. The act authorized the propane industry to conduct a referendum on whether to impose fees on propane producers and marketers in order to establish and operate a program with specified objectives. The objectives in this case were to improve safety, fund research, develop more efficient equipment, and expand public awareness of propane's uses and environmental advantages. The enabling legislation specified that the fee would become obligatory for all member companies if the referendum passed. It also set the maximum fee that could be charged. The funds raised go directly to, and are dispersed by, the non-governmental organization established under the Act, with funds remaining completely outside the annual Congressional appropriations process.

In addition to the two examples above, the U.S. Municipal Wastewater Treatment Program established under the Federal Water Pollution Act (Clean Water Act) also provides important lessons. Like the Highway Trust Fund, this program has been successful in upgrading a significant part of the national infrastructure, in this case installing and upgrading wastewater treatment facilities. The Clean Water Act offered federal grants to municipalities to assist them in meeting discharge regulations. However, the program's cost-effectiveness was seriously compromised due to the tendency of potential grant recipients to propose plants larger than needed and with more features than necessary. In order to reduce federal government financial exposure, the grant approach was later supplanted by a revolving loan program. However, a similar loan approach would not be an option for CCS until future conditions (such as a price on carbon) enabled some or all of the costs of CCS to

be recovered. Nonetheless, the “take home” messages from this program are both simple and critical:

- Federal grant program grants encourage project proposals that often are not cost-effective, and
- Expensive programs must be self-supporting

In general, the review of prior U.S. trust funds yielded the following lessons applicable to the design of a CCS Trust Fund:

Things to Avoid:

- Subjecting fund outlays to the annual federal appropriations process
- Not specifying a termination date, goal, or condition for ending the program (e.g., total amount of funds to be collected or number of projects to be funded)

Things to Promote:

- Flexibility to engage the most qualified management personnel
- A broad spectrum of stakeholders and technical and scientific experts to oversee, manage, and operate the fund
- Secure funding and financial discipline

Further information on these and other trust funds is provided in the Appendix. The review of these funds underlies the rationale and desirable characteristics recommended for a CCS Trust Fund to implement the large-scale demonstration programs discussed earlier.

Rationale for a Quasi-Independent, Fee-Based CCS Trust Fund

Here we outline the rationale for a quasi-independent trust fund supported by a fee on coal-fueled power plants¹ to provide monies that would be dedicated to commercial-scale CCS demonstrations. This approach has the potential to:

- Raise the funds required to pay the cost of a sufficient number of CCS demonstrations to overcome, as quickly as possible, the technical and other barriers to widespread deployment noted earlier
- Cost-effectively disperse funds solely for this purpose
- Establish, and then begin to substantially reduce, the costs and energy penalties for key CCS technologies across the United States in an efficient manner.

Cost-effective dispersal of funds is most likely to be achieved if the fund is managed following a private sector business model; however, this may be difficult to achieve if the fund is managed by a federal agency. That conclusion also was reached in a recent MIT study, which recommended a quasi-governmental corporation to manage a CCS demonstration program, stating that it was critical to maintain "...sufficient fidelity to commercial practice, so that both the government and the private sector can gain credible information on which to base future public and private investment decisions" (MIT, 2007). That report goes on to note that the federal government's "deep pockets" and often limited experience with commercial practice can make it difficult to protect against poor project designs proposed by private companies seeking government funding.

A significant advantage of a well-managed quasi-independent trust fund is that it could select and implement the types of demonstrations and the timing of projects that would most efficiently establish the viability of CCS options and begin to lower costs across all needed options.

CONSIDERATIONS IN PROGRAM DESIGN

To achieve emission reductions at the scale needed while retaining coal as a central energy source for electricity, CCS will be needed at coal-fueled power plants throughout the United States. This will require demonstrations of a variety of CCS technologies (e.g., at both combustion-based and gasification-based power plants), in both new-build and retrofit situations; across a variety of U.S. coal types used in different regions of the country (including differing elevations), and with CO₂ sequestered in different types of

¹ Alternatively such a fee potentially could be imposed on all fossil-fuel based electric generation units, or on generating units of all types. It could also be extended to other large industrial emitters of CO₂. However, coal-based units are likely to need CCS to meet requirements under climate change legislation before other types of plants, and are the most likely to benefit from early availability of CCS technologies.

geological formations. A companion paper (Kuuskraa, 2007), for example, suggests that a minimum of ten demonstrations, with one to three projects in each of six categories, is needed to test a full range of combinations. That paper also points out that in order to reduce energy costs and energy penalties in the most cost-effective manner, careful staging of projects is needed to enable lessons learned from one set of projects to be incorporated into the design of subsequent demonstrations. If carefully staged, a recent study estimated that approximately 30 CCS projects could bring costs down by up to 40 percent within 10 to 15 years (Kuuskraa, 2007).

Whether funded through fees or other mechanisms, a well-managed CCS Trust Fund would best be able to rapidly, efficiently, and cost-effectively achieve the key objectives of establishing the viability and bringing down the costs of key CCS technologies. Fees offer the advantage of providing a regular and predictable income stream to support CCS projects. A carefully structured loan program also might be able to achieve these objectives. Tax credit approaches lack the programmatic oversight needed to select and stage projects to achieve cost and energy penalty reductions along the most rapid and cost-efficient path. Similarly, direct allocation of allowances to individual companies under a cap-and-trade program may not result in optimal project staging. This is a critical issue because early, rapid cost and energy penalty reductions can bring both economic and environmental benefits.

A dedicated CCS Trust Fund also could start operating in the immediate future as soon as known sums are at its disposal. A fee on electricity generation or coal purchases would accomplish this objective. However, a funding stream linked to a climate change policy is likely to be much less predictable. The high current cost of CCS means that a modest GHG cap alone is unlikely to result in adoption of CCS by coal-fired plants. Modeling studies indicate that an effective carbon price of at least \$30/ton CO₂ is needed before CCS becomes a viable option for GHG reductions, with some studies suggesting much higher prices would be necessary. Policies that impose lower effective carbon prices are thus unlikely to result in any significant deployment of CCS (Wise, et al., 2006). The Bingaman-Specter cap-and-trade bill, for example, imposes a price cap starting at \$12 per ton CO₂, rising at a rate of 5 percent per year. Under such a scenario, without additional incentives, it would be unlikely that CCS would be adopted at either new or existing power plants anytime soon.

ALTERNATIVE FUNDING MECHANISMS

Both the Bingaman-Specter and Lieberman-Warner cap-and-trade bills offered in 2007 address the problem of low initial carbon prices by providing bonus allowances for sequestered carbon dioxide and an advanced coal and sequestration technologies program funded by the sale of allowances. Assuming the price of allowances is at least \$10 per ton, bill provisions allowing four or more bonus allowances per ton of CO₂ sequestered should enable CCS projects to move forward. Moreover, at this price the advanced coal technology programs would also receive sufficient funds through the bills' auction provisions to support a number of CCS deployment projects. In the case of the Lieberman-Warner bill, the advanced coal technology program funds would be dispersed by a non-profit, non-federal government corporation, with the corporation using the funds to support selected projects. This bill thus provides a management structure of the type proposed for the CCS Trust Fund described in this paper. The key question regarding the approach taken in these bills is how soon the programs would materialize and be adequately funded.

Tax credits are another alternative to a CCS Trust Fund approach. In general, tax credits do not provide the ability to selectively choose and stage projects, and also suffer from an inability to provide consistent funding over time frames of importance to investors and project sponsors. Tax credits are typically authorized for short periods of time, such as three years (Hezir, 2007). For example, the Renewable Energy Tax Credit, which provided support for wind, solar, and biomass energy projects, expired three times between 1999 and 2004. Considerable effort was required to prevent its expiration on two other occasions (Union of Concerned Scientists, 2007). This stop-and-go availability of funding has posed serious problems for development of wind-generation facilities. A trust fund with a secure source of revenue over a longer time frame is a more promising solution to the need for on-time, reliable financing of the full range of commercial CCS demonstrations that are needed. Finally, under current federal budget constraints, tax credits are likely to require an offsetting source of revenue to render them revenue-neutral. Similarly, loan guarantees are unlikely to be a useful approach for financing deployment of CCS unless conditions enabled utilities to recover their higher production costs through higher tariffs for electricity or by some other means.

Evaluating the CCS Trust Fund Approach

Every approach to achieving widespread deployment of CCS has pros and cons. Since one objective of the Pew Center Initiative is to help determine which policy approaches are likely to be most successful and viable, advice was sought from the Coal Initiative's Consultative Group at its September 26, 2006 meeting. The Consultative Group suggested the following criteria be used to evaluate proposed approaches:²

- Familiarity
- Effectiveness in reducing emissions
- Cost-effectiveness
- Equity (fairness) in regard to: regional impacts, company size, regulated versus non-regulated utilities, technology options
- Ease of implementation: ease of monitoring and enforcement, and avoidance of complexity
- Linkage: to other policies in utility sector, and to policies outside of utility sector
- Timing: achieving action in the near term, operating across administrations, clarity of time for adoption, *not rewarding pre-program construction of coal plants without CCS*
- Allowing coal to continue to play a significant role in electricity generation
- Use of trading and market mechanisms

Potentially, a trust fund dedicated to CCS demonstrations could have any number of objectives. The selected objectives would impact many aspects of the fund's design, as well as how the fund would rate against the criteria listed above. For example, a dedicated CCS Trust Fund might be designed to support the cost of 10 to 30 CCS demonstrations across a variety of power generation capture and storage options; to use a variety of coals in different regional settings; and to terminate upon completion of the pre-determined set of projects. Alternatively, a fund might operate until a desired fraction of CO₂ emissions from coal-fired (or all fossil-fuel

² These criteria were considered desirable by most of the stakeholders in the Consultative Group. However, stakeholders were more likely to vary in preferences for the following additional criteria:

- Reliance on incentives versus regulations
- Whether cost burden falls on the consumer or utilities, and if on utilities whether it falls equally on all generating units or primarily on new, existing, or fully amortized plants
- Whether the program covers all fossil-fuel plants or only coal-fired units
- Whether the program supports other clean air objectives or addresses only GHG emissions.

based) electric generation is captured and sequestered or (as would occur under the Lieberman-Warner bill) until funds are exhausted. Yet another fund option might be to repower and equip with CCS only fully amortized plants of a specified age or efficiency. Such decisions on scope will impact the time over which the program would operate; how much money would be needed; the effectiveness in reducing emissions; which entities would be assessed fees; and overall cost-benefit ratios. Consequently, the choice of program objectives would affect the evaluation of a CCS Trust Fund on almost all of the listed criteria listed above.

A “STRAW-MAN” TRUST FUND PROGRAM

The Pew Center Coal Initiative white paper, [A Program to Accelerate Deployment of CO₂ Capture and Storage \(Kuuskraa, 2007\)](#), describes a program designed to achieve deployment of CCS at the earliest possible date (over the next 10 to 15 years) by covering the incremental costs of CCS at 10 to 30 commercial-scale (400 MW net with CCS) coal-fueled electric generation units plus five to ten large non-utility industrial emitters. In the following discussion, a CCS Trust Fund dedicated to carrying out this program is evaluated against the suggested criteria listed above.

While trust funds have been used previously to build infrastructure (for example, the interstate highway system as noted earlier), use of a semi-independent or private entity to operate a trust fund is less familiar. However, this option is becoming more familiar through recent programs such as the Research Partnership to Secure Energy for America (RPSEA) and the Propane Education and Research Council (PERC) (see Appendix).

In terms of effectiveness, the larger program scale (30 plants) would be effective in reducing emissions, due both to the CO₂ captured at the supported plants, as well as to the more rapid deployment of CCS that could result from significant decreases in cost and energy penalties.

As suggested earlier, the cost-effectiveness of a trust fund could be affected by the type of fund and the management entity. A privately-managed fund, a federally-established revolving fund, or a fund subject to mandatory rather than discretionary spending and managed by a semi-independent or private entity could all be very cost-effective. Under either private or semi-independent management, the federal government would provide oversight and approval of the strategic and operating plans. It would be more difficult to operate a fund cost-effectively if expenditures were subject to the annual authorization process or managed directly by a federal agency. Program size is also a factor in cost-effectiveness, particularly in the case of a federally-established fund. The upfront costs would be relatively high if only ten demonstrations were to be supported, making the 30-project program more cost-effective than the smaller-scale program.

In terms of equity, the program described in [Kuuskraa \(2007\)](#) provides for a broad range of demonstrations across geographic regions, generation technologies, and coal types. At the 30-project scale, the program is also designed to reduce costs and energy penalties as quickly as feasible. At either scale, a fund dedicated to carrying out this program would ensure technological and regional equity.

The primary implementation hurdle for this approach is garnering political support to impose the necessary fees. Once established, a trust fund dedicated to supporting demonstrations is unlikely to encounter

monitoring or enforcement difficulties. Although reaching agreement on certain issues such as fees, criteria for project selection, and a fund dispersal mechanism will involve many considerations and some negotiation, clear outcomes are available in each case.

In terms of timing and linkages, a fund dedicated to the program described above would result in the first set of CCS demonstrations at coal-fueled plants within five years, and several subsequent sets within 10 to 15 years (depending on program scope). Thus, it would achieve results quickly on a clear schedule and could serve as a precursor to or catalyst for any national policy that might require or incentivize deployment of CCS at power plants. As explained earlier, it could also operate in conjunction with national carbon constraint policies, such as the Lieberman-Warner bill, although compatibility with such policies will depend on program and policy details. If future legislation resulted in a market value for sequestered CO₂, entities that received assistance from a CCS Trust Fund could be required to reimburse the fund for the revenues received, or could be denied credits for sequestered carbon while receiving assistance from the fund.

Table 1 summarizes how a trust fund designed to carry out the program in Kuuskraa (2007) rates against the criteria listed earlier. Trust funds with other objectives might rate differently, particularly on effectiveness and equity. For example, a trust fund focused on repowering with more efficient boilers the least efficient, fully amortized coal plants in the current U.S. fleet might or might not be technologically equitable, depending on the repowering choices made and which plants were subject to charges. However, such a program might have cost and environmental advantages.

Table 1: Evaluation of a CCS Trust Fund for the Program in Kuuskraa (2007)

Criterion	Conditions resulting in a high rating	Conditions resulting in a low rating
Familiarity	Trusts used in coal mining & other sectors of the economy	Trusts not previously used in the electric power sector
Effectiveness in addressing emissions	Larger scale	Smaller scale
Economic effectiveness	Larger scale, private-sector type management, funds not subject to annual appropriations	Smaller scale and management subject to normal federal restrictions and budget process
Equity	Either scale	Poor project selection
Ease of Implementation	Coal industry favors approach	Coal industry does not deem necessary
Linkage	Precursor to mandatory carbon limits	Concurrent linkage depends on program details
Timing: near-term action	Either scale	None
Coal remains significant in mix	Support for 30 or more plants may be needed	10 or fewer plants may not achieve this objective

DRAWBACKS AND LIMITATIONS OF A TRUST FUND APPROACH

Although a dedicated CCS Trust Fund shows promise for accelerating deployment of CCS, the approach also has important limitations and would have to overcome significant hurdles. Perhaps the biggest hurdle is the need to raise relatively large sums of money, which is likely to meet resistance from affected companies, whether done through federal action or voluntary contributions. In addition, Congress would likely be reluctant to impose fees solely to support CCS. Instead, it could be argued that any fees imposed should support a wider range of greenhouse gas emissions reduction options. This more comprehensive approach to addressing emissions is envisioned, for example, in the mission of ARPA-E (Energy Research Act, 2007). Thus if fees were imposed to support CCS, the program would quite possibly be part of a more comprehensive package, or accompanied by legislation, that also supported other greenhouse gas reduction technologies, both in the electricity and other sectors.

A second drawback of trust funds is that they are less familiar, particularly in the electric power sector. This lack of a well-trying model poses another barrier to the approach. Further, although this paper explains the advantages of insulating funds from the annual Congressional appropriations process, dispersal of funds by an entity established or enabled by federal legislation would still be subject to oversight by Congress. Finally, once trust funds are established, historically they often tended not to terminate. This can reduce cost-effectiveness when continued beyond completion of the original purpose. To avoid this, enabling legislation could include a clear termination point (such as a specified number of years, number of projects, or total revenue to be collected) as noted earlier.

Finally, establishment of a dedicated trust fund might be more onerous to utilities than the more familiar loan guarantees or tax credit approaches.³ However, a trust fund also could provide either grants or loan guarantees, so these approaches are not really incompatible, although a loan guarantee program could be instituted without recourse to a trust fund and the attendant need to establish a management entity. An advantage of a direct loan guarantee is that its budgetary impact is limited to the estimated present value of expected defaults. Further, this budgetary impact can be “neutralized” by requiring loan recipients to pay fees to cover the present value of any expected defaults—in effect a type of insurance that defaults will not result in budget losses. But as noted earlier, this approach cannot guarantee the outcomes sought by a dedicated CCS Trust Fund.

³ Bardin (2007) has suggested use of a commodity tax credit to subsidize deployment of CCS. Under this approach, utilities would receive tax credits on a “per ton of CO₂ sequestered” basis. To render the program revenue neutral, funds would be raised through a combination of fees on imported oil, liquid transportation fuel consumed, and electricity from fossil fuels delivered to the grid. The program is envisioned as operating through the U.S. Department of Treasury, and would not be a trust fund approach although similar in imposing fees and dispersing benefits for a specified purpose.

Design and Management of a CCS Trust Fund

As noted earlier, one of the compelling reasons to consider a CCS Trust Fund is its potential to assure that monies raised will be used for purposes that have merit in the eyes of key stakeholders. This requires, as is common to all trust funds, that documents establishing the fund specify the eligible uses of trust fund revenues. If government-imposed fees are used to raise the money, it will also require careful crafting of enabling legislation to protect the fund from diversion to other purposes and interference with timely expenditure.

Some of the most basic design options for a dedicated fund to accelerate deployment of CCS will be whether or not fund dispersal is:

- Managed by a federal agency, or by an entity at arms length from federal agencies
- Subject to the annual Congressional appropriations process

Ensuring that the fund remains dedicated to supporting commercial-scale demonstrations of CCS will require that the enabling legislation carefully defines: the type of fund and its budget status; the mechanism used to raise money; the purposes on which the money is to be spent; the entity charged with managing the funds; and the relationship between a non-federal agency (if one is used) and federal oversight.

The fund's authorizing language will determine whether or not disbursement of revenues is subject to the appropriations process or not. Avoiding that process is important to increase stakeholders' confidence that the proceeds will be used for the intended purposes and will be distributed in a timely manner. Important design elements that influence this determination include whether the charge on affected utilities is designated as a tax or a fee; whether it is imposed directly by the federal government, or enabled by the federal government but imposed by the industry itself; and whether, if the charge is imposed by the government, the proceeds qualify as "offsetting collections" (GAO, 2005).

Proceeds from taxes generally must go to the U.S. Treasury and be subject to the federal budgetary process, including annual appropriations. However, proceeds from fees⁴—particularly proceeds from charges that qualify as "offsetting collections"—can be routed directly to the account of the entity collecting the money and be "available for obligation to meet the account's purpose without further legislative action" (GAO, 2005; Schick, 2000).

If authorization language provides for a quasi-public or private institution to manage a dedicated fund, Congress would most likely specify the structure and basic operating rules for the entity, program objectives,

⁴ Structuring charges so that they qualify as fees rather than taxes is a legal and policy art (Hezir, 2007). If the goal is to set up a trust fund not subject to the annual federal appropriations process, experts would have to be engaged to ensure that charges qualified as fees. For example, one charge that might qualify as a fee would be a charge on electricity generated from coal to compensate for damages to the environment.

federal members of an oversight committee, and criteria for fund directors and non-federal members of the oversight committee.

REVENUE-RAISING OPTIONS

Experience from programs like the Municipal Wastewater Treatment program described earlier, as well as current federal budget rules (which require any new legislation involving expenditures to be offset by new revenues), indicates that financial self-sufficiency is likely to be one of the most important features of a program to support large-scale demonstrations of CCS. Money for a CCS Trust Fund could be raised in a number of ways as discussed earlier; for example, through an auction of allowances under a cap-and-trade program, via user charges on coal consumption, or via a fee on electricity generated. If the latter option is used, decisions on three issues will be needed:

- (a) Which entities should be subject to the fee (e.g., coal-based units only, or a larger set of facilities)
- (b) Whether the fee should be the same for all affected units, or whether it should depend on other factors (such as the plant CO₂ emission rate per kWh)
- (c) The level(s) of the fees.

Regardless of decisions on these issues, trust fund establishment documents should state when, or the conditions under which, such fees will terminate.

For any given scale of program, widening the base from which revenue is collected has the obvious advantage of lower average fees per entity. Estimates of the fees needed to support a deployment program of 10 to 30 projects were developed in Kuuskraa (2007) assuming a uniform fee per kWh of net generation was imposed only on current coal-fired facilities. The estimated average fee per kWh needed to cover the full incremental capital and operating costs was \$0.0012 per kWh for the 30-plant program and \$0.0004 per kWh for the 10-plant program. With expected future growth in coal-based generation, average fees would be lower than these estimated values. For comparison, the average price of electricity in the United States for residential consumers in 2007 was \$0.1065 per kWh (EIA, 2007). The fees cited above range from 0.4 percent to 1.1 percent of this amount. Decisions regarding the basis of a fee also would depend strongly on program objectives. For example, fees could remain flat at some pre-determined level, or rise or decline over time. They could be based on the amount of electricity generated, or could depend on plant age, plant efficiency, or some combination of factors.

FUND DISPERSAL OPTIONS

As noted earlier, a number of mechanisms are available for dispersing revenues raised to fund CCS projects, including grants, loans, tax credits, and individual industry use of proceeds sale of bonus allowances under a cap-and-trade program. Tax credits and bonus allocations to industry would be alternatives to a CCS Trust Fund approach. However, a trust fund could disperse either grants or loans. Proceeds from the sale of

allowances set aside for that purpose could be also placed into a fund and dispersed through an Advanced Coal and Sequestration Technologies Program.

For either grants or loans, a “reverse auction” procedure could be used to seek the most cost-effective projects. Thus, applicants to a CCS Trust Fund could be required to submit bids stating the amount of CO₂ that would be sequestered per loan or grant dollar, with support going to applicants judged to have the most cost-effectiveness projects (subject to technical evaluations and possible side conditions such as a minimum CO₂ capture efficiency and operating hours per year). Multiple CCS project categories also could be established to provide auctions in all desired options to be demonstrated—though there would no assurance that bids would be offered in all categories.

In selecting trust fund dispersal options, issues of technological and regional equity, as well as relevant categories of grant (or loan) recipients, also must be addressed. Specifications for these program design features can be embedded in legislative language and other documents establishing the fund ([Kuuskraa, 2007](#)).

In all cases, economic efficiency, as well as environmental effectiveness, will be supported by fund dispersal mechanisms that encourage:

- A high rate of CO₂ avoidance (low CO₂ emissions per net kWh generated);
- High amounts of total CO₂ avoided via sequestration; and
- Cost-effective projects (low cost per ton of CO₂ emissions avoided).

However, to achieve the goal of demonstrating a variety of CCS options, different cost-effectiveness criteria might be required for different combinations of power generation technologies, capture technologies, coal types and geographic or geological characteristics.

Other equity issues in fund dispersal decisions include equity between large and small companies, between regulated and non-regulated utilities, and between projects that have opportunities to recover some costs (e.g., through enhanced oil recovery) versus projects that do not have such opportunities. The entity designated to manage a CCS Trust Fund should be charged with incorporating relevant equity considerations when selecting projects to be supported.

Finally, several additional program design features could be instrumental in accelerating CCS deployment in the near term, including:

- An aggressive schedule of support for commercial-scale demonstrations, consistent with the overall program scope and objectives
- Reducing the level of payments available for new CCS projects over time
- Clear rules for terminating the program after a specified period (i.e., the opportunity to obtain support is “now or never”).

Conclusions

The premise of this paper is that coal-based power plants will continue to provide the major share of U.S. electricity demand for decades to come, and that significant reductions in the CO₂ emissions from such plants are urgently needed as part of a national effort to address global climate change. The suite of technologies for CO₂ capture and sequestration offers the only known path to achieving reductions in coal plant emissions at the necessary scale. At the present time, however, CCS remains expensive and not yet demonstrated in full-scale utility operations. A government-enabled program to accelerate the demonstration and deployment of CCS in a variety of applications, and to drive down the cost of CCS through learning-by-doing and related measures, can bring significant economic as well as environmental benefits to the nation, while also fostering domestic energy security.

A CCS Trust Fund can serve a useful role in this regard because it would:

- Support needed demonstrations of integrated CCS at commercial-scale coal-based power plants to establish its costs and viability—the likely pre-conditions for any future policy requiring the use of CCS
- More quickly and directly achieve significant cost reductions in CCS technologies than approaches that depend solely on sufficiently stringent CO₂ emission limits
- Bring substantial national economic as well as environmental benefits by reducing the future costs of achieving significant CO₂ emission reductions from coal-based electric power plants
- Foster energy security goals by enabling domestic coal to provide electricity as well as (potentially) transportation fuels (e.g., in the form of electricity or hydrogen) in a carbon-constrained environment.

Advantages of a CCS Trust Fund approach include its ability to:

- Raise the required amounts of money from non-governmental sources
- Ensure that those who pay into the fund also benefit from the program
- Ensure multi-year financial self-sufficiency of a CCS deployment program
- Ensure that demonstrations are conducted for a range of power generation facilities, CCS technologies, coal types, and geographical regions
- Get started rapidly and maintain a well-defined revenue stream.

The requisite features of such a fund have been successfully employed in past federal programs where trust funds have proven to be an important mechanism for improving other aspects of the nation's environment and infrastructure. This is also the ultimate goal of an initiative to significantly reduce CO₂ emissions from the nation's use of coal to generate electricity. If a trust fund approach is used to accelerate deployment of CCS at power plants, desirable design features of that program should include provisions to ensure that:

- Trust fund revenues are insulated from the federal annual appropriations process
- Fund management is in accordance with private-sector decision-making standards
- Clear termination guidelines or requirements are specified.

A companion paper ([Kuuskraa, 2007](#)) elaborates on the costs and objectives of a CCS demonstration program of the sort a CCS Trust Fund would support. Other policy options to achieve reductions in CO₂ emissions from the use of coal to provide electricity are explored in other Pew Center Coal Initiative reports.

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Additional perspectives on federal programs were gained through personal communications with:

David Beecy, U.S. Department of Energy
Kevin Bliss, Interstate Oil and Gas Commission
Claudia Copeland, Congressional Research Service
David Greene, Oak Ridge National Laboratory
Joseph Hezir, EOP Group
Roger Noll, University of California
Alan Pisarski, Independent Consultant
Dale Simbeck, SFA Pacific
Tom Stanton, Johns Hopkins University

Appendix: Selected Trust Fund Descriptions

THE HIGHWAY TRUST FUND

As noted earlier, the Highway Trust Fund, authorized by the Federal Aid Highway Act of 1956, established perhaps the best known and most successful trust fund in U.S. history. The Highway Revenue Act formed Title II of the Federal Aid Act, with Section 205 imposing new taxes and raising others⁵ in order to render the interstate highway program self-financing. Section 209 established the Highway Trust Fund and dedicated 100 percent of the federal gasoline tax receipts to the fund (Jackson, 2006). The idea for an interstate highway system dated to Franklin Roosevelt, but the lack of sufficient funding resulted in only 6,000 miles of roads by the time Eisenhower became President. By ensuring (via establishment of the Trust Fund) that the money raised from road users would be used for road building, the 1956 Federal Aid Act succeed in imposing the taxes and fees needed for this extensive infrastructure project. It was anticipated that approximately \$38 billion would enter the trust fund as a result of the taxes over the 16-year period 1956-1972—an amount sufficient to cover expected expenditures.

In its early years, the Highway Trust Fund remained inviolable, with funds going solely to building roads. Subsequently however, particularly after completion of the primary interstate highways, significant portions of receipts went to states with relatively light road usage and funds began to be allocated for other related purposes. Cost-effectiveness of the program also became compromised because annual spending was capped during the appropriations process in order to address federal budget deficits, and the spending limits increased project costs.

THE U.S. MUNICIPAL WASTEWATER TREATMENT PROGRAM

Two important lessons come from a federal program whose objectives resemble those of a deployment program for CCS. The Federal Water Pollution Act (Clean Water Act) provides support for installation of water treatment technology at the nation's waste water treatment plants. Like the Highway Trust Fund, this program has been successful in upgrading a very significant part of the national infrastructure. The “take home” messages from this program are both simple and critical:

- Expensive programs must be self-supporting
- Federal program grants encourage project proposals that are not cost-effective.

⁵ The pre-existing gasoline tax was raised from two to three cents per gallon. Other taxes, percentages of which went into the trust fund, included taxes on tires, inner tubes, tread rubber, trucks, and buses.

The Clean Water Act offered federal grants to municipalities to assist them in meeting discharge regulations. However, the program's cost-effectiveness was seriously compromised due to the tendency on the part of potential grant recipients to propose plants larger and with more features than necessary. In an effort to limit the federal government's financial exposure and to impose financial discipline on municipalities, the grant approach was supplanted by a revolving loan program. The intention was to render the program self-financing (Copeland, 2004). A loan approach of this type would not be an option for CCS, however, because such units would not earn enough to pay loans back, at least until federal mandates created conditions that rendered power plants with CCS competitive with units without CCS. The difficulty of ensuring the cost-effectiveness of federal grants has also characterized the history of R&D support of coal technologies (Simbeck, 2007).

TWO VOLUNTARY INDUSTRIAL TRUST FUNDS

The Propane Education and Research Act, passed in October 1996, provided for establishment of a Propane Education and Research Council to fund research and development of new and more efficient propane equipment and to expand public awareness of propane, its uses, and environmental advantages. The Propane Education & Research Council is a private organization authorized to impose fees up to a maximum amount. The legislation stipulated that it would be established if approved by a two-thirds majority vote in an industry referendum.⁶ The referendum passed in early 1998, the Council was established and fees were collected that year, and the first contracts were let early in 1999. The Act specifies the number, representation, and terms of Council members; establishes the Council's purposes and functions; provides for monthly collection of fees adequate to cover planned expenditures; and requires public and federal review of the annual budget (Propane Education and Research Council, 2007). In 2007, the Council collected five-tenths of one cent per gallon of propane, with projected revenues of \$45.1 million dollars. By passing the referendum, the propane industry committed itself to a multi-year, multi-million dollar effort, with collection and dispersal of funds handled by the Council, whose members the industry selects subject to rules set in the enabling legislation. The rapidity with which the Propane Education and Research Council was established and initiated projects suggests that this model can provide a fast-track approach for the power industry to gain experience with commercial, integrated CCS technologies.

In Australia, coal stakeholders have undertaken a voluntary approach to CCS demonstrations in response to government interest in promoting the use of CCS in that country. COAL21 is a voluntary partnership between Australian coal and electricity industries, unions, federal and state governments and the research community. Its objectives include the facilitation of demonstration, early uptake, and commercialization of technologies that can provide near-zero emission electricity. The voluntary fees are expected to result in \$1 billion dollars within the coming decade. The management and operating structure of COAL21 suggest a number of components for a U.S. CCS Fund. COAL21 has a Steering Committee broadly representative of the participants and an Advisory Committee comprised of technical and scientific experts. Sub-groups of the Advisory Committee are formed as required or requested for specific projects. A Communications Group provides for information exchange, and roundtable meetings involving all participants are held twice a year providing opportunities for networking, information sharing, and strategic decision-making. Conference calls open to all participants are held every two months (Coal21, 2007).

⁶ Voting rights were based on volume of propane produced or sold, giving larger players a greater voice.

FEDERAL PROGRAMS NOT SUBJECT TO ANNUAL APPROPRIATIONS

A number of federal funds are insulated from the annual appropriations process including a research fund established under the Energy Policy Act of 2005, the Metropolitan Washington Airports Authority, the Tobacco Master Settlement Agreement (TMSA) and, due to a recent change in law, the Abandoned Mine Land program (AML). As elaborated below, the first two utilize a quasi-public approach to administration of a trust fund, the third operates via a private entity, and the last is run by a federal agency.

The Energy Policy Act of 2005 (EPACT) Title X, Subtitle J

Subtitle J of EPACT provides one model of a fund supported by federal revenues but managed by a non-federal agency with spending independent of the federal annual appropriations process. Title X, Subtitle J, Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources, directs the Department of Energy (DOE) to contract with a non-governmental consortium to administer the subtitle's activities and manage the funds awarded under the subtitle. The subtitle establishes a special fund to finance the program, with \$50 million annually from federal oil and gas lease payment earmarked to the fund and available for expenditure without the need for further appropriations⁷.

In 2006 the Research Partnership to Secure Energy for America (RPSEA) was selected to administer the fund. RPSEA is a non-profit corporation composed of a consortium of U.S. energy entities. The Secretary of Energy has oversight on all aspects of the program, and Subtitle J establishes an Unconventional Resources Technology Advisory Committee responsible for advising the Secretary. Thus, while RPSEA itself is a non-governmental entity, its management of Subtitle J funds is subject to oversight by a committee selected through government solicitation and by the Secretary of Energy (USDOE, 2007). RPSEA thus exemplifies important features of an organization that would be established to manage a CCS Trust Fund if the fund were created by federally-imposed charges. Fund management is in the hands of private sector stakeholders and experts, with DOE (and possibly other federal agencies) exercising oversight functions.

The Metropolitan Washington Airports Authority

The Metropolitan Washington Airports Authority (MWAA) is a non-federal entity that both collects and administers fees under federal oversight. The Airports Authority, which is responsible for capital improvements at Washington's airports, was established by the U.S. Congress but is an independent, non-federal public body. It is self-supporting, using aircraft landing fees, rents, and revenues from airport concessions to fund operating expenses, and has a 13-member Board of Directors, three members of which are appointed by the President of the United States (MWAA, 2007). Important features of the MWAA include its ability to float bonds, and to make contracting and hiring decisions unconstrained by restrictions on such activities that apply to federal agencies. Such freedom from federal contracting and hiring constraints also has been considered an important element in the success of DARPA. Hiring constraints are included in the list of "peculiarities of government administered projects" that the recent study (MIT, 2007) suggests should be removed from any program used to support timely deployment of CCS.

⁷ An additional \$100 million annually, which is subject to annual appropriations process, is authorized for the fund from the U.S. Treasury general fund.

The Tobacco Master Settlement Agreement

The Tobacco Master Settlement Agreement (TMSA) illustrates a program that follows a different paradigm, creating a fund which operates without federal legislation and is administered by a private association. In 1998, stemming from a series of lawsuits, a schedule of fees to be paid by cigarette companies was established through a contractual agreement between states and the tobacco industry. The National Association of Attorneys General manages the TMSA on behalf of the states. The agreement obligates cigarette companies to make payments to states totaling more than \$40 billion over its first 25 years of operation (Redhead, 1998). In this case, however, the TMSA does not restrict how states use the money they receive under the Agreement. Nonetheless, the sums raised and distributed by the TMSA are similar in magnitude to those needed to fund the incremental costs of CCS at 30 commercial-scale coal-fueled units (Kuuskraa, 2007).

The Abandoned Mine Reclamation Fund

The Abandoned Mine Reclamation Fund, established by the Surface Mining Control and Reclamation Act of 1977 (SMCRA), is administered by the U.S. Department of Interior's Office of Surface Mining. Although this Fund originally operated under discretionary spending rules, in 2006 the program was converted to a system under which Abandoned Mine Land reclamation grants are mandatory (OMB, 2008). This change is designed to end the situation in which Congress, via the annual appropriations process, prevented much of the money collected from being spent. Annual proceeds are in the \$0.3 billion range, with over \$7.4 billion collected since 1978 (Noto, 2006), with over \$2 billion unspent at the time the change to a mandatory spending program was made.

Attributes of Selected Federal Programs

Attribute	CWA	FHA	UDW & UNG	PERC	TMSA	AML	MWAA
Purpose of program	Assistance in meeting standards	Build infrastructure	Commercialize & deploy new technologies	Research, Development and Education	Compensate victims	Remediate damage to environment	Infrastructure and operation
Self-financing	no	yes	yes	yes	yes	yes	yes
Taxes/fees	taxes	taxes	fees	fees	fees	fees	fees
Trust Fund	no	yes	yes	fund	yes	yes	no
Administering Body	EPA	IRS	DOE and RPSEA	Private Council	NAAG	Interior	WMAA
Targets infrastructure	yes	yes	yes	no	no	yes	yes
Loan/grant/credit	grants & loans	grant	grant	NA	NA		NA
\$5 billion or more	yes	yes	no	no	yes	yes	unknown
Support to private entities	no	no	yes	yes	no		yes

CWA = Clean Water Act

FHA = Federal Highway Act

UDW & UNG = Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund

PERC = Propane Education and Research Council

RPSEA = Research Partnership to Secure Energy for America

TMSA = Tobacco Master Settlement Agreement

NAAG = National Association of Attorneys General

AML = Abandoned Mine Land Fund

MWAA = Metropolitan Washington Airports Authority

This paper describes key elements of an administrative structure that could efficiently and effectively manage a *program* to accelerate deployment of carbon capture and storage at coal-fueled electric power plants. It is part of a Pew Center on Global Climate Change Coal Initiative, a series of reports examining and identifying policy options for reducing coal-related GHG emissions. The Pew Center brings a cooperative approach and critical scientific, economic, technological, business and policy expertise to the global climate change debate at the state, federal and international levels.



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Mr. BOUCHER. Thank you very much, Dr. Rubin, and for your endorsement of this measure.

Dr. Specker.

STATEMENT OF STEVEN SPECKER, PRESIDENT AND CHIEF EXECUTIVE OFFICER, ELECTRIC POWER RESEARCH INSTITUTE

Mr. SPECKER. Thank you very much, Mr. Chairman. I am Steve Specker, President and CEO of the Electric Power Research Institute, better known as EPRI. EPRI appreciates the opportunity to be considered in the legislation as the institutional home for the carbon storage research corporation. I would like to begin by summarizing my testimony today in three points.

First, EPRI's 35 years of experience as the collaborative public interest research, development, and deployment organization for the electricity sector makes us well suited to house the Carbon Storage Research Corporation. It is the type of role that EPRI is designed to perform. Second, our proven governance and operating model will enable EPRI to promptly and efficiently establish the needed structures and processes to launch the Corporation. Third, our extensive experience in helping lead large-scale technology demonstrations provides confidence that we can successfully fulfill the objectives of this legislation.

Let me briefly expand on several of these points. EPRI's collaborative and governance model compares favorably to the governance and management structure that is proposed in the legislation. Our activities are shaped by advice from public as well as different private sector and government viewpoints. Our Board of Directors has 33 members including representation from federal, municipal, cooperative, and investor-owned utilities. We also have six external directors who are typically drawn from academia and the broader business community. Our management and our board draw upon the experiences and viewpoints of our Advisory council, which consists of 30 leaders from the environmental, academic, labor, business, and regulatory communities. Very importantly, our charter requires that we include 10 State public utility Commissioners on our Advisory council. Our Advisory council helps us consider the impact of societal and public policy needs when we evaluate the direction of our various programs.

It is also important to note that EPRI is not a trade association. The IRS recognizes us as a 501(c)(3) tax-exempt scientific research organization which is chartered to operate in the public interest and for the public benefit, and we take that obligation very seriously. We conduct our activities with objectivity and scientific integrity. Our agenda is very simple: find the most effective solutions to help solve the most important challenges associated with providing the public with reliable, affordable, and environmentally responsible electricity.

Regarding our experience, we are recognized both in the United States and internationally as an organization that can successfully lead large-scale demonstrations. We work closely with industry participants, governmental agencies, equipment manufacturers, and utilities, and in doing this have helped lead major programs. Let me give you a few examples. The Cool Water program, an EPRI-led collaborative program in the late 1980s, was the first

commercial-scale IGCC plant in the United States. The Environmental Control Technology Center, which EPRI constructed and operated from 1989 to 1999, demonstrated technologies for controlling sulfur, nitrous oxide, and particulate emissions from coal-based generation, and was a very important facility. And the Advanced Light Water Reactor program, a \$1 billion public-private partnership that operated for over a decade, was coordinated by EPRI in cooperation with the U.S. Department of Energy, utilities and reactor suppliers.

Most recently in the carbon capture and storage area, we have been providing collaborative leadership for several important pre-commercial carbon capture and storage demonstrations. As already has been mentioned, the first chilled ammonia capture technology demonstration at the We Energy's Pleasant Prairie plant in Wisconsin is an EPRI-led collaboration and is the first of a kind, very important facility. We are continuing moving forward with two planned 20-megawatt CCS demonstrations on pulverized coal and several planned CCS demonstrations on both existing and new IGCC facilities.

I would like to close with a couple comments on the scale of the funding proposed by this legislation. First, the amount, \$1 billion per year, is consistent with estimates that are provided by a number of independent studies, done by the National Coal Council, the Coal Utilization Research Council and, very important, the MIT study entitled *The Future of Coal*. All of those various studies' estimates are in the ballpark of \$1 billion per year. In addition, our own work supports a number of somewhere from \$700 million to \$1 billion in that range per year for CCS.

In summary, we support the need for a very focused demonstration, and I will emphasize the demonstration part of this. This is not research. It is some development, primarily commercial-scale demonstration fund for the development of large-scale projects to advance the commercial availability of CCS. Very importantly, I agree with the previous speaker, there is no R in this. This is not research. This is large-scale commercial demonstration of this technology. We are honored to be asked to play a role in its success and look forward to the opportunity. Thank you.

[The prepared statement of Mr. Specker follows:]

Written Testimony

Hearing of the Subcommittee on Energy and Air Quality

**Committee on Energy and Commerce
United States House of Representatives**

**Dr. Steven R. Specker
President and Chief Executive Officer
Electric Power Research Institute**

July 10, 2008

Thank you, Chairman Boucher, Ranking Member Upton, and Members of the Subcommittee. I am Steve Specker, President and CEO of the Electric Power Research Institute (EPRI). EPRI appreciates the opportunity to provide testimony on HR 6258, the Carbon Capture and Storage Early Deployment Act.

EPRI is an independent, non-profit research organization that brings together its members, scientists and engineers, along with experts from academia, industry and other centers of research to:

- collaborate in solving challenges in electricity generation, delivery and use;
- provide technological, policy and economic analyses to drive long-range research and development planning
- support multi-discipline research in emerging technologies and issues; and
- accelerate the commercial deployment of advanced electricity technologies

The Promise of Carbon Capture and Storage

Recent EPRI work¹ has illustrated the necessity and the urgency to develop carbon capture and storage (CCS) technologies as part of the solution to satisfying our future energy needs in an environmentally responsible manner. Our analysis suggests that with aggressive research, development, demonstration, and deployment of advanced electricity technologies, it is technically feasible to slow down and stop the increase in U.S. electric sector CO₂ emissions, and then eventually reduce them over the next 25 years while simultaneously meeting the expected increased demand for electricity and minimizing the economic impact of reducing emissions.

¹ "The Power to Reduce CO₂ Emissions: the Full Portfolio", EPRI 1015461, August 2007, www.epri.com

To develop this analysis, we compiled data on the current and likely future cost and performance of various electricity technologies from our own internal work, various public-private technology research, development, and demonstration (RD&D) roadmaps, and expert opinions from academia, industry, and the NGO community in the published literature. From this information, EPRI assessed the benefits of achieving substantial improvements in performance and aggressive deployment of advanced technologies in seven areas: end-use efficiency, renewables, nuclear generation, advanced coal generation, CCS, plug-in hybrid electric vehicles (PHEV) and distributed energy resources (DER). We then calculated the net change in CO₂ emissions from the electric sector which would result from achieving each of those technology targets compared to the underlying assumptions in the Base Case of the 2008 Annual Energy Outlook² published by the Energy Information Administration (EIA). The results are shown in Figure 1.

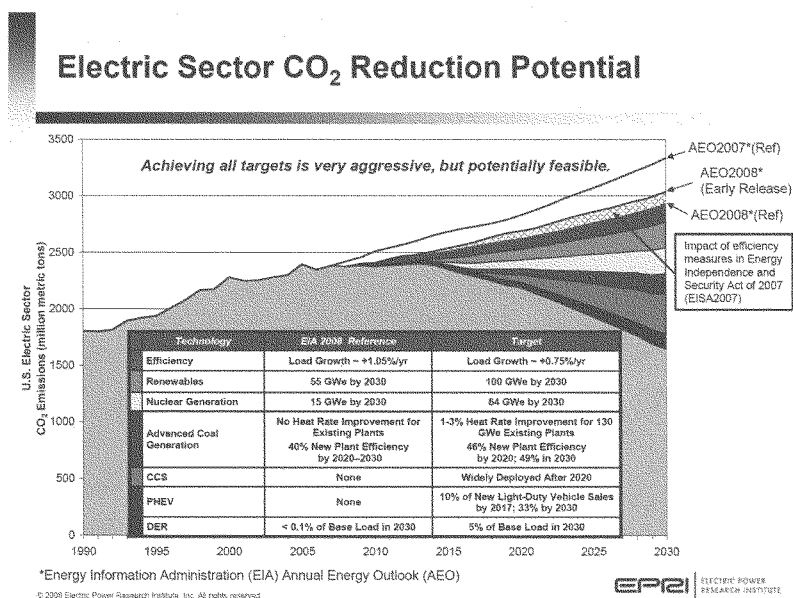


Figure 1: Technical potential for CO₂ emissions reductions from the U.S. electric power sector, assuming significant new technology RD&D investments and the aggressive deployment of the resulting technologies over the next 25 years.

² "Annual Energy Outlook 2008", Energy Information Administration, U.S. Department of Energy, June 2008, DOE/EIA-0383 (2008), www.eia.doe.gov

Of the seven options we analyzed, our work showed that the greatest reductions in future U.S. electric sector CO₂ emissions are likely to come from applying CCS technologies to nearly all new coal-based power plants coming on-line after 2020. The key to proving CCS capability is the demonstration of CCS at large-scale (on the order of 1 million tons CO₂/year) for integrated gasification combined-cycle (IGCC), for pulverized coal (PC) and for oxy-combustion technologies, with storage in a variety of geologies. This will require a sustained RD&D program at heightened levels of investment and the resolution of legal and regulatory unknowns for long-term geologic CO₂ storage. We must start immediately if we are to meet the goal of demonstrating a full portfolio of advanced coal technologies with CCS by 2020.

Furthermore, we have conducted a companion economic analysis showing that investments in RD&D which lead to the creation of a full portfolio of low-carbon electricity technologies, including advanced coal-based power plants with CCS and new expansions in nuclear power, can significantly reduce the costs of future climate policy. For a scenario in which we aspire to reduce U.S. emissions of CO₂ in 2050 to less than half of today's levels, this "full portfolio" would result in average wholesale electricity prices equivalent to approximately 9¢ per kilowatt-hour, compared to 21¢ per kilowatt-hour – more than twice as much – in the case where a "limited portfolio" of electricity technologies (i.e. excluding CCS or expansion of nuclear power) is available. Carbon prices are also twice as large in the world of the "limited portfolio". In a world without CCS and nuclear, future CO₂ constraints would be met by massive fuel switching to natural gas (with resulting price increases and increasing import dependence) and by increasingly expensive energy conservation as consumers respond to very large carbon and electricity prices.

For this hypothetical CO₂ constraint, the existence of the "full portfolio" reduces the overall cost of the climate policy to the U.S. economy by approximately \$1 trillion between now and 2050. Furthermore, the low-cost, low-carbon electricity provided by the "full portfolio" would play an essential role in enabling CO₂ reductions from other sectors of the economy. This is more than enough to justify the additional investments in the RD&D we must make now to develop the necessary portfolio of low-cost, low-carbon technologies, particularly CCS.

EPRI's Collaborative Governance and Operating Model

EPRI is designated in HR 6258 as the institutional foundation for the Carbon Storage Research Corporation, which would award grants and contracts to large-scale projects that will advance the commercial availability of CCS technology. Our 35 years of experience as a collaborative public interest RD&D organization makes EPRI well suited to successfully fulfill this role.

Our current governance and operating model serves as a good comparison to the type of governance and management structure proposed in HR 6258 and demonstrates our ability to effectively work within a collaborative framework representing multiple stakeholder

groups. From this sound basis, EPRI can promptly establish the needed structures and processes to launch the Carbon Storage Research Corporation.

EPRI's research initiatives are shaped by advice from public as well as different private and government viewpoints. Our Board of Directors has 33 members, including representation from federal power (TVA and Bonneville Power), municipal, cooperative, and investor-owned utilities, ISO/RTOs, and includes six external directors drawing upon different experienced groups such as academia. Our Board oversees the management of the Institute, including our strategic research objectives, financial plan, and compliance practices.

EPRI management and EPRI's Board also draw upon the experiences and viewpoints of our Advisory Council consisting of 30 leaders from environmental, academic, labor, business and supplier organizations; and including 10 state public utility commissioners. Our Advisory Council helps us consider the impact of societal and public policy needs when we evaluate the direction of our various research programs.

EPRI is uniquely suited to bring together diverse industry, business and public viewpoints regarding the proposed work. EPRI is not a trade association; rather, EPRI is recognized by the IRS as a 501(c)(3) tax exempt scientific research organization, operating in the public interest and for the public benefit. Our charter, which is attached to this testimony, provides additional information on the purposes for which EPRI was organized.

EPRI has a strong public interest mission that helps shape the scope and direction of our work, extending through all areas of electricity generation, delivery, and use. It requires that we conduct our RD&D activities with the utmost objectivity and scientific integrity. Our collaborative model extends throughout our RD&D operations as EPRI's scientists and engineers work with EPRI utility members and experts from academia, government and other business sectors. Our objective is to assemble the best technical teams available to conduct our work.

EPRI's work is financially supported on a voluntary funding basis by its U.S. members, who represent more than 90% of the electricity generated and delivered in the United States; and by international participants from about 40 countries. EPRI has major offices and laboratories in Palo Alto, California; Charlotte, North Carolina; Knoxville, Tennessee; and Lenox, Mass.

EPRI's Demonstration Project Experience

EPRI's leadership in the RD&D of advanced electricity technologies is well recognized throughout the utility industry and the broader global energy community.

Working closely with a wide range of industry participants, governmental agencies, equipment manufacturers, and utilities, EPRI has helped lead demonstration programs

that were instrumental in accelerating the deployment of several technologies including the following examples:

- The first commercial scale IGCC plant in the United States was demonstrated by an EPRI-led collaborative in the late 1980s. The Cool Water Program, which established the early technical foundation for future IGCC plants, included companies such as Texaco, GE, Bechtel, and Southern California Edison.
- The Environmental Control Technology Center which EPRI constructed and operated from 1989 to 1999 to demonstrate technologies for controlling emissions of sulfur dioxide, nitrogen oxides and particulate matter. The collaborative program involved U.S. and international electric utilities, energy suppliers and Federal and State research organizations.
- The Advanced Light Water Reactor Program, a \$1 billion public-private partnership that operated for over a decade, was coordinated by EPRI in cooperation with the U.S. Department of Energy, electric utilities, and reactor suppliers. The program resulted in the technical basis for today's advanced nuclear plants, currently in operation and being constructed internationally and for which construction and operating license applications have been announced in the United States.

EPRI is also a key leader in the recently-launched carbon capture pilot project at We Energies' Pleasant Prairie Power Plant in Wisconsin. This project represents a milestone in efforts to capture CO₂ from the flue gas of a pulverized-coal generating station. The 1.7-MWe system, designed and constructed by Alstom, uses their chilled ammonia process which, based on laboratory experiments, has the potential to capture more than 90% of CO₂ in the flue gas, at a cost lower than other technologies currently available. As part of the collaboration, EPRI will conduct a year-long series of performance tests and cost analyses. EPRI's collaborative process brought together more than 35 organizations to support this project, including a large number of U.S. coal-based utilities and international participants.

As part of our efforts to help enable CCS technology for widespread deployment after 2020, EPRI will create and lead industry collaboratives for several additional and important CCS demonstrations. Working in cooperation with US and international utilities and equipment suppliers, EPRI will carry out plant design, performance and economic analysis and use the data it collects to prepare independent, third-party technical and economic evaluations of the technologies involved. These projects are:

- A planned 20 MW post-combustion CCS demonstration by American Electric Power at their Mountaineer Plant in West Virginia.
- A planned ~25 MW post-combustion CCS demonstration by Southern Company at a power plant in their service territory.
- Three projects of increasing CO₂ capture scale intended to demonstrate cost-competitive IGCC plants with high efficiency, near-zero emissions, and CCS.

- Additional support for a DOE-funded pre-commercial demonstration of an advanced oxygen separation system for use in future IGCC and oxy-combustion plants

EPRI has also initiated a companion set of demonstration projects associated with energy efficiency, the “smart grid”, and energy storage; and a potential second round of demonstration projects focused on renewable energy is under development.

We are also working to develop additional CCS project proposals for:

- Further scale up of the post-combustion capture technologies outlined above, potentially as retrofits for existing units;
- Initial demonstration of oxy-combustion technologies at a power plant at pre-commercial scale; and
- One or more “UltraGen” full-scale pulverized coal plants with ultra-supercritical steam conditions, near-zero emissions, and CCS.

These projects, and others that would be needed to advance CCS technology, would benefit from the funding established in HR 6258, or other Federal support in the forms of tax incentives, loan guarantees or DOE cost-shared grant funding were HR 6258 not to be enacted into law.

Program Scale Proposed in HR 6258

Developing the suite of technologies needed to achieve competitive advanced coal and CCS technologies will require a sustained major additional investment in RD&D, over and above the support currently provided through Department of Energy programs.

The proposed funding of \$1.0 billion per year for 10 years envisioned in HR 6258 is consistent with RD&D funding needs estimated by a number of independent organizations, including EPRI, the Coal Utilization Research Council³, the National Coal Council⁴ and MIT⁵. As part of our assessment of RD&D funding needs necessary to support development of the “full portfolio” of advanced electricity technologies, EPRI estimated additional RD&D funding needs for advanced coal with CCS to range from \$700 million - \$1.0 billion/year for each of the next 25 years. The MIT *Future of Coal* report estimated the funding need at \$800–\$850 million per year, which approaches the EPRI value. Were we to conduct these same studies today, recent increases in costs for materials, labor and other inputs associated with the new construction of power plants of all types would likely lead to increased estimates on the order of the \$1.0 billion per year funding level contained in HR 6258.

³ The CURC-EPRI Clean Coal Technology Roadmap, Coal Utilization Research Council, 2007, http://www.coal.org/userfiles/File/Final_CURC-EPRI_Roadmap_2008.pdf

⁴ “Coal: America’s Energy Future – The National Coal Council Report”, National Coal Council, 2006, <http://www.coalamericasenergyfuture.com/index2.html>

⁵ “The Future of Coal: Options for a Carbon-Constrained World”, Massachusetts Institute of Technology, 2007, http://web.mit.edu/coal/The_Future_of_Coal_Summary_Report.pdf

We stress that no single advanced coal generation technology has clear-cut economic advantages across the range of U.S. and global applications. HR 6258 properly recognizes this. While there are well proven methods for capturing CO₂ resulting from coal gasification, IGCC plants will have larger components and a degree of integration that has not been demonstrated at the commercial scale. In contrast, pulverized coal technology is well proven commercially in the power industry, but demonstration of post combustion capture is yet to be proven at a commercial and affordable scale. These and other promising approaches merit consideration for RD&D funding under HR 6258, as do technologies that are suitable for either new plants or retrofit applications on existing plants (which are overwhelmingly pulverized coal).

Furthermore, there is still much work to be done before CCS can be implemented on a scale large enough to significantly reduce CO₂ emissions into the atmosphere. In addition to large-scale demonstrations at U.S. geologic formations, many legal, institutional and regulatory uncertainties need to be resolved. Uncertainty about long term monitoring requirements, liability, and insurance is an example. State-by-state variation in regulatory approaches is another. Some geologic formations suitable for CO₂ storage underlie multiple states. For private companies considering CCS, these various uncertainties translate into increased project risk that may hinder the progress of commercial-scale CCS demonstrations.

Conclusion

EPRI supports the concept of a focused RD&D fund for the development of large-scale projects to advance the commercial availability of CCS technologies. We have the collaborative governance and operating model and the technical experience to successfully implement the program on an accelerated timetable that matches the urgency of our need. Thank you for the opportunity to address the Subcommittee.

Attachment #1
Articles of Incorporation
Of the Electric Power Research Institute, Inc.

As amended through April 4, 2006

3. The purposes for which the Corporation [EPRI] is organized are
- (a) To promote, engage in, conduct and sponsor research and development with respect to electricity production, transmission, distribution and utilization, and all activities directly or indirectly related thereto;
 - (b) To provide a medium through which investor-owned, government-owned and cooperative-owned power producers and all other persons interested in the production, transmission, distribution or utilization of electricity can sponsor electricity research and development for the public benefit;
 - (c) To promote, engage in and conduct research in both the pure and applied sciences for the advancement and betterment in the public service of the production, transmission and distribution of electric power;
 - (d) To sponsor scientific research and development in the electric power field with a view towards providing economical, reliable electric service to the public with minimal adverse environmental effects;
 - (e) To discover, devise, develop, invent and create, through study and research, the methods and means to improve the production, transmission, distribution and utilization of electric power, in order to insure the adequate power supply that is vital to the progress of the nation and the world community;
 - (f) To seek and ascertain, through scientific research and development, solutions to environmental problems related to the production, transmission, distribution and utilization of electric power;
 - (g) To undertake, conduct, engage in or direct research and development activities for the discovery or improvement of new or more efficient forms of electric power production, transmission and distribution and of improved utilization, including new or more efficient uses, of electric power by the public;
 - (h) To discover and develop, through scientific study, research ways and means to protect, conserve, and maximize the efficient utilization of finite natural resources used in the production, transmission and distribution of electric power;

- (i) To provide a medium for coordination and cooperation and for the exchange of information for all organizations and persons, public or private, concerned with electric power scientific research and development;
- (j) To ascertain, prepare and disseminate information and data with respect to scientific research and development activities in the field of electric power;
- (k) To educate and instruct the public on electric power subjects useful to the individual and beneficial to the national as well as worldwide communities;
- (l) To have all those powers conferred upon corporations organized under the Non-profit Corporation Act necessary to effect any or all the purposes for which the corporation is formed subject to any limitations contained in these Articles of Incorporation or the laws of the District of Columbia.

Mr. BOUCHER. Thank you very much, Dr. Specker.
Mr. Kerr.

**STATEMENT OF JAMES Y. KERR, II, COMMISSIONER, NORTH
CAROLINA UTILITIES COMMISSION**

Mr. KERR. Thank you, Mr. Chairman, Vice Chairman Butterfield, Ranking Members Upton and Barton. My name is Jim Kerr. I am a member of the North Carolina Utility Commissioner and immediate past president of NARUC, and I guess as a matter of full disclosure, I am a member of the EPRI advisory council. We thank the chairman and the sponsors for this important piece of legislation and for the opportunity to provide the perspective of the National Association of Regulatory Utility Commissioners.

NARUC supports the policy goals of this legislation and the need for broad-based funding mechanisms that match the resources committed to the magnitude of the challenge. NARUC also supports the policy goals of the legislation to expedite the commercial application of carbon capture and storage as one option to begin addressing the revolution in energy production and delivery technologies needed if the United States expects to make a serious effort to reduce emissions of greenhouse gases in response to the threat of global climate change. We strongly agree with the underlying assumption of the authors of this legislation that a solution to the technological and research and development challenges of greenhouse gas mitigation is an off-budget mechanism that is supported by the utility industry and its regulators. State Commissioners are strong supporters of EPRI and I endorse the written testimony of Dr. Specker. There are, however, three areas of concern that we urge the subcommittee to address as this legislation advances.

First, concerning the formation and governance of the CSRC, we are troubled that there is no governmental role or regulatory oversight involved in the formation of the corporation or its ongoing operations, despite the fact that the corporation is intended to be funded through rates paid by retail consumers who have no alternative but to pay the fees. We believe that there should be a duty on the part of EPRI written into the legislation to consult with regulators and other stakeholders before the referendum is conducted. Specifically, the subcommittee could amend section 3(a) of the bill to provide the distribution utilities voting in the referendum in favor of establishing the corporation certify to the independent auditing firm that their respective retail regulators support their vote with the knowledge that the fees imposed by the bill will be automatically passed through to their customers.

Concerning the CSRC's operations once formed, we recommend that the legislation be revised to specify a role for representatives of regulators and consumers. This could be accomplished by amending section 3(c) to include such representation on the CSRC board in addition to the industry representatives there listed or by creating a separate advisory council for the CSRC modeled after the current EPRI advisory council board of directors. We also recommend that the legislation specifically provide that the CSRC consult with representatives of regulators and consumers as it prepares its budget and research agenda under section 4(e) and that

the legislation specifically require that the corporation provide its annual report and audit to each State commission with jurisdiction.

Second, we have strong reservations about the inclusion in the bill of section 8(a) on the cost recovery of the fees. This section is problematic for a host of reasons. As drafted, the legislation would authorize utilities to vote to exempt themselves from any regulatory oversight to recover costs from captive ratepayers. This is unprecedented. While Congress has preempted State authority in other areas of energy and telecommunications policy and practice, we know of no other example where it has given private entities the ability to band together to exempt themselves from the lawful application of otherwise applicable State law. In addition, H.R. 6258 treats the consumer served by investor-owned utilities less favorably than customers of publicly owned utilities such as municipal or cooperative utilities. While section 8 of the bill appears to apply equally to consumers served by all distribution utilities, public and private, there is a significant difference. Because the regulators of municipal and cooperative utility systems are the publicly owned and managed utilities themselves, their consumers have a say in how their utilities vote in the referendum to establish the CSRC and thereby become subject to the fees imposed by the legislation. By contrast, neither the consumers nor the regulators of investor-owned utilities have any say in whether their distributors will subject their consumers to these same fees. It may well be argued that because the fees established under H.R. 6258 only amount to \$10 to \$12 per residential customer per year, section 8 is of little consequence. However, for retail regulators charged under law to protect the interests of consumers who remain captive to the distributors, this is an important matter of principal. Regardless of the amounts in question, Congress should not sanction a system where the monopoly providers of an essential service agree among themselves to charge consumers fees that they cannot avoid from any regulatory oversight at either the State or federal level regardless of how worthy the purpose. Moreover, we are deeply troubled by the precedent this bill would establish for other utilities fees and charges for other worthy purposes. We are aware of bills pending that would mandate the recovery of costs for new investments in electric transmission facilities compliance with greenhouse gas emission reductions and power purchase from renewable technologies, to name but a few. Both as a matter of principle and practical application, we would strongly urge Congress to let retail regulators do their jobs. The State Commissions understand this responsibility and we last year passed a resolution endorsing the timely recovery of reasonably and prudently incurred costs. Frankly, we expect that State Commissions that would be most affected by these fees established in the bill would support recover of these costs and rates simply because of the benefit they as large consumers of fossil-based electricity would reap from this legislation. I would note, to our knowledge, no State regulators have refused to pass through the costs that nuclear utilities contribute to the nuclear waste fund, which operates under a statute, the Nuclear Waste Policy Act, that notably has no provisions mandating that costs be passed through to consumers. Similarly, we have seen little evidence that utilities that voluntarily contribute to EPRI's cur-

rent research program have suffered by virtue of disallowances of their contributions.

Third, concerning the scope of the bill, as I have noted at the beginning of this statement, NARUC strongly supports steps to advance research, development, and deployment to meet the climate challenge. Accordingly, while I understand the interests the sponsors of H.R. 6258 have in carbon capture and storage, there are clearly other areas in the utility sector and beyond that cry out for greater commitment for research, development, and demonstration. While it is not necessarily the burden of the authors of this bill to address other technologies, we look forward to working with this subcommittee, our colleagues at EPRI, and other stakeholders to fashion a research agenda that enables the Nation to reduce carbon emissions as quickly, efficiently, economically, and realistically as possible.

Thank you, and I will be happy to answer questions.

[The prepared statement of Mr. Kerr follows:]

**BEFORE THE
UNITED STATES HOUSE OF REPRESENTATIVES
COMMITTEE ON ENERGY AND COMMERCE,
SUBCOMMITTEE ON ENERGY AND AIR QUALITY
TESTIMONY OF THE HONORABLE JAMES Y. KERR, II
COMMISSIONER, NORTH CAROLINA UTILITIES COMMISSION
ON BEHALF OF THE
NATIONAL ASSOCIATION OF REGULATORY UTILITY COMMISSIONERS
ON
H.R. 6258, the “Carbon Capture and Storage Early Deployment Act”
July 10, 2008**



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Summary of Remarks by
The Honorable James Y. Kerr, II
National Association of Regulatory Utility Commissioners
Before the
U.S. House of Representatives
Committee on Energy and Commerce, Subcommittee on Energy and Air Quality

- NARUC supports the policy goals of the legislation and the need for broad-based funding mechanisms that match the resources committed to the magnitude of the challenge. NARUC also supports the policy goals of the legislation to expedite the commercial application of carbon capture and storage (CCS) as one option to begin addressing the revolution in energy production and delivery technologies needed if the U.S. expects to make a serious effort to reduce emissions of greenhouse gases in response to the threat of global climate change.
- We strongly agree with the underlying assumption of the authors of this legislation that a solution to technological and research and development challenges of greenhouse gas mitigation is an off-budget mechanism that is supported by the utility industry and its regulators.
- There are three areas of concern that we urge the Subcommittee to address as this legislation advances:
 - First, concerning the formation and governance of the CSRC: We are troubled that there is no governmental role or regulatory oversight involved in the formation of the Corporation or its ongoing operations;
 - Second, preemption of State law to permit monopoly distribution utilities to pass through the cost of funding the Corporation to their consumers with no review or approval of their regulators: We have strong reservations concerning the inclusion in the bill of section 8(a) on cost recovery of the fees.
 - Third, the scope of the bill: While NARUC understands the importance of carbon capture and storage, there are other areas in the utility sector and beyond that are worthy of greater commitment for research, development and demonstration. We believe that all options must be on the table, including carbon capture and sequestration for emissions produced by our abundant coal supplies, advanced nuclear technologies, improved efficiencies in grid and demand side technologies, greater deployment of renewable technologies, and strengthened appliance and building efficiency standards.

Mr. Chairman and Members of the Subcommittee:

Good morning. My name is James Y. Kerr II, and I am a member of the North Carolina Utilities Commission (NCUC). I am also a member of the National Association of Regulatory Utility Commissioners (NARUC), having served as NARUC's President in 2007, on whose behalf I am testifying here today. I also serve as a member of the Advisory Council to the Board of Directors of the Electric Power Research Institute (EPRI) and as a member of the Keystone Energy Board. On behalf of NARUC and the NCUC, I very much appreciate the opportunity to appear before you this morning.

NARUC is a quasi-governmental, non-profit organization founded in 1889. Our membership includes the State public utility commissions serving all States and territories. NARUC's mission is to serve the public interest by improving the quality and effectiveness of public utility regulation. Our members regulate the retail rates and services of electric, gas, water, and telephone utilities. We are obligated under the laws of our respective States to ensure the establishment and maintenance of such utility services as may be required by the public convenience and necessity and to ensure that such services are provided under rates and subject to terms and conditions of service that are just, reasonable, and non-discriminatory.

NARUC is pleased to provide its views this morning on H.R. 6258, the "Carbon Capture and Storage Early Deployment Act." This legislation would establish an industry-based program to accelerate the deployment of carbon capture and storage technologies through the creation of a funding mechanism administered by an arm of the

Electric Power Research Institute (EPRI) to support the development of large-scale demonstration projects. Specifically, the bill would authorize electric utilities that generate electricity through the combustion of fossil fuels to conduct a referendum to agree to fund the Carbon Storage Research Corporation (CSRC or Corporation). If utilities representing two-thirds of the fossil fuel-based power delivered to retail consumers agree, a fee would be established on all delivered fossil-based power to accumulate approximately \$1 billion annually to be administered by the Corporation. Utilities subject to the fee would have the legal right to recover the costs of these fees in rates charged to consumers notwithstanding otherwise applicable regulatory review and approval.

First of all, we would begin our analysis of this important legislation by commending you, Chairman Boucher, and the co-sponsors to this bill, for your vision in seeing the need to begin addressing the revolution in energy production and delivery technologies that will need to happen if the U.S. expects to make a serious effort to reduce emissions of greenhouse gases in response to the threat of global climate change. Currently, there is no scalable, commercially available technology that allows for the removal of carbon dioxide from the products of coal combustion. This fact makes the development of appropriate legislation regulating carbon emissions fundamentally different from earlier legislation to limit SOX, NOX, and other currently-regulated pollutants, because appropriate abatement technologies existed at the time that those pollutants were subject to regulation. As a result, two key goals of any climate change legislation should be (1) to provide support for the development of commercial carbon

capture and storage (CCS) technologies to ensure that effective CCS technologies are developed and become commercially available as soon as possible and (2) to establish the allowable limits on carbon emissions on the basis of a realistic view of the technological issues surrounding CCS.

As the regulators of the nation's electric and gas production and delivery systems, NARUC members are well aware of the fundamental shift in energy technologies that will need to take place if the kinds of emissions reductions contemplated in pending legislation can be made. Stated simply, the only hope we have to provide the energy services the American people expect, to maintain the safety and reliability of the power production, transmission and distribution system, and to reduce emissions, is to begin investing now in all technologies that will meet these goals.

We further believe that all options must be on the table, including carbon capture and sequestration for emissions produced by our abundant coal supplies, advanced nuclear technologies, improved efficiencies in grid and demand-side technologies, greater deployment of renewable technologies, and strengthened appliance and building efficiency standards.

To that end, NARUC has for the last decade adopted policy statements highlighting the importance of an aggressive national commitment to research, development and deployment of breakthrough technologies in each of these areas. Concerning the climate debate, NARUC has been particularly active in the last year. As

an initial step, during my term as NARUC President we established a Task Force of State commissioners from across the country charged with two responsibilities -- to set an agenda to educate the regulatory community on the implications for the utility regulatory process of actions Congress is considering, and to frame recommendations that we will advocate to respond to the legislative debate.

Importantly, through the work of this Task Force, NARUC in 2007 adopted three policy resolutions relevant to the issues raised by H.R. 6258 (which we have attached to our written statement.) Concerning the need to invest in new technologies, it is our view that Congress should consider legislation that “include[s] [s]upport for the development of more efficient generation, transmission and distribution technologies, energy efficiency, and *GHG-emission control and sequestration* technologies through various means, including, for example, increased funding for research, tax credits, bonding and more efficient national appliance standards (emphasis added).”

Concerning the role State commissions should play in addressing the climate challenge in their own jurisdictions, NARUC recommends that regulators implement regulatory policies that “[facilitate] greater reliance upon low- or no-carbon resources and technologies such as energy efficiency, high-efficiency combined heat and power, demand response, renewable generation, advanced nuclear, and *emerging technologies (such as carbon capture and storage)*” (emphasis added), and that “[support] broad-based funding for research to enable the use of thermal and other electric generating resources that result in environmentally acceptable electric generation.” Importantly, our

policy also recommends that under applicable State law, commissions “[ensure] timely recovery of reasonable and prudently incurred costs associated with this transition” to the use of emerging technologies.

While these statements speak to the current debate on climate policy, NARUC’s support for a robust research agenda is not new. Our Association has been a strong supporter of EPRI since its creation almost 40 years ago. Individual State commissions have followed through with strong support for the funding needed to implement EPRI’s agenda. That experience makes us keenly aware of the reality that addressing the climate challenge at the lowest cost will require the melding of emission reduction timetables and widespread application of the kinds of technological breakthroughs that H.R. 6258 is intended to elicit.

Accordingly, we support the policy goals of the legislation and the need for broad-based funding mechanisms that match the resources committed to the magnitude of the challenge. Based upon hard-earned experience with the unfortunate history of the Nuclear Waste Fund, we strongly agree with the underlying assumption of the authors of this legislation that a better solution to the technological challenges of greenhouse gas mitigation would be an off-budget mechanism that is supported by the utility industry and its regulators.

However, there are three areas of concern that we urge the Subcommittee to address as this legislation advances concerning the Corporation’s formation and

governance, preemption of State law to permit monopoly distribution utilities to pass through the cost of funding the Corporation to their consumers with no review or approval of their regulators, and the scope of the program the bill would establish.

First, concerning the formation and governance of the CSRC: we are troubled that there is no governmental role or regulatory oversight involved in the formation of the Corporation or its ongoing operations. Despite the fact that the Corporation is intended to be funded through rates paid by retail consumers who have no alternative but to pay the fees, we believe that there should be a duty on the part of EPRI written into the legislation to consult with regulators and other stakeholders before the referendum is conducted. Specifically, the Subcommittee could amend section 3(a) of the bill to provide that distribution utilities voting in the referendum in favor of establishing the corporation certify to the independent auditing firm that their respective retail regulators support their vote with the knowledge that the fees imposed by the bill will be automatically passed through to their customers.

Concerning the CSRC's operations once formed, we recommend that the legislation be revised to specify a role for representatives of regulators and consumers. This could be accomplished by amending section 3(c) to include such representation on the CSRC Board in addition to the industry representatives there listed, or by creating a separate advisory council for the CSRC modeled after the Advisory Council to the EPRI Board of Directors. We also recommend that the legislation specifically provide that the CSRC consult with representatives of regulators and consumers as it prepares its budget

and research agenda under section 4(e), and that the legislation specifically require that the Corporation provide its annual report and audit to each State commission with jurisdiction.

Second, we have strong reservations concerning the inclusion in the bill of section 8(a) on cost recovery of the fees. This section is problematic for a host of reasons: as drafted, the legislation would authorize utilities to vote to exempt themselves from any regulatory oversight to recover costs from captive ratepayers. This is unprecedented. While Congress has preempted State authority in other areas of energy and telecommunications policy and practice, we know of no other examples where it has given private entities the ability to band together to exempt themselves from the lawful application of otherwise applicable State law.

On this point, I would note that it's our understanding that this legislation is based upon the model of the Propane Education and Research Act of 1996, P.L. 104-284, (PERA) which was established to conduct research and development concerning clean and efficient propane utilization equipment and to support public education and training on consumer and employee safety in the use of propane. While these two programs are similarly structured and governed, there are important and telling differences. Concerning governance, the Propane Education and Research Council includes representatives of the propane industry and the public at large; by contrast, the Board of the CSRC created by H.R. 6258 is comprised solely of industry representatives. More importantly, concerning cost recovery, section 10 of PERA specifically provides that

“the [Propane Education and Research] Council may take no action, nor may any provision of this Act be interpreted as establishing an agreement to pass along to consumers the cost of the assessment. . . .” by contrast, H.R. 6258 has as its goal the conduct of a referendum for industry to conclude an agreement for the very purpose of passing through the costs of assessments to captive consumers.

In addition, H.R. 6258 treats the consumers served by investor-owned utilities less favorably than customers of publicly-owned utilities such as municipal and cooperative utilities. While section 8 of the bill appears to apply equally to consumers served by all distribution utilities, public and private, there is a significant difference. Because the regulators of municipal and cooperative utility systems are the publicly-owned and managed utilities themselves, their consumers have a say in how their utilities vote in the referendum to establish the CSRC and thereby become subject to the fees imposed by the legislation. By contrast, neither the consumers nor the regulators of investor-owned utilities have any say in whether their distributors will subject their consumers to these same fees.

It may well be argued that because the fees established under H.R. 6258 “only” amount to \$10-12 per customer, section 8 is of little consequence. However, for retail regulators charged under law to protect the interests of consumers who remain captive to their distributors, this is an important matter of principle. Regardless of the amounts in question, Congress should not sanction a system where the monopoly providers of an essential service agree among themselves to charge consumers fees that they cannot

avoid free from any regulatory oversight at either the State or Federal level, regardless of how worthy the purpose. Moreover, we are deeply troubled by the precedent this bill would establish for other utility fees and charges for other worthy purposes. We are aware of bills pending that would mandate the recovery of costs for new investment in electric transmission facilities, compliance with greenhouse gas emissions reductions, and power purchased from renewable technologies, to name but a few.

Both as a matter of principle and practical application, we would strongly urge Congress to let the retail regulators do their jobs. As I've mentioned, the State commissions understand this responsibility, adopting a policy in November 2007 that specifically endorses "timely recovery of reasonable and prudently incurred costs" through application of long-standing State law. Frankly, we expect that the State commissions that would be most affected by the fees established under H.R. 6258 would support recovery of these costs in rates simply because of the benefit that they, as large consumers of fossil-based electricity, would reap from this legislation. I would note that to our knowledge, no State regulators have refused to pass through the costs that nuclear utilities contribute to the Nuclear Waste Fund, which operates under a statute – the Nuclear Waste Policy Act – that (notably) has no provisions mandating that costs be passed through to consumers. Similarly, we have seen little evidence that utilities that voluntarily contribute to EPRI's current research program have suffered by virtue of disallowances of their contributions. In sum, section 8 is unnecessary, discriminatory, and a bad precedent. Accordingly, we strongly urge the Subcommittee to delete this section when it marks up this bill. We stand willing to work with members of the

Subcommittee and all affected stakeholders to develop alternative approaches to this issue that preserve State oversight while addressing the industry's legitimate concerns.

Third, concerning the scope of the bill. As I noted at the beginning of this statement, NARUC strongly supports steps to advance research, development and deployment to meet the climate challenge. Accordingly, while I understand the interest the sponsors of H.R. 6258 have in carbon capture and storage, there are clearly other areas in the utility sector and beyond that cry out for a greater commitment for research, development and demonstration. While it is not necessarily the burden of the authors of this bill to address other technologies, we look forward to working with this Subcommittee, our colleagues at EPRI, and other stakeholders to fashion a research agenda that enables the nation to reduce carbon emissions as quickly, efficiently, economically and realistically as possible.

In closing, I would again commend the authors of this important legislation for the critical step this bill represents. NARUC and its members look forward to working with all members of the Subcommittee to improve this legislation in ways that supports an aggressive research agenda while ensuring accountability to the consumers that will pay the bills.

Thanks. I would welcome any questions you may have.

APPENDIX



N A R U C
National Association of Regulatory Utility Commissioners

R E S O L U T I O N

Resolution on Implications of Climate Policy for Ratepayers and Public Utilities

WHEREAS, National Association of Regulatory Utility Commissioners (NARUC) seeks to ensure that participants in the climate change dialogue fully consider and understand the effects of various potential climate policies on the nation's ratepayers and public utilities; *and*

WHEREAS, NARUC formed the Task Force on Climate Policy in March 2007 to:

- Develop an interim set of policy responses as climate issues are addressed in Congress;
- Review existing NARUC policies and propose updated resolutions for consideration by the Association's membership;
- Inform lawmakers of existing State programs and regional differences, and encourage Congress to ensure that ratepayers are not unduly burdened;
- Establish programmatic and educational content designed to inform the regulatory community about climate policy options and their potential impacts on utility customers and economic regulation;
- Coordinate NARUC's involvement with efforts both within and outside the Association, including the National Action Plan for Energy Efficiency and other efforts involving federal agencies, relating to climate issues; *and*

WHEREAS, The members of the NARUC Task Force on Climate Policy represent the diverse geographic and economic characteristics and the varied regulatory structures that exist in this country and the NARUC Standing Committees that are directly affected by potential climate policies; *and*

WHEREAS, The NARUC Task Force on Climate Policy has undertaken extensive efforts to educate State commissioners and staff by providing policy issue seminars and undertaking weekly teleconferences; *and*

WHEREAS, In addressing legislative proposals intended to reduce greenhouse-gas (GHG) emissions, Congress will be making decisions that could significantly impact customers of electric and natural gas utilities; *and*

WHEREAS, The continued availability of a reliable and reasonably priced supply of electricity and natural gas is critical to our nation's economic well-being, security, and the health and well-being of our citizens; *and*

WHEREAS, While Congress is assisted by numerous climate and environmental experts as it debates the environmental consequences of alternative climate change policies, NARUC, through its unique understanding of the nation's need for, and use of, electricity and natural gas can provide vital information and a crucial perspective regarding the potential consequences of possible climate change legislation on the nation's ratepayers and public utilities; *and*

WHEREAS, NARUC seeks to ensure that participants in the climate dialogue fully weigh and balance the potential impacts, whether costs or benefits, of various alternative GHG emission reduction mechanisms on the citizens we serve and the industries we regulate; *now, therefore, be it*

RESOLVED, That Congress should ensure that any national climate change legislation minimizes, to the extent possible, adverse impacts upon public utility ratepayers and the companies that NARUC members are responsible for regulating; *and be it further*

RESOLVED, That the Board of Directors of the National Association of Regulatory Utility Commissioners, convened in its July 2007 Summer Meetings in New York, New York, urges Congress to incorporate the following principles, which have been developed by the NARUC Task Force on Climate Policy, into any national climate program:

1. Any climate change legislation should be implemented economy-wide as part of a comprehensive national energy and energy security policy.
2. Any climate change legislation and its implementing regulations should be transparent, consistent, predictable, and equitable.
3. Any climate change legislation should avoid compromising electric and natural gas system reliability, and should ensure the availability of an adequate supply of electricity and natural gas.
4. Any climate change legislation should impose the minimum economic cost necessary to achieve the desired environmental objectives in a timely manner.
5. Any climate change legislation should minimize the cost impact on electric and natural gas ratepayers. To that end, the majority of any compliance-related revenues from the electricity sector should be dedicated to reduce ratepayer energy costs.
6. Any climate change legislation should refrain from usurping the States' traditional responsibility for making generation resource decisions. Such legislation should also avoid preempting States that take more stringent actions to reduce GHG emissions within their jurisdictions.
7. Any climate change legislation should ensure the continued ability of States and regions to deploy a diverse portfolio of cost-effective generating resources based on the unique circumstances of those States and regions.
8. Any climate change legislation should be realistic and based on existing and reasonably foreseeable electric generation, transmission and distribution technologies, GHG emission control and sequestration technologies, and efficiency technologies.
9. Any climate change legislation should include support for the development of more efficient generation, transmission and distribution technologies, energy efficiency, and GHG-emission control and sequestration technologies through various means, including, for example,

increased funding for research, tax credits, bonding and more efficient national appliance standards.

10. Any climate change legislation involving emissions allowances, whether distributed by auction or direct allocation, should recognize State or regional efforts already undertaken to limit GHG emissions; *and be it further*

RESOLVED, That this resolution be adopted as the complete and definitive statement of NARUC's position with respect to climate change issues as of the effective date of this resolution and that it serve prospectively as a framework for development of NARUC's position with regard to climate policy.

*Sponsored by the Committees on Electricity, Gas, and Energy Resources and the Environment
Adopted by the NARUC Board of Directors July 18, 2007*



N A R U C
National Association of Regulatory Utility Commissioners

R E S O L U T I O N

Resolution on State Regulatory Policies toward Climate Change

WHEREAS, The National Association of Regulatory Utility Commissioners (NARUC) *Resolution on Implications of Climate Policy for Ratepayers and Public Utilities* (approved July 18, 2007) acknowledged the ongoing national debate over the desirability of limiting the emission of carbon dioxide and other greenhouse gases (GHG) and adopted certain policy principles that NARUC believes should be included in any federal legislation that attempts to regulate and reduce the level of such emissions; *and*

WHEREAS, Electric power generation is responsible for approximately 40 percent of U.S. emissions of carbon dioxide, the most common GHG; *and*

WHEREAS, The United Nations Intergovernmental Panel on Climate Change has concluded in its *Fourth Assessment Report* that "most of the observed increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations;" *and*

WHEREAS, There is growing support for State, regional, and federal actions to limit emissions of carbon dioxide and other GHGs; *and*

WHEREAS, The advocates of reducing the emission of carbon dioxide and other GHGs believe that the enactment of such legislation would provide substantial long-term environmental benefits and that a failure to address the impact of GHG emissions could, among other things, adversely affect the availability of water resources for hydroelectric generating facilities and cooling water for use in thermal generating facilities; *and*

WHEREAS, The advocates of reducing the emission of carbon dioxide and other GHGs believe that postponing action to reduce such emissions will increase the urgency of reducing emissions at a later time and increase the ultimate economic cost of actions taken to reduce such emissions; *and*

WHEREAS, Many U.S. financial and corporate interests, including many regulated utilities, have acknowledged that the enactment of federal legislation limiting the emission of carbon dioxide and other GHGs appears inevitable; *and*

WHEREAS, A broad coalition of multinational corporate and environmental leaders has formed the U.S. Climate Action Partnership in order to work collaboratively to address climate change issues; *and*

WHEREAS, Consistent with the States' traditional role as "laboratories of democracy," in which new and innovative approaches for meeting societal needs are developed at the State level, at least 18 States have taken action intended to limit carbon dioxide and other GHG emissions; *and*

WHEREAS, There is a substantial likelihood that federal legislation intended to reduce emissions of carbon dioxide and other GHGs (carbon regulation) will be enacted in the near future; *and*

WHEREAS, Assuming that such federal legislation will be enacted, State commissions should consider taking action to reduce the economic impact of compliance with such legislation; *and*

WHEREAS, The cost of compliance with carbon regulation may affect consumers differently depending upon a State's regulatory structure and the nature of the decisions made by State regulators; *and*

WHEREAS, The ultimate cost per ton of reducing carbon dioxide and other GHG emissions may vary dramatically depending on the State regulatory policy path chosen; *and*

WHEREAS, State utility regulators are well-positioned to evaluate carbon-related risks related to alternative resource options and to deliver economic benefits to their States through adoption of policies that appropriately account for and mitigate the risks arising from the likelihood that federal carbon regulation legislation will be enacted in the near future; *now, therefore, be it*

RESOLVED, The National Association of Regulatory Utility Commissioners, convened in its November 2007 Annual Convention in Anaheim, California, advocates that during the nation's likely transition to greater reliance upon lower-carbon resources for the generation of electric power, State regulators should consider adopting policy approaches and regulatory tools that ensure continued electric system reliability and minimize economic dislocation and costs to consumers; *and be it further*

RESOLVED, That State regulators should consider seeking to appropriately mitigate any risk of stranded utility investment, future cost increases, and reliability challenges resulting from the nation's likely transition to carbon regulation by requiring utilities to assess and incorporate carbon-related risks in their planning and decision making processes; *and be it further*

RESOLVED, That State regulators should consider addressing the nation's likely transition to carbon regulation through consideration of policy and regulatory options, such as:

- Facilitating greater reliance upon low- or no-carbon resources and technologies such as energy efficiency, high-efficiency combined heat and power, demand response, renewable generation, advanced nuclear, and emerging technologies (such as carbon capture and storage);
- Ensuring timely recovery of reasonable and prudently incurred costs associated with this transition;
- Requiring utilities to preserve system reliability while procuring resources in a manner that seeks to appropriately minimize the future cost of avoided carbon dioxide and other GHG emissions;
- Recognizing the costs and revenue streams associated with possible future emissions cap-and-trade mechanisms;
- Supporting broad-based funding for research to enable the use of thermal and other electric generating resources that result in environmentally acceptable electric generation;

- Supporting broad-based funding for research to enable the use of demand-side resources;
and be it further

RESOLVED, That NARUC urges State regulators to work collaboratively with State and local government entities, researchers and industries in considering the adoption of policies that appropriately promote cost-effective energy efficiency efforts and that give proper consideration to the benefits resulting from the use of cost-effective, low-or no-carbon technologies.

*Sponsored by the Committee on Energy Resources and the Environment
Recommended by the NARUC Board of Directors, November 13, 2007
Adopted by the Committee of the Whole, November 14, 2007*



N A R U C
National Association of Regulatory Utility Commissioners

R E S O L U T I O N

Resolution on Federal Climate Legislation and Cap-and-Trade Design Principles

WHEREAS, The National Association of Regulatory Utility Commissioners (NARUC) formed a Task Force on Climate Policy in March 2007 in order to educate NARUC members concerning climate policy issues and to develop policy proposals for consideration by the NARUC membership; *and*

WHEREAS, The NARUC Board of Directors adopted a resolution sponsored by the Task Force on Climate Policy at the 2007 NARUC Summer Meetings held in New York, New York, on July 18, 2007, that enunciated ten policy principles that NARUC believes should inform federal climate policy; *and*

WHEREAS, The relative merits of a market mechanism proposed for inclusion in any federal climate change legislation, including, but not limited to, a cap-and-trade mechanism, a carbon tax, and a load-side cap, should be carefully evaluated in determining how to achieve the desired emissions reductions consistent with the ten principles previously adopted by NARUC; *and*

WHEREAS, Congress has continued to debate various policy proposals for addressing the environmental and economic consequences of alternative climate change policies since the 2007 NARUC Summer Meetings; *and*

WHEREAS, Since the 2007 NARUC Summer Meetings, the Task Force on Climate Policy has also continued to examine various policy proposals relating to climate change issues; *and*

WHEREAS, The momentum for enactment of federal legislation regulating the emission of greenhouse gases (GHG) appears to have further increased, making the enactment of such legislation within the foreseeable future likely; *and*

WHEREAS, The existence of uncertainty about the nature and extent to which GHG emissions will be subject to future federal regulation makes it difficult for State regulators, regulated utilities, and others to appropriately plan for needed investments in electric transmission and generation infrastructure; *and*

WHEREAS, Despite a diversity of opinion within NARUC's membership regarding the need for national limitations on the emission of GHGs for the purpose of addressing concerns over warming of the Earth's climate, NARUC's members are in general agreement that the enactment of federal legislation limiting such emissions in would be appropriate in order to remove existing uncertainties that are hampering the making of transmission and generation investment decisions; *and*

WHEREAS, NARUC's members are also in general agreement that appropriate federal climate change legislation should be enacted in order to enhance the likelihood that appropriate

technologies will be developed and other solutions implemented so as to achieve desired reductions in GHG emissions in the most economical manner possible; *now, therefore, be it*

RESOLVED, That the National Association of Regulatory Utility Commissioners, convened in its November 2007 Annual Convention in Anaheim, California, supports the enactment of federal legislation intended to reduce GHG emissions so long as such legislation relies, to the extent practicable, on an appropriate market mechanism or mechanisms as part of an economy-wide approach to GHG regulation; provides for an appropriate transition period prior to the implementation of full regulation of GHG emissions; creates sufficient certainty to ensure the financing of needed energy infrastructure consistent with the achievement of the environmental objectives intended to be accomplished by such legislation; and is otherwise consistent with the policy principles developed by the Task Force on Climate Policy and approved by the NARUC Board of Directors at the 2007 NARUC Summer Meetings held in New York, New York, on July 18, 2007; *and be it further*

RESOLVED, That the Task Force on Climate Policy should consider and develop, as appropriate, proposed resolutions for NARUC's consideration addressing additional market mechanisms including, but not limited to, a carbon tax and a load-side cap; *and be it further*

RESOLVED, That, in the event that Congress chooses to implement a cap and trade mechanism for the purpose of limiting electric sector GHG emissions, any such federal climate change legislation should rest upon the following cap-and-trade design principles in order to appropriately balance competing criteria, including, but not limited to, equity, economic efficiency, and ease of administration:

1. Auctioning of all allowances is ultimately the most economically efficient mechanism for achieving emission reduction goals from electric generation. However, the allocation of emission allowances within the electricity sector at no cost is an appropriate transitional measure in order to ensure continued reliability, minimize economic dislocation resulting from the carbon intensity of the existing electricity generation infrastructure, and allow for the development of appropriate new technology.
2. Any emissions allowance allocation program, consistent with an economy-wide approach, should involve a reduction in the number of allowances allocated within the electricity sector over time to ensure that needed reductions in GHG emissions are encouraged through a gradual increase in the cost of carbon-intensive generation sources as compared to the cost of other generation sources.
3. The primary purpose of any transitional emissions allowance allocation process applicable to the electricity sector should be to minimize the initial economic impact of GHG-emissions regulation to end-user customers by phasing in the impact of such regulation over a reasonable period of time.
4. Any emissions allowance allocation program should produce reasonable outcomes, consistent with these cap-and-trade design principles, regardless of applicable electricity market or regulatory structures.

5. Any emissions allowance allocation program should assign all allocated allowances available to the electricity sector to local distribution companies providing a regulated local distribution function for end-user customers (including vertically-integrated utilities, distribution utilities, rural-electric cooperatives, municipal distribution systems, and all other entities providing distribution service directly to end-user customers subject to State regulation or its equivalent). This approach will allow State PUCs or other authorities to ensure that the value of these no-cost allowances will inure to the benefit of end-use consumers. Alternatively, States should be able to adopt other methods for distributing benefits to end-use consumers.
6. The assignment of no-cost allocated allowances to local distribution companies as defined above should be based primarily on the level of GHG-emissions from the resources used to provide service to the local distribution company's load during an appropriate baseline period.
7. Any emissions allowance allocation program should not inappropriately advantage or disadvantage particular regions, local distribution companies (as defined above), or generators, and should ensure that end-user customers receive the benefit of allocated emissions allowances for the purpose of offsetting the increased costs resulting from the institution of GHG-emissions regulation.
8. Any assignment of allocated emissions allowances should seek to accommodate any efforts made in particular regions or States to reduce GHG-emissions in anticipation of the enactment of federal legislation regulating GHG-emissions.
9. In defining the baseline period, proper precautions should be taken to ensure that counterproductive behavior by any allowance market participants is discouraged and that gaming does not occur.
10. Cost-containment measures should be included in any cap-and-trade mechanism in order to minimize abrupt changes in the cost of compliance, including during the initial phases of implementation, which could adversely affect electricity consumers or allowance markets. Such measures should be designed to achieve effective and appropriate environmental benefits while ensuring price stability and predictability, promoting investment in appropriate technologies, and minimizing adverse consumer impacts, including price volatility; *and be it further*

RESOLVED, That any federal climate change legislation should be consistent with existing NARUC policies regarding non-discriminatory wholesale competition; demand response; energy efficiency; renewable generation; generation resource adequacy; fuel diversity; the development of clean coal and improved nuclear technologies; and the development of a comprehensive solution for the existing nuclear waste disposal problem.

*Sponsored by the Committees on Electricity, Energy Resources and the Environment, and Gas
Recommended by the NARUC Board of Directors, November 13, 2007
Adopted by the Committee of the Whole, November 14, 2007*

Mr. BOUCHER. Thank you very much, Mr. Kerr.
Mr. Trisko, we will be happy to hear from you.

**STATEMENT OF EUGENE M. TRISKO, COUNSEL TO UNITED
MINE WORKERS OF AMERICA**

Mr. TRISKO. Thank you, Chairman Boucher, Ranking Member Upton and distinguished members of the subcommittee. I am very pleased to be here today to testify on behalf of the United Mine Workers of America to support enactment of H.R. 6258.

This bill provides an essential foundation for national climate change legislation by establishing a secure, non-budget source of financing for demonstrating the technical feasibility of carbon capture and storage technologies. CCS technologies are the only means for assuring that domestic coal can continue to supply the majority of our electric-generating needs in a carbon-constrained environment. The UMWA supports national climate change legislation. The union is mindful, however, that imprudent climate change legislation potentially represents the greatest threat to its membership and to the continued use of coal.

More than half of our Nation's electricity is generated by coal, principally in large baseload power plants. Intermittent renewables such as wind energy cannot replace baseload coal and usually are backed up with natural gas. At the margin, our gas supplies are imported from Canada and from unstable foreign markets in the form of LNG.

H.R. 6258 represents a major step forward in advancing the technologies that will allow coal to be consumed in a carbon-constrained environment. It will help us once and for all put to rest the myth of dirty coal.

In January 2008, U.S. EPA's Advanced Coal Technology Work Group, representing a broad array of stakeholders, including the mine workers, unanimously recommended that Congress immediately enact legislation to create an early deployment fund to defray the additional costs and risks of CCS technologies. This recommendation was not tied to or in any manner contingent upon enactment of broader climate change legislation. The Work Group recommended raising approximately \$1 billion annually through non-budget mechanisms such as temporary fees on fossil-fueled electricity.

H.R. 6258 translates these recommendations to reality. It calls for the creation of an industry-operated Carbon Storage Research Corporation to assess modest fees on electricity from coal, oil and gas, reflecting the relative CO₂ emissions of each fuel type. In short, the bill embraces the polluter-pays principle.

The bill directs that projects to be supported should be geographically diverse, using a variety of coal and other fossil fuel, and employing carbon capture technologies that could be used on new or existing power plants. The bill also provides for potential support to U.S. DOE and related governmental and academic programs. The UMWA envisions an active working partnership among the corporation, U.S. DOE and its national labs and other research entities collectively supporting major projects that have the greatest promise of demonstrating the technical and economic feasibility of CCS.

Moreover, the United States must take the lead in establishing the technical viability of CCS for use both here and abroad. The world's ability to stabilize future global CO₂ concentrations depends upon the willingness of major developing economies like India and China to accept meaningful commitments to reduce their future rate of emissions. Our leadership in CCS technologies is critical to the world's ability to use coal in an environmentally responsible manner.

As the EPA Work Group recognized, we cannot depend entirely upon the appropriations process to deliver the magnitude of financial support needed to commercialize these technologies. By providing a more stable form of long-term support, this bill can create the bases for independent private financing of coal-based energy technologies that otherwise might never get off the drawing board.

Mr. Chairman, the UMWA conveys its sincere appreciation for the leadership that you, sir, have taken in moving this bill forward to attract a broad bipartisan basis of support. The union stands ready to work with you and the Committee to do whatever it can to help make this program a reality. Thank you.

[The prepared statement of Mr. Trisko follows:]

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**Statement on behalf of the
United Mine Workers of America, AFL-CIO
Before the
Energy and Air Quality Subcommittee
Committee on Energy and Commerce
U.S. House of Representatives
July 10, 2008
HR 6258, "Carbon Capture and Storage Early Deployment Act"**

Chairman Boucher, Ranking Member Upton and distinguished members of the Subcommittee:

I am pleased to be here today to testify on behalf of the United Mine Workers of America (UMWA), the labor union representing the nation's organized coal miners. I have represented the UMWA in clean air and global climate change issues for some 20 years. A copy of my bio is Attachment 1, and a summary of my statement is Attachment 2 hereto.

The UMWA is here to support enactment of HR 6258, the Carbon Capture and Storage Early Deployment Act. HR 6258 provides an essential foundation for national climate change legislation by establishing a secure, non-budget source of financing for demonstrating the technical and commercial feasibility of carbon

capture and storage (CCS) technologies. CCS technologies are the only means for² assuring that domestic coal can continue to supply the majority of our electric generating needs in a carbon-constrained environment. The UMWA also regards CCS technologies as a major potential source of new well-paying “green” jobs involving a wide range of skills.

Background

First, let me offer a few historical facts that underpin the UMWA’s support for HR 6258. Since 1990, the UMWA has lost thousands of coal mining jobs as a consequence of fuel-switching in response to the market-based acid rain provisions of Title IV. The union fought, but ultimately lost, a 10-year legislative battle to require large electric utility coal plants to install available scrubber technologies to reduce their sulfur emissions. Coal production in major eastern coal producing states declined by more than 113 million annual tons between 1990 and 2000, while more than 30,000 coal mining jobs were lost. Most of these job losses were the result of switching from higher- to lower-sulfur coals to meet the emission reductions required by Title IV. Dozens of mining communities have all but ceased to exist across economically-depressed Appalachia and the rural Midwest. The UMWA is intent upon avoiding a repeat of this history.

The UMWA supports national climate change legislation. The UMWA also recognizes that imprudent climate change legislation potentially represents the

greatest threat to its membership and to the continued use of coal. This is why the³ UMWA views HR 6258 as an essential component of an overall legislative approach to climate change.

The UMWA and the AFL-CIO endorsed the bipartisan Bingaman-Specter climate change bill (S.1766) in July 2007. That bill provided an appropriate balance of technology incentives, reasonable emission reduction targets and timetables, and safeguards for the economy. Unlike the climate bill recently debated by the Senate, S. 1766 would not lead to wrenching changes in energy markets or to widespread job losses throughout the economy.

The Role of Coal in America's Energy Supply

Coal is an indispensable part of America's energy supply. The U.S. has a demonstrated coal reserve base of over 500 billion tons, with an estimated 275 billion tons of recoverable reserves. Our recoverable coal reserves have the energy equivalent of about one trillion barrels of oil, an amount comparable to the world's known oil reserves.

More than one-half of our nation's electricity is generated by coal, principally in baseload plants. Intermittent renewables such as wind cannot replace baseload coal, and usually are backed up with natural gas. To reduce coal in our energy supply mix means using another fuel to replace it for baseload generation, most likely a combination of nuclear and natural gas. Such a

fundamental shift in U.S. energy policy would bring into question not only the cost but also the availability of natural gas supplies. Substantial increases in demand for natural gas inevitably would lead to much higher electric generation costs and greater dependence on foreign sources for supply. At the margin, our gas supplies are imported from Canada and from unstable foreign markets in the form of LNG. Current LNG imports are economically limited because the prices of LNG are soaring due to demand from the EU.

Natural gas futures prices now exceed \$14 per million BTU at the wellhead for February 2009 delivery, and persist at levels above \$10 for purchases several years into the future.¹ Environmental policies that drive electric utilities away from coal – which DOE/EIA projects will cost less than \$3 per million BTU delivered to electric power plants in 2008² – conflict not only with our energy policy goal of maintaining a reliable, low-cost mix of generating sources, but with fundamental national security and defense interests.

The UMWA also recognizes that Americans demand a cleaner environment at the same time they demand low-cost energy. HR 6258 represents a major step forward in advancing the technologies that will allow coal to be consumed in an environmentally benign manner. It will help us, once and for all, to put to rest the myth of “dirty coal.”

¹ See, <http://futures.tradingcharts.com/marketquotes/NG.html> (July 4, 2008).

² DOE/EIA, Short Term Energy Outlook (June 8, 2008).

The UMWA Supports HR 6258

HR 6258 is based on the unanimous recommendations of the U.S. EPA Advanced Coal Technology Work Group (ACT). In January 2008, U.S. EPA's ACT Work Group, representing a broad array of industry, state and environmental stakeholders, including the UMWA, unanimously recommended that Congress create a Carbon Capture and Storage Early Deployment Fund to defray the additional costs and risks of these technologies.

The ACT Work Group recommended raising approximately \$1 billion annually through non-budget mechanisms such as temporary fees on fossil-fueled electricity to support creation of an Early Deployment Fund.

HR 6258 promises to translate these recommendations to reality. It calls for the creation of an industry-operated Carbon Storage Research Corporation to assess and collect modest fees on electricity produced from fossil-fueled coal, oil and gas. Approximately \$1 billion would be raised annually for a period of 10 years, to be applied directly to projects that will accelerate the commercial demonstration of CCS technologies.

Associations representing electric utility distribution companies are to conduct referenda among their members on assessment of the fees. If owners representing 67% of the total amount of fossil-fueled electricity approve the fees, the program takes effect.

The proposed fees are based on the relative carbon dioxide emissions of coal, oil and natural gas. The ACT Work Group estimates that the fees would increase electric rates by approximately 0.6 percent among electric customers. On a national level, the fees amount to less than \$10 a year per household. We note that an assessment of \$1 billion annually on consumer electric bills would represent about one-third of one percent of the \$326 billion annual retail sales of the electric power industry in 2006. This is a very small insurance premium for preserving coal as a viable and environmentally benign source of domestic energy, particularly among the vast majority of states that rely on coal for substantial portions of their electric power.

HR 6258 authorizes the Electric Power Research Institute (EPRI), an independent 501(c)(4) corporation, to create a separate subsidiary to operate the Corporation. The Corporation would be directed by a Board of twelve members representing diverse utility groups and fossil fuel producers. The Board would interact with EPRI's Public Advisory Committee. The Board of Directors is authorized to issue grants or contracts to large-scale projects that would help demonstrate the technical and commercial feasibility of CCS technologies. Reverse auctions also may be used to purchase tons of CO₂ from operational projects.

The bill directs that projects to be supported should be geographically diverse, using a variety of coal and other fossil fuels, and employing carbon

capture technologies that could be used on new or existing power plants.

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HR 6258 provides for a mid-course review by the Government Accountability Office, with a report to Congress on the Corporation's success in advancing the commercial demonstration of CCS technologies. It also provides for potential support to U.S. DOE and academic programs focused on CCS, including the Regional Carbon Sequestration Partnerships.

The UMWA envisions an active working partnership among the Corporation, U.S. DOE and its national labs and other research entities, collectively supporting major projects that have the greatest promise of demonstrating the technical and economic feasibility of CCS. DOE's recent restructuring of the FutureGen program to focus on CCS applications suggests precisely this kind of cooperation.

The Need for Accelerated CCS Demonstrations

CCS technology will store carbon dioxide emissions from power plants underground in deep storage sites, such as saline aquifers and shale formations. The U.S. is estimated to have several hundreds of years of storage potential at many locations across the nation.

Adequate federal funding is not available to accelerate the development of carbon capture and sequestration as a commercial option for meeting greenhouse gas reduction goals. The MIT report, *The Future of Coal* (2007), stressed that:

“Today, and independent of whatever carbon constraints may be chosen, the priority objective with respect to coal should be the successful large-scale demonstration of the technical, economic, and environmental performance of the technologies that make up all of the major components of a large-scale integrated CCS system — capture, transportation and storage.

MIT also concluded that current funding for advancing CCS was

“completely inadequate”:

“At present government and private sector programs to implement on a timely basis the required large-scale integrated demonstrations to confirm the suitability of carbon sequestration are completely inadequate. If this deficiency is not remedied, the United States and other governments may find that they are prevented from implementing certain carbon control policies because the necessary work to regulate responsibly carbon sequestration has not been done.”

Relationship of CCS to Climate Change Legislation

The UMW’s support for the Bingaman-Specter bill reflects agreement with its emission reduction targets and timetables, incentives for the commercialization of CCS technologies, projected moderate impacts on the U.S. economy, and on coal utilization in the electric utility sector. Striking the right balance among these variables is essential for the welfare of American consumers and workers.

The U.S. must take the lead in establishing the technical and commercial viability of CCS technologies for use both here and abroad. The world's ability to stabilize global CO₂ concentrations – the long-term goal of the U.N. Framework Convention on Climate Change - depends largely upon the willingness of major developing economies like India and China to accept meaningful commitments to reduce their future rate of emissions. These countries have vast coal reserves, and will continue to rely upon them to support their economic development.

The UMWA wishes to bring to the Subcommittee's attention the potential consequences of climate change legislation that does not provide adequate time or incentives for the full commercial deployment of CCS technologies. The union did not support S. 2191 primarily due to its adverse impacts on the economy and on American workers. Most of these impacts resulted from the bill's unrealistic schedule of emissions reductions required by 2020, just 12 years from now. Recent analyses by U.S. EPA³ and DOE/EIA⁴ confirm our judgment in this regard.

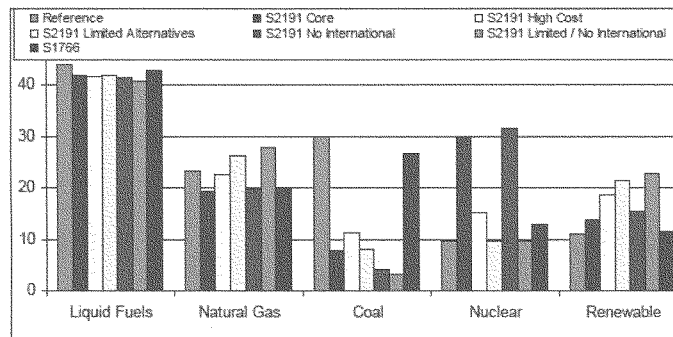
Both EPA and EIA's analyses of S. 2191 indicate that U.S. coal production for electric generation would be curtailed sharply, mainly reflecting the low availability of CCS technology to meet the bill's target of a 15% reduction below 2005 emissions by 2020. The following EIA chart summarizes the bill's impacts

³ U.S. EPA, "Analysis of the Lieberman-Warner Climate Security Act of 2008 (March 14, 2008).

⁴ U.S. DOE, Energy Information Administration, "Energy Market and Economic Impacts of S. 2191, the Lieberman-Warner Climate Security Act of 2007 (April 2008).

on coal utilization in 2030 for alternative cases, including a comparison to the Bingaman-Specter bill (S. 1766):

Primary Energy Consumption by Fuel in 2030,
S. 2191 Cases and S. 1766 Update
(In quadrillion BTUs)



Source: DOE/EIA, n.4, Figure ES-1.

The table below summarizes EIA's findings for electricity generated by coal and natural gas under its business-as-usual Reference Case, Core S. 2191 case, and "Limited Alternatives" case for 2020 and 2030. EIA's core case assumes that nuclear generation will triple by 2030. The limited alternatives case constrains coal-based CCS, new nuclear power, and renewables generation to reference case levels.

EIA S.2191 Projections of Coal and Natural Gas Electric Generation,
2020 and 2030
(Billions of Kilowatt-Hours and Pct. Chg. from 2006)

	2006	2020 Ref. Case	2020 Core Case	2020 Ltd. Alter.	2030 Ref. Case	2030 Core Case	2030 Ltd. Alter.
Coal	1,988	2,357 +19%	1,890 -5%	1,606 -19%	2,838 +20%	703 -65%	703 -65%
N.Gas	806	833 +3%	761 -6%	1,094 +36%	741 -8%	427 -47%	1,558 +93%

Source: DOE/EIA, n.4, Table ES2.

These findings, showing a 65% reduction in coal use in both the core and limited alternatives cases from 2006 levels, underscore UMWA's concerns about the impacts of overly aggressive climate change targets and timetables when CCS is not commercially available on a widespread basis. EIA projects huge increases in the demand for natural gas in the limited alternatives case, with adverse implications for other industries and consumers dependent on scarce gas resources. If EIA's core case assumptions about the robust growth of nuclear power proved optimistic, utilities would have little choice but to switch from coal to natural gas on a massive, unprecedented scale.

EPA's results for S. 2191 are consistent with EIA's findings. EPA projects that coal production for electric generation would decline from 1.1 billion tons in 2010 to less than 800 million tons in 2020, and to less than 700 million tons by

2025 – a reduction of nearly 40% from 2010 production.⁵ This is simply not an energy future that this nation can afford.¹²

Conclusion

HR 6258 takes a critical step forward in advancing the commercial readiness of CCS technologies to enable coal and other domestic fossil fuels to continue to supply the nation's electric generation needs. The bill is not a substitute for national climate legislation, but lays the foundation necessary for our nation to reduce its carbon footprint without increasing our dependence on unstable foreign energy supplies such as imported LNG.

It is not reasonable to expect that we can depend entirely upon the appropriations process to deliver the magnitude of financial support needed to address the challenges of commercializing CCS technologies. HR 6258 provides a more secure and stable form of long-term resource support, potentially capable of providing the bases for independent private financing of a variety of coal-based energy technologies that otherwise might never get off the drawing board.

The UMWA thanks the Chairman, the Ranking Member, and the Subcommittee for their consideration of its views.

⁵ U.S. EPA, n.3, at 46.

Attachment I

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Mr. Trisko has a B.A. in economics and politics from New York University (1972) and a J.D. degree from Georgetown University Law Center (1977). He is admitted in the District of Columbia, and has appeared before the U.S. Court of Appeals for the D.C. Circuit in matters concerning the Clean Air Act. He has lectured on the Clean Air Act and climate change at Penn State University, the University of Virginia, and West Virginia University College of Law.

Mr. Trisko was active on behalf of the United Mine Workers of America in the reauthorization of the 1990 Clean Air Act Amendments. He has participated as an NGO on behalf of the UMWA in all United Nations climate change negotiating sessions since the 1992 Rio Earth Summit. In 2006 and 2007, he represented the UMWA in mercury proceedings in Pennsylvania, and in the Illinois Climate Change Advisory Group. He currently represents the Illinois AFL-CIO, the UMWA and IBEW local unions in the Midwest Governors' Association climate initiative.

Mr. Trisko is a member of U.S. EPA's Clean Air Act Advisory Committee. He served on EPA's Mercury MACT Work Group from 2003 to 2005, and on the Advanced Coal Technology Working Group in 2007-08. In 2000 and again in 2007, he was appointed by the U.S. Department of State to represent U.S. labor and stationary source interests as a member of the U.S. Delegation in bilateral air quality negotiations with Canada.

Mr. Trisko is the author of more than 20 articles on energy, climate and clean air policy issues published in environmental and law journals. Before entering private practice, he served as an attorney with the Federal Trade Commission, and as an energy economist. He has appeared as an expert witness on utility cost of capital before several state public service commissions.

Attachment 2

**Summary Statement of Eugene M. Trisko on behalf of the
United Mine Workers of America, AFL-CIO
July 10, 2008
HR 6258, "Carbon Capture and Storage Early Deployment Act"**

I am pleased to be here today to testify on behalf of the United Mine Workers of America (UMWA) to support enactment of HR 6258.

HR 6258 provides an essential foundation for national climate change legislation by establishing a secure, non-budget source of financing for demonstrating the technical and commercial feasibility of carbon capture and storage (CCS) technologies. CCS technologies are the only means for assuring that domestic coal can continue to supply the majority of our electric generating needs in a carbon-constrained environment.

The UMWA supports national climate change legislation. The UMWA is mindful, however, that imprudent climate change legislation potentially represents the greatest threat to its membership and to the continued use of coal. That is why the UMWA strongly supports HR 6258 as an essential component of an overall legislative approach to climate change.

Coal is an indispensable part of America's energy supply. More than one-half of our nation's electricity is generated by coal, principally in baseload plants. Intermittent renewables such as wind cannot replace baseload coal, and usually are backed up with natural gas. At the margin, our gas supplies are imported from Canada and from unstable foreign markets in the form of LNG.

HR 6258 is based on the unanimous recommendations of the U.S. EPA Advanced Coal Technology Work Group (ACT). In January 2008, the ACT Group recommended raising approximately \$1 billion annually through non-budget mechanisms such as temporary fees on fossil-fueled electricity to support early commercial demonstrations of CCS technologies.

HR 6258 promises to translate these recommendations to reality. It invites industry associations to approve the creation of a Carbon Storage Research Corporation to assess and collect modest fees on electricity produced from coal, oil and gas. Approximately \$1 billion would be raised annually for a period of 10 years. The bill directs that projects to be supported should be geographically diverse, using a variety of coal and other fossil fuels, and employing carbon capture technologies that could be used on new or existing power plants.

The bill provides for a mid-course review by the Government Accountability Office. It also provides for potential support to and cooperation with U.S. DOE and academic programs focused on CCS, including the Regional Carbon Sequestration Partnerships.

The U.S. must take the lead in establishing the technical and commercial viability of CCS technologies for use both here and abroad. India and China have vast coal reserves, and will continue to rely upon them to support their economic development.

It is not reasonable to expect that we can depend entirely upon the appropriations process to deliver the magnitude of financial support needed to address the challenges of commercializing CCS technologies. HR 6258 provides a more stable form of long-term resource support, potentially capable of providing the bases for independent private financing of a variety of coal-based energy technologies that otherwise might never get off the drawing board.

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Mr. BOUCHER. Thank you very much, Mr. Trisko.
Mr. Goo.

**STATEMENT OF MICHAEL GOO, CLIMATE LEGISLATIVE
DIRECTOR, NATURAL RESOURCES DEFENSE COUNSEL**

Mr. GOO. Chairman Boucher and Ranking Member Upton, thank you for holding this hearing on H.R. 6258, the Carbon Capture and Storage Early Deployment Act. My name is Michael Goo. I am the climate Legislative Director for the Natural Resources Defense Council. We appreciate the opportunity to testify.

Chairman Boucher, the introduction of this legislation marks yet another step forward in our search for the solution to the urgent problem of global warming but we believe it must be part of a comprehensive package of measures. I want to commend you and Ranking Member Upton and the other members of the Committee who have cosponsored this bill for taking on directly one of the most important and toughest challenges in the global warming arena, that is, the role of coal combustion, and for trying to find ways to encourage the early deployment of carbon capture and disposal technologies. To help us stop global warming as soon as possible, we really need your leadership in this area.

As the global warming debate has progressed, too often we tend to focus on areas of disagreement and not enough on areas of agreement, so I would like to begin by emphasizing some of the things that I hope most or even all of us can agree on. First, urgent action to combat global warming is required immediately. Second, that emissions of CO₂ from the burning of coal are a major source of global warming. Third, for some time to come, we will continue to use coal as part of our energy mix. Fourth, since we will likely continue to use substantial amounts of coal, we must ensure the deployment of technologies to capture and dispose of CO₂ from coal. And fifth and perhaps most importantly, it will always be cheaper to vent CO₂ into the atmosphere than to capture and store it. These are the things that I hope we can agree on.

But turning to something that I expect there will be less agreement, but which is still true, I wish to emphasize that we have the technology now to start to deploy the first wave of carbon capture and sequestration technologies. I don't want you to accept that at face value from me, I am an environmentalist, but I would also ask that you not accept positions from people who have vested financial interest to the opposite in delaying limits on carbon capture and storage. I don't expect you to believe me but you should listen to the words of the president and chairman of BP America, Robert Malone, in testimony before Congress this year, and he said deploying CCS at scale is not as much a question of technology availability but of economic viability. CCS is available today to play a significant role in reducing greenhouse gas emissions and addressing climate change. Those are not my words, those are his words.

So what is needed then is an appropriate economic incentive for deployment, not further research and development that will serve as an excuse for delay. Many companies already, such as NRG, Tenaska, and BP, are already acting now in anticipation of caps on global warming pollution and are building facilities to capture and dispose of their CO₂. They are not so much worried about the tech-

nology as they are about the economics. The single most effective thing that one could do to encourage more early deployment of CCS technology is to enact cap-and-trade legislation that will provide a price signal to power producers using coal. There is an old saying: give a man a fish, feed him for a day, teach a man to fish, feed him for a lifetime. It is the same thing with CCS. If we give you a CCS plant, there will be one, there will be two, there will maybe be three CCS plants. Put a price cap in place, there will be large, widespread deployment of CCS technology immediately. The industry will learn how to produce electricity and capture and control their carbon. Without a cap, pushing CCS into the marketplace is like using a wet noodle to push a rock uphill. It just doesn't work.

Now, even with a cap in place, we have some other suggestions about ways to incentivize early deployment of CCS that would provide even stronger incentive for deployment of CCS, and these include a fixed feed-in approach described in my testimony that would provide a substantial subsidy to the earliest adopters of CCS, it would create a race to deploy CCS, a low-carbon generation obligation that functions like a renewable electricity standard, and a performance standard for new coal-fired power plants like what has already been adopted in California.

And with regard to the specifics of H.R. 6258, we have some suggestions outlined in my testimony for further ways to improve its efficacy, transparency, and fairness to consumers, which we will be happy to discuss further.

Mr. Chairman, thank you again for your efforts in this regard and for inviting NRDC to testify. We look forward to working with you on comprehensive global warming legislation and on specific proposals to encourage early deployment of CCS technologies.

[The prepared statement of Mr. Goo follows:]



Michael Goo
Climate Legislative Director, Climate Center
Natural Resources Defense Council

Testimony Before the
Subcommittee on Energy and Air Quality
U.S. House of Representatives

Hearing On
H.R. 6258 "The Carbon Capture and Storage Early
Deployment Act"

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Deployment Act”
July 10, 2008

Thank you for the opportunity to testify today on H.R. 6258, “The Carbon Capture and Storage Early Deployment Act.” My name is Michael Goo. I am the Climate Legislative Director of the Climate Center at the Natural Resources Defense Council (NRDC). NRDC is a national, nonprofit organization of scientists, lawyers and environmental specialists dedicated to protecting public health and the environment. Founded in 1970, NRDC has more than 1.2 million members and online activists nationwide, served from offices in New York, Washington, Los Angeles and San Francisco, Chicago and Beijing.

Chairman Boucher and Ranking Member Upton, thank you for holding this hearing on H.R. 6258, “The Carbon Capture and Storage Early Deployment Act.” As you know, there is a pressing need to enact comprehensive global warming legislation immediately. Our planet is warming and we are continuing to emit billions of tons of global warming pollution each year, locking in further warming for decades to come. The effects of this warming will be to inflict large and growing damage to human health, economic well-being, and natural ecosystems. We cannot afford to wait any longer to address this urgent problem and we urge this Committee and the Congress to act as soon as possible.

H.R. 6258, “The Carbon Capture and Storage Early Deployment Act” represents a bipartisan attempt to begin to address one of the most important issues in the global warming legislative debate: the role of coal and the pressing need for deployment of technologies that can capture and dispose of CO₂ generated from the combustion and use of coal.

Without widespread deployment of such technology, the task of fighting global warming will be more difficult. I commend Chairman Boucher for raising and exploring this important issue and for making clear that such legislation is not intended to substitute for comprehensive global warming legislation. NRDC believes such legislation should only be enacted as part of cap and trade legislation. Keeping in mind that we must enact comprehensive legislation immediately, we are pleased to be invited to explore the merits of the approach embodied in H.R. 6258.

The role of coal combustion in global warming is well established. Coal is the most abundant fossil fuel and is distributed broadly across the world. It has fueled the rise of industrial economies in Europe and the U.S. in the past two centuries and is fueling the rise of Asian economies today. Because of its abundance, coal has historically been a cheap source of energy, which has made it attractive to use in large quantities- but only if we are willing to ignore the harm it causes.

However, per unit of energy delivered, coal today is a bigger global warming polluter than any other fuel: double that of natural gas; 50 percent more than oil; and, of course, enormously more polluting than renewable energy, energy efficiency, and, more controversially, nuclear power. To reduce coal's contribution to global warming, we must deploy and improve systems that will keep the carbon in coal out of the atmosphere when it is used, specifically systems that capture carbon dioxide (CO₂) from new coal-fired power plants and other industrial sources for safe and effective disposal in geologic formations. To distinguish this industrial capture system from removal of atmospheric CO₂ by soils and vegetation, I will refer to the industrial system as Carbon Capture and Disposal or CCD.

H.R. 6258 would create a fund for "accelerating the commercial demonstration or availability" of CCD technologies. The fund would be financed via a surcharge on electricity generated from fossil fuels. The fund would only be created if electricity producers representing two thirds of the fossil based electricity generation agreed to the surcharge. The fund would be operated as a division of the Electric Power Research Institute and funds would be disbursed for deployment of large scale CCD technologies.

With the current rush to build new coal plants, here and abroad, (and the modest pace of deploying even currently available renewable technologies and energy conservation strategies) it is likely that coal will continue to play a role in our energy future. Accordingly, we need to establish ways in which to encourage and require the widespread capture and disposal of the global warming pollution from these plants as soon as possible. H.R. 6258 provides a useful proposal that could help us achieve that result, but only in part.

As discussed more fully below, by itself, H.R. 6258 is not sufficient to ensure early deployment of CCD and is only a small part of the legislative work we need to complete in order to effectively combat the threat of global warming. In order to ensure that our climate is protected, we must enact mandatory limits on global warming pollution. And the best way to do that, while also incentivizing technology and lowering costs, is through a cap and trade system. As many analysts, including the Congressional Budget Office,¹ have pointed out, in order to effectively incentivize deployment of CCD and

¹ See "Evaluating the Role of Prices and R&D in Reducing Carbon Dioxide Emissions." Congressional Budget Office, September 2006. at p. 16. "The Congressional Budget Office identified three published analyses that simulate the effects of both emissions pricing and R&D. While CBO recognizes the limitations of those modeling efforts and does not endorse any specific quantitative results, those models suggest that a combination of the two approaches—pricing emissions in the near term and funding R&D—would be necessary to reduce carbon emissions at the lowest possible cost. Further, they suggest that the largest gains in efficiency are likely to come from pricing emissions rather than from funding R&D."

other low carbon technologies, both a carbon price signal (through a cap and trade program) and additional financial incentives are necessary. Neither alone will suffice.

Thus, NRDC's primary point with regard to H.R. 6258 is that it cannot be thought of as a replacement or substitute for a full cap and trade program, nor can it be allowed to serve as a recipe for delay in enacting such a program. In addition, we believe that the amounts of money provided by H.R. 6258 are not adequate to achieve timely deployment of CCD systems on the scale that is warranted. We look forward to discussing these issues with Chairman Boucher and the other Committee members.

We also want to emphasize that technologies to capture and dispose of carbon dioxide emissions from coal fired power plants and other sources are available today. What is needed is a cap and trade system and additional incentives for commercial deployment of the first generation of such systems. At this point, commercial deployment of such systems does not require further substantial research and development efforts, it requires the right economic incentives. Although further research and development for additional technologies will continue to be necessary, pursuing those R&D activities should not serve as an excuse for delaying action in terms of limiting emissions, both nationally and from new coal fired power plants in particular. We already know enough to start limiting emissions now.

Finally, it bears mentioning that the production and use of coal remains one of the most environmentally destructive forms of energy supply for many of our citizens and communities in Appalachia, the West and other coal-producing regions of the country, as well as abroad. Many environmentally preferable and cheaper alternatives for meeting power demand, such as energy efficiency and renewable energy should be the primary focus of our efforts to address the nation's energy need, and must be explored with even greater vigor and zeal than our efforts to encourage CCD. The more those alternatives are explored, incentivized and deployed, the smaller the need will be for CCD. This is especially true in the earlier years of a cap and trade program, which is needed precisely in order to ensure the optimal economic mix between those abatement technologies and CCD-specific incentive measures like H.R. 6258. For that reason, I wish to begin my testimony by reviewing the negative environmental consequences of coal production, in its many forms.

The Toll from Coal

The role of coal now and in the future is controversial due to the damages its production and use inflict today and skepticism that those damages can or will be reduced to a point where we should continue to rely on it as a mainstay of industrial economies. When its real costs are ignored, coal appears to be a cheap source of energy compared to oil and natural gas. But in reality the toll from coal as it is used today is enormous.

From mining deaths and illness and devastated mountains and streams from practices like mountain top removal mining to accidents at coal train crossings, to air emissions of acidic, toxic, and heat-trapping pollution from coal combustion, to water pollution from coal mining and combustion wastes, the conventional coal fuel cycle is among the most

environmentally destructive activities on earth. Certain coal production processes are inherently harmful and while our society has the capacity to reduce many of today's damages, to date, we have not done so adequately nor have we committed to doing so. These failures have created well-justified opposition by many people to continued or increased dependence on coal to meet our energy needs.

Our progress of reducing harms from mining, transport, and use of coal has been frustratingly slow and an enormous amount remains to be done. Today mountain tops in Appalachia are destroyed to get at the coal underneath and rocks, soil, debris, and waste products are dumped into valleys and streams, destroying them as well. Waste impoundments loom above communities (including, in one particularly egregious case, above an elementary school) and thousands of miles of streams are polluted. In other areas surface mine reclamation is incomplete, inadequately performed and poorly supervised due to regulatory gaps and poorly funded regulatory agencies.

In the area of air pollution, although we have technologies to dramatically cut conventional pollutants from coal-fired power plants, in 2004 only one-third of U.S. coal capacity was equipped with scrubbers for sulfur dioxide control and even less capacity applied selective catalytic reduction (SCR) for nitrogen oxides control. And under the administration's so-called CAIR rule, even in 2020 nearly 30 percent of coal capacity will still not employ scrubbers and nearly 45 percent will lack SCR equipment. And even these limits are in peril as a result of coal industry litigation. Moreover, because this administration has deliberately refused to require use of available highly effective control technologies for mercury (a potent neurotoxin), we will suffer decades more of cumulative dumping of this toxin into the air at rates several times higher than is necessary or than faithful implementation of the Clean Air Act would achieve. Finally, there are no controls in place for CO₂, the global warming pollutant emitted by the more than 330,000 megawatts of coal-fired plants; nor are there any CO₂ control requirements adopted today for old or new plants save in California.

Mr. Chairman and members of the committee, the environmental community has been criticized in some quarters for our generally negative view regarding coal as an energy resource. But consider the reasons for this. Our community reacts to the facts on the ground and those facts are far from what they should be if coal is to play a role as a responsible part of the 21st century energy mix. Rather than simply decrying the attitudes of those who question whether using large amounts of coal can and will be carried out in a responsible manner, the coal industry in particular should support policies to correct today's abuses and then implement those reforms. Were the industry to do this, my community and other critics of coal might consider whether some of their positions should be re-evaluated. As it is, the mining and use of coal continues to be among the most environmentally damaging of all energy forms.

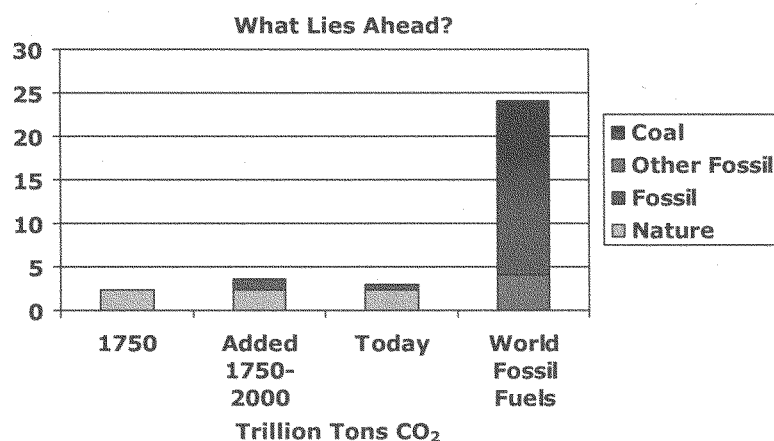
The Need for CCD

Turning to CCD, NRDC supports rapid deployment of such capture and disposal systems for sources using coal. Such support is not a statement about how dependent the U.S. or the world should be on coal and for how long. Any significant additional use of coal that

vents its CO₂ to the air is fundamentally in conflict with the need to keep atmospheric concentrations of CO₂ from rising to levels that will produce dangerous disruption of the climate system; thus, any new coal-based facilities that would emit significant quantities of CO₂ should be designed to capture their CO₂ emissions and required to do so. Clearly, an immediate world-wide halt to coal use is not plausible, but analysts and advocates with a broad range of views on coal's role should be able to agree that, for all new plants, CCD should be rapidly deployed to minimize CO₂ emissions from any new coal-based energy production, and applied as soon as feasible to reduce CO₂ from already existing sources.

Today coal use and climate protection are on a collision course. Without rapid deployment of CCD systems, that collision will occur quickly and with spectacularly bad results. The very attribute of coal that has made it so attractive—its abundance—magnifies the problem we face and requires us to act now, not a decade from now. Until now, in the view of some, coal's abundance has been an economic boon. But today, coal's abundance, absent corrective action, is more bane than boon.

Since the dawn of the industrial age, human use of coal has released about 150 billion metric tons of carbon into the atmosphere—about half the total carbon emissions due to fossil fuel use in human history. But that contribution is the tip of the carbon iceberg. As much as another 4 *trillion* metric tons of carbon are contained in the remaining global coal resources. That is a carbon pool nearly seven times greater than the amount in our pre-industrial atmosphere. Using that coal without capturing and disposing of its carbon means a climate catastrophe.



Source: Natural Resources Defense Council

And the die is being cast for that catastrophe today, not decades from now. Decisions being made today in corporate board rooms, government ministries, and congressional hearing rooms are determining how the next coal-fired power plants will be designed and operated. Power plant investments are enormous in scale, costing more than \$1 billion per plant, and plants built today will operate for 60 years or more. The International Energy Agency (IEA) forecasts that more than \$5 trillion will be spent globally on new power plants in the next 25 years. Under IEA's forecasts, over 1800 gigawatts (GW) of new coal plants will be built between now and 2030— capacity equivalent to 3000 large coal plants, or an average of ten new coal plants every month for the next quarter century. This new capacity amounts to 1.5 times the total of all the coal plants operating in the world today.

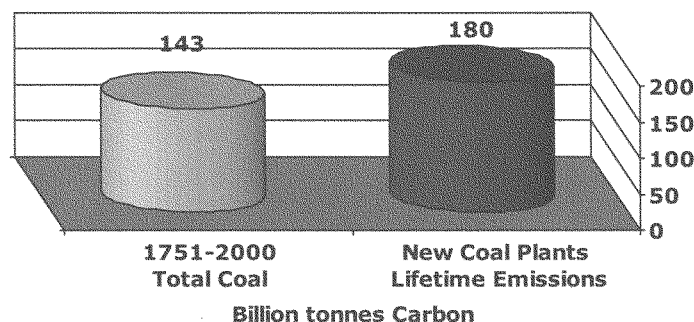
The astounding fact is that under IEA's forecast, 7 out of every 10 coal plants that will be operating in 2030 don't exist today. That fact presents a huge opportunity—many of these coal plants will not need to be built if we invest more in efficiency; additional numbers of these coal plants can be replaced with clean, renewable alternative power sources; and for the remainder, we can build them to capture their CO₂, instead of building them the way our grandfathers built them.

If we decide to do it, the world could build and operate new coal plants so that their CO₂ is returned to the ground rather than polluting the atmosphere. But we are losing that opportunity with every month of delay—10 coal plants were built the old-fashioned way last month somewhere in the world and 10 more old-style plants will be built this month, and the next and the next. Worse still, with current policies in place, none of the 3000 new plants projected by IEA are likely to capture their CO₂. Each new coal plant that is built carries with it a huge stream of CO₂ emissions that will likely flow for the life of the plant—60 years or more.

Suggestions that such plants might be equipped with CO₂ capture devices later in life might come true but there is little reason to count on it. While commercial technologies exist for pre-combustion capture from gasification-based power plants, most new plants are not using gasification designs and the few that are, are not incorporating capture systems. Installing capture equipment at these new plants after the fact is implausible for traditional coal plant designs and expensive for gasification processes.

If all 3000 of the next wave of coal plants are built with no CO₂ controls, their lifetime emissions will impose an enormous pollution lien on our children and grandchildren. Over a projected 60-year life these plants would likely emit 750 billion tons of CO₂, a total, from just 25 years of investment decisions, that is almost 30% greater than the total CO₂ emissions from all previous human use of coal. Once emitted, this CO₂ pollution load remains in the atmosphere for centuries. Half of the CO₂ emitted during World War I remains in the atmosphere today.

New Coal Plant Emissions 26% Greater Than All Historic Coal CO₂



Source: ORNL, CDIAC; IEA, and WEO 2006

In short, we face an onrushing train of new coal plants with impacts that must be diverted without delay. What can the U.S. do to help? The U.S. is forecasted to build more than 200 of these coal plants, according to reports and forecasts published by the U.S. EIA. We should adopt a national policy that new coal plants be required to employ CCD without delay. By taking action ourselves, we can speed the deployment of CCD here at home and set an example of leadership. That leadership will bring us economic rewards in the new business opportunities it creates here and abroad and it will speed engagement by critical countries like China and India.

If we do not, we risk foregoing market and export opportunities while the Chinese commercialize those technologies themselves, and begin selling them to us, at a lower cost and faster than our domestic industries will be able to respond. The signs are already clear that significant progress is being made both in the capture and the disposal front by extremely ambitious and competent Chinese businesses.

Policy Actions to Speed CCD

As the Committee is aware, in the last several years there has been a surge of announcements for planned construction of new coal-fired power plants—almost none of them proposing to use CCD. EIA's energy models currently forecast that as much as 135 GW of new coal capacity might be built in the U.S. between now and 2030. Depending on their efficiency, capacity factors and operating lives, these new coal plants could release as much as 51 billion metric tons of CO₂ cumulatively before they are replaced, if their CO₂ is not captured. Locking in such a huge potential burden of CO₂ pollution would make it difficult, if not impossible, for the U.S. to achieve needed emission reduction targets.

It is worth noting that the actual amount of new coal capacity that will be built, given the unsettled policy environment, is quite uncertain. New coal plants that do not dispose of their CO₂ are being successfully challenged, while regulators and the financial community are increasingly questioning whether investing billions of dollars in high-carbon emitting projects makes any sense as the country stands at the doorstep of a carbon-constrained world. Just in 2007, about a dozen large coal projects have been cancelled, rejected by regulatory bodies or delayed by legal challenges. Nonetheless, we cannot assume that no new coal plants will be built in the U.S. Policies to deploy CCD are needed both to deal with the prospect of new coal plants here and to provide the learning that will be necessary to make CCD a reality in countries like China, where last year a large new coal plant started up about every four days.

While research and development funding is also needed for the medium- and long-term improvement of the technology, it is neither the gateway to the deployment of the technology, nor can it substitute for the incentive that a genuine commercial market for CO₂ capture and disposal systems will provide to the private sector. Indeed, the immediate need is in early deployment incentives and requirements for the first wave of CCD projects, using technology that is available to us *today*. The amounts of capital that the private sector can spend to optimize CCD methods will almost certainly always dwarf what Congress will provide with taxpayer dollars. To mobilize those private sector dollars, Congress needs a stimulus more compelling than the offer of modest handouts for research. Congress has a model that works: intelligently designed policies to limit emissions cause firms to spend money finding better and less expensive ways to prevent or capture emissions.

Where a technology is already competitive with other emission control techniques, for example, sulfur dioxide scrubbers, a cap and trade program like that enacted by Congress in 1990, can result in more rapid deployment, improvements in performance, and reductions in costs. Today's scrubbers are much more effective and much less costly than those built in the 1980s. However, a CO₂ cap and trade program by itself may not result in deployment of CCD systems as rapidly as we need. Many new coal plant design decisions are being made literally today. Depending on the pace of required reductions under a global warming bill, a firm may decide to build a conventional coal plant and purchase credits from the cap and trade market rather than applying CCD systems to the plant. While this may appear to be economically rational in the short term, it is likely to lead to higher costs of CO₂ control in the mid and longer term if substantial amounts of new conventional coal construction leads to ballooning demand for CO₂ credits.

Recall that in the late 1990's and the first few years of this century, individual firms thought it made economic sense to build large numbers of new gas-fired power plants. The problem is too many of them had the same idea and due to increases in both the price and volatility of natural gas many of these investments are idle today.

Moreover, delaying the start of CCD until a cap and trade system price is high enough to produce these investments delays the scale of deployment of the technology that is needed in the U.S. and other countries if we continue substantial use of coal, as seems likely. The more affordable CCD becomes, the more widespread its use will be

throughout the world, including in rapidly growing economies. But the learning and cost reductions for CCD that are desirable will come only from the experience gained by building and operating the initial commercial plants. The longer we wait to ramp up this experience, the longer we will wait for what promises to be significant cost reductions to become a reality and, and to see CCD deployed worldwide.

To date our efforts have been limited to funding research, development, and limited demonstrations.² Such funding can be one of the necessary elements in this effort if it is wisely invested. But government subsidies--which are what we are talking about--cannot substitute for the driver that a real market for low-carbon goods and services provides. That market will be created only when requirements to limit CO₂ emissions are adopted. In this Congress, serious attention is finally being directed to enactment of such measures. Such measures combined with additional financial incentives (many of which could be funded from within the cap and trade system itself) is the fastest and surest path to rapid deployment of CCD.

Some have argued that key technologies, such as carbon capture and storage (CCD) are not yet available or are only available now at exorbitant cost. Such arguments are incorrect. As discussed more fully below, the elements of CCD systems are actually in use today. But arguments about what is available today, under today's market conditions, fundamentally miss the point, because global warming legislation is about setting the market conditions for technological progress going forward from today. Taking a frozen snapshot of the cost of carbon control technologies today is also misleading. Think how wrong such an assessment would have been if applied to computer technology at any point in the last thirty years. Speed and capacity have increased by orders of magnitude as costs plummeted. We now carry more computing power in our cell phones than the Apollo astronauts carried to the moon. Once market signals are in place, it will be the same for technologies such as carbon capture and storage.

CCD is Available Today

CCD technology is available to us today to begin deployment. With the right price signal from a cap and trade system, combined with appropriate, additional financial incentives or subsidies for deployment, the first wave of CCD can be deployed at commercial scale immediately, consistent with the time required to build a new power plant. As the Chairman and President of BP America, Robert Malone has testified,

"CCS cannot succeed as a commercially successful emission abatement technology without the policy or regulatory frameworks that would allow commercial entities to invest in it. New technology cannot be 'pushed' into industrial-scale deployment, a

² Title VII of the Energy Independence and Security Act of 2007 (EISA) contains some provisions that, if funded, will help to make CCD a reality. These include authorizations to conduct at least seven large-scale geologic sequestration projects and separate authorizations for projects for large-scale capture of CO₂ from industrial sources. A third provision requires the U.S. Geological Survey to carry out a comprehensive assessment of capacity for geologic disposal of CO₂. NRDC supports implementation of these provisions but we urge that they be complemented with enactment this year of a comprehensive program to cap CO₂ and other greenhouse gases, along with complementary policies to accelerate CCD deployment.

market is necessary to ‘pull’ it. *Deploying CCS at scale is not as much a question of technology availability but of economic viability. CCS is available today to play a significant role in reducing greenhouse gas emissions and addressing climate change.*³

Research on CCD has been ongoing for many years now, with major international conferences taking place since the early 1990s. Since then, knowledge on the subject has greatly expanded, to the extent that the Intergovernmental Panel on Climate Change (“IPCC”) issued a special report on CCD in 2005. An extensive Massachusetts Institute of Technology (“MIT”) study on the Future of Coal in 2007 also examined CCD in depth. There is a substantial body of evidence, knowledge, and peer-reviewed literature on CCD.⁴

In many ways, CCD is not new. There are three elements to successful geologic sequestration of carbon dioxide: capture, transportation, and sequestration. All three of these elements have been demonstrated and operated in commercial, large scale installations. There is no technical reason these elements cannot be combined to capture, transport and dispose of CO₂ from coal fired power plants immediately.

The first element of CCD is the initial capture of the carbon dioxide emissions. “Pre-combustion capture” is applied to conversion processes that gasify coal, petroleum coke, or other feedstocks (such as biomass) rather than combusting them in air. In the oxygen-blown gasification process, the feedstock is heated under pressure with a mixture of pure oxygen, producing an energy-rich gas stream consisting mostly of hydrogen and carbon monoxide.

Coal gasification is widely used in industrial processes around the world, such as in ammonia and fertilizer production. Hundreds of such industrial gasifiers are in operation today. In power generation applications as practiced today this “syngas” stream is cleaned of some impurities and then burned in a combustion turbine to make electricity in a process known as Integrated Gasification Combined Cycle (“IGCC”). Commercially demonstrated systems for pre-combustion capture from the coal gasification process involve treating the syngas to form a mixture of hydrogen and CO₂, and then separating the CO₂ primarily through the use of solvents. These same techniques are used in industrial plants to separate CO₂ from natural gas and to make chemicals such as ammonia out of gasified coal.

However, because CO₂ can be released to the air in unlimited amounts under today’s laws, except in niche applications, even plants that separate CO₂ do not capture it; rather, they release it to the atmosphere. Notable exceptions include the Dakota Gasification Company plant in Beulah, North Dakota, which captures and pipelines more than one

³ Testimony of Robert Malone Before The Select Committee on Energy Independence and Global Warming, U.S. House of Representatives (September 21, 2007). (Emphasis added)

⁴ For further information, I attached as an Appendix testimony prepared by David Hawkins, Director of NRDC’s Climate Center, which discusses the current availability of carbon capture and disposal in greater detail. Mr. Hawkins served as a review editor of the 2005 IPCC Report on CCD.

million tons of CO₂ per year from its lignite gasification plant to an oil field in Saskatchewan (the Weyburn project described below), and ExxonMobil's Shute Creek natural gas processing plant in Wyoming, which strips CO₂ from sour gas and pipelines several million tons per year to oil fields in Colorado and Wyoming.

The principal obstacle for broad application of pre-combustion capture to new power plants (and the main reason behind limited deployment of IGCC with carbon capture) is not technical, it is economic: under today's laws it is cheaper to release CO₂ to the air than capture it. Other capture technologies, including post-combustion and oxyfuel combustion are currently at the bench and/or pilot demonstration stage. The cost of CO₂ capture is by far the most expensive element in the CCD chain of operations, estimated to be in the region of 75% of total costs, depending on the geological setting and the distance of transport.

The second element of CCD is the transportation of captured carbon dioxide to the injection site, if needed. The use of CO₂ for Enhanced Oil Recovery (EOR) began in the U.S. in the early 1960s. Inexpensive industrial CO₂ sources, such as natural gas processing plants, were initially used, although to sustain the expansion this was quickly supplemented and eventually overshadowed by naturally occurring CO₂ discovered in Colorado, New Mexico and Mississippi.

Today, there are around one hundred registered CO₂ floods worldwide, almost 90% of which are in the U.S. and Canada. Some 35 million tons of CO₂ annually are injected in mature oil reservoirs. These floods are primarily in the Permian Basin of Texas and New Mexico, but also in the Bighorn Basin of Wyoming, the Rangeley Field of Colorado and the Mississippi Salt Basin. In North Dakota, CO₂ from the Great Plains Synfuels project is captured and transported across the border to Canada, and injected into the Weyburn and Midale fields in Saskatchewan. CO₂ pipelines today operate as a mature market technology and are the most common method for transporting CO₂. The first long-distance CO₂ pipeline came into operation in the early 1970s. In the United States, over 3,000 miles of pipeline transports more than 40 million tons of CO₂ per year for use in CO₂-EOR. Transport of CO₂ is happening today and it can happen at an even greater scale as CCD is more fully deployed.

The third element of CCD is the sequestration of the carbon dioxide in geological formations. Injection of carbon dioxide has been successfully demonstrated on a large scale, not least in the context of CO₂-EOR projects, some of which like Seminole, SACROC and Wasson are injecting annual amounts of CO₂ well above the quantity that a 500MW coal plant would produce.

There is also considerable scientific knowledge regarding the mechanisms for trapping carbon dioxide in sedimentary geological formations. For example, residual trapping limits carbon dioxide mobility through capillary forces. Solubility trapping occurs when injected carbon dioxide dissolves in fluids within the geological formation. Stratigraphic trapping occurs when overlying impermeable rock formations prevent upward movement of carbon dioxide from underlying reservoirs. Mineralization trapping occurs when

injected carbon dioxide forms carbonate minerals and essentially becomes part of the solid rock into which it was injected.

Both the Intergovernmental Panel on Climate Change (“IPCC”) and the interdisciplinary team from the Massachusetts Institute of Technology (“MIT”) concluded that such sequestration methods in appropriately selected and operated geologic reservoirs are likely to trap over 99% of injected carbon dioxide over 1,000 years. This conclusion is based on existing project performance and a number of natural and industrial analogs. Nature itself has stored hydrocarbons and CO₂ for millions to hundreds of millions of years, and humans have successfully stored natural gas and other fluids underground.

There are several commercial and research projects that inject carbon dioxide in sedimentary geological formations for permanent sequestration. For example, the Sleipner project in Norway has been operating since 1996 and injects about 1 million tons of CO₂ annually into a deep saline formation in the North Sea. BP’s In Salah project, operating in Algeria since 2004, injects a similar amount of CO₂ stripped from natural gas back into the water leg of the natural gas field. The Weyburn project receives CO₂ captured and transported from North Dakota to Saskatchewan and has been operating since 2000 and injects 1-2 million tons of CO₂ annually.

All three of these projects include monitoring programs. The results of that monitoring indicate that the CO₂ is remaining sequestered in the formations and that there is no reason to expect any CO₂ leakage from these projects. These projects just mentioned provide a great deal of confidence that CO₂ can remain permanently sequestered in geological reservoirs.

All components of CCD therefore – capture, transportation and injection – have been demonstrated at commercial scale in a number of industrial applications. We believe that the barriers to CCD are not technological, but rather economic and regulatory. We are joined by leaders of major industrial corporations such as NRG Energy, BP America and Tenaska who are all moving forward with CCD projects today—literally putting their money where their mouth is.

As noted above, BP believes that the CCD is “available today.” And BP has joined forces with Rio Tinto in their joint venture, Hydrogen Energy, which has immediate plans to invest billions of dollars into CCD facilities in the U.S., the Middle East, Australia and Europe. Similarly, on February 19, 2008, Tenaska, Inc., publicly announced its proposal for the Trailblazer Energy Center in Texas, a 765 MW gross output and 600 MW net output supercritical pulverized coal electric generation facility with the capability to capture and deliver to the EOR markets 90 percent of CO₂ produced in the boiler. Tenaska’s current plan is that the facility will be operational in 2014. Tenaska estimates that approximately one third of its profit will come from revenues generated from the use of CO₂ captured at the project for enhanced oil recovery.

In addition, NRG, the tenth largest power producer in the U.S. has also announced plans to move forward, together with Powerspan, to capture CO₂ from its 125 MW WA Parish

plant in Fort Bend Texas, and to generate revenue from the sale of CO₂ for enhanced oil recovery. NRG indicates that this plant will be operational in 2012.

Thus, as noted above, immediate deployment of CCD is not a technical or research issue as much as it is a policy and economic issue. As noted in testimony by Tenaska Vice President Gregory Kunkel:

“We have developed Trailblazer in anticipation of federal climate change legislation that would support, through placing a price on greenhouse gas emissions and other means, the significant capital and operating costs of carbon capture technology. Without climate legislation, it appears that revenues from enhanced oil recovery CO₂ sales will be insufficient to cover all carbon capture costs. With proposed climate legislation, projected compliance cost savings and other effects of climate change legislation, combined with EOR revenues, would provide the needed economic incentives to build and operate Trailblazer.”⁵

Mr. Kunkel is joined by yet another prominent utility. According to the CEO of NRG Energy, David Crane:

“The company I run, NRG Energy, emits more than 64 million tons of carbon dioxide (CO₂) into the atmosphere each year -- more than the total man-made greenhouse gas emissions of Norway. Why do we do it?... We do so because CO₂ emissions are free... in a world where CO₂ has no price, removing CO₂ before or after the combustion process is vastly more expensive and problematic than just venting it into the atmosphere. ...If Congress acts now, the power industry will respond. But we need to move as quickly as possible toward implementing the low-emissions ways of combusting coal that are under development or *in the case of "coal gasification" technology, are ready for commercial deployment*. Effective incentives for these new technologies could easily and readily be included in a cap-and-trade regimen. Lawmakers need to provide both the carrot and the stick to get the CO₂ out of coal.”⁶

Mr. Crane therefore points out that the reason that no large integrated power sector CCD project exists today is purely economic: it is simply cheaper to vent the CO₂ under today's laws instead of capturing it, compressing it, transporting it to a suitable reservoir and sequestering it. However, this is not an indication of the state of readiness of the technology, as his statement makes clear.

The USDOE is leading a national research program on CCD. Although we applaud the efforts of the dedicated and talented individuals involved in this program, the resources and funding available are not in line with the deployment timescale needed for CCD to reduce emissions meaningfully. Without an economy-wide cap-and-trade scheme that prices carbon emissions, and without targeted and reliably funded incentives (such as

⁵ Testimony of Gregory P. Kunkel, Ph.D. Vice President of Environmental Affairs Tenaska, Inc., before the United States House of Representatives Natural Resources Subcommittee on Energy and Mineral Resources “Spinning Straw Into Black Gold: Enhanced Oil Recovery Using Carbon Dioxide” June 12, 2008

⁶ David Crane, CEO of NRG Energy; Washington Post, October 14, 2007 (emphasis added)

auction revenues, as opposed to appropriations) to bring down the costs of CCD in the initial years when the carbon price is too low and volatile to spur investment, CCD is destined to linger in the background as it has done until now.

We are convinced, however that, under the right policy framework, hundreds of MWs of power sector CCD would be deployed in the early years. The DOE's targets and timelines should not be seen as representative of the technology, or its program as the gateway to CCD. In fact, CCD is available for deployment today---what is needed is the appropriate policy, part of which could be a fund similar to that created under H.R. 6258.

A word about costs for CCD is in order. With today's off the shelf systems, estimates are that the production cost of electricity at a coal plant with CCD could be as much as 40% higher than at a conventional plant that emits its CO₂. But the impact on average electricity prices of introducing CCD now will be very much smaller due to several factors. First, power production costs represent about 60% of the price you and I pay for electricity; the rest comes from transmission and distribution costs. Second, coal-based power represents just over half of U.S. power consumption. Third, and most important, even if we start now, CCD would be applied to only a small fraction of U.S. coal capacity for some time.

Finally, I should emphasize that although CCD is an important strategy to reduce CO₂ emissions from fossil fuel use, it is not the basis for a climate protection program by itself. Increased reliance on low-carbon energy resources is the key to protecting the climate, and will come with tremendous public health and environmental co-benefits as compared to fossil fuels. The lowest carbon resource of all is smarter use of energy; energy efficiency investments will be the backbone of any sensible climate protection strategy. Renewable energy will need to assume a much greater role than it does today. With today's use of solar, wind, biomass, geothermal and other renewable energy resources, we tap only a tiny fraction of the energy the Earth provides every day. There is enormous potential to expand our reliance on these and other resources.

H.R. 6258: The Carbon Capture and Storage Early Deployment Act.

H.R. 6258 represents one possible approach to encouraging the commercial availability of CCD. Under the bill, a Carbon Storage Research Corporation (CSRC) would be created if entities representing two thirds of the fossil fuel based electricity that is delivered to consumers voted to create such a corporation.

The Corporation would be operated as a division or affiliate of the Electric Power Research Institute (EPRI) and would be managed by a Board of not more than 12 members. The Board will be appointed by EPRI and will include representatives of investor owned utilities, utilities owned by a federal or state agency or a municipality, rural electric cooperatives and fossil fuel producers.

The Corporation would assess fees on distribution utilities for all fossil fuel-based electricity delivered to retail consumers. The assessment would apply to electricity generated from coal, natural gas and oil and would reflect the relative carbon dioxide

emission rates of each fuel. Distribution utilities would be allowed to recover the costs of the fee from retail consumers.

The total assessment would result in a fund of approximately \$1 billion annually. The fee translates into a roughly \$10-\$12 total annual increase in residential electricity rates according to the sponsors.

The Corporation would distribute the funds through grants and contracts to private, academic and governmental entities. Although the bill's stated purpose is "accelerating the commercial deployment and availability of carbon dioxide capture and storage technologies", both the amount of funding generated and the description of the projects appear to emphasize pre-commercial development and demonstration. Supported projects are to encompass a range of different fuel varieties, be geographically diverse, involve diverse storage media and employ technologies suitable for either new or retrofit applications. Moreover, such projects shall be large scale projects and not be pilot projects or similar small scale projects. Given that CCD is available today for deployment, the prohibition on funding pilot or small scale projects is appropriate and should probably be given greater definition and clarity under the legislation.

As noted previously, although Chairman Boucher has already indicated his intention to enact a comprehensive cap and trade bill, and stated clearly that H.R. 6258 is only a first step toward such a program, NRDC remains concerned that pursuing H.R. 6258 and other similar legislation in isolation will lend aid to arguments for delaying needed emissions cuts, by suggesting the need for further research and demonstration. Accordingly, while NRDC appreciates the fact that the timeframe in the bill for the life of the CSRC was shortened considerably during the drafting process, NRDC continues to believe that such legislation should only be enacted as part of an overall cap and trade system. This is so, not only because we cannot wait for full implementation of such a program before mandating steep emission cuts, but also because only a combination of cap and trade provisions and initial subsidies will provide a sufficient incentive for us to achieve a build-out rate for CCD that is consistent with the EPA's projection in its model of 60 GW of CCD capacity by 2025.

While the 10 year budget of \$10-\$11 billion is certainly a large subsidy for a research and development program, the financing hurdles required to launch this technology in commercial applications are only likely to be overcome through a combination of aggressive, short term, and front-loaded subsidies to encourage first to market participants, plus a cap and trade policy over the long term to make the decision to deploy CCD technology a purely economic one.

As an example of these economics, Tenaska's plan to build a carbon capture and storage facility is aided by the partial benefit of selling their CO₂ into the Permian Basin for enhanced oil recovery (EOR). The 600MW Trailblazer post-combustion power plant is projected to cost \$3 billion dollars by the time it is completed in 2014 which roughly equates to \$5,000/MW for a CCD power plant facility.

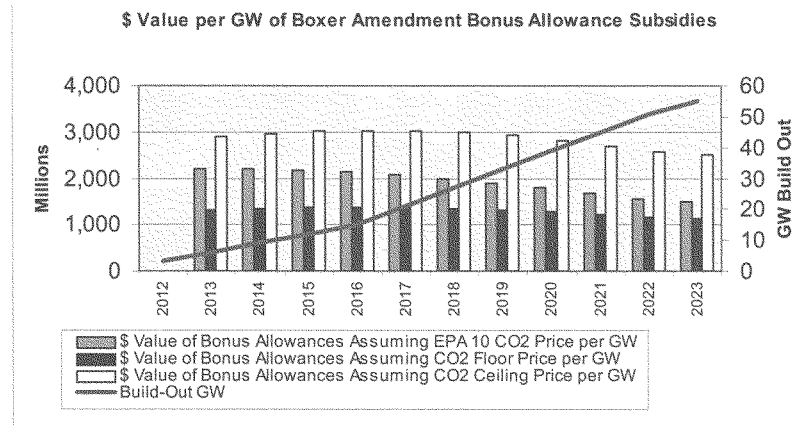
While this large-scale project would be an ideal candidate for the funding mentioned in H.R. 6258, funding from the bill alone would not provide enough support to Tenaska, independently of a cap and trade program, to make this single CCD facility economically viable.

In testimony before the House Committee on Natural Resources, Tenaska has stated that due to the higher capital and operating costs of a CCD power plant, and even with EOR benefits of being able to sell the carbon for \$20-25/ton, they would not be able to proceed with the development phase of this project without a cap and trade policy in place.

The value of a cap and trade system, which puts a price on carbon emissions, cannot be underestimated for a facility like Tenaska's Trailblazer plant. Using carbon prices projected by the US Environmental Protection Agency under its "Scenario 10", a cap and trade system would reduce Trailblazers running costs by \$4.3 billion dollars in 2008 over 30 years relative to a non-capturing pulverized coal plant. This is far more than would be offered under the most generous funding that could be provided under H.R. 6258 and would ensure that the build-out of CCD technology becomes an economic decision in its own right over time-- as higher carbon costs reduce the profitability of older non-capturing facilities.

Because a cap and trade program creates an enormous amount of potential revenue that the government can decide how to distribute, enactment of a cap and trade system will provide a means for funding CCD at levels well beyond those contemplated in H.R. 6258, as well as creating a firm price signal. Thus, it is important to recognize that the subsidies being provided under current cap and trade legislation are designed to provide higher first to market incentives than the ones provided under the Boucher legislation.

For instance, looking at the subsidies provided under the Boxer Substitute to the Climate Security Act, S. 3036, the subsidies allocated to a carbon capture and storage facility in just the "kickstart" portion of the bill (S.3036 Section 1005) would amount to \$3,000/MW for the first 5-10 facilities with a total program value of \$9-21 billion dollars, depending on the price of carbon. Following this disbursement, the Bonus Allowance subsidies would provide roughly \$1.2-2.5 billion dollars per GW or \$1,200-2,500/MW for the next 52GW of CCD build out through 2023 (see graph below):



Source: Natural Resources Defense Council

This level of subsidy effectively provides 100% of the additional capital costs of building a CCD power plant with transportation facilities for first movers plus a small subsidy for higher operating costs over the next 10 years. These performance based subsidies, while generous, are expected to allow for the financing of the early projects without the 20-30% implied rates of return that would have to be factored into such facilities on a stand alone basis given the risks and low returns of capturing carbon without a cap and trade system in place.

In sum, the amounts of money needed to launch CCD to scale are significant and will require direct subsidies but at a higher level for early participants than the funds raised in H.R. 6258 would enable to be funded. A cap and trade system, while unlikely to provide incentive to first movers, is expected to be the strongest economic driver of this technology in later years and is considered essential to the long term viability of carbon capture and storage technology.

NRDC notes that there is no guarantee that the CSRC will ever exist, since its creation requires an affirmative vote by representatives of two-thirds of fossil fuel fired electricity generation. That vote may never happen or the vote may fail to garner the necessary two-thirds majority. To the extent that the research funded by H.R. 6258 is needed it should not be left to depend on the voluntary consent of the electric power industry. In order to avoid a situation in which enactment of such legislation fails to provide any fund at all, NRDC suggests that the activity to be funded by H.R. 6258 be enacted as part of a comprehensive cap and trade legislation, that should also include some form of mandatory performance standard and incentive, such as the Low Carbon Generation Obligation/Performance Standard provisions described near the end of this testimony.

There are numerous other changes to H.R. 6258 that could improve its overall effectiveness. For instance, NRDC would recommend that the CSRC board have a broader membership base, including representatives of public interest groups, independent experts from the academic community and federal and state governmental representation. In addition, NRDC believes that additional criteria could be included to ensure that there is a comprehensive plan for ensuring the right mix of projects, both pre- and post- combustion, that there is a diversity of conditions and sites, that different coal types are included and that there is compliance with all applicable environmental requirements including those under the Safe Drinking Water Act⁷. We would also raise, but not try to resolve, concerns about the federal government legislating in the state rate recovery arena, which is a complex area of law and policy. Finally, if rate recovery is required for utilities, then to the extent that funds are not expended, and are returned to utilities, corresponding rebates should be required for consumers.

Additional Legislative Proposals Related to CCD.

A. Bonus Allowance Provisions in S. 3036.

As noted above, NRDC believes that the powerful combination of a price signal and billions of dollars in CCD subsidies made possible by a cap and trade program are clearly the best way to achieve our common goals of reducing emissions, at the lowest possible cost while incentivizing deployment of zero and low carbon technologies, including CCD. The bonus allowance provision in the Lieberman-Warner bill (that would provide a bonus allowance for CO₂ that was actually disposed of in geologic repositories,) represents one way to achieve that result. However, the amount of the subsidy represented by the bonus allowance provisions would depend heavily on the price of allowances, and therefore could be either greater than necessary or smaller than necessary. In addition, apart from any increase in allowance prices, the amount of the subsidy for the bonus allowance provisions remained relatively constant through the life of the program, and therefore failed to favor earlier CCD projects over later ones.

B. Fixed Feed in Subsidy Proposal

In light of some of the features of the bonus allowance provision described above, one alternative that NRDC suggests the Committee may wish to explore in this context is creation of a performance based fixed price subsidy that would be set at its highest level for the first three GW of CCD and would decline as additional CCD capacity is deployed. An overall amount of CCD would be incentivized during a set period. This would create a “race” for early CCD deployment and also, depending on the level of subsidy, could guarantee that such early projects were in fact economic.

Under this approach, the fixed feed-in subsidy would start at a high dollar payment per ton avoided through CO₂ geologic disposal and would be paid for the first ten years of project operation. The payment level selected for the first 3 GW of capacity would be set

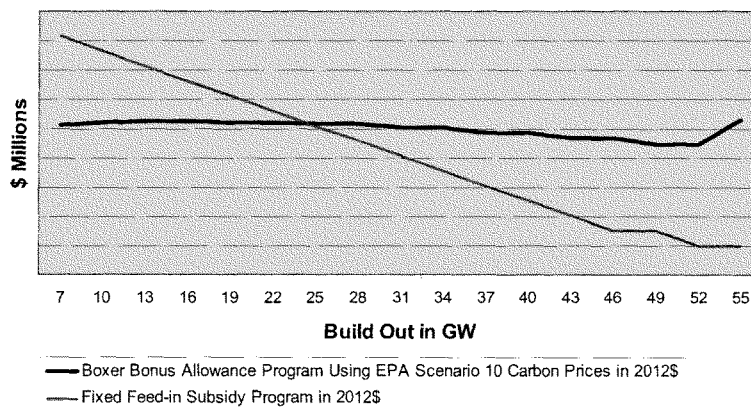
⁷ See Robert M. Sussman, “Securing Coals Future: CCS Demonstration Projects at Coal Fired Plants Must Begin Now” June 19, 2008. http://www.americanprogress.org/issues/2008/06/securing_coal.html

at a level to assure that the full incremental costs would be covered with a cushion to address the risk aversion associated with the very first projects. For subsequent projects the payment rate would be reduced, with each successive 3 GW of capacity receiving a lower payment rate until the rate reached a level of perhaps \$10/ton as the build out reaches 55GW. NRDC believes such a program would cost less than the estimated costs of the Bonus Allowance provision in the Boxer-Lieberman-Warner bill (estimated at \$135 billion assuming EPA Scenario 10 carbon prices).

A fixed feed-in approach would likely be seen as more bankable by the financial community than bonus allowances which would only have a monetary value from 2012 on and then would be subject to price volatility over the coming years.

Lastly, when looking at both subsidy approaches in terms of dollar value per GW (see graph below), the fixed feed-in approach offers a better incentive structure to encourage first to market participation by offering declining incentives over time. This is not the case under the bonus allowance approach where the relatively constant subsidy profile could encourage players to wait in order to take advantage of the declining technological learning curve for CCD.

Comparison of Boxer-Lieberman-Warner Bonus Allowance Program with a Fixed Feed-in Approach in 2012\$



Source: Natural Resources Defense Council

A fixed feed-in subsidy would attempt to target the cost spread differential between Pulverized Coal (PC) and IGCC-CCD power plants. Since this cost differential is expected to narrow over time, as the higher carbon costs and lower CCD capital costs erode the all-in cost differential between PC and IGCC-CCD, the program is designed as

a declining feed-in subsidy to reward early participants who would be forced to shoulder this initially higher cost differential.

C. Low Carbon Generation Obligation and Performance Standard.

An additional measure to speed CCD deployment is a low-carbon generation obligation (LCGO) for coal-based power. Similar in concept to a renewable performance standard, the low-carbon generation obligation requires an initially small fraction of sales from coal-based power to meet a CO₂ performance standard that is achievable with CCD. The required fraction of sales would increase gradually over time and the obligation would be tradable.

Thus, a coal-based generating firm could meet the requirement by building a plant with CCD, by purchasing power generated by another source that meets the standard, or by purchasing credits from those who build such plants. This approach has the advantage of speeding the deployment of CCD while avoiding the “first mover penalty.” Instead of causing the first builder of a commercial coal plant with CCD to bear all of the incremental costs, the tradable low-carbon generation obligation would spread those costs over the entire coal-based generation system. The builder of the first unit would achieve far more hours of low-carbon generation than required and would sell the credits to other firms that needed credits to comply. These credit sales would finance the incremental costs of these early units. This approach provides the coal-based power industry with the experience with a technology that it knows is needed to reconcile coal use and climate protection and does it without sticker shock.

The Sanders Boxer bill, S. 309, contains such a provision. It begins with a requirement that one-half of one per cent of coal-based power sales must meet the low-carbon performance standard starting in 2015 and the required percentage increases over time according to a statutory minimum schedule that can be increased in specified amounts by additional regulatory action. With the trading approach I have outlined, the incremental costs on the units equipped with CCD would be spread over the entire coal-based power sector or possibly across all fossil capacity depending on the choices made by Congress. Based on recent CCD costs, we estimate that a low-carbon generation obligation large enough to cover all forecasted new U.S. coal capacity through 2020 could be implemented for about a two per cent increase in average U.S. retail electricity rates.

However, by itself, a low carbon generation obligation would not necessarily prevent the building of new power plants without CCD technology. Such plants cost billions of dollars and will operate for 60 years or more. It is critical that we stop building new coal plants that release all of their carbon dioxide to the air. While the Low Carbon Generation Obligation would provide a strong financial incentive to build plants with CCD technology, it would need to be combined with a mandatory performance standard in order to ensure climate protection from coal fired power plants.

The Sanders-Boxer bill, S. 309, contains both a low carbon generation obligation and a complementary performance standard for coal plants. The Markey Bill, H.R. 6186, also contains a performance standard for coal fired power plants. We recommend the

Subcommittee and Committee consider including provisions of these kinds in future legislative efforts. S. 309 includes a CO₂ emissions standard that applies to new power investments. California enacted such a measure in SB1368 last year. It requires new investments for sale of power in California to meet a performance standard that is achievable by coal plants using CO₂ capture. Combined with an LCGO, this provision would ensure both the availability and deployment of new CCD plants as soon as possible. We urge the committee to explore this option for incentivizing and, ultimately, requiring CCD at new power plants.

Conclusions

In light of the number of current coal plant proposals, and government projections of future coal use, it appears that we are likely to continue using coal in the U.S. and globally in the coming decades in amounts that are incompatible with the scientifically dictated greenhouse gas reduction targets. Therefore it is imperative that we act now to deploy CCD systems instead of highly-polluting conventional coal facilities. Commercially demonstrated CO₂ capture systems exist today and competing systems are being both researched and developed. Improvements in current systems and emergence of new approaches will be greatly accelerated by requirements to limit CO₂ emissions. Commercial deployment of such systems will only happen with enactment of comprehensive climate bills that cap CO₂ emissions and also incorporate complementary policies to promote accelerate deployment of CCD. These bills will also ensure that deployment of CCD is not done at the expense of cheaper, truly clean and renewable technologies and measures, which we consider preferable. Geologic disposal of large amounts of CO₂ is viable and we know enough today to conclude that it can be done safely and effectively.

Chairman Boucher, by introducing H.R. 6258, you, and the other members of the House who have cosponsored your legislation, have initiated an inquiry into one of the most critical issues related to solving global warming. We commend you for seeking ways to accelerate the deployment of CCD technology and we look forward to working with you in that regard. Although the objective of speeding CCD deployment is one we support, we believe that H.R. 6258 by itself would not be effective in achieving this objective and that such programs should be included as part of a larger cap and trade program. Moreover, we believe that other funding approaches to achieve CCD deployment should be considered. Finally, we believe that further improvements can be made to H.R. 6258, in terms of its efficacy and transparency.

Mr. Chairman, that completes my testimony, I will be happy to take any questions you or other Committee members may have.

APPENDIX A**Is CCD Ready for Broad Deployment?****David Hawkins****Director, Climate Center****Natural Resources Defense Council****Key Questions about CCD**

I started studying CCD in detail ten years ago and the questions I had then are those asked today by people new to the subject. Do reliable systems exist to capture CO₂ from power plants and other industrial sources? Where can we put CO₂ after we have captured it? Will the CO₂ stay where we put it or will it leak? How much disposal capacity is there? Are CCD systems “affordable”? To answer these questions, the Intergovernmental Panel on Climate Change (IPCC) decided four years ago to prepare a special report on the subject. That report was issued in September, 2005 as the IPCC Special Report on Carbon Dioxide Capture and Storage. I was privileged to serve as a review editor for the report’s chapter on geologic storage of CO₂.

CO₂ Capture

The IPCC special report groups capture or separation of CO₂ from industrial gases into four categories: post-combustion; pre-combustion; oxyfuel combustion; and industrial separation. I will say a few words about the basics and status of each of these approaches. In a conventional pulverized coal power plant, the coal is combusted using normal air at atmospheric pressures. This combustion process produces a large volume of exhaust gas that contains CO₂ in large amounts but in low concentrations and low

pressures. Commercial post-combustion systems exist to capture CO₂ from such exhaust gases using chemical “stripping” compounds and they have been applied to very small portions of flue gases (tens of thousands of tons from plants that emit several million tons of CO₂ annually) from a few coal-fired power plants in the U.S. that sell the captured CO₂ to the food and beverage industry. However, industry analysts state that today’s systems, based on publicly available information, involve much higher costs and energy penalties than the principal demonstrated alternative, pre-combustion capture.

New and potentially less expensive post-combustion concepts have been evaluated in laboratory tests and some, like ammonia-based capture systems, are scheduled for small pilot-scale tests in the next few years. Under normal industrial development scenarios, if successful such pilot tests would be followed by larger demonstration tests and then by commercial-scale tests. These and other approaches should continue to be explored. However, unless accelerated by a combination of policies, subsidies, and willingness to take increased technical risks, such a development program could take one or two decades before post-combustion systems would be accepted for broad commercial application.

Pre-combustion capture is applied to coal conversion processes that gasify coal rather than combust it in air. In the oxygen-blown gasification process coal is heated under pressure with a mixture of pure oxygen, producing an energy-rich gas stream consisting mostly of hydrogen and carbon monoxide. Coal gasification is widely used in industrial processes, such as ammonia and fertilizer production around the world. Hundreds of such industrial gasifiers are in operation today. In power generation applications as practiced today this “syngas” stream is cleaned of impurities and then burned in a

combustion turbine to make electricity in a process known as Integrated Gasification Combined Cycle or IGCC. In the power generation business, IGCC is a relatively recent development—about two decades old and is still not widely deployed. There are two IGCC power-only plants operating in the U.S. today and about 14 commercial IGCC plants are operating globally, with most of the capacity in Europe. In early years of operation for power applications a number of IGCC projects encountered availability problems but those issues appear to be resolved today, with Tampa Electric Company reporting that its IGCC plant in Florida is the most dispatched and most economic unit in its generating system.

Commercially demonstrated systems for pre-combustion capture from the coal gasification process involve treating the syngas to form a mixture of hydrogen and CO₂ and then separating the CO₂, primarily through the use of solvents. These same techniques are used in industrial plants to separate CO₂ from natural gas and to make chemicals such as ammonia out of gasified coal. However, because CO₂ can be released to the air in unlimited amounts under today's laws, except in niche applications, even plants that separate CO₂ do not capture it; rather they release it to the atmosphere. Notable exceptions include the Dakota Gasification Company plant in Beulah, North Dakota, which captures and pipelines more than one million tons of CO₂ per year from its lignite gasification plant to an oil field in Saskatchewan, and ExxonMobil's Shute Creek natural gas processing plant in Wyoming, which strips CO₂ from sour gas and pipelines several million tons per year to oil fields in Colorado and Wyoming.

Today's pre-combustion capture approach is not applicable to the installed base of conventional pulverized coal in the U.S. and elsewhere. However, it is ready today for use with IGCC power plants. The oil giant BP has announced an IGCC project with pre-combustion CO₂ capture at its refinery in Carson, California. When operational the project will gasify petroleum coke, a solid fuel that resembles coal more than petroleum to make electricity for sale to the grid. The captured CO₂ will be sold to an oil field operator in California to enhance oil recovery. The principal obstacle for broad application of pre-combustion capture to new power plants is not technical, it is economic: under today's laws it is cheaper to release CO₂ to the air rather than capturing it. Enacting laws to limit CO₂ can change this situation, as discussed in my testimony.

While pre-combustion capture from IGCC plants is the approach that is ready today for commercial application, it is not the only method for CO₂ capture that may emerge if laws creating a market for CO₂ capture are adopted. I have previously mentioned post-combustion techniques now being explored. Another approach, known as oxyfuel combustion, is also in the early stages of research and development. In the oxyfuel process, coal is burned in oxygen rather than air and the exhaust gases are recycled to build up CO₂ concentrations to a point where separation at reasonable cost and energy penalties may be feasible. Small scale pilot studies for oxyfuel processes have been announced. As with post-combustion processes, absent an accelerated effort to leapfrog the normal commercialization process, it could be one or two decades before such systems might begin to be deployed broadly in commercial application.

Given, the massive amount of new coal capacity scheduled for construction in the next two decades, we cannot afford to wait and see whether these alternative capture systems prove out, nor do we need to. Coal plants in the design process today can employ proven IGCC and pre-combustion capture systems to reduce their CO₂ emissions by about 90 percent. Adoption of policies that set a CO₂ performance standard now for such new plants will not anoint IGCC as the technological winner since alternative approaches can be employed when they are ready. If the alternatives prove superior to IGCC and pre-combustion capture, the market will reward them accordingly. As discussed in my testimony, adoption of CO₂ performance standards is a critical step to improve today's capture methods and to stimulate development of competing systems.

I would like to say a few words about so-called "capture-ready" or "capture-capable" coal plants. Some years ago I was under the impression that some technologies like IGCC, initially built without capture equipment could be properly called "capture-ready." However, the implications of the rapid build-out of new coal plants for global warming and many conversations with engineers since then have educated me to a different view. An IGCC unit built without capture equipment can be equipped later with such equipment and at much lower cost than attempting to retrofit a conventional pulverized coal plant with today's demonstrated post-combustion systems. However, the costs and engineering reconfigurations of such an approach are substantial. More importantly, we need to begin capturing CO₂ from new coal plants without delay in order to keep global warming from becoming a potentially runaway problem. Given the pace of new coal investments in the U.S. and globally, we simply do not have the time to build a coal plant today and think about capturing its CO₂ down the road.

Implementation of the Energy Policy Act of 2005 approach to this topic needs a review in my opinion. The Act provides significant subsidies for coal plants that do not actually capture their CO₂ but rather merely have carbon “capture capability.” While the Act limits this term to plants using gasification processes, it is not being implemented in a manner that provides a meaningful substantive difference between an ordinary IGCC unit and one that genuinely has been designed with early integration of CO₂ capture in mind. Further, in its FY2008 budget request, the administration seeks appropriations allowing it to provide \$9 billion in loan guarantees under Title XVII of the Act, including as much as \$4 billion in loans for “carbon sequestration optimized coal power plants.” The administration request does not define a “carbon sequestration optimized” coal power plant and it could mean almost anything, including, according to some industry representatives, a plant that simply leaves physical space for an unidentified black box. If that makes a power plant “capture-ready” Mr. Chairman, then my driveway is “Ferrari-ready.” We should not be investing today in coal plants at more than a billion dollars apiece with nothing more than a hope that some kind of capture system will turn up. We would not get on a plane to a destination if the pilot told us there was no landing site but options were being researched.

Geologic Disposal

We have a significant experience base for injecting large amounts of CO₂ into geologic formations. For several decades oil field operators have received high pressure CO₂ for injection into fields to enhance oil recovery, delivered by pipelines spanning as much as several hundred miles. Today in the U.S. a total of more than 35 million tons of CO₂ are

injected annually in more than 70 projects. (Unfortunately, due to the lack of any controls on CO₂ emissions, about 80 per cent of that CO₂ is sources from natural CO₂ formations rather than captured from industrial sources. Historians will marvel that we persisted so long in pulling CO₂ out of holes in the ground in order to move it hundreds of miles and stick in back in holes at the same time we were recognizing the harm being caused by emissions of the same molecule from nearby large industrial sources.) In addition to this enhanced oil recovery experience, there are several other large injection projects in operation or announced. The longest running of these, the Sleipner project, began in 1996.

But the largest of these projects injects on the order of one million tons per year of CO₂, while a single large coal power plant can produce about five million tons per year. And of course, our experience with man-made injection projects does not extend for the thousand year or more period that we would need to keep CO₂ in place underground for it to be effective in helping to avoid dangerous global warming. Accordingly, the public and interested members of the environmental, industry and policy communities rightly ask whether we can carry out a large scale injection program safely and assure that the injected CO₂ will stay where we put it.

Let me summarize the findings of the IPCC on the safety and efficacy of geologic disposal. In its 2005 report the IPCC concluded the following with respect to the question of whether we can safely carry out carbon injection operations on the required scale:

“With appropriate site selection based on available subsurface information, a monitoring programme to detect problems, a regulatory system and the appropriate use of remediation methods to stop or control CO₂ releases if they arise, the local health, safety

and environment risks of geological storage would be comparable to the risks of current activities such as natural gas storage, EOR and deep underground disposal of acid gas.”

The knowledge exists to fulfill all of the conditions the IPCC identifies as needed to assure safety. While EPA has authority regulate large scale CO₂ injection projects its current underground injection control regulations are not designed to require the appropriate showings for permitting a facility intended for long-term retention of large amounts of CO₂. With adequate resources applied, EPA should be able to make the necessary revisions to its rules in two to three years. We urge the members of this Committee to support legislation to require EPA to undertake this effort this year.

Do we have a basis today for concluding that injected CO₂ will stay in place for the long periods required to prevent its contributing to global warming? The IPCC report concluded that we do, stating:

“Observations from engineered and natural analogues as well as models suggest that the fraction retained in appropriately selected and managed geological reservoirs is very likely to exceed 99% over 100 years and is likely to exceed 99% over 1,000 years.”

Despite this conclusion by recognized experts there is still reason to ask about the implications of imperfect execution of large scale injection projects, especially in the early years before we have amassed more experience. Is the possibility of imperfect execution reason enough to delay application of CO₂ capture systems to new power plants until we gain such experience from an initial round of multi-million ton “demonstration” projects? To sketch an answer to this question, my colleague Stefan Bachu, a geologist with the Alberta Energy and Utilities Board, and I wrote a paper for the Eighth International Conference on Greenhouse Gas Control Technologies in June 2006. The obvious and fundamental point we made is that without CO₂ capture, new

coal plants built during any “delay and research” period will put 100 per cent of their CO₂ into the air and may do so for their operating life if they were “grandfathered” from retrofit requirements. Those releases need to be compared to hypothetical leaks from early injection sites.

Our conclusions were that even with extreme, unrealistically high hypothetical leakage rates from early injection sites (10% per year), a long period to leak detection (5 years) and a prolonged period to correct the leak (1 year), a policy that delayed installation of CO₂ capture at new coal plants to await further research would result in cumulative CO₂ releases twenty times greater than from the hypothetical faulty injection sites, if power plants built during the research period were “grandfathered” from retrofit requirements. If this wave of new coal plants were all required to retrofit CO₂ capture by no later than 2030, the cumulative emissions would still be four times greater than under the no delay scenario. I believe that any objective assessment will conclude that allowing new coal plants to be built without CO₂ capture equipment on the ground that we need more large scale injection experience will always result in significantly greater CO₂ releases than starting CO₂ capture without delay for new coal plants now being designed.

The IPCC also made estimates about global storage capacity for CO₂ in geologic formations. It concluded as follows:

“Available evidence suggests that, worldwide, it is likely that there is a technical potential of at least about 2,000 GtCO₂ (545 GtC) of storage capacity in geological formations. There could be a much larger potential for geological storage in saline formations, but the upper limit estimates are uncertain due to lack of information and an agreed methodology.”

Current CO₂ emissions from the world's power plants are about 10 Gt (billion metric tons) per year, so the IPCC estimate indicates 200 years of capacity if power plant emissions did not increase and 100 years capacity if annual emissions doubled.

Mr. BOUCHER. Thank you very much, Mr. Goo, and thanks to all of the witnesses for your thoughtful testimony and also for your recommendations on ways that the legislation pending now before the committee can be strengthened. We will consider very carefully all of those recommendations.

Dr. Specker, let me begin my questions with you, and they are focused on your role as the chief executive officer of EPRI. You have made recommendations with the level of funding that would be required for the near-term deployment of CCS technologies, and my first question to you is whether or not the funding levels reflected in the legislation are consistent with EPRI's recommendations.

Mr. SPECKER. Yes, they are consistent with our recommendations. Our studies indicate \$700 million to \$1 billion a year is what is required to demonstrate CCS on a large scale.

Mr. BOUCHER. And that would be over a 10-year period?

Mr. SPECKER. Yes, we actually looked out over 25 years, the CCS in particular over the next 10, about \$1 billion a year. Also—

Mr. BOUCHER. And when would you anticipate if we expend \$1 billion annually for 10 years that CCS would be generally available, widely dispersed in various kinds of storage media around the country and affordable for use by electric utilities?

Mr. SPECKER. We have set the aggressive target of 2020 for widespread deployment for all new coal plants beginning operation after 2020. That is an accelerated schedule but we think it is still doable.

Mr. BOUCHER. You mentioned all new builds after 2020. Would that availability of storage also accommodate retrofits that would be applied to existing coal-fired units?

Mr. SPECKER. That is certainly possible. I think in the retrofit area, it is going to be a plant-by-plant situation. The technologies that would be demonstrated for new plants could certainly be applicable to retrofit but the circumstances are going to be different at every plant.

Mr. BOUCHER. Well, understanding that, but let us assume that the utilities decide they want to retrofit, perhaps to overcontrol in order to achieve emission allowances that would be tradable in the market, or in order to meet their compliance, they would be free to make those decisions. Let us suppose they decide to do that. Would the storage capacity that is produced by a 10-year schedule at \$1 billion annually by 2020 be sufficient to accommodate not only the new builds but also a measure of retrofits on existing facilities?

Mr. SPECKER. I would have to look more specifically at the data. My view right now would be that those storage locations used for the major demonstrations would have capacity for some use by retrofit but certainly could not—

Mr. BOUCHER. Let me move on to another question. Thank you. You have an analysis that shows that the presence or absence of CCS by the year 2050 would make a dramatic difference in terms of what the retail electricity rates generally would be across the country. Your analysis, as I read it, shows that with CCS, the rate would be about 9 cents per kilowatt-hour. In the absence of CCS, it would be about 21 cents per kilowatt-hour. Does that study take into account the fuel shifting to natural gas from coal that would

occur in the event that electric utilities are required by the law to reduce their emissions at a time when CCS is not available and therefore would take the obvious economic option of defaulting to the next least expensive fuel, which would be natural gas? Is that phenomenon accounted for in your analysis?

Mr. SPECKER. Yes, it is.

Mr. BOUCHER. And how much more natural gas capacity would you anticipate being built if those events transpire in that fashion?

Mr. SPECKER. Again, I don't have those exact numbers but it is very significant expansion in the amount of natural gas and LNG that would need to be used over the next 30 years.

Mr. BOUCHER. And it would be that switch from coal to natural gas that would primarily account for this major increase in electricity prices?

Mr. SPECKER. Yes, that is a primary driver of the increase.

Mr. BOUCHER. One of the things that I certainly would hope would occur and I know many other members have commented on this also is that assuming that the corporation contemplated by this legislation is created and EPRI has a guiding role in deciding how the investments of funds from this corporation will be applied to specific projects, that the roadmap which has been developed by the Department of Energy in collaboration with its multiple regional partnerships be used in some fashion as a guide and that at a minimum, DOE be involved in consultations with the corporation to make sure that the work that DOE has done, which I think most people would say has been quite effective, is utilized and that the corporation take those recommendations into serious account. Can you just talk a little bit about what your relationship from an advisory perspective with DOE would be?

Mr. SPECKER. Yes. We would certainly utilize and consult with the Department of Energy. We work closely with them today. We have worked with them on the roadmap. It is a consistent roadmap with what EPRI has developed, and that would really be the template for working with them as to how we decide the matrix of potential projects that are needed. Again would be very comfortable as we are today working closely with the Department of Energy.

Mr. BOUCHER. Thank you very much.

Mr. Trisko, let me direct some brief questions to you. I know that you were involved in the work of the EPA's Advanced Coal Technology Work Group that recommended raising approximately \$1 billion annually through a non-budget fund. Does the bill that is before us reflect that recommendation?

Mr. TRISKO. Yes, Mr. Chairman, it reflects the recommendation exactly. Moreover, the specific assessments that are assigned in the bill for coal, natural gas, and oil generation, that is, mills per kilowatt-hour, derived from a work paper that was discussed within the EPA Advanced Coal Technology Work Group and that work paper used emission rates for the various fuels taken from a report by the International Atomic Energy Agency.

Mr. BOUCHER. Thank you, Mr. Trisko. Can you speak to the degree of consensus that existed among the Working Group at the time its recommendations were adopted?

Mr. TRISKO. Yes, sir. The Advanced Coal Technology Work Group was like many EPA working group initiatives. It was a part-time job.

Mr. BOUCHER. Well, Mr. Trisko, my time is actually expired. I am looking for one word here and it starts with a U and it reflects the number of votes that were provided. I am trying not to ask a leading question.

Mr. TRISKO. Mr. Chairman—

Mr. BOUCHER. The number of votes that were provided among the working group members when the adoption of the recommendation occurred. It starts with a U. It is pretty easy.

Mr. TRISKO. You have led unavoidably—

Mr. BOUCHER. No, that wasn't the word I had in mind.

Mr. TRISKO. You have led unavoidably to the recommendation was made on a unanimous basis by all stakeholders.

Mr. BOUCHER. Thank you very much. I have one other question, Mr. Trisko. Within that recommendation, was there any linkage among the recommendations or between the recommendations for this independent, non-governmental CCS fund on the one hand and the recommendation that a mandatory program to control greenhouse gas emissions be adopted on the other hand? Were those two recommendations linked? Was one made in any way contingent on the other?

Mr. TRISKO. No, Mr. Chairman.

Mr. BOUCHER. One other question, Mr. Trisko. Was the National Resources Defense Council a member of that working group?

Mr. TRISKO. Yes, Mr. Chairman.

Mr. BOUCHER. Thank you. Thank you very much. My time is expired.

The gentleman from Michigan, Mr. Upton.

Mr. UPTON. Well, thank you, Mr. Chairman, and again, I want to thank particularly my colleagues on both sides of the aisle. I look at Mr. Shimkus to my left and Mr. Whitfield and Mr. Barton on our side that worked very diligently to get this bill in shape that we could put our name on it and feel proud, and I would just encourage you based on the testimony that I have heard this morning that we have only 18 legislative days left really probably in this session, and I would like to think that with such broad bipartisan support, that you and Mr. Dingell might be able to get together with the Speaker and see what we can do to try and push this bill through because it really is important to the future of the country. I have no bones about it, that I am a supporter of increasing the supply of electricity, whether it be nuclear, whether it be renewable, whether it be clean coal. Our electricity needs, as many of you know, are going to grow by nearly 30 to 40 percent by the year 2030, and we have to be prepared for that. Mr. Shimkus made the point that to maintain coal electricity at 50 percent, 750 new plants have to be online. Last year it was zero. Not one came online. I think we just got a new permit for one in this area of Virginia and Maryland in the last couple weeks, nuclear. Hasn't happened in 25 years. We know that there are a couple that are pending including one in Michigan that I would like to see happen. But we are very troubled by the landscape. This USA Today story just a couple

weeks ago, utilities raising the price of power, some increases around the country by 30 to 40 percent.

Mr. Morris, you raised the story that I missed this morning. I didn't see it until you referenced it. I would like to put it into the record, but today's Wall Street Journal story about China. Power shortfalls this summer could be as high as 10 gigawatts, 60 percent of the disparity in some of the manufacturing hubs, inventories are way down, and in fact, they expect a coal shortage that is likely to reach perhaps as many as 20 million tons this year. Trouble for sure. The Sierra Club, I think I read earlier this year, announced that their number 1 target was to prevent any new coal-fired plants from being permitted and they were successful last year. So I look to you, Mr. Morris, with great production in 11 States through the Midwest. What are your plans as you look to increase production for the needs that we have, whether it is an expanding population, the new utility needs that we have, perhaps electric cars, HDTV sets, charging our BlackBerries and phones, all those different things making up that 30 percent growth? Can you move new coal-fired plants without this technology? I know that when I was on Wall Street a couple weeks ago, many of the big finance folks said we are not going to do it, we are not going to provide the financing unless this technology is in place. It needs to be proven. Where do you see things coming in that regard?

Mr. MORRIS. Well, Congressman Upton, you have put your thumb on the pulse of a very important issue to this country, and quite honestly to the world. China and other countries are facing these issues. And when we see that challenge in front of us, we have four coal-based power plants that were in the overall State regulatory process as all of this discussion began some time in 2007. To date, we have received the authority from three States, Texas, Arkansas, Louisiana, to build an ultra-supercritical coal production facility in Arkansas. We are still awaiting our air permit. You mentioned the Virginia power plant but the air permit on the Virginia power plant is unaccomplishable so our friends at Dominion Energy still need to have another session to try to understand that. Our integrated gas plant in West Virginia-Virginia at Appalachian Power approved by the West Virginia commission, not approved yet by the Virginia Commission, and we will continue to try and open a dialog to see to it that that can happen as well. Our ultra-supercritical coal plant in Oklahoma voted down because they wanted us to look at natural gas, having heavy lobbying from a natural gas supplier who shut his gas wells in at \$7 a million BTUs because he thinks he is going to sell it for \$3 tomorrow or \$10 tomorrow. Our integrated gas plant in Ohio, because of the legislative restructuring process in Ohio, is caught up in the courts by some who would not like to see a plant like that built. We are heading as a Nation toward an electric shortage of baseload power that will change the environment in this country for a long, long time. Shutting malls down one or two days a week, shutting production facilities down one or two days a week, as they are doing in South Africa as we sit here today, as they are doing in China, and you looked at it today. To the answer that was given on the 9 cents, 21 cents, look at what Germany did today. Again, another Wall Street story. They are now delaying the shuttering of their

nuclear station so that they do not become more dependent on imported natural gas from Russia, the world's largest supply of natural gas in Russia. You would hate to be at the end of the pipelines that serve the European Union when Russia decides to show the Ukraine that they are not paying the appropriate price for gas. So this bill, as I tried to say in my opening comments, is so important. If we don't have this technology, and I do not agree with my friend at the end of the table, deploying carbon capture and storage technology at an oil refinery is 1,000 times different than deploying it at a power plant where you may lose as much as 30 or 40 percent of the current gigawatts-hour production. That is the equation we are trying to fill with the deployment that we are going through at We Energy, ultimately that we will do at our Mountain Air station, ultimately that we will do at our Northeastern station in Oklahoma. Those are our challenges. This funding, this bill, critically important to finally get going and do something that is constructive. As I said at the close of my comments, I hold you in high regard, you and your colleagues, for this bipartisan bill.

Mr. UPTON. I know my time is expired but let me just close with one thought, and I say this with a smile to my friend, Mr. Goo. I thought that was just the NRDC's effort to say that we ought to drill more so that we can have more capacity elsewhere around the country. They went through the troubling debate in the Senate and failed to get the votes. Another 10 Senators, Democratic Senators, came out and said that they would have voted against it had it come to final passage. It is clear that this debate is going to take a long, long time. This is a bill that we can do now. We can have this in place within the next several years and we can get it done perhaps even in this Congress without waiting for the debate that comes at some point down the line.

Mr. MORRIS. And I really believe it is disingenuous for someone to compare \$10 billion raised over 10 years by utility charges on the delivered kilowatt-hour to a \$7, \$8 trillion tax on the country, which is what Warner-Lieberman was. That is disingenuous and really unfortunate to hear those kinds of comments here this morning.

Mr. UPTON. I yield back.

Mr. BOUCHER. Well, thank you very much, Mr. Upton.

The gentleman from Pennsylvania, Mr. Doyle, is recognized for 5 minutes.

Mr. DOYLE. Thank you, Mr. Chairman.

Dr. Rubin, welcome to the Committee. I have always said to my colleagues from other parts of the country, if they would just cede power to those of from Pittsburgh, we could solve all these problems. I don't think Mr. Shimkus agrees with that though. I have a question, Dr. Rubin. You heard me say in my opening remarks that I have some concerns with the way this program would work in regards to operations at DOE and more particularly the National Energy Technology Lab, and my basic concern is that we may end up duplicating or competing with work that is already being done there. I noted in your testimony, you recommend deleting section 4(b) of the bill because, in your point, I think your words were, it puts the program in the same business as the Department of Energy. What do you see as the role the NETL would

play in this program and what values do you see NETL having as we work towards moving up deployment of CCS?

Mr. RUBIN. Thank you, Mr. Doyle. NETL and DOE have played very critical roles in the carbon sequestration program and have provided leadership not only in this country but globally. The Regional Partnership Program has been a very important effort. These efforts and the kinds of things that EPRI are doing are the critical underpinnings of the longer-term solutions. But my notion of this corporation and the purpose of this bill is to do a job that is critically needed to break the deadlock that we currently have and then go out of business in 10 years or so. I sure hope DOE and EPRI will not go out of business in 10 years. And I think the key issue is to talk about and clarify the division of labor between these different organizations. So I see NETL as with EPRI doing the critical job of advancing and developing new technologies, bringing it to a stage where it is ready for that final step of scale-up to a several-hundred-megawatt facility. That is the handoff I see to this corporation. The kinds of projects certainly initially that should go in place at large-scale need to be projects that have already been vetted, tested, and in which there is generally a high degree of confidence but you still have to take that next step because surprises happen when you scale-up an order of magnitude. So DOE is critical as is EPRI, I think, in carrying that ball up to that point but I would hand it off at that point to a different entity with a very focused mission, and that is also the way we will know whether it succeeds or not.

Mr. DOYLE. One more question. You heard our friend Michael Goo say that deployment of CCS technology, that this could be deployed today, that it is not a question of technology, it is a question of economics, and do you believe that we could today deploy CCS technology that could successfully—on a scale that could be used at a coal-fired utility plant?

Mr. RUBIN. Thanks for the softball question.

Mr. DOYLE. Since you are not an electric company, I wanted to ask somebody that didn't have a vested financial interest.

Mr. RUBIN. I am personally confident it can be done but we need to do it to be sure. Again, surprises happen when you go and scale things up an order of magnitude. But not very far from where we are sitting is a coal-fired power plant that has been capturing and sequestering CO₂ using current technology at the scale of about 40 or 50 megawatts, a plant in Cumberland, Maryland. It is one of a couple of plants, coal-fired power plants in this country which are doing this at smaller scale. But until you go from 50 to 500 megawatts and until you link the capture operation with the transport and sequestration operations, you still do not have the confidence that you need to start doing this at a larger scale. A lot of the problems I think and the most critical ones that would be facilitated and resolved by this corporation are downstream, that last step. The sequestration step, the storage step is perhaps where many of the issues that need to be resolved lie most critically. I am personally much more confident we know how to engineer and do the first step but there are legal and liability and regulatory issues which are receiving a lot of attention, and I don't know about your experience but in my experience, deadlines and real projects help

focus the mind and bring decisions to fruition. I think that could happen here.

Mr. DOYLE. Thank you. I see my time is expired.

Thank you, Mr. Chairman.

Mr. BOUCHER. Well, thank you very much, Mr. Doyle.

The gentleman from Texas, Mr. Barton, is recognized for 5 minutes.

Mr. BARTON. Thank you, Mr. Chairman.

I want to ask Dr. Rubin and Mr. Morris to comment on carbon conversion technology. All the testimony so far has been about carbon capture, but I have seen some conversion technology on a pilot program at a power plant in my district that looks very promising, and the bill before us does allow for funding to research the conversion technology also. So could you two gentlemen discuss briefly your view of conversion technology as opposed to the storage technology?

Mr. RUBIN. Thank you, Mr. Barton. By that I assume you mean taking CO₂ and doing something with it, converting it to something?

Mr. BARTON. Yes, sir.

Mr. RUBIN. I am afraid I am not going to be the bearer of good news on that as far as my—

Mr. BARTON. Tell the truth. That is all we ask.

Mr. RUBIN. That issue received a lot of attention. I spent a couple of years recently on a special report that the Intergovernmental Panel on Climate Change, the IPCC, undertook on CO₂ capture and storage, and one of the issues that was prominent in that study, and there is a chapter in that report on it, is the utilization of CO₂. It is an awfully appealing idea. God, if we could just do something useful with it and keep it out of the atmosphere. And it received a lot of attention because it had a lot of political importance and attraction. But the bottom line is that if we look at the amount of CO₂ used today and potentially useful, it is trivial in comparison to the amount of CO₂ we emit. There is a lot of CO₂ being used to make things like methanol and other chemicals and there are other things that can be done, and there are processes potentially that can convert it into minerals. But those processes are all a long way from commercial reality, and if you think normal capture processes have been characterized as expensive, these processes today are many times more expensive. Most of the CO₂ that gets used today soon gets re-emitted. A lot of CO₂, like the plants that are capturing it now in Maryland, sell it across the street—

Mr. BARTON. I don't want to interrupt you too much, but—

Mr. RUBIN. So I think—

Mr. BARTON [continuing]. I am really talking about—I am not talking about re-injection of CO₂. I am talking about actually converting it to a different substance that then has commercial value or is more easily disposed of.

Mr. RUBIN. I do not foresee that being a significant player in reducing CO₂ emissions to the atmosphere. It is a very appropriate and necessary thing to be going on at the R&D scale.

Mr. BARTON. OK. Mr. Morris?

Mr. MORRIS. Congressman Barton, a biologist/lawyer from Eastern Michigan University and Detroit College of Law knows better than to argue with an engineer from Texas A&M.

Mr. BARTON. I am not a chemist though.

Mr. MORRIS. The fact of the matter is, I am encouraged by the opportunity to do that kind of activity and I think it is again just wrong for this country to think that we are going to store CO₂ underground for millennia without understanding all of the legal ramifications. I would much rather see more of these dollars go toward the research. Our piece of this would be on conversion technology. We keep hearing that our friends in Japan are doing something along those lines in a fuel cell technology application. If that is true, wouldn't it be great if we could also join—

Mr. BARTON. The whole point of this bill is not to dictate an outcome—

Mr. MORRIS. Absolutely.

Mr. BARTON [continuing]. It is to actually do science-based research to see what is possible.

Mr. MORRIS. Absolutely.

Mr. BARTON. The bill allows it. It doesn't—we don't have a pre-ordained outcome. But I have seen a pilot project in my congressional district that the proponents of claim is just the greatest thing since sliced bread. Of course, they are the proponents of it, so that is—

Mr. MORRIS. Well, I am with you. I really believe that we ought to do that. We ought to add some of these dollars and make sure they go to the conversion, understanding it is a much better way than transporting and storing and dealing with all those issues.

Mr. BARTON. I want to ask Mr. Kerr a question. I believe you represent NARUC. Is that correct?

Mr. KERR. Yes, sir.

Mr. BARTON. One of the things that I have reserved the right to offer in the markup is an amendment that would require some corporate contribution in terms of equity to the corporation as opposed to financing it totally with ratepayer surcharges. We don't have consensus on the subcommittee about whether that is a good idea or a bad idea, but in the FutureGen project, which is somewhat similar to what we are setting up here, not totally but somewhat, we did require that corporations put up equity money themselves that would be at risk from the shareholders as opposed to the ratepayers. Does NARUC have a position or do you have a personal position whether we should require some sort of a corporate contribution to the corporation, equity capital in addition to the ratepayer surcharges?

Mr. KERR. NARUC does not have a specific position on the more discrete issue. I think our fundamental position has been that technology is the key to the climate issue and the more dollars available, the better. The support that we have given to this legislation recognizes that ratepayers have a role to play but we think there are other participants in our energy economy that are potential sources. My personal view is that that is something that ought to be considered, your amendment. I think there are also other participants, whether they be the coal production side of the business, the rail transportation, there are many participants other than con-

sumers, individual ratepayers paying their \$10 to \$12 at the end of the line. I think my comments about cost recovery go to this. It is not, should we make the investment, it is not, is this bill a good idea, but it is that there has got to be some level of protection for those nameless, faceless consumers out there who more and more in the name of climate change, more and more ideas are going to be financed on the back of individual ratepayers at the end of the line and so I think ideas like yours are certainly worthy of discussion. This is my personal view, but I also think that that is the point we are making about some level of regulatory oversight before these fees are just simply placed on the ratepayers. I appreciate your sensitivity to that.

Mr. BARTON. Thank you, Mr. Chairman.

Mr. BOUCHER. Thank you very much, Mr. Barton.

The gentlelady from Wisconsin, Ms. Baldwin, is recognized for 5 minutes.

Ms. BALDWIN. Thank you. I want to actually take up where our ranking member left off here with Mr. Kerr. You had argued in your testimony that NARUC had strong concerns about section 8(a) of the bill, because in essence it is allowing the utilities to recover their costs by increasing rates for consumers without any regulatory oversight. First, you seem to think that the costs will amount to \$10 to \$12 per customer per year in the residential sector. I wonder what estimates you have about the cost impact in the commercial and industrial sector.

Mr. KERR. I don't have any. I think that the \$10 to \$12 per residential was provided by the subcommittee and we accept that subject to checking. Obviously it will be more than the \$10 to \$12 per residential customer.

Ms. BALDWIN. What sort of precedent are we setting if we remove regulatory oversight for rate increases for monopolistic entities such as utilities?

Mr. KERR. Well, I think it is an important point to distinguish, you know, and I feel like I am a little bit throwing a wrench in the works here. It is not really a question of should these costs be recovered. I mean, we think they are reasonable and they are prudent we incurred and they should be recovered under State law. What we are concerned about, as I just mentioned in responding to Ranking Member Barton, is that there will be more and more ideas that the solution will be, well, let us just decree in Washington that they be passed through in a rising cost environment. You know, essentially you relegate State regulators to become the tax collectors for federal ideas, and we think that that this is a dangerous precedent. We think that in a rising cost environment, you ought to have more scrutiny of the costs that are incurred. Again, I have every expectation, just as with the nuclear waste fund and the \$300 million a year that EPRI receives, which is largely ratepayer funding now, these costs will be passed through in rates but we certainly think that there needs to be State regulatory review of that to make sure that these costs are reasonable, that they are going for the intended purpose, that the program itself is yielding benefits to ratepayers and under State law they will be recoverable. But you ought not to decree as section 8(a) does that these costs are deemed reasonable and necessary and there-

fore shall be recovered because, frankly, I am not sure how would you know that at this point.

Ms. BALDWIN. And absent an amendment like the one that Mr. Barton just described, the Commissions wouldn't have any discretion to look at passing this onto shareholders versus ratepayers?

Mr. KERR. As written, I think it would preempt the States from doing that.

Ms. BALDWIN. Do you think that the purpose or intent of the underlying bill would be diminished if the regulatory oversight was not preempted?

Mr. KERR. I am sorry. Ask the question again.

Ms. BALDWIN. Would the purpose or intent of the underlying bill that we are looking at be diminished if the regulatory oversight were not preempted?

Mr. KERR. No, not at all, and in my written testimony which was provided for the record, we just last year as part of our Task Force on Climate Change adopted a resolution at NARUC doing just what this bill does, supporting these technologies and decreeing that reasonable and prudent costs shall be timely recovered. So there really isn't a disagreement. The question is whether it is necessary to intrusively step in and preempt States or whether you ought to go ahead and pass the bill and then let the companies work with their regulators to ensure that those costs are recovered, and I have every expectation they will be, and similarly, I think that if this technology is as important as it is being discussed today, and it is, and we agree with that, the companies will support the bill without this language in it. They should.

Ms. BALDWIN. Turning to Mr. Goo, as I mentioned in my opening statement, studies seem to conclude that in my home State of Wisconsin, we lack the necessary geological formations for storage. As a result, we would need to transport CO₂ by a pipeline system that currently does not exist, and local experts looking at this presume that we would have to transport it to either oil or gas fields, coal seams and deep saline aquifers that are present in the Illinois basin. Where are the concerns associated with transporting CO₂ and what are the possible liabilities during transport and storage on site?

Mr. GOO. CO₂ is currently being transported many hundreds of miles. There is actually about 40 million tons of CO₂ that are transported today in the United States and in North America and that CO₂ is used for enhanced oil recovery over thousands of miles of pipeline right now. So that is a mature technology that is already in place. Right now people are doing that. There is not a regulatory structure or liability structure associated with that, and we think that that can be done now immediately and we certainly don't need to wait for a complex liability structure to be put in place.

Ms. BALDWIN. I understand that the currently existing CO₂ pipelines have quality standards that limit the amount of substances such as hydrogen sulfide that can be mixed with the CO₂. Are you aware of any movement or desires to change these standards and is that an area where we need to be careful?

Mr. GOO. It is certainly an area where we need to be careful. I am not aware of movement to change or adjust those standards but

that is one of the things that we would do. EPA is looking at a number of those issues and there can be standards and rules set for that when it starts to happen on an even more wide-scale basis than is happening today.

Ms. BALDWIN. And one—

Mr. BOUCHER. Ms. Baldwin, we are going to need to move along, but thank you.

The gentleman from Illinois, Mr. Shimkus, is recognized for 5 minutes.

Mr. SHIMKUS. Thank you, Mr. Chairman, and I appreciate the panel. I think it has been very good, and I like the debate on conversion because that should be a focus and that is what Joe Barton held out for in our discussion because of these colleagues that my colleague just addressed, the transportation and recovery.

Mr. Goo, real quick. BP, British Petroleum, do they operate any coal-fired power plants?

Mr. GOO. I am not aware that they do.

Mr. SHIMKUS. So it is a little disingenuous to talk about the ability to capture and sequester carbon based upon a crude oil petroleum liquid fuel model versus the three or four different types of coal-fired power plants out there, isn't it?

Mr. GOO. I don't think so. I mean—

Mr. SHIMKUS. They are apples and oranges. We are talking about pulverized coal. We are talking about supercritical. We are talking about gasification plants. We are talking about emissions into the air versus capturing and storage for advanced oil recovery. We are all smarter than that. You can't use British Petroleum in this debate and what they do on liquid fuel to electricity generation.

Mr. GOO. Well, they are familiar with the basic technologies to capture carbon.

Mr. SHIMKUS. In liquid fuels, in crude oil, in—

Mr. GOO. No, from petcoke, which is a solid fuel. But in any event, let us not cite them. Maybe they don't know what they are doing.

Mr. SHIMKUS. Don't cite them. I think it is bad—

Mr. GOO. Let us look at Tenaska. Let us look at NRG.

Mr. SHIMKUS. Reclaiming my time. Let me move to this fuel switching debate, which is a critical debate because that is what happened in the Clean Air Act. The coal mines in southern Illinois closed. Instead of moving to scrubbers, we shipped in western coal to meet the regulations, and you know, miners went out of work. The United Mine Workers will testify to that. The market for natural gas and cutter is probably \$1.50 per cubic foot. The United States, it is probably \$15. If we fuel shift to electricity generation, it will make the debate for more drilling in the Outer Continental Shelf because we will need massive more need for natural gas. Natural gas is used for transportation. Natural gas is used for manufacturing. Natural gas is used for farming and fertilizers and these costs—if you want to understand what is driving up the cost of food, it is energy costs, it is fertilizer costs and all these energy input costs. So that makes the other part of this energy debate, which is more supply, even more—if we fuel shift to natural gas, drilling, exploration, and recovery is even more critical. That is why this all above strategy I think is a good way to good. Don't put

all your eggs in one basket. Coal has to be a major input in this whole debate. Now, it is only because of the great leadership of the chairman that—it is hard to get Republicans to agree, as Mr. Markey said, for additional costs. But I do it for my friends in the coal industry and my mine workers because we have to have the technology available if we go down this route through climate change, and that is kind of what this debate is about, large-scale, many megawatts, ability to capture and sequester, or use conversion.

Mr. Trisko, I would much rather the United Mine Workers take this position. Your position is, we support climate change but we know there is a risk. I would rather you say like I say, I don't support climate change until you show me there is not going to be a risk in my members losing their jobs, and I am waiting for you all. You guys are the guys who can make this happen because of your connection with mostly—you have some friends over on my side but you have a lot of friends on the Democrat side and they are in charge, and so I would plead with you and the other folks who are looking for expansion of energy opportunities, the operating engineers, the electricians, that they hold out for a good bill that they are not going to lose their jobs. I am not for it. Chairman Boucher knows, I am not for it. He is going to have to convince me that my folks don't lose their jobs and my manufacturers don't lose their jobs by high costs.

Mr. Chairman, I could go on, as you know.

Mr. BOUCHER. Yes, I know.

Mr. SHIMKUS. But I will yield back the balance of my time. I had 8 seconds before she switched.

Mr. BOUCHER. And you generously conceded those. Thank you very much. We will restore that to you at the proper time some day.

The gentleman from Washington State, Mr. Inslee, is recognized for 5 minutes.

Mr. INSLEE. Thank you.

Dr. Specker, in your testimony, you made reference to when you were addressing the issue of what the appropriate level of R&D in this and sequestration. You made reference to a full portfolio of R&D projects for the full portfolio of other sources of energy. Could you tell us what your organization believes should be a national R&D budget for the full portfolio including solar, thermal, photovoltaic, engineered geothermal, hydrokinetic, you name it? Can you give us any ballpark? In your testimony, you said it would be about \$1 billion seems in the ballpark a year for this particular technology. Can you give us any other ballparks for the remaining other sources including wind?

Mr. SPECKER. We have done some looking at this and I hesitate to put an exact number on it but—

Mr. INSLEE. And I don't ask for an exact number.

Mr. SPECKER. Probably an order of magnitude more than the \$1 billion a year, at least \$10 billion, and our \$1 billion a year is really incremental to the research and development that is already going on on CCS. The \$1 billion a year is very focused on large-scale demonstration of CCS, but if you expand that as to what additionally is needed for this full portfolio, in effect the sky is the limit. I think to me the question is much more around how do you

effectively spend the money that we collectively can afford. We have to be very selective. What I like very much about this legislation, it is targeted. I think we need to be very targeted, work the whole portfolio, renewables, efficiency, nuclear, coal, but in targeted ways.

Mr. INSLEE. Well, we like to be targeted too, each to our own district. That is our targeting, of course. Your answer is music to my ears because I share it. I share we have got to have orders of magnitude and, you know, right now we are at about \$3 billion total national energy R&D for everything, the whole portfolio. We spend \$84 billion a year on R&D for full portfolio of weapons systems. It seems to me we need to increase this dramatically. We spent less than one-eighth of what we did in the original Apollo project and we need to get up in, in my view, to \$15 to \$20 billion a year investment that I believe, at least my looking at it, that is in the range of what can be usefully invested. And so I appreciate your thoughts.

Having said that, is there any reason, if we know these are good investments, if we are going to create a revenue source for investment, is there is any reason to do it for just one technology? To me, it seems very difficult to justify doing any—we all have our favorites. You know, I have my favorite. But is there any legitimate reason to restrict our investment if we are going to create a revenue source to only one technology?

Mr. SPECKER. Yes, I believe there is. First of all, at EPRI we have no favorites. We work on all of them, every part of the portfolio, but from my view, looking at the full portfolio of technologies, the biggest gap we have by far is CCS. Our prism analysis that is in my written testimony shows that CCS is the biggest opportunity to slow, stop and reverse CO₂ emissions in the electricity sector. We and others are working very hard on all the other technologies and I could go through all of those, but the fact is, today the one that we don't have confidence we can do on a large-scale is CCS and it is the most critical technology to slowing, stopping and reversing CO₂ emissions. So I think there is a good reason to target CCS specifically.

Mr. INSLEE. That is assuming we have only got \$1 billion, but if I tell you that we had a \$10 billion increase in the research and development budget of the federal, I assume you are not suggesting we put all the \$10 billion into clean coal?

Mr. SPECKER. No, absolutely not.

Mr. INSLEE. You would suggest—and I want to make sure I understand this because I think I am going to get an answer I like but I will find out. I think you would like to urge us to find a way to have a federal investment of somewhere on the order of magnitude of \$10 billion for research in a full portfolio and allocated with as much wisdom as we can muster amongst the various technologies. Would that be your preferential course?

Mr. SPECKER. I certainly agree with that, yes.

Mr. INSLEE. Thank you. I took a flier on that. You are not supposed to ever answer a question you don't know what you are going to get. I appreciate that, and that is something that is a serious issue that we will be working on.

Just one other question. Since this technology will never be used unless there is a cap-and-trade system or some price on carbon, is there any reason people should advocate for this unless they believe there should be some restraint on carbon because if they did that, they would be advocating for a total waste of taxpayer money. Would you agree that anyone who argues for this investment, and I am arguing for an investment, should also support restraints on CO₂ emissions and some price on carbon ultimately? That is an open question to the whole panel.

Mr. SPECKER. My answer would be, we have to look at option to option. This is an option we have to have.

Mr. INSLEE. But should anybody support this option unless they also support a cap on CO₂ emissions? Why would anybody anywhere in the U.S. Congress—forget Congress. How can you justify an expenditure of \$1 billion of taxpayers' money unless you also support the conditions that will lead to its usage, which is a need to restrain CO₂? Is there any answer to that? That is a rhetorical question, I think.

Mr. MORRIS. The fact of the matter is, it makes sense to have this as a predicate to the larger debate of a carbon capture or a cap-and-trade program as we go forward. The point that surely I have been trying to make in front of this committee on many occasions and my colleagues in the utility business have been trying to make is dates and rates are immaterial if you don't have this technology. So do A before you do B or you are just creating something that won't happen. It may feel good but it won't happen. It will simply be a massive tax on the United States economy.

Mr. INSLEE. But will this ever be used unless there is some cap on CO₂?

Mr. MORRIS. I don't know that it would and I don't know that it won't. I think it is too premature to come to that conclusion.

Mr. INSLEE. Why would it be used?

Mr. MORRIS. We are capturing mercury at stations today and there is no federal legislation that requires that. So there are States that already have programs, the West Coast States. I mean, it will be used. There is no question about that. And again, this is very, very different. We keep talking about the taxpayer. This is a fee on the electric customers of the country.

Mr. INSLEE. Thank you for the chair's indulgence.

Mr. BOUCHER. The gentlelady from North Carolina is recognized for 5 minutes.

Ms. MYRICK. Well, thank you, Mr. Chairman, and I thank all the witnesses. This has been extremely helpful to me to hear what you had to say this morning. Actually, all my questions have been asked by Mr. Barton and Ms. Baldwin and Mr. Shimkus, so I really don't have anything further to ask except to say thanks and hopefully we will move forward.

Mr. BOUCHER. Thank you very much, Ms. Myrick.

The gentlelady from California, Ms. Harman, is recognized for 5 minutes.

Ms. HARMAN. Thank you, Mr. Chairman. As I have said before, it is a great pleasure to be part of a committee that tackles big problems in a serious and comprehensive way. That is what this House should be doing and one of the things I love about this com-

mittee is that to a greater extent than most parts of this House, we operate in a bipartisan manner. There are few problems bigger than global climate change. The reductions in greenhouse gas emissions that we must make to have a meaningful impact on the problem are enormous. As everyone on this committee knows and obviously these witnesses know, there will be no silver bullets, no easy fixes. Turning the enormous supertanker that is the U.S. economy is a monumental undertaking and we will need all hands on deck. That means we need to consider a wide range of technologies and a varied collection of regulatory schemes to drive change in energy and climate policy. In my view, a cap-and-trade system that puts the costs of emitting carbon on the entities doing the emitting must be part of the solution, and I surely hope that early in the next term of Congress we tackle this effectively. But there also need to be efficiency standards and incentives for the development of new technologies, as we know, and I was very pleased that we were able to get a good efficiency bill out of this committee and it was signed into law late last year by the President.

I agree with you and many of our colleagues that we cannot afford to take coal off the table. Coal is, of course, a notoriously dirty fuel but it is too plentiful and too deeply enmeshed in our economy to ignore. Renewable sources of energy may someday supplant coal as the central piece of America's energy portfolio but it is not realistic to expect that day will come any time soon. Coal is also the principal energy source for much of the developing world, China in particular, and that is not likely to change anytime soon. So coal will be with us. We had better find a way to use coal in a clean manner. That likely means spending some money, maybe a lot of money, on research into carbon capture and storage technologies. I think your bill is a good beginning and I applaud you for getting the conversation started, but there are many ways to incentivize technology development and I was interested in listening to the questions from some of our members about that and about where coal fits in the bigger picture of a comprehensive energy strategy that dramatically reduces carbon emissions so that hopefully we can save our planet.

So in that spirit, let me thank you for what you are doing here and let me just put a question to the witnesses, because I do want to observe my time. That is, Mr. Inslee was just asking, you know, if we had \$10 billion that fell out of the sky, which would be nice, and we could spend it on investments in clean energy, would you think that coal would be part of that picture. Obviously the answer to that was yes. But let me ask you what else besides coal you think are the most promising clean energy technologies and just give you all a little bit of time to push some of those. I certainly hope you have that point of view. If any of you disagree with me and think coal is the only thing in our future, speak up, but I doubt that would be your view. It surely isn't mine.

Mr. MORRIS. I think it is clear that to the utility industry, we believe that energy efficiency is the first and most cost-effective way for us to tackle this issue, but to the larger comments that you made, the comments that I just made, the world is going to burn coal, period. This country may be one of the few countries that can

develop this technology appropriately so it should still stay center stage.

Ms. HARMAN. Well, I hear you, but what about other technologies? What do you think are the most promising, let me ask the rest of you, technologies other than coal that we should be investing our pretend \$10 billion in on a short-term basis?

Mr. RUBIN. Ms. Harman, I have just taken another penny out of my pocket so I can get my 2 cents in on this one. I would like to second Mr. Morris's comment about the importance of energy efficiency. I don't think we hear enough about that. Most of the discussion tends to be on supply-side issues. There is not a single supply-side option, be it fossil, nuclear or renewable that I know of that at very large-scale doesn't have problems. The one relatively and maybe totally problem-free solution is to do a more efficient job of using less energy to get the goods and services we desire.

Ms. HARMAN. Thank you.

Mr. RUBIN. We know how to do that. That is where I would put a lot of that resource.

Ms. HARMAN. Other comments?

Mr. SPECKER. I would like to add, certainly in the written testimony that I have, you have our full portfolio which has all the technologies. One I would like to emphasize is electric transportation, which is not often brought up in this context, but to tackle CO₂, we must address transportation. Tremendous advances in battery technology that are occurring open up the opportunity to electrify certainly the light-duty vehicles to a much greater degree and we think that is essential, and it all links to having a low-carbon source of electricity.

Ms. HARMAN. You bet. Well, this committee in our energy bill did authorize investments in new battery technologies. We agree with you.

Mr. KERR. I just wanted to add too, you said it yourself, I think, there is no silver bullet, and I think that is why Dr. Specker's work and EPRI's work on the Prism analysis really is the best work I have seen. It amounts to answering the question of pursuing all available options and that won't satisfy any purists, but in fact, I think it is the most prudent course and it is the most comprehensive course that I have seen put together for this country to move forward. But you have to realize that there are regional differences in terms of the availability of different sorts of generation. There are also operational and reliability differences. I think in response to Mr. Inslee's question about the need for the deployment research in this bill, as a State regulator, one of my chief concerns is reliability, and one of the reasons you need to scale this up is to make sure that when you have to have it, which we're getting more and more rapidly to that point, given the growing demand, that you can count on it and so different sorts of generation have different reliability and operational characteristics, and that is another reason we need all of the available options so the different regions can go in and tailor service to the customers in those regions in a reliable and effective manner.

Ms. HARMAN. Thank you.

Mr. Chairman, I have run over my time. I would just amend that last comment by saying all the available clean resources tailored to different regions. I thank you, and I yield back.

Mr. BOUCHER. Thank you very much, Ms. Harman.

Mr. Markey has just arrived in the nick of time to pose questions and so he is recognized for 5 minutes.

Mr. MARKEY. Thank you, Mr. Chairman, very much. Mr. Chairman, this bill imposes a \$10 billion tax on American consumers and gives the money to an industry-run private corporation. That corporation has a vague mandate to develop CCS technology but no requirement to deliver any specific results, no strings attached and no meaningful government oversight.

Can any of you identify any precedent for Congress taking \$10 billion from consumers and giving it to a private corporation for a research fund without congressional oversight? Mr. Trisko?

Mr. TRISKO. Yes, Congressman Markey. In fact, one of the design elements of this bill is that it is modeled specifically upon the 1996 Propane Research Act. In that Act, Congress authorized members of the Propane Association to vote to establish a research corporation to pursue research related to propane and natural gas and to impose a fee of 50 cents per gallon on every gallon of propane sold in the United States.

Mr. MARKEY. So how much money has that wound up providing in total?

Mr. TRISKO. Less money than we are talking about here but it was a smaller entity overall.

Mr. MARKEY. Yes, but what is the scale that we are talking about?

Mr. TRISKO. Maybe it is a couple hundred million, something—

Mr. MARKEY. A couple hundred million?

Mr. TRISKO. Yes, instead of a billion, something on that order.

Mr. MARKEY. And—

Mr. TRISKO. But there is a precedent.

Mr. MARKEY. And what was the oversight mechanism over that \$200 million?

Mr. TRISKO. I don't believe there was a direct oversight mechanism provided in the bill.

Mr. MARKEY. There was not. I see. We have a nuclear waste trust fund funded through funds collected by the Federal Government subject to congressional appropriations and oversight and overseen by the Department of Energy. Doesn't that make it different than what is being proposed here, Mr. Kerr?

Mr. KERR. It does make it different, and it is our position that something off-budget would be preferable, given the experience we have had with the nuclear waste fund. Customers who receive part of their power from nuclear generation have invested \$27 billion in the nuclear waste fund, and unfortunately, you have our money and we still have your waste.

Mr. MARKEY. Mr. Morris, last year you received about \$20 million in the—the question that I have is, why not make the funding for this effort a surcharge on coal since coal is the main beneficiary?

Mr. MORRIS. Well, in essence, that is what you are doing by having this as a fee charged to any carbon-based fuel so the fee that

coal pays is larger than the fee that natural gas pays. Let us not forget, natural gas is also a carbon-based technology and that is more than the fee that oil would pay and it too is a carbon-based fuel. So I think that they have addressed that in a most appropriate way, and again, this was the recommendation that came out of the EPA and the work that had been done a few years back supporting this kind of recommendation. I think we have done exactly as you are suggesting.

Mr. MARKEY. Mr. Goo, the Republicans in the Senate have been blocking attempts to extend tax credits for wind and solar and geothermal. Are we sending the right message by talking about passing legislation to help coal technology while the Republicans in the Senate are blocking the renewal of the tax breaks for wind and solar and geothermal and also blocking the renewable electricity standard that would also give an incentive to the—and we know Senator McCain was the key vote in the Senate, so does this make any sense in terms of balance?

Mr. GOO. In terms of balance, it does not make sense. In terms of balance, we should be pursuing renewable energy and these other types of technologies with equal, if not greater, zeal and vigor than we are pursuing CCS. Nonetheless, in order to solve the climate problem, we need to pursue CCS very rapidly and very aggressively. So we need a dual path strategy, as every one here has said.

Mr. MARKEY. And Mr. Morris, is the industry incapable of putting together its own CCS funding?

Mr. MORRIS. That is exactly what this is. This was brought to you by the United Mine Workers, brought to you by utilities across this country who burn these fuels—

Mr. MARKEY. No, I mean—

Mr. MORRIS [continuing]. And want to get going.

Mr. MARKEY. I mean out of existing profits.

Mr. MORRIS. This is a way to get it done in a more creative way in keeping with the first step of a carbon cap-and-trade program. Again, Congressman Markey, or you weren't with us when we had this conversation, but without this enabling technology, you can make all the cap-and-trade bills you want. The world is going to burn coal. It needs this technology.

Mr. MARKEY. Oh, I agree they need this technology.

Mr. MORRIS. This is a great way to go about doing it. It is an excellent way.

Mr. MARKEY. I agree they need the technology. It is just what is the mechanism by which we achieve that.

Mr. MORRIS. I would argue that utilities all across this country have for years and years and years invested our customers' money and invested it very wisely. I don't think we need government oversight.

Mr. MARKEY. Well, I will say this: it does need government oversight, and if anything is an example of something that is in need of it, it is these energy projects. In the 32 years that I have been in Congress, if you don't keep a close watch on them, they tend to run on and on in costs and return less and less in terms of a benefit to the public.

Thank you, Mr. Chairman.

Mr. BOUCHER. Thank you very much, Mr. Markey.

Again, I want to thank this panel of witnesses for what has been a very thoughtful discussion. We have all learned a lot from the testimony you provided and the excellent answers you have posed to our questions.

I am going to conclude with one suggestion. I know that Mr. Morris is concerned about making sure that whatever fees are imposed through this legislation be recoverable through rates. Mr. Kerr is concerned about making sure that utility regulators have a measure of say in those decisions. And I would like to suggest that the two of you perhaps have a conversation, assuming you are both willing to do that, and see if a way can be found to your mutual satisfaction to make sure that both of your goals are met. I note from your testimony both of you have suggested that potentially ways could be found to do it and that is what leads me to make this recommendation. So Mr. Morris and Mr. Kerr, would that be agreeable to you?

Mr. KERR. Absolutely, Mr. Chairman.

Mr. MORRIS. I am always happy to leave with an assignment.

Mr. BOUCHER. Excellent. Thank you very much. Well, let us know when you have something. With the Chair's thanks to these witnesses and to the members of the panel, this hearing is adjourned.

[Whereupon, at 12:35 p.m., the subcommittee was adjourned.]

[Material submitted for inclusion in the record follows:]

The New York Times
nytimes.com

May 30, 2008

THE ENERGY CHALLENGE

Mounting Costs Slow the Push for Clean Coal

By MATTHEW L. WALD

WASHINGTON — For years, scientists have had a straightforward idea for taming global warming. They want to take the carbon dioxide that spews from coal-burning power plants and pump it back into the ground.

President Bush is for it, and indeed has spent years talking up the virtues of “clean coal.” All three candidates to succeed him favor the approach. So do many other members of Congress. Coal companies are for it. Many environmentalists favor it. Utility executives are practically begging for the technology.

But it has become clear in recent months that the nation’s effort to develop the technique is lagging badly.

In January, the government canceled its support for what was supposed to be a showcase project, a plant at a carefully chosen site in Illinois where there was coal, access to the power grid, and soil underfoot that backers said could hold the carbon dioxide for eons.

Perhaps worse, in the last few months, utility projects in Florida, West Virginia, Ohio, Minnesota and Washington State that would have made it easier to capture carbon dioxide have all been canceled or thrown into regulatory limbo.

Coal is abundant and cheap, assuring that it will continue to be used. But the failure to start building, testing, tweaking and perfecting carbon capture and storage means that developing the technology may come too late to make coal compatible with limiting global warming.

“It’s a total mess,” said Daniel M. Kammen, director of the Renewable and Appropriate Energy Laboratory at the University of California, Berkeley.

“Coal’s had a tough year,” said John Lavelle, head of a business at General Electric that makes equipment for processing coal into a form from which carbon can be captured. Many of these projects were derailed by the short-term pressure of rising construction costs. But scientists say the result, unless the situation can be turned around, will be a long-term disaster.

Plans to combat global warming generally assume that continued use of coal for power plants is unavoidable for at least several decades. Therefore, starting as early as 2020, forecasters assume that carbon dioxide emitted by new power plants will have to be captured and stored underground, to cut down on the amount of global-warming gases in the atmosphere.

Yet, simple as the idea may sound, considerable research is still needed to be certain the technique would be safe, effective and affordable.

Scientists need to figure out which kinds of rock and soil formations are best at holding carbon dioxide. They need to be sure the gas will not bubble back to the surface. They need to find optimal designs for new power plants so as to cut costs. And some complex legal questions need to be resolved, such as who would be liable if such a project polluted the groundwater or caused other damage far from the power plant.

Major corporations sense the possibility of a profitable new business, and G.E. signed a partnership on Wednesday with Schlumberger, the oil field services company, to advance the technology of carbon capture and sequestration.

But only a handful of small projects survive, and the recent cancellations mean that most of this work has come to a halt, raising doubts that the technique can be ready any time in the next few decades. And without it, “we’re not going to have much of a chance for stabilizing the climate,” said John Thompson, who oversees work on the issue for the Clean Air Task Force, an environmental group.

The fear is that utilities, lacking proven chemical techniques for capturing carbon dioxide and proven methods for storing it underground by the billions of tons per year, will build the next generation of coal plants using existing technology. That would ensure that vast amounts of global warming gases would be pumped into the atmosphere for decades.

The highest-profile failure involved a project known as FutureGen, which President Bush himself announced in 2003: a utility consortium, with subsidies from the government, was going to build a plant in Mattoon, Ill., testing the most advanced techniques for converting coal to a gas, capturing pollutants, and burning the gas for power.

The carbon dioxide would have been compressed and pumped underground into deep soil layers. Monitoring devices would have tested whether any was escaping to the atmosphere.

About \$50 million has been spent on FutureGen, about \$40 million in federal money and \$10 million in private money, to draw up preliminary designs, find a site that had coal, electric transmission and suitable geology, and complete an Environmental Impact Statement, among other steps.

But in January, the government pulled out after projected costs nearly doubled, to \$1.8 billion. The government feared the costs would go even higher. A bipartisan effort is afoot on Capitol Hill to save FutureGen, but the project is on life support.

The government had to change its approach, said Clarence Albright Jr., the undersecretary of the Energy Department, to “limit taxpayer exposure to the escalating cost.”

Trying to recover, the Energy Department is trying to cut a deal with a utility that is already planning a new power plant. The government would offer subsidies to add a segment to the plant dedicated to capturing and injecting carbon dioxide, as long as the utility bore much of the risk of cost overruns.

It is unclear whether any utility will agree to such a deal. The power companies, in fact, have been busy pulling back from coal-burning power plants of all types, amid rising costs and political pressure. Utility executives say they do not know of a plant that would qualify for an Energy Department grant as the project is now structured.

Most worrisome to experts on global warming, the utilities have recently been canceling their commitments to a type of plant long seen as a helpful intermediate step toward cleaner coal.

In plants of this type, coal would be gasified and pollutants like mercury, sulfur and soot removed before burning. The plants would be highly efficient, and would therefore emit less carbon dioxide for a given volume of electricity produced, but they would not inject the carbon dioxide into the ground.

But the situation is not hopeless. One new gasification proposal survives in the United States, by Duke Energy for a plant in Edwardsport, Ind.

In Wisconsin, engineers are testing a method that may allow them to bolt machinery for capturing carbon dioxide onto the back of old-style power plants; Sweden, Australia and Denmark are planning similar tests. And German engineers are exploring another approach, one that involves burning coal in pure oxygen, which would produce a clean stream of exhaust gases that could be injected into the ground.

But no project is very far along, and it remains an open question whether techniques for capturing and storing carbon dioxide will be available by the time they are critically needed.

The Electric Power Research Institute, a utility consortium, estimated that it would take as long as 15 years to go from starting a pilot plant to proving the technology will work. The institute has set a goal of having large-scale tests completed by 2020.

"A year ago, that was an aggressive target," said Steven R. Specker, the president of the institute. "A year has gone by, and now it's a very aggressive target."

THE WALL STREET JOURNAL.

More Power Cuts Loom In China This Summer

By Sherry Su July 10, 2008; Page A9

SINGAPORE -- A worsening coal shortage means that China faces the prospect this summer of the most extensive power cuts it has seen in four years.

Despite encouragement to keep the current flowing, with new approval to raise electricity prices, power generators are struggling to find enough fuel, in part due to China's clampdown on illegal coal mines. This, coupled with robust demand for electricity, explains why the National Development and Reform Commission recently said the power shortfall this summer could be as high as 10 gigawatts, with 60% of the disparity in Guangdong province, a manufacturing hub.

But analysts say the shortfall may well be larger than the government economic-planning agency's forecast. Cuts are already causing major problems, and the situation may well get worse, not least due to inadequate connections, which hinder regions with surpluses from filling gaps elsewhere. Electricity rationing has been imposed in several provinces, and many power plants are struggling with shrinking coal stocks.

On July 6, inventories at 541 coal-fired power plants connected to the state grid averaged 34.64 million metric tons -- the equivalent of 11 to 12 days of stock, below the normal level of 15 days -- according to domestic media reports. Stocks at 64 plants were below three days' supply, while an additional 181 had stocks of less than seven days.

On Tuesday, shares in Aluminum Corp. of China Ltd., China's largest alumina producer by output, slumped in Hong Kong after the company said two of its smelters in Shanxi province were forced to cut production because of a power shortage.

The Chinese government has been stepping up efforts to close down illegal mines since 2005. Output from small coal mines, which account for nearly one-third of China's total production, is now stagnant at best, and large state-owned mines haven't bridged the gap, said Wang Shuai, an analyst with Shanghai-based Orient Securities. At the same time, demand has been growing robustly in the past year, with a slew of new coal-fired electricity capacity coming online.

Yang Tao, an analyst with KGI Securities, estimates that the coal shortage is likely to reach 10 million to 20 million tons this year. Though that volume is a fraction of China's total coal output -- around 2.5 billion tons in 2007 -- it is still significant, because more than 80% of China's electricity is produced by coal-fired power plants. --David Winning in Beijing contributed to this article.

Response submitted by American Electric Power to questions posed to Mr. Michael G. Morris by the Honorable Mike Rogers for the record in the hearing entitled "Legislative Hearing on H.R. 6258, the Carbon Capture and Storage Early Deployment Act" before the Subcommittee on Energy and Air Quality on July 10, 2008.

The below responses are based on the September 2 staff draft of the legislation.

QUESTION 1

Timing and Process: Once enacted, what is the estimated timing for the various steps that must be followed prior to actually distributing funds and getting demonstration projects underway? In particular how long will it take to A) Determine which utilities vote on creation of the fund and hold the referendum (Sec. 3); B) establish the Carbon Storage Research Corporation – assuming it passes; C) collect the fees; D) determine who gets demonstration funds E) fund the actual technology demonstrations; and F) complete the actual demonstration projects.

RESPONSE:

The legislative language is silent on these questions, so as to provide flexibility for the Corporation and its Board to comply with the goals of the legislation. The legislation stipulates only one deadline – related to the state regulatory authorities. The bill provides that “upon its own motion or the petition of a qualified industry organization, each State regulatory authority shall consider its support or opposition to the creation of the Corporation . . . within 180 days after the enactment of this Act.”

The intent of the legislation is to expedite the establishment of the Corporation and funding of the demonstrations. It accomplishes that by placing the responsibility in the hands of a Corporation, and Board, that operates as a division of EPRI and whose members represent those industries that are participating in and/or stand to benefit most from successful CCS demonstration projects. The distribution utilities have a strong incentive to expeditiously establish the Corporation and its Board. The Board, likewise, will have a strong incentive to begin collecting fees, solicitation of projects, and funding of demonstrations. However, to cite any specific time frame would be speculative on our part.

QUESTION 2

Placement of Projects: Since geology is an important factor, do we need to mandate placement of projects, and if so, how should we disperse them?

RESPONSE:

The bill stipulates that “such projects should encompass a range of different coal and other fossil fuel varieties, be geographically diverse, involve diverse storage media, and employ capture or storage, or capture and conversion, technologies potentially suitable either for new or for retrofit applications.” The goal of the legislation is therefore to encourage a range of different demonstrations in different parts of the United States that take into account different fuel sources, so as to prove the viability of CCS under a wide range of circumstances.

That is the only reference to geology that is included in the legislative language. As part of its solicitation for projects, the Corporation and Board could draft selection criteria that meets this legislative requirement and includes consideration of the need to demonstrate the sequestration capacity of different geologic settings and different regions of the country, but this is just one of many factors that should be considered in the selection process. To facilitate consideration of this factor and avoid duplication of geologic evaluations that have already been completed by state agencies the Corporation and Board should request that the US Geological Survey share states' high resolution surveys as they become available. The US Department of Energy also can contribute information from its regional partnership projects, although this information may be at a lower resolution than required to adequately compare projects.

QUESTION 3

Aside from R&D and large demonstration projects, what thought is being given to the myriad of other issues like liability, easement issues, and geologic challenges which must be addressed?

RESPONSE:

The legislation is silent on these issues. That does not mean that thought is not being given to these questions, only that this bill was never intended to address the full range of such legal, regulatory and environmental issues. Some of these issues will be addressed by the various states as part of their regulatory processes. Other issues are already the subject of regulatory rulemakings by the various agencies, such as the EPA.

Each of these issues is being given serious consideration in policy and technical forums seeking to advance CCS. As noted in the response to issue 2, above, geologic research is being carried out in the regional sequestration partnership projects and other national and international initiatives, so that reliable assessments of available storage capacity can be made, and geologic variability is considered appropriately in making siting decisions. There are a number of diverse settings within which sequestration can take place safely and reliably, and no action should be taken that would prematurely eliminate sites from more detailed investigation for future use.

With respect to liability issues, the experience available from existing enhanced oil recovery operations and natural gas storage formations provides reasonable assurance that properly sited projects present minimal risk of loss of stored CO₂ or damage to other underground resources. Current pipeline operations transporting CO₂ likewise have strong safety records. We expect operating facilities to be able to secure appropriate insurance or other risk management mechanisms to support their operations, but first movers may incur disproportionate costs until a broader base of experience has been established, and funds available under this program could help offset these costs. As storage sites go through closure and post-closure care monitoring, stabilization of the stored CO₂ will minimize future risks, but alternative mechanisms may be necessary to assure availability of resources to respond to future needs.

The availability of easements, leases, or other access to deep storage formations will largely be governed by state law, but should be readily available at a minimal cost due to the lack of interference with the enjoyment of property rights held by surface owners, and the critical need to advance CCS as a key component of meaningful levels of CO₂ emission reductions.

QUESTION 4

How is the “value” of the intellectual property/technology shared among the parties?

RESPONSE

The legislation provides that “the Board shall establish policies regarding the ownership of intellectual property developed as a result of Corporation grants and other forms of technology support. Such policies shall encourage individual ingenuity and invention.” The Board will therefore determine how the “value” of intellectual property will be shared, with the proviso that the goal is to encourage innovative CCS projects and not penalize those who develop technology. It should also be noted that in many cases the CCS projects will utilize technology that has already been developed and is the subject of existing patents. In those cases the CCS projects will be demonstrating that existing technology, that has

already been patented, can operate on a large commercial scale. Such technology would presumably be licensed from the vendors and developers of that technology.

QUESTION 5

What happens if overall climate change legislation is passed in the meantime and we find ourselves waiting for this process and figuring out allocations at the same time?

RESPONSE

This legislation and the possible enactment of climate change legislation are intended to work together and in concert. The goals of HR 6258 and climate legislation of the type recently distributed in draft form by Chairman Dingell and Mr. Boucher are entirely consistent.

HR 6258 is essential, because while the goals are consistent, the timing is not. Given the broad economic implications of comprehensive climate legislation and current fiscal constraints, such legislation is not likely to be enacted next year, during the first year of an incoming Administration. It is more likely that climate change legislation will be enacted within three to five years at the earliest. Once enacted, a major regulatory regime must be established, and that will take an additional four or five years. Taken together, the regulatory mechanisms to place an enforceable cap on domestic emissions will not be in place for seven to ten years at the earliest.

In addition, funding for early large scale CCS projects has been addressed in pending climate legislation, if at all, only through early auctions and the distribution of those auction revenues. (AEP does not support auctions in the case of regulated utilities, since the costs of auctions are passed directly through to our customers, and conversely, the benefits of allocated allowances are also passed to our ratepayers.) If it takes three to five years for any significant auction revenues to flow back to CCS projects from auction proceeds. Utilities will not receive any significant support for CCS deployment for up to ten or fifteen years from today.

We can't wait that long. America must develop and prove the viability of large scale commercial CCS projects far sooner, so that they are ready for widespread commercial deployment in ten to fifteen years. The next decade is critical, and it is that critical period that is not addressed in climate change legislation. HR 6258 addresses that time gap – it is the bridge to the future with regards to climate legislation. HR 6258, along with climate legislation, provides a glide path of CO₂ reductions that reflect the realities of technology development, deployment and financing. If the emissions reduction schedule is mismatched with faster deeper

reductions that would preclude the deployment of CCS technology and the curtailment of baseload generation, the impact to the nation's economy would be devastating.

But the issue is not only one of timing. For a regulated utility, without a mandatory cap, and a federal requirement to reduce greenhouse gases, there is no certainty that utilities can obtain rate recovery for CCS projects. H.R. 6258 is absolutely essential to prove CCS and other promising technologies in time for an aggressive, mandatory, cap-and-trade program. Regulated utilities need the approval of public utility commissions (PUCs) to include power and technology costs in electric rates. Generally, PUCs only approve costs that are necessary and prudent or in compliance with applicable federal and state requirements. While states may fund limited R&D projects, PUCs generally approve additional costs for environmental controls only when specifically required by statute or regulation. In rate cases, outside parties can also file comments that evaluate the viability and cost of compliance options, and if CCS is questionable, they will advocate other approaches such as switching to natural gas that may also limit the use of coal for the existing and future coal-fired fleet. This represents the ultimate “chicken-and-the-egg” climate change paradox. AEP believes that we will face a mandatory federal cap on our emissions, and that this will be enacted into law during the next decade. Many would consider it imprudent to build to build new electric generating plants with anything other than state-of-the-art and advanced technology today in order to assure the achievement of the ambitious GHG emission reduction goals for 2050. We are still operating plants that were built during the Eisenhower, Kennedy and Johnson administrations, and plants built today will be operating during the term of the President who sits in the Oval Office in the 2050s. Thus, utilities and PUCs alike face significant obstacles when constructing advanced technology to meet environmental requirements that are certain to be enacted into law, but that has not yet occurred. Despite this conundrum, AEP proposed to construct an IGCC plant to serve our West Virginia and Virginia customers, since IGCC works more effectively to reduce CO₂ emissions through future CCS applications. Although West Virginia approved, Virginia did not. Despite this outcome, I am hopeful that a means can be found to move forward. We must take the long view, and recognize that some form of cap-and-trade legislation will become law.

Despite early success in clean coal initiatives, the viability of appropriations has been undermined with a succession of appropriations deferrals, delays and reductions, and appropriations are not likely to be of the magnitude required for CCS. The broad remedy to these circumstances is a guaranteed source of funding through a small wires charge. That is the solution proposed in H.R. 6258. The demonstration projects envisioned by this bill are essential to an important public policy goal and must be started as soon as possible. H.R. 6258 represents a new, breakthrough approach to fix our broken system for funding development of advanced environmental technology. America needs H.R. 6258 now – well before actual enactment of any climate legislation. H.R. 6258

presents a vital opportunity to fix the rate recovery system for early deployment of CCS.

With regards to allocations, the Boucher-Dingell climate draft prohibits “double dipping,” so that any company that receives support under HR 6258 could not also receive bonus allowances for a CCS project. Again, in this area as well, HR 6258 works in concert with climate legislation. The bonus allowances in climate legislation are intended to help fund the wider construction of expensive CCS projects as a critical means of compliance under climate legislation. By contrast, HR 6258 is intended to prove the viability of CCS – so that it will be proven and can begin deployment under climate legislation. In point of fact, HR 6258 specifically provides that the Corporation is authorized to collect the wires charge for only ten years and the Corporation itself and all of its activities are dissolved fifteen years after date of enactment.

The Carbon Capture and Storage Early Deployment Act provides an essential bridge to the future, and a means to guarantee funding for the development of CCS in the early years, so it can be demonstrated and proven to work, to protect the environment, and to be safe for the areas in which it is deployed. Chairman Boucher and the cosponsors have provided an important public service for their constituents and for the nation, for the reality is that CCS is not just necessary – it is essential. Without CCS it will be impossible to burn coal and reach the cap levels proposed in most legislation from 2020 through 2050 and beyond for the remainder of the century. That is not only true in our own country, it is the case for the rest of the world as well since nations like China and India possess huge coal reserves and are already rapidly expanding their existing fleet of coal plants.

**Supplemental Testimony of Edward S. Rubin to Additional Questions
from the
Subcommittee on Energy and Air Quality
Committee on Energy and Commerce
U.S. House of Representatives**

**Regarding the Legislative Hearing on H.R. 6258
The Carbon Capture and Storage Early Deployment Act**

This is a reply to three additional questions from the Honorable Mike Rogers pursuant to the Legislative Hearing held on July 10, 2008, transmitted by a letter dated October 22, 2008 from the Honorable John D. Dingell, Chairman of the House Committee on Energy and Commerce.

Question 1. Placement of Projects: Since geology is an important factor in successful carbon capture and sequestrations, should Congress mandate placement of the projects in particular geological areas? If so, how should Congress disperse the projects?

Certainly geology is an important factor in the demonstration of large-scale carbon capture and sequestration (CCS). So too are a number of other factors, including the type of power plant, type of coal used, and type of capture technology employed. The successful demonstration of CCS technology for widespread use in the U.S. utility industry will therefore require a set of projects that cover different combinations of these factors. Because of the many issues and details involved in selecting project sites and technologies, the selection of particular geological areas for demonstration projects funded under this bill should be the responsibility of the Corporation established by the bill to implement the program. Congress should provide clear guidelines indicating that projects selected for funding should cover a range of geological areas across the country (among other factors). But the specific dispersal of projects should be the responsibility of the Corporation, in consultation with its designated advisory groups.

As an example of how ten large-scale demonstration projects might be dispersed across different geological regions and plant types, Table 1 shows the recommendations of a recent Pew Center study in which I participated. Here, half the plants would be deployed in the eastern U.S. and half in the western U.S. Projects at both new plants and existing plants also are desirable.

Table 1. A suggested number of plant types and locations for ten large-scale CCS demonstrations

Type of Capture Technology and Coal Resource	Geographic Location	
	East of Mississippi	West of Mississippi
POST-COMBUSTION (PC/Oxyfuel*)		
- Bituminous coal	1	1
- Sub-bituminous coal	2	1
PRE-COMBUSTION (IGCC)		
- Bituminous coal	2	-
- Sub-bituminous/ Lignite coal	-	3
TOTAL	5	5

*Oxyfuel combustion included in later years of the program.

Source: A Program to Accelerate the Deployment of CO₂ Capture and Storage (CCS): Rationale, Objectives, and Costs, Prepared by V.A. Kuuskraa for Pew Center on Global Climate Change, Arlington, VA, December 2007.

Question 2. How does this fund and the projects that are funded relate to what is already being done by DOE and others?

The purpose of this proposed new program is to accelerate the commercial deployment of CCS by providing substantial additional funds—approximately one billion dollars per year for ten years—to support the costs of early full-scale CCS projects at coal-fired power plants. A well-designed program of this type would complement—not compete with or substitute for—the current programs of DOE and others. As I indicated in my July testimony to the Subcommittee, the DOE/NETL Carbon Sequestration Program has played a critical role in advancing the technology and understanding of CCS, and continued support for that program (and others related to CCS development) is essential for continued success.

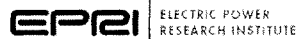
The proposed Trust Fund program likely would not be necessary if Congress were to provide DOE with a similar level of additional funding for large-scale CCS demonstrations at power plants, with flexible cost-sharing requirements and other provisions to help ensure the reliability of future funding commitments. Unfortunately, as I also indicated in my earlier testimony, public funding levels to date have not been sufficient to bring forth the set of large-scale CCS projects that are urgently needed if U.S. coal is to be used with little or no CO₂ emissions (i.e., a set of commercial-scale power plant projects akin to those illustrated earlier in Table 1). In the absence of a climate policy mandate, industry is waiting for more government support, governments worldwide are waiting for greater industry commitments, and the result to date has been little progress on full-scale demonstrations where they are most needed. Recent initiatives like the restructured FutureGen program certainly can and will play an important role if program goals are realized. But even those commitments fall short of what is needed to accelerate the widespread commercial availability of CCS in power plant applications. For this reason, a Trust Fund program offers an alternative approach to providing the additional funds that are needed.

Question 3. IP: How should the value of the intellectual property/technology developed by this proposed plan be shared among the parties?

This is an excellent and very important question, but one for which I do not personally have the expertise or experience to answer in any detail. My simple response is that this too is a matter that should be addressed in detail by the Corporation empowered to implement and manage the proposed program. Congress again should provide clear guidance that IP issues be resolved in a manner that balances the public interest with the legitimate needs and concerns of technology developers and providers who participate in the program. Experience from prior programs such as the DOE Clean Coal Technology demonstration projects, as well as other relevant precedents in dealing with IP issues, can likely provide guidance and models for this program as well.

Dated: November 26, 2008

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STEVEN R. SPECKER
President and
Chief Executive Officer

November 3, 2008

The Honorable John D. Dingell
Chairman
Committee on Energy and Commerce
U.S. House of Representatives
Washington, DC 20515-6115

Dear Chairman Dingell:

Thank you for your October 22 letter conveying additional questions from the July 10, 2008 hearing entitled "Legislative Hearing on HR 6258, the Carbon Capture and Storage Early Deployment Act". It is my privilege to provide you with the attached responses to these questions. A written copy is being hand-delivered to 2322-B Rayburn House Office Building and faxed to Ms. Rachel Blesman at 202-225-2899.

If you should require any other information, please feel free to contact me directly.

Sincerely,

Attachment

c: The Honorable Joe Barton, Ranking Member
Committee on Energy and Commerce

The Honorable Rick Boucher, Chairman
Subcommittee on Energy and Air Quality

The Honorable Fred Upton, Ranking Member
Subcommittee on Energy and Air Quality

The Honorable Mike Rogers, Member
Subcommittee on Energy and Air Quality

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**Responses to Additional Questions to
Dr. Steven R. Specker, President and CEO, Electric Power Research Institute
Legislative Hearing on H.R. 6258, the Carbon Capture and
Storage Early Deployment Act
November 5, 2008**

Question 1 – Timing and Process: Once enacted, what is the estimated timing for the various steps that must be followed prior to the actually distributing funds and getting demonstration projects underway? In particular, how long will it take to:

A) – Determine which utilities vote on the creation of the fund and hold the referendum.

Upon the passage of the legislation, two concurrent timetables will commence.

- Conducting the Referendum – The Act allows up to six months for the Secretary of Energy to propose and issue a final rule for determining the level and type of fossil fuel electricity delivered to retail customers by each distribution utility. Once this rule is in place, the qualifying industry organizations – the Edison Electric Institute (EEI), the American Public Power Association (APPA) and the National Rural Electric Cooperative Association (NRECA) – will use an independent auditing firm to conduct a vote of distribution companies. Upon approval of those persons representing two-thirds of the total quality of fossil fuel-based electricity delivered to retail consumers, the Corporation will be established unless opposed by State regulatory authorities as outlined below. Issuing and collecting the referendum vote will be completed with 90 days of issuance of the final rule. The combination of these steps will be completed within a maximum 9 months (possibly less) after the passage of the Act.
- Within 30 days of passage of the Act, the auditor, working with the National Association of Regulatory Utility Commissioners (NARUC), will give notice to state regulatory authorities of their right to support or object to creation of the Carbon Storage Research Corporation (the Corporation). If less than 40% of the state regulatory authorities submit written notices of opposition within 180 days, the Corporation shall be established. The process will require 7 months from the passage of the Act.

B) – Establish the Carbon Storage Research Corporation, assuming it passes.

The Carbon Storage Research Corporation will be established as a subsidiary of the Electric Power Research Institute (EPRI) within 60 days of the completion of the Referendum and the State regulatory authority filing of views (assuming a positive outcome on both measures). EPRI believes it would be able to use an existing but inactive nonprofit, tax-exempt subsidiary as the basic corporate structure. The Corporation's Board of Directors will be selected within this 60 day period using the collaborative model through which EPRI already works with EEI, APPA and NRECA to nominate the majority its own Board members. The remaining Board seats (Fossil Fuel Producers [one seat], Independent Generators or Wholesale Power Providers [one seat], Non-profit environment groups [one seat] and Consumer Groups [one seat]) would be

nominated within the 60 day period through collaboration with appropriate trade and non-governmental organizations and in consultation with EPRI's Advisory Council, which consists of ten state regulators and approximately 20 other stakeholders from academia, business and environmental groups.

In addition, the following non-voting members will be selected as prescribed in the Act:

- State Public Utility Commissions (two seats, non-voting) – designated by the National Association of Regulatory Utility Commissioners (NARUC). These seats must be from States that do not have the same transmission interconnection.
- DOE (one seat, non-voting) –the Secretary of Energy or his designee.

C) – Collection of Fees

The financial organization already exists within EPRI to collect fees from the distribution utilities on behalf of the Corporation. EPRI currently bills and collects fees for its RD&D program on a quarterly basis and would propose using a similar process for the Corporation funding. EPRI expects that it could put those systems in operation on behalf of the Corporation within 60 to 90 days of the passage of the Act, although billing will not commence until after the Referendum and the State regulatory authority notification processes discussed in 1A and 1B above.

D) – Determine who gets the demonstration funds

The Corporation Board, in consultation with the Technical Advisory Committee, the Secretary, and the Director of the National Energy Technology Laboratory, will establish priorities for its plans, programs, and projects, and then publish requests for proposals to identify candidate commercial-scale demonstrations of CO₂ capture and storage technologies. Eligible entities for grant, contracts or financial assistance are identified in the Act.

- The initial solicitation (request for proposals or RFP) period will be issued within 30 days of the formal establishment of the Corporation.
- Proposals for demonstrations must be received with 90 days of the RFP announcement.
- The targeted review, selection, approval and award notification process is estimated to be completed within a 120 days following the close of the RFP period.
 - Proposals will be evaluated and ranked by the Corporation staff.
 - Reviews of the proposals will be conducted with the Technical Advisory Committee for input on project selection.
 - The Corporation Board will approve final project selection and notify designated recipients.

E) – Fund the actual demonstrations

The timing on the release of funds to the selected demonstration projects will be very project specific and will coincide with pre-established project milestones to ensure the proper stewardship of funds. Audits of the completion of milestones will be conducted to ensure financial prudence.

F) – Complete the actual demonstration projects

Based on EPRI's experience with the power plant and environmental controls construction processes, the time from demonstration award to completion of the demonstration will be project specific and may vary by the complexity of the project. Anticipated times may be on the order of:

- Construction of the CCS components of the power plant – 3+ years depending on project scale
- Initial verification of project operational success for carbon capture – 1-2 years
- Ongoing capture process verification and enhancements – up to 2 years
- Underground storage monitoring for performance and safety – 3 + years

Question 2 – Placement of Projects: Since geology is an important factor, do we need to mandate placement of the projects? If so, how should we disperse them?

Section 4(b) of H.R. 6258 clearly indicates that projects to be funded by the Corporation “should encompass a range of different coal and other fossil fuel varieties, be geographically diverse, involve diverse storage media...”. Because the distribution by type of suitable storage formations (oil/gas reservoirs, unmineable coal seams, and deep saline reservoirs) across the country is not uniform, some geographic distribution of projects will necessarily occur. In addition, as specific fuel type sources are found in different regions of the country (e.g. PRB coal vs. Illinois #6), projects seeking to use these different fuel inputs will necessarily be located in different parts of the country if they seek to minimize fuel transportation costs. Further, the reservoir characterization activities from each of the DOE-funded Regional Carbon Sequestration Partnerships will provide a diverse set of regionally-specific but well-documented candidate sites on which to site projects conducted by the Corporation, with ample environmental records on which to base associated permitting decisions. Finally, these demonstration projects will be tied to the electric grid, which will have its own set of geographically-specific constraints such as demand for new generation, access to transmission, etc. Given that these projects are likely to be governed by this set of regionally-specific drivers, we do not see a need for a mandated placement of projects. Input from the Technical Advisory Committee will also provide guidance in the selection and placement of CCS projects.

Question 3 – Aside from R&D and large demonstration projects, what thought is being given to the myriad of other issues like liability, easement issues, and geological challenges, which must be addressed?

While in some ways similar to the existing practice of injection of CO₂ for enhanced oil recovery (EOR), commercial-scale geological storage of CO₂ will involve much larger CO₂ volumes, higher expectations of permanence, and more rigorous requirements for monitoring and verification. A June 2007 EPRI report¹ identified a number of key issues

¹ Overview of Geological Storage of CO₂, EPRI Technical Update 1012798, June 2007

(discussed below) which still need to be addressed before geological storage of CO₂ will efficiently receive regulatory approval and gain public acceptance:

- *Caprock Integrity* - The objectives are to develop improved testing, modeling, operating and monitoring systems to assure that the caprock remains a permanent seal for injected CO₂.
- *Injectivity and Storage Capacity* - The challenge is to test advanced CO₂ injection and storage designs that would concentrate the CO₂ plume and increase storage capacity.
- *CO₂ Trapping Mechanisms* - The R&D undertaking is to gain improved understanding of the key mechanisms that would immobilize the CO₂ plume.
- *CO₂ Leakage and Permanence* - The key task is to design highly instrumented monitoring wells to reliably detect CO₂ loss from a formation.
- *CO₂ and Mineral Interactions* - The main challenge is to establish the kinetics of CO₂ and mineral interaction at different concentrations of CO₂ in the formation water.
- *Reliable, Low-Cost Monitoring System* - Of great need are rigorous, quantitative indirect monitoring techniques to track the location and movement of the CO₂ plume.
- *Quick Response Mitigation and Remediation Procedures* - A variety of improved procedures are required for early detection and subsequent remediation of CO₂ leakage.
- *Protection of Potable Water* - Reliable early-warning monitoring systems are needed that can detect the movement of CO₂ before reaching the potable water system, as well as low cost remediation methods to treat CO₂ containing waters.
- *Mineral Rights* - Resolution of the considerable uncertainty is required with respect to mineral rights (e.g. the rights to putting CO₂ in the “pore spaces”) in non-commercial saline formations.
- *Long-Term Liability* - A methodology is needed to assure long-term liability coverage, including procedures and actions required by the storage site operator and owner for transferring long-term liability to a government-type of entity.

EPRI and a number of other U.S. institutions (DOE – NETL, MIT, Carnegie Mellon, and Stanford) are looking at these questions in detail, recognizing that these issues may pose more significant barriers to the commercial deployment of CCS than may be posed by the CCS technologies themselves. Adequate science-based solutions to these challenges will not be developed until substantial experience has been gained with large-scale demonstration CCS projects. While many activities are under way through the DOE Regional Carbon Sequestration Partnerships, accelerated progress would occur with additional CCS demonstration projects of the kind envisioned by H.R. 6258.

Question 4 – How is the “value” of the intellectual property/technology shared among the parties?

The Bill requires that the funds collected “shall be to support commercial-scale demonstration of carbon capture or storage technology projects capable of advancing the

technologies to commercial readiness.” This assumes that the technologies under study have already been developed through basic science, bench-scale and pilot testing to “near commercial” readiness. In that circumstance, the core intellectual property (“IP”) underlying the technology will probably have been developed and be owned by a third party entity. While the treatment of IP in any project depends on the specific facts, we would anticipate that contracts or grants include the following terms, intended both to promote individual ingenuity and invention (by protecting the inventor’s IP position) and to ensure broad public benefit from the commercialization of new technologies.

- The grant or contract would typically protect already-established third party IP rights through restrictive use licenses to project participants, nondisclosure agreements and similar, common contractual provisions.
- The grant or contract could in appropriate circumstances provide that any **new** IP developed through use of the Corporation’s funding would be licensed to the owner of the background IP for a reasonable royalty. It is important, however, to ensure that the public realizes the benefit of the lowest-cost implementation of concepts proved through the demonstrations they are funding. Royalties may not always be consistent with that goal. EPRI’s intellectual property strategy today focuses on determining the most efficient way to bring beneficial research into wide-spread use for the public benefit. The goal of the Corporation, in our view, would be the same.
- The grant or contract would ensure that the Corporation’s scientists, engineers and technologists have broad access to the IP or technology under study, allowing them to independently assess its technical, environmental and economic viability, without revealing third-party IP entitled to protection. The right and ability of the Corporation to publish the independent and unbiased results of its assessment, without interference by the IP owner, is essential to transferring the value of the research to the public which funded it.

Question 5 - What happens if overall climate change legislation is passed in the meantime and we find ourselves waiting for this process and figuring out allocations at the same time?

Passage of overall climate change legislation during implementation of H.R. 6258 should cause no problems because:

- HR 6258 focuses on accelerating the development and early deployment of carbon capture and sequestration (CCS) technologies, which is consistent with the policy objectives of the Dingell-Boucher Discussion Draft, as well as other House and Senate legislation supporting development of technologies to address climate change.
- Implementation of H.R. 6258 will better prepare the electricity industry to meet the requirements of a cap-and-trade program by offering more technology options to reduce greenhouse gas emissions.
- Cong. Dingell and Boucher’s draft provides a broader set of incentives and allowances, which could also help to promote the deployment of CCS

technologies and other greenhouse gas emission reduction efforts, including energy efficiency.

- EPRI's analysis, cited in the written testimony, demonstrates that CCS technologies are an important part of the solution, but ultimately represent one of several viable options for reducing greenhouse gas emissions. Overall legislation may provide additional support to those other options.
- The creation of a Carbon Storage Research Corporation managed by EPRI is unique to H.R. 6258. Therefore, it would not conflict or compete with other institutional attempts to administer overall climate change legislation.
- H.R. 6258 establishes a 180-day timeline for state regulatory written objections to the formation of the Carbon Storage Research Corporation. Following the Referendum by EEI, APPA, and NRECA, the waiting time to form the new Corporation would be relatively insignificant. Therefore, the execution of H.R. 6258 should not impact the implementation of overall climate change legislation.